112th Congress, 1st Session – – – – – – – – – – – – – – House Document 112–66

AMERICAN RIVER WATERSHED, CALIFORNIA: COMMON FEATURES PROJECT: NATOMAS BASIN

COMMUNICATION

FROM

THE ASSISTANT SECRETARY, CIVIL WORKS, THE DEPARTMENT OF THE ARMY

TRANSMITTING

THE COMMON FEATURES PROJECT AUTHORIZED BY SECTION 101(a)(1) OF THE WATER RESOURCES DEVELOPMENT ACT OF 1996

PART 4 OF 4

OCTOBER 25, 2011.—Referred to the Committee on Transportation and Infrastructure and ordered to be printed

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APPENDIX A

Public Outreach and Involvement

DEPARTMENT OF DEFENSE

Department of the Army; Army Corps of Engineers

Notice of Intent To Prepare an Environmental Impact Statement for 408 Permission and 404 Permit to Three Rivers Levee Improvement Authority for the Feather River Levee Repair Project, California, Segment 2

AGENCY: Department of the Army, U.S. Army Corps of Engineers, DoD.

ACTION: Notice of intent.

SUMMARY: The action being taken is the preparation of an Environmental Impact Statement (EIS) for the issuance of both the 408 permission to the Central Valley Flood Protection Board and 404 Permit to Three Rivers Levee Improvement Authority (TRLIA) for their work on the Feather River Levee Repair Project (FRLRP). Under 33 U.S.C. 408, the Chief of Engineers grants permission to alter an existing flood control structure if it is not injurious to the public interest and does not impair the usefulness of such work. Under section 404 of the Clean Water Act, the District Engineer permits the discharge of dredged or fill material into waters of the United States if the discharge meets the requirements of the Environmental Protection Agency's 404(b)(1) guidelines and is not contrary to the public interest. The FRLRP is located in Yuba County, CA. TRLIA is requesting this permission and permit in order to complete construction along the east levee of the Feather River.

DATES: A public scoping meeting will be held March 10, 2008, 6:30 to 8:30 at the Yuba County Government Center, 915 8th Street, Marysville, CA. Send written comments by April 9, 2008 to the address below.

ADDRESSES: Send written comments and suggestions concerning this study to Mr. John Suazo, U.S. Army Corps of Engineers, Sacramento District, Attn: Planning Division (CESPK–PD–R), 1325 J Street, Sacramento, CA 95814. Requests to be placed on the mailing list should also be sent to this address.

FOR FURTHER INFORMATION CONTACT: Questions about the proposed action and EIS should be addressed to John Suazo at (916) 557–6719, e-mail: *john.suazo@usace.army.mil* or by mail to (see **ADDRESSES**).

SUPPLEMENTARY INFORMATION:

1. *Proposed Action.* The U.S. Army Corps of Engineers is preparing an EIS to analyze the impacts of the work proposed by TRLIA from the implementation of the FRLRP, Segment 2. The FRLRP, Segment 2 is being constructed by TRLIA to improve flood protection to portions of Yuba County and Reclamation District (RD) 784.

2. *Alternatives.* The EIS will address an array of flood control improvement alternatives along Segment 2. Alternatives analyzed during the investigation will include a combination of one or more flood protection measures. These measures include seepage berms, stability berms, setback levees, seepage cutoff walls, and relocation of a pump station.

3. *Scoping Process.* a. The Corps has initiated a process to involve concerned individuals, and local, State, and Federal agencies. A public scoping meeting will be held on March 10, 2008 to present information to the public and to receive comments from the public.

b. Significant issues to be analyzed in depth in the EIS include effects on hydraulic, wetlands and other waters of the U.S., vegetation and wildlife resources, special-statns species, cultural resources, land use, fisheries, water quality, air quality, transportation, and socioeconomics; and cumulative effects of related projects in the study area.

c. The Corps is consulting with the State Historic Preservation Officer to comply with the National Historic Preservation Act, and the National Marine Fisheries Service and the U.S. Fish and Wildlife Service to comply with the Endangered Species Act. Coordination with the National Marine Fisheries Service has been completed; coordination with U.S. Fish and Wildlife Service is still ongoing.

d. A 45-day public review period will be provided for individuals and agencies to review and comment on the draft EIS. All interested parties are encouraged to respond to this notice and provide a current address if they wish to be notified of the draft EIS circulation.

4. *Availability.* The draft EIS is scheduled to be available for public review and comment in early 2008.

Dated: February 22, 2008.

Thomas C. Chapman,

COL, EN, Commanding.

[FR Doc. E8–3919 Filed 2–28–08; 8:45 am]

BILLING CODE 3710–EZ–P

DEPARTMENT OF DEFENSE

Department of the Army; Army Corps of Engineers

Notice of Intent To Prepare an Environmental Impact Statement for the American River Common Features General Reevaluation Report, Sacramento, CA

AGENCY: Department of the Army, U.S. Army Corps of Engineers; DOD.

ACTION: Notice of intent.

SUMMARY: The action being taken is the preparation of an environmental impact statement (EIS) for the American River Common Features General Reevaluation Report (GRR). The Common Features Project GRR will re-evaluate the currently authorized plan as well as develop and evaluate other viable alternatives, including a locally-preferred plan, with the goal of identifying a comprehensive plan that will lower the risk of flooding in and around the City of Sacramento. The Common Features Project GRR is located in Sacramento, Sutter and Yolo Counties, CA.

DATES: A series of public scoping meetings will be held as follows:

1. March 5, 2008, 5 to 7 p.m. at The Elk's Lodge.
2. March 6, 2008, 5 to 7 p.m. at Arden Park Commnnity Center, Room A.
3. March 10, 2008, 3 to 6 p.m. at The Library Galleria East Meeting Room.
4. March 13, 2008, 5 to 7 p.m. at The Sierra Health Foundation.

Send written comments by April 11, 2008 to the address below.

ADDRESSES: Written comments and suggestions concerning this study may be submitted to Ms. Elizabeth Holland, U.S. Army Corps of Engineers, Sacramento District, Attn: Planning Division (CESPK–PD–R), 1325 J Street, Sacramento, CA 95814. Requests to be placed on the mailing list should also be sent to this address. The location of the pnblic meetings is as follows; The Elks Lodge, 6446 Riverside Blvd., Sacramento, CA; Arden Park Community Center, 1000 La Sierra Drive, Sacramento, CA; Library Galleria, 828 "I" Street, Sacramento, CA; and Sierra Health Foundation, 1321 Garden Highway, Sacramento, CA.

FOR FURTHER INFORMATION CONTACT: Questions about the proposed action and EIS should be addressed to Liz Holland at (916) 557–6763, e-mail *Elizabeth.g.holland@usace.army.mil* or by mail to (see **ADDRESSES**).

SUPPLEMENTARY INFORMATION:

1. *Proposed Action.* The U.S. Army Corps of Engineers is preparing an EIS

to analyze the impacts of a range of alternatives that would lessen the risk of flooding in and around the City of Sacramento.

2. *Alternatives.* The EIS will address an array of flood control improvement alternatives that are intended to reduce flood risk within the project area. Alternatives analyzed during the investigation will include a combination of one or more flood protection measures. These measures include levee improvements (e.g., seepage berms, adjacent setback levees, seepage wells, seepage cutoff walls), revisions to system hydraulics through setbacks, levee raises, and/or more diversion of flow into the bypass system, and possible use of upstream lands for detention.

3. *Scoping Process.* a. A series of public scoping meeting will be held in early March, 2008 to present information to the public and to receive comments from the public. These meetings are intended to initiate the process to involve concerned individuals, and local, State, and Federal agencies.

b. Significant issues to be analyzed in depth in the EIS include effects on hydraulics, wetlands and other waters of the U.S., vegetation and wildlife resources, special-status species, esthetics, cultural resources, recreation, land use, fisheries, water quality, air quality, transportation, and socioeconomics; and cumulative effects of related projects in the study area.

c. The Corps is consulting with the State Historic Preservation Officer to comply with the National Historic Preservation Act and the U.S. Fish and Wildlife Service and National Marine Fisheries Service to comply with the Endangered Species Act. The Corps is also coordinating with the U.S. Fish and Wildlife Service to comply with the Fish and Wildlife Coordination Act.

d. A 45-day public review period will be provided for individuals and agencies to review and comment on the draft EIS. All interested parties are encouraged to respond to this notice and provide a current address if they wish to be notified of the draft EIS circulation.

4. *Availability.* The draft EIS is scheduled to be available for public review and comment in spring 2010.

Dated: February 15, 2008.

Thomas C. Chapman,

COL, EN, Commanding.

[FR Doc. E8–3922 Filed 2–28–08; 8:45 am]

BILLING CODE 3710–EZ–P

DEPARTMENT OF DEFENSE

Department of the Navy

Meeting of the Ocean Research and Resources Advisory Panel

AGENCY: Department of the Navy, DoD.

ACTION: Notice.

SUMMARY: The Ocean Research and Resources Advisory Panel (ORRAP) will meet to discuss National Ocean Research Leadership Council (NORLC) and Interagency Committee on Ocean Science and Resource Management Integration (ICOSRMI) activities. All sessions of the meeting will be open to the public.

DATES: The meeting will be held on Tuesday, April 15, 2008 from 8 a.m. to 5:30 p.m. and Wednesday, April 16, 2008 from 8 a.m. to 1:30 p.m.

ADDRESSES: The meetings will be held at the Consortium for Ocean Leadership located at 1201 New York Ave, Suite 420, Washington, DC.

FOR FURTHER INFORMATION CONTACT: Dr. Charles L. Vincent, Office of Naval Research, 875 North Randolph Street, Suite 1425, Arlington, VA 22203–1995, telephone: 703–696–4118.

SUPPLEMENTARY INFORMATION: This notice is provided in accordance with the provisions of the Federal Advisory Committee Act (5 U.S.C. App. 2). The meeting will include discussions on ocean research to applications, ocean observing, professional certification programs, and other current issues in the ocean science and resource management communities. In order to maintain the meeting time schedule, members of the public will he limited in their time to speak to the Panel. Members of the public should submit written comments at least one week prior to the meeting to Dr. Charles L. Vincent, Office of Naval Research, 875 North Randolph Street, Suite 1425, Arlington, VA 22203–1995, telephone: 703–696–4118.

Dated: February 22, 2008.

T.M. Cruz,

Lieutenant, Office of the Judge Advocate General, U.S. Navy, Federal Register Liaison Officer.

[FR Doc. E8–3893 Filed 2–28–08; 8:45 am]

BILLING CODE 3810–FF–P

DEPARTMENT OF DEFENSE

Department of the Navy

[USN–2008–0008]

Privacy Act of 1974; System of Records

AGENCY: Department of the Navy, DoD.

ACTION: Notice to Amend a System of Records.

SUMMARY: The Department of the Navy is amending a system of records notice in its existing inventory of record systems subject to the Privacy Act of 1974, (5 U.S.C. 552a), as amended.

DATES: This proposed action will be effective without further notice on Marcb 31, 2008 unless comments are received wbich result in a contrary determination.

ADDRESSES: Send comments to the Department of the Navy, PA/FOIA Policy Branch, Chief of Naval Operations (DNS–36), 2000 Navy Pentagon, Washington, DC 20350–2000.

FOR FURTHER INFORMATION CONTACT: Mrs. Doris Lama at (202) 685–6545.

SUPPLEMENTARY INFORMATION: The Department of the Navy systems of records notices subject to the Privacy Act of 1974, (5 U.S.C. 552a), as amended, have been published in the **Federal Register** and are available from the address above.

The specific changes to the record system being amended are set forth below followed by the notice, as amended, published in its entirety. The proposed amendments are not within the purview of subsection (r) of the Privacy Act of 1974, (5 U.S.C. 552a), as amended, which requires the submission of a new or altered system report.

Dated: February 25, 2008.

L.M. Bynum,

Alternate OSD Federal Register Liaison Officer, Department of Defense.

N01000–3

SYSTEM NAME:

Navy Individual Service Review Board (ISRB) Proceedings Application File (March 18, 1997, 62 FR 12806).

CHANGES:

SYSTEM NAME:

Delete entry and replace with "DoD Civilian/Military Service Review Board."

SYSTEM LOCATION:

Delete entry and replace with "Navy Personnel Command (PERS–312), 5720

Comments Received

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF TRANSPORTATION
DISTRICT 3 – SACRAMENTO AREA OFFICE
VENTURE OAKS, MS 15
P. O. BOX 942874
SACRAMENTO, CA 94274-0001
PHONE (916) 274-0614
FAX (916) 274-0648
TTY (530) 741-4509

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March 26, 2008

08SAC0046
03-SAC- 5 / 160 / 50 / 51 / 80
American River Common Features General Evaluation Report
Notice of Preparation
SCH# 2005072046

Ms. Annalena Bronson
Central Valley Flood Protection Board
3310 El Camino Avenue, Room LL-40
Sacramento, CA 95821

Dear Ms. Bronson:

We have reviewed the American River Common Features General Re-evaluation Report Notice of Preparation documentation. Our comments are as follows:

- Caltrans' prior comments in our letters of July 27, 2005 and October 3, 2002 (copies enclosed) are still valid.

- In carrying out this project's levee improvement activities, it is very likely that truck haul routes used in transporting soil, rock, borrow and cleared vegetation disposal materials to and from the various proposed sites along the American and Sacramento Rivers and Natomas Cross Canal and Natomas East Main Drainage Canal could involve the use of Interstate 5, State Route (SR) 160, U.S. 50, SR51, and I-80. We note on page 2 in the "Study Area" discussion and on Page 6's map of the project levee areas that this "project's" scope is quite large. Clarification should be made regarding which of the multiple levee improvement areas will use trucks and which will use waterside barges to transport work materials.

- If off-site levee materials are being transported by truck to these work sites to modify levee bank areas and are using adjoining State roadway facilities, a project Traffic Management Plan (TMP) will be necessary. The TMP should be prepared for our review and include appropriate strategies to mitigate construction traffic impacts to the nearby roadway intersections, freeway interchanges, and mainlines. Truck haul routes and points of access to State roadway facilities used should be clarified in the plan. If Garden Highway will be used as an access to some of the improvement areas, the TMP should explain how Garden Highway is to be accessed, whether from I-5 or via a local road network. The project's individual levee site work plan dates should also be provided, if known, and the truck trip volumes. We recommend truck-hauling operations avoid peak traffic periods (6-10 AM and 3-7 PM) whenever possible. The Caltrans TMP Guidelines are enclosed for your use. For assistance, please contact Paul Wilkinson, the Caltrans District 3 Traffic Manager (DTM), at (916) 859-7978.

- If electronic warning signs are provided within State right-of-way at work sites to alert the traveling public of trucks entering or leaving State highways, an encroachment permit will be required. For permit assistance, please contact Julio Elvir at (530) 741-4204.

- Caltrans is interested in the work zone proximity of this project's planned levee improvements on the Sacramento River near the system of relief wells and piezometer installations near the downtown Sacramento I-5 freeway and within State property. Freeway Post Mile locations may have been established for these well and piezometer locations when they were installed to help prevent levee seepage near the subgrade section of Interstate 5 (more commonly called, "the Boat Section"). The distance of well locations from freeway bridge footings might have been specified as well to help locate where they are. We understand that Encroachment Permit # 0304-NMC-0918 was obtained from Caltrans District 3 in prior years when this installation work was done. Caltrans wishes to make sure that these wells and piezometer locations are not disturbed during the levee bank work. Preliminary planning installation maps, showing where the wells and piezometers were located in relation to our right-of-way lines and freeway facilities, and "As Built" maps, were prepared for Caltrans to update its right of way records of the Interstate 5 freeway corridor.

If you have any questions regarding these comments, please contact Ken Champion at (916) 274-0615.

Sincerely,

Dawn Cheser, Office Chief
Office of Transportation Planning - South

Enclosure

c: Scott Morgan, State Clearinghouse

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF TRANSPORTATION
DISTRICT 3 – SACRAMENTO AREA OFFICE
VENTURE OAKS, MS 15
P. O. BOX 942874
SACRAMENTO, CA 94274-0001
PHONE (916) 274-0614
FAX (916) 274-0648
TTY (530) 741-4509

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July 27, 2005

05SAC0112
03-SAC- 99 PM 35.370
American River Watershed Project Common Features
Sacramento River East Levee & Natomas Cross Canal Levee Modifications
Notice of Preparation
SCH# 2005072046

Ms. Annalena Bronson
The Reclamation Board
3310 El Camino Avenue, Room 110
Sacramento, CA 95821

Dear Ms. Bronson:

We have reviewed the Sacramento River East and Natomas Cross Canal Levee Modifications Project Notice Of Preparation documentation. We look forward to reviewing the draft Environmental Impact Report. Our comments are as follows:

- Our comments provided in our letter of October 3, 2002 (copy enclosed) are still valid.

- The document map of the Sacramento River work site shows Elverta and Power Line Roads as potential access roadways. If off-site levee materials are being transported by truck to this work site to modify these levees and are using adjoining State roadway facilities, a project Traffic Management Plan (TMP) will be necessary. The TMP should be prepared for our review and include appropriate strategies to mitigate construction traffic impacts to the nearby State Route 99/Elverta Road intersection and other nearby freeway interchanges. The TMP should also clarify whether Interstate 5 would be used via Power Line Road. The Caltrans TMP Guidelines are enclosed for your use. Truck haul routes and points of access to State roadway facilities used should be clarified in the plan. The planned project initiation and completion dates should also be noted, as well as truck trip volumes, daily hours of operations, and whether electronic warning signs are provided to alert the traveling public. We recommend truck hauling operations during non-peak traffic periods.

Please provide our office with a copy of the draft TMP requested above. If you have any questions regarding these comments, please contact Ken Champion at (916) 274-0615.

Sincerely,

ORIGINAL SIGNED BY
KATHERINE EASTHAM, Chief
Office of Transportation Planning - Southwest

Enclosures

c: Scott Morgan, State Clearinghouse

Sutter County Community Services
1130 Civic Center Boulevard, Suite E
Yuba City, CA 95993

bc: John Holzhauser, Office of Traffic Operations – Sacramento
Michelle Millette, District 3 – Sutter County LDR Coordinator
Ken Champion, District 3 – Sacramento County LDR Coordinator

KC/ kc

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY GRAY DAVIS, Governor

DEPARTMENT OF TRANSPORTATION
DISTRICT 3 – Sacramento Area Office
Venture Oaks, MS 15
P.O. Box 942874
Sacramento, CA 94274-0001
PHONE (916) 274-0638
FAX (916) 274-0648
TTY (530) 741-4509

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October 3, 2002

02SAC0114
03-SAC- 99
American River Watershed Project (Common Features)
California Sacramento River East Levee/Natomas Cross Canal Levee Modifications
Notice of Preparation
SCH#1999052026

Ms. Karen Enstrom
Reclamation Board
1416 Ninth Street, Room 1601
Sacramento, CA 95814

Dear Ms. Enstrom:

Thank you for the opportunity to comment on the above mentioned project. Our comments are as follows:

- The project documentation should provide a map (s) describing the project "activity areas" and any nearby State highway facilities in order to clarify the scope of project and potential impacted highway and bridge structure areas.

- Any flood control improvements and protection measures located near State right-of-way should be identified and Caltrans should be notified. Any work conducted within State right-of-way will require an encroachment permit. For assistance, Bruce Capaul at (530) 741-4408 should be contacted.

- Haul routes for transporting soil and construction materials and any State highways used should be provided in the project discussion.

Please provide our office with the requested information, a copy of the DEIR, copies

of draft mitigation measures, and any further action regarding this project. If you have any questions regarding these comments, please contact Ken Champion at (916) 274-0615.

Sincerely,

ORIGINAL SIGNED BY

JEFFREY PULVERMAN, Chief
Office of Regional Planning

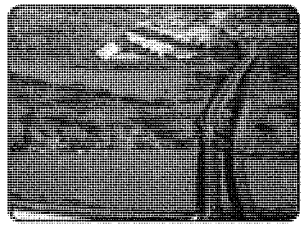
bc: John Holzhauser, Office of Traffic Operations – Sacramento
Karen Peneschi, Office of Advance and System Planning
Steve Hetland, Special Funded - Sacramento
Jim Adams, Office of Right of Way Engineering
Tom Ganyon, Office of Right of Way-Local Assistance
Dennis Jagoda, Hydraulics
Bruce Capaul, Permits
KenChampion, District 3 – Sacramento County LDR Coordinator

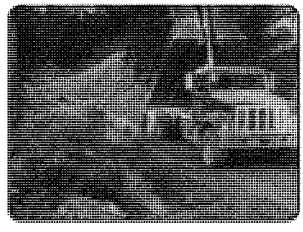
KC/ kc

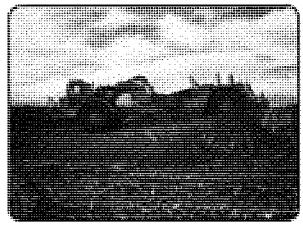
Posters from March 2008 Scoping Meetings

About the Re-evaluation Report

Flooding is a long-standing problem facing the Sacramento area. The recent floods of 1986 and 1997 devastated several communities, including homes, businesses, orchards and farmlands. In 1996 the Water Resources Development Act authorized the American River Common Features Project (CFP), designed to lessen flood risks in Sacramento. Since the authorization of the CFP 12 years ago, a great deal of progress has been made to improve the flood control system. However, new information and issues have been identified and new engineering standards have been instituted. As a result, there are continuing concerns about the integrity of Sacramento's flood control management system.



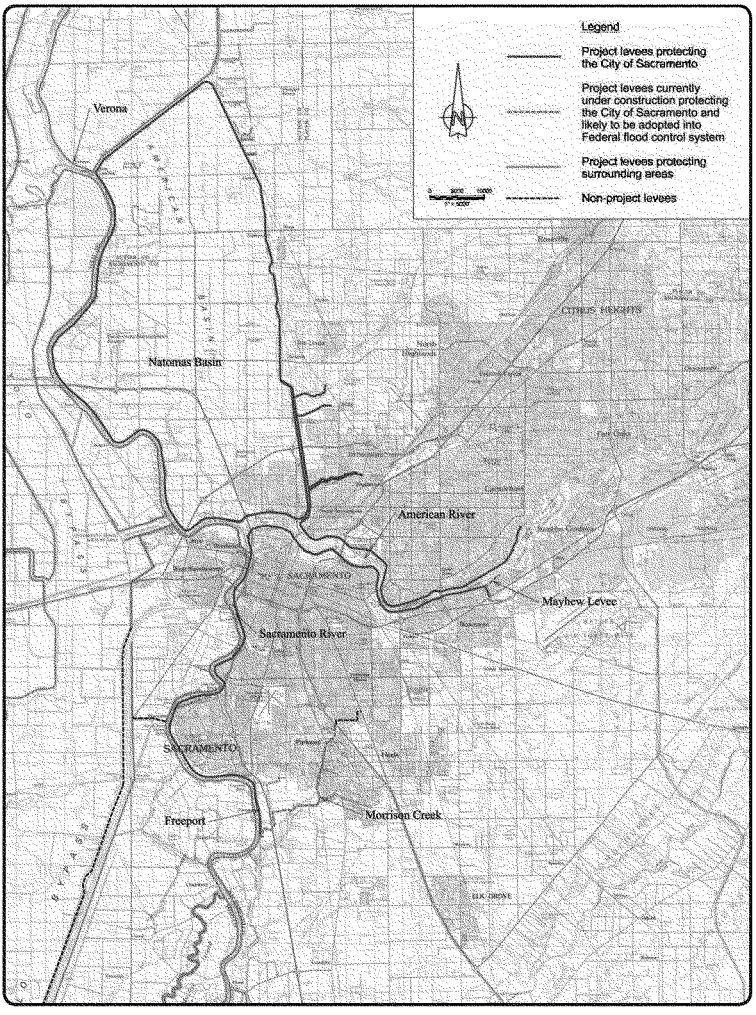




As a result, the U.S. Army Corps of Engineers plans to conduct a re-evaluation report called the American River Common Features General Re-evaluation Report (Common Features GRR) that will look at the existing CFP with the purpose of identifying alternatives to lower the risk of flooding to the City of Sacramento. The Common Features GRR will examine the City's flood management system as a whole, rather than on a site-by-site, project-by-project basis.

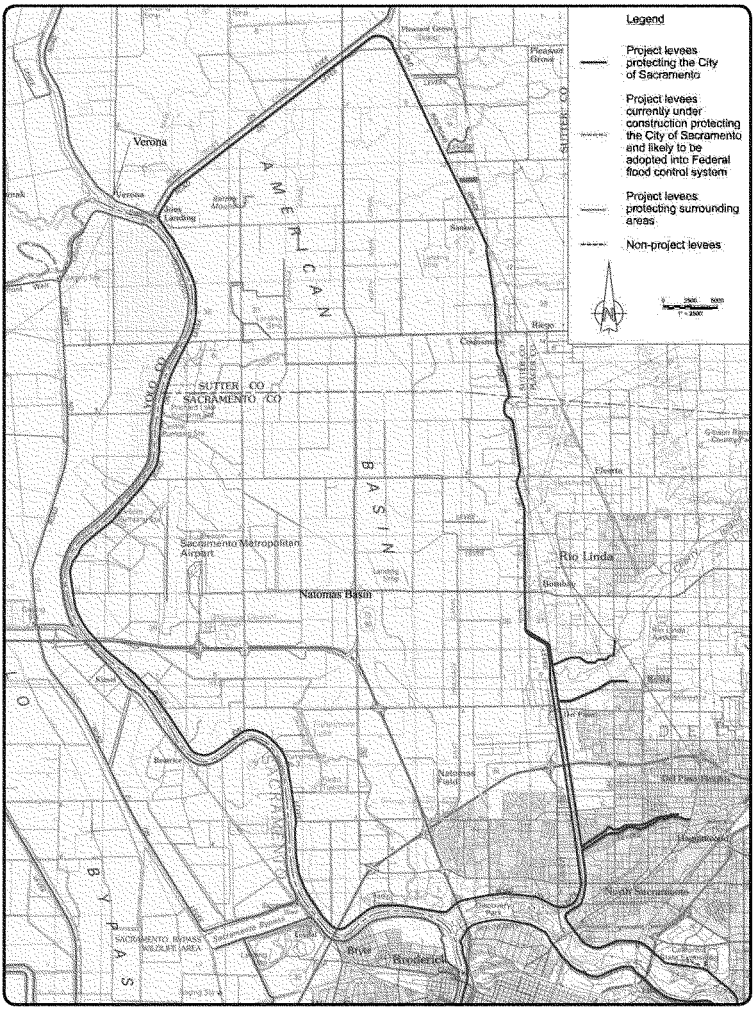
The purpose of the Common Features GRR is to review the CFP with the aim of making recommendations for changes or additions that will effectively and efficiently reduce flood risks within the American River Watershed. This includes the flood control features along the American and Sacramento Rivers that provide protection to the City of Sacramento and surrounding areas.

In a separate effort, the Sacramento Area Flood Control Agency (SAFCA) is currently working on a flood control program specific to Natomas to provide the area with 100-year flood protection as soon as possible, and ultimately, in cooperation with this study, 200-year protection. These improvements could be completed before the Common Features GRR is conducted because of the high risk of catastrophic flooding in Natomas. It is anticipated that SAFCA's program will eventually be incorporated into the Common Features GRR.


Legend
Project levees protecting the City of Sacramento
Project levees currently under construction protecting the City of Sacramento and likely to be adopted into Federal flood control system
Project levees protecting surrounding areas
Non-project levees
Verona
Natomas Basin
American River
Mayhew Levee
Sacramento River
SACRAMENTO
Freeport
Morrison Creek
CITRUS HEIGHTS

Study Area Detail
American River Common Features General Re-evaluation Report
Lower American River

Natomas Basin

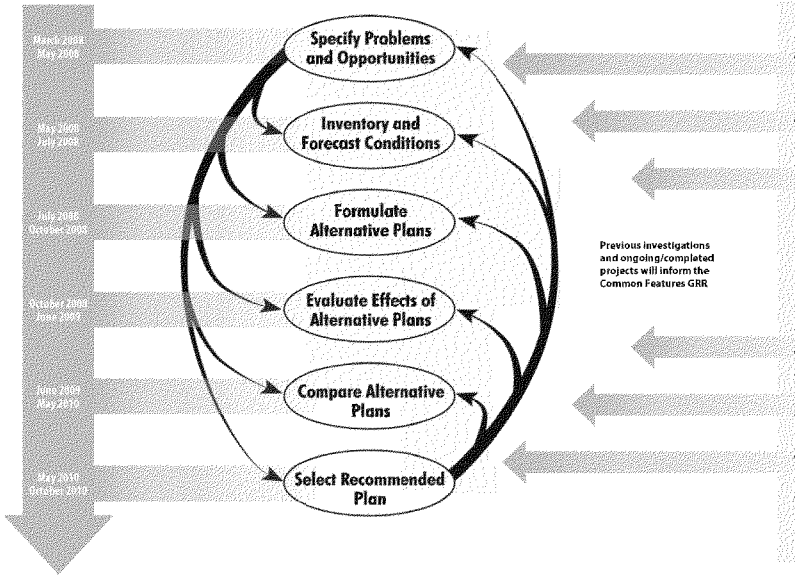


Sacramento River from American River to Freeport

Planning Process

The Corps' "Beehive" diagram represents the six planning steps and the iterative process of Corps project planning.

Corps decision making is generally based on the accomplishment and documentation of all of these steps. It is important to stress the iterative nature of this process. As more information is acquired and developed, it may be necessary to reiterate some of the previous steps. The six steps, though presented and discussed in a sequential manner for ease of understanding, usually occur iteratively and sometimes concurrently. Iterations of steps are conducted as necessary to formulate efficient, effective, complete and acceptable plans.



Completed and Ongoing Projects

A great deal of progress has been made since the major flood events in 1986 and 1997. The projects listed below are examples of recent efforts to increase the level of flood protection in the Sacramento area. These efforts will inform and be coordinated with the Common Features GRR planning process.

American River Common Features Projects

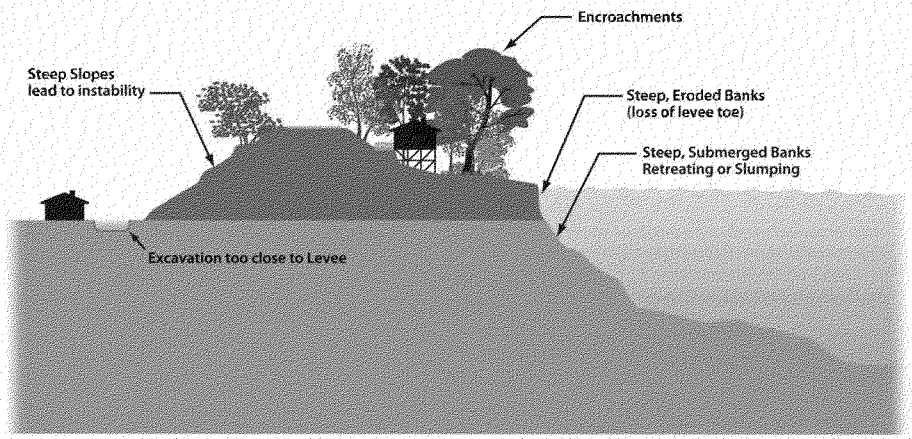
- Slurry Wall Construction along the Lower American River (24 miles completed)
- Upstream Telemetry Gages (completed)
- Erosion Protection (4 sites completed)
- Jet Grouting/Alternative Methods (ongoing)
- Seepage Remediation along the Sacramento River (completed)
- Mayhew Levee Raise and Drain Closure (under construction)
- Levee Raising and Strengthening (various sites remaining)

Other Major Flood Protection Projects

- Folsom Dam Reoperation (ongoing)
- Natomas Levee Improvement Project (ongoing)
- Sacramento River Bank Protection Project (Corps/CVFPB) (ongoing)
- West Sacramento Levee Improvement Project (Corps/City of West Sacramento) (ongoing)
- South Sacramento Streams Group Project (Corps/SAFCA) (ongoing)
- Joint Federal Project at Folsom Dam (Corps/Bureau of Reclamation/CVFPB/SAFCA)

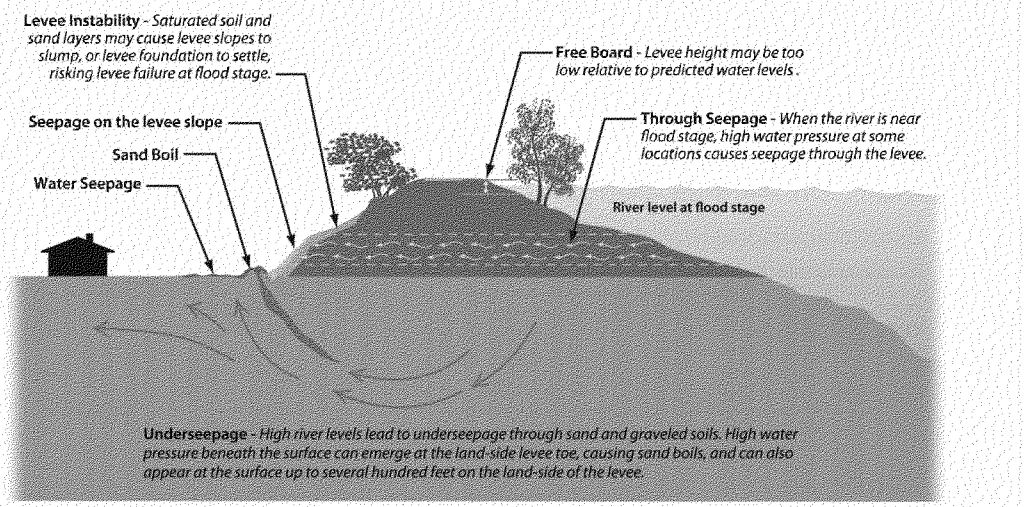
Typical Levee Deficiencies

Encroachments, Unstable Slopes, Erosion



- **Unstable Slopes - irregular or overly steep slopes compromise the levee structure**
- Encroachments including pools, homes, vegetation
- Erosion - water flow, wakes and waves, remove soil material, degrading the levee

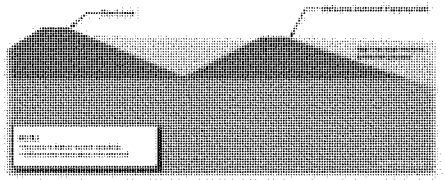
Seepage and Inadequate Freeboard



- **Inadequate Freeboard - levee height may be too low relative to predicted water levels**

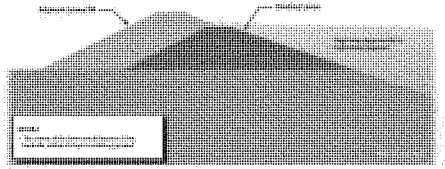
IMPROVEMENTS TO FLOOD CONTROL FEATURES THAT ADDRESS STABILITY, EROSION AND FREEBOARD

Setback Levee (stability, seepage, & freeboard)



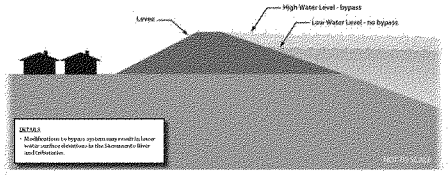
Concept:
A new levee is built toward the landside of an existing levee where the existing levee is not readily repairable or where more flooding capacity is desired.

Adjacent Levee Raise (stability, seepage, & freeboard)



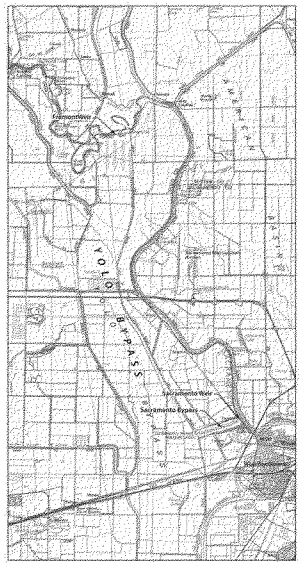
Concept:
A new embankment strengthens the existing levee and enlarges the slopes.

Diversion to Bypass System (seepage, stability, & freeboard)



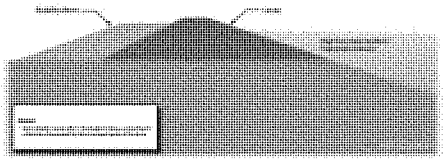
Concept:
Reducing water surface elevations by modifying diversion to the bypass system may also reduce seepage and stability issues by reducing hydrostatic pressure. Lower water surface elevations will also alleviate freeboard issues.

Diversion to Bypass System
(seepage, stability, & freeboard)



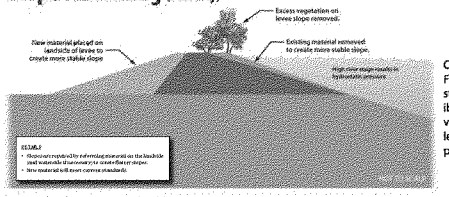
IMPROVEMENTS TO LEVEES THAT ADDRESS STABILITY, EROSION AND FREEBOARD

Stability Berm (stability)



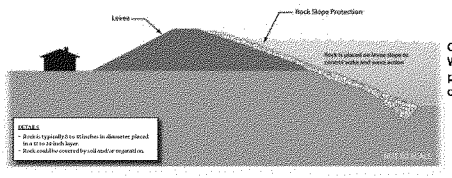
Concept:
Provides additional support to levee to increase strength.

Slope Flattening (stability)



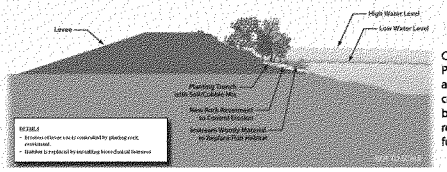
Concept:
Flatter slopes are more stable and less susceptible to erosion. Excess vegetation may inhibit levee maintenance and performance monitoring.

Rock Slope Protection (erosion)



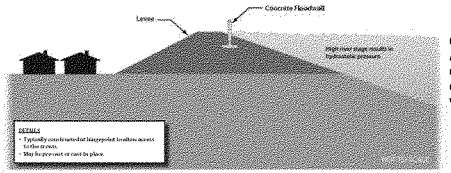
Concept:
Water-side erosion is prevented by placement of rock.

Biotechnical Erosion Protection (erosion)



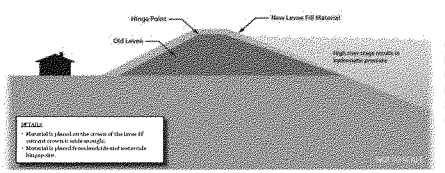
Concept:
Placing rock revetment at toe of eroding levee controls erosion. Installing biotechnical features replaces habitat and further controls erosion.

Flood Wall (freeboard)



Concept:
Additional levee height may be achieved through construction of a concrete wall on the levee crown.

In-Place Levee Raise (freeboard)

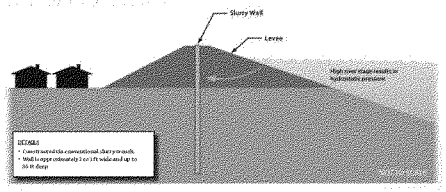


Concept:
Flood protection is increased by adding material to crown and levee slope (land or water side).

U.S. Army Corps of Engineers

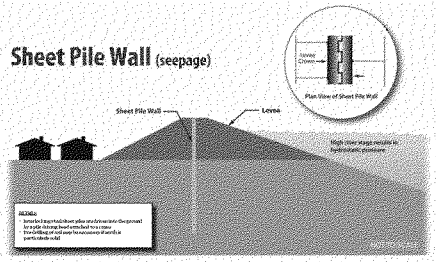
IMPROVEMENTS TO LEVEES THAT ADDRESS SEEPAGE

Slurry Wall (seepage)



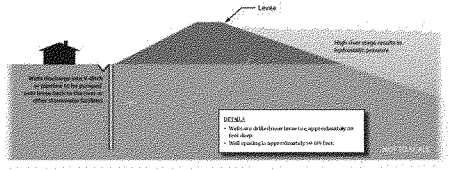
Concept:
Water pressure is contained and dispersed by a low-permeability wall constructed within the levee cross section.

Sheet Pile Wall (seepage)



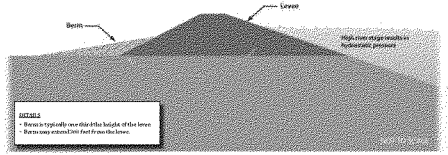
Concept:
Steel panels are driven into the levee core to provide a seepage barrier.

Relief Well (seepage)



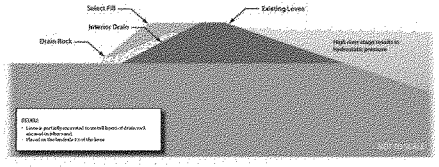
Concept:
Water pressure is relieved via passive wells, which control water discharge into a collection system.

Seepage Berm (seepage)



Concept:
Water pressure is contained and dispersed by a thickened soil layer.

Interior Drain (seepage)



Concept:
Capture any through-seepage and direct it away from the face of the levee.

U.S. Army Corps of Engineers

The process of determining the scope, focus and content of an EIS/EIR is known as "scoping". Scoping is a part of the NEPA/CEQA process in which the general public, interested agencies and stakeholders provide comments to the Lead Agency to help identify the key issues, range of actions, alternatives, and environmental affects to be analyzed in the EIS/EIR.

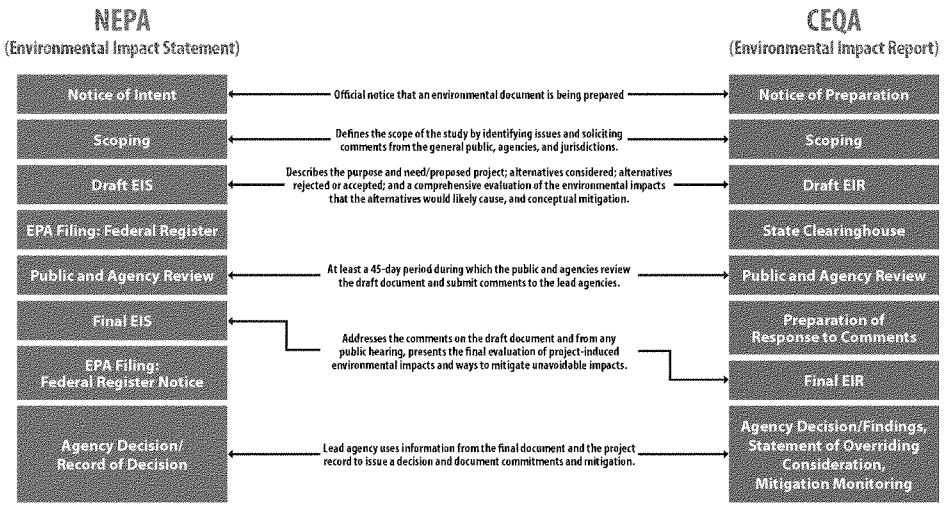
The following issues related to this project have been identified to date:

- Riparian vegetation and habitat effects;
- Cultural resources;
- Flood control and river hydraulic effect;
- Location of flood control infrastructure and effects on land use and access;
- Construction related effects such as those related to transportation, noise, and air quality;
- Economic issues

What is an EIS/EIR?

An EIS (Environmental Impact Statement) and an EIR (Environmental Impact Report) are documents that are required to comply with the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA), respectively. The purpose of these documents is to analyze and disclose a project's potential effects on the natural and human environment and identify conservation measures and alternatives to avoid significant effects.

An EIS is prepared when there is Federal involvement in the project and an EIR is prepared when the project is subject to State or local jurisdiction. A joint document, an EIS/EIR, may be prepared when both a Federal and State agency are involved. The major steps to complying with both acts are outlined below.



SAFCA
Sacramento
Area Flood
Control
Agency

NOTICE OF PREPARATION

To: Agencies and Interested Parties

From: Sacramento Area Flood Control Agency

Date: November 5, 2009

Subject: **Announcement of:**

1) **Notice of Preparation of an Environmental Impact Statement/Environmental Impact Report on the Natomas Post-authorization Change Report/Natomas Levee Improvement Program, Phase 4b Landside Improvements Project;**
2) **Public Scoping Meeting to be held on November 18, 2009; and**
3) **Scoping Comments due by December 4, 2009**

The Sacramento Area Flood Control Agency (SAFCA) and the U.S. Army Corps of Engineers (USACE), Sacramento District, intend to prepare a "joint" environmental impact statement (EIS)/environmental impact report (EIR), consistent with the National Environmental Policy Act (NEPA) (42 United States Code [USC] Section 4321 et seq.) and the California Environmental Quality Act (CEQA) (California Public Resources Code [PRC], Section 21000 et seq.; see also 14 California Code of Regulations [CCR] Sections 15220, 15222 [State CEQA Guidelines]), for the Natomas Post-authorization Change Report (Natomas PACR)/Natomas Levee Improvement Program (NLIP), Phase 4b Landside Improvements Project (Phase 4b Project) in the Natomas Basin in Sacramento and Sutter Counties, California. USACE, Sacramento District, will be the Federal lead agency for purposes of complying with NEPA, and SAFCA will be the state lead agency for compliance with CEQA.

PURPOSE OF THE NOTICE OF PREPARATION

In accordance with the State CEQA Guidelines (CCR Section 15082), SAFCA has prepared this notice of preparation (NOP) to inform responsible and trustee agencies and interested parties that an EIS/EIR will be prepared. The purpose of an NOP is to provide sufficient information about the proposed project and its potential environmental impacts to allow the Governor's Office of Planning and Research (OPR), responsible and trustee agencies, Federal agencies involved in approving or funding a project, and interested parties the opportunity to provide a meaningful response related to the scope and content of the EIS/EIR, including the significant environmental issues, reasonable alternatives, and mitigation measures that the responsible or trustee agency, or the OPR, will need to have explored in the EIS/EIR (State CEQA Guidelines CCR Section 15082[b]).

The project location, description, and probable environmental effects of the proposed project are presented below. An initial study has not been prepared because the EIS/EIR will address all issue areas and it is already known that the proposed project could have a significant effect on the environment. The EIS/EIR will also include feasible mitigation measures, where available, and consideration of a reasonable range of alternatives to avoid or substantially reduce the proposed project's significant adverse environmental impacts.

The purposes of this NOP are to:

1. briefly describe the proposed project and the anticipated content of the EIS/EIR to be prepared for the proposed project;

2. announce the public scoping meeting to facilitate public input and to be held: November 18, 2009, from 4:30 to 6:30 p.m. at South Natomas Community Center (Activity Room) located at 2921 Truxel Road in Sacramento, California; and

3. solicit input by December 4, 2009, from Federal, state, regional, and local agencies, and from interested organizations and individuals about the content and scope of the EIS/EIR, including the alternatives to be addressed and the potentially significant environmental impacts.

INTRODUCTION TO THE PHASE 4b PROJECT

The Phase 4b Project consists of improvements to a portion of the Natomas Basin's perimeter levee system (see **Exhibits 1, 2,** and **3** below) in the City of Sacramento and in Sutter and Sacramento Counties, California, associated landscape and irrigation/drainage infrastructure modifications, and habitat creation and management. A more detailed project description is provided below.

To implement the Phase 4b Project, SAFCA is requesting permission from USACE pursuant to Section 14 of the Rivers and Harbors Act of 1899 (33 United States Code [USC] 408, referred to as "Section 408") for alteration of Federal project levees; Section 404 of the Clean Water Act (33 USC 1344) for placement of fill into jurisdictional waters of the United States; and Section 10 of the Rivers and Harbors Act of 1899 (33 USC 403) for work performed in, over, or under navigable waters of the United States (such as excavation of material from or deposition of material into navigable waters).

SAFCA may also need to obtain several state, regional, and local approvals or permits to implement the Phase 4b Project in the event that USACE does not receive authorization to construct the Phase 4b Project. These include: CVFPB encroachment permit; California Surface Mining and Reclamation Act permit; Clean Water Act Section 401 water quality certification, Clean Water Act Section 402 National Pollutant Discharge Elimination System permit; California Fish and Game Code Section 2081 incidental take authorization; California Fish and Game Code Section 1602 streambed alteration agreement; encroachment permits from the California Department of Transportation, Sacramento County, Sutter County, and City of Sacramento; and authority to construct authorization from the Sacramento Metropolitan Air Quality Management District and the Feather River Air Quality Management District.

RELATIONSHIP TO OTHER U.S. ARMY CORPS OF ENGINEERS PLANNING DOCUMENTS

The EIS/EIR will support the approval of USACE's Natomas Basin General Re-evaluation Report (GRR) and Natomas PACR. The EIS/EIR will also support the final project phase of the NLIP, the Phase 4b Project.

The Natomas GRR covers the Sacramento Metropolitan Area. The American River drainage basin covers about 2,100 square miles northeast of Sacramento and includes portions of Placer, El Dorado, Sutter, and Sacramento Counties. The Natomas GRR considers flood risk management for the Natomas Basin. The GRR will consider the existing flood risk reduction projects together as a system, with the purpose of developing analysis tools that consider the flood risk reduction system as a whole and identifying a comprehensive plan that will lower the flood risk in Sacramento. Accordingly, USACE, SAFCA, and the California Department of Water Resources (DWR) seek to integrate planning, design, and implementation of enhanced flood risk reduction measures within the Natomas Basin study area.

The Natomas GRR will ultimately be incorporated into a larger and more broadly scoped investigation called the American River Common Features Project (Common Features Project) GRR. The Common Features Project GRR will consider the Sacramento River downstream of the American River to Freeport where Beach Lake levee forms the southern flank of the City of Sacramento's flood defenses. It should be noted that there are three basins in the GRR analysis that will be considered in the future: the American River-North Basin, Natomas Basin, and

the Greater Sacramento Basin located south of the American River. However, only the Natomas Basin is the subject of this EIS/EIR.

The Natomas GRR schedule has been accelerated due to the risk of levee failure in the Natomas Basin. The accelerated schedule will allow USACE to begin construction in 2011 and reduce the risk of flooding and billions of dollars of property damage in the Natomas Basin.

The EIS/EIR will summarize the NLIP project phases already completed by SAFCA and how the NLIP relates to USACE's Natomas Basin GRR and PACR. The EIS/EIR will be used for Natomas Basin GRR approval, for preparation of the Natomas PACR, and to support implementation of the Phase 4b Project. USACE plans to implement the Phase 4b Project. In the event the Natomas PACR is not approved by Congress, however, the EIS/EIR will support SAFCA's implementation of the Phase 4b Project should SAFCA choose to proceed without Federal participation.

RELATIONSHIP TO THE NATOMAS LEVEE IMPROVEMENT PROGRAM

The Phase 4b Project is a subphase of one of the four project phases of the NLIP Landside Improvements Project. The overall purpose of the NLIP is to bring the entire 42-mile Natomas Basin perimeter levee system into compliance with applicable Federal and state standards for levees protecting urban areas. The NLIP was first evaluated in SAFCA's programmatic *EIR on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area* (State Clearinghouse No. 2006072098). Volume II of that EIR contained a project-level evaluation of the Natomas Cross Canal South Levee Phase 1 Improvements (Phase 1 Project).

In 2007, SAFCA prepared the *EIR on the NLIP Landside Improvements Project* (Phase 2 EIR, State Clearinghouse No. 2007062016), which covers the three additional phases of "landside" improvements to the levees protecting the Natomas Basin, including the Phase 2 Project, Phase 3 Project, and Phase 4 Project. The Phase 2 Project was analyzed at a project-level and the remainder of the Landside Improvements Project (Phase 3 and 4 Projects) was analyzed at a program-level in the Phase 2 EIR. On November 29, 2007, the SAFCA Board of Directors certified the EIR and approved the Phase 2 Project. Following completion of the Phase 2 EIR, USACE prepared an EIS to meet USACE's NEPA requirements to support USACE's decisions on the permissions and permitting under Sections 408, 404, and 10. A record of decision (ROD) was signed by USACE in January 2009. The Phase 2 EIS also contained a project-level analysis of the Phase 2 Project and a program-level analysis of the Phase 3 and 4 Projects. Since certification of the Phase 2 EIR, SAFCA made modifications and refinements to the design of the Phase 2 Project. A supplemental EIR (SEIR) was prepared by SAFCA to evaluate these modifications, which the SAFCA Board of Directors certified in January 2009, at which time the Board also approved the modifications to the Phase 2 Project.

The Phase 3 Project was analyzed at a project-level in the *DEIS/DEIR on the NLIP Phase 3 Landside Improvements Project* (Phase 3 DEIS/DEIR, State Clearinghouse No. 2008072060), which was released for public review on February 13, 2009. Following public review, SAFCA prepared an FEIR to provide responses to comments on the Phase 3 DEIS/DEIR. The SAFCA Board of Directors certified the FEIR and approved the Phase 3 Project in May 2009. Separately, USACE prepared an FEIS to provide responses to comments received on the Phase 3 DEIS/DEIR; the Phase 3 FEIS was issued for public review in August 2009. After consideration of all comments received, USACE will consider whether to grant Section 408 permission, which will be documented in a ROD, in December 2009/January 2010. To construct the Phase 3 Project with minimal interruption of and conflict with drainage/irrigation services and special-status wildlife habitat (giant garter snake), some Phase 3 Project components (canal work, utility relocation, vegetation removal, and demolition of structures) need to be constructed in late 2009 and early 2010 in advance of the Phase 3 Project's major levee construction, which would begin in 2010. To facilitate this staged construction, a staged permitting approach was implemented for the Phase 3 Project. Specifically, irrigation and drainage infrastructure (termed the Phase 3a Project) was permitted by USACE and the Central Valley Regional Water Quality Control Board (Central Valley RWQCB) under Sections 404 and 401, respectively, of the Clean Water Act, in October 2009; this work would occur in late 2009

and early 2010, in advance of Phase 3 Project levee construction. Some vegetation removal also would occur during the non-nesting season for raptors and other bird species. A separate, but related, set of permits for the Phase 3 Project's Sacramento River east levee construction and related pumping plant improvements (termed the Phase 3b Project) is anticipated in late 2009; this work would occur in 2010 and 2011. The potential exists for up to 30% of the Phase 2 Project also to be constructed in 2010, concurrent with Phase 3 Project construction, or even potentially concurrently with the Phase 4a Project, depending on the timing and availability of funding and receipt of all required environmental clearances and permits.

The Phase 4 Project consists of two subphases (4a and 4b) to provide the flexibility to construct this phase over more than one construction season. The Phase 4 Project was analyzed at a program-level in the Phase 2 EIR. Each subphase has its own independent utility, can be accomplished with or without the other subphase, and provides additional flood risk reduction benefits to the Natomas Basin whether implemented individually or collectively. The Phase 4a Project was analyzed at a project-level in the *DEIS/DEIR on the NLIP Phase 4a Landside Improvements Project* (Phase 4a DEIS/DEIR, State Clearinghouse No. 2009032097), which was released for public review on August 28, 2009. Similar to the Phase 3 Project, USACE and SAFCA are preparing a separate FEIS and FEIR, respectively. The SAFCA Board of Directors will consider certification of the EIR and Phase 3 Project approval at its November 13, 2009 Board meeting. Separately, USACE will prepare an FEIS and issue it for a 30-day public review in early 2010. Phase 4a Project construction is planned to begin in 2010 and is anticipated to be completed in 2011, assuming receipt of all required environmental clearances and permits.

PROJECT OBJECTIVES OF THE NATOMAS LEVEE IMPROVEMENT PROGRAM

The following objectives were adopted by SAFCA in connection with the NLIP: (1) provide at least a 100-year level of flood risk reduction (0.01 Annual Exceedance Probability [AEP]) to the Natomas Basin as quickly as possible, (2) provide 200-year flood risk reduction to the Basin over time (0.005 AEP), and (3) avoid any substantial increase in expected annual damages as new development occurs in the Basin. The first two project objectives would reduce the residual risk of flooding sufficiently to meet the minimum requirements of Federal and state law for urban areas like the Natomas Basin. The third project objective is a long-term objective of SAFCA's.

Additional project objectives that have informed SAFCA's project design are to: (1) use flood damage reduction projects in the vicinity of the Sacramento International Airport (Airport) to facilitate management of Airport lands in accordance with the Airport's *Wildlife Hazard Management Plan* (Sacramento County Airport System [SCAS] 2007); and (2) use flood damage reduction projects to increase the extent and connectivity of the lands in the Natomas Basin being managed to provide habitat for giant garter snake, Swainson's hawk, and other special-status species.

PROPOSED PHASE 4b PROJECT

The Phase 4b Project would address underseepage, stability, erosion, penetrations, and levee encroachments along approximately 3.4 miles of the Sacramento River east levee in Reaches 16–20, approximately 6.4 miles of the Natomas East Main Drainage Canal (NEMDC) west levee between Elkhorn Boulevard and Sankey Road, and the windows left in the improvements done by the of previous phases at levee penetrations and road crossings on Natomas Cross Canal (NCC) south levee. The Phase 4b Project would also include relocation of the existing irrigation and drainage canals landside of the levee slopes, relocation and modifications of the pumping stations, bridges, encroachments, and any penetrations of the levee embankment. Removal of the vegetation within the levee right-of-way to address USACE requirements and any environmental mitigation are also included in the Phase 4b Project.

The Phase 4b Project includes the following major activities anticipated to begin in spring 2011, which will be analyzed at a project-level in the Phase 4b EIS/EIR:

- **Sacramento River East Levee Reaches 16–20: Levee widening/rehabilitation and seepage remediation**—Construct an adjacent levee with flattened landside slope and cutoff walls, seepage berms, and relief wells, where required, to reduce potential underseepage and seepage through the levee. Cutoff wall construction would be conducted 24 hours per day, 7 days per week (24/7).

- **American River North Levee Reaches 1–4: Slope flattening and seepage remediation**—Flatten the slope and install cutoff walls in the American River north levee from just east of Gateway Oaks Drive to Northgate Boulevard. Cutoff wall construction would be conducted 24/7.

- **NEMDC West Levee—Northern Segment: Levee raising, slope flattening, and seepage remediation**—Raise the levee in place or construct an adjacent levee, flatten slopes, and install cutoff walls from Sankey Road to just south of Elkhorn Boulevard. Cutoff wall construction would be conducted 24/7.

- **Pleasant Grove Creek Canal (PGCC) and NEMDC South: Levee raising and slope flattening**—Raise the levee in place or construct an adjacent levee and flatten slopes on the PGCC southwest levee and on the NEMDC southwest levee from Elkhorn Boulevard to Northgate Boulevard.

- **PGCC and NEMDC South: Waterside improvements**—Erosion repair and rock slope protection at locations where erosion around the outfall structures penetrating the levee was observed. Construct additional remediation to protect against damage caused by beavers and burrowing animals.

- **PGCC Culvert Remediation**—Upgrade or remove five culverts that currently drain the area east of the PGCC by passing water under the canal to canals along the landside of the PGCC southwest levee. Under the culvert removal option, construct detention basins east of the PGCC levee to provide replacement storage for drainage. Depending on the design of the detention basins, pumping stations may be needed to discharge water out of the basins and into the PGCC.

- **State Route (SR) 99 NCC Bridge Remediation**—Construct a moveable barrier system or a stop log gap at the south end of the SR 99 bridges to be used at high river stages to prevent overflow from reaching the landside of the NCC south levee. Modify the bridge deck connections to the supporting piers and abutments as needed to resist uplift pressure during high water stages. Install additional seepage remediation consisting of seepage cutoff walls where the bridges cross the NCC south levee.

- **West Drainage Canal**—Realign the West Drainage Canal to shift an approximately 1-mile portion, starting at Interstate 5 (I-5), to an alignment farther south of the Airport Operations Area. Modify the existing canal east of the alignment to reduce bank erosion and sloughing, decrease aquatic weed infiltration, improve Reclamation District (RD) 1000 maintenance access, and enhance giant garter snake habitat connectivity.

- **Riego Road Canal (Highline Irrigation Canal) Relocation**—Relocate approximately 4,000 feet of irrigation canal, approximately 250 feet of buried irrigation piping, and three irrigation turn-out structures away from the proposed levee footprint for the northern segment of the NEMDC west levee.

- **NCC South Levee Ditch Relocations**—Relocate the Vestal Drain ditch and Morrison Canal to reduce underseepage potential in Reaches 2, 5, and 6 of the NCC south levee.

- **Modifications to RD 1000 Pumping Plants**—Raise and/or replace the discharge pipes for Pumping Plant Nos. 1A and 1B along the Sacramento River east levee, and Pumping Plant Nos. 6 and 8 along the NEMDC west levee, to cross the levee above the 0.005 AEP design water surface elevation. Construct new outfall structures for Pumping Plant Nos. 6 and 8, requiring dewatering of portions of the NEMDC. Construction would be conducted 24/7.

- **Modifications to City of Sacramento Sump Pumps**—Raise and/or replace the discharge pipes for City Sump 160 (Sacramento River east levee Reach 19B), City Sump 58 (American River north levee), and City Sump 102 (NEMDC west levee at Gardenland Park) to cross the levee above the 0.005 AEP design water surface elevation. Construct new outfall structures, requiring dewatering of portions of the Sacramento River, the low-flow channel of the NEMDC along the waterside of the American River north levee, and the NEMDC. Relocate pump stations as needed to accommodate the proposed levee improvements. Construction would be conducted 24/7.

- **Borrow Site Excavation and Reclamation**—Excavate earthen material at the borrow sites and then return the sites to preconstruction uses or suitable replacement habitat. For levee improvements along the Sacramento River east levee (Reaches 16–20) and the American River north levee (Reaches 1–4), the South Fisherman's Lake Borrow Area and the West Lakeside School Site (**Exhibit 2**) are anticipated to be the primary source of soil borrow material. The Triangle Properties Borrow Area (**Exhibit 3**) would be the primary source of borrow material for levee improvements along the PGCC and NEMDC North. The South Fisherman's Lake Borrow Area, the West Lakeside School Site, and the Triangle Properties Borrow Area Areas will be fully analyzed in the EIS/EIR.

  The Fisherman's Lake Borrow Area, which was fully analyzed in the Phase 4a DEIS/DEIR, could provide additional borrow material for the Phase 4b Project. The Krumenacher borrow site and Twin Rivers Unified School District stockpile site (**Exhibit 2**), which were fully analyzed in the Phase 3 DEIS/DEIR and Phase 4a DEIS/DEIR, would be the source of borrow material for improvements to NEMDC South and back-up sources for NEMDC North.

- **Habitat Creation and Management**—Enhance connectivity between northern and southern populations of giant garter snake in the Natomas Basin by improving habitat conditions along the West Drainage Canal, and establish woodlands consisting of native riparian and woodland species in or around the Natomas Basin as compensation for woodland impacts along the Sacramento River east levee (Reaches 16–20), American River north levee, and NEMDC west levee.

- **Infrastructure Relocation and Realignment**—Relocate and realign private irrigation and drainage infrastructure (wells, pumps, canals, and pipes), and relocate utility infrastructure (power poles) as needed to accommodate the levee improvements and canal relocations.

- **Landside Vegetation Removal**—In Reaches 16–20 of the Sacramento River east levee, in Reaches 1–4 of the American River north levee, and in NEMDC South, clear landside vegetation to prepare for Phase 4b Project levee and canal improvement work.

- **Waterside Vegetation Removal**—Waterside vegetation would be removed due to modifications to pumping plants along the Sacramento River east levee, NEMDC west levee, and PGCC southwest levee.

- **Bank Protection**: **Sacramento River Left Bank**—Because the adjacent levee would be constructed in Sacramento River east levee Reaches 1–20 under the NLIP, no erosion protection is needed along the left bank of the Sacramento River. The distance from the projected levee slope of the new adjacent levee to the current bank location is sufficient to guarantee that bank erosion would not intrude into the projected levee slope in the near future. Bank protection would be constructed along the PGCC and NEMDC South to address the waterside erosion sites noted above.

- **American River Common Features Project**—Upgrade levees at locations along the American River upstream of Northgate Boulevard, including raising and/or reshaping levee sections and installing cutoff walls.

- **Right-of-Way Acquisition**—Acquire lands within the Phase 4b Project footprint along the Sacramento River east levee, American River north levee, NEMDC west levee, and at associated borrow sites.

- **Encroachment Management**—Remove encroachments as required to meet the criteria of USACE, CVFPB, and Federal Emergency Management Agency (FEMA). SAFCA would be required to submit a variance request to CVFPB, and then ultimately to USACE, requesting confirmation that SAFCA's adjacent levee design for the Sacramento River east levee and American River north levee sufficiently addresses USACE's guidance regarding vegetation on levees, if SAFCA chooses to implement the project without Federal participation.

The following additional project details are associated with the Phase 4b Project.

- **Cutoff Walls.** Three-foot-wide cutoff walls made of either soil-bentonite (SB), cement bentonite (CB), or soil-cement-bentonite (SCB) would be installed either through the existing levee or along the landside toe of the existing levee. Depending on the construction method used, the top of the cutoff walls would be at least 10 feet above the existing ground surface at the landside toe of the levee (within either the new adjacent setback levee) or in the existing levee, and extend up to a depth of 110 feet below ground surface in some areas. Locations and depths would be determined during final engineering design. The total linear extent would be approximately 17,700 feet along the Sacramento River east levee Reaches 16–20;approximately 9,400 feet along the American River north levee, and 35,700 feet along the NEMDC north west levee. Cutoff wall construction would be conducted 24/7.

- **Seepage Berms.** Sacramento River east levee seepage berm widths would extend up to 100 feet from the adjacent levee landside levee toe in Reaches 17–18, up to 250 feet from the adjacent levee landside levee toe in Reach 19A, and up to 300 feet from the adjacent levee landside toe in Reach 16. Depending upon the width, maximum thickness would be 6–7 feet. All berms would gradually slope downward to about 4 feet thick at the landside edge, with a 3H:1V slope to ground level. A gravel surface patrol road would be constructed near the outside edge of the seepage berm. Final locations of the seepage berms would be determined during final engineering design.

- **Relief Wells.** Sacramento River east levee relief wells would be constructed at selected locations where berms cannot be wide enough or walls deep enough to meet the required seepage remediation design parameters. Relief wells would also be constructed along some of the entrance channels to the landside pump stations. Relief wells would be spaced between 60–100 feet apart and would extend to depths of between 60–80 feet below the ground surface.

- **Measures to Reduce Impacts to Residences, Businesses, and Heritage Oaks.** Where residences, businesses, and heritage oak trees are located, measures would be employed to reduce the project footprint impacts to these resources, to the extent feasible given levee design and seepage remediation performance requirements. These measures could include reducing the width of the adjacent levee, seepage berms, and operations and maintenance access and utility corridors; and strategically using cutoff walls or seepage relief wells.

- **Power Pole Relocation.** Power poles that currently exist on the landside slope of the levee and at the landside levee toe would need to be relocated and/or rerouted to accommodate the widened levee footprint. To the extent feasible, mainline utility infrastructure, such as power poles, would be relocated beyond the landside levee toe. Some poles may need to be relocated to the waterside of the existing levee. No power poles would be relocated within the new levee prism. Tree pruning would likely be required in some locations to accommodate the power pole relocation and associated wires. SAFCA would conduct the relocations in coordination with the appropriate utility companies and the construction operations.

- **Removal or Modification of Landside Structures and Other Facilities.** Multiple residential and agricultural structures are located within the footprint of the levee improvements. These structures, and the facilities supporting them, would have to be modified, removed, or relocated out of the project footprint before the start of levee construction in those areas. Irrigation facility conveyance, distribution boxes, wells,

and standpipes within the footprint of the project features would be demolished and replaced as needed. Debris from structure demolition, power poles, utility lines, piping, and other materials requiring disposal would be hauled off-site to a suitable landfill. Demolished concrete could be sent to a concrete recycling facility. Wells and septic systems would be abandoned in accordance with the applicable state and county requirements. Drilling and development pumping of replacement wells would be conducted 24/7.

- **Garden Highway Closures.** Because of space constraints, in Sacramento River east levee Reaches 19B–20, the landside lane of Garden Highway would be closed for up to 6 months to allow for construction of a cutoff wall. In addition, because there would be no room for a two-way haul route at the toe of the existing levee, the waterside lane of Garden Highway would be used by haul trucks delivering materials. This lane would only be open to local traffic, with use of traffic controls. For levee improvements along the American River north levee, the Garden Highway/Arden-Garden Connector would be completely closed for up to 6 months between I-5 and Northgate Boulevard. Through traffic would be detoured to West El Camino Avenue, SR 160, and Richards Boulevard. Garden Highway would be closed at several locations, including City of Sacramento Pump 160 and RD 1000 Pumping Plant Nos. 1A and 1B, to allow for installation of pipes that need to be raised above the 0.005 AEP water surface profile.

- **Reconstruction of Intersections.** Garden Highway intersections at Natomas Park Drive, Truxel Road, Northgate Boulevard, and four additional ramps at private parcels would require degrading, rebuilding the embankment, and repaving to accommodate the installation of the American River north levee cutoff wall and levee slope flattening. Garden Highway intersections at Orchard Lane, Gateway Oaks Drive, and several additional ramps at private parcels would require degrading, rebuilding the embankment, and repaving to accommodate the installation of the Sacramento River east levee cutoff wall and levee slope flattening. The ramps would be reconstructed to the current general ramp and intersection geometry. The design would meet Sacramento County or City of Sacramento roadway design criteria, depending upon the jurisdiction. Where alternate access to the private properties is available, the private ramps would be removed and not replaced.

- **West Drainage Canal Realignment.** The proposed new alignment would abandon and reroute approximately 4,700 feet of the West Drainage Canal. The typical cross-section for the modified West Drainage Canal would require a right-of-way of up to 150 feet for approximately 1.2 miles. The realigned section of the canal would have a 30-foot bottom width, stable 3H:1V bank slopes on one or both sides, and a narrow, variable width bench on one side of the canal. A 20-foot-wide maintenance and inspection road would flank each side of the canal and would be slightly elevated above adjacent land to improve an all-weather road condition. Culverts would cross under the patrol road to allow continued drainage into the canal from adjacent fields. The realignment would include rerouting of a small section of the West Drainage Canal (starting at the M10 Drain south of I-5 which leads to RD 1000's Pumping Plant No. 5) to a north-south orientation to improve the management of adjacent agricultural parcels, and to move the canal farther from the Airport Operations Area in the vicinity of the west runway.

- **Riego Road Canal Relocation.** A portion of an irrigation canal owned by the Natomas Central Mutual Water Company (NCMWC) would be relocated to make room for the proposed improvements to the west levee of NEMDC North. The affected portion includes approximately 4,000 feet of irrigation canal, approximately 250 feet of buried irrigation piping, and three irrigation control turn-out structures. These facilities would be relocated outside of the levee footprint as part of the Phase 4b Project. To prevent disruptions, the NCMWC irrigation system would be replaced with in-kind facilities compatible with the new levee footprint to prevent disruption of irrigation service. The new canal would be a highline canal with 3H:1V side slopes and a maintenance road on each of the embankments. A right-of-way of up to 100-feet beyond the new levee footprint would be required for the new facility.

- **Natomas Levee Recreational Trail Project.** As part of the Phase 4b Project, a regional Class I (completely separated from traffic) bicycle and pedestrian trail is proposed to be constructed in an approximately 42-mile loop along the Natomas Basin levee perimeter in the northwestern portion of the City and County of

Sacramento and the southern portion of Sutter County. The exact alignment of the recreational trail, in terms of its placement in relation to levees and roadways, would be determined through detailed engineering design. Construction, operation, and maintenance of a recreation trail on the perimeter levee system would require a CVFPB encroachment permit with an endorsement by RD 1000. The proposed recreational trail is intended to provide a bicycle commuter route at the southern and eastern end of the Natomas Basin that would connect to the regional American River trail system.

ALTERNATIVES TO THE PROPOSED PHASE 4b PROJECT

Because the EIS/EIR will be a joint NEPA/CEQA document, it will fully evaluate the environmental impacts of the Phase 4b Project and the following two alternatives at an equal level of detail:

No-Action Alternative (No-Project Alternative for purposes of CEQA)—Under NEPA, the expected future without-project conditions; under CEQA, the existing condition at the time this NOP was published (November 5, 2009), as well as what would be reasonably expected to occur in the foreseeable future if the Phase 4b Project were not approved. The No-Action Alternative consists of two scenarios:

- **No Project Construction**—The No-Action Alternative consists of the conditions that would likely prevail in the Natomas Basin if no action at all were taken by SAFCA, the State, or USACE to further improve the Basin's perimeter levee system beyond the accomplishments of the Sacramento Urban Levee Reconstruction Project; the North Area Local Project; and the NLIP Phase 1, 2, 3, and 4a Projects. Under this scenario, key segments of this system would continue to provide less than 100-year flood risk reduction, and the entire Natomas Basin would be permanently designated as a special flood hazard area subject to development restrictions and mandatory flood insurance requirements pursuant to the regulations of the National Flood Insurance Program. SAFCA would not provide the Natomas Basin with at least a .01 AEP risk reduction by the end of 2010 and would not be able to facilitate achieving a 0.005 AEP risk reduction by the end of 2012.

- **Potential Levee Failure**—The same conditions with respect to development within the Natomas Basin as described above for the No Project Construction scenario would exist for the Potential Levee Failure scenario. Without additional improvements to the Natomas Basin perimeter levee system, wind and wave run-up or seepage conditions could cause portions of this system to fail, triggering widespread flooding and extensive damage to the Basin's existing residential, commercial, agricultural, and industrial structures. Extensive damage to utilities, roadways, and other infrastructure systems would also likely occur. The magnitude of the flood damage would depend upon the location of the levee breach, severity of the storm, and river flows at the time of a potential levee failure.

Fix-in-Place Alternative—All elements of the Fix-in-Place Alternative would be the same as described for the Proposed Action, except for the method of raising and rehabilitating the Sacramento River east levee, the extent of levee degradation and road closures required to construct cutoff walls, and the extent of encroachment removal along the levee. Differences from the Proposed Action are shown in italicized text below.

- **Sacramento River East Levee Reaches 16–20: Levee widening/rehabilitation and seepage remediation**—Upgrade levee in place with cutoff walls, seepage berms, and relief wells, where required, to reduce seepage potential. Cutoff wall construction would be conducted 24/7.

- **Landside Vegetation Removal**—Same as the Proposed Action, *except maximum extent of removal would likely be reduced.*

- **Waterside Vegetation Removal**—*In Reaches 16–20 of the Sacramento River east levee and Reaches 1–4 of the American River north levee, clear waterside vegetation to meet USACE vegetation guidance criteria. It is estimated that the numbers of acres of shaded riverine aquatic (SRA) habitat lost would be greater.* Same as Proposed Action for modifications to RD 1000 pump stations.

- **Encroachment Management**—Same as the Proposed Action, *except maximum extent of removal would likely be increased. SAFCA would not be eligible to request a variance and would need to fully comply with USACE's levee vegetation requirements.*

Alternatives that have already been addressed in previous environmental documents for the NLIP will be briefly summarized in the EIS/EIR for the Phase 4b Project and incorporated by reference. These alternatives include the following:

- Yolo Bypass Improvements;
- Reduced Natomas Urban Levee Perimeter;
- Construction of a New Setback Levee;
- Raise Levee in Place with a 1,000-Foot Levee Setback in the Upper 1.4 Miles along the Sacramento River East Levee;
- Construct an Adjacent Setback Levee with a 500-Foot Levee Setback in the Upper 1.4 Miles along the Sacramento River East Levee;
- No SAFCA Levee Improvements—Private Levees in Natomas;
- Natomas .01 AEP Flood Risk Reduction;
- No-Action Alternative—Airport Compartment Levee; and
- Cultural Resources Impact Reduction Alternative.

PROBABLE ENVIRONMENTAL IMPACTS OF THE PROPOSED PHASE 4b PROJECT

The EIS/EIR will describe the direct and indirect significant environmental impacts of the Phase 4b Project. The EIS/EIR will also evaluate the cumulative impacts of the project when considered in conjunction with the other phases of the Landside Improvements Project and other related past, present, and reasonably foreseeable future projects, including other USACE (408 permission) and SAFCA projects.

On the basis of programmatic environmental analyses of the Phase 4b Project in previous NEPA and CEQA documents and relevant environmental analyses of previous project phases, USACE and SAFCA have determined that the probable environmental effects of the Phase 4b Project are as follows:

- **Agricultural Resources:** Conversion of Important Farmland to nonagricultural use; temporary and permanent effects on agricultural productivity; and conflicts with lands under Williamson Act contracts.
- **Land Use, Socioeconomics, and Population and Housing:** Inconsistency with adopted land use plans and the Natomas Basin Habitat Conservation Plan; temporary disturbance and division of an existing community and temporary disruption of commercial activities during construction; potential displacement of existing housing, especially affordable housing; potential reduction in local or regional employment; and other potential socioeconomic impacts, the analysis of which is required by NEPA.
- **Geology, Soils, and Mineral Resources:** Potential soil erosion or loss of topsoil during construction; and potential loss of mineral resources.
- **Hydrology and Hydraulics:** Minimized flood risk; potential temporary and/or permanent alteration of local drainage patterns; potential effects on groundwater recharge.

- **Water Quality:** Temporary effects on water quality during construction.
- **Biological Resources:** Temporary disturbance or permanent loss of woodland habitats and wildlife corridors; temporary disturbance or permanent loss of jurisdictional waters of the United States; temporary disturbance or permanent loss of special-status plant species; temporary disturbance or permanent loss of special-status species habitats; construction disturbance or take of special-status terrestrial species, especially Swainson's hawk and giant garter snake; loss of fish or aquatic habitat through increased sedimentation and turbidity or release of contaminants during construction; and loss of SRA habitat.
- **Cultural Resources:** Temporary and/or permanent disturbance of known and unknown historic or archaeological resources.
- **Paleontological Resources:** Potential disturbance of unknown unique paleontological resources during earthmoving activities.
- **Transportation and Circulation:** Temporary increase in traffic and traffic hazards on local roadways during construction, including hauling; temporary closure of roadways, including full and partial closure of sections of Garden Highway and connecting ramps throughout the 6-month construction season; and temporary disruption of emergency service response times and access.
- **Air Quality:** Temporary and short-term increases in pollutant emissions associated with construction activities, including the potential overlap in construction of portions of the Phase 2, 3, and 4a Projects with the Phase 4b Project; and long-term increases in pollutant emissions.
- **Noise:** Temporary and short-term increases in noise and vibration levels near sensitive receptors during construction, including the need for 24/7 construction for cutoff walls and 24/7 construction associated with relocating wells away from the levee.
- **Recreation:** Addition of a new recreation trail on the improved Natomas Basin levee perimeter system; and potential construction-related closures of/impacts to recreational facilities in the project area.
- **Visual Resources:** Temporary and long-term changes in scenic views or visual character of the project area from the construction of project features and tree/vegetation removal and replanting.
- **Utilities and Service Systems:** Temporary disruption of irrigation supply; potential disruption of utility service from construction activities and from the relocation of power poles.
- **Hazards and Hazardous Materials:** Potential spills of hazardous materials during construction; potential exposure to hazardous materials at project sites during construction; potential for higher frequency of collisions between aircraft and wildlife at the Airport during construction and as a result of permanent changes in land cover; and increased exposure to wildland fire risk during construction.
- **Environmental Justice:** Potential for disproportionately high and adverse effects on minority or low income populations, including Tribal populations, the analysis of which is required by NEPA.
- **Cumulative and Growth-Inducing Impacts:** Potential cumulatively considerable incremental contributions from Phase 4b Project impacts in the areas of agricultural resources, water quality, fisheries, biological resources, cultural resources, air quality (including temporary and short-term generation of greenhouse gas emissions [CO_2] from project construction), noise, and visual resources; potential growth-inducing impacts from construction of the NLIP, including substantial new permanent employment opportunities, substantial short-term employment opportunities, and removal of an obstacle to additional growth and development in the Natomas Basin.

PUBLIC SCOPING MEETING

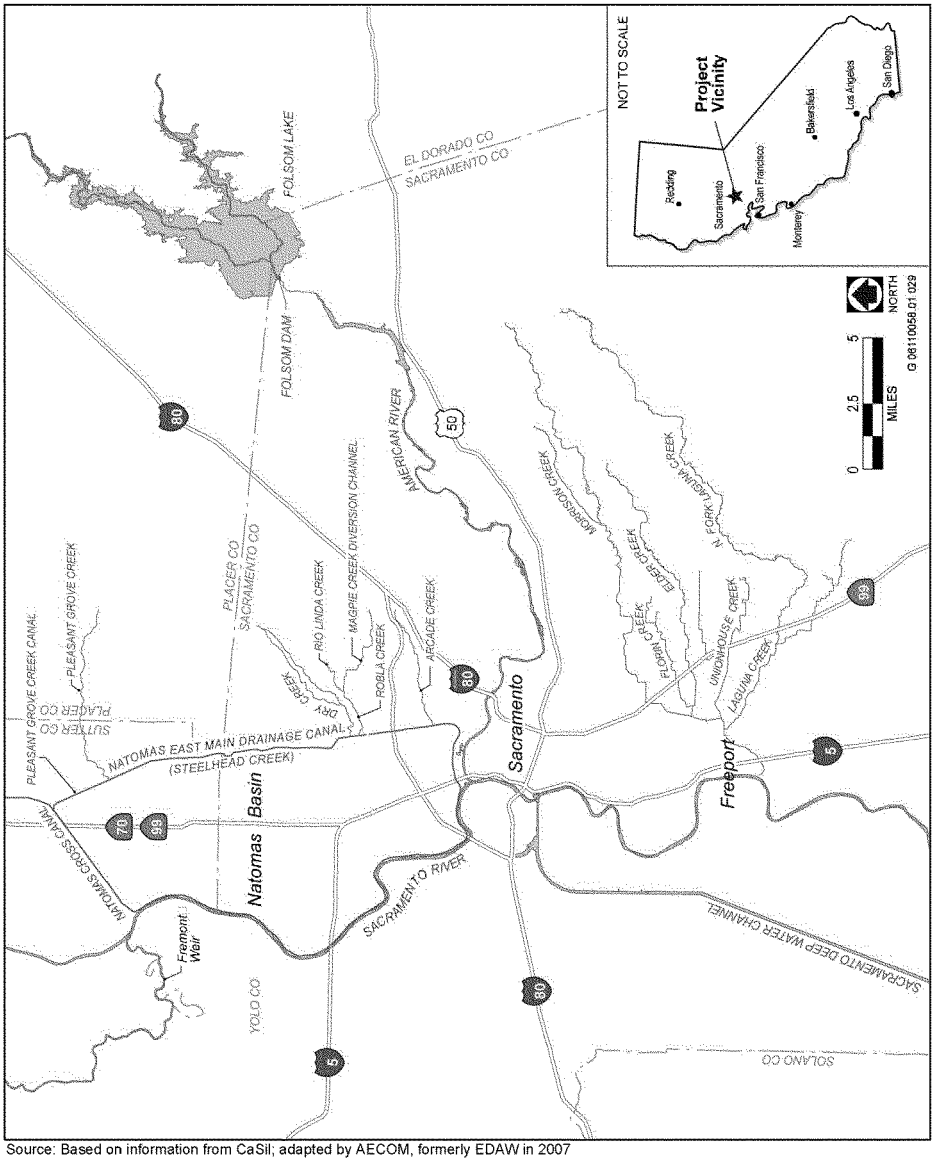
A joint EIS/EIR public scoping meeting, conducted by USACE and SAFCA, will be held during the 30-day NOP public review period to inform interested parties about the proposed project, and to provide agencies and the public with an opportunity to provide comments on the scope and content of the EIS/EIR. The joint scoping meeting will satisfy the meeting requirement for projects of statewide, regional, or areawide significance (see State CEQA Guidelines CCR Section 15082 [c]).

The meeting will be held on November 18, 2009, from 4:30 to 6:30 p.m., at 2921 Truxel Road (South Natomas Community Center) in Sacramento, California and will have an open-house format with multiple stations set up to highlight different aspects of the proposed project and the NEPA/CEQA process. Attendees will have the opportunity to ask questions and discuss the project and the EIS/EIR process with project team members and to provide oral and written comments. The meeting space is accessible to persons with disabilities and a court reporter will be available. Individuals needing special assistive devices will be accommodated to the best of SAFCA's ability. For more information, please contact John Bassett, SAFCA Director of Engineering, at least 48 hours before the meeting (contact information is provided below).

PROVIDING COMMENTS ON THE NOTICE OF PREPARATION

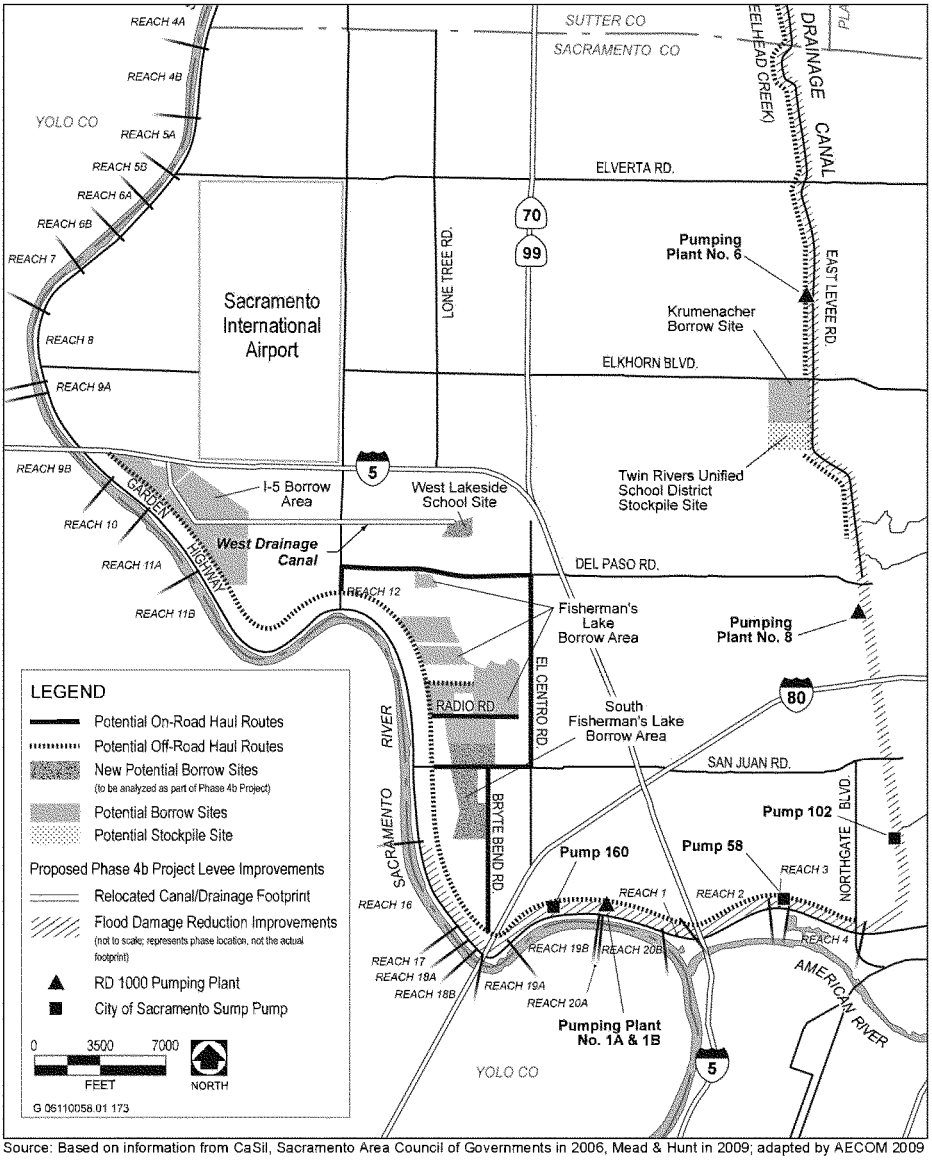
Interested parties may provide written or oral comments on the proposed content and scope of the EIS/EIR at the public scoping meeting or may provide written comments directly to SAFCA. **Written comments on the NOP must be provided to SAFCA at the earliest possible date, but must be received no later than 5 p.m. on Friday, December 4, 2009.** Agencies that will need to use the EIS/EIR when considering permits or other approvals for the proposed project should provide the name of a contact person. Comments provided by e-mail should include the name and address of the sender and include "Natomas PACR/NLIP Phase 4b Project NOP Scoping Comment" in the subject line. Please send all written and/or e-mail comments on the NOP to:

John Bassett, P.E., Director of Engineering
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814
Telephone: (916) 874-7606
Fax: (916) 874-8289
E-mail: bassettj@saccounty.net



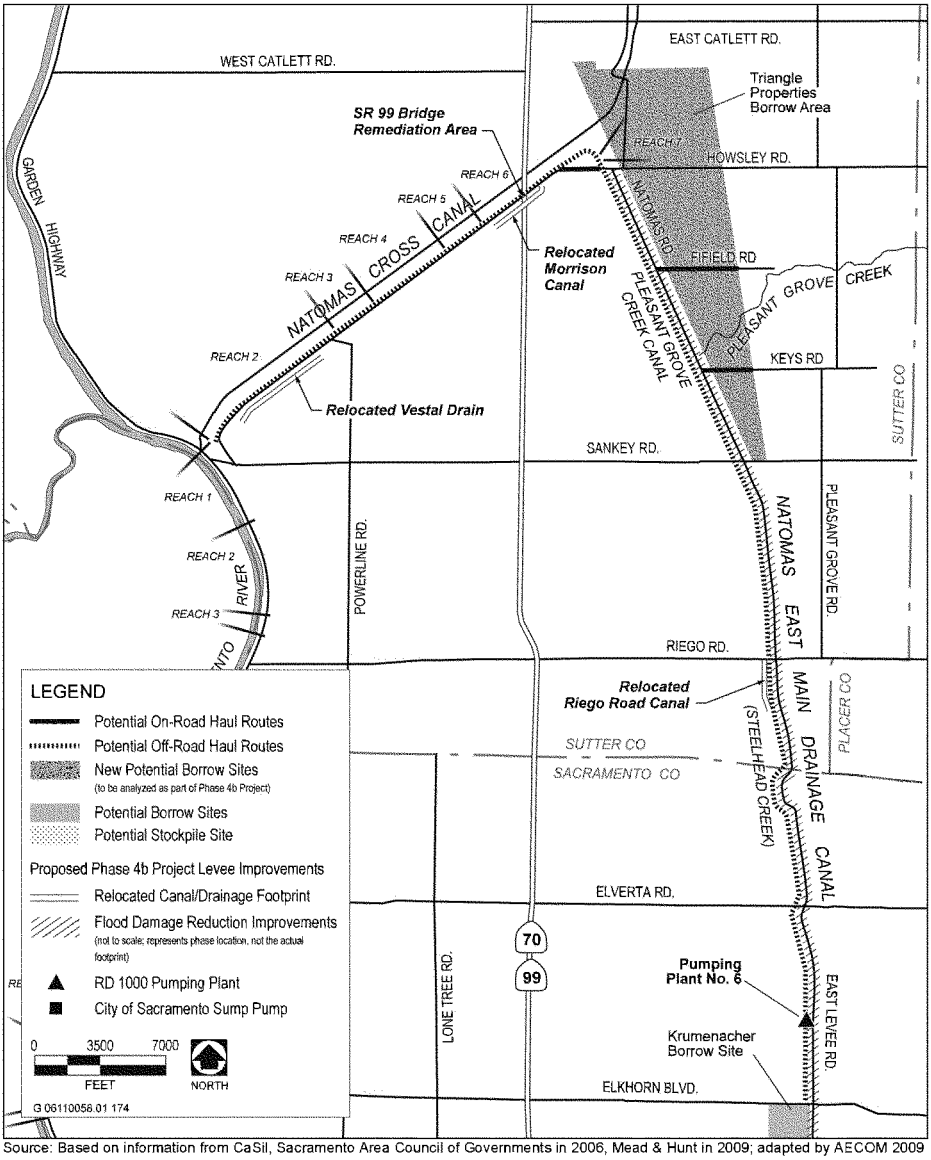
Source: Based on information from CaSil; adapted by AECOM, formerly EDAW in 2007

Regional Location **Exhibit 1**



Source: Based on information from CaSil, Sacramento Area Council of Governments in 2006, Mead & Hunt in 2009; adapted by AECOM 2009

Phase 4b Project Construction Areas (Southern Portion) **Exhibit 2**



Source: Based on information from CaSil, Sacramento Area Council of Governments in 2006, Mead & Hunt in 2009; adapted by AECOM 2009

Phase 4b Project Construction Areas (Northern Portion) **Exhibit 3**

Comments Received

U.S. Department
of Transportation
**Federal Aviation
Administration**

Western-Pacific Region
Airports Division

San Francisco Airports District Office
831 Mitten Road, Room 210
Burlingame, CA 94010

December 2, 2009

John Bassett, P.E., Director of Engineering
Sacramento Area Flood Control Agency
1007 Seventh Street, 7th Floor
Sacramento, CA 95814

Subject: Scoping Comments on Environmental Impact Statement/Environmental Impact Report for Natomas Levee Improvement Program, Phase 4 (b), Landside Improvements Project

Dear Mr. Bassett:

The Federal Aviation Administration (FAA) is providing scoping comments on the environmental issues to be addressed in the joint Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the Natomas Levee Improvement Program (NLIP), Phase 4 (b), as requested in the Sacramento Area Flood Control Agency (SAFCA) Notice of Preparation dated November 5, 2009.

The FAA, through the Airport Improvement Program, has provided federal funds for various aviation development activities at the Sacramento International Airport. The proposed flood protection improvements would increase protection of these developments for which federal funds have been expended.

Sacramento International Airport is a certificated airport under 14 Code of Federal Regulations (CFR) Part 139 of the FAA's regulations. As a result of prior FAA 14 CFR 139 inspections at Sacramento International Airport, the airport is required to maintain and implement a Wildlife Hazard Management Plan. The Wildlife Hazard Management Plan represents an ongoing effort by the Sacramento County Airport System to reduce wildlife-aircraft strike hazards and habitat attracting wildlife hazardous to aircraft operations at Sacramento International Airport.

The proposed NLIP, Phase 4 (b), project, if inappropriately designed, could replace existing vegetation and wildlife habitat with vegetation, wetlands or open water habitats that could attract wildlife hazardous to aviation and increase wildlife-aircraft collision strikes at Sacramento International Airport. FAA Advisory Circular (AC) 150/5200-33B, *Hazardous Wildlife Attractants on or Near Airports*, recommends a separation distance of 10,000 feet between airports serving turbine-powered (jet) aircraft and habitats that can attract wildlife hazardous to aircraft, and recommends a separation distance of 5 miles between hazardous wildlife attractants and the edge of an airport's Area of Operations if the attractant could cause hazardous wildlife movement into or across the approach or departure airspace.

The EIS/EIR should analyze whether the proposed flood control improvements and mitigation measures associated with those improvements are consistent with the guidelines in FAA AC 150/5200-33B, whether the proposed project would increase the amount of habitat available for wildlife hazardous to aircraft, whether the project is likely to increase the potential of hazardous wildlife to move into or across approach or departure airspace of Sacramento International Airport, and whether the proposed project would be likely to increase the risk of wildlife-aircraft collisions at Sacramento International Airport. The FAA recommends that the EIS/EIR interdisciplinary team conducting this analysis include a wildlife biologist meeting the requirements of FAA AC 150/5200-36 *Qualifications for Wildlife Biologists Conducting Wildlife Hazard Assessments,* dated June 28, 2006

The FAA is particularly concerned that if the existing elevation of the I-5 Borrow Area or Fisherman's Lake Borrow Areas is reduced by the removal of soil that these areas could become stormwater retention basins, wetlands or open waters that would attract hazardous wildlife such as ducks, geese, or other waterbirds, that have a high potential for wildlife-aircraft collisions. We recommend that SAFCA and the Army Corps of Engineers consult the Department of Transportation FAA/Department of Defense AC 150/5320-5C, *Surface Drainage Design*, regarding the appropriate sizing of drainage facilities on or near airports. Typical airport drainage facilities are generally those that drain completely within 24 to 48 hours after a 5 or 10-year storm event.

The EIS/EIR should describe the proposed future vegetation/habitats of the I-5 and Fisherman's Lake Borrow Areas under each alternative and analyze whether the vegetation is likely attract hazardous wildlife and/or result in an increase in wildlife-aircraft collisions at Sacramento International Airport. In additional to wetland vegetation and open water areas, agricultural crops such as rice, grain crops, irrigated alfalfa, or sunflowers could also make the Borrow Areas more attractive to hazardous wildlife. Unirrigated, annual grassland habitat would typically be less attractive to hazardous wildlife in this area.

The FAA recommends that the EIS/EIR select an alternative that including managing vegetation on NLIP areas within 10,000 feet of Sacramento International Airport so as to minimize its attractiveness to hazardous wildlife and minimize the potential for wildlife-aircraft collisions. We also recommend that SAFCA and Army Corps of Engineers contact the Sacramento County Airport System regarding the County's efforts to minimize the attractiveness of Sacramento International Airport to wildlife potentially hazardous to aircraft.

Vegetation changes that reduce the attractiveness of the Borrow Areas for hazardous wildlife should be considered beneficial effects of the proposed project in terms of reducing the potential for wildlife-aircraft strike hazards. Also please note that the 2003 Memorandum of Agreement Between the Federal Aviation Administration, the U.S. Air Force, the U.S. Army, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, and the U.S. Department of Agriculture to Address Aircraft-Wildlife Strikes addresses how these agencies, including the Army Corps of Engineers through the U.S. Army, are to consider and generally minimize wildlife-aircraft strike hazard issues while implementing their respective missions.

While the current proposal does not appear to propose use of airport property, please be advised that much of Sacramento International Airport is located on property acquired using a combination of Sacramento County and federal funds and the airport has received federal funding from various FAA Airport Improvement Program federal grants. If future actions to implement the proposed project require use of Sacramento International Airport property, one or more FAA approvals may also be required.

Please provide a paper copy and compact disk of the Draft EIS/EIR for this project when it is released for public review. Please contact FAA Environmental Protection Specialist Doug Pomeroy, telephone, 650-876-2778, extension 612, or e-mail Douglas.Pomeroy@faa.gov, if you have questions regarding this letter. The FAA documents mentioned in this letter are available on the FAA's public internet web site at www.faa.gov.

Sincerely,

Original signed by

Douglas R. Pomeroy
Environmental Protection Specialist

cc: G. Hardy Acree, Director of Airports, Sacramento County Airport System
District Engineer, Army Corps of Engineers, Sacramento District

4

blind copy to: chron 612 Site 2 file via 612 615 625

STATE OF CALIFORNIA

GOVERNOR'S OFFICE *of* PLANNING AND RESEARCH

STATE CLEARINGHOUSE AND PLANNING UNIT

ARNOLD SCHWARZENEGGER
GOVERNOR

CYNTHIA BRYANT
DIRECTOR

Notice of Preparation

November 5, 2009

To: Reviewing Agencies

Re: Natomas Post-Authorization Change Report/Natomas Levee Improvement Program, Phase 4b Project
SCH# 2009112025

Attached for your review and comment is the Notice of Preparation (NOP) for the Natomas Post-Authorization Change Report/Natomas Levee Improvement Program, Phase 4b Project draft Environmental Impact Report (EIR).

Responsible agencies must transmit their comments on the scope and content of the NOP, focusing on specific information related to their own statutory responsibility, within 30 days of receipt of the NOP from the Lead Agency. This is a courtesy notice provided by the State Clearinghouse with a reminder for you to comment in a timely manner. We encourage other agencies to also respond to this notice and express their concerns early in the environmental review process.

Please direct your comments to:

John Bassett
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814

with a copy to the State Clearinghouse in the Office of Planning and Research. Please refer to the SCH number noted above in all correspondence concerning this project.

If you have any questions about the environmental document review process, please call the State Clearinghouse at (916) 445-0613.

Sincerely,

Scott Morgan
Acting Director

Attachments
cc: Lead Agency

RECEIVED
NOV 10 2009

Document Details Report
State Clearinghouse Data Base

SCH# 2009112025
Project Title Natomas Post-Authorization Change Report/Natomas Levee Improvement Program, Phase 4b Project
Lead Agency Sacramento Area Flood Control Agency

Type NOP Notice of Preparation

Description The overall purpose of the Natomas Levee Improvement Program (NLIP) is to bring the entire 42-mile Natomas Basin perimeter levee system into compliance with applicable Federal and state standards for levees protecting urban areas. The Phase 4b - Project - a component of the NLIP - consists of improvements to a portion of the Natomas Basin's perimeter levee system and associated landscape, irrigation/drainage infrastructure modifications, and environmental mitigation, including habitat creation and management.

Lead Agency Contact

Name John Bassett
Agency Sacramento Area Flood Control Agency
Phone (916) 874-7606 **Fax**
email
Address 1007 7th Street, 7th Floor
City Sacramento **State** CA **Zip** 95814

Project Location

County Sacramento, Sutter
City Sacramento
Region
Cross Streets Various
Lat / Long 38° 41' N / 121° 36' W
Parcel No.
Township **Range** **Section** **Base**

Proximity to:

Highways Hwy 5, 99, 80
Airports Sacramento Int'l
Railways
Waterways Sacramento & American Rivers, NCC, NEMDC, PGCC
Schools
Land Use Various, including flood damage reduction facilities, agriculture, residential, and public right-of-way

Project Issues Aesthetic/Visual; Agricultural Land; Air Quality; Archaeologic-Historic; Biological Resources; Drainage/Absorption; Economics/Jobs; Flood Plain/Flooding; Forest Land/Fire Hazard; Geologic/Seismic; Minerals; Noise; Population/Housing Balance; Public Services; Recreation/Parks; Soil Erosion/Compaction/Grading; Solid Waste; Toxic/Hazardous; Traffic/Circulation; Vegetation; Water Quality; Water Supply; Wetland/Riparian; Growth Inducing; Landuse; Cumulative Effects; Other Issues

Reviewing Agencies Resources Agency; Office of Historic Preservation; Department of Parks and Recreation; Central Valley Flood Protection Board; Department of Water Resources; Department of Fish and Game, Region 2; Native American Heritage Commission; State Lands Commission; California Highway Patrol; Caltrans, District 3; Department of Toxic Substances Control; Regional Water Quality Control Bd., Region 5 (Sacramento)

Date Received 11/05/2009 **Start of Review** 11/05/2009 **End of Review** 12/07/2009

Note: Blanks in data fields result from insufficient information provided by lead agency.

NOP Distribution List

County: Sacramento; Sutter SCH# 2009112025

Resources Agency

- [x] **Resources Agency** Nadell Gayou
- [ ] **Dept. of Boating & Waterways** Mike Sotelo
- [ ] **California Coastal Commission** Elizabeth A. Fuchs
- [ ] **Colorado River Board** Gerald R. Zimmerman
- [ ] **Dept. of Conservation** Rebecca Salazar
- [ ] **California Energy Commission** Eric Knight
- [ ] **Cal Fire** Allen Robertson
- [x] **Office of Historic Preservation** Wayne Donaldson
- [x] **Dept of Parks & Recreation** Environmental Stewardship Section
- [x] **Central Valley Flood Protection Board** James Herota
- [ ] **S.F. Bay Conservation & Dev't. Comm.** Steve McAdam
- [x] **Dept. of Water Resources** Resources Agency Nadell Gayou
- [ ] _____ Conservancy

Fish and Game

- [ ] **Depart. of Fish & Game** Scott Flint Environmental Services Division
- [ ] **Fish & Game Region 1** Donald Koch
- [ ] **Fish & Game Region 1E** Laurie Harnsberger
- [x] **Fish & Game Region 2** Jeff Drongesen
- [ ] **Fish & Game Region 3** Robert Floerke
- [ ] **Fish & Game Region 4** Julie Vance
- [ ] **Fish & Game Region 5** Don Chadwick Habitat Conservation Program
- [ ] **Fish & Game Region 6** Gabrina Gatchel Habitat Conservation Program
- [ ] **Fish & Game Region 6 I/M** Brad Henderson Inyo/Mono, Habitat Conservation Program
- [ ] **Dept. of Fish & Game M** George Isaac Marine Region

Other Departments

- [ ] **Food & Agriculture** Steve Shaffer Dept. of Food and Agriculture
- [ ] **Depart. of General Services** Public School Construction
- [ ] **Dept. of General Services** Anna Garbeff Environmental Services Section
- [ ] **Dept. of Public Health** Bridgette Binning Dept. of Health/Drinking Water

Independent Commissions,Boards

- [ ] **Delta Protection Commission** Linda Fiack
- [ ] **Office of Emergency Services** Dennis Castrillo
- [ ] **Governor's Office of Planning & Research** State Clearinghouse
- [x] **Native American Heritage Comm.** Debbie Treadway
- [ ] **Public Utilities Commission** Leo Wong
- [ ] **Santa Monica Bay Restoration** Guangyu Wang
- [x] **State Lands Commission** Marina Brand
- [ ] **Tahoe Regional Planning Agency (TRPA)** Cherry Jacques

Business, Trans & Housing

- [ ] **Caltrans - Division of Aeronautics** Sandy Hesnard
- [ ] **Caltrans - Planning** Terri Pencovic
- [x] **California Highway Patrol** Scott Loetscher Office of Special Projects
- [ ] **Housing & Community Development** CEQA Coordinator Housing Policy Division

Dept. of Transportation

- [ ] **Caltrans, District 1** Rex Jackman
- [ ] **Caltrans, District 2** Marcelino Gonzalez
- [x] **Caltrans, District 3** Bruce de Terra
- [ ] **Caltrans, District 4** Lisa Carboni
- [ ] **Caltrans, District 5** David Murray
- [ ] **Caltrans, District 6** Michael Navarro
- [ ] **Caltrans, District 7** Elmer Alvarez
- [ ] **Caltrans, District 8** Dan Kopulsky
- [ ] **Caltrans, District 9** Gayle Rosander
- [ ] **Caltrans, District 10** Tom Dumas
- [ ] **Caltrans, District 11** Jacob Armstrong
- [ ] **Caltrans, District 12** Chris Herre

Cal EPA

Air Resources Board

- [ ] Airport Projects Jim Lerner
  - [ ] Transportation Projects Douglas Ito
  - [ ] Industrial Projects Mike Tollstrup
- [ ] **California Integrated Waste Management Board** Sue O'Leary
- [ ] **State Water Resources Control Board** Regional Programs Unit Division of Financial Assistance
- [ ] **State Water Resources Control Board** Student Intern, 401 Water Quality Certification Unit Division of Water Quality
- [ ] **State Water Resouces Control Board** Steven Herrera Division of Water Rights
- [x] **Dept. of Toxic Substances Control** CEQA Tracking Center
- [ ] **Department of Pesticide Regulation** CEQA Coordinator

Regional Water Quality Control Board (RWQCB)

- [ ] **RWQCB 1** Cathleen Hudson North Coast Region (1)
- [ ] **RWQCB 2** Environmental Document Coordinator San Francisco Bay Region (2)
- [ ] **RWQCB 3** Central Coast Region (3)
- [ ] **RWQCB 4** Teresa Rodgers Los Angeles Region (4)
- [x] **RWQCB 5S** Central Valley Region (5)
  - [ ] **RWQCB 5F** Central Valley Region (5) Fresno Branch Office
  - [ ] **RWQCB 5R** Central Valley Region (5) Redding Branch Office
- [ ] **RWQCB 6** Lahontan Region (6)
  - [ ] **RWQCB 6V** Lahontan Region (6) Victorville Branch Office
- [ ] **RWQCB 7** Colorado River Basin Region (7)
- [ ] **RWQCB 8** Santa Ana Region (8)
- [ ] **RWQCB 9** San Diego Region (9)

- [ ] Other _____

Last Updated on 10/21/2009

State of California—Business, Transportation and Housing Agency ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF CALIFORNIA HIGHWAY PATROL
North Sacramento Area
5109 Tyler Street
P.O. Box 41098
Sacramento, CA 95841-0098
(916) 338-6710
(800) 735-2929 (TT/TDD)
(800) 735-2922 (Voice)

December 3, 2009

File No.: 250.12678.13333

Mr. John Bassett, P.E., Director of Engineering
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814

Dear Mr. Bassett:

We have received the Notice of Preparation (NOP) regarding the proposed Natomas Post-Authorization Change Report/Natomas Levee Improvement Program, SCH #2009112025. Obviously, a project of this size and scope will have a significant impact on numerous roadways within Sacramento County. Of particular concern is the adverse effect this project will have on traffic utilizing Garden Highway and adjacent roadways. According to the NOP, traffic will be detoured onto West El Camino Avenue, Richards Boulevard, and State Route 160. Additionally, Interstate 80 may be impacted by the Garden Highway closures. These areas already experience high traffic volume which will be exacerbated by the detours.

While we realize the importance of sound levees, we also acknowledge the necessity to consider the influence of this major construction project on the motorists of the Sacramento area. Should you have any further questions regarding these issues, please contact myself or Lieutenant Deborah Pierce at (916) 338-6710.

Sincerely,

C. M. McGAGIN, Captain
Commander
North Sacramento Area

SACOG '09 DEC 15 PM3:46

Safety, Service, and Security

Sloatman, Lindsey

From:	Bassett. John (MSA) [bassettj@SacCounty.NET]
Sent:	Thursday, December 03, 2009 8:14 AM
To:	Dunn, Francine; Henningsen, Sarah; Rader, David; Holland, Elizabeth G SPK; Dadey, Kathleen A SPK
Cc:	Washburn. Timothy (MSA); Gilchrist. M. Holly (MSA); Ellen J. Garber
Subject:	FW: NLIP EIS/EIR Phase 4(b) Scoping comment letter from FAA

From: Rowe. Greg
Sent: Thursday, December 03, 2009 8:07 AM
To: Bassett. John (MSA); Moulton. Kelly; Car. Julie
Cc: Gilchrist. M. Holly (MSA)
Subject: RE: NLIP EIS/EIR Phase 4(b) Scoping comment letter from FAA

Thanks, John. I got copied on this directly from Doug Pomeroy at FAA. We decided that it was necessary for SCAS to submit scoping comments. We had our new planner, Julie Car, look at our previous comments on the Phase 4a project in comparison to the Phase 4B project. Based on her review, we determined that SCAS had nothing new to add to what we've conveyed previously. – Greg Rowe

Julie: John Bassett is SAFCA's director of engineering, and Holly Gilchrist is the General Counsel (formerly with County Counsel). We have an excellent working relationship with SAFCA. –GR

Greg Rowe
Senior Environmental Analyst
Planning and Environment
Sacramento County Airport System (SCAS)
6900 Airport Boulevard
Sacramento, CA 95837
916.874.0698 (office)
916.874.0741 or 0764 (fax)
e-mail: roweg@saccounty.net
www.sacairports.org

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Municipal Services Agency

Department of Transportation
Michael J. Penrose, Director

County of Sacramento

Terry Schutten, County Executive
Paul J. Hahn, Agency Administrator

November 25, 2009

John Bassett
Director of Engineering
Sacramento Area Flood Control Agency
1007 Seventh Street, 7th Floor
Sacramento, CA 95814

SUBJECT: COMMENTS ON THE NOTICE OF PREPARATION (NOP) OF A DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS)/ENVIRONMENTAL IMPACT REPORT (EIR) ON THE POST-AUTHORIZATION CHANGE REPORT/NATOMAS LEVEE IMPROVEMENT PROGRAM PHASE 4B LANDSIDE IMPROVEMENTS PROJECT.

Dear Mr. Bassett:

The Sacramento County Department of Transportation (SACDOT) has reviewed the NOP for the above referenced project, dated November 5, 2009. We appreciate the opportunity to review this document and have the following comments to offer:

- The project proposes truck haul routes to access borrow and levee improvement sites via the County's rural roadways. As shown in Exhibit 2 – Phase 4b Construction Areas (Southern Portion), the potential on-road haul routes are Del Paso Road, Power Line Road, El Centro Road and San Juan Road. The project would add significant amounts of truck traffic to these rural roads and would result in an impact to the existing pavement structure. Typically, rural area pavement sections were designed to carry low traffic volumes. The project construction truck traffic would shorten the life of the pavement section and possibly result in damage to these roadways. We would ask that the project proponent enter into a maintenance agreement with the Maintenance and Operations Section of SACDOT. This agreement shall cover the maintenance and repair of any roadway damaged by the project's construction activities.

- The proposed roadway closure and detour plans shall be coordinated with SACDOT staff.

- The project would result in a change of geometrics at the side street intersections with the Garden Highway. These roadways include Power Line Road and San Juan Road. The project proponent shall coordinate the proposed improvement plans with SACDOT staff.

- Power pole relocation shall be coordinated with SMUD and SACDOT to avoid conflicts with the intended bike/pedestrian path.

We would like to extend our sincere thanks to SAFCA staff for working with SACDOT staff for the inclusion of the Natomas Levee Bicycle & Pedestrian Trail project in the NLIP Phase 4b DEIR analysis. After completion of the analysis, this project can successfully compete for the grant opportunities in the near future. We will continue to coordinate with City of Sacramento, Sutter County, SAFCA, RD1000, County Airports, US Army Corps of Engineers and Central Valley Flood Control Protection Board as this project moves forward through the planning, engineering and construction process. Should you have any questions, please feel free to contact me at (916) 874-6121 or Kamal Atwal at (916) 875-2844

Sincerely,

for Dean Blank, P.E.
Principal Civil Engineer
Department of Transportation

DB:ka

c: Dan Shoeman, DOT
Matt Darrow, DOT
Kamal Atwal, DOT
Ron Vicari, DOT
Rizaldy Mananquil, DOT
Marry Anne Dann, MSA
Tricia Stevens, Planning and Community Development Department
Ed Cox, City of Sacramento, ecox@cityofsacramento.org
Jay Punia, CVFPB, jpunia@water.ca.gov]
Neal Hay, Sutter County, NHay@co.sutter.ca.us
Paul Devereux, RD1000 pdevereux@rd1000.org

Sloatman, Lindsey

From: Bassett. John (MSA) [bassettj@SacCounty.NET]
Sent: Wednesday, November 18, 2009 4:07 PM
To: Dunn, Francine; Henningsen, Sarah; Rader, David; Holland, Elizabeth G SPK; Dadey, Kathleen A SPK
Cc: Washburn. Timothy (MSA); Gilchrist. M. Holly (MSA); Ellen J. Garber
Subject: FW: NOP for EIS/EIR on Natomas Post Authorization Change Report/NLIP, Phase 4b Landside Improvements Project

---

From: KAREN HUSS [mailto:KHuss@airquality.org]
Sent: Wednesday, November 18, 2009 2:21 PM
To: Bassett. John (MSA); Holland, Elizabeth G SPK
Cc: LARRY ROBINSON
Subject: NOP for EIS/EIR on Natomas Post Authorization Change Report/NLIP, Phase 4b Landside Improvements Project

Hi John and Elizabeth,
We received the Notice of Preparation for NLIP Phase 4b. We do not plan to provide a NOP letter. Look forward to getting the EIS/EIR.
Thanks,

Karen Huss
Sacramento Metropolitan AQMD
Land Use & Transportation Section
777 12th Street, 3rd Floor
Sacramento, CA 95814
916-874-4881
khuss@airquality.org
www.airquality.org

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SUTTER COUNTY
COMMUNITY SERVICES DEPARTMENT

Planning – Lisa Wilson, Planning Division Chief
Animal Control
Building Inspection
Environmental Health

Director – Larry Bagley
Assistant Director – Randy Cagle
Fire Services – Dan Yager
Emergency Services – John DeBeaux

CERTIFIED AND FIRST CLASS MAIL

November 23, 2009

John Bassett, P.E., Director of Engineering
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814

Re: Response to the Notice of Preparation of an EIS/EIR on the Natomas Post-authorization Change Report/Natomas Levee Improvement Program, Phase 4b Landside Improvements Project

Dear Mr. Bassett,

Thank you for the opportunity to comment on the Notice of Preparation for the EIS/EIR on the Natomas Post-authorization Change Report/Natomas Levee Improvement Program, Phase 4b Landside Improvements Project. The County of Sutter has several areas of concern we wish to have analyzed as part of the proposed EIS/EIR.

- The proposed borrow site excavation and reclamation area located east of the Cross-Canal and east Natomas Basin levee has soils that are predominantly classified as Prime Farmland and Farmland of Statewide Importance by the Department of Conservation. The County requests the proposed project's impacts to this farmland be analyzed as part of the proposed environmental document. The County requests the reclamation of this site be to a use consistent with the County's Agriculture, 80-acre minimum General Plan designation (AG-80) and General Agricultural Zoning District (AG).

- The removal of soil from the proposed borrow site is subject to the State's Surface Mining and Reclamation Act (SMARA). As the lead agency under SMARA, a surface mining permit and reclamation plan is required to be approved by Sutter County. It is recommended the SMARA activity be analyzed as part of the proposed environmental document and all feasible and effective mitigation be incorporated into the project. Sutter County considers itself to be a responsible agency under CEQA for this portion of the proposed project and this letter constitutes our written reply as required by CEQA Guidelines Section 15096(b) (2).

SAFCA '09 NOV 25 PM4:05

- Sutter County requests the proposed environmental document discuss and analyze potential impacts the proposed project could have on the Sankey Gap.

- It appears by the Exhibit 3 map, included as part of the Notice of Preparation, the proposed borrow pit area will include land currently occupied by the Pleasant Grove Cemetery District cemetery. The District should be consulted about this proposed project and the County requests the proposed project's impacts on this cemetery be discussed and analyzed in the proposed environmental document and all feasible and effective mitigation be incorporated into the project.

- The proposed borrow site excavation and reclamation area location is within an "Out of Basin Mitigation Area" identified in the Natomas Basin Habitat Conservation Plan (NBHCP) otherwise known as "Area B." The County requests the proposed project's impacts be evaluated as to the end use's viability as potential mitigation land for the NBHCP be analyzed.

The issues discussed above are of paramount concern to the County of Sutter. As a responsible agency under CEQA for the borrow site excavation and reclamation area portion of the proposed project, we look forward to working with you to assure that all surface mining and reclamation impacts are properly analyzed and mitigated. Please provide our office with all future notices regarding this project.

Sincerely,

Douglas G. Libby, AICP
Principal Planner

DGL:gsg

P:\Planning\Projects - Misc\SAFCA - Phase 4b Landslide Improvement Project\County response to the NOP

Sloatman, Lindsey

From: Bassett. John (MSA) [bassettj@SacCounty.NET]
Sent: Friday, December 04, 2009 3:47 PM
To: Dunn, Francine; Henningsen, Sarah; Rader, David; Holland, Elizabeth G SPK; Dadey, Kathleen A SPK
Cc: Washburn. Timothy (MSA); Gilchrist. M. Holly (MSA); Ellen J. Garber
Subject: FW: Natomas PACR/NLIP Phase 4b Project NOP

From: Neal Hay [mailto:NHay@co.sutter.ca.us]
Sent: Friday, November 06, 2009 2:16 PM
To: Bassett. John (MSA)
Cc: Al Sawyer
Subject: Natomas PACR/NLIP Phase 4b Project NOP

Dear Mr. Bassett, Director of Engineering,

In reviewing the Notice of Preparation document for the NLIP Phase 4b Landside Improvements, Sutter County requests an addendum to the Roadway Repairs Agreement dated August 21, 2008. The scope of Phase 4b identifies an additional borrow area (Triangle Properties Borrow Area) which will be analyzed as part of the project. Should the borrow site be utilized, Exhibit 3 identifies two additional county roads, Fifield Rd and Keys Rd as potential on-road haul routes. Fifield Rd is a paved roadway and Keys Rd is a gravel roadway over the portions identified in the exhibit. To date, the current Road Agreement has satisfied the concerns of both parties and the levee improvement projects have continued. Should the new borrow area be utilized in the Phase 4b project, per paragraph M (page 2 of 12) of the existing agreement, an addendum is needed to continue the cooperation and address these newly identified road segments.

Additionally, please be advised that beginning in May 2010, our department will begin a bridge rehabilitation project on Pleasant Grove Road south of Keys Road. The work will cause us to close Pleasant Grove Road to through traffic for up to 4 months and Sankey Road, Natomas Road and Howsley Road will be published as the Detour route. We expect Keys Rd and Fifield Rd to be used by local traffic as an alternate detour route. Consequently, your contractor for borrow operations could not use wider than legal equipment on these county roads.

Thank you for you continued cooperation and please contact me with any questions.

Neal P Hay PE
Senior Civil Engineer
Sutter County
530-822-4402 Direct

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DEPARTMENT OF
PARKS AND RECREATION

CITY OF SACRAMENTO
CALIFORNIA

915 I Street, 5th Floor
SACRAMENTO, CA
95814-2997

PARK PLANNING &
DEVELOPMENT SERVICES
ADVANCE PLANNING

(916) 808-5200
FAX 808-8266

December 1, 2009

Mr. John Bassett, P.E., Director of Engineering
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814

Subject: **Natomas PACR/NLIP Phase 4b Project NOP Scoping Comments**

Dear Mr. Bassett:

Thank you for the opportunity to comment on the above mentioned project. The City Department of Transportation (DOT) is providing separate comments dealing with bike / pedestrian trails, so I will not repeat comments provided by DOT on trails, except where they interface with public parks that may be impacted by the project. Because this will be a program level EIR/EIS, the comments are general in nature.

Sacramento River East Levee Reaches 16 – 20
Within this area of the project, the City of Sacramento has several public parks on the land side of the levee:

- Park Site SN2 (Undeveloped; APN 274-0220-047-0000) is located north of Garden Highway and east of I-80. This undeveloped park site is currently accessible only from Garden Highway.

- Shorebird Park (Developed; APN 274-0560-024-0000 and -025) is bounded by Garden Highway (south), Swainson Way (west) and Kittiwake Drive (north).

- Natomas Oaks Park (Developed; APN 274-0320-023-0000, 274-0320-033-0000 and 274-0050-033-0000) is located at the intersection of Gateway Oaks / Garden Highway. The park includes a large grove of native oaks and other large trees in the eastern 2/3 of the park. The western 1/3 of the park contains turf, a restroom and parking area.

The City also has the following parks situated between Garden Highway and the Sacramento River in this area:

- Sand Cove Park (Developed; APN 274-0020-064-0000, 274-0220-066-0000 and 274-0220-022-0000). This park remains in its natural state with the additions of a paved parking area and trail.

- McClellan Docks (Developed; APN 274-0030-020-0000) This site was quitclaimed to the City from the federal government. It is currently leased to the Drowning Accident Rescue Team.

The EIR/EIS should include a discussion of any anticipated impacts to the public parks along the Sacramento River. The project description implies a potential loss of parkland or potential loss of existing recreational amenities, if the affected parks are developed. In the event parkland or recreational amenities will be impacted, the document should include discussion on how the impacts will be mitigated.

The Park Site SN2 and Natomas Oaks Park have large stands of heritage oaks and other heritage trees that will likely be impacted by the levee project and (in the case of the Natomas Oaks Park) intersection reconstruction project at Gateway Oaks / Garden Highway. The EIR/EIS should include a discussion of how heritage and other tree removal impacts will be mitigated where avoidance is not possible.

Pleasant Grove Creek Canal and NEMDC South – Gardenland Park
This section of the project includes the City's Ueda Parkway, which extends on both sides of the NEMDC from the American River Parkway to the northern boundary of the City of Sacramento. A portion of the Parkway was developed in 2007 with a paved, levee-top bicycle / pedestrian trail, extending between the West El Camino bridge to Sotnip Road on the west side of the canal. As part of this phase of construction, ADA-compliant ramps were constructed on the water side of the levee at Silver Eagle and on the land side of the levee at Gardenland Park and West El Camino.

Raising the levee will impact the ADA-compliant approaches to the parkway trail. In particular, the access ramp at Gardenland Park, located at 310 Bowman Avenue, winds through the entire park. Raising the levee grade will impact this very long access ramp, and potentially the entire park. This impact will need to be included in the discussion (along with any other access points).

In addition, raising the levee will widen the 'footprint' of the levee, potentially impacting the size of the park that is usable for recreation purposes and the existing improvements in Gardenland Park. Please address this issue in the document.

Lastly in March 2009, a new master plan for Gardenland Park was approved by the Sacramento City Council. The EIR/EIS should also address impacts to the park's planned improvements. A copy of the master plan for Gardenland Park is included in this packet.

Borrow Site Excavation and Reclamation
Any impacts to the City's Fisherman's Lake Park or Open Space would need to be included in the discussion. The boundaries of both are located to the east of the proposed borrow sites, adjoining the City's western boundary.

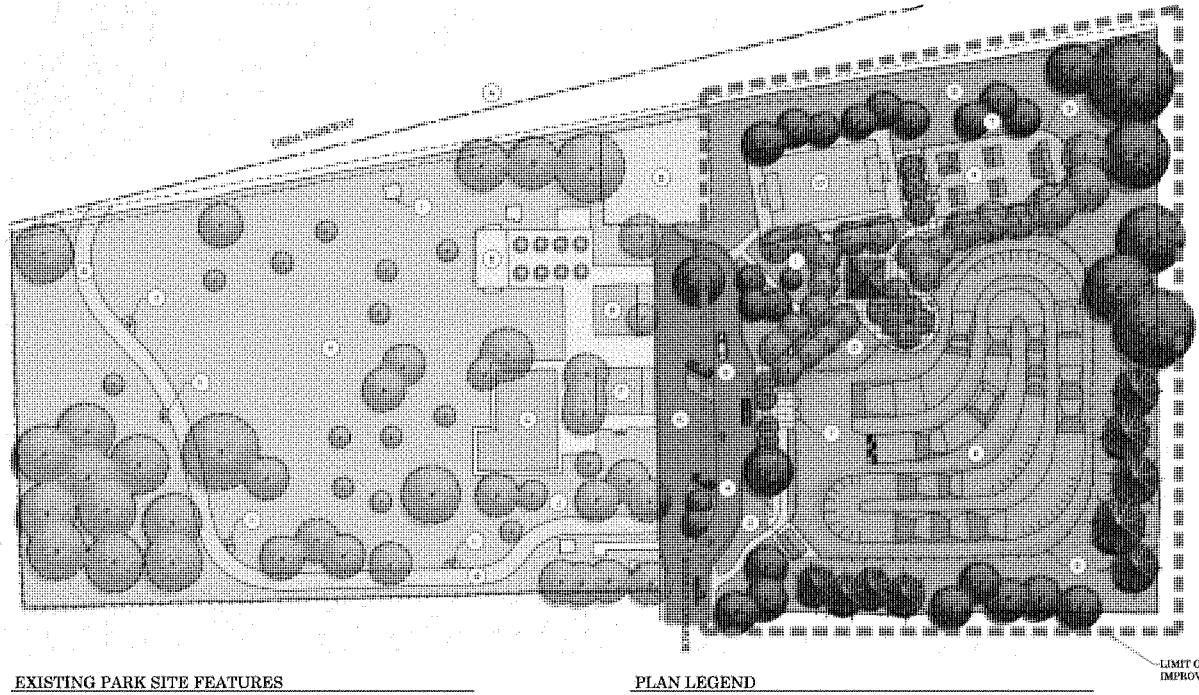
As this project moves into its design and construction modes, we look forward to active coordination between the City, SAFCA USACE and other agencies, where City parks or recreational amenities are affected. We will do all within our power to keep this important project on schedule.

Please notify me when the draft EIR/EIS is available for review.

Respectfully submitted,

Mary de Beauvieres
Principal Planner

Cc: Aelita Milatzo, DOT
Ed Cox, DOT
Scott Johnson, CDD
J.P. Tindell, PPDS



EXISTING PARK SITE FEATURES

- (A) LEVEE
- (B) PUMP STATION
- (C) ADVENTURE AREA
- (D) RESTROOM
- (E) WATER PLAY AREA
- (F) TOT LOT
- (G) BIKE PATH
- (H) TURF AREA
- (I) INDIVIDUAL PICNIC TABLE, TYP.
- (J) PICNIC AREA
- (K) PARKING LOT

PLAN LEGEND

- (1) SHADE STRUCTURE/ LARGE GROUP PICNIC AREA
- (2) FABRIC SHADE CANOPY
- (3) BENCHES
- (4) BIKE RACKS
- (5) 6' HIGH CHAINLINK FENCE
- (6) BMX TRACK
- (7) SWING GATE
- (8) DROP-OFF AREA
- (9) SKATE PARK (ABOVE GROUND COMPONENTS)
- (10) INTEGRATED SPORT COURT
- (11) FITNESS EQUIPMENT

MASTER PLAN FOR

GARDENLAND PARK (1.74 ACRES)

CITY OF SACRAMENTO CALIFORNIA

DEPARTMENT OF
TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

CITY OF SACRAMENTO
CALIFORNIA

915 I STREET, ROOM 2000
SACRAMENTO, CA
95814-2816

PH. (916) 808-5307
FAX (916) 808-8404

December 4, 2009

John Bassett
Director of Engineering
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814
bassettj@saccounty.net

Dear Mr. Bassett:

Thank you for the opportunity to review and comment on the Natomas Post-Authorization Change Report/Natomas Levee Improvement Program, Phase 4b Landslide Improvements Project NOP, dated November 5, 2009. Our comments are as follows:

Construction will include disruptions to the transportation network near the project site and adjacent area, including the possibility of temporary lane closures, street closures, sidewalk closures, bikeway closures, and detours. Pedestrian, bicycle, and transit access may be disrupted. Heavy vehicles will access the site and may need to be staged for construction. These activities could result in degraded roadway operating conditions in the area.

Prior to beginning of construction, a "Construction Traffic Control Plan" for City of Sacramento streets shall be prepared by the applicant to the satisfaction of the City Traffic Engineer and subject to review by all affected agencies. The plan shall ensure that acceptable operating conditions on local roadways are maintained. A copy of the Construction Traffic Control Plan shall be submitted to local emergency response agencies and these agencies shall be notified at least 14 days before the commencement of construction that would partially or fully obstruct roadways. Specific requirements regarding the development of a Construction Traffic Control Plan can be provided upon request.

The project description indicates that various intersections and roadways will be reconstructed and designed in accordance with City of Sacramento roadway design standards. Please note that an encroachment permit will be required for all work within the public right of way.

The project description indicates construction of various flood control measures such as adjacent levee structure, flattening of landside slopes, cut-off walls, to mention a few. Within reaches 19A through 20A of the Sacramento River and reaches 1 through 4 of the American River, there are several areas where the construction of these measures could impact existing mature heritage trees, roadways, bike trails, fencing and city utilities. The NOP indicates that this information would be considered during final engineering design. Given the close proximity of these items and the existing levee, there could be conflicts with the desired engineering design. The environmental document should indicate the degree of changes to be made to these items as a result of the project. Any proposed changes to mature heritage trees, bike trails, city parks, city streets, pump stations, and emergency access roads could result in a significant impact resulting in mitigation. Additionally some parcels that may have specific concerns and indentified to date are included in an attachment to this letter.

The project description indicates raising or constructing an additional levee on the NEMDC between Elkhorn and Northgate Boulevard; this levee has an existing bike trail. The environmental document should indicate the degree of change that will occur to this bike trail. At a minimum, information on detour routes and any modifications to the access points should be included, such as at Gardenland Park.

The project description indicates levee modifications along the American River north of Northgate Boulevard which could include cut-off walls. Currently there are two bike trails that connect Arden-Garden to East Levee Road in this area. The environmental document should indicate the degree of change that will occur to this bike trail. At a minimum, information on detour routes should be included.

The project description indicates work to be done to the West Canal; however, it is not completely clear from the description and the maps if the proposed work will impact the existing bike trail that is along the West Canal from I-80 to San Juan Road. If this bike trail is affected, mitigation should be identified in the environmental document.

The Natomas Levee Recreational Trail Project is described as a 42 mile loop to be built in conjunction with the other levee improvements. The project description indicates that details will be considered in the final engineering design. Further description indicates that this trail will be provided as a bicycle commuter route connection to the American River Parkway. A number of questions arise with this proposal that should be addressed:

a) Will this trail be a continuous paved class I bikeway at the conclusion of the project?

b) Will this trail replace existing bike trails, such as those mentioned in the previous comment?

c) Will this trail provide connection to existing bike trails that lead to and from the project site (Natomas Main Drain, Garden Highway Bike Trail)?

d) Will construction of the paved surface require local jurisdictions to provide funding? If so, how will this be addressed?

e) The City of Sacramento will need to review how this trail will be constructed to ensure compliance with established standards. Locations where this trail crosses city streets will need detailed planning to insure safe crossings.

If you have any questions about these comments please contact Aelita Milatzo at (916) 808-1953.

Sincerely,

Hector Barron
City Traffic Engineer

Attachment

ATTACHMENT

Parcels with Specific Concerns

a) Assessor's Parcel Number 274-0220-047-0000 a city owned parcel and has many healthy mature heritage trees.

b) Assessor's Parcel Number 274-0480-058-0000 a bike trail access connecting to the Garden Highway. To the north of this parcel is the cul-de-sac for Marina Glen Way and two private home sites.

c) Assessor's Parcel Number 274-0610-066-0000 a bike trail south of Avocet Court and Swainson Way.

d) Assessor's Parcel Number 274-0560-025-0000 a city park (Shorebird Park).

e) Assessor's Parcel Number 274-0560-027-0000 a city pump station (Pump 160).

f) Assessor's Parcel Number 274-0560-042-0000 an access point for an emergency access road to Shorebird Drive.

g) Assessor's Parcel Number 274-0430-108-0000 two city streets to the north (Durazno Court and La Lima Way) and a small connecting trail between the streets.

h) Assessor's Parcel Number 274-0030-019-0000 an access point for an emergency access road and bike trail connection.

i) Assessor's Parcel Number 274-0680-001-0000 a business park development with a bike trail at the toe of the levee.

j) Assessor's Parcel Number 274-0320-104-0000 an office building development (Farm Bureau) with a bike trail at the toe of the levee.

k) Assessor's Parcel Number 274-0320-103-0000 an office building development (Sutter Health) with a bike trail at the toe of the levee.

l) Assessor's Parcel Number 274-0320-023-0000 a city park, which includes a nature preserve area and mature heritage oak trees.

m) Assessor's Parcel Number 274-0050-028-0000, 274-0050-029-0000, 274-0050-030-0000, 274-0050-031-0000, 274-0050-006-0000, a bike trail in the American River Parkway.

Garden Highway Community Association
2701 Del Paso Road, #130-231
Sacramento, CA 95835

December 4, 2009

John Bassett, Director of Engineering
SAFCA
1007 7th Street, 7th Floor
Sacramento, CA 95814

AND

Elizabeth Holland, Planning Division
U.S. Army Corps of Engineers
1325 J Street, Room 1480
Sacramento, CA 95814

RE: Comments on Phase 4b "Notice of Preparation"

SAFCA and US Army Corps of Engineers:

The Garden Highway Community Association (GHCA) is an incorporated community association whose membership includes nearly all waterside and landside property owners along the Garden Highway in the area addressed in SAFCA's Natomas Levee Improvement Program (NLIP). The GHCA supports increased flood protection for the Natomas Basin, as long as it is done in a fiscally responsible, environmentally conscious, and scientifically sound manner. At the same time, as most GHCA members live on or next to the NLIP, they have an enormous interest and concern in how this project is implemented.

Below is a list of comments and concerns regarding the Phase 4b Notice of Preparation.

1. Failure to Adequately Consider Alternative Designs

SAFCA and the USACE have failed to conduct a legitimate, unbiased study to determine the most economically and environmentally sound project design to bring the Natomas Basin up to the USACE 100 year flood protection standard. SAFCA and the USACE have summarily dismissed feasible alternatives that would lead to region-wide solutions to the flooding potential in the Natomas Basin and surrounding communities. They have also failed to make a rationale, "good faith" effort at minimizing the height and footprint of the adjacent levee system, especially in light of the lower and inferior levee systems both upstream and adjacent to the NLIP. Therefore, the project is not in compliance of CEQA and NEPA requirements.

Pursuant to the applicable environmental laws, the agencies responsible for this Project must rigorously explore and objectively evaluate all reasonable alternatives and must devote substantial consideration to each alternative consideration.

Notably, during a recent SAFCA Board meeting which discussed the Project, it was repeated several times that the levee improvement design is a "work in progress" and that certification of ongoing EIS phases was a "worst case scenario" for the environment and property rights. Unfortunately, current environment destruction adjacent to Garden Highway does not correlate with these "work in progress" and "worst case scenario" portrayals. Rather, SAFCA and its contractors are in a race to remove highly sensitive habitat within the ENTIRE project footprint, despite the fact that alternative, less obtrusive levee improvement designs are gaining momentum and the fact that the Project is facing insurmountable fiscal problems.

The GHCA strongly encourages SAFCA and the USACE to look outside the Project's predestined box and not "clear a construction path" through sensitive habitats and rich farmland based upon "worst case" design scenarios. There are obviously countless alternative designs that would accomplish the flood protection our region needs at a fraction of the monetary, environmental and property-loss cost. For example, simply narrowing the footprint of the "seepage berms" would result in mammoth savings in all three of these areas. These berms, designed to be 500 feet wide in some areas, are unprecedented in our region and seem highly unwarranted when compared to the existing 10-20 foot berms that previously handled several 100-year-floods (without the cut-off walls that will be added as a part of this project). More telling, as evidenced by design concessions to certain property owners, SAFCA and the USACE have shown by their own actions that the footprint of the seepage berms can be substantially narrowed without losing the flood protection it seeks.

CEQA also requires a realistic analysis of the existing physical environmental conditions affecting the Project. Several court decisions have determined that the impacts of a proposed project must be measured against the "real conditions on the ground." Save Our Peninsula Committee v. Monterey County Board of Supervisors (2001) 87 Cal.App.4th 99, 121. "An EIR must focus on impacts to the existing environment, not hypothetical situations." ibid. In determining whether a project's impacts may significantly affect the existing environment, there must be a "baseline" set of environmental conditions to use as a comparison to the anticipated project impacts. As the Court of Appeal has explained, "it is only against this baseline than any significant environmental effects can be determined." County of Amador v. El Dorado County Water Agency (1999) 76 Cal.App.4th 99, 952.

Despite these requirements, the plans for this Project fail to describe the existing physical environmental conditions in order to determine the Project's significant adverse impacts on the existing environment. Conversely, the entire NLIP design relies upon a computer simulation that describes a hypothetical physical condition, but does not describe the actual physical conditions on the ground, including the current condition of the west side levees along the Sacramento River and the north side levee along the Natomas Cross Canal. This comparison would answer the question of "levee parity" and whether any spots along the river side of the east levee improvements or west side of the Sacramento River in Yolo County, or north side of the Natomas Cross Canal in Sutter County, would be more vulnerable to flooding.

In other words, if the east side levee along the Sacramento River has sufficient freeboard to ensure safe containment of the "200-year" design water surface, then these improved levees will have a significant adverse effect on the existing lower levee, properties, and structures along the west side of the Sacramento River as well as the homes and residents along Garden Highway on the river side of the improved east side levees.

The failure to evaluate the impact of a Project on the existing physical environmental conditions frustrates "the central function of the EIR, to inform decision makers about the impacts of the proposed project on the existing environment." Save Our Peninsula Committee, supra, 87 Cal.App.4th at p. 127.

The Project's plans further fail to consider the impacts of mounting environmental legislation and biological opinions which will significantly impact alternative flood protection plans, summarily dismissed by SAFCA as "impossible" or "inconceivable." One such edict recently issued by the The National Marine Fisheries Service unveiled a complex set of rules, a "biological opinion", which will likely have enormous impacts on local flood protection practices with the goal of increasing the populations of winter and spring-run salmon, Central Valley steelhead and green sturgeon. According to Kate Poole, attorney at the Natural Resources Defense Council, "There's no question any more about the fact that the Bay-Delta ecosystem is in dire need of significant changes and fixes. This is one big step to do that."

The new federal rules require that reclamation districts find a way to flood the Yolo Bypass more often to improve salmon habitat, negating SAFCA's argument that the Yolo Bypass could not be used to divert more water from the Sacramento River than current rules permit. Moreover, SAFCA's concern that water diversion to the Yolo Bypass would be too costly to local water and flood agencies apparently did not negate the decision on the new rules. The ruling governs water operations of the California Department of Water Resources, who will share the cost of the new orders. Clearly, flooding the Yolo Bypass "more frequently" will require a lowering of the Sacramento River weirs – a proposal made by the GHCA during 2007 as a more effective, long-term solution in lieu of an eternal levee battle in the narrow channels of the Sacramento River.

2. Failure to Adequately Consider and Protect Wildlife

The United States Environmental Protection Agency has previously commented on the NLIP, noting its continued concern over the temporary and permanent effects the Project is expected to have on the waters of the United States and recommended the continued "close consultation and collaboration" with the U. S. Fish and Wildlife Agency, California Department of Fish and Game and The Natomas Basin Conservancy to "ensure effects on woodlands, threatened and sensitive species habitat and waters of the US are avoided and minimized." Overall, this Agency has previously classified prior EIS drafts associated with the NLIP as "Insufficient Information (EC-2)".

The California Department of Fish and Game "DFG" has also expressed serious concern regarding the environmental impacts of the NLIP:

- The DFG believes pertinent mitigation measures are potentially unenforceable and may not bring the impacts to fisheries and aquatic resources to below a level that is significant.

- The DFG has found transplantation of herbaceous plants is typically unsuccessful and should be considered experimental. Mitigation measures for any potentially unavoidable impacts to special-status plants should include additional measures to increase the chances of survival for the population in question. Mitigation sites should be permanently protected and managed in perpetuity.

- The DFG is concerned with potential impacts to raptor nesting behavior not currently addressed in the DEIR, especially with regard to 24/7 construction and an estimated 900-1000 haul trips per day to deliver fill material. The DFG "believes that each of these activities could potentially result in significant impacts to nesting raptors including nest abandonment, starvation of young, and/or reduced health and vigor of eggs or nestlings that could result in death."

- In their current form, the DFG opines that the environmental documents do not explore the potential impacts of nighttime construction activities on nesting raptors. Moreover, construction at night poses additional complications for the effectiveness of biological monitors in ensuring that appropriate buffer zones are in place around active nests and that birds do not abandon their nests.

- The DFG has noted that prior DEIRS do not provide a discussion of potential impacts to the Northern Harrier, a ground nesting raptor and does not consider avoidance or mitigation measures.

The GHCA further notes the NLIP purports to mitigate the loss of woodland habitat by the promise to create three acres of canopied woodlands for every one acre destroyed. This mitigation goal is fatally flawed in that there is no discussion, explanation and/or plan to address the environmental tragedy that will result from the 50 to 100 year period required for the "new" woodland habitat to be developed – assuming the planned mitigation goal is even reached.

Despite the failure to mitigate the significant adverse impacts resulting from the destruction of woodland habitat, and the lack of necessary funding to effect the planned mitigation related thereto, SAFCA and its contractors are currently proceeding with the destruction of woodland habitat and the clear-cutting of heritage oaks and other trees.

Further, the NLIP also proposes to utilize lands purchased by the Natomas Basin Conservancy ("Conservancy") as borrow areas. These borrow areas will provide the base material for the landside levee improvements on the south side levee along the Natomas Cross Canal and the east side levee along the Sacramento River. Despite SAFCA's proposed use of these lands, the Conservancy acquired these properties to offset urban development's significant adverse impacts on protected wildlife species within the Natomas Basin. The Conservancy acquires and manages these properties consistent with the Natomas Basin Habitat Conservation Plan. The GHCA believes there still is no agreement between the Conservancy and SAFCA on the use of Conservancy lands and how these lands will carry out their intended conservation purpose after the soil necessary for the construction of the levee improvements is removed. Thus, any claimed mitigation for the loss and disturbance of Conservancy land is impermissibly deferred to some future time after Project approval and implementation.

Despite the fact that the Project's agencies have been afforded several bites at the apple in an attempt to come up with acceptable environmental mitigation, it continues to gloss over the devastating impact the

Project will have on the sensitive habitat of protected species, including raptors, snakes and flora (see comments of the California Department of Fish and Game summarized above).

3. Failure to Study Simultaneous Multi-Phase Construction

SAFCA, and now the USACE, are currently postulating that multiple phases of the NLIP could be constructed simultaneously. This directly contravenes the construction impact and mitigation advanced in the prior environmental documents and creates new issues not previously studied or addressed. For example, there would be compounded effects of CO2 emissions, noise, dust, vibration, and disruption to wildlife that has not been analyzed. Compared to the original Phase 3 EIR, for example, emissions in just Sacramento County would raise from ROG 75 lb/day to 287 lb/day, NOX 413 lb/day to 1,476 lb/day, and PM10 971 lb/day to 3,847 lb/day if these phases are to be done simultaneously. Moreover, on page ES-16, "Air Quality," the Phase 3 DEIR references the "nonattainment status of the Feather River Air Quality Management District and the Sacramento Metropolitan Air Quality Management District for ozone and PM10." The GHCA contends the cumulative effect of simultaneous construction during multiple construction phases has not been sufficiently analyzed by the responsible agencies.

Furthermore, simultaneous construction could involve three or more phases of simultaneous, 24/7 construction. Given the grave impacts of just one 24/7 worksite, the GHCA believes SAFCA and the USACE certainly cannot justify multiple worksites operating in this manner. This impact would make the simultaneous Phases (2, 3, 4a, 4b) unreasonably harmful to wildlife, the environment, and Garden Highway residents.

4. Failure to Adequately Address Encroachments/Levee Prism

At page 7 of the NOP, Encroachment Management, the following proposed action appears: "Remove encroachments as required to meet the criteria of the USACE, CVFPB, and FEMA." Conversely, the Sacramento Division of USACE and SAFCA have repeatedly advised members of the GHCA that the "adjacent" levee adopted by the NLIP "should" remove the waterside trees, landscaping, fencing, and other vegetation and improvements from the "levee prism." In other words, these agencies believe implementation of the NLIP would spare these items from removal under even the most aggressive encroachment standards. Thus, the GHCA is concerned with the apparent unchanged position regarding encroachments as described in the current NOP.

Of utmost importance to property owners along Phase 4b, the USACE does not mention how they will treat vegetation and encroachments on either side of the levee where they decide not to build an "adjacent setback levee" and thus achieve a new levee prism. If a "one size fits all" approach of denuding levees is applied, it will completely contradict the long established local USACE procedures of planting trees to stabilize the levees, protect endangered wildlife and reduced wind-driven waves. We have also been told that many members of the scientific community believe trees and other vegetation improves the strength of a levee, especially in areas of the country that do not have to contend with hurricane strength winds. What are USACE's current views on this?

It also does not appear the USACE has identified what (if any) waterside encroachments will be subject to removal within the NLIP and what legal processes will be involved in condemnation of associated property rights. These questions are of utmost importance to the GHCA and its members. SAFCA has

also advised the GHCA it has maps of approximately 30,000 encroachments and all associated easements on the waterside of the levee. SAFCA recently revealed this database to the public, but there is no mention of the encroachments and/or vegetation that the involved flood agencies consider to be unacceptable. Research has revealed some vague, inadequately mapped easements dating back to the early 1900's which appear to show little or no support for any planned encroachment removal.

SAFCA has also stated "on the record" it is willing to help facilitate "post-facto" permits for encroachments that do not endanger the levee. Would the USACE also be willing to endorse this procedure? Unfortunately, because the property owners have no information as to what items SAFCA and the USACE feel are acceptable encroachments, Garden Highway properties are being left in the dark.

Overall, the members of the GHCA are very concerned about which "encroachments" might require removal and with the various easements SAFCA and/or its partners will attempt to claim. SAFCA has promised to work with each property owner to discuss and resolve issues regarding alleged encroachments, but thus far has taken no such action. Does the USACE plan on doing the same for Phase 4b? Currently, construction Phase 2 of the Project is underway, yet the GHCA is aware of no affected property owners having been contacted regarding encroachment or easement plans. This not only impacts existing improvements, but future improvements. The uncertainty also creates resale problems and negatively affects property values.

5. <u>Failure to Justify 24/7 Construction</u>

As accurately noted by the California Department of Fish and Game, previous EIRS/NEPA documents do not adequately address the potential impacts to raptor nesting especially with regard to 24/7 construction and an estimated 900-1000 haul trips per day to deliver fill material. The DFG "believes that each of these activities could potentially result in significant impacts to nesting raptors including nest abandonment, starvation of young, and/or reduced health and vigor of eggs or nestlings that could result in death." Moreover, the NOP does not explore the potential impacts of nighttime construction activities on nesting raptors. Moreover, construction at night poses additional complications for the effectiveness of biological monitors in ensuring that appropriate buffer zones are in place around active nests and that birds do not abandon their nests.

The NOP contends Cutoff Walls, wells and perhaps additional aspects of the Project require a 24/7 construction schedule. The residents along Garden Highway and the sensitive environment that exists in the riparian, river habitat adjacent thereto cannot be subjected to 24/7 construction simply because SAFCA or the USACE is running behind schedule on what might be perceived as an overly ambitious project. It is anticipated 24/7 construction during subsequent phases of the NLIP would have an exponentially adverse impact on property owners spanning many miles in all directions. Moreover, the use of trucks to get to and from the actual "construction" sites will expand the location of the impact far beyond the limited construction sites addressed by SAFCA and this NOP.

The GHCA also feels the NOP ignores both city and county (Sacramento and Sutter) noise ordinances. As such, the GHCA seeks an explanation as how the USACE plans to deal with violations of local noise ordinances.

6. Damage to Businesses

The NOP fails to address the impact of the project on the businesses that exist along and upon Garden Highway which thrive only because individuals seek the tranquility and peace of a rural, river atmosphere that is easily accessible, peaceful and enjoyable.

7. Hydrology

The hydrology reports postulated by SAFCA and its engineers in previous Phases conclude the improved levee system contemplated by the NLIP will not increase the flood risk to the waterside property owners within the NLIP. These reports are explicitly based upon the assumption that other surrounding Reclamation Districts will NEVER improve their levees. This assumption is improper, flawed and not in concert with the current push by adjacent Districts to fortify their levees. The threat of increased flood risk cannot be summarily dismissed and a funding mechanism must be included to deal with the financial impact of this impact.

Equally troubling, SAFCA admits its "design event analysis is not the same as the analysis procedure used by USACE." As the primary advertised goal of the NLIP is to obtain USACE certification, why is SAFCA deviating from the USACE event analysis? The previous SAFCA EIRS/NEPA documents further note that the USACE analysis "includes consideration of system uncertainties." Does this mean the SAFCA analysis does not account for "system uncertainties" such as the other side of the levee overtopping or failing?

Waterside residents adjacent to the NLIP are very concerned about increased flooding of their homes due to the levee being raised as much as three feet. SAFCA has systematically advised the GHCA not to worry, as levees will overtop or fail elsewhere. Unfortunately, it appears SAFCA's engineering analysis does not account for this or assumes the other levees will be raised and reinforced. If both sides of the levee are eventually raised, then the water capacity of the river will be increased. This would allow the upstream reservoirs to release more water during a flood event and subject residents to a much greater chance of flooding. The GHCA has been advised there is debate amongst USACE engineers as to which provides the better hydrological model, "perfect world" where you cannot take into account deficiencies in other parts of the levee, or "real world" where you can. What is USACE's view on this?

8. Property Values

The NOP, consistent with all prior SAFCA action related to the NLIP, wholly fails to address the impact of the Project on property values in the affected areas and has no funding mechanism in place to deal with the destruction of property values in and around the project that will ripen into eminent domain and inverse condemnation lawsuits. This exposure includes, but is not limited to, irreparable damage to property values which began when this project was first publically announced (at a time when real estate values were significantly higher than today), and will continue indefinitely into the future. The Project has stalled and prevented sales, land improvements and retirement plans. This trend will increase exponentially when active construction begins. Due the lack of a funding mechanism, the taxpayers will be left to shoulder yet another wave of unanticipated and undisclosed cost overruns.

9. Failure to Consider Environmental Impact of Development

While SAFCA publicly justifies the massive NLIP as a necessary cure for the imminent, Hurricane Katrina type flooding that could occur in the Natomas Basin in the event of a 100-year-flood, in reality SAFCA is simply trying to lift the building moratorium affecting the builders who have imprudently chosen to pave over rice fields in a "basin". These are the same developers who have spent hundreds of thousands of dollars supporting our local officials and lobbying for the right to resume rapid development within the floodplain. Without more "urban sprawl", these developers and the County of Sacramento are unable to tap into the "quick cash" that has been created from destroying our evaporating farm lands.

The GHCA contends that rather than encouraging additional urban sprawl, local agencies should be focusing on creating more housing in urban areas, i.e. building up, not out. Moreover, the failure of local agencies to curb their appetite for our farmlands will only increase traffic congestion, gas and carbon emissions and regional pollution at a time when universal fears and concerns over global warming, water scarcity and energy depletion is gaining momentum.

The GHCA contends the urban sprawl into the Natomas Basin, quite ironically, increases the flood potential for Natomas and surrounding communities. Vast farmland that previously collected and stored water during heavy storms, before slowly releasing it through natural underground seepage, has now been paved and improved with storm drains. Accordingly, thousands of acre feet of rainwater that previously rested safely within area farmland is now immediately collected and pumped into the Sacramento River. Historical flow charts from the Sacramento River during times of heavy storms confirm the negative impact Natomas Basin development is having on regional flood protection.

10. Failure of the Notice of Preparation to abide by the Settlement Agreement between SAFCA and the GHCA.

The "Notice of Preparation" in no way mentions the previously agreed to settlement agreement between SAFCA and the GHCA. While the GHCA understands the USACE is not SAFCA, as the assignee of certain aspects of the Project, the USACE is legally required to comply with all legally enforceable agreements entered into by SAFCA, the assignor. To hold otherwise would render the settlement agreement between SAFCA and the GHCA illusory.

11. Rights of Entry/Eminent Domain.

It has recently come to the attention of the GHCA that SAFCA has pursued Right of Entry Agreements from Garden Highway property owners without advising those property owners of any authority for the desired access and without advising owners of their associated rights. By withholding this critical information, SAFCA has in essence coerced many Garden Highway residents into making uninformed decisions under the bold threat of imminent litigation should they resist.

In response to a recent complaint by the GHCA, counsel for SAFCA has confessed that entry onto the private property of Garden Highway residents is being sought pursuant to the Eminent Domain laws of the State of California. However, pursuant to California Code of Civil Procedure Section 1245.010, SAFCA and/or its contractors must be "**authorized to acquire property for a particular use**" **before**

they may enter private property in order to "take photographs, studies, surveys, examinations, tests, soundings, borings, samplings, or appraisals or to engage in similar activities reasonably related to acquisition or use of the property for that use." Apparently, SAFCA has repeatedly misinformed property owners that SAFCA possesses this authority when, in reality, no such authority had ever been obtained.

Based upon the foregoing, the GHCA hereby submits that all involved flood agencies seeking permission to enter private property must notify the affected property owners **of the legal authority upon which the agency relies, along with a full description of the associated rights afforded the property owners**.

Lastly, the GHCA hereby objects to the "taking" of private lands pursuant to the Eminent Domain laws under the guise that these lands are necessary for the development of the Project, when in fact the involved agency actually and surreptitiously plans to convey the condemned land to another private party, i.e. the airport.

12. Natomas Levee Recreational Trail Project.

The GHCA is pleased a recreational trail is finally being included as part of the NLIP. Unfortunately there is no funding mechanism in place other than waiting on the Department of Transportation, which has admitted could take years. As SAFCA and the USACE are already spending millions of dollars protecting cultural resources of Native American Indians, the GHCA believes it would be practical to allocate a nominal sum of money to enhance the resources of the current living residents in the Natomas Basin. The simple modification of the design of the new levee crown from a gravel road to paved road would bear a meager cost and would streamline the bike path for the DOT.

13. Incorporation.

The GHCA also hereby incorporates by reference all comments asserted by Garden Highway property owners and/or their representatives in response to this portion of the NLIP.

In sum, while the GHCA appreciates the daunting task this Project presents to the involved flood agencies, its members strongly feel that a more rational design approach would substantially reduce these challenges, save the taxpayers hundreds of millions of dollars, preserve sensitive habitat and rich farmland and ultimately expedite recertification of the Natomas levees. Moreover, the GHCA implores the involved flood agencies to continue to acknowledge and adhere to the rights of all Garden Highway residents, businesses and property owners.

Respectfully submitted,

GARDEN HIGHWAY COMMUNITY ASSOCIATION

Sloatman, Lindsey

From: Bassett. John (MSA) [bassettj@SacCounty.NET]
Sent: Friday, December 04, 2009 3:24 PM
To: Dunn, Francine; Henningsen, Sarah; Rader, David; Holland, Elizabeth G SPK; Dadey, Kathleen A SPK
Cc: Washburn. Timothy (MSA); Gilchrist. M. Holly (MSA); Ellen J. Garber
Subject: FW: Notice of Preparation of EIS/EIR on Phase 4b of the Natomas Levee Improvement Program

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From: Walt Seifert [mailto:bikesaba@gmail.com]
Sent: Friday, December 04, 2009 1:58 PM
To: Bassett. John (MSA)
Subject: Notice of Preparation of EIS/EIR on Phase 4b of the Natomas Levee Improvement Program

John Bassett, P.E., Director of Engineering
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814

RE: Notice of Preparation of EIS/EIR on Phase 4b of the Natomas Levee Improvement Program

Dear Mr. Bassett:

Thank you for the opportunity to comment on the subject NOP. SABA works to ensure that bicycling is safe, convenient, and desirable for everyday transportation. Bicycling is the healthiest, cleanest, cheapest, quietest, most energy efficient, and least congesting form of transportation.

We are very pleased that the Phase 4b Project includes construction of the Natomas Levee Recreational Trail Project, a 42-mile bicycle and pedestrian Class I facility. This trail will tremendously enhance the recreational opportunities for bicyclists and pedestrians in the Sacramento region. It will also provide key linkages for bicycle commuters to access employment centers from the northern residential neighborhoods of Sacramento and its suburbs.

Construction of the Phase 4b Project will cause significant adverse impacts to existing bicycle routes for both recreational and utilitarian purposes. These important bicycle routes include the Garden Highway and its intersecting streets and roads and the Ueda Parkway bike trail along the western levee of the Natomas East Main Drainage Canal (also called Steelhead Creek). The NOP states that project construction may require closure of these bike routes for up to 6 months, a significant adverse impact on bicycle transportation.

To mitigate this significant adverse impact, the EIS/EIR must describe adequate mitigation including:

- Alternative bicycle access through or adjacent to construction areas,
- Proper advance signage for any detours or route changes,
- Access to bicycle devices at traffic signals,
- Signage for vehicle operators (for example, "share the road" signs and pavement symbols) and maximum vehicle speed limits of 25 mph where separate bicycle lanes cannot be provided,

- Advance development of Traffic Control Plans that show traffic control measures for bicyclists with the plans reviewed and approved before construction initiation by the Sacramento city and county bicycle coordinators, and
- Noticing to bicycle-interest organizations in the Sacramento area.

The Ueda Parkway bike trail currently has limited connections with surface streets in the neighborhoods near which it passes. Reconstruction of the Ueda Parkway bike trail after completion of the levee project should include establishing connections to the following surface streets:

- Indiana Ave
- Senator Ave
- Rosin Court
- Tandy Court
- North Market Blvd

SABA is an award-winning nonprofit organization with more than 1400 members. We represent bicyclists. Our aim is more and safer trips by bike. We are working for a future in which bicycling for everyday transportation is common because it is safe, convenient, and desirable. Bicycling is the healthiest, cleanest, cheapest, quietest, most energy efficient, and least congesting form of transportation.

Thank you for considering our comments.

Yours truly,

Jordan Lang
Project Assistant

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Sloatman, Lindsey

From:	Bassett. John (MSA) [bassettj@SacCounty.NET]
Sent:	Monday, November 09, 2009 3:21 PM
To:	Dunn, Francine; Henningsen, Sarah; Rader, David; Holland, Elizabeth G SPK; Dadey, Kathleen A SPK
Cc:	Washburn. Timothy (MSA); Gilchrist. M. Holly (MSA); Ellen J. Garber
Subject:	FW: 2maps
Attachments:	DK_2maps.pdf

-----Original Message-----
From: Dan Kaufman [mailto:dan@kaufmancoltd.com]
Sent: Monday, November 09, 2009 2:34 PM
To: Bassett. John (MSA)
Subject: FW: 2maps

John,

In response to SAFCA Notice dated November 5, 2009, would you please advise me of the proposed phase and year covering property located north of Sankey Road to Howsley Road. Also, please advise us why our property is not included in your Notice as a Potential Borrow Site, given that it has been considered in the past as a Basin as shown on the attached map due to the Sankey Spill.
Thank you.

Dan Kaufman
License No. 00233837
KAUFMAN & COMPANY, LTD
KAUFMAN PROPERTIES, INC
10 Fullerton Court, Suite 200
Sacramento, CA 95825
Ph (916) 565-7000
Fax (916) 565-7010
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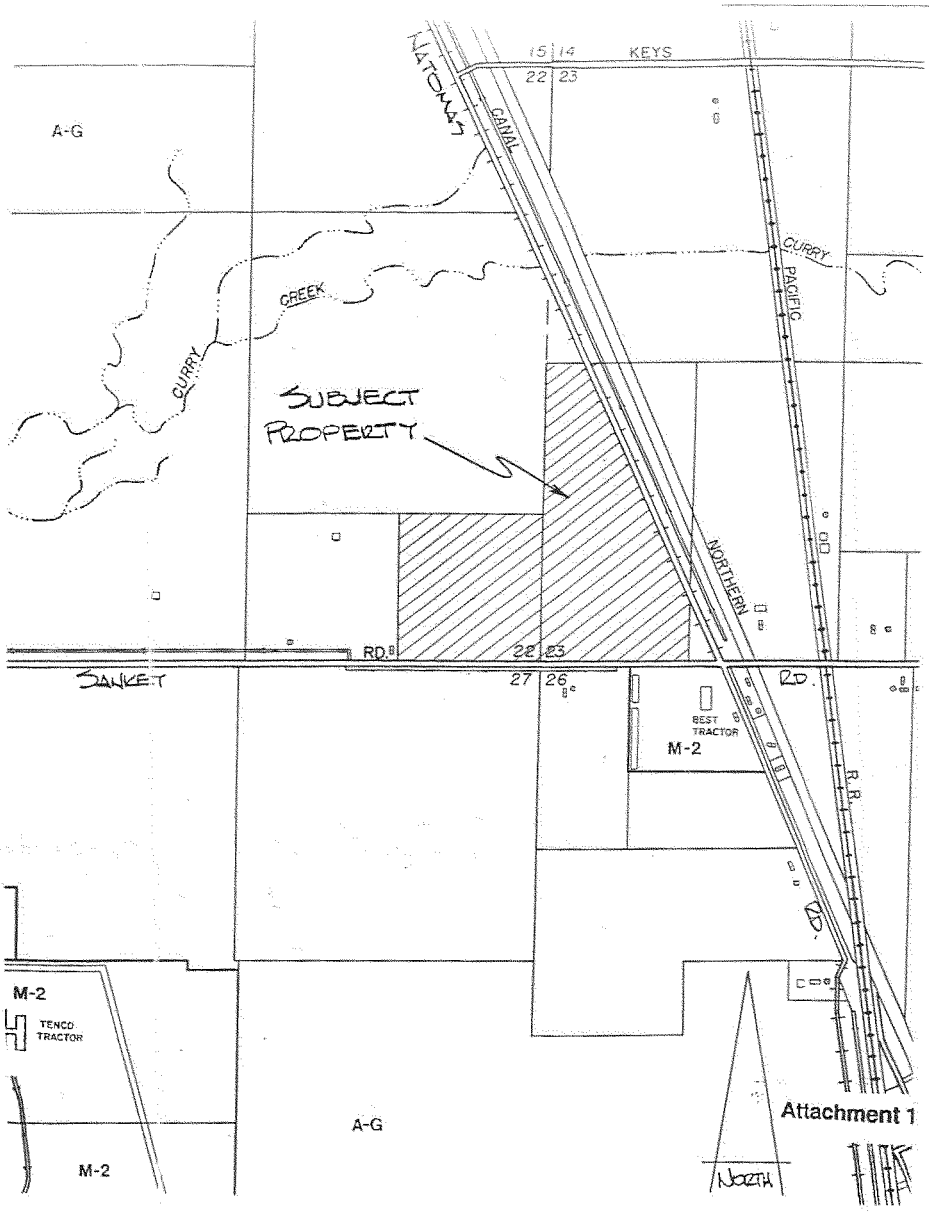
A-G
NATOMAS
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CREEK
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BEST TRACTOR
M-2
R.R.
M-2
TENCO TRACTOR
A-G
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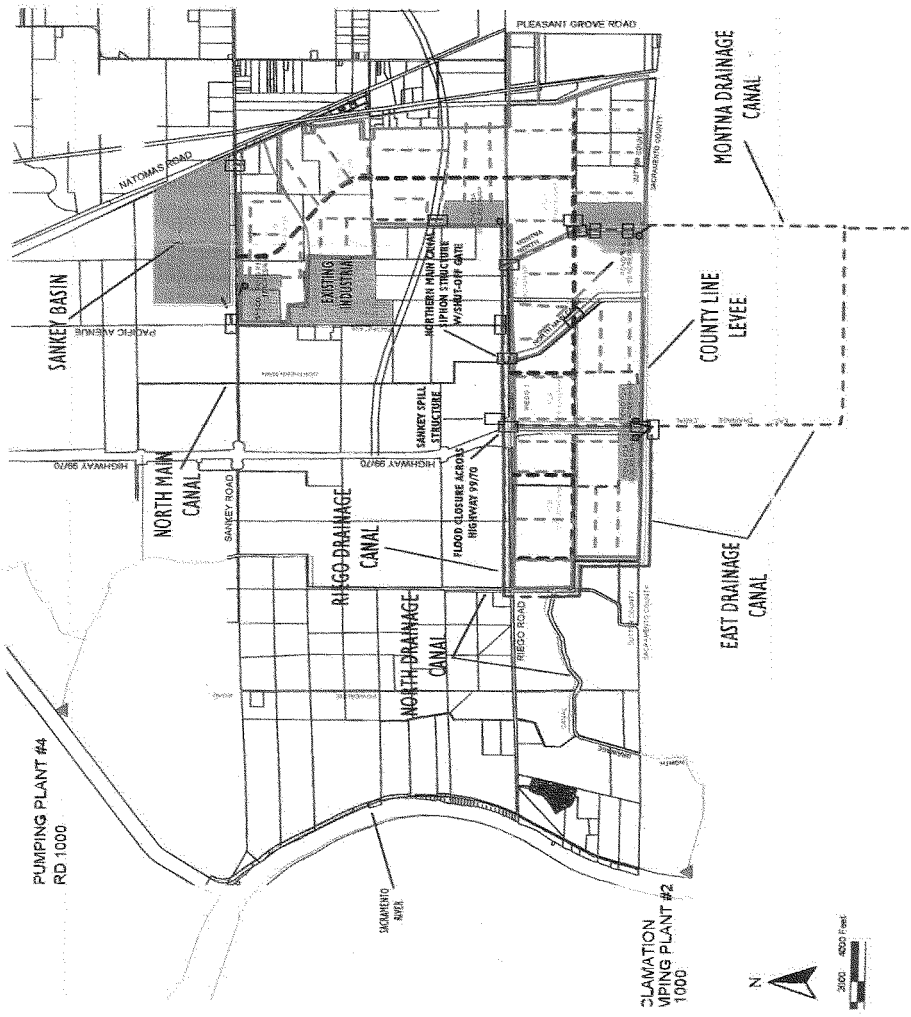
NORTH
Attachment 1


PLEASANT GROVE ROAD
NATOMAS ROAD
PACIFIC AVENUE
SANKEY BASIN
EXISTING INDUSTRIAL
NORTHERN MAIN CANAL SIPHON STRUCTURE W/SHUT-OFF GATE
SANKEY SPILL STRUCTURE
FLOOD CLOSURE ACROSS HIGHWAY 99/70
HIGHWAY 99/70
NORTH MAIN CANAL
SANKEY ROAD
RIEGO DRAINAGE CANAL
NORTH DRAINAGE CANAL
RIEGO ROAD
MONTNA DRAINAGE CANAL
COUNTY LINE LEVEE
EAST DRAINAGE CANAL
PUMPING PLANT #4
RD 1000
SACRAMENTO RIVER
CLAMATION
MPING PLANT #2
1000
N
2000
4000 Feet

Sloatman, Lindsey

From: Bassett. John (MSA) [bassettj@SacCounty.NET]
Sent: Friday, December 04, 2009 4:11 PM
To: Dunn, Francine; Henningsen, Sarah; Rader, David
Subject: FW: 2maps
Attachments: DK_2maps.pdf

-----Original Message-----
From: Dan Kaufman [mailto:dan@kaufmancoltd.com]
Sent: Friday, November 13, 2009 3:35 PM
To: Bassett. John (MSA)
Subject: FW: 2maps

John,

At your earliest convince, would you call or reply to my November 9, 2009 email so that I may advise my partners on the status of SAFCA interest in our property. Again, Thanks.

Dan Kaufman
License No. 00233837
KAUFMAN & COMPANY, LTD
KAUFMAN PROPERTIES, INC
10 Fullerton Court, Suite 200
Sacramento, CA 95825
Ph (916) 565-7000
Fax (916) 565-7010
dan@kaufmancoltd.com

-----Original Message-----
From: Dan Kaufman
Sent: Monday, November 09, 2009 2:34 PM
To: John Bassett
Subject: FW: 2maps

John,

In response to SAFCA Notice dated November 5, 2009, would you please advise me of the proposed phase and year covering property located north of Sankey Road to Howsley Road. Also, please advise us why our property is not included in your Notice as a Potential Borrow Site, given that it has been considered in the past as a Basin as shown on the attached map due to the Sankey Spill.
Thank you.

Dan Kaufman
License No. 00233837
KAUFMAN & COMPANY, LTD
KAUFMAN PROPERTIES, INC
10 Fullerton Court, Suite 200
Sacramento, CA 95825
Ph (916) 565-7000

Fax (916) 565-7010
dan@kaufmancoltd.com

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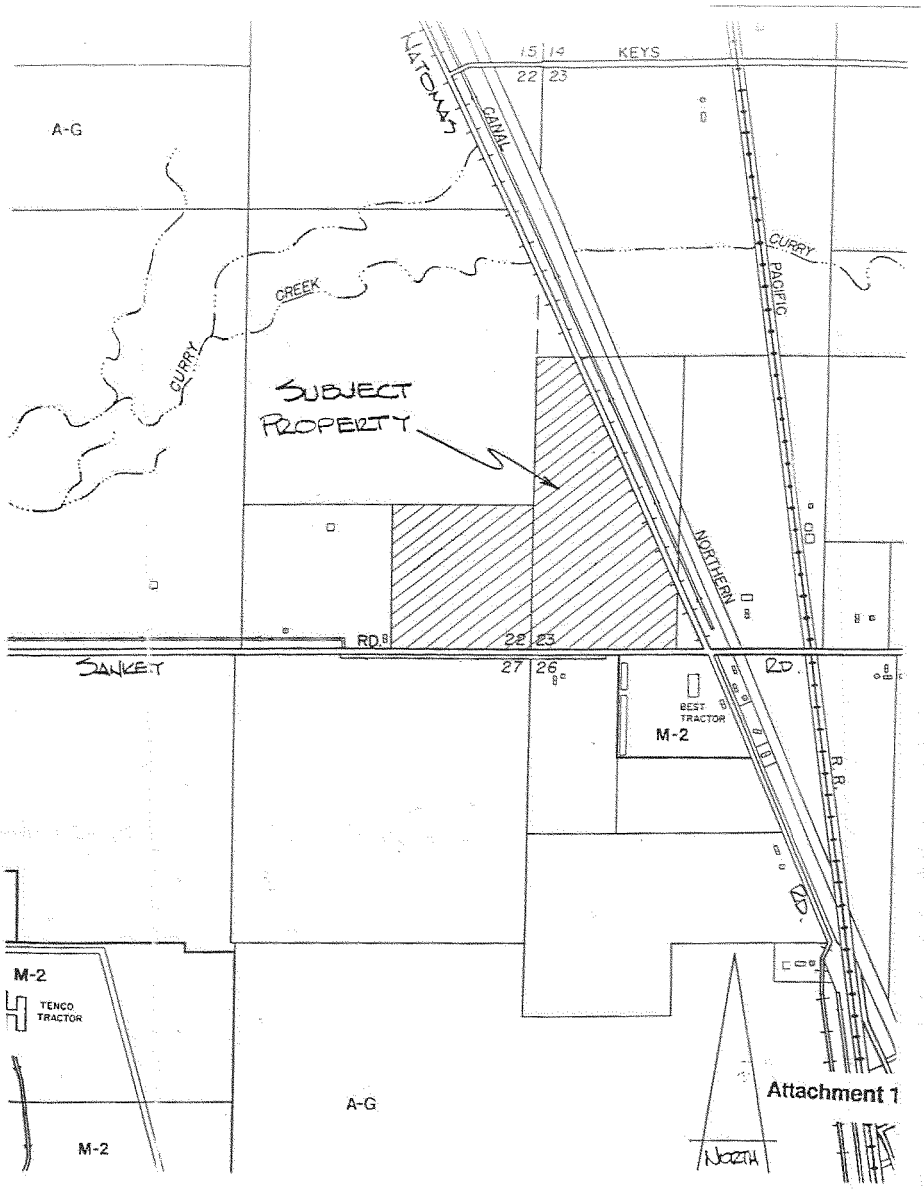
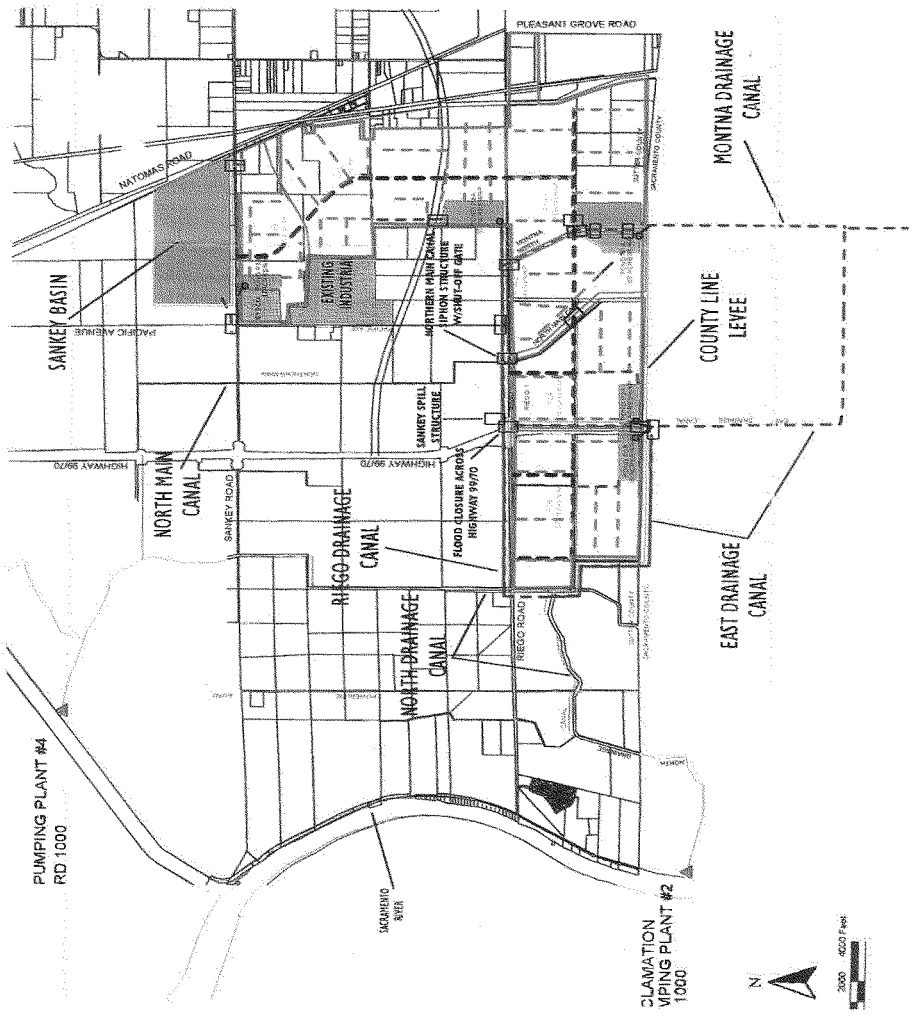


Attachment 1


PLEASANT GROVE ROAD
NATOMAS ROAD
SANKEY BASIN
PACIFIC AVENUE
EXISTING INDUSTRIAL
NORTHERN MAIN CANAL SIPHON STRUCTURE W/SHUT-OFF GATE
SANKEY SPILL STRUCTURE
HIGHWAY 99/70
NORTH MAIN CANAL
SANKEY ROAD
RIEGO DRAINAGE CANAL
FLOOD CLOSURE ACROSS HIGHWAY 99/70
NORTH DRAINAGE CANAL
RIEGO ROAD
MONTNA DRAINAGE CANAL
COUNTY LINE LEVEE
EAST DRAINAGE CANAL
PUMPING PLANT #4
RD 1000
SACRAMENTO RIVER
CLAMATION
MPING PLANT #2
1000
N
2000
4000 Feet

Sloatman, Lindsey

From: Bassett. John (MSA) [bassettj@SacCounty.NET]
Sent: Tuesday, November 10, 2009 1:53 PM
To: Dunn, Francine; Henningsen, Sarah; Rader, David; Holland, Elizabeth G SPK; Dadey, Kathleen A SPK
Cc: Washburn. Timothy (MSA); Gilchrist. M. Holly (MSA); Ellen J. Garber
Subject: FW: NOP
Attachments: --static--liam_fetch_lb.gif; --static--liam_fetch_bl.gif

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From: Shirley Wallace [mailto:shirleywallace40@yahoo.com]
Sent: Tuesday, November 10, 2009 1:24 PM
To: Bassett. John (MSA)
Subject: NOP

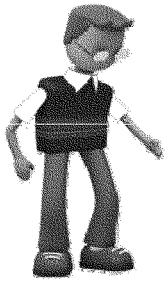
We currently own and farm 200 acres bordering Fifield Road in Pleasant Grove, Sutter County.

On the current NOP our property is designated as a "New potential borrow site."

Can you give me more exact information as to the extent of this potential borrow pit? Our home and barns currently front on Fifield Road also.

Shirley and Robert Wallace
2950 Fifield Road
Pleasant Grove, CA 95668

E-Mail: shirleywallace40@yahoo.com



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Sloatman, Lindsey

From: Bassett. John (MSA) [bassettj@SacCounty.NET]
Sent: Wednesday, November 25, 2009 3:09 PM
To: Dunn, Francine; Henningsen, Sarah; Rader, David; Holland, Elizabeth G SPK; Dadey, Kathleen A SPK
Cc: Washburn. Timothy (MSA); Gilchrist. M. Holly (MSA); Ellen J. Garber; Jay Davis; Barbara Gualco; Buer. Stein (MSA)
Subject: FW: Natomas PACR/NLIP Phase 4b Project NOP Scoping Comment

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From: mjod@eaglevisioneyecare.com [mailto:mjod@eaglevisioneyecare.com]
Sent: Wednesday, November 25, 2009 3:04 PM
To: Bassett. John (MSA)
Subject: Natomas PACR/NLIP Phase 4b Project NOP Scoping Comment

To whom it may concern,

My family lives at 2269 Swainson Way along Reach19b and I am very concerned for wellbeing of my family and property. While I understand the need for the levee work and the gravity of the situation if the levee work is not completed, my family will unjustly be affected.

My four month old son's room faces the levee, and per your documents, this work will take place 24 hours/seven days per week. My son and family's ability to obtain adequate and sound sleep will certainly be impeded and I am concerned that we all will suffer detrimental health problems if the construction goes on as planned. My infant son is especially at risk hearing damage/loss, allergies and/or other respiratory issues, and sleep deprivation.

My property value is absolutely going to drop as a result of a wall constructed outside my front door. In addition to the unavoidable loss of property value after levee work is complete, my dwelling may be unlivable during construction. The physical concerns outlined above, coupled with noise, dust and construction debris, will undoubtedly make my dwelling un-sellable and un-rentable during the construction phase of levee work. My family will have to find an alternate place to live and incur costs associated with moving and maintaining two households for the entire duration of construction. Additionally, our home will be at risk for damage by construction equipment, and if left unattended, break-in and/or vandalism.

Since there are multiple households on Swainson Way, I feel these concerns should be addressed directly with the home-owners. I for one did not receive notice of the meeting on November 18th until after the meeting had ended (it was later determined that the flyer was dropped off at the front door a mere 24 hours prior to the meeting). Considering the staggering impact the levee work will have on Swainson Way residents, the parties involved need to make a greater effort in informing and managing the concerns of residents affect by the construction on Reach 19b.

In order to maintain my right to legally challenge any and all aspects of the levee project, please note that this letter has been submitted via email prior to the December 4, 2009 for comments and a hard copy will be mailed via USPS as well.

Michael and Sara Johnson

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Phillip Day Perry
2346 La Lima Way
Sacramento, California 95833

December 2, 2009

John Bassett, P.E., Director of Engineering
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814

RE: Comments related to the NOP for the Phase 4b Landside Improvements Project

Dear Mr. Bassett,

Is the USACE familiar with the term, A Morton's Fork?

Simply put, a Morton's Fork is a choice between two equally unpleasant alternatives or two lines of reasoning that lead to the same unpleasant conclusion. I.E., "between a rock and a hard place."

That is what this Notice of Preparation is serving us; a big heaping fork full of Morton.

What the NOP tells us is that while SAFCA may have been content to reinforce in-place the existing levee system, USACE believes the only way to lessen the risk of flood is to channelize the Sacramento River in a fashion similar to that taken by them with respect to the Los Angeles River back in the late 1930s.

This does not need to be the case.

A few years back, the initial design proposal for RD1000's Pumping Plant #1 Improvement Project was to completely denude all vegetation in the area, scrape the slope from the land to the water to a 21-degree angle, and install steel sheet piles opposite the pumping plant.

In other words, make the area a big, beautiful (to an engineer) bathtub drain.

While it is understandable why an engineer would believe this the best way to achieve the desired purpose, it fails to take into account the people, or the wildlife, that live here long after construction is complete.

This project proposes to follow the same logic as that initial RD1000 design proposal.

For example, Page 9 references landside vegetation removal under the "fix-in-place alternative," that would allow some landside vegetation to be saved, yet <u>all</u> waterside vegetation would be removed.

Why is USACE married to the idea that all vegetation is bad and what options are available to change their position? A recent Sacramento Bee article (06/28/2009, page B1) makes it clear that there is no scientific consensus supporting the hypothesis that vegetation is harmful to the operation of levees. In fact, there appears to be abundant research that shows vegetation is vital as it slows waterside bank erosion.

This leads to a somewhat obvious question; What happens to the waterside slope after an impermeable cutoff wall is placed in an existing levee?

Where seepage occurs, there would be a balance in moisture on the landside and waterside of the levee. By placing an additional slurry cutoff wall and/or adjacent levee berm, would that not cause more moisture to remain in the waterside slope and -- with a higher moisture content -- would it not result in a greater chance of liquefaction occurring during periods of high water level? Moreover, with that higher water level, could there not easily begin a process of erosion that would result in much of the waterside slope disintegrating into the river flow?

For instance, when was the last time you saw a slope of any kind on the waterside of a river with a wall? The natural action of the river is to scour away at its banks where there is no vegetation until it reaches an impermeable barrier... like a cutoff wall.

Homeowners on the waterside of the Garden Highway levee have already witnessed measurable ground subsidence of their properties subsequent to the previous slurry wall project of the mid 1990s. How does this NOP take into consideration that action?

While page 5 references the construction of adjacent landside levee with wider landside slope & seepage berms, no designs are offered to identify the actual impacts for the majority of the frontage along Reach 19B. The closest we get is, "measures would be employed to reduce the project footprint impacts to these resources (residences, business, heritage oaks) to the extent feasible given levee design and seepage remediation requirements."

How can environmental impacts be judged when project design & limits are not presented? We require some form of preliminary design to identify the limits and actual environmental impact that the project expects to make.

Page 5 also notes the modifications to RD1000 pumping plants are required. How will this fit in with the recent work the Corps *just completed* at pumping plant #1? Will this require them to tear-up the work?

Page 6 notes right-of-way acquisition of lands within the 4b project footprint. Again, this is an area of almost urban density and the NOP gives no guidance as to the extent of the project footprint.

Page 8 notes the three-foot-wide cutoff walls. The $100 million spent in the 1990s was primarily spent on cutoff walls. Are these walls inadequate? What happens to them?

Page 8 notes the reconstruction of Garden Highway intersections at Orchard and Gateway Oaks to accommodate levee slope flattening, but the properties east and west of these intersections are fully improved with minimum setback available for such construction.

Does USACE plan a program of imminent domain to acquire various properties in these areas and other areas? Again, there are no design proposals that allow us to ascertain the extent of the plans.

Page 5 endorses 24/7 construction for cut-off walls. While that may be logical for the more rural areas of Garden Highway, in the areas encompassed by this NOP that is wholly unfeasible. There are dozens of houses that would be in close proximity to the ongoing construction. The offered mitigation that SAFCA would provide vouchers for folks to find temporary housing is insufficient.

Page 7 references the seepage berm, up to 250' wide, in addition to the adjacent levee construction. While this may be feasible in parts of Reach 19A, it is ridiculous to assume it feasible for much – if any – of heavily populated Reach 19B.

The Los Angeles River used to be a natural river that regularly flooded. I understand the need of the Natomas area to be – relatively – safe from floods. As engineers, I understand the need to "fix" the problem to the best of your abilities, but this is not Los Angeles.

The area encompassed by the Phase 4b Project is heavily populated and heavily wooded. What the Corps proposes is – in effect – scorched earth and will scar this area for decades without a discernable difference in flood protection from what SAFCA proposed back in the mid 1990s.

Having lived in the Natomas area for over 20 years, I went through the first Natomas levee "fix" that USACE now says is inadequate, yet SAFCA's own reports indicate did a decent job making Natomas reasonably safe from flood.

From the Natomas Levee Improvement Program Update, March 20, 2008:
"Due to over $100 million in flood levee improvements expended between 1990 and 1998, the 1997 flood, which can reasonably be characterized as the largest flood event in the last 150 years, caused no significant levee problems for the Natomas Basin. The through-levee seepage which threatened to cause levee failures in the 1986 flood have been effectively controlled with the cut-off walls and seepage berms constructed by the Corps and SAFCA."

Overall, the NOP reads as being designed for a project destined for the rural areas of reaches 1 – 16 or is simply naive as to the types of residential densities found in the 4b project area. "Multiple residential and agricultural structures are located within the footprint of the levee improvement," is as much an understatement as it might be wishful thinking.

Please, go back to the drawing board. Do not subject the residents of Natomas to an overbuilt monstrosity of a levee fix required simply due to the Corps compensating for their failure in New Orleans.

Sincerely,

Phil Perry

cc: Honorable Doris Matsui
Honorable Ray Tretheway

Sloatman, Lindsey

From: Javed Siddiqui [Javed.Siddiqui@jtsengineering.com]
Sent: Friday, November 20, 2009 9:28 AM
To: Buer. Stein (MSA)
Cc: Nottoli. Don; Patrick Tully; Doug Cummings; Jay Davis; David Ingram; Jimmie Yee
Subject: 1996-127 : Premature Oak Tree Cutting Pursuant to Contract 4047
Attachments: Sbizhubc35309112010260.pdf

Mr. Buer:
Please see attached proposed X-section. I wish to propose alternate 1. Floodwall, slurry wall and seepage trench. . This would considerably reduce the levee footprint and the associated impacts.
Thank You!

Very Truly Yours,

Javed T. Siddiqui, P.E.
JTS Engineering Consultants, Inc.
1808 J Street
Sacramento, CA 95811-3010
Tel: (916) 441-6708
Fax: (916) 441-5336
Email: Javed.Siddiqui@JTSEngineering.com

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From: David Ingram [mailto:David@tennantingram.com]
Sent: Wednesday, November 18, 2009 10:07 AM
To: buers@SacCounty.net
Cc: nottolid@SacCounty.net; Patrick Tully; Doug Cummings; Jay Davis; Javed Siddiqui
Subject: RE: Premature Oak Tree Cutting Pursuant to Contract 4047

Mr. Buer:

The Garden Highway Community Association (GHCA) shares Mr. Cummings' concern.

Notably, during the SAFCA Board meeting on Friday, it was repeated several times that the levee improvement design is a "work in progress" and that certification of the Phase 4a EIS was a "worst case scenario" for the environment and property rights. With alternative, less obtrusive levee improvement designs gaining momentum, and in the face of the insurmountable fiscal problems facing this Project, the GHCA strongly encourages SAFCA to look outside its predestined box. We also urge SAFCA not to prematuredly "clear a construction path" through sensitive habitats and rich farmland based upon this "worst case" design scenario. This action would sadly transform the "worst case" into the "real case."

There are obviously countless alternative designs that would accomplish the flood protection our region needs at a fraction of the monetary, environmental and property-loss cost. For example, simply narrowing the

footprint of the "seepage berms" would result in mammouth savings in all three of these areas. These berms, designed to be 500 feet wide in some areas, are unprecedented in our region and seem highly unwarranted when compared to the existing 10-20 foot berms that previously handled several 100-year-floods (without the cut-off walls that will be added as a part of this project). More telling, as evidenced by design concessions to certain property owners, including the Teal Bend Golf Club, SAFCA has shown by its own actions that the footprint of the seepage berm can be substantially narrowed without losing the flood protection it seeks.

While we appreciate the daunting task this Project presents to SAFCA and its Board, we strongly feel that a more rational design approach would substantially reduce these challenges, save the taxpayers hundreds of millions of dollars, preserve sensitive habitat and rich farmland and ultimately expedite recertification of the Natomas levees.

Thank you for consideration.

David Ingram,
Director, GHCA

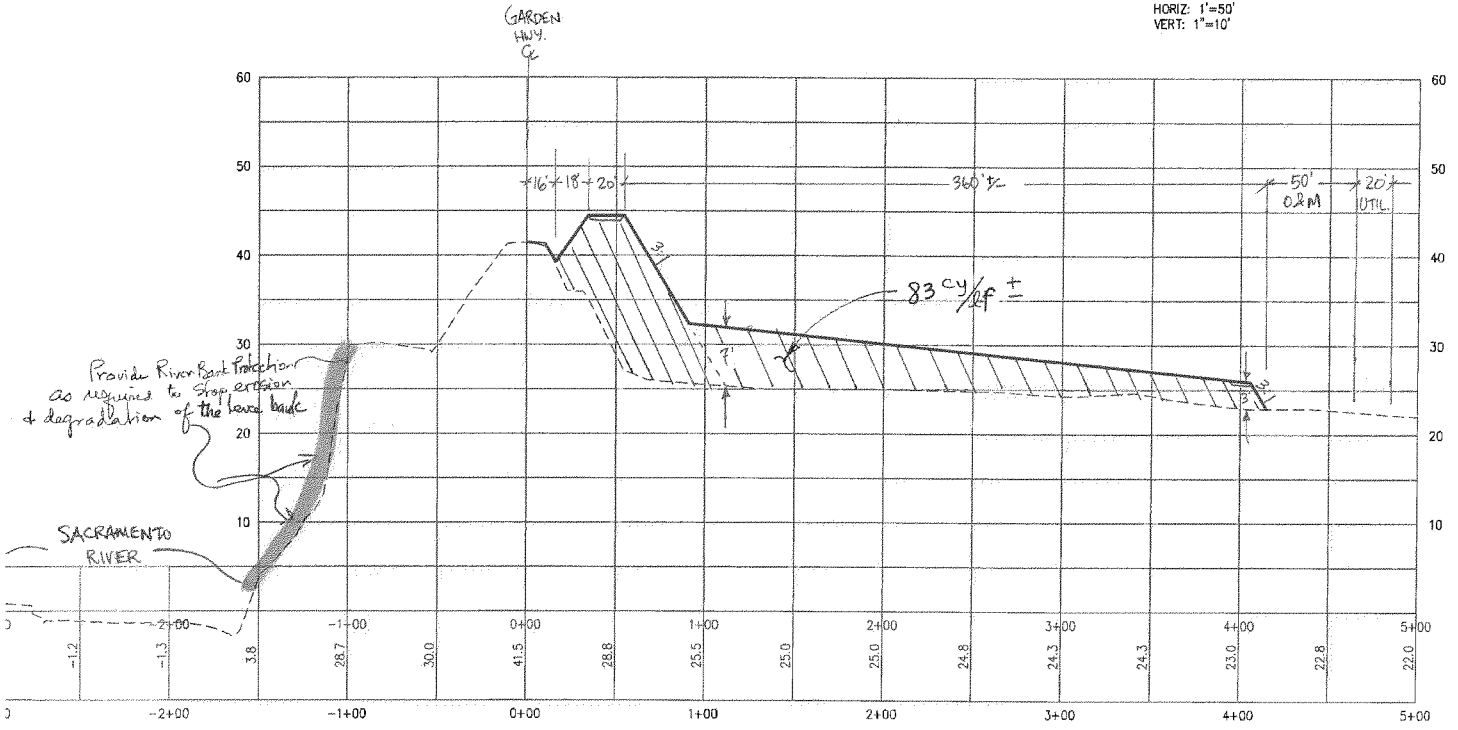
From: Doug Cummings [mailto:dougcummings@sbcglobal.net]
Sent: Wednesday, November 18, 2009 9:07
To: buers@SacCounty.net; Jay Davis
Cc: nottolid@SacCounty.net; David Ingram; Patrick Tully
Subject: Premature Oak Tree Cutting Pursuant to Contract 4047

Mr. Bauer: We note that you "promise" that SAFCA will not cut the thousands of trees on the landside of the Garden Highway in the NLIP Phases 3 and 4a until funding is secure to award levee construction contracts in these areas. We note the January 7 and March 1 "go ahead" dates in the tree cutting contract, Contract 4044. However, We also note that there are a great number of trees scheduled to be cut pursuant the demolition contract, Contract 4047. We understand that your suggested reason for including certain trees in Contract 4047 is because these trees are located in the path of canal work -- which is part of 4047. However, many, many large oak trees scheduled for destruction pursuant to 4047 are NOT in the path of canals. For example, a great number of trees on properties north of North Bayou Way (Bell property, Vanderford property, etc.) are not located in the path of a proposed canal. There are several other examples. If you are indeed sensitive to unnecessary mature oak tree cutting in this project, you should include ALL trees (other than ones directly impacting Contract 4047 work) in the "save until secure funding" concept.

We would appreciate meeting with your staff immediately to discuss the reasons for including the large amount of trees in Contract 4047 -- and in working with you to include the Contract 4047 non-impacting trees in the "save until secure funding" umbrella.

Doug Cummings, co-chair
Association for the Environmental Preservation of the Garden Highway

Station #
490
HORIZ: 1"=50'
VERT: 1"=10'

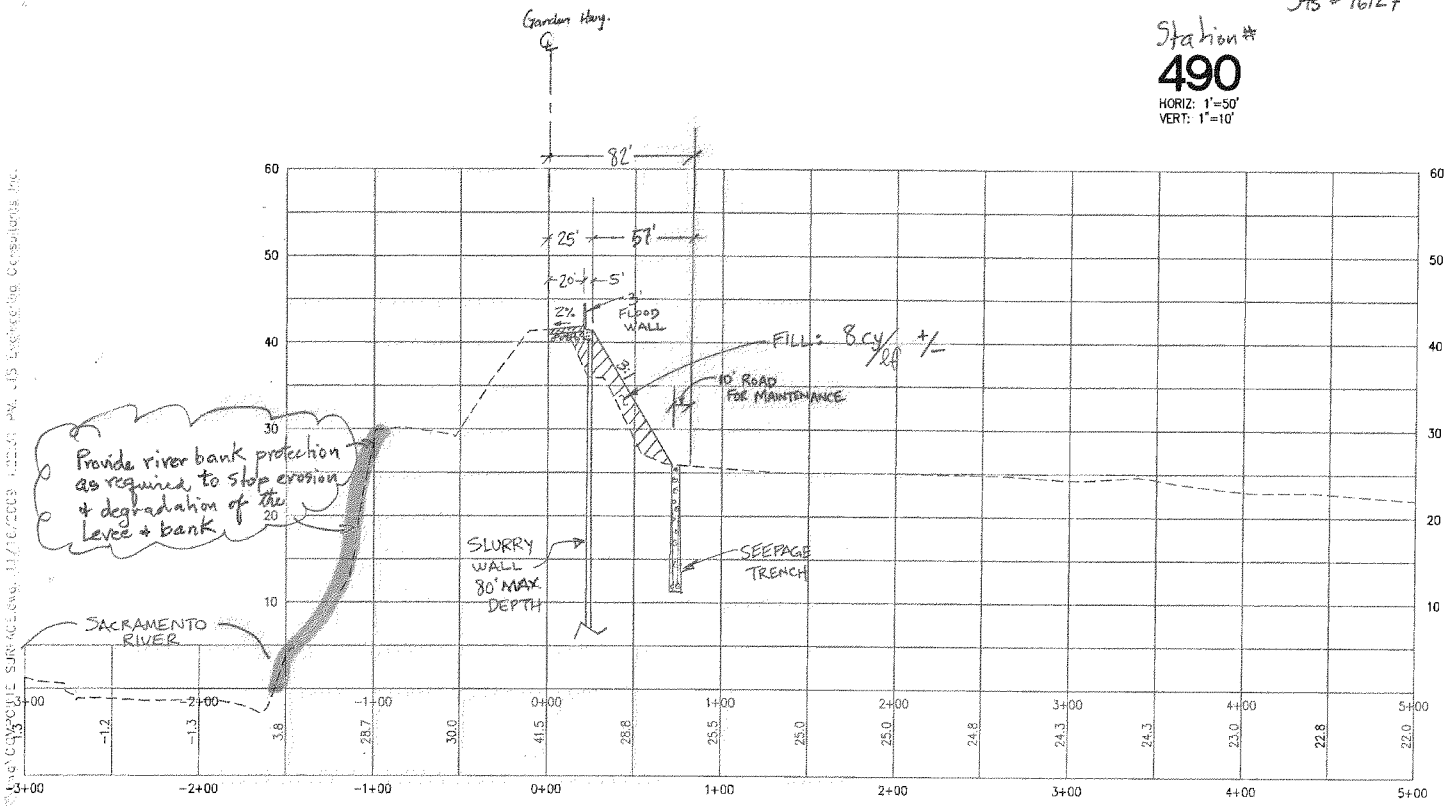


ALTERNATE #2

NEW LEVEE 3' ABOVE GARDEN HWY, 300' SEEPAGE BERM
FOOTPRINT OF DISTURBANCE EXTENDS 430 LF FROM EXISTING LEVEE TOE

JTS #96127

Station #
490
HORIZ: 1"=50'
VERT: 1"=10'



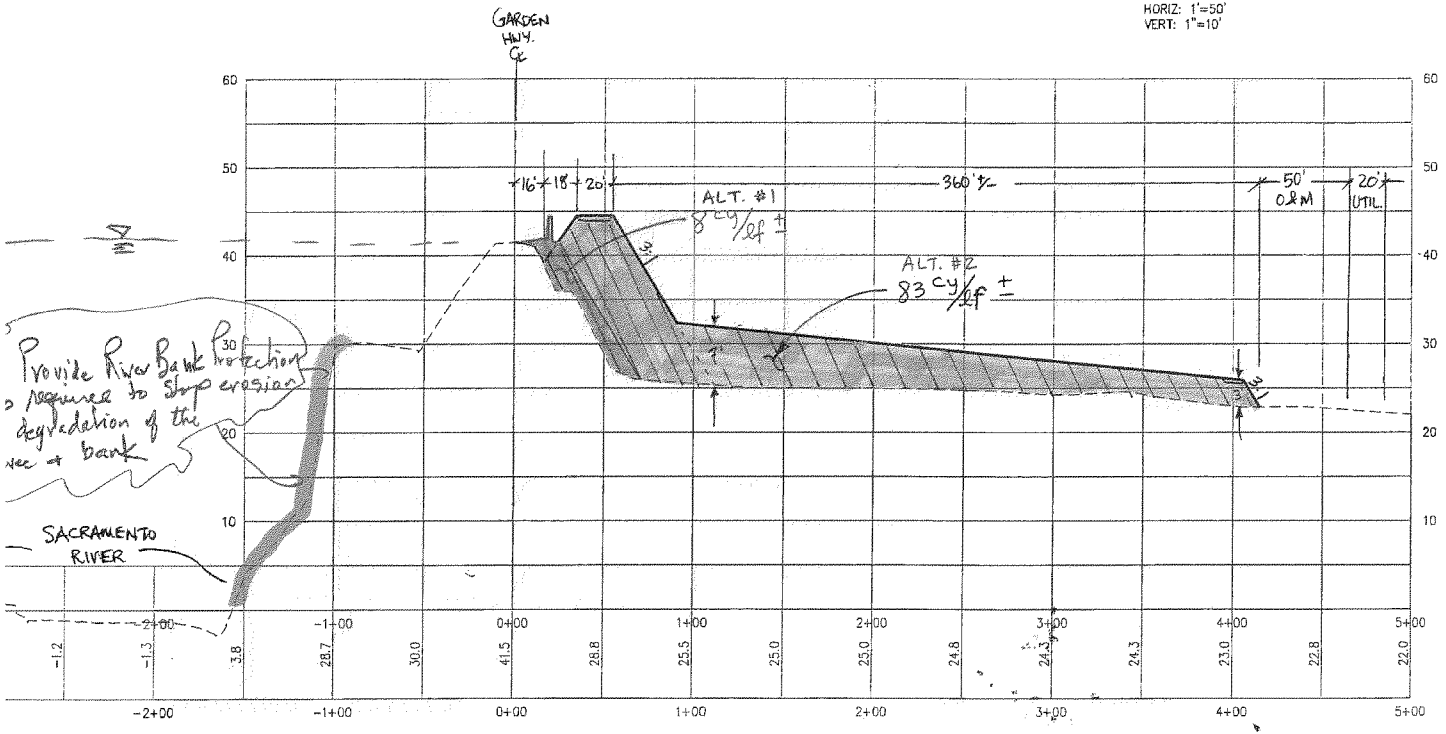
ALTERNATE #1

WIDEN GARDEN HWY., 3' FLOOD WALL, STRENGTHEN LEVEE, SLURRY-WALL & SEEPAGE TRENCH
ADVANTAGE: MINIMIZE FOOTPRINT OF DISTURBANCE TO 30LF FROM EXISTING LEVEE TOE

Station #

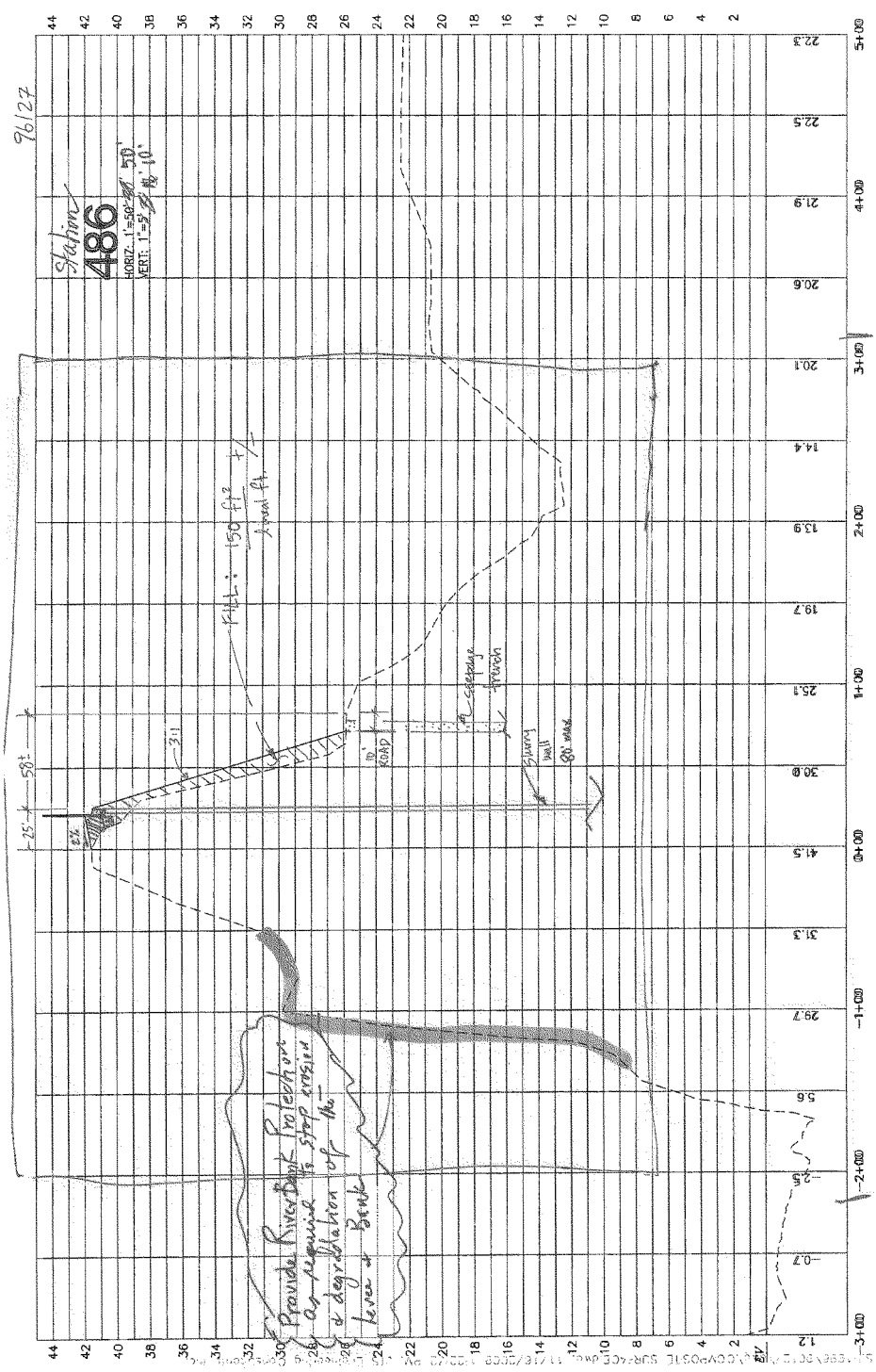
490

HORIZ: 1"=50'
VERT: 1"=10'



COMPARISON OF ALTERNATES #1 & #2

ALT.#2 REQUIRES ~10 X EARTHWORK QUANTITY OF ALT. #1.


96/27
Station
486
HORIZ: 1"=50' 50'
VERT: 1"=5' 10' 10'
FILL: 150 ft² +/- 1 real ft.
Seepage trench
Slurry wall 80' max
10' ROAD
3:1
58±
25'
Provide River Bank Protection as required to stop erosion & degradation of the levee & Bank

LIVING HERE

HOME & GARDEN

Springlike weather fools many flowering plants, so enjoy the show

Gateway garden honors history

UC Davis Arboretum provides a showcase of plants used and revered by Patwin tribe

Gateway garden honors history
UC Davis Arboretum provides a showcase of plants used and revered by Patwin tribe
Fall Savings
SILVERADO
ECOBURN
Pellet-Fuel
$3.95/Bag
Pallets of 50 Bags
$190.00
20% OFF
DELIVERY AVAILABLE

Native Americans: Other universities interested in creating similar sites

"We've already been approached by (Florida) university members who would like to see these methods for tested making. That's a wonderful idea."

PATIO COVERS
Solid & Lattice

SUNROOMS

WINDOWS, SIDING, ROOFING & STUCCO

BATHROOM UPGRADES

AIR CONDITIONING

Don't Buy New...

Sloatman, Lindsey

From:	Bassett. John (MSA) [bassettj@SacCounty.NET]
Sent:	Wednesday, December 02, 2009 7:29 PM
To:	Dunn, Francine; Henningsen, Sarah; Rader, David; Holland, Elizabeth G SPK; Dadey, Kathleen A SPK
Cc:	Washburn. Timothy (MSA); Gilchrist. M. Holly (MSA); Ellen J. Garber
Subject:	FW: DEC 4 last day for comments on Phase 4b "Notice of Preparation"..... Comments attached for inclusion and study by SAFCA and Corps of engineers.
Attachments:	Phase 4b NOP Comments.pdf; Sbizhubc35309111222260.pdf; Sbizhubc35309111222261.pdf; 1996-127 : Premature Oak Tree Cutting Pursuant to Contract 4047

From: Javed Siddiqui [mailto:Javed.Siddiqui@jtsengineering.com]
Sent: Wednesday, December 02, 2009 3:18 PM
To: Washburn. Timothy (MSA); Bassett. John (MSA); Holland, Elizabeth G SPK; Buer. Stein (MSA)
Cc: all@srpoa.org; gib@mail.com; Javed Siddiqui; Khalid Siddiqui
Subject: DEC 4 last day for comments on Phase 4b "Notice of Preparation"..... Comments attached for inclusion and study by SAFCA and Corps of engineers.

John, Tim and Elizabeth:

I am sending herewith the following attachments, which we would like to submit to you include as comments/suggestions/ requests from our family related to the Environmental documents (EIR/EIS for CEQA/NEPA) for proposed improvements along the Sacramento River levees flood improvement program:

1 Copy of the article that appeared in the Bee regarding Heritage Oaks and their ties to Natomas Basin history and heritage.

2 Two letters dated November 11 and November 12, submitted to SAFCA on November 12, but was not included in the SAFCA presentation packet for the EIR certification on November 13, 2009 hearing.

3 Email to SAFCA on November 20, 2009 regarding proposed x-section for levee improvements with a floodwall and seepage berm for consideration and evaluation of this viable alternative.

We will continue to do our best to protect our historic, cultural, environmental and economic resources if it is possible to do so. We are asking SAFCA and the Corps of engineers to evaluate the historic, cultural, environmental and economic value and benefits of these valuable resources. We ask that you balance these benefits with the flood protection needs of the Natomas basin.

NEPA and CEQA requirements are not satisfied unless all viable alternatives that should have been considered in the EIR/EIS process are included.. As of now, not all reasonable alternatives that would minimize environmental impacts have been evaluated. Floodwalls with seepage trench alternative deserve to be evaluated.
We continue to hope that staff will evaluate our request before it is too late.
Please confirm receipt and acknowledgement that these and the previous information will be provided to the appropriate staff for inclusion in the EIR/EIS for CEQA/NEPA process.
Thank You!

Very Truly Yours,

Javed T. Siddiqui, P.E.
JTS Engineering Consultants, Inc.
1808 J Street
Sacramento, CA 95811-3010
Tel: (916) 441-6708
Fax: (916) 441-5336
Email: Javed.Siddiqui@JTSEngineering.com

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From: Gibson Howell [mailto:gib@mail.com]
Sent: Wednesday, December 02, 2009 11:31 AM
To: all@srpoa.org
Subject: DEC 4 last day for comments on Phase 4b "Notice of Preparation"

Hello All,

Just a reminder, Dec 4 is the last day to submit comments on Phase 4b "Notice of Preparation" (NOP).

While Phase 4b is similar to other Phases of the Natomas Levee Improvement Project, it is very different in the fact that the US Army Corps will be conducting the work instead of SAFCA.

We encourage as many residents as possible to provide comments so the Army Corps knows the concerns of Garden Highway property owners. The attached one page document contains highlights of the NOP and email addresses where you can send comments.

Thank You,

Gibson Howell
President, Garden Highway Community Association
916/730-0141

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Siddiqui Family Partnership	1808 J Street Sacramento, CA 95811 Tel: (916) 441-6708 Fax: (916) 441-5336

November 11, 2009
11-12-09

John Bassett, P.E.
SAFCA
1007 – 7th Street, 7th Floor
Sacramento, CA 95814-3407
Tel: (916) 874-7606
Fax: (916) 874-8289
bassettj@saccounty.net

Tim Washburn
SAFCA
1007 – 7th Street, 7th Floor
Sacramento, CA 95814-3407
Tel: (916) 874-7606
Fax: (916) 874-8289
Washburnt@saccounty.net

RE: Protest to adoption of Environmental Impact Statement and Environmental Impact Report on the Natomas Levee Improvement Program (SCH # 2009032097)

Dear John and Tim,

I have reviewed the documentation in the Draft and Final Environmental Impact Report and must protest the certification of the final EIR. My protest is based on the following:

1. Not all reasonable range of alternatives were evaluated consistent with the requirements of NEPA and CEQA because the alternative does not include floodwall, seepage cut off and pressure relief seepage trench alternatives.
2. The project is not in compliance with Section 2.1.1.1, pertaining to NEPA requirements (40 Code of Federal Regulations (CFR) 15012.14). An objective evaluation of all reasonable alternatives has not been included.
   a) All reasonable alternatives were not identified.
   b) Information that would allow reviewers to evaluate the comparative merits of the proposed action for all reasonable alternatives was not performed.
   c) Agencies preferred alternative did not thoroughly study all reasonable alternatives.
   d) NEPA requires the analysis of the proposed action and all reasonable alternatives at a substantially similar level of detail. The Council on Environmental Quality Regulations (40 CFR 1502.14) require agencies to rigorously explore and objectively evaluate all reasonable alternatives and to devote substantial treatment to each alternative considered. The EIR did not review floodwall and cut off wall with seepage trench alternatives at a similar level detail.

3. The project is not in compliance with Section 2.1.1.2 – CEQA Requirements: The California Code of Regulations (CCR) Section 15126.6(a) of the State CEQA Guidelines requires that an EIR:

   a) Describe a range of reasonable alternatives to a proposed project, or to the location of the project that would feasibly attain most of the basic project objectives but would avoid or substantially lessen any of the significant effects of the project.

   b) Evaluate the comparative merits of the alternatives.

4. The final EIR exhibits indicating "taking" major portions of our properties as necessary for the project. The resolution and agenda for the SAFCA meeting indicate that certain properties "taken" would be exchanged with the airport. I protest the "taking" of land as necessary to the project and then exchanging the land with a third party.

An EIR must consider a range of reasonably potentially feasible alternatives that will foster informed decision making and public participation. Not all reasonable alternatives for floodwall and cut off wall with seepage trench were considered.

Based on the fact that not all reasonable alternatives were considered and SAFCA design team is still investigating design issues, the final EIR can not be properly certified at this time.

I have been corresponding with your agency for the last two years in an attempt to have other reasonable alternatives considered for upgrading of flood protection. Unfortunately, I have been unsuccessful in obtaining a review by your agency of other reasonable alternatives. I am left with little choice but to formally protest certification of the EIR.

Please feel free to contact me if you have any questions or comments. Thank you.

Sincerely,

Javed T. Siddiqui

Javed T. Siddiqui
General Partner
Siddiqui Family Partnership

JTS/fob

Florida O'Brien

From: Florida O'Brien
Sent: Thursday, November 12, 2009 12:16 PM
To: 'bassettj@saccounty.net'; 'washburnt@saccounty.net'
Cc: Javed Siddiqui
Subject: Protest to adoption of Environmental Impact Statement and Env Impact Report on the Natomas Levee Impr Program
Attachments: Sbizhubc35309111213120.pdf

Mr. Bassett and Mr. Washburn,

On behalf of Javed Siddiqui, I am forwarding the attached letter regarding the above subject matter. Please contact Javed directly for any questions or comments. His telephone # is 916-441-6708.

Thank you.

Florida O'Brien
JTS Engineering Consultants, Inc.
1808 J Street
Sacramento, CA 95811-3010
Tel: (916) 441-6708
Fax: (916) 441-5336
florida.obrien@jtsengineering.com

From: bizhubc353@jtsengineering.com [mailto:bizhubc353@jtsengineering.com]
Sent: Thursday, November 12, 2009 1:12 PM
To: Florida O'Brien
Subject: Message from bizhubc353

Siddiqui Family Partnership	1808 J Street Sacramento, CA 95811 Tel: (916) 441-6708 Fax: (916) 441-5336

November 12, 2009

John Bassett, P.E.
SAFCA
1007 – 7th Street, 7th Floor
Sacramento, CA 95814-3407
Tel: (916) 874-7606
Fax: (916) 874-8289
bassettj@saccounty.net

Tim Washburn
SAFCA
1007 – 7th Street, 7th Floor
Sacramento, CA 95814-3407
Tel: (916) 874-7606
Fax: (916) 874-8289
Washburnt@saccounty.net

RE: Protest to adoption of Environmental Impact Statement and Environmental Impact Report on the Natomas Levee Improvement Program (SCH # 2009032097) – Appended letter

Dear John and Tim,

I previously been in contact via correspondence and also testimony before SAFCA Board and State Flood Control Protection Board and expressed my concern that the project as currently proposed did not incorporate recommendation for bank protection as identified in the Natomas East Levee Evaluation Study 2006. That study identified sites I, J, K, L, & M that needed to be stabilized.

The Natomas East Levee Improvement Program for bank protection DEIR of September 2007 ~~1977~~ stated that the bank protection was to prevent erosion that could undermine or increase seepage through the existing levee by installing hardscape and prevent further retreat of existing river bank as a result of flood flow scour and wave erosion. The Proposed improvement would stabilize the bank to insure that the levees are not eroding during a large flood event.

In reading the alternatives carried forward under the Table ES-1, there is no river bank erosion control recommendation identified. Bank erosion proposes either a high or moderate risk to stability of Sacramento River East Levee at the identified locations downstream of I-5 where river flows and waves generated by boat wakes have weakened and under cut portions of the bank supporting the levee. The flood wall alternative, if adopted, would require that the bank protection improvement be implemented.

Because the current EIR did not consider the potentially feasible alternative for a flood wall that will foster informed decision making and public participation, the Environmental Impact Statement and the Environmental Impact Report is not in compliance with NEPA

requirements (40 Code of Federal Regulations (CFR) 15012.14) and the California Code of Regulations (CCR) Section 15126.6(a).

Pleased also see that attached email to you dated 11/8/09 requesting 9 documents which have not been received to date. In addition, I understand that SAFCA consultants are working toward providing missing information/justification. This information is necessary for an informed decision process.

Please append this information to my letter dated 11/11/09. I would I appreciate receiving your comments. Thank your for your courtesy and cooperation.

Sincerely,

Javed T. Siddiqui
General Partner
Siddiqui Family Partnership

JTS/fob

Javed Siddiqui

From: Javed Siddiqui
Sent: Sunday, November 08, 2009 4:52 PM
To: Javed Siddiqui; 'Bassett, John (MSA)'; 'Washburn, Timothy (MSA)'
Cc: Khalid Siddiqui
Subject: RE: 1996-127 Response to the information received for NLIP Phase 3 and Phase 4a projects along Garden Highway properties SREL reaches 9 and 10 .
Attachments: Sbizhubc35309110817460.pdf

John and Tim:

On October 21, I forwarded to you my initial response to the information I received. I support your efforts for providing 100-year flood protection to the Natomas Basin and am anxious to work together and reform the project that offers the highest net benefits formulated to minimize the negative environmental impacts and maximizes the cost effectiveness. I have attached herewith a copy of my letter sent to you on October 21st and a copy of the information list indicating 9 items that you were going to provide but have not been received to date. Please let me know.

I look forward to working with you.

Thank You!
Very Truly Yours,

Javed T. Siddiqui, P.E.
JTS Engineering Consultants, Inc.
1808 J Street
Sacramento, CA 95811-3010
Tel: (916) 441-6708
Fax: (916) 441-5336
Email: Javed.Siddiqui@JTSEngineering.com

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11-8-09

Natomas Levee Improvement Program
Siddiqui Family Partnership
Kleinfelder Documents Requested / Furnished

August 7, 2009

Item	Kleinfelder Document	Date Furnished	Progress of Reports for SFP
	SFP Letter Dated 7-22-09		
1, 2, 3, 4, 5	SR2 Revised Draft AA - 7-8-09	08/07/09	
1, 3, 4, 5, 5	SR3 Draft AA	(1)	Document scheduled to publish 9-1-09
6	SR2 Draft BOD	(2)	Document scheduled to publish 9-1-09
6	SR3 Draft BOD	(3)	Document scheduled to publish 9-30-09
7 thru 9	n/a		
10	SR2 Draft GDR - 2-18-09	08/07/09	
10	SR2 Supplemental Draft GDR - 7-8-09	08/07/09	
10	SR3 Draft GDR	(4)	Document scheduled to publish 9-1-09
11 a thru g	n/a		
	SFP Letter Dated 6-16-09		
1 thru 3	n/a		
4	SR2 Draft GDR - 2-18-09	08/07/09	
4	SR2 Supplemental Draft GDR - 7-8-09	08/07/09	
4	SR3 Draft GDR	(4)	Document scheduled to publish 9-1-09
5	n/a		
6	SR2 Revised Draft AA - 7-8-09	08/07/09	
	SR3 Draft AA	(5)	Document scheduled to publish 9-1-09
	SR2 Draft BOD	(6)	Document scheduled to publish 9-1-09
	SR3 Draft BOD	(7)	Document scheduled to publish 9-30-09
8 thru 11	n/a		
12	SR2 Revised Draft AA - 7-8-09	08/07/09	
12	SR3 Draft AA	(8)	Document scheduled to publish 9-1-09

What is the status of release of the above (8) documents?

US Army Corps of NLIP Phase 4b Notice of Preparation (NOP)

Comments Due by 4 Dec 2009

If you live South of San Juan Rd, this affects YOU!!!

The Sacramento Area Flood Control Agency (SAFCA) is handing over implementation and construction for levee improvement Phase 4b (Reaches 16 – 20, essentially Garden Highway from San Juan Road SOUTH to the American River) to the US Army Corps of Engineers.

Please send your comments to:

Liz Holland, USACE
Elizabeth.g.Holland@usace.army.mil

AND

John Bassett, SAFCA Director of Engineering:
bassettj@saccounty.net

Important items affecting YOUR property include:

- Removal of the vegetation within the levee right-of-way to address USACE requirements
- Construction of an adjacent levee, flattened landside slope, cutoff walls, seepage berms, and relief wells. Cutoff wall construction would be conducted 24 hours per day, 7 days per week (24/7).
- Raise and/or replace the discharge pipes for 4 RD 1000 and city pumping plants located on Garden Hwy from South of I-80 to Northgate Blvd. Construction would be conducted 24/7.
- Clearing of landside vegetation to prepare for Phase 4b levee and canal improvement work.
- Acquiring lands and/or right-of way within the Phase 4b Project footprint along the Sacramento River.
- Removal of waterside encroachments as required to meet the criteria of USACE, Central Valley Flood Protection Board (CVFPB), and Federal Emergency Management Agency (FEMA).
- Power pole relocation, some poles may need to be relocated to the waterside of the existing levee.
- Removal or modification of landside homes, structures, and other facilities.
- Extensive Garden Highway partial and complete closures, up to 6 months at a time.
- Use of Garden Highway for heavy haul trucks delivering materials, possibly involving 1000's of trips.
- Proposed 42-mile recreational bike/walking trail along the Natomas Basin levee perimeter.

M. KEVIN McRAE, CPA, Inc.

Kevin McRae, Certified Fraud Examiner,
MBA & Real Estate Broker
1830-15th Street, Suite 100
Sacramento, CA 95811
(916) 442-8685
FAX 447-0415
kevin@mcraecpa.com

December 2, 2009

John Bassett
SAFCA- Director of Engineering
1007-7TH Street, 7th Floor
Sacramento, CA 95814

Ms. Liz Holland, USACE

Re: NLIP Phase 4b NOP Comments

Dear Mr. Bassett and Ms Holland:

My family has resided for over fifteen years on the waterside of the Garden Highway in Sacramento.

I have been a local businessman and home owner in this county since 1986.

After reviewing the NLIP DEIR and Phase 4b NOP, I would make the following comments:

1) VEGETATION- that removal of the vegetation within the levee right-of-way be minimized, especially the taking of **"Heritage oaks" and waterside riparian habitat**.

2) WATERSIDE ENCROACHMENTS- that in the removal of waterside encroachments, the **USACE be sensitive to homeowner concerns**, while being responsible in application of criteria of the Central Valley Flood Protection Board (CVFPB) and FEMA.

3) POWER POLES- that **power poles be relocated to the landside** as much as is practical, for the safety and esthetic concerns of current residents.

4) RESIDENCE STRUCTURES- that waterside residence structures, such as gates, fences, driveways be **modified or removed as little as is possible**.

Yours truly,

Kevin McRae

Kevin McRae
Oranit, Ian and Aaron McRae
4559 Garden Highway, Sac 95837

Current Director: Garden Highway Home Owners Association (SRFPOA) (7 Years)
Past President: Garden Highway Home Owners Association (6 Years)

safca usace nlip Phase 4b NOP comments

Sloatman, Lindsey

From: Bassett. John (MSA) [bassettj@SacCounty.NET]
Sent: Thursday, December 03, 2009 3:06 PM
To: Dunn, Francine; Henningsen, Sarah; Rader, David; Holland, Elizabeth G SPK; Dadey, Kathleen A SPK
Cc: Washburn. Timothy (MSA); Gilchrist. M. Holly (MSA); Ellen J. Garber
Subject: FW: Comments on NLIP Phase 4b Notice of Preparation (NOP) for inclusion

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From: Roger Sherman [mailto:flow72@gmail.com]
Sent: Thursday, December 03, 2009 3:03 PM
To: Washburn. Timothy (MSA); Bassett. John (MSA); Elizabeth.G.Holland@usace.army.mil; Buer. Stein (MSA)
Cc: all@srpoa.org; gib@mail.com
Subject: Comments on NLIP Phase 4b Notice of Preparation (NOP) for inclusion

John Bassett, Tim Wahsburn, Elizabeth Holland,

I understand the last day to provide comments to the NLIP Phase 4b Notice of Preparation is December 4, 2009. I have two comments for inclusion;

1. In April 2009 the California Governor's Office of Planning and Research submitted to the Secretary for Natural Resources its proposed amendments to the State CEQA Guidelines for greenhouse gas emissions as required by Senate Bill 97 (Chapter 185, 2007). It is law now and guidelines to follow perhaps in January but I do not see anything in the NOP and I believe there should be.
2. Near my residence in Reach 16 across from the wildlife passthru there are thousands of oak trees. These serve as our connection to the Native American culture and heritage, some are 400 years old about the same time the pilgrams were celebrating the first Thanksgiving in 1621! Given the importance of protecting the oak trees overall in connection with the NLIP and in particular the density of Oaks in Phase 4b (landside stretch approx. 2400 Garden Highway) I do not believe there is appropriate environmental impact or accommodation.

Please confirm receipt by Reply email and if necessary I can provide via US mail.

Thank You,

Roger Sherman
(916) 425-8282

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Sloatman, Lindsey

From: Bassett. John (MSA) [bassettj@SacCounty.NET]
Sent: Thursday, December 03, 2009 9:15 PM
To: Dunn, Francine; Henningsen, Sarah; Rader, David; Holland, Elizabeth G SPK; Dadey, Kathleen A SPK
Cc: Washburn. Timothy (MSA); Gilchrist. M. Holly (MSA); Ellen J. Garber
Subject: FW: Phase 4B, Natomas Levee Project - NOP

From: Robert Orr [mailto:badorderbob@sbcglobal.net]
Sent: Thursday, December 03, 2009 8:51 PM
To: Elizabeth.g.Holland@usace.army.mil; Bassett. John (MSA)
Subject: Phase 4B, Natomas Levee Project - NOP

Greetings:

Exactly 36 years ago we purchased our home on Garden Highway; it's been a wonderful place to raise our children and generally enjoy some of the best aspects of life in Sacramento.

The greatest disruption to the tranquility of our riverfront neighborhood was probably the installation of the slurry wall. When was that? Fifteen years ago perhaps? But it appears that the present plans for levee reconstruction will be far more disruptive and long-lasting. My primary concerns are:

Garden Highway closures
24 hour construction activity
Destruction of landside "encroachments," i.e., oak groves
Destruction of waterside "encroachments," i.e., valley oaks, many probably 100 years old

The elimination or significant mitigation of these elements in the next phase of the plan would be a most welcome development!

Robert Orr

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Sloatman, Lindsey

From: Bassett. John (MSA) [bassettj@SacCounty.NET]
Sent: Friday, December 04, 2009 12:53 PM
To: Dunn, Francine; Henningsen, Sarah; Rader, David; Holland, Elizabeth G SPK; Dadey, Kathleen A SPK
Cc: Washburn. Timothy (MSA); Gilchrist. M. Holly (MSA); Ellen J. Garber
Subject: FW: [SRPOA:] Comments on NLIP Phase 4b Notice of Preparation (NOP) for inclusion

---

From: Patricia Nealon [mailto:PNealon@synapsense.com]
Sent: Friday, December 04, 2009 12:14 PM
To: Roger Sherman; Washburn. Timothy (MSA); Bassett. John (MSA); Elizabeth.G.Holland@usace.army.mil; Buer. Stein (MSA)
Cc: all@srpoa.org; gib@mail.com; Javed Siddiqui
Subject: RE: [SRPOA:] Comments on NLIP Phase 4b Notice of Preparation (NOP) for inclusion

Jim Bassett, Tim Washburn, Elizabeth Holland:

We share the concerns voiced by Mr. Roger Sherman below. Specifically, destruction of the oak trees and the impact to the wild life all along the Garden Hwy has not been adequately addressed. There are indeed thousands of Heritage Oaks, which are "protected" slated for destruction.

In addition, Mr Javeed Siddiqui has proposed an alternative, less environmentally destructive methodology to achieve the results necessary to provide flood protection. We respectfully request that you review his proposal and respond prior to engaging in this project.

Best regards,

Dr. Del Wright
Patricia E. Nealon

5629 Garden Hwy
Sacramento, CA

Patricia Nealon
Director of Corporate Marketing
SynapSense Corporation
2008 DOE Energy Innovator Award Winner
2009 Global Clean Tech 100 Award Winner
www.synapsense.com
(916) 293-0918 Office
(916) 549-8574 Mobile

From: Roger Sherman [mailto:flow72@gmail.com]
Sent: Thursday, December 03, 2009 3:03 PM
To: washburnt@SacCounty.NET; bassettj@SacCounty.NET; Elizabeth.G.Holland@usace.army.mil; buers@saccounty.net
Cc: all@srpoa.org; gib@mail.com
Subject: [SRPOA:] Comments on NLIP Phase 4b Notice of Preparation (NOP) for inclusion

John Bassett, Tim Wahsburn, Elizabeth Holland,

I understand the last day to provide comments to the NLIP Phase 4b Notice of Preparation is December 4, 2009. I have two comments for inclusion;

1. In April 2009 the California Governor's Office of Planning and Research submitted to the Secretary for Natural Resources its proposed amendments to the State CEQA Guidelines for greenhouse gas emissions as required by Senate Bill 97 (Chapter 185, 2007). It is law now and guidelines to follow perhaps in January but I do not see anything in the NOP and I believe there should be.
2. Near my residence in Reach 16 across from the wildlife passthru there are thousands of oak trees. These serve as our connection to the Native American culture and heritage, some are 400 years old about the same time the pilgrams were celebrating the first Thanksgiving in 1621! Given the importance of protecting the oak trees overall in connection with the NLIP and in particular the density of Oaks in Phase 4b (landside stretch approx. 2400 Garden Highway) I do not believe there is appropriate environmental impact or accommodation.

Please confirm receipt by Reply email and if necessary I can provide via US mail.

Thank You,

Roger Sherman
(916) 425-8282

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Sloatman, Lindsey

From:	Bassett. John (MSA) [bassettj@SacCounty.NET]
Sent:	Friday, December 04, 2009 12:53 PM
To:	Dunn, Francine; Henningsen, Sarah; Rader, David; Holland, Elizabeth G SPK; Dadey, Kathleen A SPK
Cc:	Washburn. Timothy (MSA); Gilchrist. M. Holly (MSA); Ellen J. Garber
Subject:	FW: [SRPOA:] Comments on NLIP Phase 4b Notice of Preparation (NOP) for inclusion

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From: Edward Bronder [mailto:ebronder@allianceimaging.com]
Sent: Friday, December 04, 2009 12:21 PM
To: PNealon@synapsense.com; flow72@gmail.com; Washburn. Timothy (MSA); Bassett. John (MSA); Elizabeth.G.Holland@usace.army.mil; Buer. Stein (MSA)
Cc: all@srpoa.org; gib@mail.com; Javed.Siddiqui@jtsengineering.com
Subject: Re: [SRPOA:] Comments on NLIP Phase 4b Notice of Preparation (NOP) for inclusion

We echo these comments.

Ed and Patti Bronder

From: Patricia Nealon
To: Roger Sherman ; washburnt@SacCounty.NET ; bassettj@SacCounty.NET ; Elizabeth.G.Holland@usace.army.mil ; buers@saccounty.net
Cc: all@srpoa.org ; gib@mail.com ; Javed Siddiqui
Sent: Fri Dec 04 12:14:24 2009
Subject: RE: [SRPOA:] Comments on NLIP Phase 4b Notice of Preparation (NOP) for inclusion
Jim Bassett, Tim Washburn, Elizabeth Holland:

We share the concerns voiced by Mr. Roger Sherman below. Specifically, destruction of the oak trees and the impact to the wild life all along the Garden Hwy has not been adequately addressed. There are indeed thousands of Heritage Oaks, which are "protected" slated for destruction.

In addition, Mr Javeed Siddiqui has proposed an alternative, less environmentally destructive methodology to achieve the results necessary to provide flood protection. We respectfully request that you review his proposal and respond prior to engaging in this project.

Best regards,

Dr. Del Wright
Patricia E. Nealon

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From: Roger Sherman [mailto:flow72@gmail.com]
Sent: Thursday, December 03, 2009 3:03 PM
To: washburnt@SacCounty.NET; bassettj@SacCounty.NET; Elizabeth.G.Holland@usace.army.mil; buers@saccounty.net
Cc: all@srpoa.org; gib@mail.com
Subject: [SRPOA:] Comments on NLIP Phase 4b Notice of Preparation (NOP) for inclusion

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Please confirm receipt by Reply email and if necessary I can provide via US mail.

Thank You,

Roger Sherman
(916) 425-8282

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Sloatman, Lindsey

From: Bassett. John (MSA) [bassettj@SacCounty.NET]
Sent: Friday, December 04, 2009 3:21 PM
To: Dunn, Francine; Henningsen, Sarah; Rader, David; Holland, Elizabeth G SPK; Dadey, Kathleen A SPK
Cc: Washburn. Timothy (MSA); Gilchrist. M. Holly (MSA); Ellen J. Garber
Subject: FW: Response to USACE of NLIP Phase 4b NOP

From: Melissa Brown [mailto:melissa@ffblaw.com]
Sent: Friday, December 04, 2009 2:26 PM
To: Elizabeth.g.Holland@usace.army.mil; Bassett. John (MSA); washburnt@accounty.net
Cc: all@srpoa.org; gib@mail.com
Subject: Response to USACE of NLIP Phase 4b NOP

Dear Ms. Holland, Mr. Bassett and Mr. Washburn,

My husband, Don Fraulob, his 92 year old mother and I live at 2315 Garden Highway, Reach 16 as I understand it.

We join in the concerns raised by Mr. Howell on behalf of our association, Mr. Sherman and Mr. Siddiqui.

In addition, we have never had any assurance that the proposals have addressed and/or resolved:

1. the impact on the ability of emergency vehicles to get to our home in case my 92 year old mother-in-law has a medical emergency;
2. the impact on our well water;

3. whether the existing Garden Highway can handle the 24/7 trucks;

4. the impact on our health. In my case, I have asthma and am very reactive to dust, diesel and gasoline fumes;

5. the noise that will interfere with the enjoyment of our home. As it is we are across from the weir. The work starts before daylight using powerful construction lighting. The noise of rocks being loaded onto a barge, together with the vehicle back-up alarms is extremely disruptive;

6. the decrease in value of our homes for property tax purposes;

7. the denuding of the levees, our property and surrounding property;

8. the environmental impact on the natural access to the river by wildlife. The southern border of our property is traveled by deer, squirrels, raccoons, possums, skunks, fox and even beavers from time to time. In addition, hawks, owls, magpies, hummingbirds, ducks, geese and many other birds face disruption and probable decimated numbers, as well as bees, butterflies and other insects necessary for pollination;

9. the appropriate mitigation for the homeowners for the loss of quiet enjoyment of our homes as well as reduced value during the many years of planned construction.

We appreciate the need for flood protection, however it is not at all clear that the damage to the environment, historical lands and quality of life is outweighed by the hoped for protection. I was happy to see that a recreational bike/walk trail is proposed. If this does develop, it would seem that a natural path would be the existing Garden Highway with the new set-back levee handling the 24/7 trucks and future traffic.

Lastly, the last major construction project, during which a trench was dug and filled with slurry, resulted in asphalt, petroleum and who knows what other toxic waste being dumped across the street from our home. I hope the that this project will have a better clean up record.

I urge the corps to address these and the other concerns raised by my neighbors before further construction is undertaken.

Respectfully,

Melissa Brown

Melissa C. Brown, Esq.

Farrell, Fraulob & Brown

2315 Capitol Avenue

Sacramento, CA 95816

Tel. 916.442.5835

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Sloatman, Lindsey

From: Bassett. John (MSA) [bassettj@SacCounty.NET]
Sent: Friday, December 04, 2009 3:28 PM
To: Dunn, Francine; Henningsen, Sarah; Rader, David; Holland, Elizabeth G SPK; Dadey, Kathleen A SPK
Cc: Washburn. Timothy (MSA); Gilchrist. M. Holly (MSA); Ellen J. Garber
Subject: FW: Response to USACE of NLIP Phase 4b NOP

From: Melissa Brown [mailto:melissa@ffblaw.com]
Sent: Friday, December 04, 2009 3:27 PM
To: melissa@ffblaw.com; Elizabeth.g.Holland@usace.army.mil; Bassett. John (MSA); washburnt@accounty.net
Cc: all@srpoa.org; gib@mail.com
Subject: RE: Response to USACE of NLIP Phase 4b NOP

Dear Ms. Holland, Mr. Bassett and Mr. Washburn,

To my embarrassment, I listed our address as 2315 Garden Highway.

It is **2517** Garden Highway. 2315 is our office address, which indicates I am spending too much time here.

Please note that correction.

Thank you,

Melissa Brown

-----Original Message-----

From: Melissa Brown [mailto:melissa@ffblaw.com]

Sent: Friday, December 04, 2009 2:26 PM

To: Elizabeth.g.Holland@usace.army.mil; bassettj@saccounty.net; washburnt@accounty.net

Cc: all@srpoa.org; gib@mail.com

Subject: Response to USACE of NLIP Phase 4b NOP

Dear Ms. Holland, Mr. Bassett and Mr. Washburn,

My husband, Don Fraulob, his 92 year old mother and I live at 2315 Garden Highway, Reach 16 as I understand it.

We join in the concerns raised by Mr. Howell on behalf of our association, Mr. Sherman and Mr. Siddiqui.

In addition, we have never had any assurance that the proposals have addressed and/or resolved:

1. the impact on the ability of emergency vehicles to get to our home in case my 92 year old mother-in-law has a medical emergency;
2. the impact on our well water;

3. whether the existing Garden Highway can handle the 24/7 trucks;

4. the impact on our health. In my case, I have asthma and am very reactive to dust, diesel and gasoline fumes;

5. the noise that will interfere with the enjoyment of our home. As it is we are across from the weir. The work starts before daylight using powerful construction lighting. The noise of rocks being loaded onto a barge, together with the vehicle back-up alarms is extremely disruptive;

6. the decrease in value of our homes for property tax purposes;

7. the denuding of the levees, our property and surrounding property;

8. the environmental impact on the natural access to the river by wildlife. The southern border of our property is traveled by deer, squirrels, raccoons, possums, skunks, fox and even beavers from time to time. In addition, hawks, owls, magpies, hummingbirds, ducks, geese and many other birds face disruption and probable decimated numbers, as well as bees, butterflies and other insects necessary for pollination;

9. the appropriate mitigation for the homeowners for the loss of quiet enjoyment of our homes as well as reduced value during the many years of planned construction.

We appreciate the need for flood protection, however it is not at all clear that the damage to the environment, historical lands and quality of life is outweighed by the hoped for protection. I was happy to see that a recreational bike/walk trail is proposed. If this does develop, it would seem that a natural path would be the existing Garden Highway with the new set-back levee handling the 24/7 trucks and future traffic.

Lastly, the last major construction project, during which a trench was dug and filled with slurry, resulted in asphalt, petroleum and who knows what other toxic waste being dumped across the street from our home. I hope the that this project will have a better clean up record.

I urge the corps to address these and the other concerns raised by my neighbors before further construction is undertaken.

Respectfully,

Melissa Brown

Melissa C. Brown, Esq.

Farrell, Fraulob & Brown

2315 Capitol Avenue

Sacramento, CA 95816

Tel. 916.442.5835

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From: Bassett, John (MSA)
To: Dunn, Francine; Henningsen, Sarah; Rader, David; Holland, Elizabeth G SPK; Dadey, Kathleen A SPK;
cc: Washburn, Timothy (MSA); Gilchrist, M. Holly (MSA); Ellen J. Garber;
Subject: FW: Garden Hwy Construction
Date: Friday, December 04, 2009 4:18:36 PM

From: Josh Harmatz [mailto:joshharmatz@hotmail.com]
Sent: Friday, December 04, 2009 4:07 PM
To: Bassett, John (MSA); Elizabeth.G.Holland@usace.army.mil
Cc: gib@mail.com
Subject: Garden Hwy Construction

To SAFCA and Army Corps,

Please note my agreement with the comments of my fellow residents and the analysis of the GH homeowners association. We want the tree's to stay and would like assurances that the beauty of the Garden Hwy corridor will not be altered. The safety of the Sacramento basin is of concern to us all, and I am sure there is a middle ground that would not involve the removal or encroachments on the water side or the tree's on the land side of the hwy.

Thank you for your consideration.

Josh W. Harmatz
4171 Garden Hwy
Cell (916) 585-3303

Please consider the environment before printing this email

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Sloatman, Lindsey

From: Bassett. John (MSA) [bassettj@SacCounty.NET]
Sent: Friday, December 04, 2009 4:22 PM
To: Dunn, Francine; Henningsen, Sarah; Rader, David; Holland, Elizabeth G SPK; Dadey, Kathleen A SPK
Cc: Washburn. Timothy (MSA); Gilchrist. M. Holly (MSA); Ellen J. Garber
Subject: FW: Phase 4 Notice of Preparation
Attachments: GHCA NLIP Phase 4b NOP Comments.pdf

From: Richard Myers MD [mailto:myersr@radiological.com]
Sent: Friday, December 04, 2009 4:07 PM
To: Bassett. John (MSA)
Cc: gib@mail.com; Elizabeth.G.Holland@usace.army.mil
Subject: Phase 4 Notice of Preparation

Richard and Judee Myers
3061 Garden Hwy

Sirs:

We agree with all of the comments from our neighbors.

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Garden Highway Community Association
2701 Del Paso Road, #130-231
Sacramento, CA 95835

December 4, 2009

John Bassett, Director of Engineering
SAFCA
1007 7th Street, 7th Floor
Sacramento, CA 95814

AND

Elizabeth Holland, Planning Division
U.S. Army Corps of Engineers
1325 J Street, Room 1480
Sacramento, CA 95814

RE: Comments on Phase 4b "Notice of Preparation"

SAFCA and US Army Corps of Engineers:

The Garden Highway Community Association (GHCA) is an incorporated community association whose membership includes nearly all waterside and landside property owners along the Garden Highway in the area addressed in SAFCA's Natomas Levee Improvement Program (NLIP). The GHCA supports increased flood protection for the Natomas Basin, as long as it is done in a fiscally responsible, environmentally conscious, and scientifically sound manner. At the same time, as most GHCA members live on or next to the NLIP, they have an enormous interest and concern in how this project is implemented.

Below is a list of comments and concerns regarding the Phase 4b Notice of Preparation.

1. Failure to Adequately Consider Alternative Designs

SAFCA and the USACE have failed to conduct a legitimate, unbiased study to determine the most economically and environmentally sound project design to bring the Natomas Basin up to the USACE 100 year flood protection standard. SAFCA and the USACE have summarily dismissed feasible alternatives that would lead to region-wide solutions to the flooding potential in the Natomas Basin and surrounding communities. They have also failed to make a rationale, "good faith" effort at minimizing the height and footprint of the adjacent levee system, especially in light of the lower and inferior levee systems both upstream and adjacent to the NLIP. Therefore, the project is not in compliance of CEQA and NEPA requirements.

Pursuant to the applicable environmental laws, the agencies responsible for this Project must rigorously explore and objectively evaluate all reasonable alternatives and must devote substantial consideration to each alternative consideration.

Notably, during a recent SAFCA Board meeting which discussed the Project, it was repeated several times that the levee improvement design is a "work in progress" and that certification of ongoing EIS phases was a "worst case scenario" for the environment and property rights. Unfortunately, current environment destruction adjacent to Garden Highway does not correlate with these "work in progress" and "worst case scenario" portrayals. Rather, SAFCA and its contractors are in a race to remove highly sensitive habitat within the ENTIRE project footprint, despite the fact that alternative, less obtrusive levee improvement designs are gaining momentum and the fact that the Project is facing insurmountable fiscal problems.

The GHCA strongly encourages SAFCA and the USACE to look outside the Project's predestined box and not "clear a construction path" through sensitive habitats and rich farmland based upon "worst case" design scenarios. There are obviously countless alternative designs that would accomplish the flood protection our region needs at a fraction of the monetary, environmental and property-loss cost. For example, simply narrowing the footprint of the "seepage berms" would result in mammoth savings in all three of these areas. These berms, designed to be 500 feet wide in some areas, are unprecedented in our region and seem highly unwarranted when compared to the existing 10-20 foot berms that previously handled several 100-year-floods (without the cut-off walls that will be added as a part of this project). More telling, as evidenced by design concessions to certain property owners, SAFCA and the USACE have shown by their own actions that the footprint of the seepage berms can be substantially narrowed without losing the flood protection it seeks.

CEQA also requires a realistic analysis of the existing physical environmental conditions affecting the Project. Several court decisions have determined that the impacts of a proposed project must be measured against the "real conditions on the ground." Save Our Peninsula Committee v. Monterey County Board of Supervisors (2001) 87 Cal.App.4th 99, 121. "An EIR must focus on impacts to the existing environment, not hypothetical situations." ibid. In determining whether a project's impacts may significantly affect the existing environment, there must be a "baseline" set of environmental conditions to use as a comparison to the anticipated project impacts. As the Court of Appeal has explained, "it is only against this baseline than any significant environmental effects can be determined." County of Amador v. El Dorado County Water Agency (1999) 76 Cal.App.4th 99, 952.

Despite these requirements, the plans for this Project fail to describe the existing physical environmental conditions in order to determine the Project's significant adverse impacts on the existing environment. Conversely, the entire NLIP design relies upon a computer simulation that describes a hypothetical physical condition, but does not describe the actual physical conditions on the ground, including the current condition of the west side levees along the Sacramento River and the north side levee along the Natomas Cross Canal. This comparison would answer the question of "levee parity" and whether any spots along the river side of the east levee improvements or west side of the Sacramento River in Yolo County, or north side of the Natomas Cross Canal in Sutter County, would be more vulnerable to flooding.

In other words, if the east side levee along the Sacramento River has sufficient freeboard to ensure safe containment of the "200-year" design water surface, then these improved levees will have a significant adverse effect on the existing lower levee, properties, and structures along the west side of the Sacramento River as well as the homes and residents along Garden Highway on the river side of the improved east side levees.

The failure to evaluate the impact of a Project on the existing physical environmental conditions frustrates "the central function of the EIR, to inform decision makers about the impacts of the proposed project on the existing environment." Save Our Peninsula Committee, supra, 87 Cal.App.4th at p. 127.

The Project's plans further fail to consider the impacts of mounting environmental legislation and biological opinions which will significantly impact alternative flood protection plans, summarily dismissed by SAFCA as "impossible" or "inconceivable." One such edict recently issued by the The National Marine Fisheries Service unveiled a complex set of rules, a "biological opinion", which will likely have enormous impacts on local flood protection practices with the goal of increasing the populations of winter and spring-run salmon, Central Valley steelhead and green sturgeon. According to Kate Poole, attorney at the Natural Resources Defense Council, "There's no question any more about the fact that the Bay-Delta ecosystem is in dire need of significant changes and fixes. This is one big step to do that."

The new federal rules require that reclamation districts find a way to flood the Yolo Bypass more often to improve salmon habitat, negating SAFCA's argument that the Yolo Bypass could not be used to divert more water from the Sacramento River than current rules permit. Moreover, SAFCA's concern that water diversion to the Yolo Bypass would be too costly to local water and flood agencies apparently did not negate the decision on the new rules. The ruling governs water operations of the California Department of Water Resources, who will share the cost of the new orders. Clearly, flooding the Yolo Bypass "more frequently" will require a lowering of the Sacramento River weirs – a proposal made by the GHCA during 2007 as a more effective, long-term solution in lieu of an eternal levee battle in the narrow channels of the Sacramento River.

2. Failure to Adequately Consider and Protect Wildlife

The United States Environmental Protection Agency has previously commented on the NLIP, noting its continued concern over the temporary and permanent effects the Project is expected to have on the waters of the United States and recommended the continued "close consultation and collaboration" with the U. S. Fish and Wildlife Agency, California Department of Fish and Game and The Natomas Basin Conservancy to "ensure effects on woodlands, threatened and sensitive species habitat and waters of the US are avoided and minimized." Overall, this Agency has previously classified prior EIS drafts associated with the NLIP as "Insufficient Information (EC-2)".

The California Department of Fish and Game "DFG" has also expressed serious concern regarding the environmental impacts of the NLIP:

- The DFG believes pertinent mitigation measures are potentially unenforceable and may not bring the impacts to fisheries and aquatic resources to below a level that is significant.

- The DFG has found transplantation of herbaceous plants is typically unsuccessful and should be considered experimental. Mitigation measures for any potentially unavoidable impacts to special-status plants should include additional measures to increase the chances of survival for the population in question. Mitigation sites should be permanently protected and managed in perpetuity.

- The DFG is concerned with potential impacts to raptor nesting behavior not currently addressed in the DEIR, especially with regard to 24/7 construction and an estimated 900-1000 haul trips per day to deliver fill material. The DFG "believes that each of these activities could potentially result in significant impacts to nesting raptors including nest abandonment, starvation of young, and/or reduced health and vigor of eggs or nestlings that could result in death."

- In their current form, the DFG opines that the environmental documents do not explore the potential impacts of nighttime construction activities on nesting raptors. Moreover, construction at night poses additional complications for the effectiveness of biological monitors in ensuring that appropriate buffer zones are in place around active nests and that birds do not abandon their nests.

- The DFG has noted that prior DEIRS do not provide a discussion of potential impacts to the Northern Harrier, a ground nesting raptor and does not consider avoidance or mitigation measures.

The GHCA further notes the NLIP purports to mitigate the loss of woodland habitat by the promise to create three acres of canopied woodlands for every one acre destroyed. This mitigation goal is fatally flawed in that there is no discussion, explanation and/or plan to address the environmental tragedy that will result from the 50 to 100 year period required for the "new" woodland habitat to be developed – assuming the planned mitigation goal is even reached.

Despite the failure to mitigate the significant adverse impacts resulting from the destruction of woodland habitat, and the lack of necessary funding to effect the planned mitigation related thereto, SAFCA and its contractors are currently proceeding with the destruction of woodland habitat and the clear-cutting of heritage oaks and other trees.

Further, the NLIP also proposes to utilize lands purchased by the Natomas Basin Conservancy ("Conservancy") as borrow areas. These borrow areas will provide the base material for the landside levee improvements on the south side levee along the Natomas Cross Canal and the east side levee along the Sacramento River. Despite SAFCA's proposed use of these lands, the Conservancy acquired these properties to offset urban development's significant adverse impacts on protected wildlife species within the Natomas Basin. The Conservancy acquires and manages these properties consistent with the Natomas Basin Habitat Conservation Plan. The GHCA believes there still is no agreement between the Conservancy and SAFCA on the use of Conservancy lands and how these lands will carry out their intended conservation purpose after the soil necessary for the construction of the levee improvements is removed. Thus, any claimed mitigation for the loss and disturbance of Conservancy land is impermissibly deferred to some future time after Project approval and implementation.

Despite the fact that the Project's agencies have been afforded several bites at the apple in an attempt to come up with acceptable environmental mitigation, it continues to gloss over the devastating impact the

Project will have on the sensitive habitat of protected species, including raptors, snakes and flora (see comments of the California Department of Fish and Game summarized above).

3. Failure to Study Simultaneous Multi-Phase Construction

SAFCA, and now the USACE, are currently postulating that multiple phases of the NLIP could be constructed simultaneously. This directly contravenes the construction impact and mitigation advanced in the prior environmental documents and creates new issues not previously studied or addressed. For example, there would be compounded effects of CO2 emissions, noise, dust, vibration, and disruption to wildlife that has not been analyzed. Compared to the original Phase 3 EIR, for example, emissions in just Sacramento County would raise from ROG 75 lb/day to 287 lb/day, NOX 413 lb/day to 1,476 lb/day, and PM10 971 lb/day to 3,847 lb/day if these phases are to be done simultaneously. Moreover, on page ES-16, "Air Quality," the Phase 3 DEIR references the "nonattainment status of the Feather River Air Quality Management District and the Sacramento Metropolitan Air Quality Management District for ozone and PM10." The GHCA contends the cumulative effect of simultaneous construction during multiple construction phases has not been sufficiently analyzed by the responsible agencies.

Furthermore, simultaneous construction could involve three or more phases of simultaneous, 24/7 construction. Given the grave impacts of just one 24/7 worksite, the GHCA believes SAFCA and the USACE certainly cannot justify multiple worksites operating in this manner. This impact would make the simultaneous Phases (2, 3, 4a, 4b) unreasonably harmful to wildlife, the environment, and Garden Highway residents.

4. Failure to Adequately Address Encroachments/Levee Prism

At page 7 of the NOP, Encroachment Management, the following proposed action appears: "Remove encroachments as required to meet the criteria of the USACE, CVFPB, and FEMA." Conversely, the Sacramento Division of USACE and SAFCA have repeatedly advised members of the GHCA that the "adjacent" levee adopted by the NLIP "should" remove the waterside trees, landscaping, fencing, and other vegetation and improvements from the "levee prism." In other words, these agencies believe implementation of the NLIP would spare these items from removal under even the most aggressive encroachment standards. Thus, the GHCA is concerned with the apparent unchanged position regarding encroachments as described in the current NOP.

Of utmost importance to property owners along Phase 4b, the USACE does not mention how they will treat vegetation and encroachments on either side of the levee where they decide not to build an "adjacent setback levee" and thus achieve a new levee prism. If a "one size fits all" approach of denuding levees is applied, it will completely contradict the long established local USACE procedures of planting trees to stabilize the levees, protect endangered wildlife and reduced wind-driven waves. We have also been told that many members of the scientific community believe trees and other vegetation improves the strength of a levee, especially in areas of the country that do not have to contend with hurricane strength winds. What are USACE's current views on this?

It also does not appear the USACE has identified what (if any) waterside encroachments will be subject to removal within the NLIP and what legal processes will be involved in condemnation of associated property rights. These questions are of utmost importance to the GHCA and its members. SAFCA has

also advised the GHCA it has maps of approximately 30,000 encroachments and all associated easements on the waterside of the levee. SAFCA recently revealed this database to the public, but there is no mention of the encroachments and/or vegetation that the involved flood agencies consider to be unacceptable. Research has revealed some vague, inadequately mapped easements dating back to the early 1900's which appear to show little or no support for any planned encroachment removal.

SAFCA has also stated "on the record" it is willing to help facilitate "post-facto" permits for encroachments that do not endanger the levee. Would the USACE also be willing to endorse this procedure? Unfortunately, because the property owners have no information as to what items SAFCA and the USACE feel are acceptable encroachments, Garden Highway properties are being left in the dark.

Overall, the members of the GHCA are very concerned about which "encroachments" might require removal and with the various easements SAFCA and/or its partners will attempt to claim. SAFCA has promised to work with each property owner to discuss and resolve issues regarding alleged encroachments, but thus far has taken no such action. Does the USACE plan on doing the same for Phase 4b? Currently, construction Phase 2 of the Project is underway, yet the GHCA is aware of no affected property owners having been contacted regarding encroachment or easement plans. This not only impacts existing improvements, but future improvements. The uncertainty also creates resale problems and negatively affects property values.

5. <u>Failure to Justify 24/7 Construction</u>

As accurately noted by the California Department of Fish and Game, previous EIRS/NEPA documents do not adequately address the potential impacts to raptor nesting especially with regard to 24/7 construction and an estimated 900-1000 haul trips per day to deliver fill material. The DFG "believes that each of these activities could potentially result in significant impacts to nesting raptors including nest abandonment, starvation of young, and/or reduced health and vigor of eggs or nestlings that could result in death." Moreover, the NOP does not explore the potential impacts of nighttime construction activities on nesting raptors. Moreover, construction at night poses additional complications for the effectiveness of biological monitors in ensuring that appropriate buffer zones are in place around active nests and that birds do not abandon their nests.

The NOP contends Cutoff Walls, wells and perhaps additional aspects of the Project require a 24/7 construction schedule. The residents along Garden Highway and the sensitive environment that exists in the riparian, river habitat adjacent thereto cannot be subjected to 24/7 construction simply because SAFCA or the USACE is running behind schedule on what might be perceived as an overly ambitious project. It is anticipated 24/7 construction during subsequent phases of the NLIP would have an exponentially adverse impact on property owners spanning many miles in all directions. Moreover, the use of trucks to get to and from the actual "construction" sites will expand the location of the impact far beyond the limited construction sites addressed by SAFCA and this NOP.

The GHCA also feels the NOP ignores both city and county (Sacramento and Sutter) noise ordinances. As such, the GHCA seeks an explanation as how the USACE plans to deal with violations of local noise ordinances.

6. Damage to Businesses

The NOP fails to address the impact of the project on the businesses that exist along and upon Garden Highway which thrive only because individuals seek the tranquility and peace of a rural, river atmosphere that is easily accessible, peaceful and enjoyable.

7. Hydrology

The hydrology reports postulated by SAFCA and its engineers in previous Phases conclude the improved levee system contemplated by the NLIP will not increase the flood risk to the waterside property owners within the NLIP. These reports are explicitly based upon the assumption that other surrounding Reclamation Districts will NEVER improve their levees. This assumption is improper, flawed and not in concert with the current push by adjacent Districts to fortify their levees. The threat of increased flood risk cannot be summarily dismissed and a funding mechanism must be included to deal with the financial impact of this impact.

Equally troubling, SAFCA admits its "design event analysis is not the same as the analysis procedure used by USACE." As the primary advertised goal of the NLIP is to obtain USACE certification, why is SAFCA deviating from the USACE event analysis? The previous SAFCA EIRS/NEPA documents further note that the USACE analysis "includes consideration of system uncertainties." Does this mean the SAFCA analysis does not account for "system uncertainties" such as the other side of the levee overtopping or failing?

Waterside residents adjacent to the NLIP are very concerned about increased flooding of their homes due to the levee being raised as much as three feet. SAFCA has systematically advised the GHCA not to worry, as levees will overtop or fail elsewhere. Unfortunately, it appears SAFCA's engineering analysis does not account for this or assumes the other levees will be raised and reinforced. If both sides of the levee are eventually raised, then the water capacity of the river will be increased. This would allow the upstream reservoirs to release more water during a flood event and subject residents to a much greater chance of flooding. The GHCA has been advised there is debate amongst USACE engineers as to which provides the better hydrological model, "perfect world" where you cannot take into account deficiencies in other parts of the levee, or "real world" where you can. What is USACE's view on this?

8. Property Values

The NOP, consistent with all prior SAFCA action related to the NLIP, wholly fails to address the impact of the Project on property values in the affected areas and has no funding mechanism in place to deal with the destruction of property values in and around the project that will ripen into eminent domain and inverse condemnation lawsuits. This exposure includes, but is not limited to, irreparable damage to property values which began when this project was first publically announced (at a time when real estate values were significantly higher than today), and will continue indefinitely into the future. The Project has stalled and prevented sales, land improvements and retirement plans. This trend will increase exponentially when active construction begins. Due the lack of a funding mechanism, the taxpayers will be left to shoulder yet another wave of unanticipated and undisclosed cost overruns.

9. Failure to Consider Environmental Impact of Development

While SAFCA publicly justifies the massive NLIP as a necessary cure for the imminent, Hurricane Katrina type flooding that could occur in the Natomas Basin in the event of a 100-year-flood, in reality SAFCA is simply trying to lift the building moratorium affecting the builders who have imprudently chosen to pave over rice fields in a "basin". These are the same developers who have spent hundreds of thousands of dollars supporting our local officials and lobbying for the right to resume rapid development within the floodplain. Without more "urban sprawl", these developers and the County of Sacramento are unable to tap into the "quick cash" that has been created from destroying our evaporating farm lands.

The GHCA contends that rather than encouraging additional urban sprawl, local agencies should be focusing on creating more housing in urban areas, i.e. building up, not out. Moreover, the failure of local agencies to curb their appetite for our farmlands will only increase traffic congestion, gas and carbon emissions and regional pollution at a time when universal fears and concerns over global warming, water scarcity and energy depletion is gaining momentum.

The GHCA contends the urban sprawl into the Natomas Basin, quite ironically, increases the flood potential for Natomas and surrounding communities. Vast farmland that previously collected and stored water during heavy storms, before slowly releasing it through natural underground seepage, has now been paved and improved with storm drains. Accordingly, thousands of acre feet of rainwater that previously rested safely within area farmland is now immediately collected and pumped into the Sacramento River. Historical flow charts from the Sacramento River during times of heavy storms confirm the negative impact Natomas Basin development is having on regional flood protection.

10. Failure of the Notice of Preparation to abide by the Settlement Agreement between SAFCA and the GHCA.

The "Notice of Preparation" in no way mentions the previously agreed to settlement agreement between SAFCA and the GHCA. While the GHCA understands the USACE is not SAFCA, as the assignee of certain aspects of the Project, the USACE is legally required to comply with all legally enforceable agreements entered into by SAFCA, the assignor. To hold otherwise would render the settlement agreement between SAFCA and the GHCA illusory.

11. Rights of Entry/Eminent Domain.

It has recently come to the attention of the GHCA that SAFCA has pursued Right of Entry Agreements from Garden Highway property owners without advising those property owners of any authority for the desired access and without advising owners of their associated rights. By withholding this critical information, SAFCA has in essence coerced many Garden Highway residents into making uninformed decisions under the bold threat of imminent litigation should they resist.

In response to a recent complaint by the GHCA, counsel for SAFCA has confessed that entry onto the private property of Garden Highway residents is being sought pursuant to the Eminent Domain laws of the State of California. However, pursuant to California Code of Civil Procedure Section 1245.010, SAFCA and/or its contractors must be "**authorized to acquire property for a particular use**" **before**

they may enter private property in order to "take photographs, studies, surveys, examinations, tests, soundings, borings, samplings, or appraisals or to engage in similar activities reasonably related to acquisition or use of the property for that use." Apparently, SAFCA has repeatedly misinformed property owners that SAFCA possesses this authority when, in reality, no such authority had ever been obtained.

Based upon the foregoing, the GHCA hereby submits that all involved flood agencies seeking permission to enter private property must notify the affected property owners **of the legal authority upon which the agency relies, along with a full description of the associated rights afforded the property owners**.

Lastly, the GHCA hereby objects to the "taking" of private lands pursuant to the Eminent Domain laws under the guise that these lands are necessary for the development of the Project, when in fact the involved agency actually and surreptitiously plans to convey the condemned land to another private party, i.e. the airport.

12. Natomas Levee Recreational Trail Project.

The GHCA is pleased a recreational trail is finally being included as part of the NLIP. Unfortunately there is no funding mechanism in place other than waiting on the Department of Transportation, which has admitted could take years. As SAFCA and the USACE are already spending millions of dollars protecting cultural resources of Native American Indians, the GHCA believes it would be practical to allocate a nominal sum of money to enhance the resources of the current living residents in the Natomas Basin. The simple modification of the design of the new levee crown from a gravel road to paved road would bear a meager cost and would streamline the bike path for the DOT.

13. Incorporation.

The GHCA also hereby incorporates by reference all comments asserted by Garden Highway property owners and/or their representatives in response to this portion of the NLIP.

In sum, while the GHCA appreciates the daunting task this Project presents to the involved flood agencies, its members strongly feel that a more rational design approach would substantially reduce these challenges, save the taxpayers hundreds of millions of dollars, preserve sensitive habitat and rich farmland and ultimately expedite recertification of the Natomas levees. Moreover, the GHCA implores the involved flood agencies to continue to acknowledge and adhere to the rights of all Garden Highway residents, businesses and property owners.

Respectfully submitted,

GARDEN HIGHWAY COMMUNITY ASSOCIATION

Sloatman, Lindsey

From: Bassett. John (MSA) [bassettj@SacCounty.NET]
Sent: Friday, December 04, 2009 4:39 PM
To: Dunn, Francine; Henningsen, Sarah; Rader, David; Holland, Elizabeth G SPK; Dadey, Kathleen A SPK
Cc: Washburn. Timothy (MSA); Gilchrist. M. Holly (MSA); Ellen J. Garber
Subject: FW: [SRPOA:] Response to USACE of NLIP Phase 4b NOP

From: Tyson Shower [mailto:tshower@mhalaw.com]
Sent: Friday, December 04, 2009 3:48 PM
To: Elizabeth.g.Holland@usace.army.mil; Bassett. John (MSA)
Cc: gib@mail.com
Subject: RE: [SRPOA:] Response to USACE of NLIP Phase 4b NOP

John and Elizabeth,

My family resides at 6941 Garden Hwy and agrees with these comments and all comments previously submitted. Additionally, we are concerned with the encroachment issue. Like many other Garden Highway residents, we have permitted encroachments that have appeared on SAFCA's encroachment list. For example, a well, propane tank and driveway. To remove and relocate any of the alleged encroachments will be prohibitively expensive and SAFCA, USACE or any other responsible entity will be obligated to pay for any relocation of any alleged encroachments. Please address these impacts as well. Thank you.

Tyson M. Shower
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From: Melissa Brown [mailto:melissa@ffblaw.com]
Sent: Friday, December 04, 2009 2:26 PM
To: Elizabeth.g.Holland@usace.army.mil; bassettj@saccounty.net; washburnt@accounty.net
Cc: all@srpoa.org; gib@mail.com
Subject: [SRPOA:] Response to USACE of NLIP Phase 4b NOP

Dear Ms. Holland, Mr. Bassett and Mr. Washburn,

My husband, Don Fraulob, his 92 year old mother and I live at 2315 Garden Highway, Reach 16 as I understand it.

We join in the concerns raised by Mr. Howell on behalf of our association, Mr. Sherman and Mr. Siddiqui.

In addition, we have never had any assurance that the proposals have addressed and/or resolved:

1. the impact on the ability of emergency vehicles to get to our home in case my 92 year old mother-in-law has a medical emergency;
2. the impact on our well water;
3. whether the existing Garden Highway can handle the 24/7 trucks;
4. the impact on our health. In my case, I have asthma and am very reactive to dust, diesel and gasoline fumes;

5. the noise that will interfere with the enjoyment of our home. As it is we are across from the weir. The work starts before daylight using powerful construction lighting. The noise of rocks being loaded onto a barge, together with the vehicle back-up alarms is extremely disruptive;

6. the decrease in value of our homes for property tax purposes;
7. the denuding of the levees, our property and surrounding property;
8. the environmental impact on the natural access to the river by wildlife. The southern border of our property is traveled by deer, squirrels, raccoons, possums, skunks, fox and even beavers from time to time. In addition, hawks, owls, magpies, hummingbirds, ducks, geese and many other birds face disruption and probable decimated numbers, as well as bees, butterflies and other insects necessary for pollination;

9. the appropriate mitigation for the homeowners for the loss of quiet enjoyment of our homes as well as reduced value during the many years of planned construction.

We appreciate the need for flood protection, however it is not at all clear that the damage to the environment, historical lands and quality of life is outweighed by the hoped for protection. I was happy to see that a recreational bike/walk trail is proposed. If this does develop, it would seem that a natural path would be the existing Garden Highway with the new set-back levee handling the 24/7 trucks and future traffic.

Lastly, the last major construction project, during which a trench was dug and filled with slurry, resulted in asphalt, petroleum and who knows what other toxic waste being dumped across the street from our home. I hope the that this project will have a better clean up record.

I urge the corps to address these and the other concerns raised by my neighbors before further construction is undertaken.

Respectfully,
Melissa Brown

Melissa C. Brown, Esq.
Farrell, Fraulob & Brown
2315 Capitol Avenue
Sacramento, CA 95816
Tel. 916.442.5835

McDonough Holland & Allen PC wishes our clients and friends a happy holiday season and a successful new year. With hope of spreading holiday cheer to local families and youth in need, McDonough's 2009 Holiday Giving Program will benefit: the Alameda County Community Food Bank; the Bay Area Urban Debate League; the Sacramento Food Bank & Family Services; and the Sacramento Philharmonic Orchestra Music Education Program for the children at the Sacramento Area Emergency Housing Center. To learn more about McDonough's Holiday Giving Program, please visit www.mhalaw.com.

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MELVIN BORGMAN
3559 Howsley Road
Pleasant Grove, CA 95668

December 4, 2009

SAFCA
1007 7th Street, 7th Floor
Sacramento, CA 95814
Attention: John Bassett, Director of Engineering

Subject: NOP: Natomas Levee Landside Improvement Project Phase 4b

Mr. Bassett:

In reviewing the Notice of Preparation of the Environmental Impact Statement/Environmental Impact Report for the Natomas Levee Improvement Program, Phase 4b Landside improvement Project, I have the following questions and comments:

► NEMDC West Levee – Northern segment: How will the "Sankey Gap" and the overflow of water, particularly water which overflows on the east side of the W.P./S.P railroad at high water events be addressed?

► Pleasant Grove Creek Canal (PGCC) and NEMDC levee raising: To what elevation are these levees to be raised?

► PGCC and NEMDC Waterside improvements: How will erosion repair and rock slope protection effect upstream water levels? Any material placed inside (water side) of the levee will increase water levels upstream.

► PGCC Culvert Remediation: These culverts are the only means of drainage for the areas between the W.P./S.P. railroad and the PGCC.

► State Route (SR) 99 NCC Bridge Remediation: The material added to the inside (water side) of the NCC south levee will restrict the westerly flow of water thus increase uplift and lateral forces on the bridges. This fill should be removed back to original profile. A reinforced concrete overlay could be placed on the levee surface, extending down to firm subsoil. Excavate additional material under bridges to facilitate flow under the bridges.

► Borrow Site Excavation and Reclamation: Borrow sites should be utilized for retention ponds for storm water run off. The NCC and PGCC should be used for borrow material as deepening these canals would reduce flooding of upstream areas, particularly areas immediately east of the W.P./S.P. railroad.

► Bank Protection: Sacramento River Left Bank-Encroachment Management: Any material or structures placed inside (water side) the levee will increase water elevations upstream.

Alternative actions which should be included in the project:

► Improvements to the Yolo Bypass.

► Set levees back a minimum of 1000 feet to provide more width to channels thus lowering water elevation in the river.

► Remove levees from "islands" created in the Delta and East Bay estuaries.

► Reduce or curtail discharge of drainage water into the river system during periods of high water levels.

Probable environmental impacts of the proposed Phase 4b Project:

Raising levees and placing material inside levees in the Sacramento River, the Natomas Cross Canal and the Pleasant Grove Creek Canal will increase the risk of flooding in other areas of south Sutter County, particularly in the Pleasant Grove area. In addition to potential damage to homes and farms, Pleasant Grove School, Fire Department, Post Office and cemetery are also threatened, as well as Catlett Substation (PG&E at Fifield Road).

The raised levees are also a visual barrier.

Previous EIS/EIR documents have failed to adequately address impacts of these projects on the surrounding communities. Since the bulk of the funding is provided by State and Federal general funds, these project should benefit the broader region, not just one isolated area at the detriment of neighboring communities.

Respectfully submitted,

Melvin Borgman

Sloatman, Lindsey

From: Bassett. John (MSA) [bassettj@SacCounty.NET]
Sent: Friday, December 04, 2009 4:23 PM
To: Dunn, Francine; Henningsen, Sarah; Rader, David; Holland, Elizabeth G SPK; Dadey, Kathleen A SPK
Cc: Washburn. Timothy (MSA); Gilchrist. M. Holly (MSA); Ellen J. Garber
Subject: FW: Garden Hwy project

From: Vicki Anne Pfingst [mailto:vicpfingst@sbcglobal.net]
Sent: Friday, December 04, 2009 4:16 PM
To: Elizabeth.g.Holland@usace.army.mil; Bassett. John (MSA); washburnt@accounty.net
Subject: Garden Hwy project

To Elizabeth Holland, etal

I also share the concerns of my neighbors. This project should not reduce our quality of life and enjoyment of our homes. The river is a Sacramento treasure and should be appreciated as such. I ask that all means be taken to complete this project with peace, beauty, and enjoyment of the properties be considered.

Thank you for attention to these matters.

Sincerely,

Vicki Pfingst and Susan Fast and our pets
(916) 929-4663

2521 Garden Hwy

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2342 Swainson Way
Sacramento, CA 95833
rjjohnson916@yahoo.com

December 4, 2009

John Bassett, P.E.
Director of Engineering
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814

Dear Mr. Bassett,

RE: Natomas Levee Improvement Program Phase 4b Landside Improvements Project

Subject: EIR NOP Comments

I am a homeowner within the River Oaks Community Association (ROCA) and my property is located within 800 feet of Garden Highway. After review of the NOP dated November 5, 2009, I have several concerns that either further information needs to be provided, mitigation provided, or both.

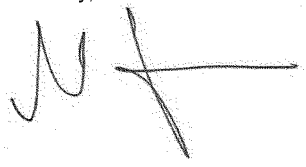
- **Construct adjacent landside levee with wider landside slope & seepage berms** (page 5)-Nothing has actually been designed to identify the actual impacts for the majority of the River Oaks frontage (Reach 19B), only that "measures would be employed to reduce the project footprint impacts to these resources (residences, business, heritage oaks) to the extent feasible given levee design and seepage remediation requirements" (page 7).
    - How can environmental impacts be judged when project design & limits are not presented? Some form of preliminary design is needed to identify the actual project limits and thus determine the Environmental Impact that the project expects to make. Otherwise, there is no way to trust that the level of feasibility isn't set so low that anything can be done.
    - Reconstruction of intersections at Orchard and Gateway Oaks is also noted (page 8) to accommodate levee slope flattening (ie widening), but the properties east and west of these intersections are fully improved with minimum setback available for such. Again, project limits need to be determined.
    - Right-of-way acquisition (page 6) to acquire lands is noted, yet extents not determined. Again, project limits need to be determined.
- **Landside vegetation removal** (page 6)- All landside vegetation will be cleared, with the measures noted above for heritage oaks. Clarification on actual means to save these trees needs to be made, and where trees will not be saved those locations need to be presented. In Reach 19A there is a large stand of oaks near I-80 that were to be part of a future park but are clearly in the path of a seepage berm. Perhaps a seepage berm (noted further below) should not be used for anything east of the 1-80 bridge as it would

negatively impact the trees, but rather implement the to be determined designs of Reach 19B throughout.

- **Waterside vegetation removal** (page 6)- Is this only at locations where pumping plant modifications are occurring? It seems that is the intent, but the language is not clear.
- **Construction on Garden Hwy** (Page 8)- Requirements need to be added that guarantee equipment will not exceed a certain decibel level, and that light pollution will not exceed a certain foot-candle level at homes.
- **24/7 construction for cut-off walls** (page 5)- This is not acceptable, particularly for residential properties closest to the levee. If work needs to be accelerated, double and triple crews should be used, a max of 16 hrs/day where work adjoins residential.
- **Power pole relocation** (page 7)- Relocating the existing land side power poles from the top of the levee down to the bottom of the slope is not acceptable. These are a real eyesore to put into our neighborhoods that were built to specifically avoid these and are a serious concern. Rather, these utilities should be kept up on the road serving the riverfront parcels, but undergrounded and placed at shallow depths above the 0.005 AEP flood surface elevation similar to the reconstructed pump station discharge pipes. Any above grade facilities can be placed on either side of the road.
- **Seepage berm, up to 250' wide in addition to the adjacent levee construction at Tim Lewis** (page 7)-. Given that the distance from the top of levee to the back of sidewalk along Wheelhouse Ave is 330', construction (which consists of adjacent levee construction, the berm, and transition slope down to ground level) will extend all the way to the sidewalk.
    - Clarify impacts to the oak tree stand on the west end of the reach.
    - If this berm will be constructed, confirm the treatment to the top of it.
    - Provide beautification at the 12' wide transition slope behind the sidewalk.
- **Bike trail along south side of Natomas Basin** (Page 8)- Preliminary levee improvement design through Reach 19A & Reach 19B needs to be provided with this shown incorporated.

Please incorporate these comments into your documentation. If you have any questios, please feel free to contact me via email or USPS mail.

Sincerely,



Ronald Johnson, P.E.

NOVEMBER 18, 2009

PUBLIC SCOPING MEETING

Natomas Community Center
2901 Truxel Road
Sacramento, California

Reported by:
CHERIE L. LUBASH

20 ----------

21 JAN BROWN & ASSOCIATES

22 NATIONWIDE DEPOSITION & VIDEOGRAPHY SERVICES

23 701 Battery Street, 3rd Floor

24 San Francisco, CA 94111

25 (415) 981-3948

MR. JARDIN: My name is Manuel Jardin. My concerns have to do mainly with safety and noise pollution. As far as safety is concerned, I'm concerned about the off road, haul roads they're going to use. Specifically Power Line Road and Del Paso Road and also San Juan Road. I wish that they would not use those roads simultaneously. So for instance, if they're using Power Line and Del Paso that they not use San Juan so that the public without encountering any of the trucks or anything else. And vise versa if they're using San Juan that they not use Del Paso and Power Line. That's my first concern.

And my second concern has to do with noise pollution. And that is that if they're using trucks to do their hauling, I would request that they not use what's called a compression break. Sometimes they're also known as Jake Brakes. And those are brakes on the engine that really emit a very loud noise, and if they're going to be working seven days a week or even

six days a week 12 hours a day with that many trucks and they're using their compression breaks, it's going to create a lot of noise for the residents.

MR. SEEGMILLER: I have comments that are related to my concerns based on this reading only. My name is Keith K-e-i-t-h. Last name Seegmiller,

S-e-e-g-m-i-l-l-e-r, 2598 Garden Highway. I am 1000 yards south of the ending of Project 4a. Approximately. I am in the northern portion of reach 16. I own property on both sides of Garden Highway, an undeveloped lot on the river side and my home on the land side. I am concerned, based only on this reading here, that at the conclusion of Project 4a SAFCA will declare its job done and will hence forth relinquish all responsibility for this project. That's what I read in here. The Corps of Engineers will then be the public phase of phase 4b. I do not like that.

So I guess what I'm saying at that point I think we as residents lose all contact with any local agency. And it's clear that the agency, SAFCA, now believes that at the end of 4a they will have achieved their goal of the 100 year flood protection and there goal of getting FEMA to lift there moratorium of building. As a matter of realistic politics, that's the end of SAFCA's concerns. And therefore I see them

abdicating and walking away from the project because the money from this forth the money and going to come from the federal share and the Corps will dictate how that money is used. Not withstanding any agreements that we have with SAFCA. All of those will be -- that's a serious concern. It makes me very nervous.

If I think of anything else I'll come back.

MS. BORGMAN: I'm Charlotte Borgman, C-h-a-r-l-o-t-t-e B-o-r-g-m-a-n. I live at 3559 Howsley Road in Pleasant Grove. Part of my concern is what is being done to mitigate the increase in water to the east of the Natomas Basin when the levy on the west side is raised and the water level in the canals and the river both river and Natomas Cross Canal and the Pleasant Grove Creek canal is raised then the drainage, where is it supposed to go? How does it get out? Is it backing up on me and causing me a problem? In previous EIRs when we've questioned that. We have been told that there is an insignificant amount. By the time we have done five or six or eight or ten insignificant amounts then it becomes a significant amount as far as I see. So help.

I do hereby certify that the foregoing meeting was taken at the time and place therein stated; that the testimony of said parties was reported by me, a shorthand reporter and a disinterested person, and was under my supervision thereafter transcribed into typewriting.

CHERIE L. LUBASH

C. MORRISON RANCH
P. O. Box 771
Pleasant Grove, CA 95668

Charlotte Borgman
(916) 655-3339
FAX: (916) 655-1449
Cell: (916) 847-5716

Phillip Morrison
(916) 655-3237
Cell: (916) 798-7274

December 4, 2005

SAFCA
1007 7th Street, 7th Floor
Sacramento, CA 95814
Attention: John Bassett, Director of Engineering

Subject: NOP: Phase 4b, Natomas Levee Improvement Project

Mr. Bassett:

I am a partner of the C. Morrison Ranch in Pleasant Grove. To provide a meaningful response to an EIR/EIS I need information regarding the relocation of the Morrison Canal.

The single statement "Relocate the Vestal Drain ditch and Morrison Canal to reduce underseepage potential" does not tell me where the canal will be relocated, how the relocation will be accomplished, how the relocation might affect our property, and will the relocation interrupt the irrigation season.

Please provide details for the relocation of the Morrison Canal in the EIR/EIS.

Respectfully,

Charlotte Borgman

Charlotte Borgman

P. O. Box 771
Pleasant Grove, CA 95668
(916) 655-3339
FAX: (916) 655-1449

The C. Morrison Ranch

Fax

To: SAFCA,	**From:** Charlotte Borgman
ATTN: John Bassett	
Fax: (916) 874-8289	**Pages:** 2 pages, including cover page
Phone: (916) 874-7606	**Date: 12/04/2009**
Re: NOP, Phase 4b, NLIP	**CC:**

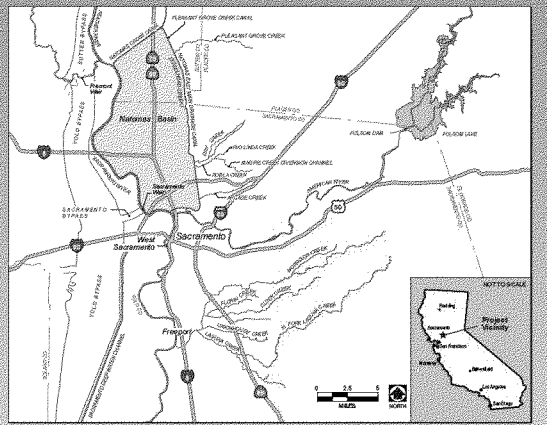
• Comments:

Attached: Letter regarding the NOP for Phase 4b of the Natomas Levee Improvement Project.

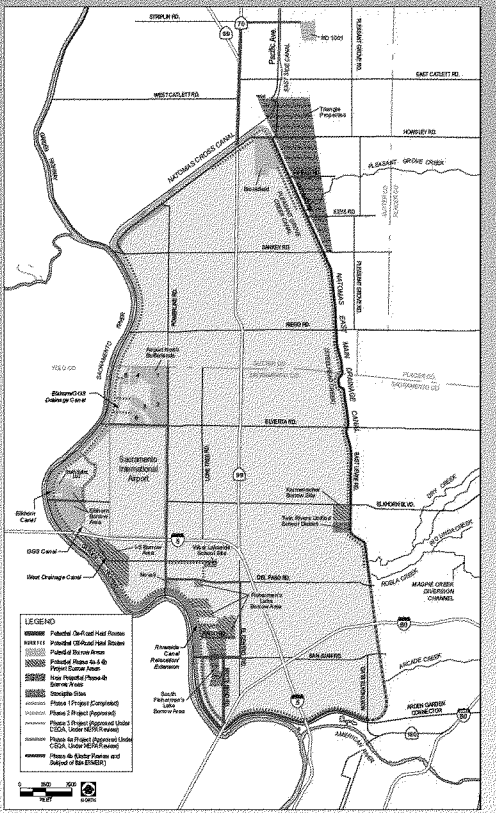
Posters from November 18, 2009 Scoping Meeting

Station 1 – Introduction
American River Common Features
General Reevaluation Report Study Area
Relationship between USACE Planning Documents

Station 2 – Project Location and Background



CEQA = California Environmental Quality Act
EIR = environmental impact report
EIS = environmental impact statement
GGS = giant garter snake
NEPA = National Environmental Policy Act
RD = reclamation district



Station 3 – History of the Natomas Basin Flood Damage Reduction System

Year/Timeframe	Flood Damage Reduction Project/Event
1911–1915	Natomas Basin reclaimed; levees and interior drainage constructed
1917–1967	Levees authorized as part of the SRFCP; construction on the SRFCP is initiated and completed in stages
1968	NFIP authorized
1978	First NFIP 100-year Flood Maps issued by FEMA
1986	Major floods lead to SRFCP system re-evaluation
1989	FEMA issues new 100-year Flood Maps encompassing most of the city of Sacramento
1990–1993	Congress provides funding for the Sacramento Urban Levee Reconstruction Project
1993–1998	SAFCA carries out the NALP
1996	Congress authorizes raise and strengthening of Sacramento River east levee and strengthening of American River north levee
1997	Major flood in SRFCP
1998	USACE certifies Natomas Basin levees for 100-year FEMA flood protection
1999	Congress authorizes raise and strengthening of the NCC south levee
1999	Post-1997 Flood Assessment recognizes underseepage as a threat
2000	USACE initiates Natomas Basin Common Features Design
2002	USACE conducts public scoping meetings
2003	USACE Levee Task Force completes development of deep underseepage criteria
2004	USACE adopts Standard Operating Procedures for Urban Levee Design
2004–2006	SAFCA evaluates Natomas Basin levees
2004	USACE initiates General Re-Evaluation of the Common Features Project
2006	USACE recommends levee decertification based on new geotechnical information and new standards
2006	SAFCA initiates the NLIP
2006	SAFCA Board of Directors certifies the EIR for the Phase 1 Project, and USACE adopts a Finding of No Significant Impact and grants permission pursuant to Section 408 for the Phase 1 Project
2007	SAFCA Board of Directors certifies the EIR for the Phase 2 Project
2008	USACE issues the Draft and Final EIS for the Phase 2 Project
2008	USACE issues NOI for the General Re-evaluation of the Common Features Project
2008	SAFCA completes construction of the Phase 1 Project
2009	USACE issues the Phase 2 EIS ROD, granting permission pursuant to Sections 408, 404, and 10 for the Phase 2 Project
2009	SAFCA Board of Directors certifies the Supplement to the EIR for the Phase 2 Project
2009	SAFCA Board of Directors certifies the EIR for Phase 3 Project
2009	USACE prepares Final EIS for the Phase 3 Project
2009	USACE and SAFCA issue Draft EIS/EIR for the Phase 4a Project
2009	USACE issues Phase 3a ROD
2009	SAFCA Board of Directors certifies the Phase 4a EIR
2009	SAFCA issues NOP for the Natomas PACR/Phase 4b Project

EIR = environmental impact report
EIS = environmental impact statement
FEMA = Federal Emergency Management Agency
NALP = North Area Local Project
NCC = Natomas Cross Canal
NFIP = National Flood Insurance Program
NLIP = Natomas Levee Improvement Program
NOI = notice of intent
NOP = notice of preparation
PACR = Post-authorization Change Report
ROD = record of decision
SAFCA = Sacramento Area Flood Control Agency
SEIR = Supplemental EIR
SRFCP = Sacramento River Flood Control Project
USACE = U.S. Army Corps of Engineers

Station 4 – National Environmental Policy Act and California Environmental Quality Act
CEQA and NEPA Compliance
CEQA
NEPA
Understanding the CEQA and NEPA Processes
CEQA
NEPA

Station 5 – Levee Problems and Needs

SAFCA's Project Objectives

- Provide at least a 0.01 Annual Exceedance Probability (AEP) (100-year) level of flood protection to the Natomas Basin as quickly as possible
- Provide 0.005 AEP (200-year) protection to the Natomas Basin over time

NEED FOR ACTION

- Inadequate levee height
- Through-levee seepage and foundation underseepage with excessive hydraulic gradients
- Embankment instability
- Susceptibility to riverbank erosion and scour

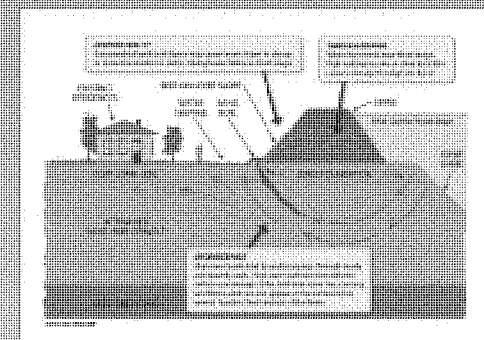
USACE PERMITTING REQUIRED
(If SAFCA proceeds without Federal participation)

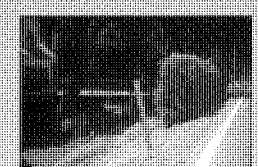
- Permission to alter Federal project levees under Section 408 of the Rivers and Harbors Act of 1899
- Permission to place fill in jurisdictional Waters of the United States under Section 404 of the Clean Water Act
- Permission to perform work in, under, or over navigable waters, and excavation of material from or deposition of material into navigable waters under Section 10 of the Rivers and Harbors Act of 1899

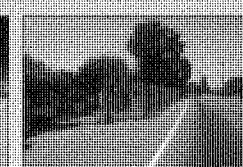
RELATIONSHIP TO THE GENERAL
RE-EVALUATION OF THE COMMON FEATURES PROJECT

- USACE initiated a General Re-evaluation (GRR) of the Natomas Basin elements of the Common Features Project
- The EIS/EIR will be used for Natomas Basin GRR approval, for preparation of the Natomas Post-authorization Change Report (PACR), and support implementation of the Natomas Levee Improvement Program (NLIP) Phase 4b Landside Improvements Project (Phase 4b Project)
- USACE plans to implement the NLIP Phase 4b Project; however, in the event that the Natomas PACR is not approved by Congress, the EIS/EIR will support SAFCA's implementation of the Phase 4b Project if SAFCA chooses to move forward without Federal participation

Natomas Basin Levee Deficiencies





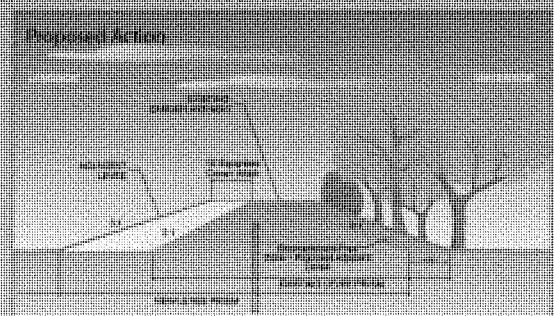


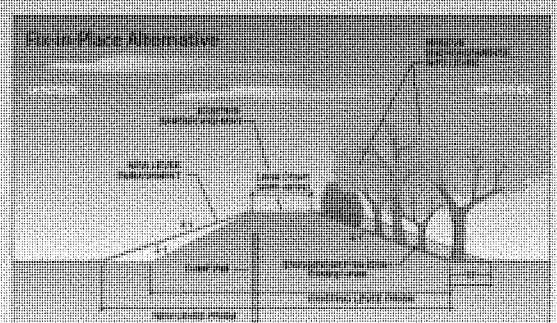
Levee Encroachments

Station 6 – Natomas Levee Improvements Program
Phase 4b Landside Improvements Project
Location of Phase 4b Project Components
Summary of the Natomas Levee Improvement Program
Phase 4b Project Components

Station 7 – Phase 4b Project Action Alternatives

Action Alternatives	No-Action Alternatives
Proposed Action	No Project Construction
Fix-in-Place	Potential Levee Failure





Comparison of Major Project Components of the Action Alternatives

All elements of the Fix-in-Place Alternative would be the same as described for the Proposed Action, except for the method of raising and rehabilitating the Sacramento River east levee, the extent of levee degradation and road closures required to construct cutoff walls, and the extent of encroachment removal along the levee. Differences from the Proposed Action are shown in reduced text below.

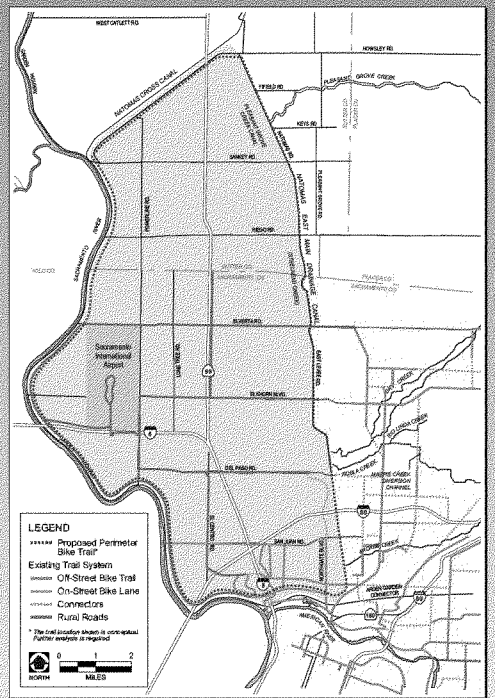
Component	Proposed Action	Fix-in-Place Alternative
Sacramento River East Levee Reaches 16–20: Levee Widening/Rehabilitation and Seepage Remediation	Construct an adjacent levee	Upgrade levee in place
Landside Vegetation Removal	Reaches 16–20 of the Sacramento River east levee, Reaches 1–4 of the American River north levee, NEMDC South, and for preparation of land improvement work	Same as the Proposed Action, except maximum extent of removal would likely be reduced
Waterside Vegetation Removal	Waterside vegetation would be removed due to modifications to pumping plants along the Sacramento River east levee, NEMDC west levee, and PGCC west levee	In Reaches 16–20 of the Sacramento River east levee and Reaches 1–4 of the American River north levee, near waterside vegetation to meet USACE vegetation policy criteria. It is estimated that the numbers of acres of shaded riverine aquatic habitat that would be present, Same as Proposed Action, the mitigation is to RIS 1000 pump stations
Encroachment Management	Remove encroachments as required to meet the criteria of USACE, CVFPB, and FEMA	Same as the Proposed Action, except maximum extent of removal would likely be increased SAFCA would need to fully comply with USACE's three vegetation policy requirements

[illegible]

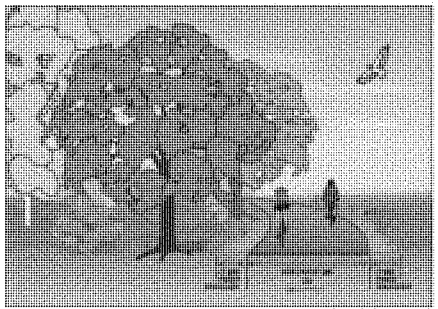
Station 8 – Proposed Natomas Basin Perimeter Bike Trail

Natomas Basin Perimeter Bike Trail

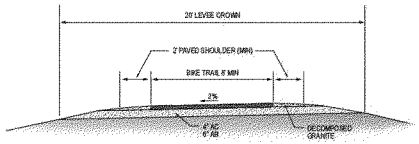
Goal: This regional trail would provide a bicycle commuter route at the southern and eastern end of the Natomas Basin that would connect to the regional American River trail system.



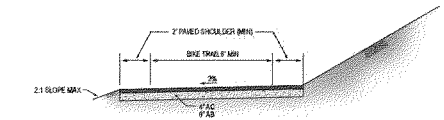
Design Concepts



Conceptual Illustration of Perimeter Bike Trail



Typical Cross Section of Bike Trail on Top of the Levee



Typical Cross Section of Bike Trail on Toe of the Levee

* The trail designs and locations shown are conceptual. Further analysis is required.

Station 9 – Project Commitments
Construction Methods
Impact Reduction Methods
Utility Pole Relocations

Station 10 – Probable Phase 4b Project Environmental Impacts

On the basis of preliminary evaluation, programmatic environmental analyses of the Phase 4b Project in previous NEPA and CEQA documents, and relevant environmental analyses of previous project phases, USACE and SAFCA have determined that the probable environmental effects of the Phase 4b Project are as follows:

AIR QUALITY, NOISE, AND TRAFFIC

- Temporary, short-term effects during construction
- Cumulative effects of possible combined construction phases
- 24/7 construction for some elements of the project

AGRICULTURAL LAND CONVERSION

- Conversion of farmland to nonagricultural uses
- Temporary conversion during borrow operations

BIOLOGICAL RESOURCES

- Temporary disturbance or permanent loss of habitats, wildlife corridors, and special-status species
- Loss of woodland and shaded riverine aquatic habitat and sensitive aquatic habitat

CULTURAL RESOURCES

- Temporary and/or permanent disturbance of known and unknown historic or prehistoric resources

LAND USE AND PLANNING

- Physically divide an established community

TRANSPORTATION AND CIRCULATION

- Temporary increase in traffic and traffic hazards
- Full or partial Garden Highway closure for up to 6 months

CUMULATIVE GROWTH-INDUCTING IMPACTS

- Agricultural Resources
- Water Quality
- Fisheries
- Biological Resources
- Cultural Resources
- Air Quality
- Noise
- Visual Resources

GROWTH-INDUCING IMPACTS

- Create new permanent employment opportunities
- Short-term employment opportunities
- Removal of an obstacle to additional growth and development in the Natomas Basin

SETTLEMENT AGREEMENT

This Settlement Agreement ("Agreement" is made as of this 18th day of April 2008 by and between GARDEN HIGHWAY COMMUNITY ASSOCIATION, Inc., a California not-for-profit corporation ("GHCA"), and the Sacramento Area Flood Control Agency, a joint exercise of powers agency created by a Joint Exercise of Powers Agreement made pursuant to Government Code section 6500 *et seq.* ("SAFCA"). GHCA and SAFCA are referred to collectively herein as the "Parties" and each individually as a "Party."

RECITALS

A. The project at issue here is the Natomas Levee Improvement Program ("NLIP") Landside Improvements Project (the "Project"). It includes improvements to the Natomas Cross Canal south levee and the Sacramento River east levee, construction of a new Giant Garter Snake/Drainage Canal, relocation of a portion of the Natomas Mutual Water Company's Elkhorn Canal, and affiliated land recontouring and habitat creation, as more particularly described in the environmental impact report ("EIR") discussed below.

B. SAFCA is entrusted with the reduction of flood risk in the Sacramento region. It is the lead agency for the Project under the California Environmental Quality Act ("CEQA"); Public Resources Code section 21000 *et seq.*

C. GHCA is an incorporated association of landowners who reside in the "Project Area," as depicted and defined in Exhibit A hereto.

D. SAFCA analyzed a regional program of flood control improvements for the Sacramento area, which included improvements to Folsom Dam, the American River, and the South Streams Group, as well as the Natomas Levee Improvement Program (collectively the "Program"), in an Environmental Impact Report on Local Funding Mechanisms for

Comprehensive Flood Control Improvements for the Sacramento Area ("Local Funding EIR"). SAFCA certified the Local Funding EIR in February 2007. SAFCA intends for the Program to provide the Natomas Basin with at least a 100-year level of flood protection by the end of 2010 and a 200-year level of flood protection by the end of 2012.

E. SAFCA analyzed the Project, which is a part of the broader regional Program, in a separate Environmental Impact Report that is "tiered," within the meaning of CEQA, from the Local Funding EIR. The actions analyzed in the NLIP Landside EIR include land side improvements to the levee system in the Natomas Basin and related landscape modifications and drainage and infrastructure improvements, all to be undertaken between 2008 and 2010. The NLIP Landside EIR presents a project-level analysis of the 2008 construction components and a program-level analysis of the 2009-2010 elements. The 2009-2010 elements will require additional environmental review based on more detailed design plans.

F. On November 29, 2007, the SAFCA Board approved Resolution 07-105, which certified the environmental impact report prepared for the Natomas Levee Improvement Program Landside Improvements project; adopted findings and a statement of overriding considerations, mitigation measures, and a mitigation monitoring and reporting program; and approved the Natomas Levee Improvement Program Landside Improvements Project 2008 construction projects, consisting of the "Natomas Cross Canal Phase 2 Improvement Project" and the "Sacramento River East Levee Phase 1 Improvement Project (reaches 1 through 4b)."

G. On December 19, 2007, GHCA filed a Petition for Writ of Mandate and Complaint for Injunctive Relief ("Petition") in Sacramento Superior Court (Case No. 34-2007-00883632-CU-WM-GDS) against SAFCA. The Petition challenges SAFCA's approval of

the 2008 construction components and alleges that the NLIP Landside EIR does not comply with CEQA.

H. In January 2008, the United States Army Corps of Engineers ("USACE") completed a hydraulic analysis of the Natomas Basin, which found that the Natomas Basin has less than a 30-year level of flood protection.

I. On February 7, 2008, SAFCA filed its Answer to the Petition, and on February 19, 2008 SAFCA filed its Notification and Lodging of the Administrative Record. GCHA and SAFCA filed their Statements of Issues on March 7, 2008 and March 17, 2008, respectively.

J. Pursuant to stipulation of the Parties, in March 2008 GHCA and SAFCA engaged in two days of mediation. The mediation resulted in a stipulation for settlement, the majority of which is reproduced below as part of the final Settlement Agreement.

K. Accordingly, the Parties enter into this Agreement to address GHCA's concerns and allow the portion of the Project approved by Resolution 07-105 to proceed. Nevertheless, SAFCA intends to apply the design and construction practices set forth in Paragraphs 1 through 9, below, to the entirety of the Project, as applicable.

AGREEMENT

NOW, THEREFORE, in consideration of the foregoing recitals, which are hereby incorporated by reference, and of the mutual covenants set forth herein, and for other good and valuable consideration, the receipt and adequacy is hereby acknowledged, the Parties agree as follows:

1. Power Pole and Overhead Power Line Placement. To the extent that the main electrical power transmission lines and poles serving the Garden Highway must be relocated or replaced to accommodate the Project, the relocation or replacement shall occur east of the new

adjacent levee and in a manner that appropriately accommodates private land side improvements and properties. Existing main electrical power transmission lines and poles on the water side of the existing Garden Highway levee that do not need to be relocated or replaced to accommodate the Project may be left in place. No new main electrical power transmission lines and poles shall be installed on the water side of the Garden Highway levee.

Consistent with sound engineering practices that prioritize the following, individual service lines shall: (i) use existing configurations and facilities, and (ii) any new poles shall be placed on the land side of Garden Highway, subject to the approval of the United States Army Corps of Engineers ("USACE"), Central Valley Flood Protection Board ("CVFPB"), and any other regulatory public agencies and the utility companies.

SAFCA shall advocate power line and pole locations consistent with this provision to the USACE, CVFPB, and other regulatory agencies and utilities by way of one-time master letters, attached hereto as Exhibits B and C, approved as to form by the SAFCA Board as part of this Agreement and signed by the SAFCA Executive Director. These letters, attached as Exhibits B and C, have received the prior approval of GHCA's attorney.

If the property owner and SAFCA cannot agree on a location of an individual service line pole from among locations that are otherwise acceptable to the USACE, CVFPB, other regulatory agencies and the utility provider, SAFCA agrees to pay the cost of a referee, who is a qualified registered civil engineer and agreeable to both Parties, to decide the dispute over the location of the individual service line pole.

SAFCA agrees to provide working drawings sixty (60) days to GCHA's contact person designated pursuant to Paragraph 5, below, in advance of commencing construction of power poles and lines for which locations would be changed as part of the Project.

2. Removal of Encroachments and Existing Landscaping and Fencing. As part of this Agreement, the SAFCA Board directs the SAFCA Executive Director to write a letter, the approved form of which is attached hereto as Exhibit B, to the responsible regulatory agencies advocating SAFCA's project design, which requires minimal removal of encroachments. This letter, attached as Exhibit B, has received the prior approval of GHCA's attorney.

Once SAFCA determines that the Sacramento River east levee is certifiable for the Federal Emergency Management Agency's ("FEMA") flood protection purposes, SAFCA shall make its best efforts to get written agreement from the USACE, CVFPB, and Reclamation District 1000 ("RD1000") that no additional encroachments on the water side of the Garden Highway levee need to be removed.

3. Damage to Existing Wells, Septic Systems, Concrete Structures, etc. As part of the notice provided pursuant to Paragraph 8, below, SAFCA shall give property owners within the Project Area (see Exhibit A) an informational package, which shall have received the prior approval of Petitioner's attorney, advising the property owners that pre-project inspections of their properties are important and that SAFCA will conduct a free pre-construction inspection of the property, but only if requested by the property owner. The scope of the inspection and documentation will be determined by SAFCA in consultation with the property owner.

SAFCA will provide a copy of its February 2008 study entitled, "Evaluation of Potential Groundwater Impacts Due to Proposed Sacramento River East Levee Improvements with Emphasis on Reaches 2 & 3" to the GHCA contact person designated pursuant to Paragraph 5, below. If requested by a property owner within the Project Area, SAFCA will test the owner's domestic well water before and after Project construction for the presence of bentonite, concrete, and cement.

4. Drainage Lines. No roadside swales shall be included in the design of the new adjacent levee downstream of Power Line Road. Consistent with sound engineering practices, and subject to the approval of the USACE, CVFPB, and the Regional Water Quality Control Board ("RWQCB"), any new drainage outfall lines required by the Project shall be buried pipes, located along property lines, and drain to the river. If a property owner does not want a new drain line located along the property line, he or she may request that the drain line be placed elsewhere on his or her property.

SAFCA shall advocate the location, design, and outfall of the drain lines consistent with this provision to the USACE, CVFPB, and the RWQCB by way of one-time master letters, attached hereto as Exhibits B and D, approved as to form by the SAFCA Board as part of this Agreement and signed by the SAFCA Executive Director. These letters, attached as Exhibits B and D, have received the prior approval of GHCA's attorney.

If the property owner and SAFCA cannot agree on a location for a new drain line from among locations that are otherwise acceptable to the USACE, CVFPB, and the RWQCB, SAFCA agrees to pay the cost of a referee, who is a qualified registered civil engineer and agreeable to both parties, to decide the dispute over the location of the drain line.

5. Construction Monitoring. SAFCA agrees to cooperate with a construction monitoring committee established by GHCA to resolve reasonable complaints regarding SAFCA or its contractors' construction activities for the Projects improvements in accordance with this provision. Within fifteen (15) days of the Effective Date of this Agreement, GHCA shall notify SAFCA of the name of a contact person, who shall be a member of GHCA's construction monitoring committee, for purposes of having one contact point for communicating with SAFCA's Ombudsperson and keeping GHCA apprised of the construction schedule for the

Project pursuant to Paragraph 8, below. A complaint procedure and hierarchy shall be developed by the GHCA's contact person and SAFCA's Ombudsperson in time to be included in the informational packet referenced in Paragraph 3, above. In addition, the information packet will include SAFCA's instructions to its contractors regarding appropriate use of the Garden Highway. SAFCA agrees to resolve all complaints pertaining to dangerous activities immediately and to resolve all other reasonable complaints in an expeditious manner.

SAFCA shall prohibit the use of earth moving equipment or haul trucks on the Garden Highway in conjunction with the Project.

6. Relocation. Where a property owner occupies a residence on property to be acquired for the Project, SAFCA will allow up to twelve (12) months, rather that the statutory allowance of three (3) months, for the owner to relocate off the property. The 12 month period shall be counted from the first written offer.

7. Study of Improving Flood Conveyance in Yolo Bypass. SAFCA agrees to provide GHCA with documents prepared by SAFCA synthesizing information gathered by USACE, CVFPB, DWR, and SAFCA regarding the feasibility of increasing flood conveyance through the Yolo Bypass. SAFCA believes these documents are characteristic of the state of knowledge regarding this flood control alternative as of 2003 when these documents were prepared.

8. Construction Schedule. SAFCA will provide GHCA with a timeline for the phased completion of the Project that indicates the role of the various agencies involved in implementing or permitting the Project. SAFCA will post its construction schedule for the Project on the SAFCA website. The schedule shall be updated on a monthly basis. A hard copy of the schedule and monthly updates shall be mailed to the GHCA contact person identified in

Paragraph 5, above. In addition, SAFCA will post a "60-day notice" of Planned Construction on the SAFCA website. A hard copy of the "60-day notice" shall be mailed to the GHCA contact person identified in Paragraph 5, above. "Planned Construction" will not include construction in the event of an emergency or construction necessary to remedy a condition discovered after completion of the Project. However, SAFCA will provide whatever notice is possible under the circumstances to affected, adjacent landowners prior to any emergency or remedial work.

For property owners who request prior inspections/documentation, the inspection/documentation must be scheduled prior to the start of construction within the specified reach of the Sacramento River where Project construction will commence.

9. Bicycle Trail. The Parties agree that the new adjacent levee would provide a good opportunity for creation of a new bicycle trail along the top of the levee consistent with applicable levee operation and maintenance requirements. SAFCA is prepared to work with GHCA and other interested parties in securing funding for a feasibility analysis for this bicycle trail and, based on the results of this feasibility analysis, to secure funding for construction, operation, and maintenance of the bicycle trail.

10. Dismissal of Action. Within five (5) business days of the Effective Date, GHCA shall execute and file a Request for Entry of Dismissal with Prejudice of Case Number 34-2007-00883632-CU-WM-GDS at the Sacramento County Superior Court. The Entry of Dismissal with Prejudice shall have the effect of dismissing the Action against all of the Parties named in the Action. The Parties agree to request that the trial court, in response to said request, enter an order reserving jurisdiction to enforce the Agreement pursuant to Code of Civil Procedure section 664.6, unless the trial court, for whatever reason, will not sign the proposed order reserving jurisdiction, as described immediately below. The Parties agree to submit a proposed

order reserving jurisdiction in the trial court pursuant to a Stipulation and Order substantially in the following form:

> Petitioner/Plaintiff and Respondent/Defendant have entered into a Settlement Agreement ("the Agreement"), a copy of which is attached hereto as Exhibit 1.
>
> The Agreement includes terms anticipating that the trial court enter an order reserving jurisdiction to enforce the Agreement pursuant to Code of Civil Procedure section 664.6.
>
> THEREFORE, it is hereby STIPULATED by Petitioner/Plaintiff and Respondent/Defendant that, and Petitioner/Plaintiff and Respondent/Defendant jointly request that, this Court reserve jurisdiction to enforce the Agreement pursuant to Code of Civil Procedure section 664.6 and this written stipulation of the parties.

In the event that, for whatever reason, the trial court does not grant GHCA's request to enter the proposed order described immediately above, and thus declines to make this Agreement enforceable pursuant to Code of Civil Procedure section 664.6, the Agreement shall instead be enforceable by either party through the filing of new litigation alleging a breach of the Agreement.

11. Attorney's Fees and Costs. SAFCA shall pay, within five business (5) days after the Effective Date of this Agreement, attorney's fees and costs incurred by GHCA in connection with the litigation and settlement of this Action (Sacramento County Superior Court Case No. 34-2007-00883632-CU-WM-GDS) in the sum of $55,000.00 by check made payable to the law firm of Kenyon Yeates, LLP. If GHCA accepts this offer without change, GHCA waives any right to seek recovery of any additional money from SAFCA in connection with the dismissed claims. SAFCA shall bear its own attorney's fees and costs.

12. Mutual Release and Waiver. Except for the rights and obligations set forth in this Agreement, each Party agrees and covenants as follows:

(a) To forever release, quit and discharge the other party and its respective officers, employees, agents, and officials from any and all claims, causes of action, action, rights,

theories, contentions, demands, obligations, suits, losses, costs, expenses, attorneys' fees, liens, liabilities and indemnities of any nature whatsoever, based on contract, tort, statute, or other legal or equitable theory of recovery, whether on account of past, present or potential future liability, whether known or unknown, or any type or character whatsoever, insofar as any of the same related to or arose out of, or could have related, or could have arisen out of the dispute set forth in the foregoing Recitals to this Agreement. The Parties intend this release to apply only to the 2008 Construction Projects, which were analyzed at a project level in the NLIP Landside EIR and were approved by the SAFCA Board of Directors on November 29, 2007. The Parties do not intend the settlement agreement and this mutual release and waiver to apply to the 2009-2010 construction phase, which was analyzed at a program level in the NLIP Landside EIR and has not yet been approved by the SAFCA Board of Directors.

(b) To expressly waive any right or claim of right to assert hereafter that any claim, demand, and/or obligation has, through ignorance, oversight or error been omitted from the terms of this Agreement and further expressly waive any right or claim of right that each may have under the law under any jurisdiction to the effect that those releases herein given do not apply to unknown or unstated claims. It is the express intent of the Parties to waive any and all claims they may have against the other party hereto insofar as any of the same, directly or indirectly, relate to the Project, including any which are presently known, unsuspected, unanticipated, or undisclosed. The Parties hereto acknowledge that they are apprised of the provisions of Civil Code section 1542 which provides:

> **A general release does not extend to claims which the creditor does not know or suspect to exist in his favor at the time of executing the release, which if known by him must have materially affected his settlement with the debtor.**

Having been so apprised, each party elects to waive and does waive all rights that may be granted to them pursuant to Civil Code section 1542 and to assume all risks, known or unknown, covered by this release.

(c) Never to commence, recommence, appeal, or seek certiorari or other review by any court, state or federal, and/or other proceeding against any other party to this Agreement that is based in whole or in part upon the claims, demands, causes of action, obligations, damages and/or liabilities released by this Agreement.

13. Entire, Sole and Final Agreement. This Agreement constitutes the entire understanding between the Parties with respect to the matters set forth herein. Except as otherwise provided herein, this Agreement is intended to be the final expression of the Agreement between the Parties with respect to the subject matter of this Agreement and supersedes and fully and completely extinguishes any prior understandings or agreements by or between the Parties, whether oral or in writing.

14. Amendments. This Agreement may not be modified, supplemented, or amended, or any of its provisions waived, except in writing by the party against whom such modification, supplementation, amendment, or waiver is sought. Any modification, supplementation, amendment, or waiver that would materially affect the rights of both Parties must be signed by both Parties.

15. Warranty of Authority. Each person signing this Agreement warrants to each other party that he or she is authorized by the party on whose behalf he or she is signing to execute this Agreement and to bind such party to the terms of this Agreement.

16. Time of the Essence. Time is of the essence for this Agreement.

17. Mutual Cooperation. The Parties agree to cooperate in good faith to carry out the provisions and intent of this Agreement, including timely execution and delivery of other documents necessary to carry out its provisions. Each of the Parties shall execute and deliver to the others all such further instruments and documents, and take all other such actions, as may be reasonably necessary to carry out the terms and provisions of this Agreement and secure to the others the full and complete enjoyment of their respective rights and privileges hereunder. The Parties agree to meet and confer in good faith to try to resolve any conflicts arising under this Agreement prior to bringing any actions in court to enforce this Agreement.

18. Severability. If any term or provision of this Agreement, or the application of any term or provision of this Agreement to a particular situation, shall be finally found to be void, invalid, illegal or unenforceable by a court of competent jurisdiction, then notwithstanding such determination, such term or provision shall remain in force and effect to the extent allowable by such ruling and all other terms and provisions of this Agreement or the application of this Agreement to other situations shall remain in force and effect.

19. Agreement Admissible in Enforcement Action. The Parties agree that this Agreement is admissible in any action to enforce this Agreement. Nothing in this Agreement shall be used as an admission of any fact or matter in any other challenge.

20. Construction. This Agreement, and each of the provisions hereof, is the product of negotiations between the Parties and their respective attorneys. Each of the Parties hereto expressly acknowledges and agrees that this Agreement shall not be deemed to have been prepared by or drafted by any particular party hereto. The rule of construction to the effect that any ambiguities are to be resolved against the drafting party shall not be employed in the interpretation of this Agreement.

21. Third Party Beneficiaries. Nothing in this Agreement shall be construed to confer any rights or impose any obligations upon any person or entity not a Party to this Agreement.

22. Governing Law. This Agreement shall be governed by and construed in accordance with the laws of the State of California.

23. Headings and Captions. The headings and captions used in this Agreement are for convenience and ease of reference only, and are not intended to be part of the body of this Agreement, nor are they intended to be referred to in construing the provisions of this Agreement.

24. Exhibits. All exhibits referenced in this Agreement are made part of and incorporated herein.

25. Notices. All notices and other communications in connection with this Agreement shall be in writing and shall be personally delivered, sent by first class United States mail, sent by telefacsimile ("fax") with original sent by United State Postal Service or reputable overnight courier for delivery the following day, or sent by reputable overnight courier to the addresses and fax numbers set forth below. Any Party may at any time change its address or fax number for the delivery of notice upon five (5) days written notice to the other Party.

GARDEN HIGHWAY COMMUNITY ASSOCIATION:

Doug Cummings, President
Garden Highway Community Association, Inc.
1500 W. El Camino Avenue, #640
Sacramento, CA 95833

With a copy to:

Bill Yeates
Kenyon Yeates LLP
3400 Cottage Way, Suite K
Sacramento, CA 95825
Fax: (961) 609-5001

SACRAMENTO AREA FLOOD CONTROL AGENCY:

Stein Buer, Executive Director
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814
Fax: (916) 874-8289

With copies to:

Timothy N. Washburn, Agency Counsel
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814
Fax: (916) 874-8289

Ellen J. Garber
Shute, Mihaly & Weinberger LLP
396 Hayes Street
San Francisco, CA 94102
Fax: (415) 552-5816

26. Understanding of Terms. This Agreement is executed voluntarily by each of the Parties without any duress or undue influence on the part of, or on behalf of, any of them. Each of the Parties to this Agreement has read and fully understands the meaning of each provision of this Agreement and has relied on independent advice and representation of legal counsel in entering into this Agreement.

27. Binding Effect. This Agreement and its terms shall be binding upon and inure to the benefit of the Parties hereto and their respective successors, assignees, buyers, grantees, vendees, transferees, officers, directors, principals, agents, employees, representatives, attorneys, insurers and sureties, and any others claiming through or under of having the right to claim through or under any or all of them, wherever located.

28. Equitable Relief. Each Party hereto expressly agrees that the provisions of this Agreement shall be specifically enforceable by either Party and, except as specifically provided

in Paragraphs 1, 3, and 4 of this Agreement for the payment of costs and expenses incurred in a dispute, each Party hereto waives and relinquishes all claims for damages arising from a claim based on breach of this Agreement by any other Party. In the event of breach of any term or provision of this Agreement or any duty or obligation hereunder, remedies shall be limited to bringing an action for specific performance and recovery of such costs and expenses provided for in Paragraphs 1, 3, and 4 of this Agreement.

29. Execution in Counterparts. This Agreement may be executed in counterparts, and photocopies, facsimile copies, or electronic copies of this Agreement may be used as originals. Each such counterpart, photocopy, facsimile copy, or electronic copy of this Agreement shall be deemed an original, but all of which together shall constitute one and the same instrument and shall have the same force and effect as if a single original had been executed by all Parties.

30. Settlement of Disputed Claims. The Parties hereto understand and agree that this settlement is a compromise of disputed claims, and that no Party's actions under this Agreement shall be construed as an admission of liability.

31. Effective Date. This Agreement shall become effective upon execution by all Parties.

IN WITNESS WHEREOF, the Parties have executed this Agreement as of the date and year first set forth above.

Date: 4/15/08

Garden Highway Community Association, Inc.
By Doug Cummings, President

Approved as to form and legality for GHCA:

Date: April 10, 2008

By Bill Yeates
Kenyon Yeates LLP
Attorneys for Garden Highway Community Association, Inc

Date: April 18, 2008

Sacramento Area Flood Control Agency
By Stein Buer, Executive Director

Approved as to form and legality for SAFCA:

Date: April 17, 2008

Timothy N. Washburn, Agency Counsel

Date: APRIL 15, 2008

Shute, Mihaly & Weinberger LLP
By Ellen J. Garber

Attorneys for SACRAMENTO AREA FLOOD CONTROL AGENCY

List of Exhibits

Exhibit A: Project Area Map
Exhibit B: Form-Of Letter to CVFPB and DWR
Exhibit C: Form-Of Letter to Utility Company
Exhibit D: Form-Of Letter to CVRWQCB

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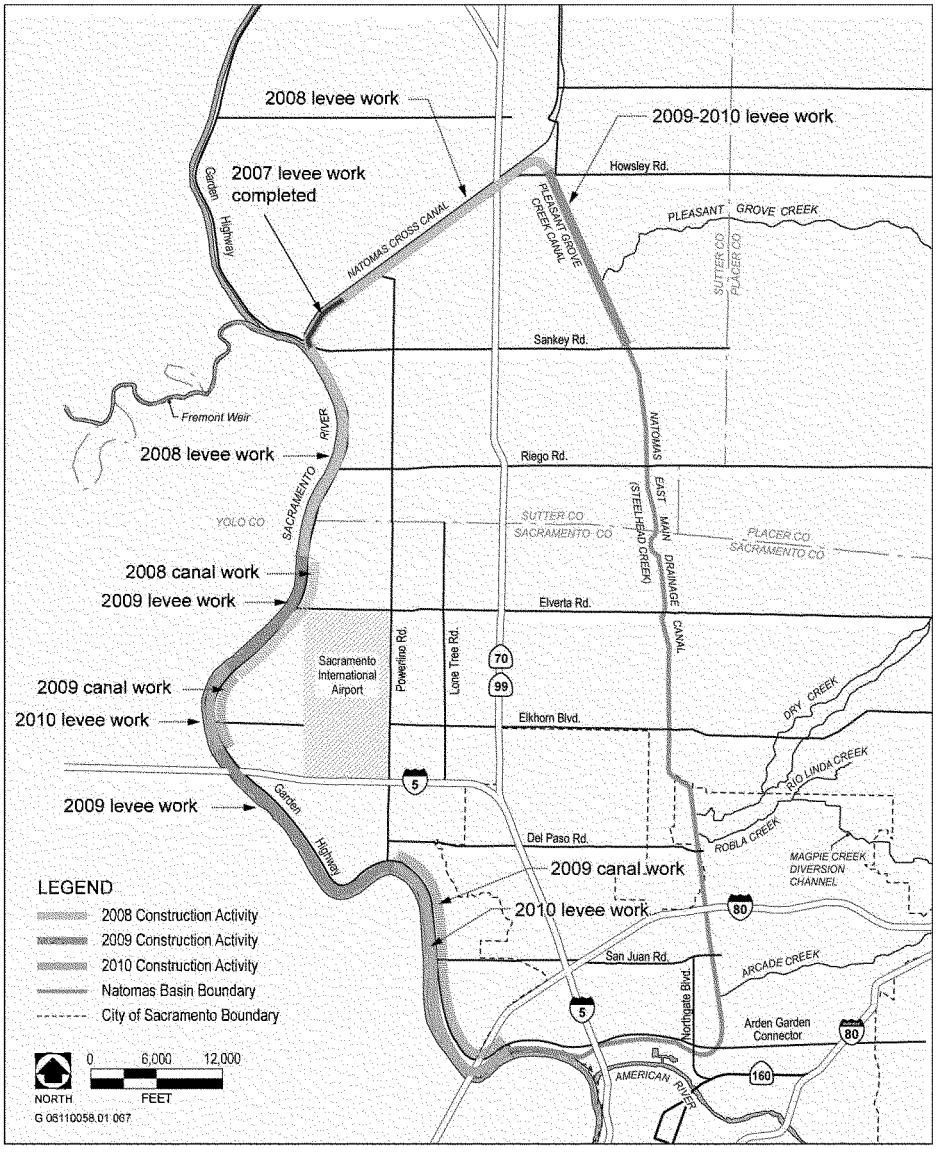
EXHIBIT A
PROJECT AREA



Source: CaSil; adapted by EDAW in 2007

NLIP Landside Improvements Project Construction Phases

EXHIBIT B
FORM-OF LETTER TO CVFPB and DWR

[SAFCA LETTERHEAD]
[Date]

Jay Punia, Executive Officer
Central Valley Flood Protection Board
P. O. Box 942836
Sacramento, CA 94236

Lester Snow, Director
California Department of Water Resources
P.O. Box 942836
Sacramento, CA 94236

RE: Encroachment Permit for SAFCA Natomas Levee Improvement Program Landside Improvements Project

Dear Sirs:

On March 21, 2008, the Central Valley Flood Protection Board (Board) issued Permit 18159-3 BD to SAFCA to improve portions of the Sacramento River east levee as part of the Agency's Natomas Levee Improvement Program (NLIP) Landside Improvements Project (Project). Permit condition Fourteen states that no work authorized by this permit shall be performed until the Board and the Department of Water Resources (Department) have received, reviewed and approved a complete set of final plans and specifications for the Project. In order to satisfy this condition, under separate cover SAFCA has submitted the required final plans and specifications for review and approval by the Board and the Department.

The purpose of this letter is to highlight several key features of the Project and underscore the SAFCA's commitment to ensuring that these features are incorporated into the final design. First, the final design calls for construction of a new levee adjacent to the existing Sacramento River east levee along Garden Highway. A key objective of this design is to preserve the existing Garden Highway and minimize the removal of levee encroachments located on private lands along the water side of this roadway. SAFCA intends to work closely with the Board and the Department to achieve this objective in a manner that is consistent with the Board's Supplemental Standards for Control of Residential Encroachments in Reclamation District 1000, which are found in Section 133 of Title 23 of the California Code of Regulations.

Second, in order to accommodate the Project footprint and minimize the effects of the Project on residences along the Garden Highway, the final design calls for relocation of portions of the existing main electrical transmission system, including poles and powerlines that provide electricity to these residences, into a new utility operation and maintenance corridor for which

right-of-way has been acquired east of the new adjacent levee. In addition, SAFCA has sought to avoid relocating existing secondary poles and individual service lines that link the main transmission line to the residences. To the extent that such relocations are necessary, wherever possible the new secondary poles have been located along the landside of the Garden Highway between the roadway pavement and the new adjacent levee.

Third, SAFCA has incorporated new storm water drainage facilities into the final design to offset the potential increase in storm water that would otherwise be discharged from the Garden Highway onto the private parcels occupying the water side of the levee. These drainage facilities consist of a collection swale located between the new adjacent levee and the Garden Highway, and new pipes and drainage outfall lines to drain collected storm water to the river. Where these outfalls cross private property, they are located along existing parcel boundaries in buried pipes that drain to the river [or in an alternative location selected in consultation with the property owner].

SAFCA requests that the Board and the Department approve these Project features as shown in the final design package. However, if for any reason the Board or the Department determines that the proposed location of electrical or drainage facilities is unacceptable, SAFCA requests that the Board and/or the Department identify alternative locations that would be acceptable so that affected property owners may have an opportunity to work with SAFCA in selecting from among these alternatives. Please contact us if you have any questions in this regard. We look forward to working with you to continue to improve flood protection for the Natomas Basin.

Very truly yours,

Stein M. Buer
Executive Director

cc: United States Army Corps of Engineers
Reclamation District 1000

EXHIBIT C
FORM-OF LETTER TO UTILITY COMPANY

[SAFCA LETTERHEAD]
[Date]

[Name]
[Name of Utility Company]
[Address]
[City, State ZIP]

RE: Relocation of Electrical and Telephone Utility Poles and Lines
SAFCA Natomas Levee Improvement Program Landside Improvements Project,
[Year] Construction Projects

Dear [Name]:

SAFCA has undertaken the Natomas Levee Improvement Program ("NLIP") Landside Improvements Project ("Project") in order to provide increased flood protection to the Natomas Basin. The Project will require relocation of utility poles and lines along the levee system in order to accommodate the widened levee and related infrastructure.

Enclosed with this letter please find plans which identify SAFCA's proposed locations for installation of new poles and lines and relocation of existing facilities to accommodate the footprint of the Project. In order to minimize the effects of the Project on Garden Highway residences, these locations have been selected so as to ensure that no new main transmission lines and poles are installed on the water side of the Garden Highway. In addition, SAFCA has sought to avoid relocating poles that support individual service lines. To the extent such relocations are necessary, wherever possible the new poles have been located on the land side of the Garden Highway.

SAFCA believes the proposed utility relocation plan is consistent with sound engineering practices and we look forward to your approval. However, if for any reason [utility provider] determines that any proposed utility pole location is unacceptable, we request that [utility provider] identify alternative locations that would be acceptable so that the affected property owners may have an opportunity to work with SAFCA in selecting from among these alternatives.

Please contact us if you have any questions or concerns. We appreciate your cooperation on this important Project to improve flood protection for the Natomas Basin.

Very truly yours,

Stein M. Buer
Executive Director

cc: United States Army Corps of Engineers
[Reclamation District 1000]
[Central Valley Flood Protection Board]

EXHIBIT D
FORM-OF LETTER TO CVRWQCB

[SAFCA LETTERHEAD]
[Date]

[Name]
Central Valley Regional Water Quality Control Board
Sacramento Main Office
11020 Sun Center Drive #200
Rancho Cordova, CA 95670-6114

RE: Request for Waste Discharge Requirements for Drainage Pipes and Outfalls
Natomas Levee Improvement Program
Landside Improvements Project, [Year] Construction Projects

Dear [Name]:

SAFCA has undertaken the Natomas Levee Improvement Program ("NLIP") Landside Improvements Project ("Project") in order to provide increased flood protection to the Natomas Basin. The Project will involve the construction of a new adjacent levee on the land side of the existing Sacramento River east levee along the Garden Highway. The section of the adjacent levee between the Natomas cross Canal and Powerline Road will be raised above the elevation of the existing levee. This grade difference results in a change in the drainage pattern associated with the eastern side of the roadway.

Enclosed with this letter please find SAFCA's application for waste discharge requirements associated with the new storm water drainage facilities which are proposed to offset the potential increase in storm water that would otherwise be redirected from eastern side of the Garden Highway onto the private parcels occupying the water side of the levee. These drainage facilities consist of a collection swale located between the new adjacent levee and the Garden Highway, and new pipes and drainage outfall lines to drain collected storm water to the river. In order to minimize the effects of the Project on Garden Highway residences, where these outfalls cross private property, SAFCA has sought to locate the new drainage pipes and outfalls along existing parcel boundaries in buried pipes that drain to the river [or in an alternative location approved by the property owner].

SAFCA believes that the Project and the enclosed application for waste discharge requirements are consistent with sound engineering practices, the Settlement Agreement between the Garden Highway Community Association and SAFCA, and the Porter-Cologne Water Quality Control Act. Accordingly, we request that the Regional Board approve this application. However, if for any reason the Regional Board determines that the location of any proposed new pipe or outfall line is unacceptable, we request that the Regional Board identify alternative

locations that would be acceptable so that the affected property owners may have an opportunity to work with SAFCA in selecting from among these alternatives.

Please contact us if you have any questions or concerns. We look forward to your cooperation on this important Project to improve flood protection for the Natomas Basin.

Very truly yours,

Stein M. Buer
Executive Director

cc: United States Army Corps of Engineers
Central Valley Flood Protection Board

APPENDIX B

Project Description

APPENDIX B1
ALTERNATIVES FORMULATION AND SCREENING DETAILS

This appendix contains more detailed information on the alternatives evaluation process that was summarized in Chapter 2, "Alternatives," of this EIS/EIR.

1.1 INTRODUCTION

This appendix describes the alternatives related to the Natomas Levee Improvement Program (NLIP) Landside Improvements Project that were considered to provide additional flood risk reduction to the Natomas Basin consistent with the project objectives described in Chapter 1, "Introduction and Statement of Purpose and Need" of this EIS/EIR. The Phase 4b Project builds upon a program of improvements analyzed in previous environmental documents for achieving flood risk damage reduction for the 53,000-acre Natomas Basin, which is encircled by 42 miles of levees. Although they provide contrasting advantages and disadvantages, each of the action alternatives is considered feasible based on relevant economic, environmental, social, technological, and legal factors. Three alternatives are evaluated at an equal level of detail in this EIS/EIR:

- No-Action Alternative,
- Adjacent Levee Alternative (Proposed Action), and
- Fix-in-Place Alternative.

These alternatives represent a reasonable range of alternatives, consistent with the requirements of NEPA and CEQA and when considered in the context of prior alternatives analyses described in previous environmental documents and which are incorporated by reference in this EIS/EIR. The action alternatives under consideration have been formulated to feasibly accomplish the primary objectives of the project as discussed in Chapter 1, "Introduction and Statement of Purpose and Need," of this EIS/EIR, which includes reducing the risk of flooding to the Natomas Basin. The action alternatives include components that could avoid or substantially lessen one or more of the project's significant effects.

The NLIP design criteria in terms of maximum water surface elevation and maximum flow at key locations along the Natomas Basin perimeter levee system are identified in **Table B1-1**.

Table B1-1
NLIP Design Criteria: Water Surface Elevation and Maximum Flow

Location	100-year (0.01 AEP) FEMA Criteria Flood [1]		200-year (0.005 AEP) NLIP Design Criteria Flood [2]	
	Maximum Water Surface Elevation (feet) NAVD88	Maximum Flow (cfs)	Maximum Water Surface Elevation (feet) NAVD88	Maximum Flow (cfs)
Sacramento River at Verona	43.40	117,000	44.85	143,000
Latitude of Verona	NA	528,000	NA	622,000
NCC at PGCC	43.73	NA[3]	45.24	NA[3]
NEMDC near Main Avenue	38.98	14,500	40.89	17,100

Notes: AEP = Annual Exceedance Probability; cfs = cubic feet per second; FEMA = Federal Emergency Management Agency; NAVD = North American Vertical Datum of 1988; NCC = Natomas Cross Canal; NEMDC = Natomas East Main Drainage Canal; NLIP = Natomas Levee Improvement Program; PGCC = Pleasant Grove Creek Canal

[1] Levees overtop without failing; existing levees; existing Folsom Dam.

[2] Levees overtop without failing; 200-year (0.005 AEP) urban levees; Folsom Joint Federal Project.

[3] Maximum water surface elevation controlled by high tailwater in Sacramento River.

Source: SAFCA 2008

1.1.1 NEPA/CEQA REQUIREMENTS FOR EVALUATION OF ALTERNATIVES

1.1.1.1 NEPA REQUIREMENTS

The NEPA Council on Environmental Quality Regulations (40 Code of Federal Regulations Section 15012.14) for EIS requirements are briefly described in Chapter 1, "Introduction and Statement of Purpose and Need," of this EIS/EIR.

1.1.1.2 CEQA REQUIREMENTS

The CEQA requirements for an EIR (as noted in the California Code of Regulations [CCR] Section 15126.6[a] of the State CEQA Guidelines) are briefly described in Chapter 1, "Introduction and Statement of Purpose and Need," of this EIS/EIR.

2.1 ALTERNATIVES FORMULATION

USACE and SAFCA formulated the project and a reasonable range of alternatives that would achieve the specific project objectives through the following steps:

- identification of the deficiencies in the Natomas levee system that must be addressed to provide at least 100-year flood risk reduction (0.01 annual exceedance probability [AEP]) as quickly as possible;
- identification of the deficiencies in the Natomas levee system that must be addressed to provide 200-year flood risk reduction (0.005 AEP);
- identification of feasible remedial measures to address the deficiencies;
- determination of the likely environmental impacts of the remedial measures;
- development of a reasonable range of flood damage reduction alternatives for implementing the remedial measures; and
- identification of measures to ensure that each alternative would improve aviation safety, minimize impacts on significant cultural resource sites, and enhance habitat values.

Alternatives screening for the overall NLIP has been undertaken in a systematic manner through several environmental documents as described later in this appendix. A description of the flood risk reduction measures that SAFCA considered for developing alternatives is provided below.

2.1.1 TYPES OF FLOOD RISK REDUCTION MEASURES CONSIDERED

Designing effective flood risk reduction measures is an iterative process that involves identifying, evaluating, and comparing measures and preliminary alternatives to develop a reasonable range of final alternative plans for consideration by decision makers and the general public. For the NLIP Landside Improvements Project, engineering measures were developed and considered that alone or in various combinations would address the project objectives.

The engineering measures that were considered for the Phase 4b Project must meet several criteria. The design selected must adequately improve performance of the levee so that Federal Emergency Management Agency (FEMA) certification is possible. Generally, the requirements are to provide a sufficient height of levee raise so that the levee height is adequate, levee stability meets levee design criteria, and/or seepage through or beneath the levee is reduced to levels acceptable to USACE. Measures considered are described below.

2.1.1.1 LEVEE IMPROVEMENTS

USACE has divided the flood damage reduction improvements within the Natomas Basin into nine reaches (Reaches A–I). USACE's reach designations differ from SAFCA's reach designations, which are more finely subdivided than the USACE system for the Sacramento River east levee, American River north levee, and the NCC. Lettered reaches follow the USACE designation, while numbered reaches follow the SAFCA designations:

- Sacramento River east levee: Reach A:16–20
- Sacramento River east levee: Reach B:5A–15
- Sacramento River east levee: Reach C:1–4B
- NCC: Reach D:1–7
- PGCC: Reach E: there are no SAFCA reaches, just station numbers
- NEMDC North: Reaches F–G
- NEMDC South: Reach H
- American River north levee: Reach I:1–4

Sacramento River East Levee (Reach A:16–20)

The existing levee in Sacramento River east levee Reach A:16–20 currently meets height requirements, and, therefore, no levee raise is necessary in this reach. However, the levee needs to be upgraded to meet USACE requirements regarding seepage through the levee and its foundation, slope stability, and free access for inspection, maintenance, and emergency flood fighting. Two engineering options were analyzed for the levee upgrade: the Fix-in-Place Method and the Adjacent Levee Method. Because these options have potentially different effects on the environment, they are analyzed as the two action alternatives in this EIS/EIR:

- **Fix-in-Place Method.** Most levee reaches in the Natomas Basin have a 2-to-1 horizontal-to-vertical (2H:1V) landside slope, which may not meet criteria for slope stability or access on the levee for maintenance and operation. This condition is found on Sacramento River east levee Reach A:16–20, which is a component of the Phase 4b Project. Using the Fix-in-Place method, the remedy would be to flatten the slope to a minimum 3-to-1 horizontal-to-vertical (3H:1V) landside slope by adding fill on top of the existing landside levee slope, thereby widening the base of the levee prism but not expanding the width of the levee crown (**Plate 2-1**, upper illustration). The Fix-in-Place method is compatible with the seepage remediation methods described under Section 2.1.3.2. By leaving the levee prism in the current alignment, this method requires vegetation clearance on the waterside of the levee to comply with USACE levee guidance that requires the removal of vegetation greater than 2 inches in diameter on the levee slopes and within 15 feet of the waterside and landside levee toes (USACE 2000). However, in reaches where the existing levee is already wide enough that the levee prism is considered clear of vegetation, such as in American River north levee Reach I:1–4, the Fix-in-Place method may be used to reduce the theoretical levee footprint to avoid encroachments on the landside.

  While the levee footprint (its base) size may not be substantially altered, mitigation for loss of habitat would be required by various regulatory agencies. Where the widening results in filling waters of the United States, including wetlands, mitigation would be required, generally at a 1:1 replacement ratio. Where the widening occurs on the landside or waterside and trees that provide habitat or are otherwise protected exist, the mitigation requirement is to plant replacement woodlands and/or shaded riverine aquatic (SRA) habitat. In some instances, irrigation and drainage ditches and canals exist at the toe of the levee, and would require relocation to ensure USACE's seepage and stability criteria are met. Widening of the existing levee may require the purchase of additional easements and/or rights-of-way, including areas for utilities and planting/replacement woodlands and other habitats. Proper construction of the widened levee may require excavation of a keyway trench in the foundation area at the toe of the levee.

- **Adjacent Levee Method.** This method combines slope flattening to 3H:1V with a widening of the existing levee crown by 15 to 20 feet on the landside. The concept of an adjacent levee is that the levee prism would

be shifted landward (as shown in **Plate 2-1**, lower illustration), such that much of the vegetation on the waterside of the existing levee would be less likely to need to be cleared for levee operation and maintenance (see Section 2.1.3.4, "Management of Levee Vegetation and Structural Encroachments," below). This design potentially reduces the need to remove vegetation on the waterside to meet USACE vegetation guidance criteria. The irrigation and drainage ditches and canals that exist at the toe of the levee may require relocation farther to the landside. Construction of an adjacent levee may also require the purchase of additional easements and/or rights-of-way, including areas for utilities and planting of replacement woodlands and other habitats. Proper construction of the adjacent levee foundation often requires excavation of an inspection trench in the foundation soils. Because the Natomas Basin's natural levees have been augmented by human efforts, it is possible to find buried prehistoric features at considerable depth in the landside footprint.

Raised adjacent levees have been constructed or are in the approval process for Sacramento River east levee Reach C:1 to part way through Reach B:13 (Phase 2, 3, and 4a Projects). From the remainder of Sacramento River east levee Reach B:12 to Reach A:20 (Phase 4a and 4b Projects), the existing levee has sufficient height, and the proposed adjacent levee would be at the same height as the existing levee. The Phase 2, 3, and 4a Projects are summarized in Section 4.18, "Summary of Environmental Impacts and Mitigation Measures from Previous Natomas Levee Improvement Program Phase 1–4a Landside Improvements Projects," of this EIS/EIR.

Pleasant Grove Creek Canal and Natomas East Main Drainage Canal West Levee (North of Natomas East Main Drainage Canal Stormwater Pumping Station)

Two engineering options are also available for reaches where levee raising is required to meet the level of risk reduction required by the State for urbanized areas, such as the Natomas Basin. In the Phase 4b Project, these raises are proposed for the west levees of the Pleasant Grove Creek Canal (PGCC) (Reach E) and the Natomas East Main Drainage Canal (NEMDC) North (Reaches F–G). These options have similar environmental effects, and they are analyzed as part of both the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative:

- **Raise-in-Place Method.** Raising the levee in place would require the existing levee footprint to be widened at its base on one or both sides. This method may require replacement of public roadways that may be located on the crown of the levee. Although the levee footprint (its base) size may not be substantially altered, mitigation for loss of habitat would be required by various regulatory agencies. In some instances, irrigation and drainage ditches and canals exist at the toe of the levee, and would require relocation. Widening of the existing levee may require the purchase of additional easements and/or rights-of-way, including areas for utilities and planting/replacement woodlands and other habitats. Proper construction of the widened levee may require excavation of a keyway trench in the foundation area at the toe of the levee.

- **Adjacent Levee Raise Method.** In lieu of modifying the existing levee, a levee raise may also be achieved by constructing a new landside embankment adjoining the existing levee. This approach, which is similar to the adjacent levee method described above, allows sufficient levee height to be achieved without degrading the existing levee and rebuilding public roadways that may be located on top of the existing levee. However, it requires excavation of additional suitable material to build the adjacent structure. The irrigation and drainage ditches and canals that exist at the toe of the levee may require relocation farther to the landside. Construction of an adjacent levee may also require the purchase of additional easements and/or rights-of-way, including areas for utilities and planting of replacement woodlands and other habitats. Because the west levees of the PGCC and NEMDC, north of the NEMDC Stormwater Pumping Station, already substantially comply with levee vegetation guidance criteria, the adjacent levee is not needed as an option to avoid vegetation removal on the waterside (see 2.1.3.4, "Management of Levee Vegetation and Structural Encroachments," in Chapter 2, "Alternatives," in this EIS/EIR).

2.1.1.2 SEEPAGE REMEDIATION

Pre-NLIP existing seepage remediation in the Natomas Basin has primarily addressed seepage through the levee embankment (through-seepage). Through-seepage occurs when the waterside slope is loaded by high river stage for a sufficient time to develop a steady state condition in the levee embankment in which water is seeping on the levee landside slope, removing material from the levee embankment by internal erosion and leading to slope instability. Through-seepage is the movement of water through the levee itself, when high-flow conditions, and/or wind and wave action exist on the waterside of the levee. Through-seepage may be addressed by construction of cutoff walls through the levee prism or drained stability berms on the landside slope. The cutoff walls provide a low-permeability barrier to water flow through the levee. Drained stability berms prevent levee material from being removed, drains the seepage water away from the levee, and also increases the stability of the levee slope. Underseepage or seepage through the levee foundation occurs during prolonged high river stages and results in high gradients at the levee landside toe due to build-up of the water pore pressure in the levee foundation to a high limit which may lead to levee collapse due to piping (removal of material from the levee foundation through sand boils [**Plate 1-4**]) or slope instability due to high water pore pressures in the foundation soils. Excessive underseepage gradients can be addressed by cutoff walls, seepage berms, and relief wells, or using a combination of these measures, which are discussed below.

Cutoff Walls

Cutoff walls use specialized earthen materials (often bentonite clay) constructed in the levee embankment, which extend into the levee foundation to a sufficient depth to reduce the seepage gradient at the landside toe of the levee below an allowable limit. Specialized equipment allows the cutoff walls to reach deep into the subsurface, to depths of 120 feet (**Plate 2-2**). Often the levee crown is "degraded," meaning that the levee embankment is excavated to create a wide working platform for the construction equipment to install the cutoff wall. A fully penetrating cutoff wall installed deep enough to reach a lower impervious layer in the foundation may reduce the seepage gradient to a very low limit. A partially penetrating wall, which does not reach the lower impervious strata in the foundation, may reduce the seepage gradient by increasing the seepage path, but sometimes the reduction is not sufficient to drop the gradient below the maximum allowable limit and an additional seepage berm or relief well is required. Fully penetrating cutoff walls are generally preferred, if it is constructible, because they are the least costly (particularly if a soil-bentonite [SB] mix is used and the depth of wall is less than 85 feet); are the most reliable under uncertain hydraulic and geotechnical conditions (e.g., water surface elevations above design and variations in foundation soil conditions); and, when combined with an adjacent levee, minimize construction disturbance outside the levee footprint.

If a fully penetrating wall is not feasible due to the foundation conditions (the lower impervious layer is non-existent or at a depth not possible to be reached with the existing equipment), then partially penetrating walls eventually supplemented with additional methods of seepage mitigation (such as seepage berms or relief well) may be used. Eventually, partially penetrating walls may be completely replaced by seepage berms or relief wells.

Seepage Berms

Seepage berms are wide, shallow features with relatively flat surface slopes graded to drain landward. They are typically constructed using material excavated from borrow sites. The berms may be constructed of any impervious material from the borrow sites or, to increase the berms efficiency and decrease the berm width, the random berm material may be placed on a free drainage layer 2–2.5 feet thick placed on a 6 inches of filter material to prevent removal of the fine foundation material by piping. Seepage berms may extend between a minimum of 80 feet to up to 500 feet landside of the toe of the levee or the adjacent levee (**Plate 2-3**). In areas of limited space, seepage berms are supplemented with relief wells at the landside toe of the seepage berms.

Constructing seepage berms rather than cutoff walls avoids the deep ground-disturbing work that may adversely affect cultural resources that may be present, while still achieving flood damage reduction objectives. It is

possible to construct a seepage berm using specialized equipment that minimizes vibration and pressure on the immediate subsurface environment. This construction method is often used where sensitive historical features may be expected near the ground surface, and relief wells are omitted. A seepage berm without relief wells extends the levee footprint farther landside and depending upon adjacent land use, may require relocation of permanent structures or take affected agricultural land out of production, as well as other environmental impacts.

Relief Wells

Relief wells are controlled artificial springs that relieve the confined water pressures to safe values. This reduces the potential for the removal of soil via piping or internal erosion caused by the uplift pressures beneath elements of the levee or beneath landward soil next to the levee. Relief wells are usually spaced about 50–150 feet apart to decrease the gradients at the levee toe below the maximum allowable gradient between two adjacent wells and allow water to flow without pumping during times of high water table. Piezometers are used as a tool to verify relief well performance by measuring the hydrostatic pressure between the wells. Because relief wells may only flow on an intermittent basis, sometimes several years apart, it is necessary to conduct regular maintenance of relief wells to ensure that they perform properly (**Plate 2-4**). Relief wells also require collection of water flowing through the wells during high river stages, which is then discharged back into the river through a pumping station. This may require excavation of a ditch along the landside toe of the levee or seepage berm or collecting the water through an underground piping system.

Pre-NLIP existing seepage remediation in the Natomas Basin has primarily addressed through-seepage. Through-seepage is the movement of water through the levee itself, when high-flow conditions, and/or wind and wave action exist on the waterside of the levee. Through-seepage may be addressed by construction of cutoff walls through the levee prism or a drained stability berm on the landside slope. The cutoff walls provide a low-permeability barrier to water flow through the levee. Underseepage occurs below the levee prism, and is caused by the buildup of water pressure in the subsurface foundation soils, when high river stages are present on the waterside of the levees. This pressure can be great enough to force water through the earthen foundation layers under the levee. The water finds a pathway of less resistance and exits at the landside ground surface. Excessive underseepage gradients can be corrected through the use of cutoff walls, seepage berms, and relief wells, which are discussed below. Current construction methods can correct underseepage and be compatible with the underseepage improvement methods employed for Phase 2 and 3 Project construction.

2.1.1.3 Bank Erosion Control

Bank erosion poses either a high or moderate risk to the stability of the Sacramento River east levee at several locations upstream and downstream of Interstate 5 (I-5) where river flows and waves generated by boat wakes have weakened and undercut portions of the bank supporting the levee. The adjacent levee design would address the potential instability created by these bank erosion processes by enlarging the levee section and moving the levee foundation landward away from the eroding bank. These bank erosion processes could also be addressed by installing rock revetments or other engineered structures along the eroding banks so as to reduce further erosion and protect the foundation of the levee (as proposed for the NEMDC South; see Section 2.3.3.2, "Sacramento River East Levee," under "Pleasant Grove Creek Canal and Natomas East Main Drainage Canal – South Waterside Improvements," in Chapter 2, "Alternatives," of this EIS/EIR).

2.1.1.4 Management of Levee Vegetation and Structural Encroachments

USACE levee guidance requires the removal of vegetation greater than 2 inches in diameter on the levee slopes and within 15 feet of the waterside and landside levee toes (USACE 2000). USACE levee guidance also requires an assessment of encroachments on the levee slopes, including utilities, fences, structures, retaining walls, driveways, and other features that penetrate the levee prism (see Section 2.3.4.11, "Structural Encroachments," in Chapter 2, "Alternatives," of this EIS/EIR). Substantial encroachments are present on the Sacramento River east levee with a smaller number of encroachments on the other Natomas levees.

Vegetation Variance Request

SAFCA and the Central Valley Flood Protection Board (CVFPB), the non-Federal sponsors of the NLIP, are requesting a variance from the standard vegetation guidelines set forth in USACE's Engineering Technical Letter 1110-2-571 (USACE 2009a). Under this variance, vegetation would be allowed to remain on all or a portion of the waterside slope and berm of several of the levee segments comprising the perimeter levee system protecting the Natomas Basin. The following sections describe the levee segments that would be covered by this variance. Sections 2.3, "Proposed Action," and 2.4, "Fix-in-Place Alternative," in Chapter 2, "Alternatives," of this EIS/EIR describe the vegetation removal assumptions used by this EIS/EIR to provide environmental analysis to support consideration of this variance request.

Adjacent Levees

One of the objectives of constructing an adjacent levee along the Sacramento River east levee is to facilitate acceptable management of existing vegetation and structural encroachments along the waterside of this levee. By making the levee wider and effectively moving the "designated levee" section landward (**Plate 2-1**, lower illustration), the separation between waterside vegetation and the levee prism would be increased, thus reducing the conflicts between applicable USACE levee operation and maintenance requirements, and waterside vegetation and structural encroachments. Because this design would allow vegetation to remain on the waterside under the proposed variance, valuable riparian habitat would be preserved, benefiting several special-status species. This riparian habitat, which is shown on **Plates 3-4c** and **3-4d**, also provides a migration corridor habitat for a variety of wildlife species that inhabit the Natomas Basin.

Section 2.3.4.10, "Vegetation Management," in Chapter 2, "Alternatives," of this EIS/EIR provides additional information on the relationship of the Adjacent Levee Alternative (Proposed Action) with management of levee vegetation. Construction of the adjacent levee would also involve removal of vegetation within 15 feet of the landside toe of the widened levee. The adjacent levee has been constructed and/or approved for Sacramento River east levee Reaches C:1–4B and B:5A–15 as part of the Phase 2 and 3 Projects.

Other segments of the Natomas Basin perimeter levee system may already be in compliance with levee vegetation guidance criteria or may qualify for a variance within the next several years because: (1) vegetation did not exist or has already been cleared within the 15-foot clearance zone; (2) these segments were previously overbuilt to the point where their levee prism could be considered clear of waterside or landside vegetation and would potentially qualify for a variance; or (3) planned improvements would ensure compliance through waterside slope flattening, shifting levee crowns in a landward direction, and removing any vegetation that would penetrate the levee prism. Levee segments falling into this category include most of the Natomas Cross Canal (NCC) south levee (Reach D:1–7), the PGCC west levee (Reach E), and the west levee of the NEMDC north of the NEMDC Stormwater Pumping Station (Reaches F–G).

Overbuilt Levees

An overbuilt levee is defined as a levee with land and waterside slopes of at least 3H:1V and a virtual levee crown (measured at the design water surface elevation) that is at least 35-feet wide (designated levee crown). Similar to the adjacent levee, the overbuilt levee allows for considering that the levee prism meets the criteria of having a 15-foot vegetation free zone from the projected waterside toe, such that much of the vegetation on the waterside of the existing levee is less likely to need to be cleared for levee operation and maintenance. Like the adjacent levee, to be in compliance, trees would not be allowed to remain within the area extending 15 feet landward from the toe of the overbuilt levee out to 15 feet from the toe of the projected waterside slope.

The American River north levee is an extension of the Sacramento River east levee that extends from I-5 to Northgate Boulevard, where it becomes the west levee of NEMDC South. This segment of the Natomas perimeter levee system is considered an overbuilt levee and may qualify for a variance from USACE levee vegetation guidance because it was widened beyond standard levee dimensions to support the Arden-Garden Connector

transportation project. Also considered overbuilt and potentially eligible for a variance is the segment of the west levee of NEMDC South that extends from Northgate Boulevard to the Arden-Garden Connector. Although these levee segments are overbuilt to the extent that they may not need vegetation clearance on the waterside if a variance is granted, on the landside an extensive number of trees would be removed to accommodate the expanded levee footprint, including removal of vegetation within 15 feet of the new landside levee toe.

Non-Conforming Levees

The lower portion of the NEMDC west levee from the NEMDC Stormwater Pumping Station to Northgate Boulevard presents more challenging vegetation management options. This portion of the levee system was raised and strengthened by SAFCA in 1995–1996 as part of the American River Watershed Project authorized by Congress in the 1993 Defense Appropriations Act. The authorized project called for raising the levee to protect the Natomas Basin from the combined effects of high flows in the American River channel and high flows in Dry Creek and Arcade Creek, the tributary streams that drain foothill watersheds east of Natomas. SAFCA widened the existing levee section to the landside and raised the levee by two to three feet. Urban development along the landside of the levee constrained the space available for the project and the improved levee was designed and constructed with a 2:1 landside slope.

Project construction required landside tree removal to accommodate the widened footprint of the improved levee. However, with the concurrence of USACE and the State, to minimize the project's environmental effects, trees were allowed to remain in the maintenance area along the landside toe of the improved levee and along the waterside slope of the levee and waterside berm. It was felt that these trees would not impair the performance of the improved levee because there was adequate visibility of and access to both sides of the levee to conduct routine maintenance and flood fighting activities. Nor was there any significant concern regarding the impact of the remaining trees on the safety or structural integrity of the improved levee. Although nearly overtopped and subjected to prolonged high flow during the flood of 1986, the old levee had performed well with few signs of stress. With its increased height, the new levee performed even better during the flood of 1997. However, this levee is no longer considered in compliance with USACE levee vegetation guidance, and avoidance of landside tree clearing in this maintenance area would require a variance from USACE.

The Phase 3 Project analyzed the installation of cutoff walls through portions of the NEMDC west levee where it crosses the old streambeds of Dry Creek, Arcade Creek and Magpie Creek. The Phase 4b Project proposes construction of cutoff walls along the entire length of the NEMDC and PGCC west levee. Installation of these cutoff walls would address the risk of destabilizing underseepage in these locations which occupy approximately one-half the length of the levee between the NEMDC Stormwater Pumping Station and Northgate Boulevard. This risk was not considered to be substantial when the improvements described above were designed and constructed. Insofar as vegetation on or near the improved levee has also now been identified as a risk factor, removal would be required for all non-native trees from within the vegetation-free zone; all native trees that have a diameter at breast height (dbh) of four inches or less; and all larger native trees that are located in the upper two-thirds of the waterside slope, the crown, or within 15 feet of the landside toe (or within the right-of-way, if less than 15 feet).

Life Cycle Management Program

The following five risk factors are associated with levee vegetation:

- access (trees could obstruct access for routine maintenance and flood fighting);
- visibility (trees could impair routine levee inspection and high water condition monitoring);
- slope stability (trees could contribute to slope instability);
- seepage (tree roots could create seepage pathways); and
- windthrow (overturned trees could create destabilizing slip planes).

For non-conforming levees that may be granted a variance, implementation of a Life Cycle Management (LCM) program would use GIS- and field-based evaluation tools to ensure that new trees would not become established in the vegetation-free zone, and trees allowed to remain in this zone would be carefully monitored, trimmed and, if necessary, removed if they become an unacceptable risk to the performance of the levee due to age or infirmity.

3.1 ALTERNATIVES CONSIDERED IN PREVIOUS ENVIRONMENTAL ANALYSES AND INCORPORATED BY REFERENCE

This section describes the alternatives analysis performed in previous documents from which this EIS/EIR is tiered. The alternatives analyses from the documents listed below are incorporated by reference, herein. This material is provided here to summarize the scope of analysis that has already been performed and thus to show which alternatives have been eliminated from further analysis or rejected by previous agency decisions.

The alternatives analyses incorporated herein by reference are from the following environmental documents:

- *Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area*, State Clearinghouse No. 2006072098 (Local Funding EIR) (SAFCA 2007a);
- *Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project*, State Clearinghouse No. 2007062016 (Phase 2 EIR) (SAFCA 2007b);
- *Environmental Impact Statement for 408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project* (Phase 2 EIS) (USACE 2008);
- *Supplement to the Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project—Phase 2 Project*, State Clearinghouse No. 2007062016 (Phase 2 SEIR) (SAFCA 2009a);
- *Addendum to the Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project – Phase 2 Project*, State Clearinghouse No. 2007062016 (Phase 2 EIR 1st Addendum) (SAFCA 2009c);
- *2nd Addendum to the Environmental Impact Report on the Natomas Levee Improvement Program, Landside Improvements Project – Phase 2 Project,* State Clearinghouse No. 2007062016 (Phase 2 EIR 2nd Addendum) (SAFCA 2009d);
- *Environmental Impact Statement and Environmental Impact Report on the Natomas Levee Improvement Program, Phase 3 Landside Improvements Project*, State Clearinghouse No. 2008072060 (Phase 3 EIS and EIR) (USACE 2009b and SAFCA 2009b);
- *Addendum to the Environmental Impact Report on the Natomas Levee Improvement Program, Phase 3 Landside Improvements Project*, State Clearinghouse No. 2008072060 (Phase 3 EIR Addendum) (SAFCA 2009e); and
- *Environmental Impact Statement and Environmental Impact Report on the Natomas Levee Improvement Program, Phase 4a Landside Improvements Project*, State Clearinghouse No. 2009032097 (Phase 4a EIS and EIR) (USACE 2010 and SAFCA 2009f).

Relevant portions of these documents, where specifically noted, are summarized throughout this EIS/EIR. Printed copies of these documents are available to the public at USACE's office at 1325 J Street, Sacramento, California and at SAFCA's office at 1007 7th Street, 7th Floor, Sacramento, California, during normal business hours, and

are also available on USACE's Web site, at http://www.spk.usace.army.mil and at SAFCA's Web site, at http://www.safca.org/Programs_Natomas.html.

3.1.1 ALTERNATIVES CONSIDERED IN THE LOCAL FUNDING EIR

In the Local Funding EIR (SAFCA 2007a), SAFCA analyzed the environmental effects associated with the creation of a new assessment district to fund necessary flood damage reduction measures in the Sacramento region. This funding supports projects including the NLIP, and thus analyzes, at a programmatic level, the environmeutal effects for a program of flood damage reduction projects in the region, including the NLIP. The project objective used to screen alternatives for the project was the identification and creation of a source of funding that would allow SAFCA to provide 100-year flood risk reduction (0.01 AEP) for developed areas within SAFCA's jurisdiction, and to lay the groundwork for creation of 200-year flood risk reduction (0.005 AEP) over time (SAFCA 2007a: 7-2).

- **Proposed Project.** The proposed project alternative consisted of creation of an assessment district and a development fee program to fund improvements along the portions of Sacramento and American Rivers within SAFCA's jurisdiction. This alternative was determined to provide sufficient funds for project objectives (SAFCA 2007a: 3-1).

- **No Project (Alternative 1).** In this alternative, SAFCA considered the impact of neither creating nor seeking new funding mechanisms for flood damage reduction. This would limit flood damage reduction projects to current efforts to provide 100-year flood risk reduction along the American River and the South Sacramento Streams Group and thus would not meet project objectives (SAFCA 2007a: 7-2).

- **No New Public Funding; Private Levees in Natomas (Alternative 2).** This alternative assumed the same conditions as the No-Project Alternative but looked at the probable effect of private levee construction for residential development projects (SAFCA 2007a: 7-2). This alternative was eliminated because it would increase projected flood damages without a commensurate reduction in flood risk (SAFCA 2007a: 7-7).

- **Natomas 100-Year Protection (Alternative 3).** SAFCA analyzed the impacts associated with creation of one new assessment district which would provide only 100-year flood risk reduction to the Natomas Basin, and would use funding raised through existing Capital Assessment District Number 3 to provide the local share of the cost of completing improvements to provide 100-year flood risk reduction to the lower American River and South Sacramento Streams Group areas (SAFCA 2007a: 7-2). This alternative was eliminated because it would fail to provide groundwork for the creation of 200-year protection over time (SAFCA 2007a: 7-8).

- **Reduced Natomas Levee Perimeter (Alternative 4).** Under this alternative, SAFCA considered construction of a new levee across the Natomas Basin in lieu of improving the south levee of the NCC and the upper reach of the east levee of the Sacramento River. This alternative would have reduced the project footprint and would have excluded the northern undeveloped portion of the Basin both from flood risk reduction and the assessment districts to be created (SAFCA 2007a: 7-2). This alternative was eliminated because it would have a much larger footprint than proposed improvements in the Natomas Basin (SAFCA 2007a: 7-11), and it would be subject to potential veto by Reclamation District (RD) 1000 (SAFCA 2007a: 7-12).

The Local Funding EIR analyzed the ability of these alternatives to meet the project objectives and determined that only the proposed project would meet project goals (SAFCA 2007a: 7-14). In addition, the Local Funding EIR analyzed the environmental effects of the various alternatives and concluded that Alternative 3 was the environmentally superior alternative. Alternative 3 would have eliminated or reduced a range of significant effects associated with creation of a new assessment district; however, it was not selected because it would not meet the important project objective of laying the groundwork for 200-year flood risk reduction (0.005 AEP). The proposed project alternative was selected because it would meet all of the project objectives.

3.1.2 ALTERNATIVES CONSIDERED IN THE PHASE 2 EIR AND PHASE 2 EIS

In the Phase 2 EIR (SAFCA 2007b) and Phase 2 EIS (USACE 2008), SAFCA and USACE, respectively, analyzed construction of flood damage reduction measures required to protect the Natomas Basin at a program level (Phase 3 and 4 Projects) and a project level (Phase 2 Project). The project objectives used to screen alternatives consisted of developing 100-year flood risk reduction (0.01 AEP) in the Natomas Basin as quickly as possible, developing 200-year flood risk reduction (0.005 AEP) over time, and ensuring that new development in Sacramento's floodplains would not substantially increase the risk of flooding. Project-specific objectives included reducing hazards to aviation safety in the vicinity of the Sacramento International Airport, and enhancing habitat values in the Natomas Basin for giant garter snake, Swainson's hawk, and other special-status species. (Note: below, page numbers are provided for the Phase 2 EIR only.)

- **Construct an Adjacent Setback Levee along the Sacramento River East Levee.** This alternative was analyzed as the proposed project, carried forward in the EIR as Alternative 1. This project consisted of constructing an adjacent setback levee on the Sacramento River east levee. Other improvements included levee raising and seepage remediation on the Sacramento River east levee, the NCC south levee, and the Pleasant Grove Creek Canal (PGCC) west levee. Other project components included improvements to major irrigation and drainage infrastructure, habitat creation and management, and right-of-way acquisition (SAFCA 2007b: 6-6, 6-7). This alternative was determined to meet project objectives (SAFCA 2007b: 6-7).

- **Raise Levee in Place with a 1,000-Foot Levee Setback in the Upper 1.4 Miles along the Sacramento River East Levee.** This alternative would have provided a location for a substantial amount of tree planting on the waterside of the levee, contributing to offsetting mitigation for the loss of trees that could have been removed along the existing levee to meet USACE criteria. This alternative was eliminated because it was unlikely that the new setback levee would provide 100-year flood risk reduction per USACE criteria (SAFCA 2007b: 6-11).

- **Construct an Adjacent Setback Levee with a 500-Foot Levee Setback in the Upper 1.4 Miles along the Sacramento River East Levee.** This alternative was evaluated because it would provide the opportunity for partially offsetting the loss of landside tree groves through the establishment of new riparian plantings in the levee setback area as well as woodland plantings on the landside of the adjacent setback levee. This alternative was eliminated because it would require substantially greater quantities of borrow material with greater impacts on important farmland and transportation and circulation (SAFCA 2007b: 6-19, 6-20).

- **No-Project Alternative—No Flood Control Improvements in Natomas.** Consideration of a no-project alternative is required under CEQA. Under this alternative, it was assumed that the Natomas Basin flood damage reduction system would not be improved. This alternative was eliminated because it would not meet project objectives (SAFCA 2007b: 6-14).

- **No SAFCA Levee Improvements—Private Levees in Natomas.** This alternative was analyzed assuming no SAFCA project providing flood risk reduction in the Basin, thus causing private developers to separately fund individual flood risk reduction in the form of private compartment levees that would protect new developments. This was eliminated because it would only partially meet the first objective of providing 100-year flood risk reduction and it would potentially lead to increased fragmentation of habitat for special-status species (SAFCA 2007b: 6-15).

The proposed project was identified as the environmentally superior alternative after all alternatives were compared relative to their foreseeable effects (SAFCA 2007b: 6-25). The proposed project was selected for implementation.

After the November 29, 2007 certification of the Phase 2 EIR, SAFCA made minor modifications to the design of the Phase 2 Project. The Phase 2 SEIR (SAFCA 2009a) was prepared by SAFCA to evaluate these modifications;

the SAFCA Board of Directors certified the SEIR on January 29, 2009, at which time the Board also approved the modifications to the Phase 2 Project. No new alternatives were identified in the Phase 2 SEIR. Subsequently, two addenda to the Phase 2 EIR were prepared by SAFCA to evaluate additional minor modifications to the Phase 2 Project; the 1st Addendum to the Phase 2 EIR (SAFCA 2009c) was certified by the SAFCA Board of Directors on June 8, 2009 and the 2nd Addendum to the Phase 2 EIR (SAFCA 2009d) was certified on August 20, 2009. No new alternatives were identified in these Phase 2 addenda.

3.1.3 ALTERNATIVES CONSIDERED IN THE PHASE 3 EIS AND EIR

In the Phase 3 EIS and EIR, USACE and SAFCA analyzed construction of flood damage reduction measures required to protect the Natomas Basin at a project level for the Phase 3 Project (USACE 2009 and SAFCA 2009b). The following alternatives were analyzed at an equal level of detail:

- **No-Action Alternative**—Under NEPA, the expected future without-project conditions; under CEQA, the existing condition at the time the notice of preparation was published (July 18, 2008), as well as what would be reasonably expected to occur in the foreseeable future (two scenarios) if the Phase 3 Project were not approved.

- **Proposed Action**—Construction of an adjacent setback levee along the Sacramento River east levee and improvements to the PGCC west levee and the NEMDC west levee from Elkhorn Boulevard to Northgate Boulevard.

- **Levee Raise-in-Place Alternative**—Raising of the Sacramento River east levee in place and improvements to the PGCC west levee and the NEMDC west levee from Elkhorn Boulevard to Northgate Boulevard.

The Proposed Action and one action alternative (the Levee Raise-in-Place Alternative) were developed for consideration for the Phase 3 Project with a focus on improvements to the Sacramento River east levee (Reach B:5A–9B). Phase 3 Project improvements to the PGCC west levee, the NEMDC west levee, and landscape and irrigation/drainage system modifications would be similar under the Proposed Action and the Levee Raise-in-Place Alternative.

Development of the Proposed Action and the Levee Raise-in-Place Alternative included substantial planning based on consideration of effects on wetlands and other waters of the United States, woodlands, giant garter snake habitat, and other habitats. Accordingly, levee improvements were designed to avoid or minimize such effects where practicable and feasible. However, several agricultural canals or portions of canals and small seasonal wetlands exist near the levee toe along the Sacramento River east levee, PGCC west levee, and NEMDC west levee. These would require filling under either the Proposed Action or the Levee Raise-in-Place Alternative because their proximity to the existing levees places them within the expanded landside levee footprint or adjacent maintenance access under the Proposed Action and the Levee Raise-in-Place Alternative. Similarly, portions of several woodland groves extend into the proposed footprint of the flood damage reduction features along the landside of the Sacramento River east levee under the Proposed Action and the Levee Raise-in-Place Alternative and would need to be removed and/or relocated. Consequently, effects on wetlands and other waters of the United States and on other habitats along the landside of the levees were very similar for the Proposed Action and the Levee Raise-in-Place Alternative, and the same compensation strategies were proposed for unavoidable effects.

The Levee Raise-in-Place Alternative differed from the Proposed Action in that it would result in the (1) removal of waterside trees along the Sacramento River east levee to conform with USACE guidance regarding levee encroachments, and (2) loss of waters of the United States due to the implementation of erosion control improvements along the waterside toe of Sacramento River east levee. These effects would require a different compensation strategy than for the Proposed Action because, under the Proposed Action, these actions would not occur on the waterside of the levee.

In terms of flood risk reduction system design, the Proposed Action and the Levee Raise-in-Place Alternative differed in terms of how they would achieve the required levee height increases along the Sacramento River east levee. Therefore, the differences between the Proposed Action and the Levee Raise-in-Place Alternative, including effects on habitats, were the result of these Sacramento River east levee design differences.

The Proposed Action was identified as the environmentally superior alternative after all alternatives were compared relative to their foreseeable effects. The Proposed Action was approved for implementation by the SAFCA Board of Directors on May 21, 2009.

Since certification of the Phase 3 EIR, SAFCA has made minor modifications to the design of the Phase 3 Project. An addendum to the Phase 3 EIR (SAFCA 2009e) was prepared by SAFCA to evaluate these modifications; the SAFCA Board of Directors certified the Addendum and approved the modifications to the Phase 3 Project on September 17, 2009. No new alternatives were identified in the Phase 3 addendum.

3.1.4 ALTERNATIVES CONSIDERED IN THE PHASE 4a EIS AND EIR

In the Phase 4a EIS and EIR, USACE and SAFCA analyzed construction of flood damage reduction measures required to protect the Natomas Basin at a project level for the Phase 4a Project (USACE 2010 and SAFCA 2009f). The following alternatives were analyzed at an equal level of detail:

- **No-Action Alternative**—Under NEPA, the expected future without-project conditions; under CEQA, the existing condition at the time the notice of preparation was published (March 27, 2009), as well as what would be reasonably expected to occur in the foreseeable future (two scenarios) if the Phase 4a Project were not approved.

- **Proposed Action**—An adjacent levee would be constructed along the Sacramento River east levee, raised in Reach B:10–11B and at the same height as the existing levee in Reach B:12–15; and, where required, cutoff walls, seepage berms, and relief wells would be installed for seepage remediation. A cutoff wall would be installed for additional seepage remediation in Reach 4B. In two locations, the NCC south levee would be raised, a cutoff wall would be installed, and existing pumps would be modified or replaced to reflect raising the discharge pipes above the 200-year design flood elevation (0.005 AEP). The Riverside Canal would be relocated and extended. Parcels within the Fisherman's Lake Borrow Area would be used as the primary source of soil borrow for Phase 4a Project construction; those parcels excavated for borrow material would be reclaimed as agricultural land, grassland, or managed marsh depending on their location and existing land use. Wells would be constructed to provide a water supply for habitat features.

- **Raise and Strengthen Levee in Place (RSLIP) Alternative**—The Sacramento River east levee would be raised in place in Reach B:10–12 and strengthened in place in Reach B:12–15 and seepage remediation and erosion control measures would be implemented. The RSLIP Alternative would be the same as described for the Proposed Action except for the method of levee raising and rehabilitation, the extent of levee degrade to construct cutoff walls, and extent of encroachment removal along the Sacramento River east levee.

The Proposed Action and the RSLIP Alternative were developed for consideration for the Phase 4a Project with a focus on improvements to the Sacramento River east levee (Reach B:10–15). Phase 4a Project improvements to the NCC south levee, relocation and extension of the Riverside Canal, and modifications to the landscape and irrigation/drainage system would be similar under the Proposed Action and the RSLIP Alternative.

As noted above, the Proposed Action and the RSLIP Alternative would use differing methods to achieve the required levee height increases along the Sacramento River east levee for flood damage reduction. Therefore, the differences between the Proposed Action and the RSLIP Alternative, including effects on habitats, are the result of these differences in design of the Sacramento River east levee.

The Proposed Action was identified as the environmentally superior alternative after all alternatives were compared relative to their foreseeable effects. The Proposed Action was approved for implementation by the SAFCA Board of Directors on November 13, 2009.

3.2 ALTERNATIVES CONSIDERED, BUT ELIMINATED FROM FURTHER CONSIDERATION IN PREVIOUS ENVIRONMENTAL ANALYSES AND INCORPORATED BY REFERENCE

Numerous alternatives have been considered by USACE and SAFCA to reduce flood risk in the Natomas Basin. These alternatives were evaluated and eliminated from further consideration during completion of previous environmental documents.

The following alternatives were reviewed and eliminated from further consideration as described below:

- **Yolo Bypass Improvements.** This measure would involve lengthening the Fremont Weir and widening the Yolo Bypass to increase the amount of flood water conveyed through the bypass and reduce the amount of flood water conveyed through the Sacramento River channel downstream of the weir. This alternative was eliminated because: (1) it would be too costly for SAFCA to implement; (2) levee height increases and substantial seepage and slope stability remediation would still be required for the Natomas perimeter levee system, adding to costs; (3) these improvements lie outside of SAFCA's jurisdiction and would require Federal, State, and local cooperation and funding; and (4) the project objective of restoring 100-year (0.01 AEP) design flood levels to the Natomas Basin could not be achieved as quickly as possible. (Considered and eliminated in Phase 2 EIS.)

- **Reduced Natomas Urban Levee Perimeter.** This measure would involve construction of a cross levee running east to west across the Natomas Basin along an alignment north of Elkhorn Boulevard to protect existing developed areas in the City and County of Sacramento. This alternative was eliminated because: (1) it is inconsistent with current Federal and State authorizations and would strand Federal, State, and local investments already made in improving the NCC south levee and Sacramento River east levee pursuant to past Congressional authorization; (2) it would result in the need to raise State Route (SR) 99 or otherwise protect SR 99 from flooding; (3) it would divide Reclamation District (RD) 1000 and disrupt several portions of the Natomas Basin irrigation and drainage system and require reconfiguration of these systems; (4) it would present significant barriers to achieving the goals of the *Natomas Basin Habitat Conservation Plan* (NBHCP); (5) it would have substantially greater costs than other alternatives without achieving any additional flood damage reduction benefit; and (6) it would leave a portion of the Basin currently planned for development by Sutter County (i.e., *Sutter Pointe Specific Plan* mixed-use development project) outside the urban levee perimeter and likely cause Sutter County to exercise its rights under SAFCA's joint exercise of powers agreement to prevent the expenditure of Consolidated Capital Assessment District funds on this measure. (Considered and eliminated in Local Funding EIR and Phase 2 EIS.)

- **Construction of a New Setback Levee.** This alternative would involve construction of a 5-mile-long levee along the northern reaches of the Sacramento River east levee parallel to the existing levee alignment but set back from the existing alignment by 500–1,000 feet. This alternative was eliminated because it is infeasible due to: (1) the presence of waterside residences along the existing levee from the southern end of Sacramento River east levee Reach C:2 to the American River north levee, and the need to maintain access to these residences from Garden Highway; (2) the proximity of the Sacramento River east levee to the Airport, and the need to prevent project features from increasing potential hazards to aviation safety; and (3) the possibility that utility relocations (power poles) and flood damage reduction measures could encroach into surface slopes of runway approach zones. (Considered and eliminated in Phase 2 EIR and Phase 2 EIS.)

Two additional alternatives were considered for the Phase 3 EIS and EIR but were eliminated from further consideration. These alternatives, as well as the rationale for eliminating them from further consideration, are described in the following subsections.

3.1.1 No-Action Alternative—Airport Compartment Levee

The Phase 2 EIS evaluated and eliminated from further consideration the No-Action Alternative—Airport Compartment Levee Alternative. The prior discussion of this alternative, which is hereby incorporated by reference, is summarized as follows.

With no authorization for the subsequent project phases (Phase 3, 4a, and 4b Projects), which are part of the overall NLIP, SAFCA would not meet timing objectives for providing the Natomas Basin with at least a 100-year level of flood risk reduction and achieving a 200-year level of protection. Federal and state floodplain regulations would effectively prevent new development in most of the Natomas Basin. The Airport would either be compelled to operate within its existing footprint, abandoning its current plans for expansion and modernization, or, alternatively, the Airport may construct its own limited flood damage reduction structure (i.e., a ring levee) to protect existing facilities and its expansion area. As of December 31, 2007, the leases for rice production on fields north of the Airport expired and were not renewed; hence, rice production has been discontinued on these fields to reduce wildlife hazards to aviation safety. These leases will not be renewed.

Table B1-2 summarizes the impacts identified in the Phase 2 EIS associated with implementation of the Airport Compartment Levee. The Phase 2 EIS concluded that significant impacts could occur. However, because there were no detailed design plans for this alternative, it was not possible to accurately determine exactly what environmental impacts could occur; therefore, one could also have concluded that the potential impacts were too speculative for meaningful consideration.

For the reasons provided in the Phase 2 EIS (listed below), this alternative was not carried forward for further evaluation in the Phase 3 EIS and EIR or Phase 4a EIS and EIR, nor is it carried forward for further evaluation in this EIS/EIR:

- construction of a separate levee around the Airport would be under the responsibility and jurisdiction of another agency (Sacramento County Airport System [SCAS]), over which SAFCA would have no jurisdiction, and would require a lengthy process that is completely separate from the Proposed Action;
- the timeline for that process is unknown and there are no design plans that would enable an accurate evaluation of potential environmental impacts; and
- the action would require SCAS to prepare a separate CEQA and potentially NEPA)environmental document.

In addition to those reasons provided in the Phase 2 EIS, design plans are not available for this alternative, thus preventing USACE and SAFCA from accurately evaluating its potential impacts; implementation of the Airport Compartment Levee would not meet any of the goals and objectives of the project; the residents, residences, and businesses within the Natomas Basin would not receive flood risk reduction; implementation of the Airport Compartment Levee would only protect the Airport; and SCAS has not proposed such a project and, therefore, this alternative is not considered a reasonable alternative.

3.1.2 Cultural Resources Impact Reduction Alternative

The Phase 3 Project's Proposed Action included construction primarily of deep cutoff walls in the Sacramento River east levee Reach B:5A–9B, which would require excavation and placement of slurry at great depths along these reaches. The Sacramento River east levee has the potential to contain buried and undiscovered cultural

Table B1-2
Summary of Impacts: No-Action Alternative—Airport Compartment Levee

Issue Area	Impacts
Agricultural Resources	A substantial conversion of Important Farmland to nonagricultural uses would likely occur in the footprint of the flood risk reduction features, given that the Airport is surrounded by agricultural land, much of which is Important Farmland. However, the amount of such conversion is uncertain because no concept plan for an Airport flood damage reduction system has been developed, and the footprint size and location are unknown. This impact could be significant.
Topography, Geology, and Soils	Construction-related activities would result in localized soil erosion effects. This impact would be significant.
Hydrology and Hydraulics	The Basin's existing residential, commercial, and industrial structures and their contents would continue to remain subject to a relatively high risk of flooding. Substantial alteration of local drainage systems around the Airport and of drainage patterns would result. This impact would be significant unless a substantial redesign of local drainage systems were included in the design of the Airport flood risk reduction system.
Water Quality	Construction-related activities would result in adverse effects to water quality. Construction activity would involve ground disturbance and the potential for contaminants to enter local waterways either from direct spills, or from stormwater runoff. These impacts could be significant.
Fisheries	Construction-related activities would result in adverse effects on water quality in agricultural canals. These effects could, in turn, result in localized water quality degradation in receiving water bodies (e.g., the Sacramento River) and affect habitats and the physical health of individual fish and species populations in those water bodies. This impact could be significant.
Sensitive Aquatic Habitats	Construction of a compartment levee would require the fill of portions of several agricultural canals in the Airport vicinity, which may be jurisdictional waters of the United States. This impact would be significant. Because there is no conceptual design for a compartment levee, the amount of fill of potentially jurisdictional waters cannot be estimated.
Vegetation and Wildlife	Numerous elements of the irrigation and drainage system in the west-central portion of the Natomas Basin would likely be severed and would need to be rerouted with construction of a compartment levee. Ditches and canals in the basin serve as critical corridors for movement of aquatic species, and this movement could be significantly disrupted by construction of an Airport flood risk reduction system.
Special Status Terrestrial Species	The compartment levee, as well as construction-related activities would likely affect habitat for some special-status plants in ditches and canals. A concept plan for such a flood risk reduction system has not been developed, therefore, the likelihood and extent of such an impact is not predictable and cannot be estimated. The construction footprint might include areas where elderberry shrubs are present and would have to be relocated. The compartment levee would likely cross several irrigation and/or drainage canals in the west-central portion of the Natomas Basin that may provide habitat for giant garter snake, adversely affecting the habitat and potentially resulting in take of individual snakes. This impact would be significant.
Cultural Resources	The compartment levee would significantly alter elements of RD 1000. It is possible that historic-era resources of significance could be encountered during construction. Known prehistoric site CA-Sac-16/H south of the Airport would likely be adversely affected. Construction-related activities could encounter previously undiscovered cultural resources and potentially encounter human remains. These impacts would be significant.
Paleontological Resources	Construction-related activities could damage unique paleontological resources. This impact could be significant.
Transportation and Circulation	Construction-related activities could cause temporary traffic delays, temporarily increase emergency service response times, and interfere with emergency service access. These impacts would be significant.

Table B1-2
Summary of Impacts: No-Action Alternative—Airport Compartment Levee

Issue Area	Impacts
Air Quality	Construction-related activities would result in the temporary and short-term generation of ROG, NO_X, and PM_{10} emissions. Construction-related activities would likely result in the temporary, short-term generation of diesel exhaust emissions. These impacts would be significant.
Noise	Construction-related activities would generate temporary and intermittent noise that could be near individual noise-sensitive locations. This potential impact could be significant; however, because concept design for such a levee has not been developed, it is not possible to estimate the potential magnitude or location of an impact.
Recreation	It is unlikely that any recreational uses would be affected, because there are no recreational facilities in the vicinity of the Airport. There would be no impact.
Visual Resources	The presence and movement of heavy construction equipment, construction-generated dust, and the presence of the compartment levee in the landscape would likely temporarily and permanently degrade the existing visual character and/or quality of the Natomas landscape. This impact would be significant.
Utilities and Service Systems	Significant temporary interruptions of irrigation supply could occur if construction activities result in damage to irrigation infrastructure or otherwise render the infrastructure inoperable at a time when it is needed (e.g., reconnections to water supply sources are not completed by the time crop irrigation must begin). This impact would be significant.
Hazards and Hazardous Materials	It is assumed that construction would not cause any significant hazards associated with the transport and handling of hazardous materials because the applicable regulations would be followed. Previously unknown or undocumented hazardous materials could be present in construction areas (including borrow sites). Excavation at or near areas of currently unrecorded soil and/or groundwater contamination could result in the exposure of construction workers, the general public, and the environment to hazardous materials. This impact could be significant.
Wildfire Hazards	Physical and weather conditions could combine to lead to a high risk of fire hazard, and construction equipment or construction practices could ignite fires that may result in wildland fires and expose people or structures to a significant risk of loss, injury, or death under some circumstances. This potential impact would be significant.

Notes: RD = Reclamation District; ROG = Reactive Organic Gases; NO_X = oxides of nitrogen; PM_{10} = respirable particulate matter with an aerodynamic diameter of 10 micrometers or less
Source: USACE 2008; data compiled by EDAW (now AECOM) in 2008

resources that are difficult to detect by inspecting the ground surface. The Proposed Action under the Phase 3 Project, therefore, has the potential to result in significant and unavoidable impacts to known prehistoric resources, previously unidentified cultural resources, and interred human remains. Unlike other resources, the magnitude of potential impacts on previously undiscovered cultural resources and interred human remains is harder to discern because there are few feasible ways to investigate the presence of these resources within the footprint of deep cutoff walls proposed for construction along the Sacrament River east levee. Deep cutoff walls require excavation into strata that are currently beneath existing levees. Because of the potential magnitude of these impacts, the Phase 3 EIS and EIR analyzed an alternative means of remediating seepage along the Sacramento River east levee to determine if it would be possible to reduce impacts on cultural resources. This alternative consisted of construction of a 500-foot-wide seepage berm on the landside of the levee instead of construction of deep cut-off walls. The analysis of this alternative concluded that while a berm may reduce impacts on any resources identified adjacent to the Sacramento River east levee, it would dramatically increase the potential for impacts on undiscovered cultural deposits as well as other resources, and thus was eliminated.

Construction of a 500-foot-wide seepage berm rather than primarily deep cutoff walls in these reaches would avoid the deep ground disturbing work associated with cultural resource impacts while still achieving flood damage reduction objectives. Construction of a 500-foot-wide seepage berm would have more than doubled the borrow material requirement for the Sacramento River east levee Reach B:5A–9B component of the Phase 3 Project's Proposed Action from approximately 1.8 million cubic yards (cy) to 3.8 million cy.

Table B1-3 compares impacts for the Proposed Action under the Phase 3 Project and the Cultural Resources Impact Reduction Alternative. Impacts to cultural resources and aviation safety hazards would be reduced by the construction of a 500-foot-wide berm. Of the 16 issue areas analyzed, impacts on ten of the issue areas were considered to be more severe with the Cultural Resources Impact Reduction Alternative. Approximately four impacts were determined to be generally similar. One impact was reduced ("24/7" noise associated with construction of deep cut-off walls) and one impact potentially less impacted by construction of a seepage berm.

Because the Cultural Resources Impact Reduction Alternative would have resulted in a net increase in the number, intensity, and severity of environmental impacts compared to the Phase 3 Project Proposed Action, and because implementation of the 500-foot-wide seepage berm would have resulted in the permanent displacement of residences and temporary closure, disruption, and redesign of portions or all of the Teal Bend Golf Club, it was eliminated from further consideration, and thus was not carried forward for detailed analysis in the Phase 3 EIS and EIR.

Although this alternative was eliminated for the Phase 3 Project due to the reasons cited above, 500-foot-wide seepage berms was analyzed in the Phase 4a EIS and EIR as part of the Phase 4a Project Proposed Action to represent the worst-case scenario because it is anticipated that at least one very large cultural site may require avoidance (CA-Sac-16/H), and additional previously undiscovered cultural resource sites may be present.

The locations and widths of the seepage berms would be determined during final engineering design. The use of seepage berms would take into the consideration overall impacts to resources and whether residences, heritage oak trees, or other sensitive resources would be affected. SAFCA would employ measures to minimize the project footprint to avoid these resources to the extent feasible, under levee design and seepage remediation performance requirements.

3.3 ADDITIONAL ALTERNATIVE CONSIDERED, BUT ELIMINATED FROM FURTHER CONSIDERATION—UPSTREAM TRANSITORY STORAGE

3.1.3.1 ROBBINS BASIN (RECLAMATION DISTRICT 1500) TRANSITORY STORAGE

This alternative would utilize the RD 1500 basin as an upstream transitory storage site (or off-stream storage). Flood waters would be diverted into the basin via an un-gated or gated weir. The preliminary design locates the weir at River Mile (RM) 69.50 on the Sutter Bypass and is 5280 feet long. For this alternative to successfully perform, it is necessary for the basin to be empty at the start of weir flow. To assure this, it was assumed that all levees surrounding the basin are improved.

The target stage for diverting water into the basin is 40.4 feet (National Geodetic Vertical Datum of 1929 [NGVD29]). This is equal to the minimum elevation of the surrounding existing condition levees. The stage of 40.38 corresponds to a storage space of 987,862 acre-feet. Exit gates and/or weirs would also be needed to drain the water from the basin after the flood peak. They would be located at the lowest spot in basin, in the left levee of the Sacramento River at about RM 85.00, about one mile upstream of the Fremont Weir.

Table B1-3
Comparison of Impacts: Phase 3 Project Proposed Action and Cultural Resources Impact Reduction Alternative

Issue Area	Proposed Action	Cultural Resources Impact Reduction Alternative (500-Foot-Wide Seepage Berm)
Hydrology and Hydraulics	Significant	Greater impacts to local drainage infrastructure
Water Quality	Significant	Similar
Fisheries	Significant	Similar
Sensitive Aquatic Habitats	Significant	Greater impacts to potentially jurisdictional features (loss of an additional 17.13 acres of riparian habitat, 7.58 acres of seasonal wetlands, and 0.88 acre of freshwater marsh)
Vegetation and Wildlife	Significant	Greater impacts to woodlands (additional loss of 14 acres of woodland habitat)
Special-Status Terrestrial Species	Significant	Greater impacts to Swainson's hawk foraging and nesting habitat (loss of an additional 185 acres of Swainson's hawk foraging habitat [47 acres of high quality foraging alfalfa crop habitat and 14 acres of Swainson's hawk nesting habitat—woodlands])
Cultural Resources	Significant and unavoidable Greater impacts to undiscovered cultural resources and interred human remains from deep cut-off wall construction	Potentially greater impacts to undiscovered cultural resources and interred human remains resulting from increased borrow materials usage (from 1.8 million cy to 3.8 million cy) for 500-foot-wide seepage berm
Paleontological Resources	Significant	Potentially greater impacts associated with greater borrow material excavation (from 1.8 million cy to 3.8 million cy)
Transportation and Circulation	Significant and unavoidable	Potentially greater impacts to traffic. Increase borrow use would more than double haul route usage and potentially significantly increase truck traffic on Elkhorn Boulevard
Air Quality	Significant and unavoidable	Greater severity of significant and unavoidable impacts with greater borrow material excavation (from 1.8 million cy to 3.8 million cy)
Noise	Significant and unavoidable	Similar, with exception of 24/7 construction associated with cut-off wall construction (lesser)
Recreation	Significant	Greater due to temporary closure and disruption of the Teal Bend Golf Club and likely need to redesign all or portions of the golf course. Since it is likely infeasible to construct a seepage berm within the golf course, requiring the proposal for cut-off walls in this area to remain unaffected, the impact would remain similar within the golf course.
Visual Resources	Significant and unavoidable	Greater impacts to oak woodlands and existing views from removal of trees from the loss of 14 acres of woodland habitat
Utilities and Service Systems	Significant	Greater temporary impacts and relocations of existing irrigation infrastructure and utilities. Greater impacts resulting from permanent relocation of residences within the footprint of the 500-foot-wide berm
Hazards and Hazardous Materials	Significant	Potentially less impacts from fewer requirements for night lighting, potentially resulting in less aviation hazard
Wildfire Hazards	Significant	Similar

Source: Compiled by EDAW (now AECOM) in 2008

The stage in the Sacramento River at RM 69.9983 (about halfway between the Cross Canal and American River confluences) would be reduced by up to 2.3 feet for the 200-year (0.005 AEP) event under this alternative. This reduction in water surface elevation is not significant enough to preclude the need for levee modification.

3.1.3.2 Nicolaus Basin (Reclamation District 1500) Transitory Storage

This alternative would utilize the RD1001 basin as an upstream transitory storage site (or off-stream storage). Flood waters would be diverted into the basin via a gated weir approximately 500 feet long. The preliminary design locates the weir at RM8.501 on the Feather River. For this alternative to sueeessfully perform, it is necessary for the basin to be empty at the start of weir flow. To assure this, it was assumed that all levees surrounding the basin are improved.

The target stage for diverting water into the basin is 42.0 feet (NGVD29). This is equal to the minimum elevation of the surrounding existing condition levees. The stage of 42.0 corresponds to a storage space of 25,000 acre-feet. Exit gates and/or weirs would also be needed to drain the water from the basin after the flood peak. They would be located at the lowest spot in the basin, along the left levee of the Sacramento River.

The stage in the Sacramento River at RM 69.9983 (about halfway between the Cross Canal and American River confluences) would be reduced by up to 1.8 feet for the 200-year (0.005 AEP) event under this alternative. This reduction in water surface elevation is not significant enough to preclude the need for levee modification.

3.1.3.3 Elkhorn Basin (Reclamation Districts 537, 827, 785, 1600) Transitory Storage

This alternative would utilize the Elkhorn basin as a transitory storage site (or off-stream storage). Flood waters are diverted into the basin via an un-gated weir. The preliminary design locates the weir at RM 69.00 on the Sacramento River, and it is 10,560 feet long. For this alternative to successfully perform, it is necessary for the basin to be empty at the start of weir flow. To assure this, it was assumed that all levees surrounding the basin are improved.

The target stage for diverting water into is 30.27 feet (NGVD29). This is equal to the minimum elevation of the surrounding existing condition levees. The stage of 30.27 corresponds to a storage space of 225,000 acre-feet. Exit gates/weirs would also be needed to drain the water from Elkhorn Basin after the flood peak.

The stage in the Sacramento River at RM 69.9983 (about halfway between the Cross Canal and American River confluences) would be reduced by up to 0.9 feet for the 200-year (0.005 AEP) event under this alternative. This reduction in water surface elevation is not significant enough to preclude the need for levee modification.

Table B1-4
Transitory Storage Basins

Basin	Maintaining Agencies	Acres	Miles of Levee	Land Use	Population
Robbins	RD 1500	65,692	59.4	Rural	900
Nicolaus	RD 1001	37,393	30.2	Rural	1,311
Elkhorn	RD 1600, RD 827, RD785, RD 537	12,323	31.8	Rural	172

Source: Information provided by USACE in 2010

Table B1-5 Preliminary Cost Estimates for Transitory Storage Alternatives		
Action	Cost	Sub-total/Total
Robbins Basin (Reclamation District 1500) Transitory Storage		
Cost to Improve Levees	331,632 levee feet @ $2,000/levee foot	$663,264,000
Cost of Land for Storage	65,692 acres @ $5,000/acre	$328,460,000
Cost to Construct Weirs (inlet/outlet)	2 weirs @ $2,000,000 each	$4,000,000
Construct Ring Levee around Robbins	10,000 lf @ $7,000/levee foot	$70,000,000
Total		**$1,065,724,000**
Nicolaus Basin (RD 1001) Transitory Storage1		
Cost to Improve Levees	159,456 levee feet @ $2,000/levee foot	$318,912,000
Cost of Land for Storage	37,393 acres @ $5,000/acre	$186,965,000
Cost to Construct Weirs (inlet/outlet)	2 weirs @ $2,000,000 each	$4,000,000
Construct Ring Levee around Nicolaus	5,000 lf @ $7,000/levee foot	$35,000,000
Total		**$544,877,000**
Elkhorn Basin (RD 537, 827, 785, 1600) Transitory Storage2		
Cost to Improve Levees	167,904 levee feet @ $2,000/levee foot	$335,808,000
Cost of Land for Storage	12,323 acres @ $5,000/acre	$61,615,000
Cost to Construct Weirs (inlet/outlet)	2 weirs @ $2,000,000 each	$4,000,000
Total		**$ 401,423,000**

[1] Connecting to existing levee along Feather River.

[2] These estimates do not include costs to purchase or raise structures.

Source: Information provided by USACE in 2010

As discussed above, various upstream detention measures were evaluated as part of this EIS/EIR. Initial evaluation indicates that these measures would not be cost-effective. The water levels in Natomas would not be reduced to a significant degree to justify the costs associated with implementing the alternative. These costs include: construction of intake and outtake structures for water to enter and leave the detention basins, improvement of the perimeter levees around the detention basin(s) to current standards, and acquisition of real estate easements for water storage and to purchase and/or relocate existing properties in the basins. Transitory storage would not alleviate the need to implement other measures to address the seepage, stability, erosion, and vegetation and encroachment issues facing the existing Natomas Basin perimeter levees.

Because of the extent and likely cost of these improvements, this alternative would require an unprecedented degree of State, Federal, and local cooperation and funding. For this reason, this alternative was not pursued as a component of the Phase 4b Project, but is considered worthy of further evaluation as part of the State's pending update of the State plan of flood protection for the Central Valley.

4.1 ALTERNATIVES CARRIED FORWARD FOR EVALUATION IN THIS EIS/EIR

The following alternatives are carried forward for detailed analysis in this EIS/EIR and are described in detail in Chapter 2, "Alternatives":

- **No-Action Alternative**—Under NEPA, the expected future without-project conditions; under CEQA, the existing condition at the time the notice of preparation was published (November 5, 2009) as modified by

what would be reasonably expected to occur in the foreseeable future if the Phase 4b Project were not approved (two scenarios are proposed).

- **Adjacent Levee Alternative (Proposed Action)**—An adjacent levee would be constructed along the Sacramento River east levee Reach A:16–20; and, where required for this levee, cutoff walls, seepage berms, and relief wells would be installed for seepage remediation. A cutoff wall would be installed in the American River north levee east of Gateway Oaks Drive to Northgate Boulevard, and the landside slope would be flattened. The NEMDC west levee would be raised in place or widened from just south of Elkhorn Boulevard to Sankey Road, and the landside slope would be flattened and seepage remediation would be constructed as necessary. Waterside erosion protection would be constructed in locations along the PGCC and NEMDC (south of Elkhorn Boulevard). Culverts located beneath the PGCC would be upgraded or removed, and replacement flood storage would be provided as needed. At the SR 99 crossing of the NCC, seepage remediation would be installed and a moveable barrier system would be constructed to prevent overflow from reaching the landside of the NCC south levee. The western portion of the West Drainage Canal would be realigned to the south, and the remaining portion of the existing canal would be improved to reduce bank erosion and sloughing, decrease aquatic weed infiltration, improve RD 1000 maintenance access, and enhance giant garter snake habitat connectivity. Irrigation canals and ditches would be relocated either to make room for expanded levee sections or to reduce underseepage potential. Discharge pipes for RD 1000 pumping plants and City of Sacramento sump pumps would be raised to cross the levee above design flood water surface elevation. Parcels in the South Fisherman's Lake and Triangle Properties Borrow Areas and at the West Lakeside School Site would be excavated and reclaimed as agricultural land. Woodland groves would be established to compensate for impacts along the Sacramento River east levee Reach A:16–20, American River north levee Reach I:1-4, and NEMDC.

- **Fix-in-Place Alternative**—The Sacramento River east levee would be improved in place in Sacramento River east levee Reach A:16–20 and seepage remediation would be implemented. The Fix-in-Place Alternative would be the same as described for the Adjacent Levee Alternative (Proposed Action) except that the crown of the Sacramento River east levee would not be widened. This type of levee improvement would narrow the overall landside footprint by 15 feet but would require a greater extent of levee degrade to construct cutoff walls and a greater extent of encroachment removal along the Sacramento River east levee compared to the Adjacent Levee Alternative (Proposed Action).

The above three alternatives are described in detail in Chapter 2, "Alternatives," of this EIS/EIR. The Adjacent Levee Alternative (Proposed Action) and the Fix-in-Place Alternative were developed for consideration with a focus on improvements to the Sacramento River east levee Reach A:16–20. Phase 4b Project improvements to the American River east levee Reach I:1-4, NEMDC west levee, PGCC west levee, NCC south levee, West Drainage Canal, and modifications to the landscape and irrigation/drainage system would be similar under the Adjacent Levee Alternative (Proposed Action) and the Fix-in-Place Alternative.

As noted above, the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative would use differing methods to achieve flood damage reduction objectives for the Sacramento River east levee Reach A:16–20. Therefore, the differences between the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative, including effects on habitats, are the result of these differences in design of the Sacramento River east levee. These effects are more fully described in Chapter 4, "Environmental Consequences and Mitigation Measures," of this EIS/EIR.

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SAFCA. *See* Sacramento Area Flood Control Agency.

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APPENDIX B2
NEPA AND/OR CEQA STANDARDS AND CHECKLIST APPLICABLE TO BORROW AREAS USED BY THE PHASE 4b PROJECT

This appendix reviews the standards that apply to preparation of NEPA and/or CEQA documents, and provides USACE and SAFCA with a tool for determining whether subsequent project-related activities within borrow areas used by the Phase 4b Project (described in Chapter 2, "Alternatives," of this EIS/EIR) will require further environmental documentation under either NEPA or CEQA. An environmental checklist is provided to identify the appropriate level of documentation for satisfying NEPA and/or CEQA.

This checklist concept has been developed as a tool to maximize flexibility for screening and selecting specific borrow sites within the proposed borrow areas for the Phase 4b Project. While several properties have been identified within the proposed borrow areas from which borrow may be removed, ongoing investigations will be required to determine the most suitable location(s) for excavating borrow. Therefore, there is insufficient information for some of the proposed borrow sites to make a final selection of specific properties in this EIS/EIR. Accordingly, this checklist will be used to inform USACE and/or SAFCA to determine if specific borrow sites proposed within this EIS/EIR have been analyzed at a sufficient level of detail, under NEPA and/or CEQA, or if further environmental review is required. If further environmental review and analysis is required, this checklist will help guide USACE and SAFCA in determining the appropriate level of NEPA and/or CEQA compliance.

Under NEPA, a supplemental environmental impact statement (supplemental EIS) is required when changes in the proposed action are "relevant to environmental concerns," (40 Code of Federal Regulations [CFR] Section 1502.9[1][i]), or when there are "significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts" (40 CFR Section 1502.9[1][ii]). In general, this means that a supplemental EIS is required if new and potentially significant impacts that were not previously disclosed or identified in a public NEPA document are identified in association with a subsequent activity. Courts have further interpreted this requirement to indicate that when new mitigation measure(s) are identified that would reduce some of the impacts of a Federal action subject to NEPA, an SEIS is required if that measure itself would result in new significant impacts that were not previously disclosed in the EIS (*National Wildlife Federation v. Marsh* 721 F.2d 767, [11th Cir.] 1983).

USACE NEPA regulations incorporate the Council on Environmental Quality standard to determine when a supplemental EIS is required (33 CFR Section 230.13):

> Environmental Impact Statement (EIS). (b) Supplements. A supplement to the draft or final EIS should be prepared whenever required as discussed in 40 CFR Section 1502.09(c).

The USACE NEPA regulations, however, provide that "District commanders may also publish periodic factsheets and/or other supplemental information documents on long-term or complex EISs to keep the public informed on the status of the proposed action" (33 CFR Section 230.13[d]). USACE will use this standard to screen subsequent activities, if they are subject to NEPA.

1. TIERING FROM PROGRAM-LEVEL ANALYSIS UNDER CEQA

The following rules from CEQA and the State CEQA Guidelines provide for screening subsequent project activities in a program through the use of a checklist to determine if the project activities have received sufficient CEQA review, or if another CEQA compliance document is required. CEQA and the State CEQA Guidelines

specify the criteria for determining whether additional environmental review is required and, if so, what form of additional environmental document is appropriate.

- Where a program EIR has been prepared for a series of related actions and activities (in this case, the previous environmental documents completed for the NLIP), the lead agency may use a checklist to determine whether subsequent site-specific activities, such as the use of a specific property as a borrow site, were covered in the prior EIR(s) (State CEQA Guidelines California Code of Regulations [CCR] Section 15168[c][4]; see also CCR Sections 15152[d] and [f]).

- If the lead agency determines that none of the conditions specified in State CEQA Guidelines CCR Section 15162, discussed below, that trigger the need for a subsequent EIR or negative declaration have occurred and no new effects could occur or no new mitigation is required, the lead agency may approve the activity. No additional environmental document is required. (State CEQA Guidelines CCR Section 15168[c]][2]).

- Pursuant to State CEQA Guidelines CCR Section 15162, if the lead agency determines that any of the following conditions have occurred, either a supplemental or subsequent EIR shall be prepared:

    - Substantial changes to the project, substantial changes in circumstances, or new information show either new significant effects or a substantial increase in the severity of previously identified significant effects; or

    - New information shows that mitigation measures or alternatives which were previously identified as infeasible, and would substantially reduce the severity of one or more significant effects, are now found to be feasible, but the project proponent declines to adopt them; or

    - New information shows that considerably different mitigation measures or alternatives from those analyzed in the prior EIR(s) would substantially reduce the severity of one or more significant effects, are now found to be feasible, but the project proponent declines to adopt them.

- If any of the State CEQA Guidelines CCR Section 15162 conditions described above are present, but only minor changes or revisions to a previous EIR are required, the lead agency may prepare a supplement to the EIR. The supplemental EIR shall focus only on those changes or revisions that are necessary to make the previous study adequate and shall be circulated as a draft and final supplemental EIR (State CEQA Guidelines CCR Section 15163).

- If the lead agency determines that a subsequent activity requires some minor technical changes or revisions to a previously completed EIR or negative declaration, but none of the conditions described below require either a supplemental or a subsequent EIR, the lead agency may prepare an addendum to the EIR or negative declaration and attach the addendum to the final EIR or adopted negative declaration. No public circulation is required (State CEQA Guidelines CCR Section 15164).

- In some circumstances, a subsequent negative declaration may be warranted (see State CEQA Guidelines CCR Section 15152[g]).

2. CEQA CHECKLIST FOR SCREENING SUBSEQUENT SELECTION OF BORROW SITES

This checklist will be used to review impacts applicable to specific properties within the identified borrow areas that would be used by the Phase 4b Project, once they are proposed for use, for the purpose of determining whether and what additional CEQA environmental review is required. The checklist involves a three-step process for determining whether a specific borrow site has been sufficiently analyzed, or if the use of the borrow site

would require preparation of a new CEQA compliance document. The checklist also can provide guidance to USACE for determining the appropriate NEPA compliance document, if needed.

First, the project proponent(s) will review the impacts that were identified as "less than significant" in the checklist below and fill out the checklist accordingly. If the use of the borrow site would contribute to these impacts, the project proponent(s) will determine whether the contribution of borrow site operations would result in a significant impact. If a new significant impact would result, a supplemental or subsequent EIR will be required and prepared.

Next, for impacts that the checklist shows previously analyzed and disclosed as "significant," and for which the project proponent(s) identified and adopted mitigation measures that would reduce those impacts to less-than-significant levels, the project proponent(s) will determine whether the borrow site operations would contribute to those impacts. If the borrow site operations contribute to those impacts, but implementation of the mitigation measures and environmental commitments identified in the previous environmental documents completed for the NLIP, which were previously adopted and incorporated into the project, would mitigate that contribution to a less-than-significant level, the borrow site's contribution to those impacts will not trigger the need to prepare a new CEQA compliance document. If the use of the borrow site would cause these impacts to become significant impacts even after implementation of identified mitigation, SAFCA will prepare the appropriate CEQA compliance document, as described above.

The project proponent(s) will also use the checklist to determine if the borrow site operations would contribute to identified significant and unavoidable impacts. If the borrow site operations cause or contribute to any of the previously analyzed and disclosed significant or potentially significant and unavoidable impacts, SAFCA will determine if the borrow site's contribution was included when calculating the severity of the impact. If the borrow site's contribution to that impact was included in the impacts previously analyzed in the previous environmental documents completed for the NLIP and/or this EIS/EIR, no new CEQA compliance document will be required. If the borrow site's contribution was not included in the impacts analyzed in the aforementioned documents, a new EIR, EIR addendum, or potentially a mitigated negative declaration would be required and prepared.

Finally, the project proponent(s) will use the checklist to determine if the use of the proposed borrow sites would result in new impacts that were not previously disclosed in the aforementioned documents or would affect resources that were not identified when analyzing previously disclosed impacts. If so, SAFCA would prepare the appropriate CEQA compliance document, as described above.

Borrow Area Checklist	
ENVIRONMENTAL SETTING **Designated borrow site APN(s):**_____	
Land use types within designated borrow site Does the site include: ☐ Developed land ☐ Agricultural land ☐ Orchards ☐ Grassland ☐ Non-Riparian Woodlands ☐ Riparian Woodland/Scrub ☐ Williamson Act Land (in a preserve or under contract)	**Information from surveys:** Does the site include: ☐ Cultural Resources ☐ Wetlands ☐ Special-Status Species ☐ Suitable Habitat for Special-Status Species ☐ Recognized Environmental Conditions

Impacts Identified as "Less Than Significant"		
Issue Area	Impact	Would the use of the borrow site result in any of the identified impacts, and if so would the impact be considered less than significant without mitigation?
Land Use , Socioeconomics, and Population and Housing	Impact 4.3-e: Displacement of Residences and Businesses	Not Applicable ☐ Yes ☐ No ☐
Geology, Soils, and Mineral Resources	Impact 4.4-b: Potential Soil Erosion During Project Operations	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.4-c: Potential Loss of Mineral Resources	Not Applicable ☐ Yes ☐ No ☐
Hydrology and Hydraulics	Impact 4.5-a: Hydraulic Impacts on Other Areas and Exposure to Flood Risk	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.5-c: Effects on Groundwater	Not Applicable ☐ Yes ☐ No ☐
Biological Resources	Impact 4.7-k: Impacts to Fish Species Associated with Operation of Pumping Plants and Surface Drains	Not Applicable ☐ Yes ☐ No ☐
Air Quality	Impact 4.11-b: General Conformity with the Applicable Air Quality Plan	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.11-c: Long-Term Changes in Emissions of ROG, NO_X, and PM_{10} Associated with Project Implementation	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.11-d: Exposure of Sensitive Receptors to Toxic Air Emissions	Not Applicable ☐ Yes ☐ No ☐
Noise	Impact 4.12-d: Long-Term Increases in Project-Generated Noise	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.12-e: Temporary and Short-Term Exposure of People Working in the Project Area to Excessive Airport Noise Levels	Not Applicable ☐ Yes ☐ No ☐
Recreation	Impact 4.13-a: Effects Related to the Proposed Natomas Levee Class 1 Bike Trail Project	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.13-c: Temporary Changes in Recreational Opportunities during Project Construction Activities	Not Applicable ☐ Yes ☐ No ☐
Utilities and Service Systems	Impact 4.15-c: Increases in Solid Waste Generation	Not Applicable ☐ Yes ☐ No ☐
Hazards and Hazardous Materials	Impact 4.15-a: Accidental Spills of Hazardous Materials	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.15-g: Potential for Higher Frequency of Collisions between Aircraft and Wildlife at Sacramento International Airport	Not Applicable ☐ Yes ☐ No ☐

Impacts Identified as "Less than Significant" after Mitigation Implementation			
Issue Area	Impact	Mitigation Measure	Would the use of the borrow site result in significant impacts, and would the application of identified mitigation reduce the impact to a less-than-significant level?
Land Use, Socioeconomics, and Population and Housing	Impact 4.3-b: Inconsistency with the Natomas Basin Habitat Conservation Plan	Mitigation Measure 4.3-b: Implement Mitigation Measure 4.7-l, "Ensure that Project Encroachment Does Not Jeopardize Successful Implementation of the NBHCP and Implement Mitigation Measures 4.7-a and 4.7-c through 4.7-h"	Not Applicable ☐ Yes ☐ No ☐
Geology, Soils, and Mineral Resources	Impact 4.4-a: Potential Temporary Localized Soil Erosion during Construction	Mitigation Measure 4.4-a(1): Implement Mitigation Measure 4.6-a, "Implement Standard Best Management Practices, Prepare and Implement a Stormwater Pollution Prevention Plan, and Comply with National Pollutant Discharge Elimination System Permit Conditions" Mitigation Measure 4.4-a(2): Secure and Implement the Conditions of the California Surface Mining and Reclamation Act Permit or Exemption	Not Applicable ☐ Yes ☐ No ☐
Hydrology and Hydraulics	Impact 4.5-b: Alteration of Local Drainage	Mitigation Measure 4.5-b(1): Coordinate with Landowners and Drainage Infrastructure Operators, Prepare Final Drainage Studies as Needed, and Implement Proper Project Design Mitigation Measure 4.5-b(2): Prepare Hydraulic Study, and Design and Implement Lower Dry Creek Woodland Planting Areas to Avoid Adverse Hydraulic Effects	Not Applicable ☐ Yes ☐ No ☐
Water Quality	Impact 4.6-a: Temporary Impacts on Water Quality from Stormwater Runoff, Erosion, or Spills	Mitigation Measure 4.6-a: Implement Standard Best Management Practices, Prepare and Implement a Stormwater Pollution Prevention Plan, and Comply with National Pollutant Discharge Elimination System Permit Conditions	Not Applicable ☐ Yes ☐ No ☐

Impacts Identified as "Less than Significant" after Mitigation Implementation			
Issue Area	**Impact**	**Mitigation Measure**	**Would the use of the borrow site result in significant impacts, and would the application of identified mitigation reduce the impact to a less-than-significant level?**
	Impact 4.6-b: Impacts to Sacramento River Water Quality from Pleasant Grove Creek Canal Detention Basin Discharges	Mitigation Measure 4.6-b: Implement Best Management Practices and Comply with NPDES Permit Conditions for a Point-Source Discharge	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.6-c: Effects on Water Quality from Groundwater Discharged by Relief Wells	Mitigation Measure 4.6-c: Conduct Groundwater Quality Tests, Notify the Central Valley RWQCB, and Comply with the Central Valley RWQCB's Waste Discharge Requirements and NPDES Permit	Not Applicable ☐ Yes ☐ No ☐
Biological Resources	4.7-c: Direct and Indirect Impacts to Jurisdictional Waters of the United States	Mitigation Measure 4.7-c: Minimize Effects on Jurisdictional Waters of the United States; Complete Detailed Design of Habitat Creation Components and Secure Management Agreements to Ensure Compensation of Waters Filled or Dewatered; and Comply with Section 404, Section 401, Section 10, and Section 1602 Permit Processes	Not Applicable ☐ Yes ☐ No ☐
	4.7-d: Potential Loss of or Disturbance to Special-Status Plant Species and Their Habitats	Mitigation Measure 4.7-d: Minimize Impacts on Special-Status Plant Species	Not Applicable ☐ Yes ☐ No ☐
	4.7-e: Giant Garter Snake Mortality, Injury, and/or Disturbance to Habitat	Mitigation Measure 4.7-e: Minimize the Potential for Direct Loss of Giant Garter Snake Individuals, Implement All Upland and Aquatic Habitat Improvements and Management Agreements to Ensure Adequate Compensation for Loss of Habitat, and Obtain Incidental Take Authorization	Not Applicable ☐ Yes ☐ No ☐
	4.7-g: Potential Loss and/or Direct Impact of Elderberry Shrubs and/or Potential Loss of Valley Elderberry Longhorn Beetle	Mitigatiou Measure 4.7-g: Conduct Focused Surveys for Elderberry Shrubs as Needed, Implement All Woodland Habitat Improvements and All Management Agreements, Ensure Adequate Compensation for Loss of Shrubs, and Obtain Incidental Take Authorization	Not Applicable ☐ Yes ☐ No ☐

Impacts Identified as "Less than Significant" after Mitigation Implementation			
Issue Area	**Impact**	**Mitigation Measure**	**Would the use of the borrow site result in significant impacts, and would the application of identified mitigation reduce the impact to a less-than-significant level?**
	4.7-h: Impacts on Northwestern Pond Tnrtle and Burrowing Owl	Mitigation Measure 4.7-h: Conduct Focused Surveys for Northwestern Pond Turtles, Relocate Turtles, Minimize Potential Impacts on Burrowing Owls, and Relocate Owls as Needed	Not Applicable ☐ Yes ☐ No ☐
	4.7-i: Disturbance to Special-Status Vernal Pool Crustaceans	Mitigation Measure 4.7-i: Survey for Presence or Absence of Vernal Pool Invertebrates, Avoid Disrupting Vernal Pool Habitat, and Implement Measures to Mitigate Loss of Habitat	Not Applicable ☐ Yes ☐ No ☐
	4.7-j: Temporary Construction-related Impacts to Fish and Aquatic Habitats	Mitigation Measure 4.7-j: Implement Mitigation Measure 4.6-a, "Implement Standard Best Management Practices, Prepare and Implement a Stormwater Pollution Prevention Plan, Prepare and Implement a Spill Containment Plan, and Comply with National Pollutant Discharge Elimination System Permit Conditions;" Implement a Feasible Construction Work Window that Minimizes Impacts to Special-Status Fish Species for Any In-Water Activities; and Implement Operational Controls and a Fish Rescue Plan that Minimizes Impacts to Fish Associated with Cofferdam Construction and Dewatering	Not Applicable ☐ Yes ☐ No ☐
	4.7-l: Impacts on Successful Implementation of Habitat Conservation Plans	Mitigation Measnre 4.7-l: Ensure that Project Encroachment Does Not Jeopardize Successful Implementation of the NBHCP and Implement Mitigation Measures 4.7-a and 4.7-e through 4.7-h	Not Applicable ☐ Yes ☐ No ☐
Cultural Resources	Impact 4.8-a: Potential Changes to Elements of Reclamation District 1000 aud the Rural Landscape District	Mitigation Measure 4.8-a: Incorporate Mitigation Measures to Documents Regarding Any Elements Contributing to RD 1000 aud Rural Landscape District and Distribute the Informatiou to the Appropriate Repositories	Not Applicable ☐ Yes ☐ No ☐

Impacts Identified as "Less than Significant" after Mitigation Implementation			
Issue Area	Impact	Mitigation Measure	Would the use of the borrow site result in significant impacts, and would the application of identified mitigation reduce the impact to a less-than-significant level?
Paleontological Resources	Impact 4.9-a: Disturbance of Unknown Unique Paleontological Resources during Earthmoving Activities	Mitigation Measure 4.9-a: Conduct Construction Personnel Training and, if Paleontological Resources are Found, Stop Work Near the Find and Implement Mitigation in Coordination with a Professional Paleontologist	Not Applicable ☐ Yes ☐ No ☐
Transportation and Circulation	Impact 4.10-c: Temporary and Short-Term Disruption of Emergency Service Response Times and Access	Mitigation Measure 4.10-c: Implement Mitigation Measure 4.10-a, "Prepare and Implement a Traffic Safety and Control Plan for Construction-Related Truck Trips"	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.10-d: Conflict with Adopted Policies, Plans, or Programs Supporting Alternative Transportation	Mitigation Measure 4.10-d: Prepare and Implement a Bicycle Detour Plan for Project Area Roadways and Bike Trails, Including Garden Highway and the NEMDC Levees	Not Applicable ☐ Yes ☐ No ☐
Noise	Impact 4.12-b: Temporary and Short-term Exposure of Sensitive Receptors to, or Temporary and Short-term Generation of, Excessive Groundborne Vibration	Mitigation Measure 4.12-b: Implement Vibration-Reducing Construction Practices, Prepare and Implement a Groundborne Vibration Control Plan, and Monitor and Record Construction Gronndborne Vibration Near Sensitive Receptors	Not Applicable ☐ Yes ☐ No ☐
Recreation	Impact 4.13-c: Temporary Changes in Recreational Opportunities during Project Construction Activities	Mitigation Measure 4.13-c(1): Prepare and Implement a Bicycle Detonr Plan for All Bicycle Trails and On-Street Bicycle Routes, Provide Detours for Bicycle Facilities, and Coordinate with City and/or County Departments of Parks and Recreation to Repair of Damage to Recreational Facilities Mitigation Measure 4.13-c(2): Provide Construction Period Information on Recreational Facility Closures and Detours and Provide Detours for Alternate Routes to Marinas	Not Applicable ☐ Yes ☐ No ☐

Impacts Identified as "Less than Significant" after Mitigation Implementation			
Issue Area	Impact	Mitigation Measure	Would the use of the borrow site result in significant impacts, and would the application of identified mitigation reduce the impact to a less-than-significant level?
Utilities and Service Systems	Impact 4.15-a: Potential Temporary Disruption of Irrigation Water Supply	Mitigation Measure 4.15-a: Coordinate with Irrigation Water Supply Users Before and During All Irrigation Infrastructure Modifications and Implement Measures to Minimize Interruptions of Supply	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.14-b: Potential Disruption of Utility Service	Mitigation Measure 4.15-b: Verify Utility Locations, Coordinate with Utility Providers, Prepare and Implement a Response Plan, and Conduct Worker Training with Respect to Accidental Utility Damage	Not Applicable ☐ Yes ☐ No ☐
Hazards and Hazardous Materials	Impact 4.16-b: Potential Land Use Constraints Due to Contamination within the Pumping Plant No. 8 Footprint and Potential Exposure of Construction Workers and the General Public to Contaminated Groundwater	Mitigation Measure 4.16-b: Cooperate with Olympian Oil and Regulatory Agencies to Preserve, Modify, or Close Existing Groundwater Monitoring Wells at the Olympian Oil Site	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.16-c: Potential Exposure of Construction Workers and the General Public to Hazardous Materials Encountered at Project Sites	Mitigation Measure 4.16-c(1): Complete Recommendations Included in Phase I and/or II ESAs and Implement Required Measures Mitigation Measure 4.16-c(2): Complete Phase I and/or II ESAs, Soil, and/or Groundwater Investigations in Phase 4b Project Footprint Areas Not Covered by the Existing Phase I and/or II ESAs, and Implement Required Measures (e.g., Site Management and/or Other Contingency Plans)	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.16-d: Interference with an Adopted Emergency Evacuation Plan	Mitigation Measure 4.16-d: Implement Mitigation Measure 4.10-a, "Prepare and Inuplement a Traffic Safety and Control Plan for Construction-Related Truck Trips," and Mitigation Measure 4.10-c, "Notify Emergency Service Providers about Project Construction and Maintain	Not Applicable ☐ Yes ☐ No ☐

Impacts Identified as "Less than Significant" after Mitigation Implementation			
Issue Area	**Impact**	**Mitigation Measure**	**Would the use of the borrow site result in significant impacts, and would the application of identified mitigation reduce the impact to a less-than-significant level?**
		Emergency Access or Coordinate Detours with Providers"	
	Impact 4.16-e: Possible Hazardous Emissions or Handling of Hazardous or Acutely Hazardous Materials, Substances, or Waste within One-Quarter Mile of an Existing or Proposed School	Mitigation Measure 4.16-e: Notify the Natomas Unified School District and Affected Schools within One-Quarter Mile of Project Construction Activities	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.16-h: Potential Exposure to Wildland Fires	Mitigation Measure 4.16-h: Prepare and Implement a Fire Management Plan to Minimize Potential for Wildland Fires	Not Applicable ☐ Yes ☐ No ☐
Environmental Justice	Impact 4.17-a: Potential to Have a Disproportionate High and Adverse Environmental Impact on any Minority or Low-Income Populations	Mitigation Measure 4.17-a: Increase the Direct Benefits of the Project for the Ancestors of the Native American Tribes	Not Applicable ☐ Yes ☐ No ☐

Impacts Identified as "Significant and Unavoidable"			
Issue Area	**Impact**	**Mitigation Measure**	**After implementation of mitigation (if available), would the level of severity/intensity be equal to or less than as described in this EIS/EIR? Was the borrow sites' contribution to this impact identified in a previous document (if relevant)?**
Agricultural Resources	Impact 4.2-a: Conversion of Important Farmland to Non-agricultural Uses	Mitigation Measure 4.2-a: Minimize Important Farmland Conversion to the Extent Practicable and Feasible	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.2-b: Conflict with Lands under Williamson Act Contracts	Mitigation Measure 4.2-b: Minimize Impacts on Agricultural Preserve Land and Williamson Act–Contracted Land; Comply with California Government Code Sections 51290–51293; and Coordinate with Landowners and Agricultural Operators	Not Applicable ☐ Yes ☐ No ☐

Impacts Identified as "Significant and Unavoidable"			
Issue Area	Impact	Mitigation Measure	After implementation of mitigation (if available), would the level of severity/intensity be equal to or less than as described in this EIS/EIR? Was the borrow sites' contribution to this impact identified in a previous document (if relevant)?
Land Use, Socioeconomics, and Population and Housing	Impact 4.3-a: Inconsistency with Airport Master Plan, Airport Comprehensive Land Use Plan, and Airport Wildlife Hazard Management Plans	Mitigation Measure 4.3-a: Implement Mitigation Measure 4.16-g, "Consult with SCAS and the FAA during Design of the Proposed Natomas Levee Class I Bike Trail to Implement Appropriate Airport Safety Precautions"	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.3-c: Inconsistency with the American River Parkway Plan and Wild and Scenic Rivers Act	No mitigation is available	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.3-d: Potential to Physically Divide or Disrupt an Established Community	Mitigation Measure 4.3-d: Notify Residents and Businesses of Project Construction and Road Closure Schedules; and Implement Mitigation Measures 4.10-a, "Prepare and Implement a Traffic Safety and Control Plan for Construction-Related Truck Trips," and 4.10-c, "Notify Emergency Service Providers about Project Construction and Maintain Emergency Access or Coordinate Detours with Providers"	Not Applicable ☐ Yes ☐ No ☐
Biological Resources	Impact 4.7-a: Loss of Landside and Waterside Woodland and Shaded Riverine Aquatic Habitats	Mitigation Measure 4.7-a: Minimize Effects on Woodland Habitat; Implement Woodland Habitat Improvements and Management Agreements; Compensate for Loss of Habitat; and Comply with Section 7 of the Federal Endangered Species Act, Section 2081 of the California Endangered Species Act, and Section 1602 of the California Fish and Game Code	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.7-b: Disruption to and Loss of Existing Wildlife Corridors	Mitigation Measure 4.7-b: Implement Mitigation Measures 4.7-a, "Minimize Effects on Woodland Habitat; Implement Woodland Habitat Improvements and Management Agreements; Compensate for	Not Applicable ☐ Yes ☐ No ☐

Impacts Identified as "Significant and Unavoidable"			
Issue Area	Impact	Mitigation Measure	After implementation of mitigation (if available), would the level of severity/intensity be equal to or less than as described in this EIS/EIR? Was the borrow sites' contribution to this impact identified in a previous document (if relevant)?
		Loss of Habitat; and Comply with Section 7 of the Federal Endangered Species Act, Section 2081 of the California Endangered Species Act, and Section 1602 of the California Fish and Game Code," and 4.7-e, "Minimize the Potential for Direct Loss of Giant Garter Snake Individuals, Implement All Upland and Aquatic Habitat Improvements and Management Agreements to Ensure Adequate Compensation for Loss of Habitat, and Obtain Incidental Take Authorization"	
	4.7-f: Impacts on Swainson's Hawk and Other Special Status Birds	Mitigation Measure 4.7-f: Minimize Potential Impacts on Swainson's Hawk and Other Special-Status Birds Foraging and Nesting Habitat, Monitor Active Nests during Construction, Implement All Upland and Agricultural Habitat Improvements and Management Agreements to Compensate for Loss of Quantity and Quality of Foraging Habitat, Obtain Incidental Take Authorization; and Implement Mitigation Measure 4.7-a, "Minimize Effects on Woodland Habitat, Implement all Woodland Habitat Improvements and Management Agreements, Compensate for Loss of Habitat, and Comply with Section 7 of the Federal Endangered Species Act, Section 2081 of the California Endangered Species Act, and Section 1602 of the California Fish and Game Code"	
Cultural Resources	Impact 4.8-b: Potential Damage or Disturbance to Known Archaeological or Architectural Resources	Mitigation Measure 4.8-b: Avoid Ground Disturbance Near Eligible and Listed Resources to the Extent Feasible, Prepare a	Not Applicable ☐ Yes ☐ No ☐

Impacts Identified as "Significant and Unavoidable"			
Issue Area	Impact	Mitigation Measure	After implementation of mitigation (if available), would the level of severity/intensity be equal to or less than as described in this EIS/EIR? Was the borrow sites' contribution to this impact identified in a previous document (if relevant)?
	from Ground-Disturbance or Other Construction-Related Activities	Finding of Effect, and Resolve Any Adverse Effects through Preparation of an HPTP	
	Impact 4.8-c: Potential Damage to or Destruction of Previously Unidentified or Undiscovered Cultural Resources from Ground-Disturbance or Other Construction-Related Activities	Mitigation Measure 4.8-c: Train Construction Workers before Construction, Monitor Construction Activities, Stop Potentially Damaging Activities, Evaluate Any Discoveries, and Resolve Adverse Effects on Eligible Resources, if Encountered	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.8-d: Potential Discovery of Human Remains during Construction	Mitigation Measure 4.8-d: Stop Work Within An Appropriate Radius Around the Find, Notify the Applicable County Coroner and Most Likely Descendant, and Treat Remains in Accordance with State Law and Measures Stipulated in an HPTP Developed in Consultation between the Project Proponent(s) and the SHPO	Not Applicable ☐ Yes ☐ No ☐
Transportation and Circulation	Impact 4.10-a: Temporary and Short-Term Increases in Traffic on Local Roadways	Mitigation Measure 4.10-a: Prepare and Implement a Traffic Safety and Control Plan for Construction-Related Truck Trips	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.10-b: Temporary and Short-Term Increases in Traffic Hazards on Local Roadways	Mitigation Measure 4.10-b: Implement Mitigation Measure 4.10-a, "Prepare and Implement a Traffic Safety and Control Plan for Construction-Related Truck Trips"	Not Applicable ☐ Yes ☐ No ☐
Air Quality	Impact 4.11-a: Temporary and Short-Term Emissions of ROG, NO_X, and PM_{10} during Construction	Mitigation Measure 4.11-a: Implement Applicable District-Recommended Control Measures to Minimize Temporary Emissions of ROG, NO_X, and PM_{10} during Construction	Not Applicable ☐ Yes ☐ No ☐

Impacts Identified as "Significant and Unavoidable"			
Issue Area	Impact	Mitigation Measure	After implementation of mitigation (if available), would the level of severity/intensity be equal to or less than as described in this EIS/EIR? Was the borrow sites' contribution to this impact identified in a previous document (if relevant)?
Noise	Impact 4.12-a: Generation of Temporary and Short-Term Construction Noise	Mitigation Measure 4.12-a: Implement Noise-Reducing Construction Practices, Prepare and Implement a Noise Control Plan, and Monitor and Record Construction Noise Near Sensitive Receptors	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.12-c: Temporary and Short-term Exposure of Residents to Increased Traffic Noise Levels from Truck Hauling Associated With Borrow Activity	Mitigation Measure 4.12-c: Implement Noise-Reduction Measures to Reduce the Impacts of Haul Truck Traffic Noise	Not Applicable ☐ Yes ☐ No ☐
Recreation	Impact 4.13-a: Effects Related to the Proposed Natomas Levee Class 1 Bike Trail Project	No feasible mitigation is available	Not Applicable ☐ Yes ☐ No ☐
	Impact 4.13-b: Permanent Disruption of Recreational Activities and Facilities	Mitigation Measure 4.13-b: Compensate City of Sacramento Department of Parks and Recreation for Loss of Parkland and Park Amenities	Not Applicable ☐ Yes ☐ No ☐
Visual Resources	Impact 4.14-a: Alteration of Scenic Vistas, Scenic Resources, and Existing Visual Character of the Project Area	Mitigation Measure 4.14-a: Implement Mitigation Measures 4.7-a, "Minimize Effects on Woodland Habitat; Implement all Woodland Habitat Improvements and Management Agreements; Compensate for Loss of Habitat; and Comply with Section 7 of the Federal Endangered Species Act, Section 1602 of the California Fish and Game Code, and Section 2081 of the California Endangered Species Act Permit Conditions," and 4.13-b, "Compensate City of Sacramento Department of Parks and Recreation for Loss of Parkland and Park Amenities"	Not Applicable ☐ Yes ☐ No ☐

Impacts Identified as "Significant and Unavoidable"			
Issue Area	Impact	Mitigation Measure	After implementation of mitigation (if available), would the level of severity/intensity be equal to or less than as described in this EIS/EIR? Was the borrow sites' contribution to this impact identified in a previous document (if relevant)?
	Impact 4.14-b: New Sources of Light and Glare that Adversely Affect Views	Mitigation Measure 4.14-b: Direct Lighting Away from Adjacent Properties	Not Applicable ☐ Yes ☐ No ☐
Hazards and Hazardous Materials	Impact 4.16-g: Aircraft Safety Hazards Resulting from Project Implementation	Mitigation Measure 4.16-g: Consult with SCAS and the FAA during Design of the Proposed Natomas Levee Class I Bike Trail to Implement Appropriate Airport Safety Precautions	Not Applicable ☐ Yes ☐ No ☐

CHECKLIST SUMMARY	
Are there new significant impacts in addition to those discussed above? If yes, describe using an attachment to this checklist.	Yes ☐ No ☐
Are there significant impacts discussed above that are substantially more severe than discussed in this EIS/EIR? If yes, explain on an attachment to this checklist.	Yes ☐ No ☐
Are there significant impacts discussed in the Phase 2 EIR (program level) that are substantially more severe than previously disclosed? If yes, explain on an attachment to this checklist.	Yes ☐ No ☐
Are additional mitigation measures or alternatives? Are they feasible or considerably different from the previously adopted mitigation measures? If yes, explain on an attachment to this checklist.	Yes ☐ No ☐
Is additional environmental documentation required? If yes, specify type of environmental compliance document required:	
• EIR Addendum	Yes ☐ No ☐
• Mitigation Negative Declaration	Yes ☐ No ☐
• Supplemental EIR	Yes ☐ No ☐
• Subsequent EIR	Yes ☐ No ☐
• Supplemental EIS	Yes ☐ No ☐

B3 Documents Incorporated By Reference
(Cover and Title Pages Only)

Draft Environmental Impact Report on

Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area

Volume I: Programmatic Evaluation of the Proposed Funding Mechanisms

Volume II: Project-Level Evaluation of Natomas Cross Canal South Levee Phase 1 Improvements

State Clearinghouse # 2006072098

Prepared for:

SAFCA
Sacramento Area Flood Control Agency

November 2006

EDAW | AECOM

Draft Environmental Impact Report on

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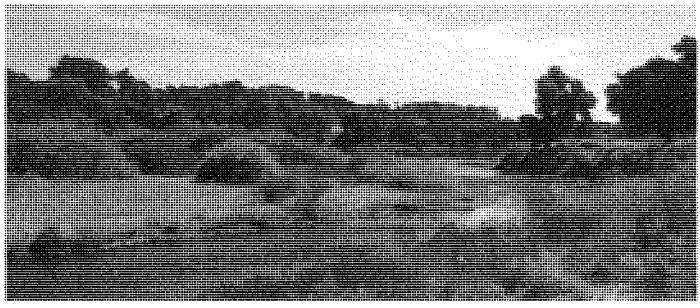

Volume I: Programmatic Evaluation of the Proposed Funding Mechanisms

Volume II: Project-Level Evaluation of Natomas Cross Canal South Levee Phase 1 Improvements

State Clearinghouse # 2006072098

Prepared for:

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11/14/06

Final Environmental Impact Report on

Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area

Responses to Comments and Revisions to the Draft EIR

Programmatic Evaluation of the Proposed Funding Mechanisms

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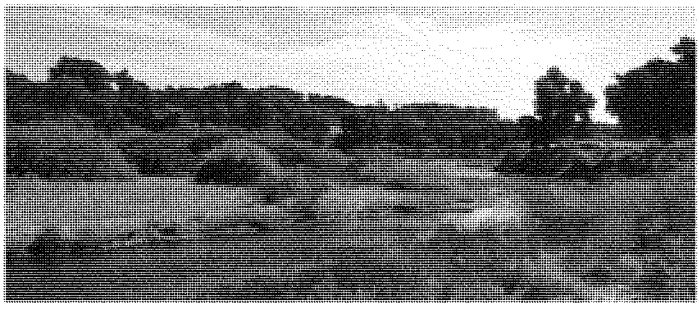

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Draft Environmental Impact Report on the
Natomas Levee Improvement Program
Landside Improvements Project

State Clearinghouse # 2007062016

Prepared for:

SAFCA
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September 2007

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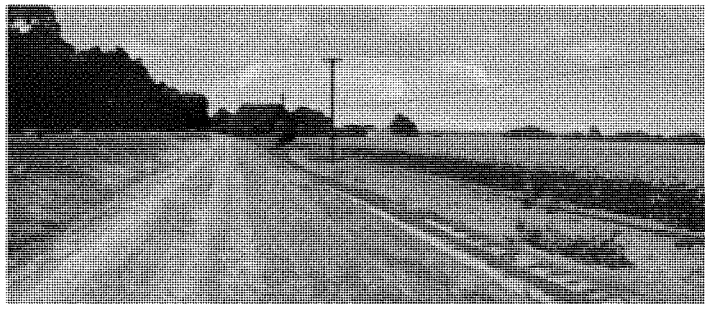

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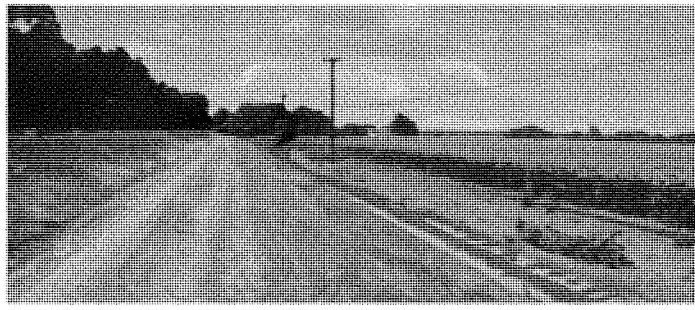
408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project, Sacramento, CA

US Army Corps
of Engineers ®
Sacramento District

June 2008

Draft Environmental Impact Statement



408 Permission and 404 Permit to Sacramento Area Flood Control Agency for the Natomas Levee Improvement Project, Sacramento, CA

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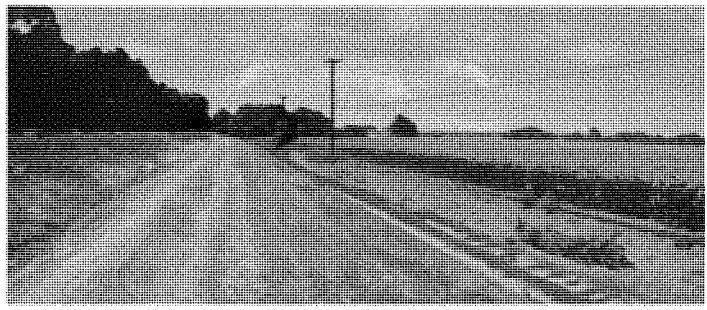

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Draft

Supplement to the Environmental Impact Report on the

Natomas Levee Improvement Program
Landside Improvements Project—Phase 2 Project

State Clearinghouse # 2007062016

Prepared for:

SAFCA

Sacramento
Area Flood
Control
Agency

November 2008

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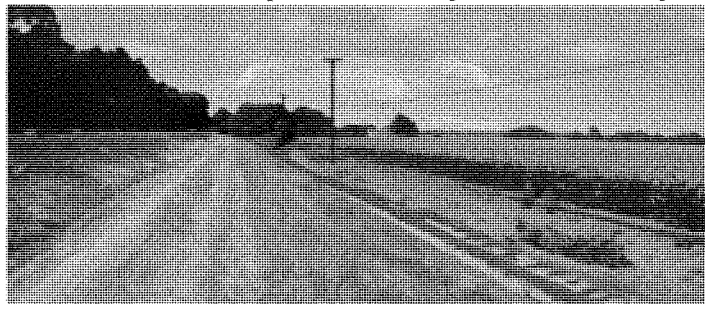
Draft

Supplement to the Environmental Impact Report on the

Natomas Levee Improvement Program
Landside Improvements Project—Phase 2 Project



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Final

Supplement to the Environmental Impact Report on the Natomas Levee Improvement Program Landside Improvements Project—Phase 2 Project

State Clearinghouse # 2007062016

Prepared for:

SAFCA
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January 2009

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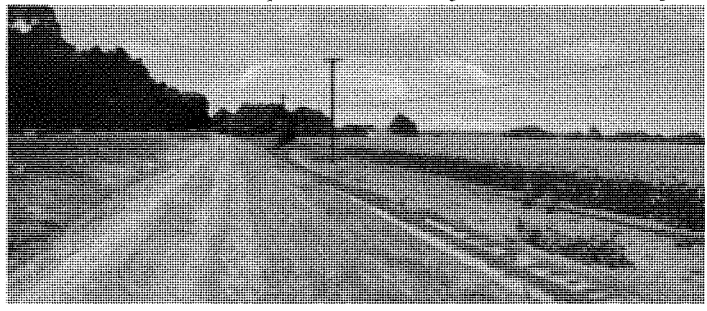

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Addendum to the Environmental Impact Report on the
Natomas Levee Improvement Program
Landside Improvements Project—Phase 2 Project

State Clearinghouse # 2007062016

Prepared for:

SAFCA
Sacramento
Area Flood
Control
Agency

June 2009

Addendum to the Environmental Impact Report on the

Natomas Levee Improvement Program Landside Improvements Project—Phase 2 Project

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2nd Addendum to the Environmental Impact Report on the Natomas Levee Improvement Program Landside Improvements Project—Phase 2 Project

State Clearinghouse # 2007062016

Prepared for:

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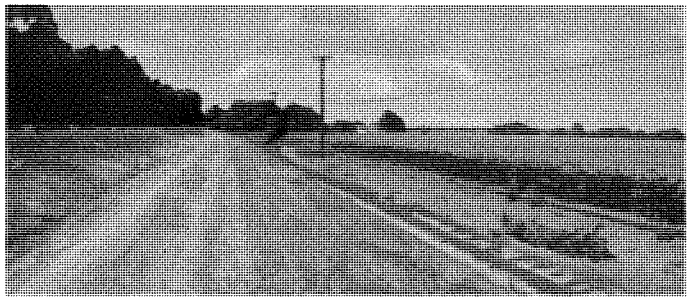
August 2009

2nd Addendum to the Environmental Impact Report on the

Natomas Levee Improvement Program Landside Improvements Project—Phase 2 Project



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Draft Environmental Impact Statement/Draft Environmental Impact Report on the

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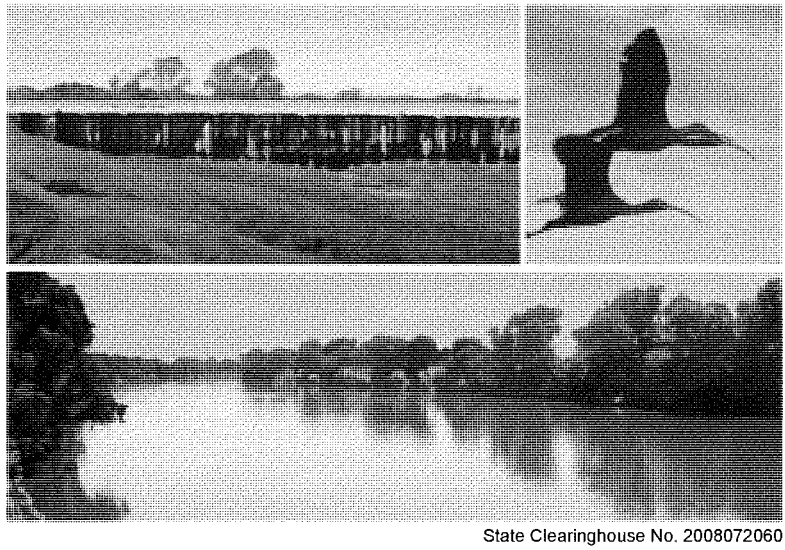
Phase 3 Landside Improvements Project



State Clearinghouse No. 2008072060

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Final Environmental Impact Report on the

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Phase 3 Landside Improvements Project

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Final Environmental Impact Report on the

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Phase 3 Landside Improvements Project

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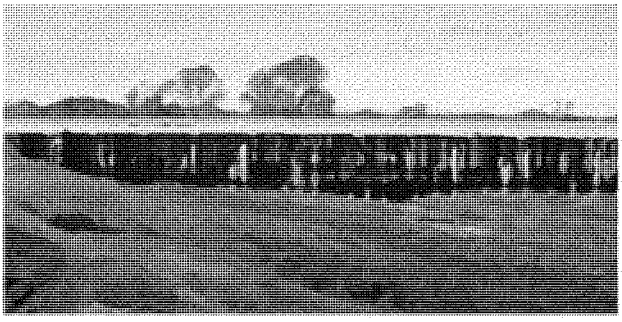

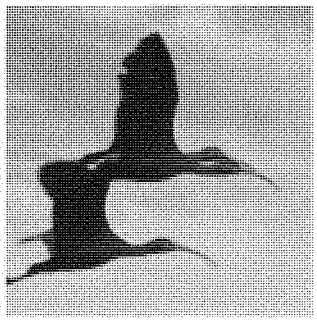

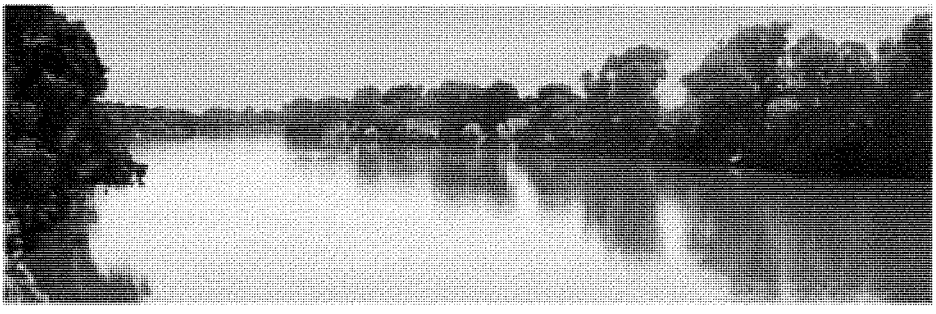

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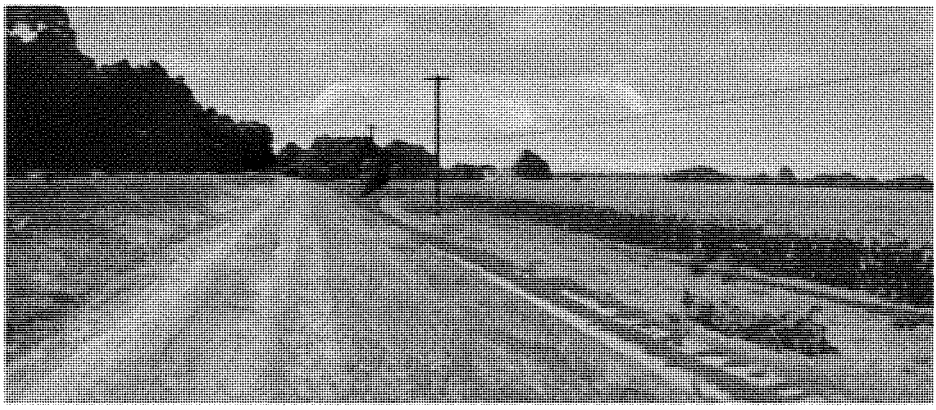

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Addendum to the Environmental Impact Report on the

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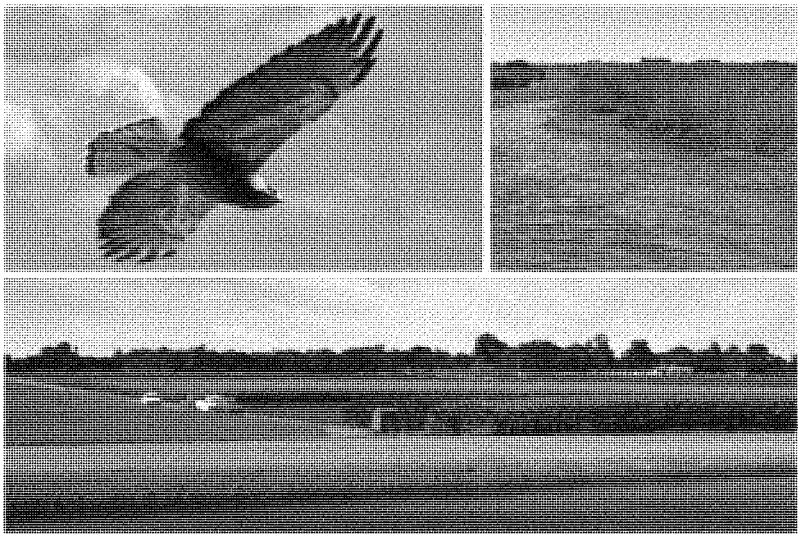
Draft Environmental Impact Statement/Draft Environmental Impact Report on the

Natomas Levee Improvement Program
Phase 4a Landside Improvements Project



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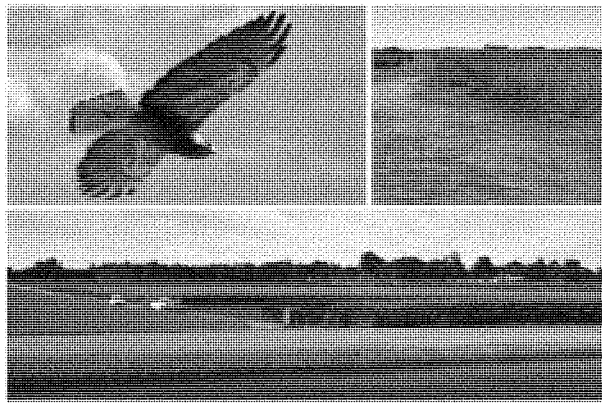

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Final Environmental Impact Report on the

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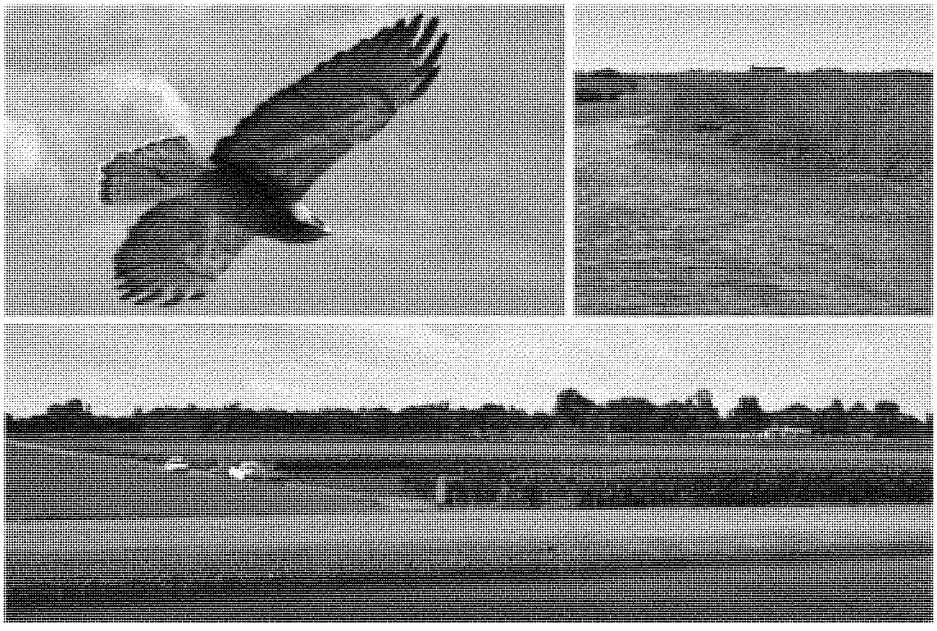
Phase 4a Landside Improvements Project



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SAFCA
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Final Environmental Impact Report on the

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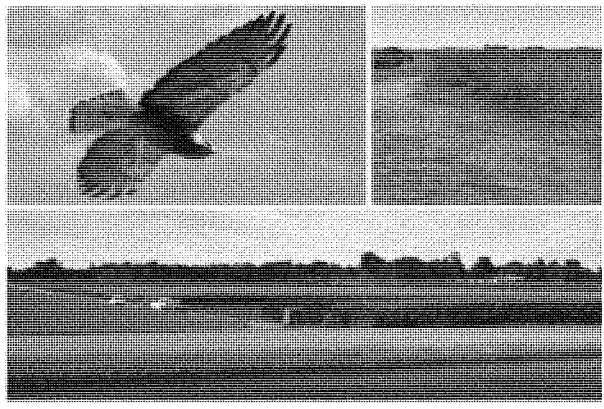
Phase 4a Landside Improvements Project



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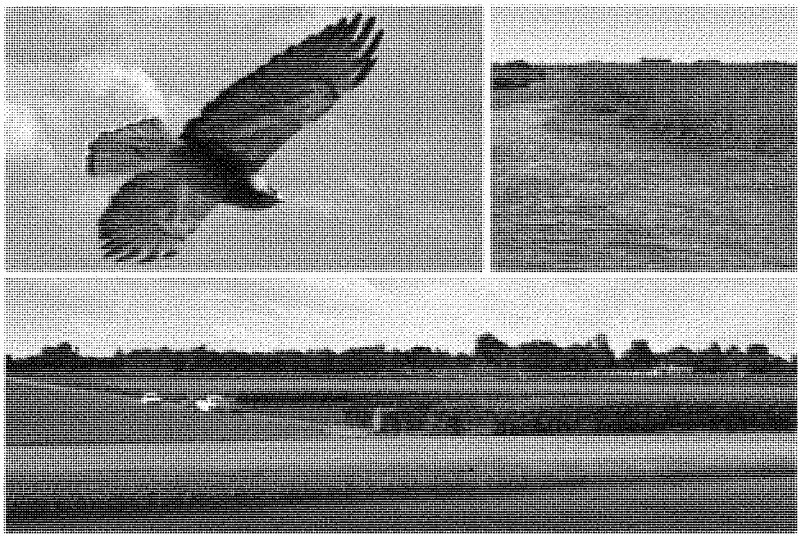

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US Army Corps of Engineers ®
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Final Environmental Impact Statement on the

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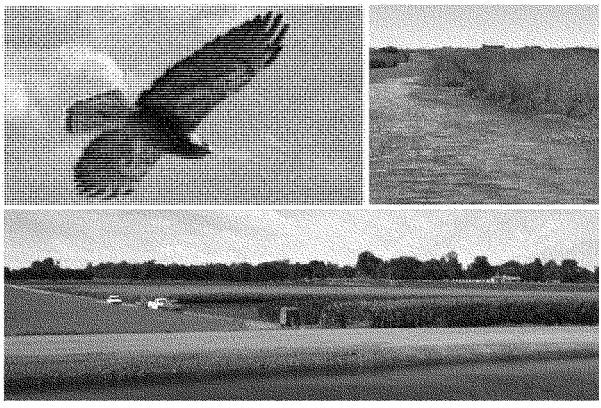
Phase 4a Landside Improvements Project



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APPENDIX B4
SUMMARY OF MITIGATION MEASURES ADOPTED IN CONNECTION WITH THE NATOMAS LEVEE IMPROVEMENT PROGRAM, PHASE 1–4a LANDSIDE IMPROVEMENTS PROJECTS

The U.S. Army Corps of Engineers (USACE), Sacramento District and the Sacramento Area Flood Control Agency (SAFCA) have prepared and certified/approved various environmental documents for the Natomas Levee Improvement Program (NLIP) Phase 1–4a Landside Improvements Projects (Phase 1–4a Projects). This appendix contains a summary (in tabular form) of the mitigation measures contained in those certified/approved environmental documents and adopted in connection with the Phase 1–4a Projects.

The table columns contain the following information:

Mitigation Number: Lists the mitigation measures by number, as designated in each of the previous NLIP environmental documents, by issue area. For example, the project phase is followed by the mitigation measure number that corresponds to the certified/approved environmental document for that phase (i.e., Phase 1: 3.3-a, Phase 2: 3.2-b, Phase 3: 4.1-a, Phase 4a: 4.2-a).

Mitigation Measure: Provides the text of the mitigation measures (by issue area), as presented in the Phase 4a EIS and EIR, each of which has been adopted and incorporated into the project. The Phase 4a EIS and EIR are referenced because these environmental documents contain the most up-to-date mitigation commitments. It is important to note that although the mitigation commitments may apply to more than just the Phase 4a Project, the mitigation language has evolved with each certified and approved document, as new information becomes available, as more refined engineering and design details are available for each project phase, from lessons learned in the field (primarily from Phase 2 Project construction) on the most effective techniques, and from ongoing coordination and consultation with regulatory agencies. Although the mitigation language has been modified in some of the mitigation measures, the essence of the mitigation commitment has remained the same, but has been enhanced and/or refined.

Project Phase: Distinguishes what mitigation measures apply to what project phases.

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Agricultural Resources					
Phase 2: 3.2-b **Phase 3: 4.1-a** **Phase 4a: 4.2-a**	**Minimize Important Farmland Conversion to the Extent Practicable and Feasible** (a) Borrow sites shall be configured to minimize the fragmentation of lands that are to remain in agricultural use. Contiguous parcels of agricultural land of sufficient size to support their efficient use for continued agricultural production shall be retained to the extent practicable and feasible. (b) To the extent practicable and feasible, when expanding the footprint of a flood damage reduction facility (e.g., levee or berm) onto agricultural land, the most productive topsoil from the construction footprint shall be salvaged and redistributed to less-productive agricultural lands in the vicinity of the construction area that could benefit from the introduction of good-quality soil. By agreement between the implementing agencies or landowners of affected properties and the recipient(s) of the topsoil, the recipient(s) shall be required to use the topsoil for agricultural purposes. SAFCA shall implement all terms and conditions of agreements. (c) During project construction, use of utilities that are needed for agricultural purposes (including wells, pipelines, and power lines) and of agricultural drainage systems shall be minimized so that agricultural uses are not substantially disrupted. (d) Disturbance of agricultural land and agricultural operations during construction shall be minimized by locating construction staging areas on sites that are fallow, that are already developed or disturbed, or that are to be discontinued for use as agricultural land, and by using existing roads to access construction areas to the extent possible. (e) To the extent feasible, lands acquired for flood damage reduction purposes shall also be used as mitigation land for Natomas Basin Habitat Conservation Plan (NBHCP) programs so that agricultural land conversion is minimized.		√	√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Phase 2: 3.2-b	(f) Agricultural conservation easements shall be acquired at a 1:1 ratio (i.e., 1 acre on which easements are acquired to 1 acre of Prime Farmland, Unique Farmland, and Farmland of Statewide Importance removed from agricultural use), and the lands on which the easements are acquired shall be maintained in agricultural use.		√		
Phase 3: 4.1-b **Phase 4a: 4.2-b**	**Minimize Impacts on Agricultural Preserve Land and Williamson Act–Contracted Land; Comply with Government Code Sections 51290–51293; and Coordinate with Landowners and Agricultural Operators** (a) SAFCA shall comply with California Government Code Sections 51290–51295 with regard to acquisition of Williamson Act contracted lands as follows: ▸ The policy of the state, consistent with the purpose of the Williamson Act to preserve and protect agricultural land, is to avoid, whenever practicable, locating public improvements and any public utilities improvements in agricultural preserves. If it is necessary to locate within a preserve, it shall be on land that is not under contract (Government Code Section 51290[a][b]). More specifically, the basic requirements are: • Whenever it appears that land within a preserve or under contract may be required for a public improvement, the public agency or person shall notify the California Department of Conservation (DOC) and the city or county responsible for administering the preserve (Government Code Section 51291[b]). • Within 30 days of being notified, DOC and the city or county shall forward comments, which shall be considered by the public agency or person (Section 51291[b]). ▸ The contract shall be terminated when land is acquired by eminent domain or in lieu of eminent domain (Government Code Section 51295). ▸ DOC and the city or county shall be notified before project completion of any proposed substantial changes to the public improvement (Government Code Section 51291[d]).			√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▸ DOC shall be notified within 10 working days upon completion of the acquisition (Section 51291[c]). ▸ If, after acquisition, the acquiring public agency determines that the property will not be used for the proposed public improvement, before returning the land to private ownership, DOC and the city or county administering the involved preserve shall be notified. The land shall be reenrolled in a new contract or encumbered by an enforceable restriction at least as restrictive as that provided by the Williamson Act (Government Code Section 51295).			√	√
	(b) SAFCA shall coordinate with landowners and agricultural operators to sustain existing agricultural operations, at the landowners' discretion, within the project area until the individual agricultural parcels are needed for project construction.			√	√
	(c) Properties that were under Williamson Act contract prior to conversion for borrow use and that are owned by SAFCA or are acquired by SAFCA shall be reenrolled under Williamson Act contract upon reclamation to agricultural use if those properties can be covered by the Williamson Act.				√
Land Use, Socioeconomics, and Population and Housing					
Phase 3: 4.2-c **Phase 4a: 4.3-c**	**Notify Residents and Businesses of Project Construction and Road Closure Schedules; Comply with the Garden Highway Settlement Agreement** a) SAFCA shall provide residents and business owners located adjacent to the construction areas with information regarding construction activities including contact information and complaint procedures and with a construction timeline and shall post its construction schedule on the SAFCA Web site. Information shall include road closures and detour information. The schedule shall be updated on a regular basis.			√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	b) SAFCA shall apply the following measures to power line relocations: To the extent that the main electrical power transmission lines and poles serving the Garden Highway must be relocated or replaced to accommodate the project, the relocation or replacement shall occur east of the new adjacent levee and in a manner that appropriately accommodates private landside improvements and properties. Existing main electrical power transmission lines and poles on the waterside of the existing Garden Highway levee that do not need to be relocated or replaced to accommodate the project may be left in place. No new main electrical power transmission lines and poles shall be installed on the waterside of the Garden Highway levee. Consistent with sound engineering practices that prioritize the following, individual services shall: (1) use existing configurations and facilities, and (2) any new poles shall be placed on the landside of Garden Highway, subject to the approval of U.S. Army Corps of Engineers (USACE), the Central Valley Flood Protection Board (CVFPB), and any other regulatory public agencies and utility companies. If the affected property owner and SAFCA cannot agree on a location of an individual service line pole from among locations that are otherwise acceptable to USACE, CVFPB, other regulatory agencies, and the utility provider, SAFCA shall pay the cost of a referee, who is a qualified registered civil engineer and agreeable to both the affected property owner and SAFCA, to decide the dispute over the location of the individual service line pole.			√	√
	c) SAFCA shall apply the following measure to encroachments: Once SAFCA determines that the Sacramento River east levee is certifiable for the Federal Emergency Management Agency's (FEMA's) flood protection purposes, SAFCA shall make its best efforts to get written agreement from USACE, CVFPB, and RD 1000 that no additional encroachments on the waterside of the Garden Highway levee need to be removed.			√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	d) SAFCA shall implement the following measures before and during construction: (i) SAFCA shall give property owners within the project area an informational package advising the property owners that pre-project inspections of their properties are important and that SAFCA will conduct a free preconstruction inspection of the property, but only if requested by the affected property owner. The scope of the inspection and documentation shall be determined by SAFCA in consultation with the property owner. For property owners who request prior inspections/ documentation, the inspection/documentation must be scheduled prior to the start of construction within the specified reach of the Sacramento River east levee where project construction will commence. (ii) If requested by a property owner within the project area, SAFCA shall test the owner's domestic well water before and after project construction for the presence of bentonite, concrete, and cement. (iii) SAFCA shall cooperate with a construction monitoring committee established by local residents and businesses to resolve reasonable complaints regarding SAFCA or its contractors' construction activities for the projects improvements in accordance with this provision. A complaint procedure and hierarchy shall be developed by the committee and SAFCA's Ombudsperson in time to be included in the informational packet referenced in subsection (i), above. In addition, the information packet shall include SAFCA's instructions to its contractors regarding appropriate use of the Garden Highway. SAFCA agrees to resolve all complaints pertaining to dangerous activities immediately and to resolve all other reasonable complaints in an expeditious manner. (iv) SAFCA shall prohibit the use of earth-moving equipment or haul trucks on the Garden Highway in conjunction with project construction.			√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	(v) SAFCA shall provide local residents and businesses with a timeline for the phased completion of the project that indicates the role of the various agencies involved in implementing or permitting the project. SAFCA shall post its construction schedule for the project on the SAFCA Web site. The schedule shall be updated on a monthly basis. In addition, SAFCA shall post a "60-day notice" of Planned Construction on the SAFCA Web site. "Planned Construction" shall not include construction in the event of an emergency or construction necessary to remedy a condition discovered after completion of the project. However, SAFCA shall provide whatever notice is possible under the circumstances to affected, adjacent landowners prior to any emergency or remedial work.			√	√
	e) SAFCA shall apply the following measures to drainage line location and relocation: No roadside swales shall be included in the design of the new adjacent levee downstream of Powerline Road. Consistent with sound engineering practices, and subject to the approval of USACE, CVFPB, and the Regional Water Quality Control Board (RWQCB), any new drainage outfall lines required by the project shall be buried pipes, located along property lines, and drain to the river. If a property owner does not want a new drain line located along the property line, he or she may request that the drain line be placed elsewhere on his or her property. If the property owner and SAFCA cannot agree on a location for a new drain line from among locations that are otherwise acceptable to USACE, CVFPB, and Central Valley RWQCB, SAFCA shall pay the cost of a referee, who is a qualified registered civil engineer and agreeable to both parties, to decide the dispute over the location of the drain line.			√	√
	f) Where a property owner occupies a residence on property to be acquired for the project, SAFCA shall allow up to 12 months, rather that the statutory allowance of 3 months, for the owner to relocate off the property. The 12-month period shall be counted from the first written offer.			√	√
	g) SAFCA shall provide notice as feasible for emergency construction or remedial construction.				

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Phase 3: 4.2-c	b) SAFCA shall comply with the provisions of the Garden Highway Settlement Agreement including provisions regarding complaint procedures, power pole plans, encroachment removal plans, and construction schedule.			√	
Geology, Soils, and Mineral Resources					
Phase 3: 4.3-a(2) **Phase 4a: 4.4-a(2)**	**Secure and Implement the Conditions of the California Surface Mining and Reclamation Act Permit or Exemption** In the event that any borrow site activity is determined to be subject to the California Surface Mining and Reclamation Act (SMARA), SAFCA shall secure and implement the conditions contained in the SMARA permit or exemption as administered and issued by the local agency (applicable county).			√	√
Phase 4a: 4.4-b	**Conduct Soil Core Sampling in Areas of the Phase 4a Project Footprint Designated as MRZ-3** SAFCA shall retain a qualified geologist to analyze soil core samples extracted from proposed borrow sites, to depth of at least 3 feet, in areas that are designated as MRZ-3. In the event that a clean layer of economically viable aggregate is discovered, the county, DOC, and other appropriate agencies shall be notified. In addition, the horizontal extent of available aggregate shall be delineated by a qualified geologist.				√
Hydrology and Hydraulics					
Phase 2: 3.4-b **Phase 3: 4.4-b** **Phase 4a: 4.5-b**	**Coordinate with Landowners and Drainage Infrastructure Operators, Prepare Final Drainage Studies as Needed, and Implement Proper Project Design** During project design, SAFCA's project engineers shall coordinate with owners and operators of local drainage systems and landowners served by the systems. This coordination shall enable the project engineers to evaluate the pre-project and postproject drainage needs and the design features to consider in project design any project-related substantial drainage disruption or alteration in runoff that would increase the potential for local flooding.				

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	If substantial alteration of runoff patterns or disruption of a local drainage system could result from a project feature, a final drainage study shall be prepared and implemented as part of project design. The study shall consider the design flows of any existing facilities that would be crossed by project features and shall develop appropriate plans for relocation or other modification of these facilities and construction of new facilities, as needed, to ensure that the altered systems provide drainage services during and after construction that are equivalent to the drainage services that were provided prior to construction. If no drainage facilities (e.g., ditches, canals) would be affected, but project features would have a substantial adverse impact on runoff amounts and/or patterns, then new drainage systems shall be included in the design of project improvements to ensure that the project would not result in new or increased local flooding. Any necessary features to remediate project-induced drainage problems shall be constructed before the project is completed or as part of the project, depending on site-specific conditions. Any additional coordination with landowners and drainage infrastructure operators related to future selection of borrow sites in the Fisherman's Lake Area shall be completed by SAFCA before commencement of any earth-moving activities.		√	√	√
Phase 3: 4.4-c	**Monitor Landside Production Wells along the Natomas East Main Drainage Canal (NEMDC) for Effects on Yield, and Remediate Effects if Necessary** SAFCA shall implement a program to monitor groundwater elevations within 500 feet of the NEMDC west levee to determine what effects, if any, occur on the yield of shallow domestic wells following installation of cutoff walls in this area of the NLIP. In the event that the yield of any of these wells is measurably reduced, SAFCA shall arrange with the owners of affected wells to retrofit or replace these wells to provide pre-construction yields.			√	

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Water Quality					
Phase 1: 3.3-a/ 3.4-a/3.5-a **Phase 2: 3.3-a/ 3.5-a/ 3.6-a** **Phase 3: 4.5-a** **Phase 4a: 4.6-a**	**Implement Standard Best Management Practices, Prepare and Implement a Stormwater Pollution Prevention Plan, and Comply with National Pollutant Discharge Elimination System Permit Conditions** SAFCA shall file a Notice of Intent (NOI) to discharge stormwater associated with construction activity with the Central Valley RWQCB. Final design and construction specifications shall require the implementation of standard erosion, siltation, and good housekeeping Best Management Practices (BMPs). Construction contractors shall be required to prepare and implement a Stormwater Pollution Prevention Plan (SWPPP) and comply with the conditions of the National Pollutant Discharge Elimination System (NPDES) general stormwater permit for construction activity. The SWPPP shall describe the construction activities to be conducted, BMPs that will be implemented to prevent discharges of contaminated stormwater into waterways, and inspection and monitoring activities that shall be conducted. The SWPPP shall include the following: ▸ pollution prevention measures (erosion and sediment control measures and measures to control nonstormwater discharges and hazardous spills), ▸ demonstration of compliance with all applicable Central Valley RWQCB standards and other applicable water quality standards, ▸ demonstration of compliance with regional and local standards for erosion and sediment control, ▸ identification of responsible parties, ▸ detailed construction timelines, and ▸ a BMP monitoring and maintenance schedule.	√	√	√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	BMPs shall include the following:				
	▸ conduct all work according to site-specific construction plans that identify areas for clearing, grading, and revegetation so that ground disturbance is minimized;				
	▸ install silt fences near riparian areas or streams to control erosion and trap sediment, and reseed cleared areas with native vegetation;			√	√
	▸ stabilize disturbed soils of the new or raised levees, existing levee removal areas, and borrow sites before the onset of the winter rainfall season; and				
	▸ stabilize and protect stockpiles from exposure to rain and potential erosion.				
	The SWPPP also shall specify appropriate hazardous materials handling, storage, and spill response practices to reduce the possibility of adverse impacts from use or accidental spills or releases of contaminants. Specific measures applicable to the project include, but are not limited to, the following:				
	▸ develop and implement strict on-site handling rules to keep potentially contaminating construction and maintenance materials out of drainages and other waterways;				
	▸ conduct all refueling and servicing of equipment with absorbent material or drip pans underneath to contain spilled fuel, and collect any fluid drained from machinery during servicing in leak-proof containers and deliver to an appropriate disposal or recycling facility;			√	√
	▸ maintain controlled construction staging and fueling areas at least 100 feet away from channels or wetlands to minimize accidental spills and runoff of contaminants in stormwater;				
	▸ prevent substances that could be hazardous to aquatic life from contaminating the soil or entering watercourses;				
	▸ maintain spill cleanup equipment in proper working condition. Clean up all spills immediately according to the spill prevention and response plan;				

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▸ develop a slurry spill contingency plan to respond to a potential for bentonite slurry spill and prevent slurry from entering the Sacramento River or NCC; and ▸ immediately notify the California Department of Fish and Game (DFG) and the Central Valley RWQCB of any spills and cleanup procedures.				
	BMPs shall be applied to meet the "maximum extent practicable" and "best conventional technology/best available technology" requirements and to address compliance with water quality standards. A monitoring program shall be implemented during and after construction to ensure that the project is in compliance with all applicable standards and that the BMPs are effective.	√	√	√	√
Phase 2: SEIR 3.2-a **Phase 3: 4.5-b** **Phase 4a: 4.6-b**	**Implement Standard Best Management Practices and Comply with NPDES Permit** SAFCA and its contractor(s) for construction shall implement a suite of stormwater quality BMPs designed to remove contaminants from water discharging through the Garden Highway outlets. These BMPs shall be based on the strategies for effectively integrating stormwater quality management into project design described in *Stormwater Quality Design Manual for Sacramento and South Placer Regions* (May 2007). Treatment control measures such as vegetated swales and vegetated filter strips shall be used, depending upon the design requirements of the levee. BMPs shall meet "maximum extent practicable" and "best conventional technology/best available technology" requirements, and comply with NPDES permit conditions.		√	√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Phase 2: 3.5-b Phase 4a: 4.6-c	**Conduct Groundwater Quality Tests, Notify the Central Valley RWQCB, and Comply with the RWQCB's Waste Discharge Authorization and NPDES Permit** SAFCA, in coordination with RD 1000, shall ensure that groundwater in the vicinity of potential relief well locations is tested during project design and before well construction, to ensure that discharge of extracted groundwater does not exceed maximum contaminant levels specified in Title 22. SAFCA shall provide the Central Valley RWQCB with the results of these water quality tests and a conceptual plan for how the relief wells will be used (e.g., extracting and discharging groundwater), and shall comply with any waste discharge requirements and the NPDES permit issued by the Central Valley RWQCB.		√		√
Phase 3: 4.5-c	**Implement Best Management Practices and Comply with NPDES Permit Conditions for a Point-Source Discharge** Prior to operation of Pumping Plant No. 2 for discharge of water into the Sacramento River, SAFCA and RD 1000 shall file a report of waste discharge with RWQCB and comply with NPDES permit conditions (See Mitigation Measure 4.5-a for more information on BMPs and the SWPPP).			√	
Biological Resources					
Phase 3: 4.8-a Phase 4a: 4.7-a	**Minimize Effects on Woodland Habitat; Implement all Woodland Habitat Improvements and Management Agreements; Compensate for Loss of Habitat; and Comply with Section 7 of the Federal Endangered Species Act, Section 1602 of the California Fish and Game Code, and Section 2081 of the California Endangered Species Act Permit Conditions** ▸ Native woodland areas shall be identified and the primary engineering and construction contractors shall ensure, through coordination with a qualified biologist retained by SAFCA, that construction is implemented in a manner that minimizes disturbance of such areas to the extent feasible. Temporary fencing shall be used during construction to prevent disturbance of native trees that are located adjacent to construction areas but can be avoided.			√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▲ SAFCA shall coordinate with U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), DFG, and the Sacramento County Airport System (SCAS) (if on Airport property) to ensure that all woodland habitat improvements of the NLIP are created and managed. SAFCA shall prepare a project-specific Mitigation and Monitoring Plan (MMP) and append the programmatic Long-Term Management Plan (LTMP) to ensure the creation and long-term management of these components before construction commences. SAFCA shall enter into agreements with the appropriate local entity responsible for long-term management of these created woodland habitats and shall coordinate with USFWS, NMFS, and DFG to ensure that performance standards and long-term management goals that are required by the regulatory agencies with jurisdiction over these resources will be specifically detailed and outlined in the MMP and LTMP. All performance standards and long-term management goals will be in full compliance with the Endangered Species Act (ESA) and California Endangered Species Act (CESA). SAFCA shall implement all terms and conditions of the agreements.			√	√
	▲ Sacramento River waterside riparian woodland areas that provide shaded riverine aquatic (SRA) habitat functions shall be identified and the primary engineering and construction contractors shall ensure, through coordination with a qualified biologist retained by SAFCA, that construction is implemented in a manner that minimizes disturbance of such areas to the extent feasible. Temporary fencing shall be used during construction to prevent disturbance of trees and shrubs that are located adjacent to construction areas but can be avoided.			√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▲ Sacramento River waterside riparian forest and scrub (canopy acreage) shall be restored using ratios established by NMFS. Mitigation shall be 1:1 for in-kind mitigation and 3:1 for mitigation above the levee bench hinge (a surrogate for the ordinary high water mark (OHWM) for impacts below the levee bench hinge (OHWM). Mitigation shall be conducted using native plant species, including an assemblage of grasses, sedges, shrubs, and trees. At maturity, the riparian vegetation community would provide SRA functions. SAFCA shall develop a detailed woodland planting design and management protocols in coordination with USFWS, NMFS, and DFG. A monitoring plan with performance criteria shall be developed to determine the progress of the woodland habitats towards providing adequate mitigation.				√
	▲ The criteria for measuring performance shall be used to determine if the habitat improvement is trending toward sustainability (reduced human intervention) and to assess the need for adaptive management (e.g., changes in design or maintenance revisions). These criteria must be met for the habitat improvement to be declared successful, both during a particular monitoring year and at the end of the establishment period. These performance criteria, shall be developed in consultation with USFWS, NMFS, and DFG, and shall include, but not be limited to: • percent survival of planted trees (from 65–85%), • percent survival of transplanted trees (from 60–85%), and • percent relative canopy cover (from 5–35%).				√
	▲ SAFCA shall also enter into agreements with entities responsible for long-term management of created SRA habitats to ensure that performance standards and long-term management goals are met. SAFCA shall provide assurances for habitat creation and management goals that are required by regulatory agencies with jurisdiction over these resources will be specifically detailed and outlined in the LTMP and MMP. Such agreements shall be coordinated with USFWS, NMFS, and DFG. SAFCA shall implement all terms and conditions of the agreements.			√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▸ A Section 1602 Streambed Alteration Agreement from DFG shall be obtained before any trees within a stream zone under DFG jurisdiction are removed. SAFCA shall comply with all terms and conditions of the streambed alteration agreement including measures to protect fish habitat or to restore, replace, or rehabilitate any SRA habitat on a no-net-loss basis.			√	√
	▸ USACE shall initiate Section 7 consultation with NMFS under Section 7 of the Federal ESA and SAFCA shall consult or coordinate with DFG under CESA regarding potential impacts of the loss of SRA habitat on Federally listed fish species and state-listed fish species, respectively. SAFCA shall implement any additional measures developed through the ESA Section 7 and CESA consultation processes, including Section 2081 permit conditions, to ensure no net loss of SRA habitat functions.			√	√
Phase 1: 3.5-a (b) Phase 2: 3.6-b	**Restore, Replace, or Rehabilitate Loss of Degraded SRA Habitat Function and Comply with Section 1602 Permit Conditions** SAFCA or its representative shall consult with DFG regarding potential disturbance to fish habitat, including SRA, and shall obtain a streambed alteration agreement, pursuant to Section 1602 of the California Fish and Game Code, for construction work associated with levee improvements made on the water side of a levee, if needed. SAFCA shall comply with all permit conditions of the streambed alteration agreement to protect fish habitat or to restore, replace, or rehabilitate any habitat on a no-net-loss basis.	√	√		

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Phase 2: 3.7-a (SEIR 3.3-a)	**Minimize Effects on Sensitive Habitats, Develop a Habitat Management Plan to Ensure Compensation for Unavoidable Adverse Effects, and Comply with Section 404, Section 401, and Section 1602 Permit Processes**				
	Areas of sensitive habitat shall be identified and the primary engineering and construction contractors shall ensure, through coordination with a qualified biologist retained by SAFCA, that staging areas and access routes are designed to minimize disturbance of canals and ditches, seasonal wetlands, and woodland patches. Trees within the Sacramento County portion of the project area that qualify as Native Oaks or Heritage Trees under Sacramento County's tree preservation ordinance shall be identified. All sensitive habitats and protected trees that are located adjacent to construction areas, but can be avoided, shall be protected by temporary fencing during construction. SAFCA shall develop a Mitigation Monitoring Plan (MMP) to address establishment and management of aquatic (i.e., GGS/Drainage Canal and marsh/seasonal wetland habitat) and woodland habitats that are created as part of the proposed project in order to ensure that the performance standard of no net loss of sensitive habitat is met. The MMP shall identify the measures and performance criteria during the initial mitigation monitoring period (8 years) and shall be submitted to federal and state agencies for review and approval prior to project construction.		√		
	GGS/Sensitive Aquatic Habitats Mitigation for impacts to aquatic habitat include the construction of a new GGS/Drainage canal, relocation of the Elkhorn Irrigation Canal, and preservation of rice fields. The GGS Canal shall create jurisdictional waters of the United States, and include banks that are designed to facilitate shoreline growth of freshwater marsh plants, plantings of native perennial grasses on the upper canal banks for better giant garter snake cover, and creation of giant garter snake hibernacula (rock piles keyed into the bank). This habitat shall be protected in perpetuity through an easement. In addition, to the extent feasible, the Elkhorn Irrigation Canal shall be relocated near the new GGS/Drainage Canal to provide the potential for additional aquatic habitat (its main function would still be irrigation).		√		

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	A monitoring program with performance criteria shall be developed to determine the progress of the GGS/Drainage canal towards achieving the performance standard of no net loss. The criteria for measuring performance shall be used to determine if the habitat is trending toward sustainability (reduced human intervention) and to assess the need for adaptive management (e.g., changes in mitigation design or maintenance revisions). These criteria must be met in order for the mitigation site to be declared successful, both during a particular monitoring year and at the end of the establishment period. These performance criteria, which shall be developed in consultation with DFG and USFWS, shall include, but are not limited to: ▸ percent total cover (from 85–90%), ▸ percent relative cover by wetland species (from 85–90%), ▸ percent relative cover by native species (from 50–85%), and ▸ water level controlled to within +/- 6 inches of design water level.		√		
	Vegetation assessments of the GGS/Drainage Canal shall be conducted annually for native perennial grasses (during the appropriate peak flowering period). The presence of giant garter snakes shall be monitored and recorded along this canal, consistent with monitoring methods currently conducted for SAFCA and TNBC elsewhere in the Natomas Basin. All monitoring shall occur for the full monitoring period or until the performance criteria are met, whichever period is longer. Waterline plug plantings (sedges and rushes) may not be mowed once established. All areas seeded with perennial grasses shall be mowed to a height of between 6–12 inches above ground. The primary function and service of the Elkhorn Canal is to deliver irrigation water to users throughout the Natomas Basin. The water supply within the Elkhorn Canal shall vary depending on the needs of those users. Therefore, the performance standard for the Elkhorn Canal is the delivery of irrigation water.		√		

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	Woodlands To mitigate impacts to woodland habitats, woodland corridors and groves shall be established. In addition, existing woodlands located within project acquisition areas adjacent to the new groves shall be preserved. Generally, the woodland mitigation areas shall vary somewhat depending on the characteristics of their unique locations. Trees under 10 inches diameter at breast height (dbh) located within the project footprint (mostly valley oaks), that can be feasibly relocated shall be transplanted into woodland mitigation areas. Elderberry shrubs located within the project footprint that can be feasibly relocated shall be transplanted into woodland mitigation areas.		√		
	The botanical species composition of individual clusters and rows shall mimic vegetation types commonly found along the Sacramento River, including: ▸ Valley oak woodland ▸ Mixed riparian forest, cottonwood-dominant ▸ Shallow scrub (at moist soil sites or depressions) ▸ Sycamore and oak savanna (with native perennial grassland) ▸ Elderberry shrub/scrub		√		
	A monitoring plan with performance criteria shall be developed to determine the progress of the woodland habitats towards providing adequate mitigation. The criteria for measuring performance shall be used to determine if the mitigation is trending toward sustainability (reduced human intervention) and to assess the need for adaptive management (e.g., changes in mitigation design or maintenance revisions). These criteria must be met in order for the mitigation site to be declared successful, both during a particular monitoring year and at the end of the establishment period. These performance criteria, which shall be developed in consultation with DFG and USFWS, shall include, but are not limited to: ▸ Percent survival of planted trees (from 65–85%) ▸ Percent survival of transplanted trees (from 60–85%) ▸ Percent relative canopy cover (from 5–35%)		√		

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	Field assessments of woodland planting areas shall be conducted once per year. The timing of these assessments shall be adjusted according to annual site-specific conditions, but assessments shall generally occur in late summer. To measure percent survival of trees and shrubs, each plant shall be inspected and the species of each live plant shall be recorded. Qualitative assessments shall be recorded to track the health and vigor of each species for adaptive management of the mitigation sites.		√		
	To determine the success of the woodland plantings as a functioning ecosystem, percent canopy shall be estimated each fall by recording the extent of woodland habitat on aerial photographs, or using repeat transects or fixed radius plots at ground level. The timing of these assessments shall be adjusted according to annual site-specific conditions, but assessments shall generally occur in late summer or early fall while trees are still in full foliage. The results of these assessments shall also be used to determine where replanting should occur to maintain suitable Swainson's hawk habitat. All monitoring shall occur for the full monitoring period or until the performance criteria are met, whichever is longer.		√		
	A Long-Term Management Plan (LTMP) shall be implemented by SAFCA in connection with the NLIP Landside MMP. The LTMP shall establish the long-term management practices (post establishment period success criteria) and land protection mechanisms that shall be implemented as each phase of the NLIP is approved and permitted. Land ownership and management responsibilities shall be held by SAFCA, RD 1000, NCMWC, TNBC, and the SCAS.		√		
	Applicable permits, including a Section 404 permit from the USACE, Section 401 certification from the Central Valley RWQCB, and a Section 1602 streambed alteration agreement from DFG, shall be obtained before any impact on the relevant resources occurs. All permit terms and conditions adopted through these permitting processes shall be implemented.		√		

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Phase 1: 3.6-a	Sensitive Habitats: Avoid Sensitive Habitats to the Extent Feasible, Comply with Section 404 and Section 1602 Permit Processes as Needed, and Mitigate on a No-Net-Loss Basis				
	The primary engineering and construction contractors shall ensure, through coordination with a qualified biologist retained by SAFCA, that construction zones, staging areas, and access routes are designed to minimize disturbance of sensitive habitats to the extent feasible and practicable. All sensitive habitat that can be avoided shall be protected during construction by temporary fencing, as appropriate. A protective barrier shall be installed below the construction zone on the water side of the NCC south levee to minimize potential for incidental fallback of material into the NCC during project construction. Construction activity within the seasonal wetland shall be minimized to the maximum extent feasible and practical. Qualified biologists shall regularly monitor construction to ensure these impact avoidance and minimization measures are properly implemented. SAFCA shall consult with the USACE to determine whether the potential for incidental fallback of material into the NCC and/or disturbance of the seasonal wetland during project construction can be adequately avoided to preclude the need for USACE authorization. If such authorization would be required, the Section 404 permitting process shall be completed and the acreage of affected jurisdictional habitat shall be rehabilitated. Habitat rehabilitation shall be by feasible methods agreeable to the USACE. SAFCA shall implement minimization and rehabilitation measures adopted through the permitting process.	√			

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	SAFCA shall also consult with DFG regarding impacts to the NCC levee and unavoidable effects to riparian habitat. A streambed alteration agreement shall be obtained, if necessary, and affected woodland shall be replaced and/or rehabilitated in accordance with DFG regulations and as specified in the streambed alteration agreement, if warranted. Habitat restoration, rehabilitation, and/or replacement shall be conducted in a manner that ensures there is no net loss of riparian habitat functions and values and shall be at a location and by methods agreeable to DFG. SAFCA shall implement minimization and compensation measures adopted through the permitting process.	√			
Phase 3: 4.6-a	**Implement a Feasible Construction Work Window that Minimizes Impacts to Special-Status Fish Species for Any In-Water Activities; and Implement Operational Controls and a Fish Rescue Plan that Minimizes Impacts to Fish Associated with Cofferdam Construction and Dewatering**				
	SAFCA shall identify and implement feasible in-water construction work windows in consultation with National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USWFS), and DFG. In-water work windows shall be timed to occur when sensitive fish species/life stages are not present or least susceptible to disturbance (e.g., July 1–October 31). This measure would reduce potential construction-related direct impacts to fish from potential dredging and/or construction of the cofferdam and dewatering, and/or the placement of rock riprap because all in-water work would occur during the period of time that sensitive fish (or life stages) would be least likely to be present in the construction area.			√	

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	The cofferdam sheetpiles at the outfall structure construction site shall be installed using a vibratory hammer that minimizes underwater sound pressure levels to the greatest extent feasible to minimize effects to sensitive fish species. Hammers shall only be used during daytime hours and shall commence at low energy levels and slowly build to impact force. If it is determined that a higher-intensity percussion hammer would be required for installing the cofferdam, avoidance of potential adverse effects would be achieved by consulting with NMFS, USFWS, and DFG to determine the appropriate actions, which may include surveying the outfall site to determine fish presence prior to installation, and possibly modifying the work window accordingly.			√	
	To reduce the potential for fish stranding or minimize the potential for harm during cofferdam dewatering activities, SAFCA or its contractor shall implement a fish rescue plan. Prior to the closure of the cofferdam in the Sacramento River, seining by a qualified fisheries biologist (with a current DFG collection permit) would be conducted within the cofferdam using a small-mesh seine to direct and move fish out of the cofferdam area. Upon completion of seining, the entrance to the cofferdam will be blocked with a net to prevent fish from entering the cofferdam isolation area before the cofferdam is completed. Once the cofferdam is completed and the area within the cofferdam is closed and isolated, additional seining will be conducted within the cofferdam to remove any remaining fish. Once most of the fish have been removed from the isolated area, portable pumps with intakes equipped with 1.75 mm mesh screen shall be used to dewater to a depth of 1.5-2 feet. A qualified biologist would implement further fish rescue operations using electrofishing and dip nets. All fish that are captured will be placed in clean 5-gallon buckets and/or coolers filled with Sacramento River water, transported downstream of the construction area, and released back into suitable habitat in the Sacramento River with minimal handling. After all fish have been removed using multiple seine passes, electrofishing, and dip nets (as necessary) portable pumps with screens (see above) will be used for final dewatering. NMFS, USFWS, and DFG shall be notified at least 48 hours prior to the fish rescue.			√	

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Phase 3: 4.7-a **Phase 4a: 4.7-c**	**Minimize Effects on Jurisdictional Waters of the United States; Complete Detailed Design of Habitat Creation Components and Secure Management Agreements to Ensure Compensation of Waters Filled; and Comply with Section 404, Section 401, Section 10, and Section 1602 Permit Processes**				
	▸ Waters of the United States, including wetlands, shall be identified and the primary engineering and construction contractors shall ensure, through coordination with a qualified biologist(s), that construction is implemented in a manner that minimizes disturbance of canals, ditches, and seasonal wetlands. Temporary fencing shall be used during construction to prevent disturbance of waters of the United States that are located adjacent to construction areas but can be avoided.			√	√
	▸ To mitigate for permanent impacts to sensitive aquatic resources, at least 1 acre of aquatic habitat (irrigation/drainage canal) or 1 acre of seasonal wetland shall be created for every acre that is lost to ensure no net loss of sensitive aquatic habitat. The mitigation ratio that is ultimately required will be determined by USACE through the Section 404 permitting process.			√	√
	▸ Features planned in the Phase 4a Project (under both action alternatives), would provide aquatic habitat that has been designed to offset the effects described above. These features include the creation of aquatic habitat resulting from construction of the relocated Riverside Canal and creation of managed marsh in the vicinity of Fisherman's Lake, much of which would meet the criteria for Waters of the United States, including wetlands.				√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects					
Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▸ Develop and implement a Mitigation and Monitoring Plan and Long-Term Management Plan in coordination with and subject to approval of USACE, USFWS, and DFG. The MMP and LTMP shall provide complete detailed designs of habitat creation components, performance standards and management protocols. SAFCA shall also enter into agreements with entities responsible for long-term management of created canals and marsh habitats to ensure that performance standards and long-term management goals that are required by the regulatory agencies with jurisdiction over these resources will be met and specifically detailed and outlined in the LTMP and MMP. All performance standards and long-term management goals will be in full compliance with ESA and CESA. SAFCA shall secure all such agreements and implement all conditions of the agreements.			√	√
	▸ Obtain the following applicable permits prior to the start of construction activities that would affect the resources covered by these permits: an individual permit pursuant to Section 404 of the CWA and Section 10 of the Rivers and Harbors Act from USACE, Section 401 certification from the Central Valley RWQCB, and a Section 1602 Streambed Alteration Agreement from DFG. All requirements of these permitting processes shall be implemented by SAFCA.			√	√
Phase 2: 3.7-b Phase 3: 4.9-a	**Conduct Focused Surveys for Special-Status Plants, Minimize Effects, Transplant Unavoidable Individual Plants, and Develop Management Plans for Transplanted Populations**				
	Before any ground-disturbing activities begin, a qualified biologist retained by SAFCA shall conduct surveys for special-status plants in appropriate habitat within the project footprint, in accordance with USFWS and/or DFG guidelines and at the appropriate time of year when the target species would be clearly identifiable. If no special-status plants are found during focused surveys, no further action shall be required.		√	√	

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▲ If special-status plants are found in the project footprint, areas of occupied habitat shall be identified and the primary engineering and construction contractors shall ensure, through coordination with the biologist, that construction activities are implemented in a manner that minimizes disturbance of these areas (e.g., temporary fencing shall be used during construction to protect all occupied habitat that is located adjacent to construction areas that can be avoided).		√	√	
	▲ If special-status plants are present in areas that cannot be avoided, SAFCA shall coordinate with USFWS and DFG to determine whether transplanting would be appropriate to further minimize adverse effects. Affected plants may potentially be transplanted to the GGS/Drainage Canal, if feasible. At least 1 acre of irrigation/drainage canal or marsh habitat shall be created for every acre of occupied special-status plant habitat that is lost.				
	▲ If special-status plants cannot be avoided, seed shall be collected and propagated at a DFG-approved nursery to provide additional plantings and transplanted during the dormant season if feasible to an approved site. Additionally, a mitigation plan shall be developed and approved by DFG. The plan shall include success criteria and specific requirements for planting, monitoring, and remediation in the event that success criteria cannot be met. Mitigation sites shall be permanently protected and managed in perpetuity.			√	

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Phase 2: 31.7-b	If special-status plants are found, areas of occupied habitat shall be identified and the primary engineering and construction contractors shall ensure, through coordination with the biologist, that staging areas and access routes are designed to minimize disturbance of these areas. All occupied habitat that is located adjacent to construction areas, but can be avoided, shall be protected by temporary fencing during construction. If special-status plants are present in areas that cannot be avoided, plants that would be affected shall be transplanted to the GGS/Drainage Canal, if feasible. If this is infeasible (i.e., because the created habitat is not suitable at the time transplantation is required), an alternative transplantation location (e.g., TNBC preserves), approved by USFWS and DFG, shall be utilized. A plan to address management of the transplanted populations and their habitat shall be developed. The management plan shall be approved by USFWS and DFG and shall, at a minimum, establish specific success criteria (e.g., no net loss of occupied special-status plant habitat), specify remedial measures to be undertaken if success criteria are not met (e.g., enhancement of habitat quality and additional monitoring), and describe short- and long-term maintenance of the transplantation site. Long-term protection of the special-status plants, and funding for management of their habitat, shall be provided through appropriate mechanisms to be determined by SAFCA, in consultation with the regulatory agencies and other entities cooperating in implementation of the proposed project.		√		

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Phase 1: 3.6-c Phase 2: SEIR 3.3-b Phase 3: 4.9-c Phase 4a: 4.7-e	**Minimize the Potential for Direct Loss of Giant Garter Snake Individuals, Implement All Upland and Aquatic Habitat Improvements and Management Agreements to Ensure Adequate Compensation for Loss of Habitat, and Obtain Incidental Take Authorization**				
	▸ The engineering and design consultants and primary construction contractors shall ensure, through coordination with a qualified biologist retained by SAFCA, that construction is implemented in a manner that minimizes disturbance of giant garter snake habitat (e.g., temporary fencing shall be used during construction to protect all aquatic and adjacent upland habitat that is located adjacent to construction areas that can be avoided).	√	√	√	√
	▸ Additional measures consistent with the goals and objectives of the NBHCP shall be implemented to minimize the potential for direct injury or mortality of individual giant garter snakes during project construction.	√			
	▸ Such measures shall be finalized in consultation with USFWS and DFG, and are likely to include conducting worker awareness training, timing initial ground disturbance to correspond with the snake's active season (as feasible in combination with project needs and minimizing disturbance of nesting Swainson's hawks), dewatering aquatic habitat before fill, conducting preconstruction surveys, erecting fencing around habitat features that can be avoided to ensure that these remain undisturbed by construction vehicles and personnel, conducting biological monitoring during construction, and removing any temporary fill or construction debris and restoring temporarily disturbed areas to their pre-project conditions according to the USFWS's *Guidelines for the Restoration and/or Replacement of Giant Garter Snake Habitat* (USFWS 1997).	√	√	√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▲ SAFCA shall coordinate with USFWS, DFG, and SCAS (if on Airport property) to ensure that the NLIP's aquatic and upland habitat improvements are created and managed. SAFCA shall prepare a project-specific MMP and programmatic LTMP to ensure the creation and long-term management of these components before construction commences. SAFCA shall enter into agreements with the appropriate local entity responsible for long-term management of these created giant garter snake habitats and shall coordinate with USFWS and DFG to ensure that performance standards and long-term management goals required by the regulatory agencies with jurisdiction over these resources will be specifically detailed and outlined in the LTMP and MMP.		√	√	√
	▲ All performance standards and long-term management goals will be in full compliance with ESA and CESA. SAFCA shall implement all terms and conditions of the management agreements.				
	▲ SAFCA shall implement all measures developed through informal consultation with UWFWS and DFG, as well as any additional measures adopted through a formal permitting process, if applicable.	√			
	▲ Where borrow sites would result in impacts to giant garter snake habitat over more than one construction season, the work shall progress in cells that will be incrementally developed as habitat or returned to agricultural use as the borrow activities are completed such that no area would be used in consecutive years or such that replacement habitat is available prior to loss of existing habitat.				√
	▲ Authorization for take of giant garter snake under the ESA and CESA shall be obtained. All measures subsequently adopted through the permitting process shall be implemented.	√	√	√	√
Phase 1: 3.6-e Phase 2: SEIR 3.3-c Phase 3: 4.9-f Phase 4a: 4.7-f	**Minimize Potential Impacts on Swainson's Hawk and Other Special-Status Birds Foraging and Nesting Habitat, Monitor Active Nests during Construction, Implement All Upland and Agricultural Habitat Improvements and Management Agreements to Compensate for Loss of Quantity and Quality of Foraging Habitat, Obtain Incidental Take Authorization**				

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▸ The primary engineering and design consultants and primary construction contractors shall ensure, through coordination with a qualified biologist retained by SAFCA, that construction is implemented in a manner that minimizes disturbance of potential nesting habitat for special-status birds through the following activities: ▸ The biologist shall conduct preconstruction surveys to identify active special-status bird nests near construction areas.	√	√	√	√
	• Surveys for nesting birds shall be conducted before project activities are initiated during the nesting season (March 1–September 15). Surveys shall be conducted in accordance with standardized protocols and NBHCP requirements.	√	√	√	√
	• Removal of potential nesting habitat shall be conducted during the non-nesting season, to the extent feasible and practicable, to minimize the potential for loss of active nests. • If an active nest is found, the biologist shall determine an appropriate buffer that minimizes potential for disturbance of the nest, in coordination with DFG. No project activities shall commence within the buffer area until a qualified biologist confirms that the nest is no longer active or the birds are not dependent on it. • Monitoring shall be conducted during construction and by a qualified biologist to ensure that project activity does not result in detectable adverse effects on the nesting pair or their young. • The size of the buffer may vary, depending on the nest location, nest stage, construction activity, and monitoring results. If implementation of the buffer becomes infeasible or construction activities result in an unanticipated nest disturbance, DFG shall be consulted to determine the appropriate course of action.	√	√	√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▲ The biologist shall conduct preconstruction surveys to identify active nests within 0.50 mile of construction areas, in accordance with DFG guidelines. Surveys shall be conducted in accordance with NBHCP requirements and *Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in California's Central Valley* (Swainson's Hawk Technical Advisory Committee 2000).	√	√	√	√
	▲ SAFCA shall coordinate with USFWS, DFG, and SCAS (if on Airport property) to ensure that the NLIP's woodland, upland, and agricultural habitat improvements are created and managed. SAFCA shall prepare a project-specific MMP and programmatic LTMP to ensure the creation and long-term management of these components before construction commences. SAFCA shall enter into agreements with the appropriate local entity responsible for long-term management of these created Swainson's hawk habitats and shall coordinate with USFWS and DFG to ensure that performance standards and long-term management goals that are required by the regulatory agencies with jurisdiction over these resources will be specifically detailed and outline in the LTMP and MMP. All performance standards and long-term management goals will be in full compliance with ESA and CESA. SAFCA shall implement all terms and conditions of the management agreements.			√	√
	▲ The criteria for measuring performance shall be used to determine if the habitat improvement is trending toward sustainability (reduced human intervention) and to assess the need for adaptive management (e.g., changes in design or maintenance revisions). These criteria must be met for the habitat improvement to be declared successful, both during a particular monitoring year and at the end of the establishment period. Performance criteria for managed grasslands shall be developed in consultation with USFWS, NMFS, and DFG, and shall include, but not be limited to: • percent cover of invasive species (<1%), • percent cover of nonnative herbaceous plants (<10–25%), and • percent absolute cover of native species (>50–80%).		√	√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▸ Authorization for take of Swainson's hawk under CESA shall be obtained. All measures subsequently adopted through the permitting process shall be implemented.			√	√
Phase 2: SEIR 3.3-c	SAFCA shall develop and implement an MMP to address management of grassland habitats that are created as part of the proposed project in order to ensure that the performance standard of no net loss of sensitive habitat is met. To mitigate impacts on cropland and grassland suitable for Swainson's hawk foraging habitat, SAFCA shall create managed native perennial grassland habitats on the new levee slopes, seepage berms, access right-of-ways, and canal embankments. This grassland shall provide moderate-quality Swainson's hawk foraging habitat. In addition, grasslands on and adjacent to canal banks shall provide basking and aestivation habitat for giant garter snake.		√		
	▸ The MMP shall include methods to create the grasslands, including native grass mixes which shall be seeded along new levee slopes and seepage berms, staging areas, and adjacent maintenance and utility rights-of-way. Seed material shall be purchased from a reputable nursery and must be from local genetic stock within 200 miles of the project site unless otherwise approved by a qualified ecologist. The native grass mix shall include the following:Purple needlegrass (*Nassella pulchra*) ▸ Creeping wildrye (*Leymus triticoides*) ▸ Six weeks grass (*Vulpia microstachys*) ▸ Slender wheatgrass (*Elymus trachycaulus*) ▸ Meadow barley (*Hordeum brachyantherum*) ▸ An initial baseline assessment of grassland mitigation sites shall be conducted following the initial drill seeding program, and then a monitoring program with performance criteria shall be developed to determine the progress of the grassland habitats towards providing adequate mitigation.		√		

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Phase 1: 3.6-f	**Special-Status Nesting Birds: Identify Habitat and Nest Locations, Minimize Potential Impacts, Monitor Active Nests during Construction, and Mitigate in Consultation with USFWS and DFG as Needed**				
	The primary engineering and construction contractors shall ensure, through coordination with a qualified biologist retained by SAFCA, that construction zones, staging areas, and access routes are designed to minimize disturbance and removal of nesting habitat for special-status nesting birds to the extent feasible and practicable. Nesting habitat that cannot be avoided shall be removed during the non-nesting season, to the extent feasible and practicable. To avoid potential impacts to active nests of special-status birds, pre-construction surveys shall be conducted and buffers implemented. A qualified biologist shall conduct preconstruction surveys to identify active special-status bird nests along the NCC, within 500 feet of construction areas. Surveys shall be conducted in accordance with NBHCP requirements. If an active nest is found, an appropriate buffer to minimize impacts and maintain consistency with the goals and objectives of the NBHCP shall be determined by a qualified biologist. No project activities shall commence within the buffer area until a qualified biologist confirms that the nest is no longer active or the birds are not dependent upon it. The size of the buffer may vary, depending on the nest location, nest stage, and construction activity. Monitoring shall be conducted by a qualified biologist to ensure project activity does not result in detectable adverse effects to the nesting pair or their young. SAFCA shall consult with USFWS and DFG regarding measures to avoid and minimize disturbance of active nests and shall implement all measures deemed appropriate and feasible during this consultation.	√			
Phase 3: 4.9-b Phase 4a: 4.7-g	**Conduct Focused Surveys for Elderberry Shrubs as Needed, Implement all Woodland Habitat Improvements and all Management Agreements, Ensure Adequate Compensation for Loss of Shrubs, and Obtain Incidental Take Authorization**				

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▸ A qualified biologist retained by SAFCA shall conduct focused surveys of elderberry shrubs within 100 feet of the project footprint, in accordance with USFWS guidelines. All elderberry shrubs with potential to be affected by project activities shall be mapped, the number of stems greater than 1 inch in diameter on each shrub that requires removal shall be counted, and these stems shall be searched for beetle exit holes. ▸ The engineering and design consultants and primary construction contractors shall ensure, through coordination with the biologist, that construction is implemented in a manner that minimizes disturbance of areas that support elderberry shrubs (e.g., temporary fencing shall be used during construction to protect all elderberry shrubs that are located adjacent to construction areas but can be avoided). Shrubs that require removal shall be transplanted to the woodland creation areas, if feasible, when the plants are dormant (November through the first 2 weeks of February) to increase the success of transplanting. If none of the areas of suitable habitat to be created as part of the project would be available before the impact would occur, alternative transplantation locations (e.g., other SAFCA mitigation areas or The Natomas Basin Conservancy [TNBC] preserves) shall be identified and shall be approved by USFWS. ▸ The number of replacement elderberry plantings shall be determined based on USFWS guidelines, which require replacement ratios ranging from 1:1 to 8:1 for lost stems at least 1 inch in diameter, depending on the size of the affected stems and presence or absence of beetle exit holes. Associated native species shall be planted at ratios ranging from 1:1 to 2:1 for each elderberry planting.			√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▸ SAFCA shall coordinate with USFWS, DFG, and SCAS (if on Airport property) to ensure that the NLIP's woodland habitat improvements are created and managed. SAFCA shall prepare a project-specific MMP and programmatic LTMP to ensure the creation and long-term management of these components before construction commences. SAFCA shall enter into agreements with the appropriate local entity responsible for long-term management of these created woodland habitats and shall coordinate with USFWS and DFG to ensure that performance standards and long-term management goals that are required by regulatory agencies with jurisdiction over these resources will be specifically detailed and outlined in the LTMP and MMP. All performance standards and long-term management goals will be in full compliance with the ESA and CESA. SAFCA shall implement all terms and conditions of the management agreements USACE shall initiate consultation activities with USFWS under Section 7 of the ESA, and authorization for take of valley elderberry longhorn beetle under the ESA shall be obtained if it is determined, in consultation with USFWS, that shrub removal is likely to result in such take. All measures subsequently developed through the Section 7 consultation process shall be implemented by SAFCA.			√	√
Phase 2: 3.7-c	**Minimize Effects on Valley Elderberry Longhorn Beetle, Conduct Focused Surveys, Develop a Management Plan to Ensure Adequate Compensation for Unavoidable Adverse Effects, and Obtain Incidental Take Authorization** The primary engineering and construction contractors shall ensure, through coordination with a qualified biologist retained by SAFCA, that staging areas and access routes are designed to minimize disturbance of areas that support elderberry shrubs. All elderberry shrubs that are located adjacent to construction areas, but can be avoided, shall be protected by temporary fencing during construction.		√		

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	Before the initiation of any ground-disturbing activities, the biologist shall conduct surveys for elderberry shrubs within 100 feet of the impact area, in accordance with USFWS guidelines. All elderberry shrubs with potential to be affected by project activities shall be mapped, the number of stems greater than 1 inch in diameter on each shrub that requires removal shall be counted, and these stems shall be searched for beetle exit holes. Shrubs that are removed shall be transplanted to the woodland creation areas, if feasible. If none of the areas of suitable habitat to be created as part of the proposed project would be available before the impact would occur, alternative transplantation locations (e.g., other SAFCA mitigation areas or TNBC preserves) shall be identified. SAFCA shall develop and implement a plan to address establishment and management of the elderberry shrubs and associated species plantings to compensate for unavoidable effects on elderberry shrubs. The plan shall, at a minimum, describe requirements for transplantation of shrubs that require removal; specify the number of replacement elderberry shrubs and associated native plants to be established and associated success criteria; specify remedial measures to be undertaken if mitigation success criteria are not met; and describe short- and long-term maintenance and management. The number of replacement plantings shall be determined based on USFWS guidelines, which require replacement ratios ranging from 1:1 to 8:1 for lost stems at least 1 inch in diameter, depending on the size of the affected stems and presence or absence of beetle exit holes. Associated native species shall be planted at ratios ranging from 1:1 to 2:1 for each elderberry planting. Long-term protection of the planting area for elderberry and associated species, and funding for its management, shall be provided through appropriate mechanisms to be determined by SAFCA, USFWS, and other entities cooperating in implementation of the proposed project.		√		

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	The management plan shall be reviewed and approved by USFWS before removal of any elderberry shrubs. Authorization for take of valley elderberry longhorn beetle under ESA shall be obtained if it is determined, in consultation with USFWS, that shrub removal is likely to result in such take. All measures subsequently developed through informal consultation with USFWS shall be implemented, as well as any additional measures adopted through a formal permitting process, if applicable.		√		
Phase 2: 3.7-e & 3.7-g **Phase 3: 4.9-e & 4.9-g** **Phase 4a: 4.7-h**	**Conduct Focused Surveys for Northwestern Pond Turtles, Relocate Turtles, Minimize Potential Impacts on Burrowing Owls, and Relocate Owls as Needed** ▸ A qualified biologist retained by SAFCA shall conduct surveys for northwestern pond turtle in aquatic habitats to be dewatered and/or filled during project construction. Surveys shall be conducted immediately after dewatering and before fill of aquatic habitat suitable for pond turtles. If pond turtles are found, the biologist shall capture them and move them to nearby areas of suitable habitat that would not be disturbed by project. ▸ The engineering and design consultants and primary construction contractors shall ensure, through coordination with a qualified biologist retained by SAFCA, that construction is implemented in a manner that minimizes disturbance of potential nesting habitat for burrowing owls (e.g., removal of potential nesting habitat shall be conducted during the non-nesting season, to the extent feasible and practicable, to minimize the potential for loss of active nests).		√	√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▲ The biologist shall conduct preconstruction surveys to identify occupied burrowing owl burrows in the vicinity of construction areas. Surveys for burrowing owl shall be conducted before project activities are initiated at any time of year. Surveys shall be conducted in accordance with standardized protocols, including DFG's *Staff Report on Burrowing Owl Mitigation* (DFG 1995), and NBHCP requirements. If an occupied nest burrow is found, an appropriate buffer that minimizes potential for disturbance of the nest shall be determined by the biologist, in coordination with DFG. No project activities shall commence within the buffer area until a qualified biologist confirms that the nest is no longer active or the birds are not dependent on it. Monitoring shall be conducted by a qualified biologist to ensure that project activity does not result in detectable adverse effects on the nesting pair or their young. The size of the buffer may vary, depending on the nest location, nest stage, construction activity, and monitoring results. If implementation of the buffer becomes infeasible or construction activities result in an unanticipated nest disturbance, DFG shall be consulted to determine the appropriate course of action.		√	√	√
	▲ If an occupied burrowing owl burrow that does not support an active nest is found, SAFCA shall develop and implement a relocation plan, in coordination with and subject to approval of DFG and USFWS and consistent with requirements of the NBHCP, DFG's *Staff Report on Burrowing Owl Mitigation* (DFG 1995), and the Airport *Wildlife Hazard Management Plan* (WHMP). Relocation is anticipated to occur through passive exclusion of owls from the project site (using one-way doors at the burrow entrances). The owls would then be able to reoccupy the area after construction is complete. Because the project would generally result in temporary disturbance of burrowing owl habitat and conversion from one suitable habitat type to another, no mitigation for temporary burrow or habitat loss would be required.		√	√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Phase 3: 4.6-a Phase 4a: 4.7-i	**Implement a Feasible Construction Work Window that Minimizes Impacts to Special-Status Fish Species for Any In-Water Activities, and Implement Operational Controls and a Fish Rescue Plan that Minimizes Impacts to Fish Associated with Cofferdam Construction and Dewatering** ▲ SAFCA shall implement Mitigation Measure 4.6-a, as described in Section 4.6, "Water Quality." This measure requires filing a Notice of Intent (NOI) with the Central Valley RWQCB; implementing standard erosion and siltation measures and best management practices (BMPs); preparing and implementing a storm water pollution prevention plan (SWPPP); preparing and implementing a spill containment plan; and complying with the conditions of the National Pollutant Discharge Elimination System (NPDES) general stormwater permit for construction activity. ▲ SAFCA shall identify and implement feasible in-water construction work windows in consultation with NMFS and DFG. In-water work windows shall be timed to occur when sensitive fish species/life stages are not present or least susceptible to disturbance (e.g., July 1–October 1). This measure would reduce potential construction-related direct impacts to fish from dredging and/or construction of the cofferdam and dewatering, general in-water construction, and/or the placement of rock riprap because all in-water work would occur during the period of time that sensitive fish (or life stages) would be least likely to be present in the construction area. ▲ USACE shall initiate Section 7 consultation with NMFS under Section 7 of the ESA, and SAFCA shall consult with DFG under CESA regarding potential construction-related impacts to Federally listed fish species and state-listed fish species, respectively. SAFCA shall implement any additional measures developed through the ESA Section 7 and CESA consultation processes, including Section 2081 permit conditions, to ensure that impacts are avoided and/or minimized.			√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▲ The cofferdam sheetpiles at the outfall structure construction site and the piles at the South Lauppe Pumping Plant site shall be installed using a vibratory hammer when possible to minimize underwater sound pressure levels to the greatest extent feasible and associated effects to sensitive fish species. Vibratory hammers/pile drivers shall only be used during daytime hours and shall commence at low energy levels and slowly build to impact force. If it is determined that a higher-intensity percussion hammer or pile driver would be required for installing the cofferdam or pilings, avoidance of potential adverse effects would be achieved by consulting with NMFS, USFWS, and DFG to determine the appropriate actions, which may include surveying the outfall site to determine fish presence prior to installation, and possibly modifying the work window accordingly.				
	▲ To reduce the potential for fish stranding or minimize the potential for harm during cofferdam dewatering activities, SAFCA or its contractor shall implement a fish rescue plan. Prior to the closure of the cofferdam in the Sacramento River, seining by a qualified fisheries biologist (with a current DFG collection permit) will be conducted within the cofferdam using a small-mesh seine to direct and move fish out of the cofferdam area. Upon completion of seining, the entrance to the cofferdam will be blocked with a net to prevent fish from entering the cofferdam isolation area before the cofferdam is completed. Once the cofferdam is completed and the area within the cofferdam is closed and isolated, additional seining will be conducted within the cofferdam to remove any remaining fish. Once most of the fish have been removed from the isolated area, portable pumps with intakes equipped with 1.75 mm mesh screen shall be used to dewater to a depth of 1.5–2 feet. A qualified biologist shall implement further fish rescue operations using electrofishing and dip nets. All fish that are captured will be placed in clean 5-gallon buckets and/or coolers filled with Sacramento River water, transported downstream of the construction area, and released back into suitable habitat in the Sacramento River with minimal handling. After all fish have been removed using multiple seine passes, electrofishing, and dip nets (as necessary) portable pumps with screens (see above) will be used for final dewatering. NMFS, USFWS, and DFG shall be notified at least 48 hours prior to the fish rescue.			√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Phase 2: 3.7-i Phase 3: 4.9-h Phase 4a 4.7-k	**Ensure that Project Encroachment Does Not Jeopardize Successful Implementation of the NBHCP**				
	Based on the current value-per-acre, SAFCA shall contribute funds to TNBC to offset direct impacts to TNBC reserves on an acre-per-acre basis, drawing upon TNBC's existing land surplus			√	√
	SAFCA shall coordinate with TNBC to determine the most effective means of ensuring that the small encroachment onto reserves that would result from project implementation does not adversely affect the ability to meet the minimum-size and mitigation-ratio requirements of the NBHCP, require revision of existing management plans, and/or affect revenue-generation requirements. SAFCA shall, in coordination with TNBC, identify and implement necessary actions to ensure that encroachment does not jeopardize successful implementation of the NBHCP. Such actions may include direct supplementation of TNBC funding to offset losses in revenue generation, management of portions of the reserve that are encroached upon by project		√		
Cultural Resources					
Phase 1: 3.7-a	**Document Alterations and Distribute the Information to the Appropriate Repositories** Consistent with previous mitigation efforts for alterations to RD 1000, a qualified professional archaeologist or architectural historian shall document the alterations made to the NCC levee and distribute the information to the appropriate repositories.	√			

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Phase 2: SEIR 3.4-a Phase 4.10-a Phase 4a: 4.8-a	**Incorporate Mitigation Measures to Documents Regarding Any Elements Contributing to RD 1000 and Rural Landscape District and Distribute the Information to the Appropriate Repositories** The management of the cultural resources that constitute the contributing elements of RD 1000 is governed by the PA. Because the elements of the RD 1000 historic landscape district have already been recorded, a new inventory of these resources is not required under Stipulation IV(A) of the PA. After an APE has been determined per Stipulation III(C), a qualified architectural historian shall determine if contributing elements of the district are present in the APE. If contributing elements are present, the architectural historian shall update records for these resources and evaluate those elements to determine if they retain integrity. Because much of the Natomas Basin has been developed, it is possible that changes to the setting have diminished the integrity and thus eligibility of contributing elements in the APE. If the elements in the APE retain eligibility, the architectural historian shall make a finding of effect.		√	√	√
	If there is an adverse effect to a contributing element (under Section 106) or a significant impact on the resource's integrity as an historical resource (under CEQA), the architectural historian shall review existing HAER documentation and determine whether any augmentation of this documentation is needed. The original documentation for the American River Watershed Project (completed in 1997) contemplated changes to the setting of the district and thus provided comprehensive documentation to record the district before urbanization (Peak & Associates 1997). This original documentation was intended to adequately recorded and preserve records of the elements that may be affected. However, if this documentation is not sufficient for adversely affected and contributing elements, SAFCA shall prepare an Historic Property Treatment Plan (HPTP) stipulating additional HAER documentation, or other similar treatment as required under Stipulation V(A). After consultation with USACE and the State Historic Preservation Officer (SHPO), SAFCA shall implement the required documentation or treatment prior to construction. Any additional documentation that is needed shall be prepared and distributed to appropriate public repositories.		√	√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Phase 3: 4.10-c Phase 4a: 4.8-b	**Avoid Ground Disturbance Near Eligible and Listed Resources to the Extent Feasible, Prepare a Finding of Effect, and Resolve Any Adverse Effects through Preparation of an HPTP** ▸ Complete an evaluation of identified resources, and determine the effect of each phase of work on all eligible or listed resources in accordance with Stipulation IV(A) of the PA. ▸ Consult with USACE, the SHPO, the MLD and other consulting parties such as Native American individuals and organizations, to develop appropriate treatment or mitigation in an HPTP, per Stipulation V(A) of the PA if the project would result in adverse effects on eligible resources. ▸ Document the site and avoid further effects by protecting the resource through capping per management under an HPTP or other avoidance measures where feasible. Where physical impacts cannot be avoided and such physical impacts could damage the data these sites contain, including mortuary components, further mitigation may be required. Such mitigation may consist of data recovery excavations to retrieve those values and mortuary assemblages that contain significance for archaeology after consultation with and the agreement of the Native American most likely descendent (MLD), where possible. ▸ Monitor potentially destructive construction in the vicinity of documented resources, as required under the Construction Monitoring and Inadvertent Discovery Plan.			√	√
Phase 2: 3.8-c(1)	**Avoid Ground Disturbance Near Known Prehistoric Archaeological Sites CA-Sac-485/H and the Barney Mound to the Extent Feasible, and Conduct Resource Documentation and Data Recovery at CA-Sac-485/H as Needed**				

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	For CA-Sac-485/H ▸ SAFCA and its engineers for canal design and construction shall consult with a qualified professional archaeologist during project design to delineate the extent of potentially significant deposits east of the mapped location of CA-Sac-485/H and shall design ground-disturbing work to avoid the deposits as feasible and practicable. ▸ The archaeologist shall determine an appropriate radius around the site for monitoring adjacent construction work, and SAFCA shall retain an archaeological monitor and Native American monitor to be present during this work. ▸ If prehistoric resources are discovered, a professional archaeologist shall assess the significance of the find and recommend additional work such as data recovery to retrieve the materials that convey the significance of the resource.		√		
	For the Barney Mound: ▸ SAFCA and its engineers for borrow excavation shall consult with a qualified professional archaeologist during project design to delineate the extent of potentially significant deposits in the vicinity of the Barney Mound. SAFCA shall restrict all ground disturbance for borrow removal to areas beyond the significant deposits as feasible and practicable. ▸ SAFCA shall retain an archaeological monitor and Native American monitor to be present during adjacent construction work. ▸ If prehistoric resources are discovered, a professional archaeologist shall assess the significance of the find and recommend additional work such as data recovery to retrieve the materials that convey the significance of the resource.		√		

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Phase 2: 3.8-c(2)	**Avoid Ground Disturbance near Known Prehistoric Archaeological Site CA-Sac-485/H to the Extent Feasible, and Conduct Resource Documentation and Data Recovery as Needed** ▸ If ground disturbance may be conducted within 500 feet of known prehistoric resources (CA-Sac-485/H,), SAFCA and its engineers for levee design and construction shall consult with a qualified professional archaeologist during project design to delineate the extent of potentially significant deposits around the recorded locations. If feasible and practicable, the project activities shall be designed to avoid disturbance of the resource. The archaeologist shall determine an appropriate radius around the site for monitoring adjacent construction work, and SAFCA shall retain an archaeological monitor and Native American monitor to be present during this work.		√		
	▸ If, in the judgment of the archaeologist, project activities would disturb the resource and these impacts cannot be avoided, the archaeologist shall prepare and implement a research design and treatment plan. Before any construction-related ground disturbance begins in the vicinity of the resource, a professional archaeologist shall carry out a testing program based on the plan to determine whether the resource meets the definition of a unique archaeological resource or a historical resource as defined by CEQA. If the construction activity is part of a federal undertaking, all actions shall be conducted in compliance with Section 106 of the NHPA. If the resource is determined to be ineligible for listing on the CRHR or the NRHP, no further mitigation is required. If the resource appears to meet the definition of a unique archaeological resource or a historical resource or property (under NHPA), the archaeologist shall perform a program of data recovery in coordination with a Native American monitor to retrieve the materials that convey the significance of the resource.		√		
Phase 2: SEIR 3.4-b	**Avoid Ground Disturbance near Known Prehistoric Archaeological Site CA-Sac-485/H to the Extent Feasible and Prepare and Implement a Historic Properties Treatment Plan.**				

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	SAFCA shall implement the following measures required by the PA (Appendix C) to address potential significant impacts on CA-SAC-485/H associated with Phase 2 Project construction impacts:		√		
	▸ Prior to start of construction, SAFCA shall prepare an HPTP as required under the PA (Stipulation V[A]). ▸ The HPTP shall address the effect of construction of a seepage berm on CA-SAC-485/H, including the effects of operating heavy equipment on the site during construction and of the placement of a seepage berm over the resource		√		
	▸ The HPTP shall recommend an appropriate program of research and analysis for any portion of the assemblage removed from the site during test excavations. SAFCA shall then consult with USACE, the SHPO, and appropriate Native American individuals and entities regarding the recommendations of the HPTP. ▸ To the extent possible, SAFCA shall minimize or avoid direct impacts on the site by carefully selecting equipment with consideration given to the pressure the construction equipment will place on the site and the capability of the assemblage to withstand these impacts. SAFCA shall also minimize the impact of the weight of the berm on the site through engineering and design to the maximum extent possible. ▸ Upon concurrence from USACE and the SHPO, SAFCA shall implement the HPTP. The HPTP shall account for and incorporate the concerns of all consulting parties, to the extent possible, given project goals, as required under Section 106. ▸ During construction, SAFCA shall monitor construction at this location and within an appropriate radius. This monitoring shall be governed by a plan for monitoring and response to inadvertent discoveries that has been approved by USACE, as required in the PA (Stipulation V[B]).		√		

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Phase 1: 3.7-b Phase 2: 3.8-d	**Perform Research and/or Surveys, Brief Workers Before Construction, Monitor Construction, Halt Potentially Damaging Activities, Investigate and Avoid Resources to the Extent Feasible, and Conduct Resource Documentation and Data Recovery as Needed**				
	▸ A qualified archaeologist shall survey all accessible portions of the proposed areas of project disturbance if they have not been surveyed within the previous 5 years, and shall document and evaluate the significance of any resources that are found during the surveys. If any resources are found during the surveys that may be considered historical or unique resources under CEQA, the steps described in Mitigation measure 3.8-c for known resources shall be followed.		√		
	▸ Before construction begins, a qualified professional archaeologist shall give a presentation and training session to all construction personnel so that they can assist with identification of undiscovered cultural materials and avoid them where possible.	√	√		
	▸ A qualified archaeologist shall monitor all ground-disturbing construction activities along the Sacramento River east levee and at other locations determined by the archaeologist to be sensitive for subsurface cultural resource deposits. If a previously unidentified archaeological resource is uncovered during construction, construction activities shall be halted within 50 feet of the find and the construction contractor, SAFCA, and other appropriate parties shall be notified regarding the discovery.		√		

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	The archaeologist shall determine whether the resource is significant under CEQA or the NHPA and shall develop appropriate mitigation. If the resource is found to be a unique archaeological resource or a historical resource, the archaeologist shall recommend additional actions deemed necessary for the preservation or documentation of the resource. Such actions may include (but shall not be limited to) measures such as testing for subsurface features, additional background research, additional resource documentation, avoidance of the resource, or additional monitoring of construction activity to minimize any effects. SAFCA shall ensure that necessary protection actions are implemented before construction resumes within 50 feet of the site. The preferred mitigation is preservation in place of as much of the resource as possible through project modification or protective measures. In many cases, archaeological data recovery can mitigate impacts to a less-than-significant level. However, construction activities may encounter unique or historical archaeological resources that cannot be protected or recovered and for which adequate data recovery may not be feasible.	√	√		
Phase 3: 4.10-d **Phase 4a: 4.8-c**	**Train Construction Workers before Construction, Monitor Construction Activities, Stop Potentially Damaging Activities, Evaluate Any Discoveries, and Resolve Adverse Effects on Eligible Resources, if Encountered.** ▸ SAFCA shall complete surveys to identify cultural resources in the Phase 4a Project footprint, as identified in the Phase 2 EIR (SAFCA 2007:3.8-31) at the program level. ▸ Mitigation Measure 3.4-d from the SEIR prepared for the Phase 2 Project is copied below and shall be implemented, as appropriate within the footprint of the Proposed Action (SAFCA 2009: 3.4-10).			√	√
Phase 2: SEIR 3.4-d	**Conduct Additional Backhoe and Canine Forensic Investigations As Appropriate** To increase the data set for identifying buried sites under the existing levee, SAFCA shall recommend that the following additional mitigation measures be adopted by USACE during Section 106 consultation:		√		√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▲ Additional inventory may be conducted at appropriate intervals along the Sacramento River east levee, using a backhoe excavator, to increase the sample of information at depths below 6 feet that cannot be reached with conventional shovel test methods.		√	√	√
	▲ Such methods may be used only when necessary to address potential project-related effects to cultural resources because other methods are ineffective or project circumstances dictate that such resources must be identified in advance of construction. USACE and SAFCA shall consult with the MLD regarding the use of such methods. USACE and SAFCA recognize the Tribe's preference for less invasive methods of investigation such as the use of canine forensics.				√
	▲ Where this process or additional inventory efforts reveal other resources, SAFCA recommends the use of canine forensic investigations as a way of identifying interred human remains with minimal disturbance, and for further refinement of an understanding of the constituents of identified resources		√	√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▲ Before construction begins, a qualified professional archaeologist retained by SAFCA shall give a presentation and training session to all construction personnel so that they can assist with identification of undiscovered cultural resource materials and avoid them where possible. Such training shall note the importance of these materials to Native American groups that attach cultural significance to resources in the project area. A qualified archaeologist shall monitor ground-disturbing construction activities along the Sacramento River east levee. In areas of known sacred value, such as archaeological sites containing Native American burials, a Native American monitor will be present to observe potentially destructive construction activities and to ensure proper treatment of human remains in accordance with State law. If a previously unidentified archaeological resource is uncovered during construction, construction activities shall be halted in the vicinity of the find and the construction contractor, SAFCA, USACE, the MLD, and the NAHC (if appropriate), and other appropriate parties shall be notified regarding the discovery. Where construction would consist of cutoff walls excavated in a bentonite and/or cement slurry, SAFCA and USACE anticipate that it will not be possible to identify the precise location of any materials found in spoils or at soil mixing stations, thus construction cannot stop during excavation of cutoff walls if resources are discovered in spoils.			√	√
	▲ SAFCA shall then consult with USACE and the SHPO to determine the eligibility of the resource. If SAFCA and USACE, in consultation with the SHPO, concur that the resource is eligible and the project may result in adverse effects on the resource, SAFCA shall prepare and implement an HPTP as required under the PA. Stipulation V(A). The HPTP shall be prepared in consultation with USACE, the SHPO, and other appropriate consulting parties such as Native American individuals or organizations.			√	√
	▲ Work may only resume when either all necessary treatment has been performed under the HPTP, or construction in the vicinity will not result in adverse effects, and that work does not encroach within 30 meters of the known boundaries of the resource, or the boundaries designated by the SHPO, per the PA, Stipulation V(B)(2). All treatment stipulated in the HPTP shall be performed by SAFCA, in consultation with USACE.			√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Phase 1: 3.7-b	**Suspend Potentially Damaging Activity, Investigate Resources, Avoid to the Extent Feasible, and Conduct Resource Documentation and Data Recovery as Needed** ▸ Before the commencement of construction, a qualified professional archaeologist shall give a presentation to all construction personnel regarding the likelihood and type of resources that might be found during construction operations associated with the individual flood control projects, and measures that shall be taken in the event that potential archaeological or historical resources are found during construction.	√			
	▸ If unrecorded cultural resources (e.g., unusual amounts of shell, animal bone, bottle glass, ceramics, structure/building remains, etc.) are encountered during construction activity, all ground-disturbing activities shall be restricted within a 100-foot radius of the find or a distance determined by a qualified professional archaeologist to be appropriate based on the potential for disturbance of additional cultural resource materials. ▸ A qualified archaeologist shall identify the materials, determine their potential to meet the definition of a unique archaeological resource or a historical resource in Section 15064.5, and formulate appropriate measures for their treatment, which shall be implemented by the agency implementing the project. Potential treatment methods for significant and potentially significant resources may include, but would not be limited to, no action (i.e., resources determined not to be significant), avoidance of the resource through changes in construction methods or project design, and implementation of a program of testing and data recovery, in accordance with all applicable federal and state requirements.	√			

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	For unique archaeological resources and archaeological historical resources, the preferred mitigation is preservation in place of as much of the resource as possible, where feasible, through project modification or protective measures. In many cases, archaeological data recovery can mitigate impacts that cannot be avoided. However, construction activities may encounter unique archaeological resources and archaeological historical resources that cannot be protected or recovered and for which adequate data recovery may not be feasible. For example, resources encountered during excavation through the NCC levee for construction of a cutoff wall are likely to be unrecoverable.				
Phase 2: SEIR 3.4-c **Phase 3: 4.10-e** **Phase 4a: 4.8-d**	**Stop Work Within An Appropriate Radius Around the Find, Notify the Applicable County Coroner and Most Likely Descendant, and Treat Remains in Accordance with State Law and Measures Stipulated in an HPTP Developed in Consultation between USACE, SAFCA, and the SHPO** If human remains are uncovered during ground-disturbing activities, SAFCA shall cease all ground-disturbing activities within the vicinity of the find, if known. If the discovery occurs in spoils removed from construction of cutoff walls, the remains shall be treated in accordance with state law. Because cutoff walls are constructed at great depth within a slurry of soil and bentonite and/or cement, SAFCA and USACE anticipate that it will not be possible to pinpoint the location of human remains that may be disinterred during construction of these features and it will not be feasible or useful to stop construction. Discovered remains removed from cutoff wall spoils will be treated as required by state law, as follows. SAFCA's archaeological monitors and/or the contractor shall notify the relevant county coroner and a SAFCA-retained archaeologist skilled in osteological analysis to determine the nature of the remains. If the coroner determines that the remains are those of a Native American, he or she must contact the NAHC by phone within 24 hours of making that determination (Health and Safety Code Section 7050[c]). The NAHC will designate an MLD who may decide how to reinter the remains with appropriate dignity in an appropriate location.		√	√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	Prehistoric remains are usually found in the context of an archaeological site. The treatment of any associated site shall be in consultation with the MLD, as required under the PA and Mitigation Measure 4.8-c. It is unlikely, but also possible, that ground-disturbing work may disinter human remains associated with an historic burial, not subject to the jurisdiction of the NAHC. Such a resource shall be treated as an archaeological discovery as required by Mitigation Measure 3.4-d from the SEIR prepared for the Phase 2 Project.			√	√
Phase 1: 3.7-c Phase 2: SEIR 3.4-e	**Halt Work Within 100 Feet (Phase 1)/50 Feet (Phase 2) of the Find, Notify the County Coroner and Most Likely Descendant, and Implement Appropriate Treatment of Remains** ▸ If human remains are uncovered during ground-disturbing activities, all ground-disturbing activities shall cease within a 100-foot radius (Phase 1)/50-foot radius (Phase 2) of the find, and SAFCA or its designated representative shall be notified. In accordance with the California Health and Safety Code, if human remains are uncovered during ground-disturbing activities, SAFCA and/or the contractor shall notify the county coroner of the county in which the remains are uncovered (Sutter or Sacramento) and a professional archaeologist to determine the nature of the remains. The coroner is required to examine all discoveries of human remains within 48 hours of receiving notice of a discovery on private or state lands (Health and Safety Code Section 7050.5[b]). If the coroner determines that the remains are those of a Native American, he or she must contact the NAHC by phone within 24 hours of making that determination (Health and Safety Code Section 7050[c]). The NAHC will designate a Most Likely Descendant (MLD) to dispose of the remains with appropriate dignity.	√	√		

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▸ After a determination that the remains are of prehistoric Native American origin, SAFCA shall coordinate with the MLD for reburial of the remains and associated grave goods in an appropriate location. If the MLD fails to make a recommendation or re-inter the remains, further treatment will conform to PRC Section 5097 et seq. and other appropriate authorities. ▸ The discovery of prehistoric burials often reveals locations sensitive for the occurrence of additional archaeological material. Newly discovered prehistoric resources associated with human remains shall be evaluated, and if the resource is eligible for the CRHR or the NRHP and the project would result in adverse effects to those eligible resources, SEIR Mitigation Measure 3.4-c shall be implemented.		√		
Phase 2: SEIR 3.4-c	**Evaluate NLIP-7 and NLIP-22. If the Resources are Eligible, Avoid Disturbance to the Extent Feasible, and Prepare and Implement a Historic Properties Treatment Plan.** ▸ Complete an evaluation of NLIP-7 and NLIP-22 resources, and determine the effect of Phase 2 work on all eligible or listed resources in accordance with Stipulation IV(A) of the PA. ▸ Consult with USACE, the SHPO, and other consulting parties such as Native American individuals and organizations, to develop appropriate treatment or mitigation in an HPTP, as required by Stipulation V(A) of the PA, if the project would result in adverse effects on eligible resources. ▸ If the resources are deemed to be eligible, document the sites and avoid or reduce adverse effects by minimizing disturbance from construction of the berm. Where physical impacts cannot be avoided and such physical impacts could damage the data these sites may contain, further excavation shall be conducted in order to support documentation of the resource as required under Section 110(b) of the NHPA, or, in the alternative, data recovery excavations to retrieve those values and mortuary assemblages that contain significance for archaeology and Native American culture after consultation with and the agreement of the Native American MLD tribe.		√		

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▸ Monitor all construction in the vicinity of documented and eligible resources, as required under the pending construction monitoring and inadvertent discovery plan.		√		
Paleontological Resources					
Phase 1: 3.8-a Phase 2: 3.9-a Phase 3: 4.11-a Phase 4a: 4.9-a	**Conduct Construction Personnel Training and, if Paleontological Resources Are Found, Stop Work Near the Find and Implement Mitigation in Coordination with a Professional Paleontologist** Before the start of construction and/or borrow activities in the Riverbank Formation or the Modesto Formation, construction personnel involved with earthmoving activities shall be informed by SAFCA of the possibility of encountering fossils, the appearance and types of fossils likely to be seen during construction activities, and the proper notification procedures should fossils be encountered. This worker training may be either (1) prepared and presented by an experienced field archaeologist at the same time as construction worker education on cultural resources, or (2) prepared and presented separately by a qualified paleontologist.	√	√	√	√
	If paleontological resources are discovered during earthmoving activities, the construction crew shall immediately stop work in the vicinity of the find. SAFCA shall retain a qualified paleontologist to evaluate the resource and prepare a mitigation plan in accordance with SVP guidelines (1995). The mitigation plan may include a field survey, construction monitoring, sampling and data recovery procedures, museum storage coordination for any specimen recovered, and a report of findings. Recommendations made by the paleontologist, in consultation with SAFCA, shall be implemented before construction activities can resume at the site where the paleontological resources were discovered.	√	√	√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Transportation and Circulation					
Phase 1: 3.9-b Phase 2: 3.10-a Phase 3: 4.12-a Phase 4a: 4.10-a	**Prepare and Implement a Traffic Safety and Control Plan for Construction-Related Truck Trips** Before the start of construction in each construction season, SAFCA and its primary contractors for engineering and construction shall develop a coordinated construction traffic safety and control plan to minimize the simultaneous use of roadways by different construction contractors for material hauling and equipment delivery to the extent feasible and to avoid and minimize potential traffic hazards on local roadways during construction. Upon selection of borrow sites within the Elkhorn Borrow Area, the traffic safety and control plan shall reflect affected roadways. Items (a) through (e) of this mitigation measure, as listed below, shall be integrated as terms of the construction contracts.		√	√	√
	(a) The plan shall outline phasing of activities and the use of multiple routes to and from off-site locations to minimize the daily amount of traffic on individual roadways. SAFCA shall ensure that the construction contractors enforce the plans throughout the construction periods.		√	√	√
	(b) The construction contractors shall develop a traffic safety and control plan for the local roadways that would be affected by construction traffic. Before the initiation of construction-related activity involving high volumes of traffic, the plan shall be submitted for review by Caltrans and the agencies of the local jurisdictions (Sutter County, Sacramento County, and/or City of Sacramento) having responsibility for roadway safety at and between project sites. The plan shall call for the following elements:	√	√	√	√
	▸ posting warnings about the potential presence of slow-moving vehicles;	√	√	√	√
	▸ using traffic control personnel when appropriate; and	√		√	√
	▸ placing and maintaining barriers and installing traffic control devices necessary for safety, as specified in Caltrans's *Manual of Traffic Controls for Construction and Maintenance Works Zones* and in accordance with city/county requirements (Caltrans 1996).	√	√	√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	The contractor shall train construction personnel in appropriate safety measures as described in the plan and shall implement the plan. The plan shall include the prescribed locations for staging equipment and parking trucks and vehicles. Provisions shall be made for overnight parking of haul trucks to avoid causing traffic or circulation congestion.		√	√	√
	(c) Consistent with Phase 4a Mitigation Measure 4.11-a "Implement Applicable District-Recommended Control Measures to Minimize Temporary Emissions of reactive organic gases (ROG), oxides of nitrogen (NO_X), and respirable particulate matter less than 10 microns in diameter (PM_{10}) during Construction," the track-out of bulk material onto public paved roadways as a result of operations, or erosion, shall be minimized by the use of track-out and erosion control, minimization, and preventive measures. Tracked-out materials shall be removed within 1 hour from adjacent streets anytime such material track-out extends for a cumulative distance of greater than 50 feet onto any paved public road during active operations. All visible roadway dust tracked out upon public paved roadways as a result of active operations shall be removed at the conclusion of each work day when active operations cease, or every 24 hours for continuous operations. Wet sweeping or a high-efficiency particulate air (HEPA) filter equipped vacuum device shall be used for roadway dust removal				√
	All operations shall limit and expeditiously remove, as necessary, the accumulation of project-generated mud or dirt from adjacent public streets at least once every 24 hours if substantial volumes of soil have been carried onto adjacent paved public roadways during project construction.	√	√	√	
	(d) Construction of project features along the Sacramento River east levee shall be accommodated through the creation of temporary haul roads along the landside of the adjacent levee and berm footprint. Garden Highway shall not be used for earthen materials hauling activities.		√	√	√
	(e) A Transportation Management Plan shall be prepared and submitted to Caltrans District 3 to cover any points of access from the state highway system for haul trucks and other construction equipment.			√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	(f) Before the start of the construction season, SAFCA shall coordinate with Sacramento and Sutter Counties and the City of Sacramento to address maintenance and repair of affected roadways resulting from increased truck traffic.		√	√	√
	(g) Before project construction begins, SAFCA shall provide notification of project construction to all appropriate emergency service providers in Sutter County, Sacramento County, and/or the City of Sacramento and shall coordinate with providers throughout the construction period to ensure that emergency access through construction areas is maintained.	√	√	√	√
	(h) Before the start of construction, SAFCA and its primary contractors shall coordinate with Sutter County, Sacramento County, and/or the City of Sacramento regarding any closures of any public roadways.			√	√
Phase 4a: 4.10-d	**Prepare and Implement a Bicycle Detour Plan for Project Area Roadways, Including Garden Highway**				
	▸ Before the start of construction, SAFCA or its primary contractor shall prepare a bicycle detour plan for roadways that would be affected by project construction activities, including Garden Highway, in consultation with the County Alternative Modes Coordinator and/or City of Sacramento Bicycle and Pedestrian Coordinator as applicable. The detour plan shall include posted signs clearly indicating closure points, truck haul routes, detour routes, and informational signs to notify motorists and bicyclists to share the roads. Signs shall be posted outside of the immediate project area in order to notify bicyclists of closure points and detours. The detour plan shall be in place before the start of construction and shall be maintained and implemented throughout the construction period.				√
Air Quality					
Phase 3: 4.13-a Phase 4a: 4.11-a	**Implement Applicable District-Recommended Control Measures to Minimize Temporary Emissions of ROG, NO_X, and PM_{10} during Construction**		√	√	√

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Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	Construction in Sutter County (Feather River Air Quality Management District [FRAQMD])				
	For portions of the project occurring in Sutter County, FRAQMD's *Indirect Source Review Guidelines* and online CEQA guidance provide mitigation measures for reducing short-term air quality impacts. As recommended by FRAQMD, SAFCA shall ensure that the following mitigation measures are implemented during all project construction activities to the extent practicable.	√	√	√	√
	In addition, construction of the proposed levee improvements are required to comply with all applicable FRAQMD rules and regulations, in particular Rule 3.0 (Visible Emissions), Rule 3.16 (Fugitive Dust Emissions), and Rule 3.15 (Architectural Coatings).		√	√	√
	1. SAFCA shall implement a Fugitive Dust Control Plan that includes the following measures:	√	√	√	√
	▸ All earthmoving operations should be suspended when winds exceed 20 miles per hour or when winds carry dust beyond the property line despite implementation of all feasible dust control measures.				
	▸ Construction sites shall be watered as directed by the Sutter County Department of Public Works or FRAQMD and as necessary to prevent fugitive dust violations.	√	√	√	√
	▸ An operational water truck shall be on-site at all times. Apply water to control dust as needed to prevent visible emissions violations and off-site dust impacts.				
	▸ On-site dirt piles or other stockpiled particulate matter shall be covered, wind breaks installed, and water and/or soil stabilizers employed to reduce wind blown dust emissions. Incorporate the use of approved nontoxic soil stabilizers to all inactive construction areas according to manufacturers' specifications.	√	√	√	√
	▸ All transfer processes involving a free fall of soil or other particulate matter shall be operated in such a manner as to minimize the free-fall distance and fugitive dust emissions.	√	√	√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▸ Apply approved chemical soil stabilizers to all inactive construction areas (previously graded areas that remain inactive for 96 hours), including unpaved roads and employee/equipment parking areas, according to the manufacturers' specifications.	√	√	√	√
	▸ To prevent track-out, wheel washers shall be installed where project vehicles and/or equipment exit onto paved streets from unpaved roads. Vehicles and/or equipment shall be washed before each trip. Alternatively, a gravel bed or rumble strip may be installed as appropriate at vehicle/equipment site exit points to effectively remove soil buildup on tires and tracks to prevent/diminish track-out.	√	√	√	√
	▸ Paved streets shall be swept frequently (at least once per day by water sweeper with reclaimed water recommended; wet broom) if soil material has been carried onto adjacent paved, public thoroughfares from the project site.	√	√	√	√
	▸ Provide temporary traffic control as needed during all phases of construction to improve traffic flow, as deemed appropriate by the Sutter County Department of Public Works and/or Caltrans and to reduce vehicle dust emissions. An effective measure is to enforce vehicle traffic speeds at or below 15 miles per hour on unpaved roads.	√	√	√	√
	▸ Reduce traffic speeds on all unpaved surfaces to 15 miles per hour, where feasible, and reduce unnecessary vehicle traffic by restricting access. Provide appropriate training, on-site enforcement, and signage.	√			
	▸ Where restricting vehicle speeds on unpaved surfaces to 15 miles per hour would make timely completion of the project infeasible, SAFCA shall cooperate with FRAQMD to implement alternative dust control measures that would be at least as effective in reducing fugitive dust emissions. Such measures may include increased frequency in applying water to the unpaved roads in the vicinity of sensitive receptors and reducing speeds in the vicinity of sensitive receptors.		√	√	√
	▸ Reestablish ground cover on the construction site as soon as possible, through seeding and watering.	√	√	√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▸ Open burning is yet another source of fugitive gas and particulate emissions, and it shall be prohibited at the project site. No open burning of vegetative waste (natural plant growth wastes) or other legal or illegal burn materials (trash, demolition debris, etc.) may be conducted at the project site. Vegetative wastes should be chipped or delivered to waste to energy facilities (permitted biomass facilities), mulched, composted, or used for firewood. It is unlawful to haul waste materials off-site for disposal by open burning.	√	√	√	√
	2. Construction equipment exhaust emissions shall not exceed FRAQMD Regulation III, Rule 3.0, Visible Emissions Limitations (40% opacity or Ringelmann 2.0). Operators of vehicles and equipment found to exceed opacity limits shall take action to repair the equipment within 72 hours or remove the equipment from service. Failure to comply may result in a notice of violation.	√	√	√	√
	3. SAFCA shall be responsible for ensuring that all construction equipment is properly tuned and maintained before and during on-site operation.	√	√	√	√
	4. Minimize idling time to 10 minutes, to conserve fuel and minimize emissions.	√	√	√	√
	5. Use existing power sources (e.g., power poles) or clean fuel generators rather than temporary diesel-powered generators.	√	√	√	√
	6. Portable engines and portable engine-driven equipment units used at the project work site, with the exception of on-road and off-road motor vehicles, may require California Air Resources Board (ARB) Portable Equipment Registration with the state or a local district permit. The owner/operator shall be responsible for arranging appropriate consultations with ARB or FRAQMD to determine registration and permitting requirements before equipment is operated at the site.	√	√	√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects					
Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	7. SAFCA shall assemble a comprehensive inventory list (i.e., make, model, engine year, horsepower, and emission rates) of all heavy-duty off-road (portable and mobile) equipment (50 horsepower [hp] and greater) that will be used an aggregate of 40 or more hours for the construction project and apply the following mitigation measure:	√	√	√	√
	▸ Reduce NO_X emissions from off-road diesel-powered equipment: SAFCA shall provide a plan for approval by FRAQMD demonstrating that the heavy-duty (equal to or greater than 50 hp) off-road equipment to be used in the construction project, including owned, leased and subcontractor vehicles, shall achieve a project wide fleet-average 20% NO_X reduction and 45% particulate reduction[1] compared to the most recent ARB fleet average at time of construction.	√	√	√	√
	8. SAFCA shall enter into a voluntary emissions reduction agreement with the FRAQMD to mitigate the portion of construction-generated emissions of NOX that exceeds EPA's applicable threshold for general conformity purposes. The calculation of the fee shall be determined in coordination with the FRAQMD and paid prior to the occurrence of any construction-related activities within areas under the jurisdiction of the FRAQMD.			√	√
Phase 1: 3.10-a	6. Develop a traffic plan to minimize traffic flow interference from construction activities. The plan may include advance public notice of routing, use of public transportation, and satellite parking areas with a shuttle service. Schedule operations affecting traffic for off-peak hours. Minimize obstruction of through-traffic lanes. Provide a flag person to guide traffic properly and ensure safety at construction sites.		√		

[1] Acceptable options for reducing emissions may include use of late-model engines, low-emission diesel products, alternative fuels, engine retrofit technology (Carl Moyer Guidelines), and after-treatment products; voluntary off-site mitigation projects; providing funds for air district off-site mitigation projects; and/or other options as they become available. FRAQMD should be contacted to discuss alternative measures.

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	Construction in Sacramento County (Sacramento Metropolitan Air Quality Management District [SMAQMD]) For portions of the project occurring in Sacramento County, SMAQMD's Guide to Air Quality Assessment in Sacramento County (SMAQMD 2004) provides mitigation measures for reducing short-term air quality impacts. As recommended by SMAQMD, SAFCA shall ensure that the following mitigation measures are implemented during all project construction activities to the extent practicable and feasible.				
	▸ SAFCA shall prepare a construction emissions dust control plan(s) in accordance with SMAQMD recommendations that reduces fugitive dust emissions by at least 85% (or shall provide calculations based on SMAQMD-approved methodologies showing that emissions would be reduced to less than 100 tons per year assuming a conservative reduction of 75% with typical mitigation). All grading operations shall be suspended when fugitive dust levels exceed levels specified by SMAQMD rules. SAFCA and its primary construction contractors shall ensure that dust is not causing a nuisance beyond the property line of the construction site.			√	√
	▸ If overlapping construction phases in Sacramento County create unmitigated PM_{10} emissions in excess of 400 TPY SAFCA shall use advanced dust suppressant materials (such as EnviroTac II) on all unpaved roadways and stockpiled materials to ensure 95% or greater control of fugitive dust and a reduction of PM_{10} emissions below 100 TPY.				√
	Overlapping Phases where this would apply includes all work on the Sacramento River east level for the Phase 3 and 4a Projects.				√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▲ SAFCA shall develop a plan, in consultation with SMAQMD, demonstrating that the heavy-duty (>50 hp), off-road vehicles to be used in the construction project (including owned, leased, and subcontractor vehicles) shall achieve a project-wide fleet-average 20% NO_X reduction and 45% particulate reduction compared to the most recent ARB fleet average at the time of construction.2		√	√	√
Phase 2: 3.11-a	▲ Acceptable options for reducing emissions include the use of late-model engines, low-emission diesel products, alternative fuels, particulate-matter traps, engine retrofit technology, after-treatment products, and/or such other options as become available.		√		
	▲ A comprehensive inventory of all off-road construction equipment equal to or greater than 50 hp that will be used for an aggregate of 40 or more hours during any portion of project construction shall be submitted to SMAQMD. The inventory shall be updated and submitted monthly throughout the duration of the project, except that an inventory shall not be required for any 30-day period in which no construction operations occur. At least 48 hours before heavy-duty off-road equipment is used, SAFCA shall provide SMAQMD with the anticipated construction timeline, including the start date, and the name and phone number of the contractor's project manager and on-site foreman.		√	√	√

2 Acceptable options for reducing emissions include the use of late-model engines, low-emission diesel products, alternative fuels, particulate-matter traps, engine retrofit technology, after-treatment products, and/or such other options as become available.

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▲ Emissions from off-road, diesel-powered equipment used on the project site shall not exceed 40% opacity for more than 3 minutes in any 1 hour. Any equipment found to exceed 40% opacity (or Ringelmann 2.0) shall be repaired immediately, and SMAQMD shall be notified of noncompliant equipment within 48 hours of identification. A visual survey of all in-operation equipment shall be made at least weekly. A monthly summary of visual survey results shall be submitted to SMAQMD throughout the construction period, except that the monthly summary shall not be required for any 30-day period in which no construction operations occur. The monthly summary shall include the quantity and type of vehicles surveyed, as well as the dates of each survey. SMAQMD and/or other officials may conduct periodic site inspections to determine compliance.		√	√	√
	▲ SAFCA shall pay SMAQMD an off-site mitigation fee for implementation of any proposed alternatives for the purpose of reducing impacts to a less-than-significant level.		√	√	√
	▲ Calculation of fees associated with subsequent improvement plans/project phases shall be conducted at the time of project approval. The applicable fee rate shall be determined and the total fee shall be calculated based on the fee rate in effect at the time that subsequent environmental documents are prepared. The fee for subsequent construction projects shall be remitted to SMAQMD before groundbreaking.		√	√	√
	SAFCA shall pay into SMAQMD's off-site construction mitigation fund to further mitigate construction-generated emissions of NO_X that exceed SMAQMD's daily emission threshold of 85 lb/day. The calculation of daily NO_X emissions is based on the cost to reduce 1 ton of NO_X at the time when the document is prepared (currently $16,000 per ton [Phase 4a-11/09]). The determination of the final mitigation fee shall be conducted in coordination with SMAQMD before any demolition or ground disturbance occurs for any project phase. Calculation of and payment of the fee for all subsequent project phases shall also be included in the CEQA MMRP for the project.		√	√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	All Project Construction				
	SAFCA shall implement the following additional measures to reduce construction emissions of PM_{10} comprising fugitive dust and mobile-exhaust and ozone precursors throughout the project area:		√	√	√
	▸ Open burning of removed vegetation shall be prohibited. Vegetation material shall be chipped on-site or delivered to waste-to-energy facilities to the extent feasible. ▸ An operational water truck shall be on-site at all times. Water shall be applied to control dust as needed to prevent dust impacts off-site. ▸ Unpaved areas subject to vehicle traffic, including employee parking areas and equipment staging areas, shall be stabilized by being kept wet, treated with a chemical dust suppressant or soil binders, or covered. ▸ The track-out of bulk material onto public paved roadways as a result of operations, or erosion, shall be minimized by the use of track-out and erosion control, minimization, and preventive measures, and removed within 1 hour from adjacent streets such material anytime track-out extends for a cumulative distance of greater than 50 feet onto any paved public road during active operations. ▸ All visible roadway dust tracked out upon public paved roadways as a result of active operations shall be removed at the conclusion of each work day when active operations cease, or every 24 hours for continuous operations. Wet sweeping or a HEPA filter equipped vacuum device shall be used for roadway dust removal. ▸ Low-sulfur fuel shall be used for stationary construction equipment. ▸ Existing power sources or clean fuel generators shall be used rather than temporary power generators to the extent feasible.				

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▸ Low-emission on-site stationary equipment shall be used. ▸ Vehicle speeds on unpaved roadways shall be limited to 15 miles per hour. ▸ Idling time for all heavy-duty equipment shall be limited to 5 minutes.		√	√	√
	▸ Install ARB-certified Level 3 diesel particulate filters (DPF) on a minimum of 15% of the total number of off-road (non-street legal) diesel-powered construction equipment pieces with an engine size equal to or greater than 50 hp throughout the duration of the project. For fleets with 6 or fewer total applicable equipment pieces, a DPF shall be installed on a minimum of one engine. All DPFs shall be kept in working order and maintained in operable condition according to manufacturer's specifications. At the time of writing, a list of ARB-certified Level 3 DPF can be found at http://www.arb.ca.gov/diesel/verdev/level3/level3.htm.			√	√
	▸ Install Level 3 ARB-certified DPF that are functional and kept in working order to meet manufacturer's specifications throughout the duration of the project on at least 15% of the total pieces of off-road (non-street legal) construction equipment on the project site over 50 hp (a minimum of one diesel particulate filter for fleets with 6 or less total pieces).		√	√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	SMAQMD has also recently released since publication of the [Phase 4a] DEIS/DEIR, draft BMPs for consideration as practical alternatives to reduce construction-generated greenhouse gas (GHG) emissions. SAFCA shall implement a range of measures to reduce GHG emissions, which may include the following: ▸ improve fuel efficiency from construction equipment by reducing unnecessary idling (modify work practices, install auxiliary power for driver comfort); performing equipment maintenance (inspections, detect failures early, corrections); training equipment operators in proper use of equipment; using the proper size of equipment for the job; and using equipment with new technologies (repowered engines, electric drive trains); ▸ use alternative fuels for generators at construction sites such as propane or solar, or use electrical power; ▸ encourage and provide carpools, shuttle vans, transit passes, and/or secure bicycle parking for construction worker commutes; ▸ reduce electricity use in the construction office by using compact fluorescent bulbs, powering off computers every day, and replacing heating and cooling units with more efficient ones; ▸ recycle or salvage non-hazardous construction and demolition debris (goal of at least 75% by weight); ▸ use locally sourced or recycled materials for construction materials (goal of at least 20% based on costs for building materials, and based on volume for roadway, parking lot, and sidewalk and curb materials); and ▸ develop a plan to efficiently use water for adequate dust control.				√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Noise					
Phase 1: 3.11-a Phase 2: 3.12-a Phase 3: 4.14-a Phase 4a: 4.12-a	**Implement Noise-Reducing Construction Practices, Prepare and Implement a Noise Control Plan, and Monitor and Record Construction Noise Near Sensitive Receptors** **All Project Construction** Measures that shall be used to reduce noise impacts shall include the following:	√	√	√	√
	▸ Equipment shall be used as far away as practical from noise-sensitive uses.				
	▸ All construction equipment shall be equipped with noise-reduction devices such as mufflers to minimize construction noise and all internal combustion engines shall be equipped with exhaust and intake silencers in accordance with manufacturers' specifications.	√	√	√	√
	▸ Equipment that is quieter than standard equipment shall be used, including electrically powered equipment instead of internal combustion equipment where use of such equipment is a readily available substitute that accomplishes project tasks in the same manner as internal combustion equipment.				
	▸ Construction site and haul road speed limits shall be established and enforced.		√	√	√
	▸ The use of bells, whistles, alarms, and horns shall be restricted to safety warning purposes only.				
	▸ Noise-reducing enclosures shall be used around stationary noise-generating equipment (e.g., compressors and generators).	√	√	√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▲ Fixed construction equipment (e.g., compressors and generators), construction staging **and** stockpiling areas, and construction vehicle routes shall be located at the most distant point feasible from noise-sensitive receptors.				
	▲ When noise sensitive uses are within close proximity and subject to prolonged construction noise, noise-attenuating buffers such as structures, truck trailers, or soil piles shall be located between noise generation sources and sensitive receptors.		√	√	√
	▲ Before construction activity begins within 500 feet of one or more residences or businesses, written notification shall be provided to the potentially affected residents or business owners, identifying the type, duration, and frequency of construction activities. Notification materials shall also identify a mechanism for residents or business owners to register complaints with the appropriate jurisdiction if construction noise levels are overly intrusive. The distance of 500 feet is based on the 60-dBA contour of the loudest anticipated construction activity.		√	√	√
	▲ If noise-generating activities are conducted within 300 feet (Phase 1)/100 feet (Phases 2, 3, 4a) of noise-sensitive receptors (the 70-dBA noise contour of construction noise), the primary contractor shall continuously measure and record noise levels generated as a result of the proposed work activities. Sound monitoring equipment shall be calibrated before taking measurements and shall have a resolution within 2 dBA. Monitoring shall take place at each activity operation adjacent to sensitive receptors. The recorded noise monitoring results shall be furnished weekly to SAFCA.	√	√	√	√
	▲ The primary contractor shall prepare and implement a detailed noise control plan based on the proposed construction methods. This plan shall identify specific measures to ensure compliance with the noise control measures specified above. The noise control plan shall be submitted to and approved by SAFCA before any noise-generating construction activity begins.	√		√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	24/7 Project Construction				
	▸ When construction of cutoff walls takes place during nighttime hours (between 10:00 p.m. and 6:00 a.m.), SAFCA shall honor requests from affected residents to provide reasonable reimbursement of local hotel or short-term rental stays for the period of time that cutoff wall construction takes place within 500 feet of the residents requesting reimbursement.		√	√	√
	▸ When construction of groundwater wells (including up to two weeks of continuous pump testing for each well) or modifications to Pumping Plant Nos. 3 and 5 takes place during nighttime hours (between 10:00 p.m. and 6:00 a.m.) and the resulting noise levels exceed the applicable County noise standard (i.e., 45 dBA L_{eq} and 65 dBA L_{max} for Sutter County and 45 dBA L_{50} and 65 dBA L_{max} for Sacramento County), SAFCA shall honor requests from affected residents to provide reasonable reimbursement of local hotel or short-term rental stays for the period of time that construction of groundwater wells or modifications to Pumping Plant Nos. 3 and 5 takes place within 500 feet of the residents requesting reimbursement.				√
Phase 2: 3.12-a	▸ The primary contractor shall prepare a detailed noise control plan based on the construction methods proposed. This plan shall identify specific measures to ensure compliance with the noise limits specified above. The noise control plan shall be submitted to and approved by SAFCA before any noise-generating construction activity begins. ▸ Construction of cutoff walls in Reaches 1 and 4A of the Sacramento River east levee shall be limited to the hours of 6 a.m. to 8 p.m., Monday through Saturday, with only maintenance activities on Sunday.		√		
Phase 3: 4.14-b	**Implement Measures to Minimize Construction-Related Vibration Effects (Phase 2) and at the Pumping Plant No. 2 Site (Phase 3)**				

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▸ Pile driving shall be conducted as far as practicable from the residential structure. ▸ Vibration monitoring equipment shall be placed at the property line adjacent to large equipment and, with owner approval, at the back of the residential structure adjacent to the large equipment. ▸ A preconstruction and postconstruction survey shall be conducted to assess potential architectural damage from pile driving at the residence near the RD 1000 Pumping Plant No. 2 site which is owned by RD 1000 and/or Natomas Central Mutual Water Company (NCMWC). The survey shall include visual inspection of the structure and documentation of the structure by means of photographs and video. This documentation shall be reviewed with the individual owner prior to any construction activity. Postconstruction monitoring of the structure shall be performed to identify (and repair, if necessary) damage, if any, from construction vibrations. Any damage shall be documented with photographs and video.		√	√	
Phase 3: 4.14-c Phase 4a: 4.12-c	**Implement Noise-Reduction Measures to Reduce the Impacts of Haul Truck Traffic Noise**				
	▸ All heavy trucks shall be equipped with noise-control (e.g., muffler) devices in accordance with manufacturers' specifications. ▸ All haul trucks shall be inspected before use and a minimum of once per year to ensure proper maintenance and presence of noise-control devices (e.g., lubrication, nonleaking mufflers, and shrouding). ▸ Before haul truck trips are initiated during a construction season on roads within 600 feet of residences (Phase 2)/160 feet of residences (Phase 3&4a) (the 60-dBA noise contour of haul truck traffic), written notification shall be provided to the potentially affected residents identifying the hours and frequency of haul truck trips. Notification materials shall also identify a mechanism for residents to register complaints with the appropriate jurisdiction if haul truck noise levels are overly intrusive or occur outside the exempt daytime hours for the applicable jurisdiction.		√	√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Recreation					
Phase 2: 3.13-b	**Compensate the City of Sacramento for Encroachments that Cause Permanent Loss of the Recreational Use of Affected Recreational Facilities** ▸ Before the start of construction, SAFCA shall compensate the City of Sacramento for any loss of land on the Costa Park site. The negotiated compensation may be in the form of payment, replacement land, or other in-kind compensation for the permanent loss of recreational use at the affected site.		√		
Phase 3: 4.15-a	**Prepare and Implement a Bicycle Detour Plan for all Bicycle Trails and On-street Bicycle Routes, Including the Ueda Parkway Trail and Garden Highway, Provide Construction Period Information on Recreational Facility Closures and Detours, Provide Detours for Bicycle Facilities, and Coordinate with Recreation Agencies to Allow Them to Repair Damage to Recreational Facilities** ▸ Before the start of construction, prepare a bicycle detour plan for all bicycle paths and on-street bicycle routes, including the Ueda Parkway Bicycle Trail and Garden Highway, in consultation with the County and/or City of Sacramento Bicycle and Pedestrian Coordinator as applicable. The detour plan shall include posted signs clearly indicating closure points, detour routes, roadway markings to designate temporary bike lanes, and informational signs to notify motorists to share the roads with bicyclists. Signs shall be posted at major entry points for bicycle trails and routes to notify users of closure points and detours. The detour plan shall be in place before the start of construction and shall be maintained and implemented throughout the construction period. ▸ Provide construction period information on recreational facility closures and detours. ▸ Upon completion of the levee improvements, coordinate with the City and/or County (where applicable) for the City and/or County (where applicable) to restore access and repair any construction related damage to recreational facilities, including the Ueda Parkway bicycle trail.			√	

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects					
Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Phase 3: 4.15-b	**Provide Construction Period Information on Recreational Facility Closures and Detours and Provide Detours for Access Routes to Alternate Boat Launch Ramps and Marinas** ▸ Provide public information through the media and on SAFCA's Web site regarding detours and alternative access routes to public and private recreational facilities affected by project construction. SAFCA shall coordinate with the City of Sacramento Recreation and Parks Department to make available information to the public regarding closure of public recreational facilities, detours and alternate sites available.			√	
Visual Resources					
Phase 3: 4.16-b	**Direct Lighting Away from Adjacent Properties** (a) SAFCA shall require that nearby residents be notified in advance of nighttime construction activities. (b) SAFCA shall require that construction and security lighting be shielded and directed downward to minimize the spill of light onto adjacent properties.			√	
Utilities and Service Systems					
Phase 2: 3.14-a **Phase 3: 4.17-a** **Phase 4a: 4.14-a**	**Coordinate with Irrigation Water Supply Users Before and During All Irrigation Infrastructure Modifications and Minimize Interruptions of Supply**		√		√
	SAFCA and its primary contractors for engineering design and construction shall ensure that the measures listed below are implemented to minimize the potential for irrigation water supply interruptions during construction activities.				√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▲ Coordinate the timing of all modifications to irrigation supply infrastructure with the affected infrastructure owners and water supply users, either directly or through NCMWC. ▲ Include detailed scheduling of the phases of modifications/replacement of existing irrigation infrastructure components in project design and in construction plans and specifications. ▲ Plan and complete modifications of irrigation infrastructure for the nonirrigation season to the extent feasible. ▲ Provide for alternative water supply, if necessary, when modification/replacement of irrigation infrastructure must be conducted during a period when it would otherwise be in normal use by an irrigator. ▲ Ensure either that (1) users of irrigation water supply do not, as a result of physical interference associated with the project, experience a substantial interruption in irrigation supply when such supply is needed for normal, planned farming operations (i.e., a decrease in level of service in comparison with the existing level of service), or (2) users of irrigation water supply that experience a substantial decrease in an existing level of service that meets the established standards for the project area are compensated in kind for losses associated with the reduction in level of service.		√	√	√
Phase 2: 3.15-b Phase 4a: 4.14-b	**Verify Utility Locations, Coordinate with Utility Providers, Prepare and Implement a Response Plan, and Conduct Worker Training with Respect to Accidental Utility Damage** Before construction begins, SAFCA and its primary contractors shall coordinate with USACE, the CVFPB, and applicable utility providers to implement orderly relocation of utilities that need to be removed or relocated.		√		√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	Power pole relocations shall be coordinated with SMUD and SACDOT to avoid conflicts with the SACDOT-proposed bike/pedestrian path. Existing main electrical power transmission lines and poles on the waterside of the existing Garden Highway levee that do not need to be relocated or replaced to accommodate the project may be left in place. No new main electrical power transmission lines and poles shall be installed on the waterside of Garden Highway. Consistent with sound engineering practices that prioritize the following, individual service lines shall: (1) use existing configurations and facilities, and (2) any new poles shall be placed on the landside of Garden Highway, subject to the approval of USACE, the CVFPB, and any other regulatory public agencies and utility companies				√
	▸ SAFCA and its primary construction contractors shall provide the following: Notification of any potential interruptions in service shall be provided to the appropriate agencies and affected landowners. ▸ Before the start of construction, utility locations shall be verified through field surveys and the use of the Underground Service Alert services. Any buried utility lines shall be clearly marked in the area of construction on the construction specifications in advance of any earthmoving activities.		√		√
	▸ Before the start of construction, a response plan shall be prepared to address potential accidental damage to a utility line. The plan shall identify chain of command rules for notification of authorities and appropriate actions and responsibilities to ensure the safety of the public and workers. Worker education training in response to such situations shall be conducted by the contractor. The response plan shall be implemented by SAFCA and its contractors during construction activities. ▸ Utility relocations shall be staged to minimize interruptions in service.		√	√	√
Phase 2: 3-15-b	▸ No new utility poles shall be located on the water side of Garden Highway in the vicinity of existing waterside residences unless there is no feasible alternative for providing service to these residences.		√		

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Phase 3: 4.17-b	▸ Additionally, upon borrow site selection within the Elkhorn Borrow Area, further verification of utility locations, coordination with utility providers, preparation and implementation of a response plan, and any required construction worker training with respect to accidental utility damage shall be completed before any earth-moving activities take place.			√	
Hazards and Hazardous Materials					
Phase 3: 4.18-b(1) **Phase 4a: 4.15-b(1)**	**Complete Phase I and/or II ESAs and Implement Recommended Measures** ***NLIP Phase 4a Phase I ESA sites*** Before the start of any construction activities, SAFCA shall ensure that Phase I ESAs are completed for all sites subject to ground disturbance, and that any additional site evaluations that be recommended in the Phase I ESAs are conducted. For the following sites where Phase I ESAs have been completed, the following additional evaluations (as recommended in the applicable Phase I ESAs) shall be completed prior to start of construction or earthmoving activities:				√
	Assessor's Parcel Number (APN) 201-0330-019 ▸ Conduct a limited Phase II ESA to evaluate for pesticide residues, and the possible presence of petroleum and/or other hazardous materials associated with on-site ASTs and drums.				√
	APNs 225-0010-038, 225-0010-041, and 225-0010-043 ▸ Conduct a limited Phase II ESA to evaluate for pesticide residues, and the possible presence of petroleum and/or other hazardous materials associated AST tanks and an on-site vehicle.				√
	▸ Conduct a geophysical survey to assess the presence of a possible underground storage tank (UST) and if present, collect soil and/or groundwater samples to evaluate if contamination exists. ***APNs 225-0090-014, 225-0110-050, 225-0101-007, 225-0101-057, 225-0101-058, 225-0101-061, 225-0110-018, and 225-0110-051***				√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▸ Conduct a limited Phase II ESA to evaluate for pesticide residues.				√
	APN 225-0090-040 (Novak Property)				
	▸ As recommended in the Phase I ESA (Kleinfelder 2009a), a limited Phase II ESA was completed to evaluate for pesticide residues. The possible presence of petroleum and/or other hazardous materials associated with on-site ASTs, car batteries, burn areas, and drums shall be evaluated before the start of earth-moving activities.				√
	APN 225-0090-069				
	▸ Conduct a limited Phase II ESA to evaluate for pesticide residues.				
	▸ Conduct a geophysical survey to assess the presence of a possible UST and if present, collect soil and/or groundwater samples to evaluate if contamination exists.				√
	APNs 225-0101-003, 225-0101-004, 225-0101-005, 225-0101-006				√
	▸ Conduct a limited Phase II ESA to evaluate for pesticide residues.				
	▸ Conduct a geophysical survey to assess the presence of a possible UST and if present, collect soil and/or groundwater samples to evaluate if contamination exists.				√
	APN 225-0210-026				
	▸ Conduct a limited Phase II ESA to evaluate for pesticide residues and residual chemical concentrations related to petroleum product surface staining.				√
	APNs 225-0110-019, 225-0110-020, and 225-0110-037 (Huffstutler Trust/Johnson Property)				
	▸ Conduct additional Phase II ESA work to further evaluate for potentially hazardous materials discussed in the Phase I ESA, including potential hydrocarbon contamination, miscellaneous refuse, unlabeled containers, and compounds found in aboveground and underground structures.				

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▸ Retain an Industrial Hygienist to prepare a Construction Worker Health and Safety Plan. The Construction Worker Health and Safety Plan Shall include, but shall not be limited to: personal protective equipment for workers, a delineation of the horizontal and vertical extent of elevated arsenic levels, a list of required monitoring equipment to be onsite during contaminated soil excavation (e.g., air quality meter), and proper procedures in the event that stained soil is encountered.				√
	▸ Retain a qualified professional to conduct an Ecological Risk Assessment. The Ecological Risk Assessment shall include, but shall not be limited to: potential chemicals of concern, biological characterization of the site, identification of potential exposure pathways, ecological receptors, and recommendations for and implementation of remediation, if necessary.				
	APNs 201-0250-015, 201-0270-002, and 201-0270-037 (South Sutter, LLC Borrow Site)				
	▸ Conduct a Phase II ESA to evaluate for potentially hazardous materials discussed in the Phase I ESA, including potential miscellaneous refuse, unlabeled containers, and ASTs may have impacted the soil.				√
	▸ Remove, as appropriate, items on site, such as the AST, car batteries, unlabeled storage tanks, debris, and water wells in accordance with regional, local, state, and Federal regulations.				
Phase 3: 4.18-b(1)	***NLIP Phase 3 Phase I ESA sites***				
	Before the start of any construction activities, SAFCA shall ensure that all recommendations from the Kleinfelder Phase I ESA, listed below, are implemented by the property owner in compliance with applicable rules and regulations:			√	
	The Yuki Pear Farm (Assessor's Parcel Number [APN] 201-0150-033):				
	▸ Conduct further investigation and implement all feasible remedial actions recommended in the Phase II ESA.				

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▸ Consult with the Sacramento County Environmental Management Department regarding any hazardous materials actions that may be necessary during future use of the site. ▸ Continue sampling from monitoring wells on a quarterly basis. ▸ Stockpile and sample soil for dichloro-diphenyl-trichloroethane (DDT) and dichlorodiphenyldichloroethylene (DDE) before removal.			√	
Phase 2: 3.16-b(1)	**Ensure that Contaminants Are Not Present at Unacceptable Levels on the Yuki Farms Site Near the Location of Project Construction Activities** Before the start of any construction activities on the Sacramento County–owned property known as "Yuki Farms," SAFCA shall ensure that (1) any issues of documented soil or groundwater contamination on the property have been resolved by Sacramento County in accordance with federal, state, and local requirements; or (2) a qualified hazardous materials specialist, through soil and groundwater testing, has determined that any previously documented contamination site on the property is sufficiently distant from areas of project-related disturbance to ensure that hazardous materials at the site will not be encountered during construction activity and would not migrate into water carried in the new canals and pose a threat to the safety of construction workers, the general public, or the environment.		√		
	Dunmore Borrow Site (APN 201-0120-031): Properly abandon wells, in accordance with applicable Federal, state, and local requirements, if found within the site and determined to be no longer needed.			√	
	Brookfield Borrow Site (APN 35-080-021): ▸ Properly dispose of buckets containing waste found on-site at a licensed disposal facility.			√	
	APNs 201-0150-040, 201-0150-041, 201-0150-042:				
	▸ Obtain requirements from State of California Department of Oil, Gas, and Geothermal Resources (DOGGR) for construction activities near the dry hole.				

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▸ Investigate the presence of an underground conveyance pipeline that may be present on the Shell Oil easement and if found, coordinate with the owner to avoid or minimize impacts on said pipeline during construction activities, or relocate the pipeline if it is determined to be necessary.			√	
	APNs 201-0150-055, 201-0140-059:				
	▸ Consult with DOGGR and the gas well lease holder if the idle gas well would be disturbed during construction activities; if so, then implement all recommendations for safe project operations as provided by DOGGR following the initial consultation.			√	
	▸ Confirm the presence of water wells and septic systems and perform appropriate actions to abandon them in accordance with state and local requirements.				
	APN 201-0270-028:				
	▸ Complete a Phase II ESA to determine the presence of lead contamination associated with petroleum products.			√	
	▸ Determine if the former underground storage tanks (USTs) are located on site, and if they have been properly abandoned and/or removed.				
	APN 201-0270-048:				
	▸ Complete a Phase II ESA to determine if the damaged automotive battery observed on site has contaminated soil.			√	
	APN 201-0280-037:				
	▸ Determine if a 100-gallon UST is located on site. If it exists, confirm proper abandonment practices.			√	
	APN 201-0280-044:				
	▸ Complete a Phase II ESA to determine elevated concentrations of chemicals remain on site.			√	

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	Sites with Historical Agricultural Use: ▸ Conduct a limited sampling program (Phase II ESA) to analyze concentrations of organochlorine pesticides, organophosphorous pesticides, chlorinated herbicides, and selected metals residues. ▸ Investigate presence and location of asbestos-containing irrigation pipes. ▸ Implement all feasible remedial action recommendations contained in the Phase II ESA.			√	
Phase 1: 3.15-a **Phase 2: 3.16-b(2)**	**Prepare a Worker Health and Safety Plan, and Implement Appropriate Measures to Minimize Potential Exposure to Unknown Hazardous Materials**				
	If, during site preparation and construction activities, previous undiscovered or unknown evidence of hazardous materials contamination is observed or suspected through either obvious or implied site characteristics (e.g., stained or odorous soil), construction activities shall immediately cease in the area of the find. A qualified hazardous materials specialist shall assess the construction site and shall collect and analyze soil samples, if needed, from the site. If contaminants at unacceptable levels are identified in the samples, SAFCA or its primary construction contractor shall implement measures in accordance with federal and state regulations before beginning construction activities. SAFCA shall require all contractors to prepare a worker health and safety plan before the start of construction activities. This plan shall identify, at a minimum, all contaminants that could be encountered during construction activity; all appropriate worker, public health, and environmental protection equipment and procedures to be used during project activities; emergency response procedures; the most direct route to the nearest hospitals; and a site safety officer. The plan shall describe actions to be taken should hazardous materials be encountered on-site, including protocols for handling hazardous materials and preventing their spread and emergency procedures to be taken.	√	√		

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Phase 3: 4.18-b(2) Phase 4a: 4.15-b(2)	**Complete Investigations Related to the Extent to Which Soil and/or Groundwater May Have Been Contaminated in Areas Not Covered by the Phase I and/or II ESAs and Implement Required Measures (e.g., Site Management and/or Other Contingency Plans)**				
	For parcels that will be used for borrow activities or where earthmoving activities would occur, SAFCA shall ensure that the contractor complete the following prior to start of construction and earthmoving activities:				√
	▸ Prepare a site management plan, subject to SAFCA review and approval that contains protocols and procedures for excavation, use, disposal, and handling of soil containing pesticide residues or contaminants, and for identifying possible contamination during construction. The plan shall include measures for the safe transport, use, and disposal of pesticide residue impacted soil and building debris removed from the site. Soil reuse may include: containing portions of the affected topsoil within the core of seepage berms, with an overlay of clean soil to prevent surface runoff caused by rainfall erosion on the topsoil materials; rip, mix, and/or amend affected topsoil that is re-spread onto borrow sites, levee, and/or berm surfaces, to provide a plant growth medium and reduce the concentration of pesticide residues in the soil; establish native perennial grasses and other perennial vegetation cover (e.g., hay, alfalfa) on these planted surfaces to reduce sediment runoff that may be caused by rainfall erosion or surface irrigation; and improve the drainage of agricultural lands used as borrow/mitigation sites to reduce ponded water and minimize the discharge of sediments into nearby drainages. In the event that impacted groundwater is encountered during site excavation activities, the contractor shall report the chemical concentrations to the appropriate regulatory agencies, dewater the excavated area, and treat the groundwater to remove the chemicals before discharge. The contractor shall be required to comply with applicable Federal, state, regional, and local laws. The plan shall outline measures for specific handling and reporting procedures for hazardous materials and disposal of hazardous materials removed from the site at an appropriate off-site disposal facility. The plan shall include, but shall not be limited to: delineations of the horizontal and vertical extent and concentration of soil contamination; a list				√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	of required monitoring equipment to be onsite during soil excavation (e.g., an air quality meter shall be used at the fenceline during dust-producing activities); sampling and analysis protocol for additional soil investigations; a list of necessary agencies to be contacted if chemical concentrations in water, air, and/or soil exceed set threshold limits; and a list of necessary permits, reports, or other compliance mechanisms.				
	▸ Retain an industrial hygienist to prepare a construction worker health and safety plan. The construction worker health and safety plan shall include, but not be limited to: personal protective equipment for workers, a delineation of the horizontal and vertical extent of elevated arsenic levels, a list of required monitoring equipment to be on-site during contaminated soil excavation (e.g., air quality meter), and proper procedures in the event that stained soil is encountered.				√
	▸ Retain a qualified professional to conduct an ecological risk assessment on sites found to contain levels of contaminant exceeding pertinent ecological risk levels. The ecological risk assessment shall include, but not be limited to: potential chemicals of concern, biological characterization of the site, identification of potential exposure pathways, ecological receptors, and recommendations for and implementation of remediation, where feasible and practicable.				√
	▸ Retain an air quality specialist to monitor the concentration of particulates of concern in the air at the project fenceline, adjacent to residential property to ensure compliance with Federal, state, regional, and local regulations, to the extent feasible and practicable. Airborne particulate monitoring should be performed in the on-site worker's breathing zone using the Particulate Not Otherwise Specified (NOS) concentrations standard of 5 mg/m^3 as well as at the project boundaries using the Fenceline Particulate NOS goal of 0.3 mg/m^3.				√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▲ Retain a licensed contractor to remove USTs, ASTs, and stained soils in accordance with applicable Federal, state, regional, and local regulations.				
	▲ Retain a licensed contractor to remove and dispose of asbestos cement pipe found within the project area in accordance with applicable Federal, state, regional, and local regulations.				
	▲ Retain a licensed contractor to remove septic systems, water wells, and other underground structures, as needed, in accordance with applicable Federal, state, regional, and local regulations.				
	▲ Retain an asbestos specialist who is certified by the California Occupational Safety and Health Administration (Cal/OSHA) The asbestos specialist shall investigate whether asbestos-containing materials or lead-based paints are present before demolition of on-site buildings and utilities. If materials containing asbestos or lead are found, they shall be removed by an accredited contractor in accordance with EPA and Cal/OSHA standards. In addition, activities (construction or demolition) in the vicinity of these materials shall comply with Cal/OSHA asbestos and lead worker construction standards. The materials containing asbestos and lead shall be disposed of properly at an appropriate off-site disposal facility.			√	√
	▲ Obtain an assessment conducted by the Sacramento Municipal Utility District and/or Pacific Gas & Electric Company pertaining to the contents of the existing pole-mounted transformers that would be relocated as part of the Phase 4a Project. The assessment shall determine whether existing on-site electrical transformers contain polychlorinated biphenyls (PCBs) and whether there are records of spills from such equipment. If equipment containing PCBs is identified, the maintenance and/or disposal of the transformer shall be subject to the regulations of the Toxic Substances Control Act under the authority of the Sutter County Environmental Health Division and Sacramento County Environmental Management Department.			√	√
	▲ Identify oil and gas well locations. Prepare and implement a California Department of Oil, Gas, and Geothermal Resources well review program, if necessary.				√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▲ Notify the appropriate Federal, state, regional, and local agencies, as required, if evidence of previously undiscovered soil or groundwater contamination (e.g., stained soil, odorous groundwater) is encountered during construction activities. Areas with chemical concentrations exceeding regulatory levels shall be cleaned up in accordance with recommendations made by the Sutter County Environmental Health Division, Sacramento Environmental Management Department, Central Valley RWQCB, DTSC or other appropriate Federal, state, regional, or local regulatory agencies as generally described above.			√	√
Phase 3: 4.18-b(2)	▲ Conduct Phase I ESAs, and if necessary, Phase II ESAs, and/or other appropriate testing and include, as necessary, analysis of soil and/or groundwater samples for the potential contamination sites that have not yet been covered by previous investigations before construction activities begin. Similar appropriate testing for borrow sites selected within the Elkhorn Borrow Area shall be completed before any earth-moving activities. Recommendations in the Phase I and II ESAs to address any contamination that is found shall be implemented before initiating ground-disturbing activities in these areas.			√	
	Implement the following measures before ground-disturbing or demolition activities begin within each project phase to reduce health hazards associated with potential exposure to hazardous substances:			√	

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	▲ Prepare a site plan that identifies any necessary remediation activities appropriate for proposed land uses, including excavation and removal of on-site contaminated soils, and redistribution of clean fill material on the project site. The plan shall include measures that ensure the safe transport, use, and disposal of contaminated soil and building debris removed from the site. In the event that contaminated groundwater is encountered during site excavation activities, the contractor shall report the contamination to the appropriate regulatory agencies, dewater the excavated area, and treat the contaminated groundwater to remove contaminants before discharge into the sanitary sewer system. The contractor shall be required to comply with the plan and applicable Federal, state, and local laws. The plan shall outline measures for specific handling and reporting procedures for hazardous materials and disposal of hazardous materials removed from the site at an appropriate off-site disposal facility.			√	
Phase 4a: 4.15-c	**Review Design Specifications and Prepare and Implement an Impact Avoidance and contingency Plan in Consultation with Wickland Pipelines, LLC** Prior to issuance of construction contract bid requests for the Phase 4a Project, SAFCA and its engineering and design consultants shall ensure that Wickland Pipelines, LLC has approved design specifications and impact avoidance and safety measures for construction activities within 50 feet of the jet fuel pipeline (CCR Title 8, Section 1541). Construction specifications to be approved with Wickland Pipelines, LLC include, but are not limited to, the type of construction and equipment (e.g., bulldozers, graders, excavators) and the location and depth of earth-moving activities near the pipeline (i.e., 50 feet). All excavation and construction in the vicinity (i.e., 50 feet) of the jet fuel pipeline shall be undertaken in strict conformity with the most recent version of the Best Practice of the Common Ground Alliance available.				√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	Prior to the start of earthmoving activities, an impact avoidance and contingency plan shall be prepared and implemented by SAFCA in consultation with Wickland Pipelines, LLC. The plan shall include, but shall not be limited to: ▸ a contingency plan for actions to take in the event of damage to the pipeline or release of jet fuel, which shall include chain of command and notification procedures, worker safety, pipeline security, wildlife care, response procedures, necessary permits for response actions, and waste handling and disposal; ▸ a worker health and safety plan and worker training that shall consider personal protective equipment, operations safety within 50 feet of the pipeline, and a contact list for reporting and obtaining medical service; and ▸ a method to provide the Airport with jet fuel in the event that the pipeline incurs substantial damage. Agreements made between SAFCA, SAFCA's contractor, and Wickland Pipelines, LLC shall be in compliance with applicable Federal and state regulations (e.g., Hazardous Liquid Pipeline Safety Act, Pipeline Safety Improvement Act of 2002, Cal OSHA regulations).				√
Phase 2: 3.16-e Phase 3: 4.18-c Phase 4a: 4.15-d	**Notify State and Local Emergency Management Agencies about Project Construction and Coordinate Any SR 99/70 Detours with these Agencies to Ensure That Any Need for Emergency Use Is Not Significantly Impaired**		√	√	√
	(a) SAFCA shall implement [Phase 2 Project] Mitigation Measures 3.10-a, 3.10-b, and 3.10-c.		√		
	(b) During project design, SAFCA shall coordinate with Caltrans to plan detours through the NCC south levee construction area at SR 99/70 that will ensure an acceptable flow of traffic through this area.		√		

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	(c) Before the beginning of construction, SAFCA shall notify the California Highway Patrol and the Sutter County, Sacramento County, and City of Sacramento emergency management agencies of the timing and nature of detours and traffic controls required on SR 99/70 during project construction. SAFCA shall coordinate with these agencies and Caltrans to ensure that information on potential traffic delays and impairment of the use of this highway as an emergency evacuation route are appropriately publicized, as determined necessary by these agencies.		√		
	SAFCA shall implement [Phase 3 Project] Mitigation Measure 4.12-a to avoid impairment of the use of SR 99/70 as an emergency evacuation route.			√	
	SAFCA shall implement [Phase 4a Project] Mitigation Measures 4.10-a and 4.10-c, set forth in Section 4.10, "Traffic and Circulation" to avoid impairment of the use of SR 99/70 as an emergency evacuation route.				√
Phase 3: 4.18-d Phase 4a: 4.15-e	**Notify the Natomas Unified School District and Applicable Schools with Jurisdiction within One-Quarter Mile of Project Construction Activities** SAFCA shall provide written notification of the project to each of the affected schools and the Natomas and Twin Rivers Unified School Districts within 30 days prior to certification of this EIS/EIR and shall consult with the Natomas and Twin Rivers Unified School Districts regarding the potential impacts on schoolchildren from hazards associated with project implementation.			√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Phase 2: 3.16-c Phase 3: 4.19-a Phase 4a: 4.15-f	**Coordinate Work in the Critical Zone with Airport Operations and Restrict Night Lighting Within and Near the Runway Approaches** ▸ No borrow activities shall be conducted within the Airport Critical Zone during nighttime hours. ▸ All project-related nighttime lighting that is in, or is aligned with, the Airport runway approach zones (Natomas Cross Canal south levee Reaches 1–4, and Sacramento River east levee Reaches 1–11B) shall be directed downward to avoid potential interference with nighttime aircraft operations. ▸ SAFCA shall ensure that the SCAS is informed in advance of the timing and nature of all construction activities within the Airport Critical Zone, and shall coordinate with SCAS during final project design to ensure that all appropriate safety precautions within the Airport Critical Zone are incorporated into the construction plans.		√	√	√
	▸ Additionally, requirements provided by the Federal Aviation Administration (FAA), not incorporated into this document, shall be followed. ▸ SAFCA shall submit the FAA form 7460-1, Notice of Proposed Construction or Alteration, which notifies the FAA of construction or alteration that might affect navigable airspace. This form must be submitted to the FAA at least 30 days before the earlier of the following dates: (1) the date the proposed construction or alteration is proposed to begin, or (2) the date an application for a construction permit is to be filed.			√	√

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Phase 2: 3.16-d	**Implement Measures to Avoid Substantial Increases in Hazardous Wildlife within the Critical Zone or Wildlife Collisions with Aircraft** A qualified biologist, retained by SAFCA, shall conduct a wildlife-aircraft strike analysis to determine to what extent the proposed project could increase the potential for wildlife collisions with aircraft, and how the project could be modified to reduce any potential increase in wildlife collisions. The analysis, which shall be completed as part of project design of Airport borrow sites and of woodland plantings within the Critical Zone (2009–2010 construction), shall include the following: ▸ A summary of existing information on wildlife-aircraft strikes at the Airport, relevant research conducted at the Airport and other airports in the United States, and a description of the sources of uncertainty resulting from insufficient data. ▸ A comparison of current land use and habitat types in the Natomas Basin with anticipated land use changes over the next 20 years (i.e., the period covered by the Airport's master plan). The purpose of this analysis will be to predict how anticipated land use changes will influence the diversity, abundance, and distribution of hazardous wildlife in the vicinity of the Airport. Particular attention will be given to analyzing potential effects of implementing the proposed project on hazardous wildlife populations. ▸ An analysis of the anticipated effects of project implementation on the frequency and patterns of wildlife-aircraft strikes at the Airport. ▸ Mitigation options, including alternative designs for habitat compensation sites, on-site versus off-site mitigation opportunities, and monitoring and adaptive management options that could be implemented if it is determined that the overall project could result in a no net increase of risk to aircraft. If the wildlife-aircraft strike analysis concludes that implementation of project elements proposed for construction in 2009–2010 would not result in an increase the potential for wildlife collisions with aircraft, no further mitigation is necessary.		√		

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
	If the wildlife-aircraft strike analysis concludes that project elements proposed for construction in 2009–2010 could increase the potential for wildlife collisions with aircraft, SAFCA shall implement the following mitigation: ▸ SAFCA, in consultation with SCAS and the FAA, shall design and implement mitigation and/or modify the proposed project as needed until it is determined by SCAS and the FAA that the proposed project would not substantially increase the risk of wildlife collisions with aircraft		√		
Phase 2: 3.16-f **Phase 3: 4.20-a** **Phase 4a: 4.15-h**	**Prepare and Implement a Fire Management Plan to Minimize Potential for Wildland Fires** SAFCA and its primary contractors for engineering design and construction shall prepare and implement a fire management plan in coordination with the appropriate emergency service and/or fire-suppression agencies of the applicable local jurisdictions before beginning project construction. The plan shall describe fire prevention and response methods, including fire precaution, presuppression, and suppression measures that are consistent with the policies and standards of the affected jurisdictions. All materials and equipment required for implementation of the plan shall be maintained on-site. All construction personnel shall be made familiar with the contents of the plan before construction activities begin.		√	√	√
Phase 3: 4.20-a	The plan shall be amended, as appropriate, upon selection of borrow sites within the Elkhorn Borrow Area.			√	

Summary of Mitigation Measures Adopted in Connection with the Natomas Levee Improvement Program, Phase 1–4a Landside Improvements Projects

Project Phase and Mitigation Measure No.	Mitigation Measure	Phase 1 Project	Phase 2 Project	Phase 3 Project	Phase 4a Project
Environmental Justice					
Phase 3: 4.21-a **Phase 4a: 4.16-a**	**Increase the Direct Benefits of the Project for the Ancestors of the Native American Tribes** As part of the Phase 4a Project, SAFCA proposes to acquire various properties in the Natomas Basin as compensation for the project's potential impacts, as required under Federal and state laws. As part of the process for restoring these lands, SAFCA shall implement the following measures to address environmental justice and increase the direct benefits to the ancestors of the Native American tribes that would bear disproportionate adverse effects: ▸ consult with appropriate Native American representatives to identify plant species of value for traditional cultural uses; ▸ consult with Native American representatives to identify traditional cultural activities that could occur on these lands, consistent with habitat conservation and safety objectives; ▸ to the extent feasible, include identified plant species in the planting palettes developed for habitat conservation; ▸ to the extent feasible, establish easements or other protective measures on these properties that include access for appropriate Native American representatives for plant gathering and other traditional cultural activities; and ▸ where feasible, also provide access to appropriate Native American representatives to the river front on acquired parcels that have access to the Sacramento River, provided that access does not permit the construction of physical structures on the levee, beaches, or in the river without prior approval from the appropriate regulatory agency.			√	√

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APPENDIX C

Hydraulics and Hydrology

C1 Summary Report on Hydraulic Impact Analyses, Phase 4b Project (MBK Engineers)

SACRAMENTO AREA FLOOD CONTROL AGENCY

NATOMAS LEVEE IMPROVEMENT PROGRAM

SUMMARY REPORT ON HYDRAULIC IMPACT ANALYSES

PHASE 4B PROJECT

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Prepared for

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1. OVERVIEW

The Sacramento Area Flood Control Agency (SAFCA) is proposing to raise and strengthen portions of the federal project levee system protecting the Natomas Basin in Sacramento and Sutter Counties in order to provide urban development in the basin with at least a 100-year level of flood protection as quickly as possible, while laying the groundwork for providing at least a 200-year level of flood protection over time. This effort is referred to as the Natomas Levee Improvement Program (or "NLIP"). It is part of a larger program of improvements, including modifications to Folsom Dam that would provide the Sacramento area as a whole with at least a 200-year level of flood protection.

Under applicable federal law, no federal project levee or related flood control facility may be altered unless: Congress has authorized the alteration; or, pursuant to 33 U.S.C. 408, the Secretary of the Army acting through the Chief of Engineers of the U.S. Army Corps of Engineers ("USACE") has granted permission for the alteration based on a determination that the proposed work will not be injurious to the public interest and will not otherwise impair the usefulness of the affected facility. Under Title 23 of the California Water Code, such alterations must also be either authorized by the State Legislature, or permitted by the California Central Valley Flood Protection Board ("Board"), formerly the Reclamation Board. In order to coordinate these federal and state decision-making processes, the Board's recent practice has been to issue a letter to the USACE requesting permission for proposed alterations after the Board has made its own determination that the work will not have a detrimental impact on the affected flood control system.

At the heart of both processes is an analysis of the hydraulic effects of the proposed alteration. SAFCA has historically conducted this analysis by evaluating the potential effects of its levee improvement projects on water surface elevations in the stream and river channels in the project area and in the larger watershed within which the project is situated. This approach was used to evaluate the flood related impacts of the NLIP for purposes of meeting the requirements of the California Environmental Quality Act (CEQA). Specifically, SAFCA's engineering consultant, MBK Engineers ("MBK"), has used a UNET hydraulic computer model of the Sacramento River Flood Control Project ("SRFCP"), which was reviewed and approved for use for this project in 2006 by the USACE Sacramento District, to compare existing conditions in the waterways surrounding the Natomas Basin and in the larger SRFCP with and without the NLIP improvements and the other improvements comprising the 200-year flood protection program for the Sacramento area. MBK's initial routings assumed that the levees outside the project area would fail when overtopped. However, in order to test the sensitivity of this assumption, a later set of routings was performed assuming that none of these levees would fail even if overtopped.

The results of the initial routings were presented in the program-level Environmental Impact Report ("EIR") on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area, which was certified by the SAFCA Board of Directors in February 2007. Using the same methodology, the analysis was performed again and presented in the Draft EIR for the NLIP Landside Improvements Project in September 2007. The 'no levee failure' routings were performed thereafter and presented in the Landside Improvements Final EIR, which was certified by the SAFCA Board in November 2007. The modeling showed that the

proposed NLIP improvements by themselves would not significantly increase any of the identified water surface elevations in the river channels comprising the SRFCP. Moreover, when the NLIP improvements are analyzed as part of the larger 200-year flood protection program for the Sacramento area, including modifications to Folsom Dam, the result is a lowering of water surface elevations for the 100-year and 200-year floods along the lower Sacramento River for most of the reach adjacent to the Natomas Basin. On this basis, SAFCA has concluded that the NLIP improvements would not cause any significant hydraulic impacts.

2. SRFCP SYSTEM BACKGROUND

The perimeter levee system around the Natomas Basin is part of a larger integrated system of levees, dams, and bypass channels comprising the SRFCP (Figure 1). This system encompasses six historic flood basins in the Sacramento Valley (Butte, Colusa, Sutter, Feather, Yolo, and American Flood Basins) and the sub-basins contained therein. Planning, design, and construction of the SRFCP has been ongoing since the early 1900s under the leadership of the USACE and the State of California (State), with local levee and reclamation districts playing a principal role in operating and maintaining the system.

The SRFCP levees were set close to the river channel in order to improve navigation by having the rivers scour hydraulic mining sediments. The design of the system assumed no levee failures, but included five engineered diversions and one natural overflow diversion. The natural diversion is to Butte Basin, which is at the head of the SRFCP levees. This diversion did not include flowage easements because the Butte Basin is a historic flood basin. The five engineered diversions include two additional diversions to Butte Basin (Moulton and Colusa Weirs), one diversion to the Sutter Bypass (Tisdale Weir), and two diversions to the Yolo Bypass (Fremont and Sacramento Weirs). All of the engineered diversions included the acquisition of property rights to support the diversions. The deliberate planning, construction, and maintenance of the diversions ensured that they would function during flood conditions and serve as reliable features of the flood project.

Initially, the river channel and bypass levees in each segment of the system were constructed based on a standard geometry. The levees were designed with a predetermined freeboard allowance tied to specified flows and associated water surface elevations, generally matched to the 1907 and 1909 floods, adjusted for loss of floodplain storage by construction of the SRFCP. Over time, the standard levee section was increased because of numerous levee failures. The minimum standard levee changed from a levee with a top width of 10 feet to one with a top width of 20 feet. In addition, the design flows were modified substantially on the Feather and American Rivers. This was the result of floods that occurred after 1909, which demonstrated these rivers could produce substantially greater flows than occurred during the 1907 and 1909 floods. Because numerous levee failures occurred along the Feather River levees between 1920 and 1934, these levees were set back and enlarged to accommodate greater flows. These changes were summarized in memorandums issued by the USACE which define the minimum freeboard requirements for each segment of the SRFCP, collectively referred to as the "USACE 1957 Profile." Over the years, the capability of the SRFCP to provide higher levels of flood protection was greatly expanded by the construction of five major multiple-purpose reservoirs

(Shasta, Black Butte, Oroville, New Bullards Bar, and Folsom Reservoirs), containing 2.7 million acre-feet of flood control storage space.

The record floods of 1986 and 1997 triggered additional system modifications. Although these floods were significantly larger than the 1907 and 1909 floods, the availability of reservoir storage largely prevented flows in the system from exceeding the design of the SRFCP. Nevertheless, numerous project levees experienced unexpectedly severe stress and some failed. This experience caused the USACE, the State, and their local partners to perform a series of geotechnical evaluations on the SRFCP levees and to adopt new, more rigorous levee design standards, including updated standards for seepage through and under project levees. To meet these standards, USACE, the State, and local flood control agencies have made substantial investments in addressing identified deficiencies in levees throughout the SRFCP and in improving the level of flood protection provided by the levees, particularly in urban areas. Federal, State and local support for these levee improvements has been secured under several federally authorized projects, including the Sacramento Urban Levee Reconstruction Project, the American River Watershed Investigation, the West Sacramento Levee Improvement Project, and the Yuba River Basin Project. In the aftermath of the flooding of New Orleans, these authorized projects are being expanded to support an even broader scope of urban levee improvement activity.

The evolution of these urban levee improvements is occurring within a SRFCP management framework that has historically allowed necessary adaptations to the system without undermining its basic operational principles. These principles may be summarized as follows. First, the SRFCP is not intended to provide a uniform level of flood protection (statistical probability of flooding) to the various sub-basins within the protected area. Rather, each sub-basin is protected by levees that are required to at least meet the SRFCP minimum geometrical standards, including freeboard reflecting the water surface profile prescribed for that segment of the system. Second, each sub-basin's flood protection is dependent on the fitness of its own levees and not on the condition (or failure) of any other sub-basin's levees. Accordingly, each sub-basin has the right to keep its levees in the fittest possible condition to ensure that these levees will perform as reliably as possible in a flood. This right ensures the orderly operation and maintenance of the system since even the most modest levee work has the potential to trigger a "transfer of risk" from one sub-basin to another, at least in theory; and there are no data or modeling tools available to quantify such transfers of risk, assess their significance, or determine how they might be mitigated. Third, for this reason, the administration of the SRFCP has historically relied on "change in design water surface elevation" as the guideline for evaluating the effects of any proposed levee work.

The strictest scrutiny is given to levee work involving physical changes in the geometry of the river channel since these changes have the most potential to alter water surface elevations prescribed by the SRFCP design water surface profiles (SRFCP 1957 profiles). This work includes placement of fill or construction of structures in the floodway, construction of new levees, relocation of existing levees, excavation within the floodway, construction of large berms for protecting riverbanks, raising an existing levee, construction of a new bypass, and planting of vegetation within the floodway. Landside levee work of the type proposed as part of the NLIP, such as placing a cutoff wall in a levee, adding a seepage berm to a levee, placing a field of

seepage relief wells along a levee, raising a levee, widening a levee (increased top width), and relocating a seepage ditch, is also strictly scrutinized; but is not likely to cause impacts.

The standard procedure for this evaluation is to use hydrologic and hydraulic computer modeling tools such as, HEC-1, HEC-2, UNET, HEC-RAS, RMA2, FESWMS, etc. The analysis consists of calibrating the hydraulic model to historic flood events using high-water marks and stream gage data. The calibration activity is normally conducted on a system-wide basis instead of a site-specific basis. However, data available for computer model calibration can be sparse or nonexistent. In addition, assumptions must be made regarding reservoir operations. Because all of the reservoirs that contribute to the operation of the SRFCP (Shasta, Black Butte, Oroville, New Bullards Bar and Folsom) are governed by water control manuals issued by USACE, current reservoir operations are assumed to continue except where it is reasonably foreseeable that the current operation would change. Examples of such changes are at the Folsom Dam and Reservoir: where Congress has directed USACE to formalize the variable space storage operation that has been in effect by agreement between SAFCA and the U.S. Bureau of Reclamation since 1995; and where water control structures are being modified as part of the Folsom Dam Joint Federal Project.

3. APPROACH TO MODELING ANALYSIS

As discussed above, in order to evaluate the hydraulic impacts of the levee alterations proposed as part of the NLIP, MBK used a UNET hydraulic computer model calibrated to historic flood events using high-water marks and stream gage data gathered in connection with the 1997 Flood. The UNET model is a one-dimensional, unsteady flow hydraulic model. It characterizes the hydraulic capacity of the system by use of channel and bypass cross-sections, most of which are positioned every ¼ mile throughout the system. Figure 2 displays the geographical extent of the UNET model. Figure 3 provides the UNET model river mile stationing around the Natomas Basin. Results of the model calibration are shown in Figures 4 through 7.

The hydraulic impacts of the levee alterations proposed as part of the NLIP were evaluated based on the potential of the proposed levee alterations to increase one or more of the SRFCP's recognized design water surface elevations: (1) the SRFCP 1957 water surface profiles that serve as the minimum design standard for the SRFCP; (2) the 100-year flood elevations that govern management of SRFCP protected floodplains under the National Flood Insurance Program (33 CFR. 65.10); and (3) the 200-year water surface elevations that are likely to govern implementation of floodplain management standards recently adopted by the State Legislature (Statutes of 2008, Chapter 364 [adding Water Code Section 9602(i)]). In addition, SAFCA has provided information on the project impacts to the 500-year flood elevation. This flood represents an extreme flood event and is the largest flood event for which hydrologic input data has been developed for the hydraulic simulation model.

The modeling runs compare the "Existing", "Without Project" and "With Project" conditions under each of the above flood scenarios. The Existing Condition analysis provides an evaluation of the levee and reservoir system as it exists in December 2009. The Without Project condition assumes implementation of federally authorized improvements to Folsom Dam and anticipated

improvements to the levees protecting existing urban areas outside the Natomas Basin (American River Basin, West Sacramento, Yuba Basin, and Sutter Basin) so as to provide these areas with 200-year flood protection. The With Project condition adds the improvements proposed as part of the NLIP to the Without Project condition. The NLIP improvements consist of levee raises on the Sacramento River, Natomas Cross Canal, PGCC, and NEMDC in the locations shown in Figure 3. The magnitude of the levee raise is shown in the levee profile plots provided in Figures 8 through 11. All fill related to the levee raises would occur on the landside of the levees with the exception of an approximately one mile reach of the Natomas Cross Canal where some waterside fill would be required. Figure 12 shows a typical section showing the waterside fill. The low spots in the PGCC levee at Howsley Road and Sankey Road (see Figure 10) are not raised and are assumed to retain their existing configurations in the With Project condition. The levee raising that is part of the Phase 4B EIS/EIR is located on the PGCC and NEMDC, as shown in Figures 3, 10 and 11. The with project condition also includes shaded riverine aquatic habitat mitigation on the Sacramento River from river mile 79.2 to river mile 77.75, erosion repair and rock bank protection at three locations on the PGCC and two locations on the NEMDC, and low flow channel realignment in the NEMDC at Interstate 80. The shaded riverine aquatic habitat mitigation, which consists of increased bank vegetation, was modeled by increasing the bank Manning's n roughness coefficient from 0.045 to 0.10. The PGCC erosion repair was not included in the hydraulic model since it is in an area that is controlled by backwater from the Sacramento River during large flood events, and therefore, would not affect the peak flood stages on the PGCC. The NEMDC erosion repair sites, which include rock berms along the low flow channel, were modeled by modifying the affected cross-sections as shown in Figures 13 and 14. The low flow channel realignment was not included in the hydraulic model since it would not change the cross-sectional area of the NEMDC, and therefore, would not affect the hydraulic capacity of the NEMDC.

In order to compare these conditions, assumptions about the performance of SRFCP levees under flow conditions that exceed the design of the levee system are necessary for the 100-year, 200-year, and 500-year floods. At the request of the USACE, the hydraulic impact analysis assumed that levees would overtop without failing. For comparison purposes, an additional analysis was completed to show impacts with the assumption that levee failures would occur if water reaches the top of levee. The assumptions supporting these modeling scenarios are summarized in Table 1.

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Table 1. Definition of Model Assumptions for Various Conditions			
Condition	**Top of Levee Assumption**	**Levee Failure Assumption**	**Reservoir Ops Assumption**
Existing	Existing top of levee grade December 2009 (including California Levee Database information)	Levees overtop without failing.	Existing reservoirs and current (2009) operation criteria
Without Project	Same as Existing with the following changes. Urban area levees outside the Natomas Basin are assumed to have levees at 200-year water surface + 3 feet of freeboard. NLIP levees same as Existing Condition.	Levees overtop without failing.	Same as Existing except Folsom Dam will be operated in accordance with the Joint Federal Project currently under construction
With Project	Same as Without Project except NLIP levees raised to design level	Levees overtop without failing.	Same as Without Project
Sensitivity Analysis - Existing	Same as Existing	Levees fail when water reaches top of levee.	Same as Existing
Sensitivity Analysis - Without Project	Same as Without Project	Levees fail when water reaches top of levee.	Same as Without Project
Sensitivity Analysis - With Project	Same as With Project	Levees fail when water reaches top of levee.	Same as Without Project

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As noted above, the Without Project condition assumes that urban areas (outside the Natomas Basin) will be provided with 200-year protection. This is the most likely near term future condition of the levee system based on the information currently available. This condition is reasonable based on California voters' November 2006 approval of a bond measure that would provide over $3 billion for urban levee improvements in the Central Valley. Additionally, in September 2007, the State Legislature enacted the Central Valley Flood Protection Act of 2008 (Act), Water Code Section 9600 et seq., which was signed into law by the governor in October 2007. The Act is based on the following findings:

- The Central Valley of California is experiencing unprecedented development, resulting in the conversion of historically agricultural lands and communities to densely populated residential and urban centers.

- The legislature recognizes that by their nature, levees, which are earthen embankments typically founded on fluvial deposits, cannot offer complete protection from flooding, but can decrease the frequency of flooding.

- The legislature recognizes that the level of flood protection afforded rural and agricultural lands by the original flood control system would not be adequate to protect those lands if they are developed for urban uses, and that a dichotomous system of flood protection for urban and rural lands has developed through many years of practice.

- The legislature further recognizes that levees built to reclaim and protect agricultural land may be inadequate to protect urban development unless those levees are significantly improved.

- Cities and counties rely upon federal floodplain information when approving developments, but the information available is often out of date and the flood risk may be greater than that indicated using available federal information.

- The legislature recognizes that the current federal (FEMA) flood standard is not sufficient for urban and urbanizing areas within flood prone areas throughout the Central Valley.

(Statutes of 2007, Chapter 364, Section 9.)

Based on these findings, the Act embraces a new flood protection standard for urban areas (defined as "developed areas in which there are 10,000 residents or more") located in levee-protected floodplains in the Central Valley. This new "urban level of flood protection" is defined as "the level of protection that is necessary to withstand flooding that has a 1-in-200 chance of occurring in any given year using criteria consistent with, or developed by, the Department of Water Resources." (Statutes of 2007, Chapter 364 [adding Water Code Section 9602(i)]).

4. RESULTS OF MODELING ANALYSIS

The flood routings described herein indicate that under the Existing condition, all SRFCP levees would contain the SRFCP 1957 design flood profile. The 100-year flood would overtop some non-urban levees, but this flood would be contained by all urban levees under the Existing condition. The 200-year flood would generate multiple levee overtopping locations in several non-urban areas under both the Existing and Without Project conditions and along the Lower American River under the Existing condition. However, this flood would be effectively contained under both the Existing and Without Project conditions by all existing urban levees outside the American River basin, including the levees around the Natomas Basin. The 500-year flood would cause massive levee overtopping affecting all segments of the system under the Existing and Without Project conditions. Only West Sacramento and the Natomas Basin would avoid overtopping under these conditions with upstream levee failures. Table 2 provides a summary of the extent of levee overtopping in the Without Project condition simulations.

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Table 2. Extent of Levee Overtopping, Without Project Conditions, Levees Overtop Without Failing (all values approximate)

River	Leveed Length (miles)	Approximate Length of Overtopped Levee (miles)					
		Left Bank [a]			Right Bank [a]		
		100-yr	200-yr	500-yr	100-yr	200-yr	500-yr
American River	13	0	0	5.1	0	0	7.8
Feather River	50	0	0	5.9	0	0	7.5
Natomas Cross Canal	5	0	2.0	3.3	0.1	2.0	2.3
Sacramento Bypass	1.7	0	0	0	0	0	0.2
Sacramento R. upstream of Natomas Cross Canal	90	0	1.0	5.1	0.5	1.6	3.6
Sacramento R. Adjacent to Natomas	18	0	<0.1	2.3	0	2.6	3.5
Sacramento R. downstream of American R.	60	0	0.2	0.5	0	0	0.9
Sutter Bypass	30	0	1.4	2.0	0	2.4	3.9
Tisdale Bypass	4	0	0	1.4	0	0	2.0
Wadsworth Canal	4	0	0	0	1.6	1.9	2.9
Yolo Bypass	37	0	0.3	2.3	0	0	0

[a] Left and right bank reference based on downstream facing orientation.

Tables 3, 4 and 5 summarize the computed maximum water surface elevations at several locations in and around the project area for the Existing, Without Project, and With Project conditions for the 100-year, 200-year and 500-year flood events, respectively, for the levee overtop without failure condition.

Computed water surface elevation profiles for each of the key flow conditions in the project area (Sacramento River channel downstream of the Fremont Weir) are shown in Figures 15 through 30. Figures 15 through 18 show the relationship between the 1957 design and the height of the levees for the Sacramento River, Natomas Cross Canal, PGCC, and NEMDC, respectively. Figure 15 also shows the locations in which the non-urban Sacramento River west levee would be raised to meet the minimum freeboard requirements of the SRFCP 1957 design standard under the sensitivity analysis. Figures 19 through 22 show the profile of the current 100-year flood. Figures 23 through 26 show the profile of the 200-year design condition (no levee failure) flood. Figures 23 through 26 also show the likely 200-year water surface profile assuming upstream levee failures in non-urban areas. Figure 23 shows that the current height of the Sacramento River east levee along the Natomas Basin is essentially at the same elevation as the 200-year (no levee failure) design water surface profile and considerably higher than the likely water surface profile assuming upstream levee failures. It also shows the extent to which the Sacramento River west levee across from Natomas would be overtopped in a 200-year flood. Figures 27 through 30 show the profiles for the 500-year flood with upstream levee failures. The 500-year (with levee failures) water surface elevation in the Sacramento River channel is lower throughout the most critical portion of this reach than the 200-year (no levee failure) design water surface elevation. As reflected in Figures 27 through 30, under the likely assumption that upstream levees will fail when water reaches the top of the levee, the water surface elevations around Natomas would be dramatically lower than the 200-year (no levee failure) profile that was used for design of NLIP. This 200-year levee design condition thus represents a worst-case scenario for the Sacramento River and the Natomas Cross Canal, and underscores the high

degree of protection against Natomas Basin levee overtopping that would be provided by the design of the NLIP improvements.

Table 3. 100-year Maximum Water Surface Elevation Summary, Levees Overtop Without Failing

Location (Comp Stndy River Mile)	Maximum Water Surface Elevation (ft NAVD88)			Change (ft)	
	Existing	Without Project	With Project	Existing to Without Project	Without Project to With Project
Sacramento River					
at Knight's Landing (90.22)	44.55	44.53	44.53	-0.02	0
at Fremont Weir, west end (84.75)	42.60	42.56	42.56	-0.04	0
at Natomas Cross Canal (79.21)	43.44	43.38	43.39	-0.06	+0.01
at I-5 (71.00)	39.18	38.94	38.92	-0.24	-0.02
at Sacramento Bypass (63.82)	34.27	33.69	33.69	-0.58	0
at NEMDC (61.0)	34.81	34.25	34.24	-0.56	-0.01
at I St. (59.695)	34.54	33.97	33.96	-0.57	-0.01
at Freeport Bridge (46.432)	28.19	27.78	27.78	-0.41	0
Natomas Cross Canal					
u/s Hwy 99/70 (4.82)	43.50	43.44	43.45	-0.06	+0.01
Pleasant Grove Creek Canal					
at Sankey Rd. gap (SA25)	43.36	43.30	43.30	-0.06	0
at Fifield Rd. (1.475)	43.50	43.44	43.44	-0.06	0
at Howsley Rd. (0.41)	43.51	43.45	43.45	-0.06	0
Natomas East Main Drainage Canal					
at Elverta Road (10.402)	34.26	34.26	34.26	0	0
at Elkhorn Blvd. (8.352)	33.47	33.48	33.48	+0.01	0
at Main Ave. (6.09)	39.71	39.69	39.69	-0.02	0
at West El Camino Ave. (2.96)	36.85	36.18	36.18	-0.67	0
Feather River					
at Nicolaus Gage (8.00)	50.98	50.97	50.97	-0.01	0
Yolo Bypass					
at Woodland Gage (51.10)	35.59	35.48	35.48	-0.11	0
American River					
at H St. (6.471)	45.40	43.11	43.11	-2.29	0

Note: Water surface elevations originally calculated in NGVD29 vertical datum. Converted to NAVD88 by adding 2.3 ft. (0 NGVD29 = 2.3 NAVD88).

Table 4. 200-year Maximum Water Surface Elevation Summary, Levees Overtop Without Failing

Location (Comp Study River Mile)	Maximum Water Surface Elevation (ft NAVD88)			Change (ft)	
	Existing	Without Project	With Project	Existing to Without Project	Without Project to With Project
Sacramento River					
at Knight's Landing (90.22)	45.20	45.20	45.20	0	0
at Fremont Weir, west end (84.75)	44.04	44.02	44.03	-0.02	+0.01
at Natomas Cross Canal (79.21)	44.91	44.89	44.92	-0.02	+0.03
at I-5 (71.00)	40.66	40.35	40.35	-0.31	0
at Sacramento Bypass (63.82)	37.19	35.76	35.76	-1.43	0
at NEMDC (61.0)	37.97	36.34	36.34	-1.63	0
at I St. (59.695)	37.68	36.05	36.05	-1.63	0
at Freeport Bridge (46.432)	30.76	29.64	29.64	-1.12	0
Natomas Cross Canal					
u/s Hwy 99/70 (4.82)	44.94	44.92	44.95	-0.02	+0.03
Pleasant Grove Creek Canal					
at Sankey Rd. gap (SA25)	44.69	44.68	44.70	-0.01	+0.02
at Fifield Rd. (1.475)	44.89	44.88	44.90	-0.01	+0.02
at Howsley Rd. (0.41)	44.93	44.91	44.94	-0.02	+0.03
Natomas East Main Drainage Canal					
at Elverta Road (10.402)	38.25	38.23	38.33	-0.02	+0.10
at Elkhorn Blvd. (8.352)	38.11	38.09	38.19	-0.02	+0.10
at Main Ave. (6.09)	44.18	41.05	41.05	-3.13	0
at West El Camino Ave. (2.96)	42.28	38.44	38.44	-3.84	0
Feather River					
at Nicolaus Gage (8.00)	53.32	53.32	53.32	0	0
Yolo Bypass					
at Woodland Gage (51.10)	36.93	36.87	36.88	-0.06	+0.01
American River					
at H St. (6.471)	49.61	46.72	46.72	-2.89	0

Note: Water surface elevations originally calculated in NGVD29 vertical datum. Converted to NAVD88 by adding 2.3 ft. (0 NGVD29 = 2.3 NAVD88).

Table 5. 500-year Maximum Water Surface Elevation Summary, Levees Overtop Without Failing					
Location (Comp Study River Mile)	Maximum Water Surface Elevation (ft NAVD88)			Change (ft)	
	Existing	Without Project	With Project	Existing to Without Project	Without Project to With Project
Sacramento River					
at Knight's Landing (90.22)	45.49	45.51	45.52	+0.02	+0.01
at Fremont Weir, west end (84.75)	44.91	44.95	44.99	+0.04	+0.04
at Natomas Cross Canal (79.21)	45.57	45.59	45.77	+0.02	+0.18
at I-5 (71.00)	41.54	41.55	41.61	+0.01	+0.06
at Sacramento Bypass (63.82)	38.66	38.71	38.72	+0.05	+0.01
at NEMDC (61.0)	39.57	39.68	39.68	+0.11	0
at I St. (59.695)	39.24	39.38	39.38	+0.14	0
at Freeport Bridge (46.432)	31.74	31.91	31.91	+0.17	0
Natomas Cross Canal					
u/s Hwy 99/70 (4.82)	45.54	45.55	45.76	+0.01	+0.21
Pleasant Grove Creek Canal					
at Sankey Rd. gap (SA25)	45.35	45.35	45.48	0	+0.13
at Fifield Rd. (1.475)	45.59	45.60	45.75	+0.01	+0.15
at Howsley Rd. (0.41)	45.60	45.61	45.79	+0.01	+0.18
Natomas East Main Drainage Canal					
at Elverta Road (10.402)	41.90	41.90	42.23	0	+0.33
at Elkhorn Blvd. (8.352)	41.75	41.75	42.10	0	+0.35
at Main Ave. (6.09)	47.03	47.09	47.09	+0.06	0
at West El Camino Ave. (2.96)	45.32	45.41	45.41	+0.09	0
Feather River					
At Nicolaus Gage (8.00)	55.79	55.93	55.94	+0.14	+0.01
Yolo Bypass					
At Woodland Gage (51.10)	38.03	38.08	38.21	+0.05	+0.13
American River					
At H St. (6.471)	50.54	50.61	50.61	+0.07	0
Note: Water surface elevations originally calculated in NGVD29 vertical datum. Converted to NAVD88 by adding 2.3 ft. (0 NGVD29 = 2.3 NAVD88).					

A summary of the number of levee failures that occur in the simulations that assumed levees would fail when the water reached the top of the levee is provided in Table 6. The computed maximum water surface elevations at several locations in and around the project area for the Existing, Without Project, and With Project conditions for the 100-year, 200-year and 500-year flood events with assumed levee failures are shown in Tables 7, 8 and 9.

Table 6. Levee Failure Summary (Number of Levee Failures)				
Condition	Event Flood			
	SRFCP (1957)	100-year	200-year	500-year
Existing	0	13	58	129
Without Project	0	12	32	135
With Project	0	12	32	133

Table 7. 100-year Maximum Water Surface Elevation Summary, Levees Fail When Water Reaches Top of Levee					
Location (Comp Study River Mile)	Maximum Water Surface Elevation (ft NAVD88)			Change (ft)	
	Existing	Without Project	With Project	Existing to Without Project	Without Project to With Project
Sacramento River					
at Knight's Landing (90.22)	43.95	43.95	43.95	0	0
at Fremont Weir, west end (84.75)	42.22	42.19	42.19	-0.03	0
at Natomas Cross Canal (79.21)	42.87	42.82	42.82	-0.05	0
at I-5 (71.00)	38.74	38.50	38.48	-0.24	-0.02
at Sacramento Bypass (63.82)	34.04	33.43	33.42	-0.61	-0.01
at NEMDC (61.0)	34.55	33.96	33.96	-0.59	0
at I St. (59.695)	34.28	33.69	33.68	-0.59	-0.01
at Freeport Bridge (46.432)	28.00	27.51	27.50	-0.49	-0.01
Natomas Cross Canal					
u/s Hwy 99/70 (4.82)	42.94	42.94	42.95	0	+0.01
Pleasant Grove Creek Canal					
at Sankey Rd. gap (SA25)	42.80	42.82	42.83	+0.02	+0.01
at Fifield Rd. (1.475)	42.91	42.92	42.93	+0.01	+0.01
at Howsley Rd. (0.41)	42.91	42.93	42.93	+0.02	0
Natomas East Main Drainage Canal					
at Elverta Road (10.402)	34.26	34.34	34.35	+0.08	+0.01
at Elkhorn Blvd. (8.352)	33.47	33.49	33.49	+0.02	0
at Main Ave. (6.09)	39.70	39.74	39.74	+0.04	0
at West El Camino Ave. (2.96)	36.81	36.16	36.15	-0.65	-0.01
Feather River					
at Nicolaus Gage (8.00)	50.87	50.86	50.86	-0.01	0
Yolo Bypass					
at Woodland Gage (51.10)	35.22	35.13	35.13	-0.09	0
American River					
at H St. (6.471)	45.39	43.08	43.08	-2.31	0
Note: Water surface elevations originally calculated in NGVD29 vertical datum. Converted to NAVD88 by adding 2.3 ft. (0 NGVD29 = 2.3 NAVD88).					

Table 8. 200-year Maximum Water Surface Elevation Summary, Levees Fail When Water Reaches Top of Levee

Location (Comp Study River Mile)	Maximum Water Surface Elevation (ft NAVD88)			Change (ft)	
	Existing	Without Project	With Project	Existing to Without Project	Without Project to With Project
Sacramento River					
at Knight's Landing (90.22)	43.96	43.96	43.96	0	0
at Fremont Weir, west end (84.75)	42.80	42.82	42.82	+0.02	0
at Natomas Cross Canal (79.21)	43.29	43.28	43.30	-0.01	+0.02
at I-5 (71.00)	39.58	39.30	39.30	-0.28	0
at Sacramento Bypass (63.82)	36.39	35.10	35.10	-1.29	0
at NEMDC (61.0)	37.13	35.66	35.66	-1.47	0
at I St. (59.695)	36.84	35.38	35.38	-1.46	0
at Freeport Bridge (46.432)	30.02	28.88	28.89	-1.14	+0.01
Natomas Cross Canal					
u/s Hwy 99/70 (4.82)	43.42	43.45	43.47	+0.03	+0.02
Pleasant Grove Creek Canal					
at Sankey Rd. gap (SA25)	43.43	43.48	43.51	+0.05	+0.03
at Fifield Rd. (1.475)	43.52	43.57	43.60	+0.05	+0.03
at Howsley Rd. (0.41)	43.49	43.53	43.56	+0.04	+0.03
Natomas East Main Drainage Canal					
at Elverta Road (10.402)	34.66	34.66	34.66	0	0
at Elkhorn Blvd. (8.352)	33.78	33.78	33.78	0	0
at Main Ave. (6.09)	43.70	41.03	41.03	-2.67	0
at West El Camino Ave. (2.96)	42.28	38.31	38.30	-3.97	-0.01
Feather River					
at Nicolaus Gage (8.00)	52.42	52.48	52.48	+0.06	0
Yolo Bypass					
at Woodland Gage (51.10)	35.91	35.85	35.86	-0.06	+0.01
American River					
at H St. (6.471)	49.28	46.62	46.62	-2.66	0

Note: Water surface elevations originally calculated in NGVD29 vertical datum. Converted to NAVD88 by adding 2.3 ft. (0 NGVD29 = 2.3 NAVD88).

Table 9. 500-year Maximum Water Surface Elevation Summary, Levees Fail When Water Reaches Top of Levee

Location (Comp Study River Mile)	Maximum Water Surface Elevation (ft NAVD88)			Change (ft)	
	Existing	Without Project	With Project	Existing to Without Project	Without Project to With Project
Sacramento River					
at Knight's Landing (90.22)	44.10	44.11	44.12	+0.01	+0.01
at Fremont Weir, west end (84.75)	43.62	43.64	43.64	+0.02	0
at Natomas Cross Canal (79.21)	44.21	44.24	44.24	+0.03	0
at I-5 (71.00)	39.92	39.45	39.47	-0.47	+0.02
at Sacramento Bypass (63.82)	37.10	36.71	36.70	-0.39	-0.01
at NEMDC (61.0)	37.93	37.40	37.38	-0.53	-0.02
at I St. (59.695)	37.62	37.10	37.08	-0.52	-0.02
at Freeport Bridge (46.432)	30.49	30.16	30.15	-0.33	-0.01
Natomas Cross Canal					
u/s Hwy 99/70 (4.82)	44.42	44.43	44.44	+0.01	+0.01
Pleasant Grove Creek Canal					
at Sankey Rd. gap (SA25)	44.45	44.45	44.46	0	+0.01
at Fifield Rd. (1.475)	44.59	44.59	44.60	0	+0.01
at Howsley Rd. (0.41)	44.57	44.57	44.58	0	+0.01
Natomas East Main Drainage Canal					
at Elverta Road (10.402)	36.46	36.72	37.04	+0.26	+0.32
at Elkhorn Blvd. (8.352)	35.97	36.35	36.75	+0.38	+0.40
at Main Ave. (6.09)	45.62	45.28	45.28	-0.34	0
at West El Camino Ave. (2.96)	43.49	43.25	43.25	-0.24	0
Feather River					
At Nicolaus Gage (8.00)	54.27	54.27	54.27	0	0
Yolo Bypass					
At Woodland Gage (51.10)	36.57	36.62	36.62	+0.05	0
American River					
At H St. (6.471)	49.39	50.11	50.11	+0.72	0

Note: Water surface elevations originally calculated in NGVD29 vertical datum. Converted to NAVD88 by adding 2.3 ft. (0 NGVD29 = 2.3 NAVD88).

5. SUPPORT OF IMPACT ANALYSIS METHODOLOGY

California Legislature

Consistent with its approval of a new more rigorous standard for urban flood protection, the State Legislature also approved "the project features necessary to provide a 200-year level of flood protection along the American and Sacramento Rivers and within the Natomas Basin as described in the final engineer's report dated April 19, 2007, adopted by the Sacramento Area Flood Control Agency." (Statutes of 2007, Chapter 641 [amending Water Code Section 12670.14(b)]). Moreover, in connection with this approval, the legislature adopted the following findings and declarations (Statutes of 2007, Chapter 641, Section 1[k]):

> *As evidenced by the environmental impact reports certified in connection with these projects, including the hydrology and hydraulics impact analysis set forth in the environmental impact report prepared by the Sacramento Area Flood Control Agency with regard to local funding mechanisms for comprehensive flood control improvements for the Sacramento area dated February 2007, the increase in flood protection associated with improving the American and Sacramento River levees and modifying Folsom Dam will be accomplished without altering or otherwise impairing the design flows and water surface elevations prescribed as part of the Sacramento River Flood Control Project. Accordingly, these improvements will not result in significant adverse hydraulic impacts to the lands protected by the Sacramento River Flood Control Project. Thus, it is not necessary or appropriate to require these projects to include hydraulic mitigation.*
>
> *The projects authorized in Section 12670.14 of the Water Code will increase the ability of the existing flood control system in the lower Sacramento Valley to protect heavily urbanized areas within the City of Sacramento and the Counties of Sacramento and Sutter against very rare floods without altering the design flows and water surface elevations prescribed as part of the Sacramento River Flood Control Project or impairing the capacity of other segments of the Sacramento River Flood Control Project to contain these design flows and to maintain water surface elevations. Accordingly, the projects authorized in that section will not result in significant adverse hydraulic impacts to the lands protected by the Sacramento River Flood Control Project and neither the Reclamation Board nor any other state agency shall require the authorized projects to include hydraulic mitigation for these protected lands.*

Although these findings are not legally binding, they indicate the legislature's concurrence with SAFCA's approach to analyzing hydraulic impacts. Congressional authorization for raising and strengthening a twelve-mile reach of the Sacramento River east levee in the 1996 Water Resources Development Act ("WRDA"), and for raising and strengthening all five-plus miles of the NCC south levee in the 1999 WRDA, without in either case requiring hydraulic mitigation, offers additional indirect legislative support for SAFCA's approach.

USACE HQ

USACE has been using a risk-based analysis for economic evaluation for some time and has been moving to a risk-based analysis for system performance, largely for certification of levees for FEMA. However, in his memo dated *August 2, 2007, Subject: Section 408 Approval of a Flood Control Project Alteration - Sacramento River Flood Control Project, Feather and Yuba Rivers, California* (copy enclosed), Deputy Director of Civil Works Steven L. Stockton indicated that the discussion of flood protection in terms such as 100-year or 200-year level of protection is acceptable to comply with NEPA and other environmental statues. However, a risk-based analysis as required by ER 1105-2-100 and ER 1105-2-101 will be needed to determine the terms of any eventual Section 104 reimbursement. SAFCA has prepared and submitted a risk-based analysis to USACE as part of the 408 Summary Report for Phase 3.

6. NLIP COORDINATION WITH REGIONAL IMPROVEMENTS

SAFCA's approach to providing an urban standard of flood protection to the Natomas Basin is being replicated in the other urbanizing sub-basins in the lower Sacramento Valley (West Sacramento, Marysville extending south to Reclamation District 784, and Yuba City). However, these improvements are intended to complement rather than substitute for pursuing improvements on a regional scale that would improve the flow of water through the Yolo and Sacramento Bypass systems and lower water surface elevations throughout the lower Sacramento Valley. In 2002 through 2003, SAFCA made substantial investments in hydraulic studies and analyses of the improvements that would be required to move more flood water into and through the Yolo Bypass during large flood events in the Sacramento-Feather River watershed to reduce flows and water surface elevations in the Sacramento River channel downstream of the Fremont weir. The Lower Sacramento River Regional Project Initial Report (SAFCA 2003) indicated that this could be accomplished by widening the Fremont weir; setting back the levees on the east side of the Yolo Bypass; discharging flood flows into the Sacramento Deep Water Ship Channel; and eliminating low, restricted elevation levees at the lower end of the Yolo Bypass. However, these improvements would be extremely costly and time consuming to implement; they would occur entirely outside SAFCA's jurisdiction; and would require extraordinary cooperation among affected federal, state, and local interests; and they would not resolve the seepage problems affecting the Sacramento River east levee and the Natomas Cross Canal south levee adjacent to the Natomas Basin. For these reasons, SAFCA concluded that this alternative would not achieve the objectives of the NLIP; and therefore, it was not carried forward for further analysis.

On a long-term basis; however, regionally oriented improvements to the Yolo and Sacramento Bypass systems may help to address potential changes in hydrology due to climate change and may reduce the risk of uncontrolled flooding on a system-wide basis. Although this flooding is most likely to occur in lightly populated agricultural areas, reducing its frequency by increasing the conveyance capacity of the SRFCP would avoid the cost of repairing and reconstructing damaged levees and other public infrastructure and would increase public support for the "dichotomous system of flood protection for urban and rural lands" that exists in the Sacramento Valley. Early implementation of the NLIP, as well as early implementation of proposed

improvements to SRFCP levees protecting other urban areas, would not preclude any of the alternatives contemplated for the update of the Central Valley Flood Protection Plan.

7. CONCLUSION

Raising and strengthening portions the federal project levee system protecting the Natomas Basin in Sacramento and Sutter Counties as proposed by SAFCA would not result in any significant, adverse hydraulic impacts to other sub-basins protected as part of the SRFCP. Furthermore, these improvements would be consistent with the principles that have guided the management of the SRFCP over the past century and with the policies adopted by the State Legislature calling for an immediate and comprehensive effort to increase the level of flood protection provided to Sacramento and the other urban areas within the SRFCP. The NLIP improvements would also be consistent with the direction given by Congress when it approved raising and strengthening 12 miles of the Sacramento River east levee (WRDA 1996) and 5.3 miles of the Natomas Cross Canal south levee (WRDA 1999).

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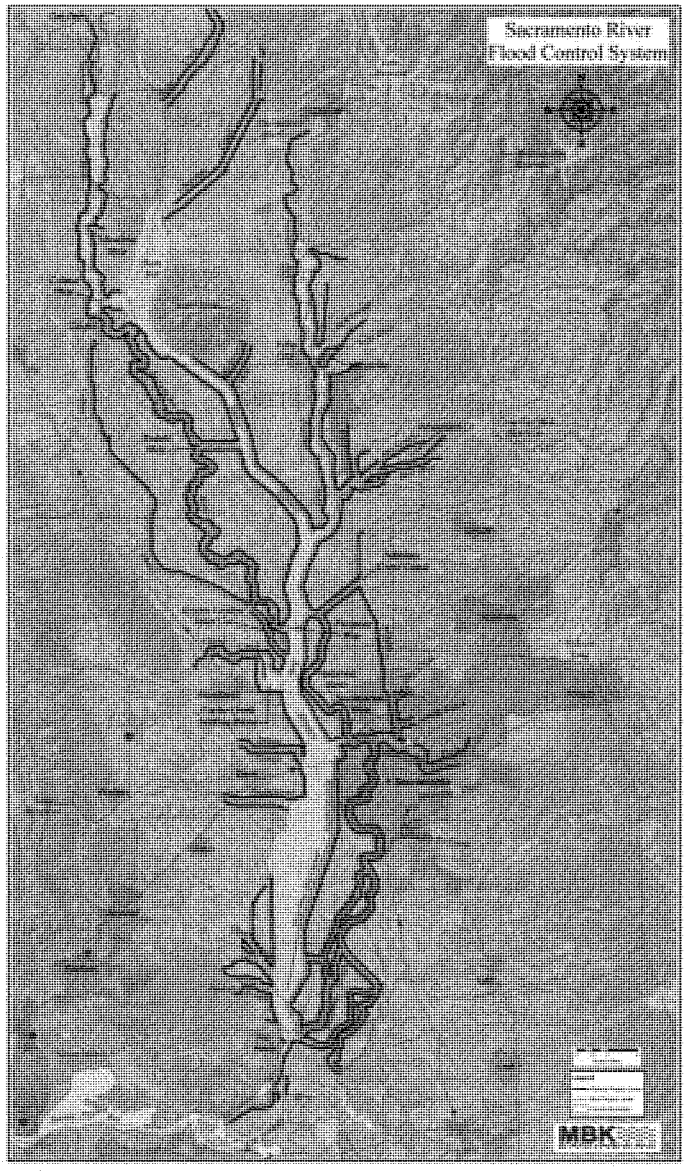

Figure 1. Sacramento River Flood Control System Map

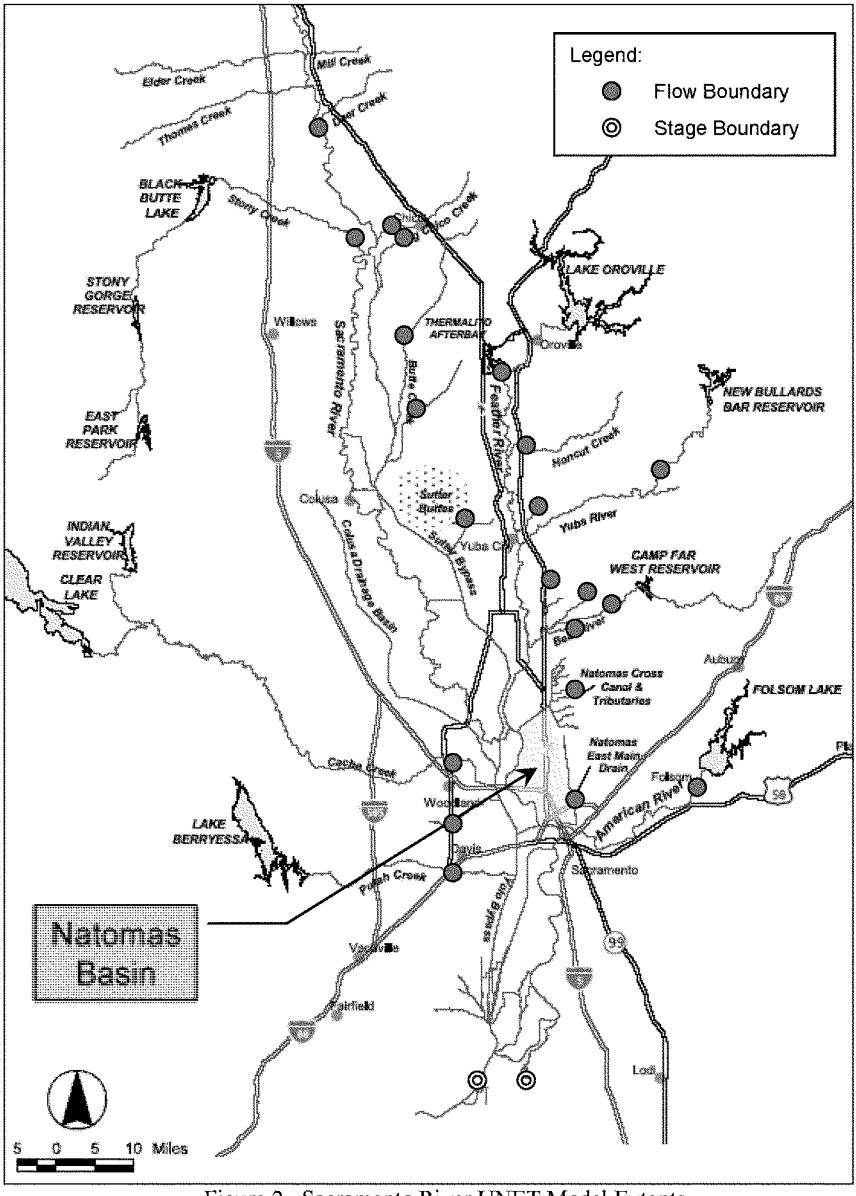

Figure 2. Sacramento River UNET Model Extents

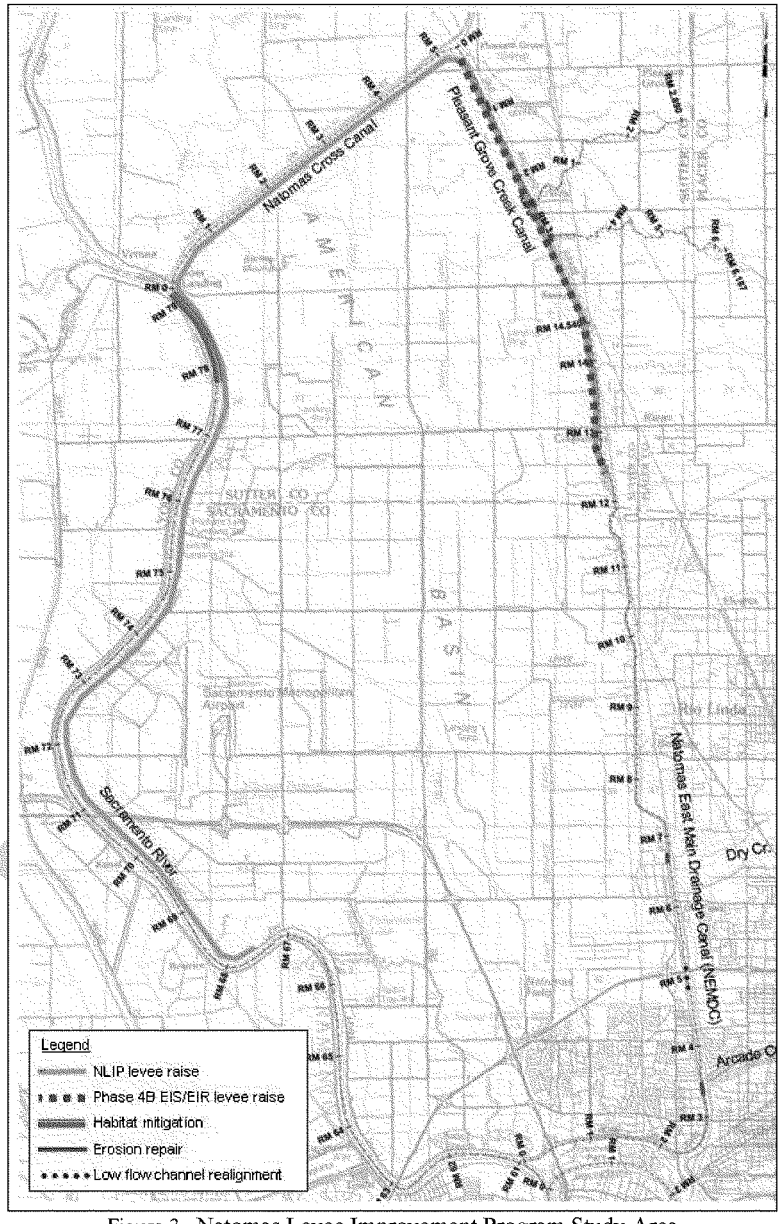

Figure 3. Natomas Levee Improvement Program Study Area

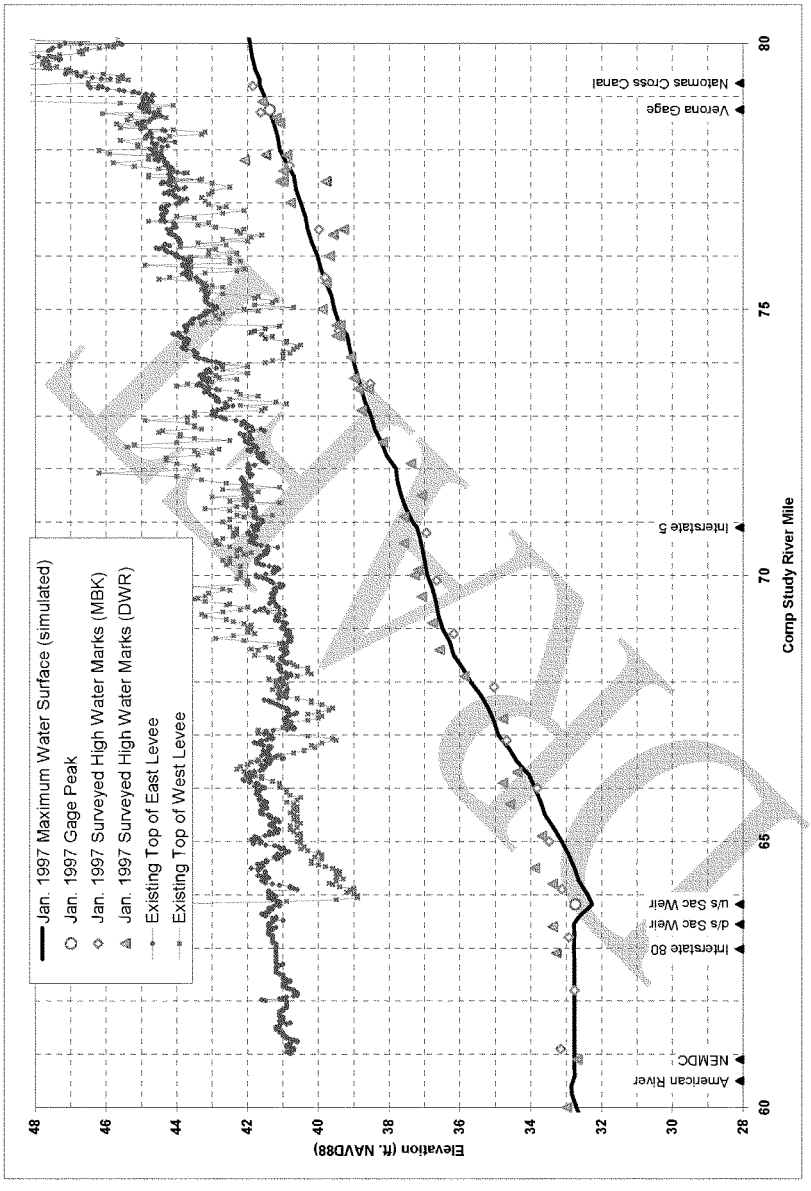

Figure 4. Model Calibration – Sacramento River Profile

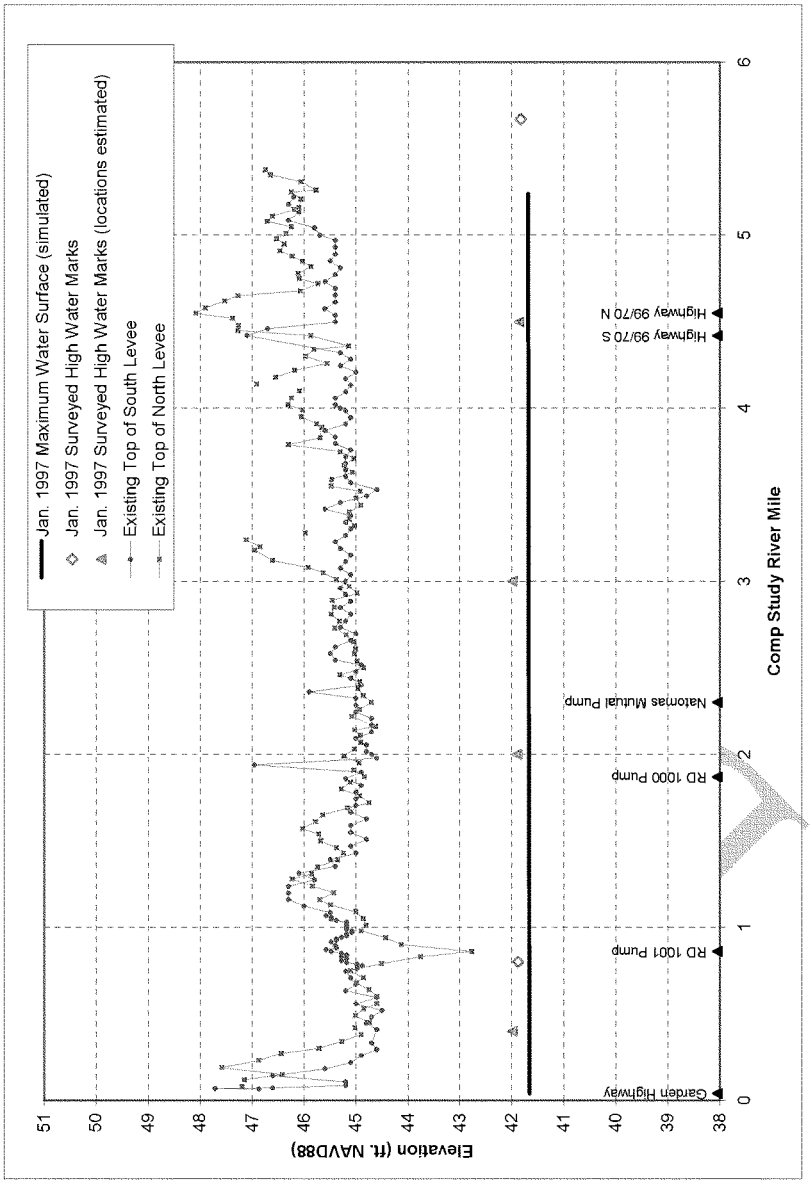

Figure 5. Model Calibration – Natomas Cross Canal Profile

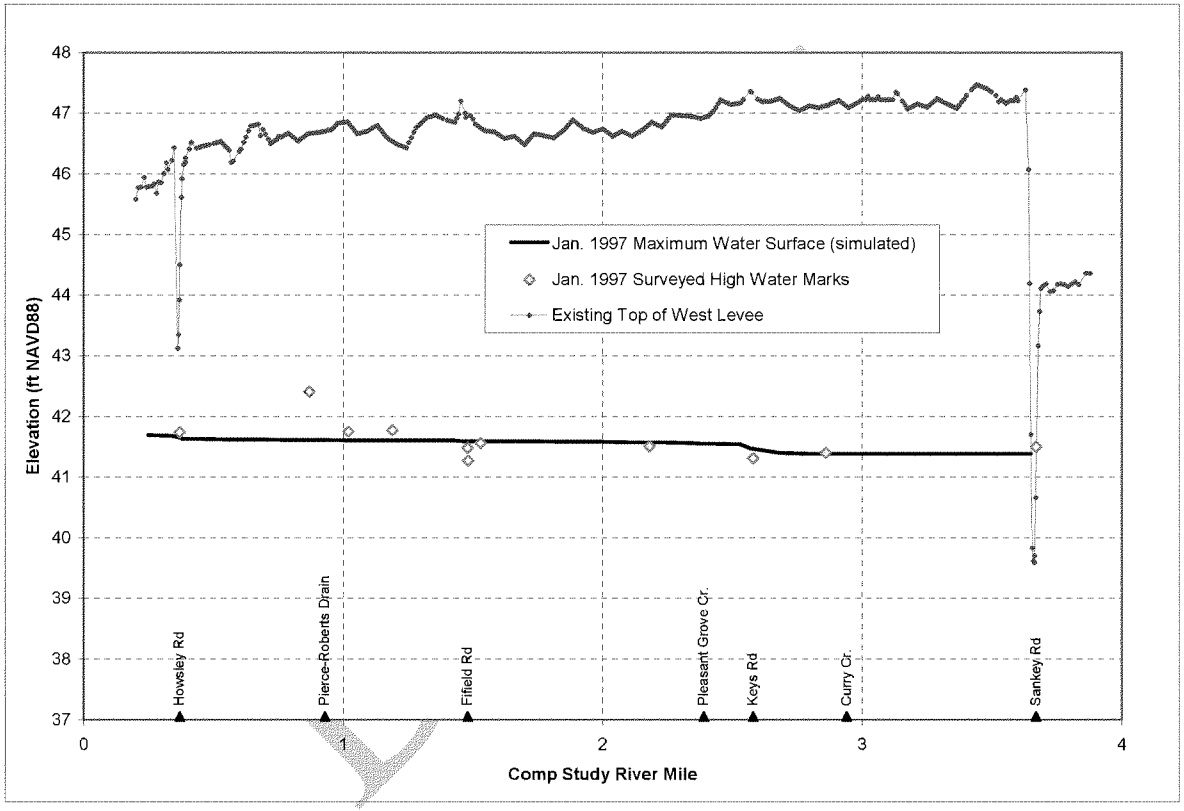

Figure 6. Model Calibration – Pleasant Grove Creek Canal Profile

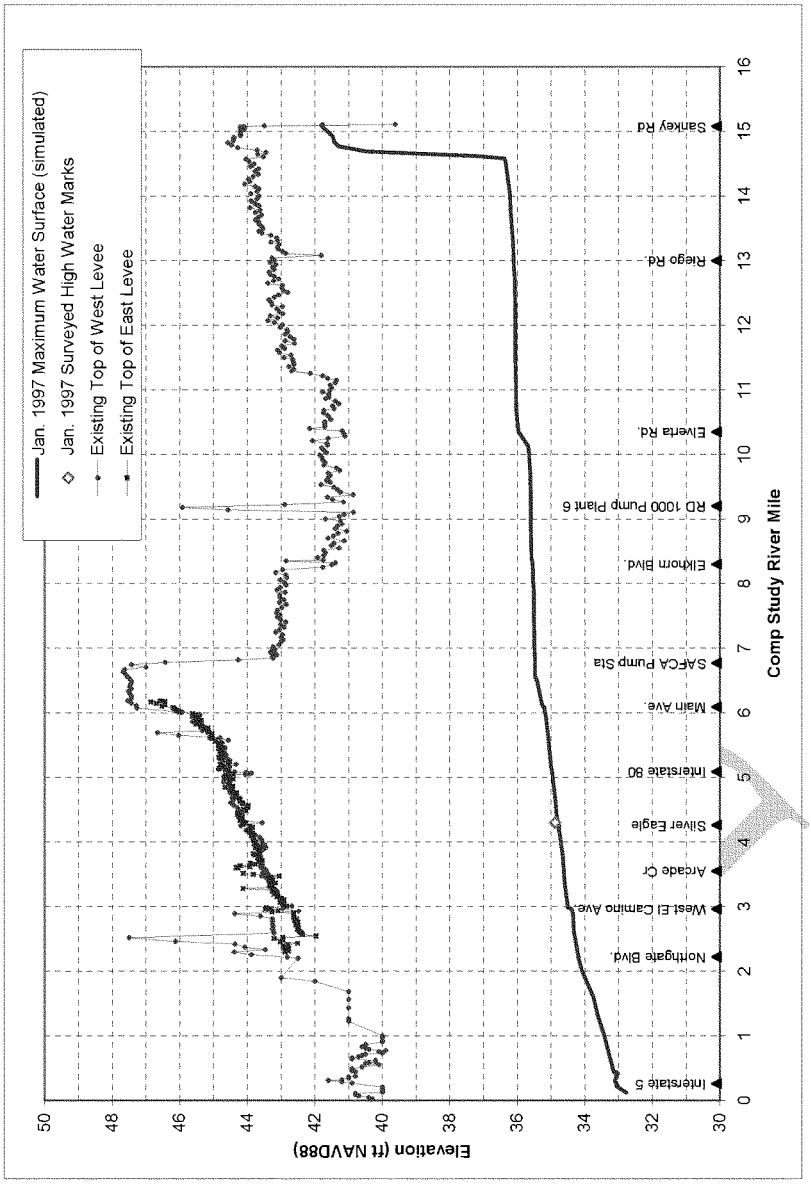

Figure 7. Model Calibration – NEMDC Profile

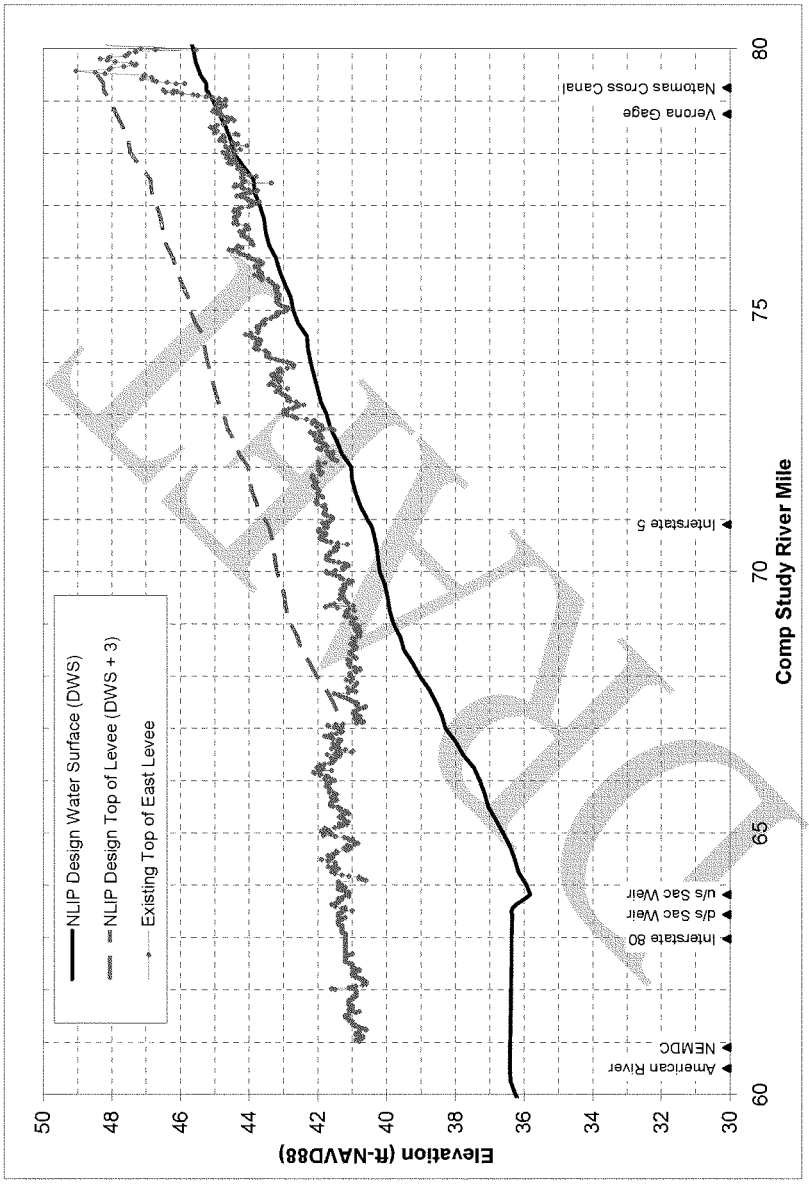

Figure 8. NLIP Design Top of Levee Profile – Sacramento River

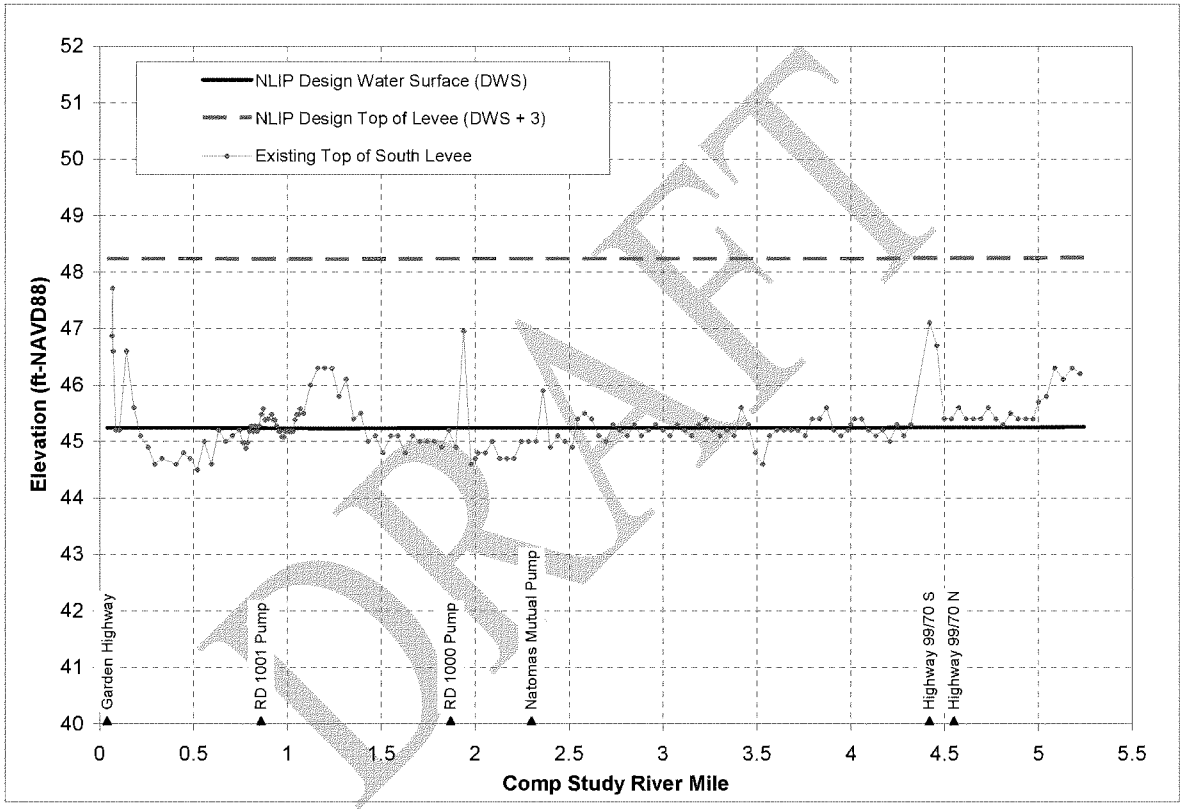

Figure 9. NLIP Design Top of Levee Profile – Natomas Cross Canal

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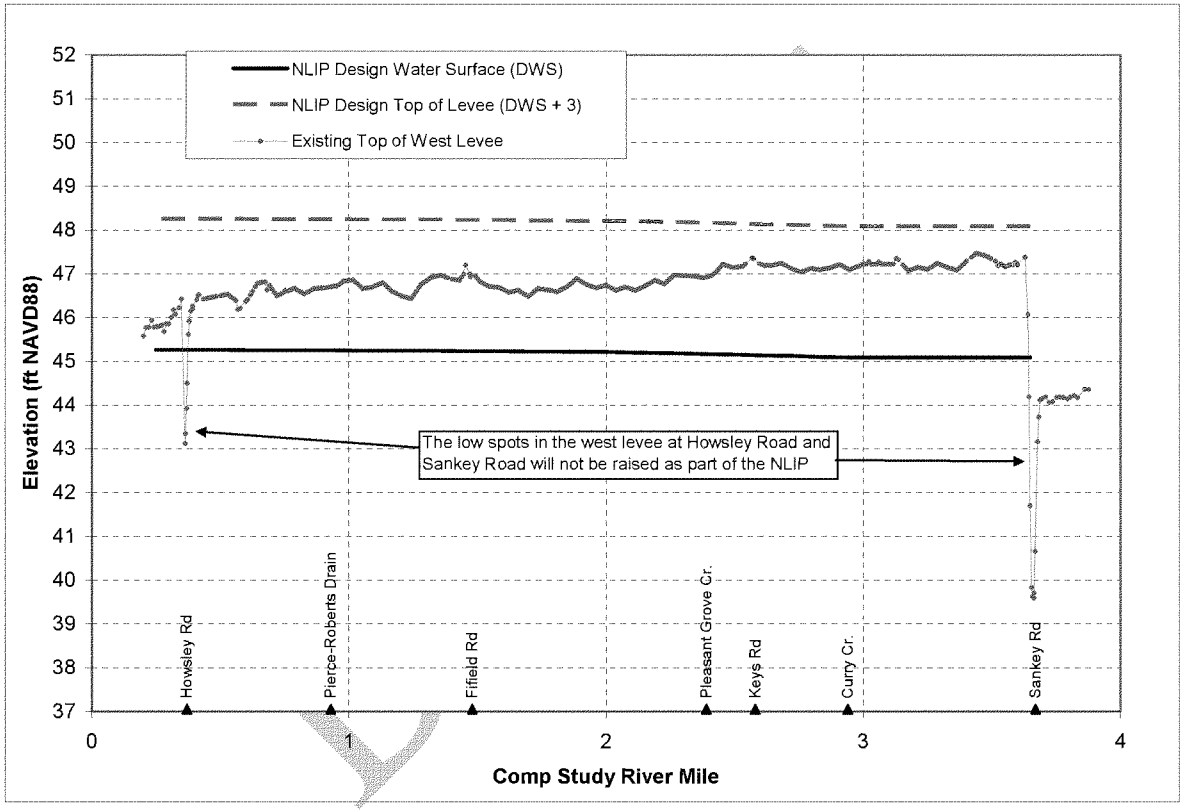

Figure 10. NLIP Design Top of Levee Profile – Pleasant Grove Creek Canal

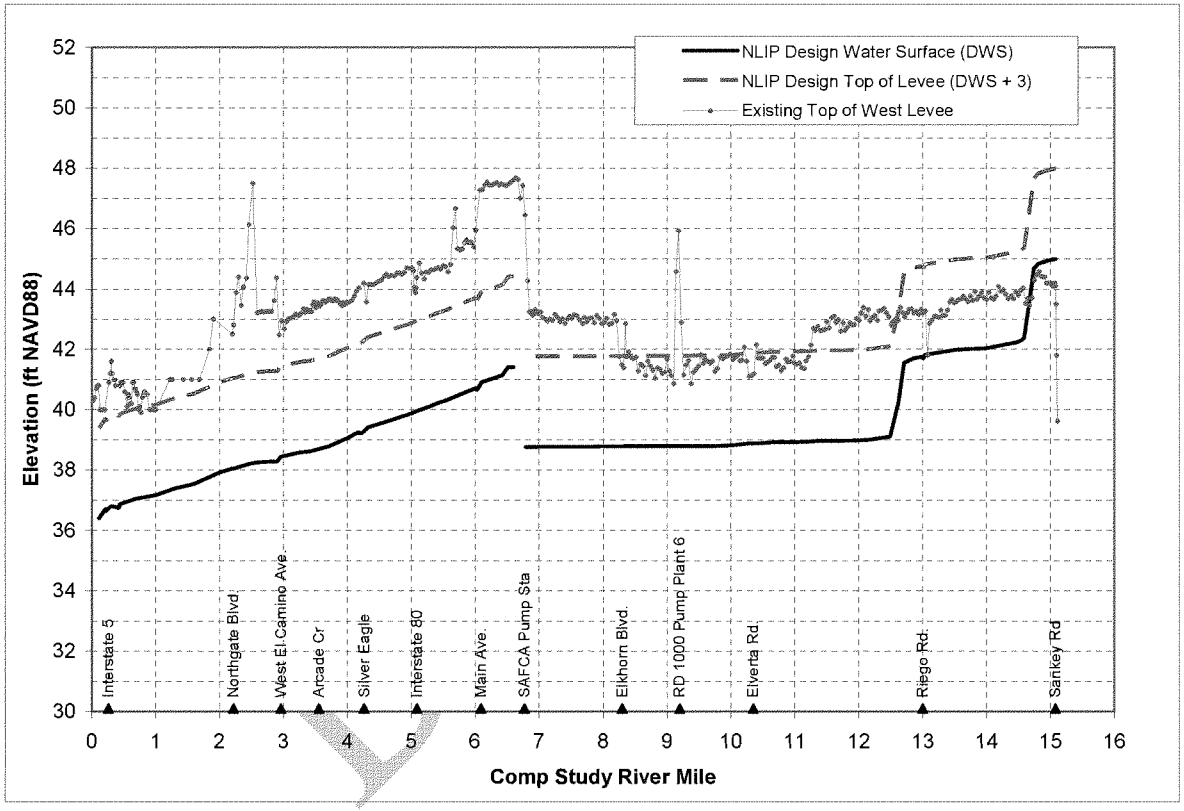

Figure 11. NLIP Design Top of Levee Profile – NEMDC

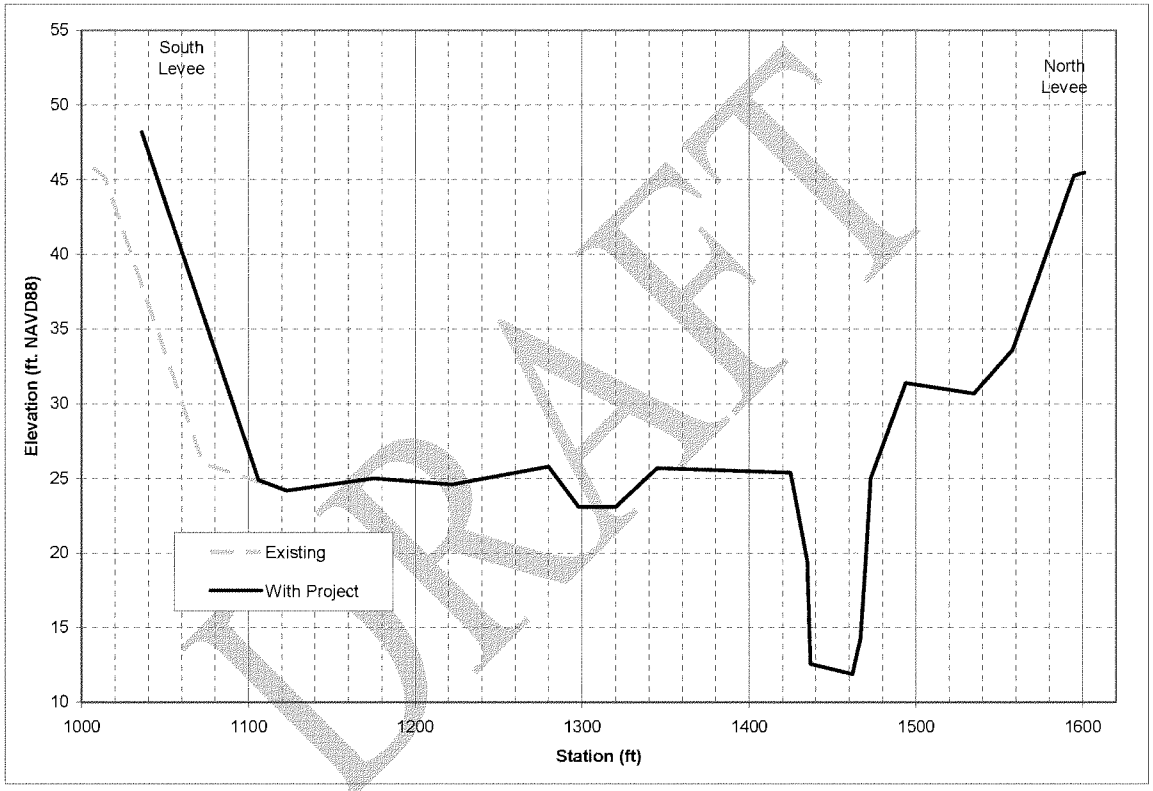

Figure 12. Typical Natomas Cross Canal Section with Waterside Fill

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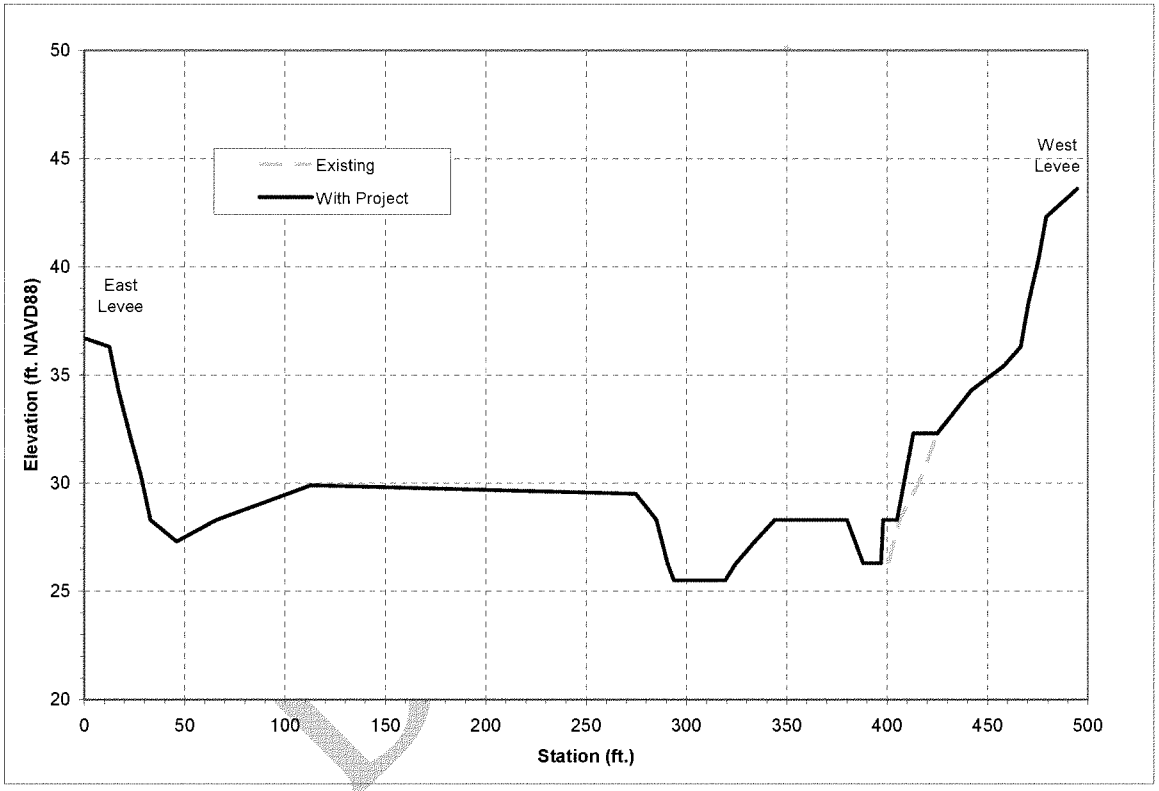

Figure 13. Rock Erosion Protection Berm in Hydraulic Model at NEMDC Northern Erosion Protection Site

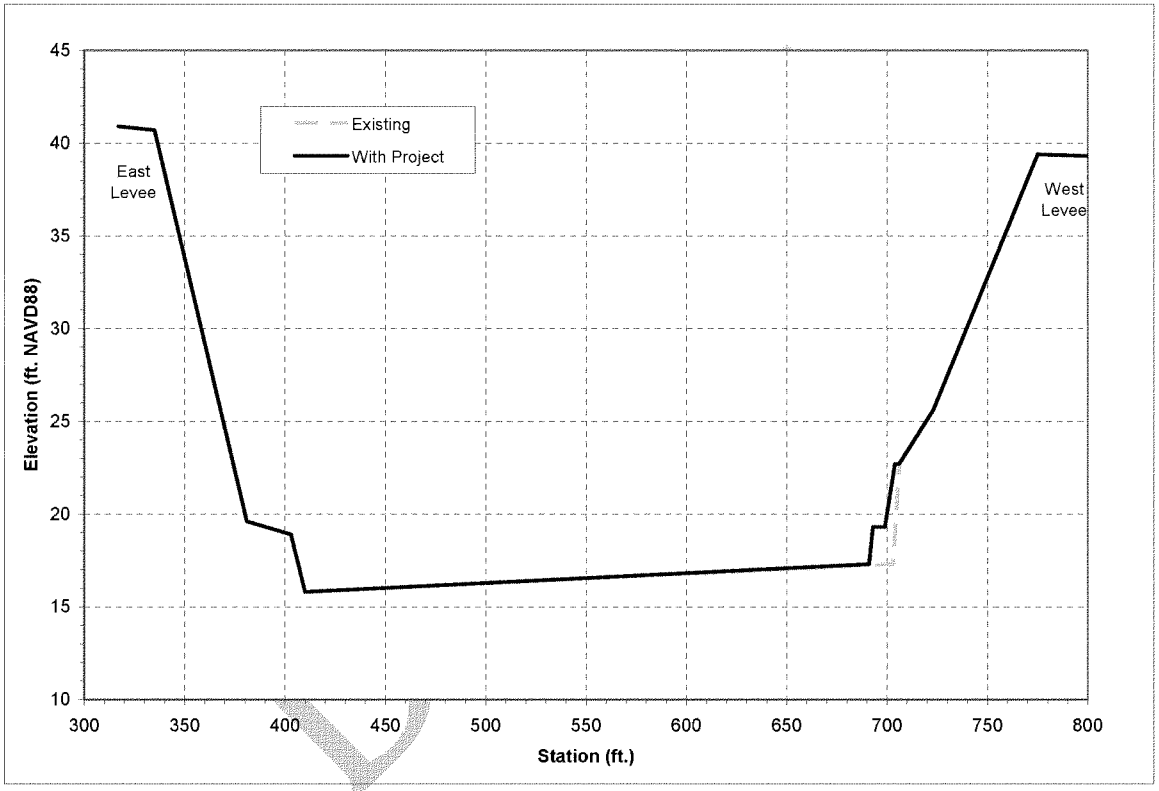

Figure 14. Rock Erosion Protection Berm in Hydraulic Model at NEMDC Southern Erosion Protection Site

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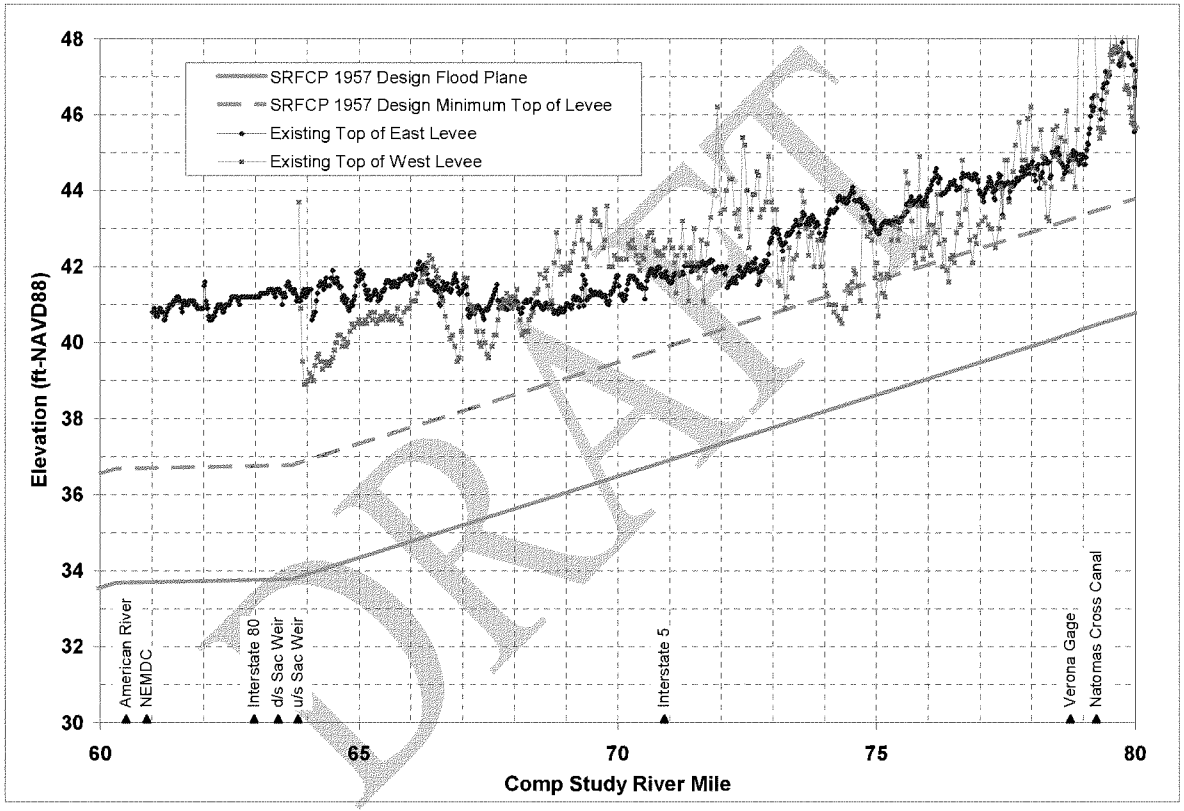

Figure 15. SRFCP 1957 Design Profile, Sacramento River Natomas Reach

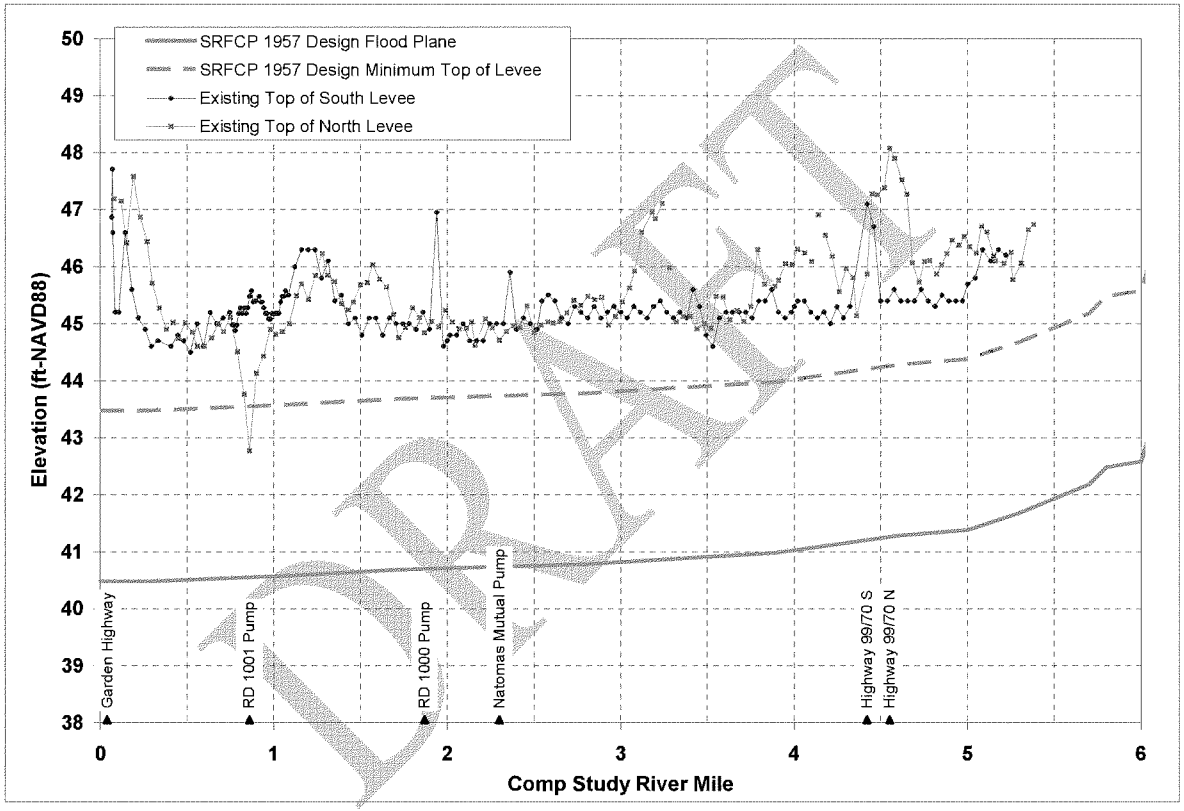

Figure 16. SRFCP 1957 Design Profile, Natomas Cross Canal

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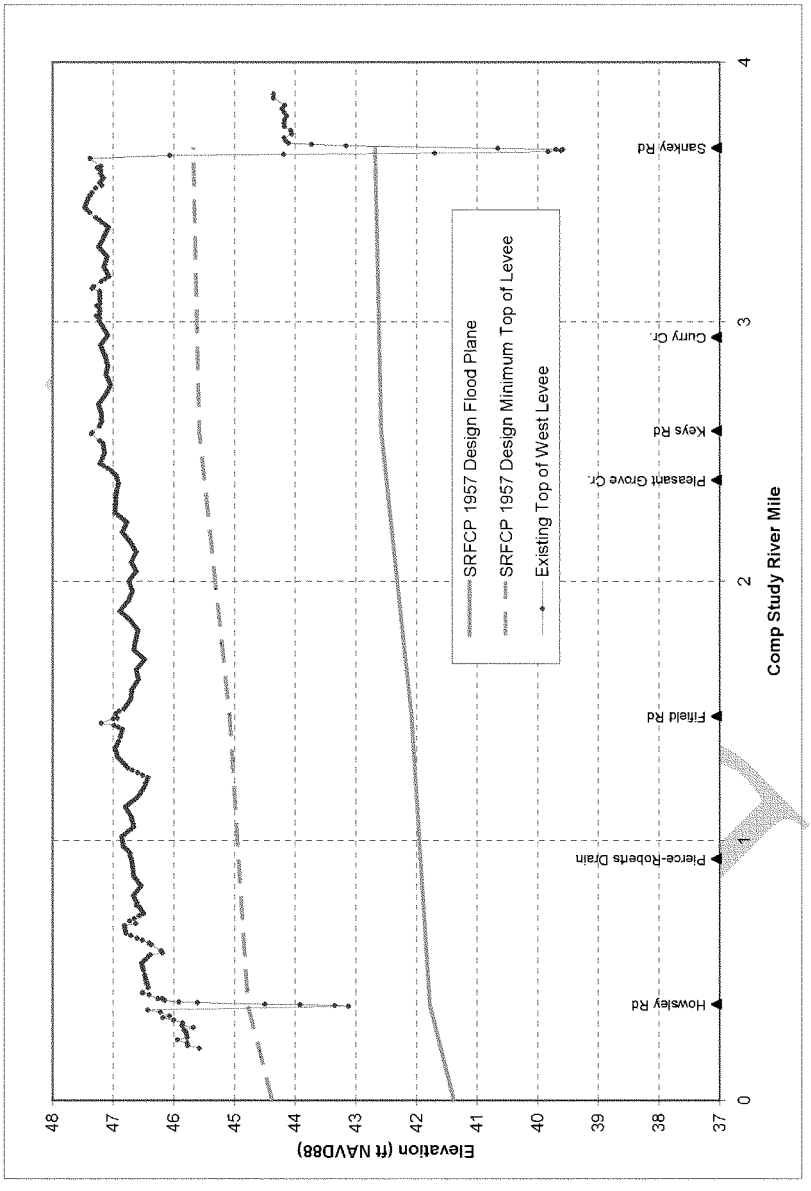

Figure 17. SRFCP 1957 Design Profile, Pleasant Grove Creek Canal

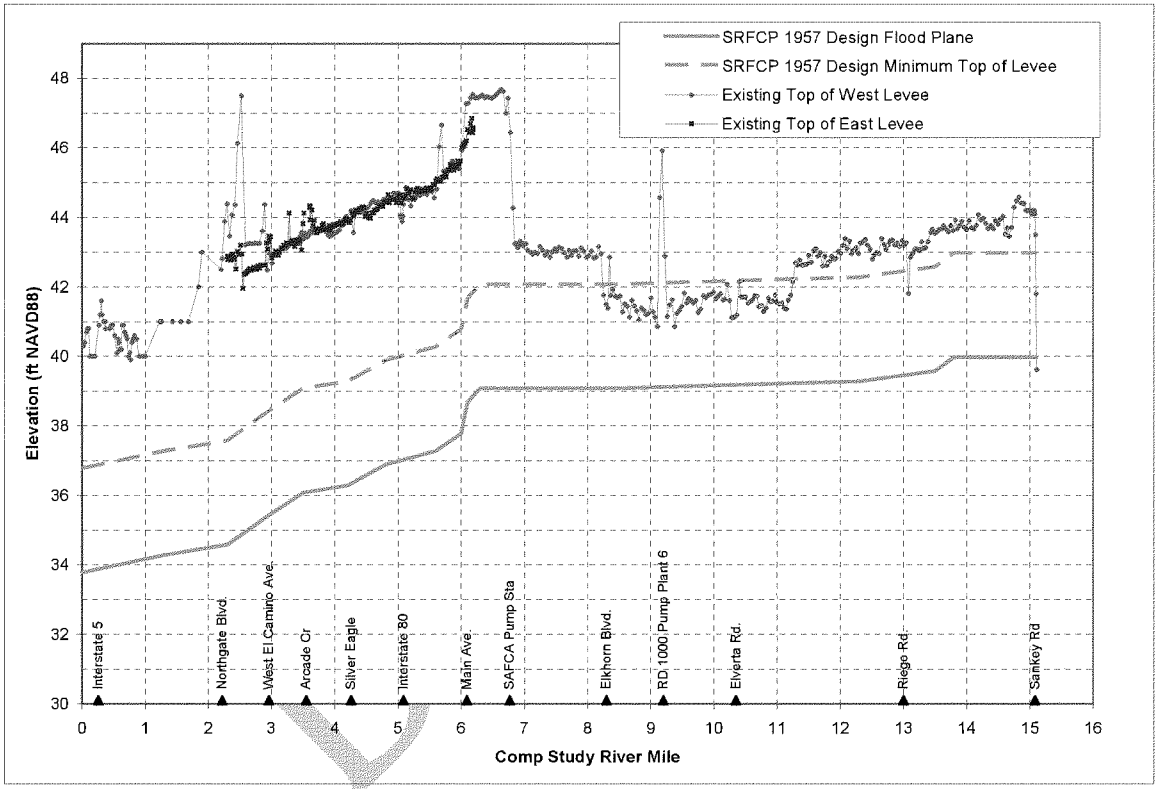

Figure 18. SRFCP 1957 Design Profile, NEMDC

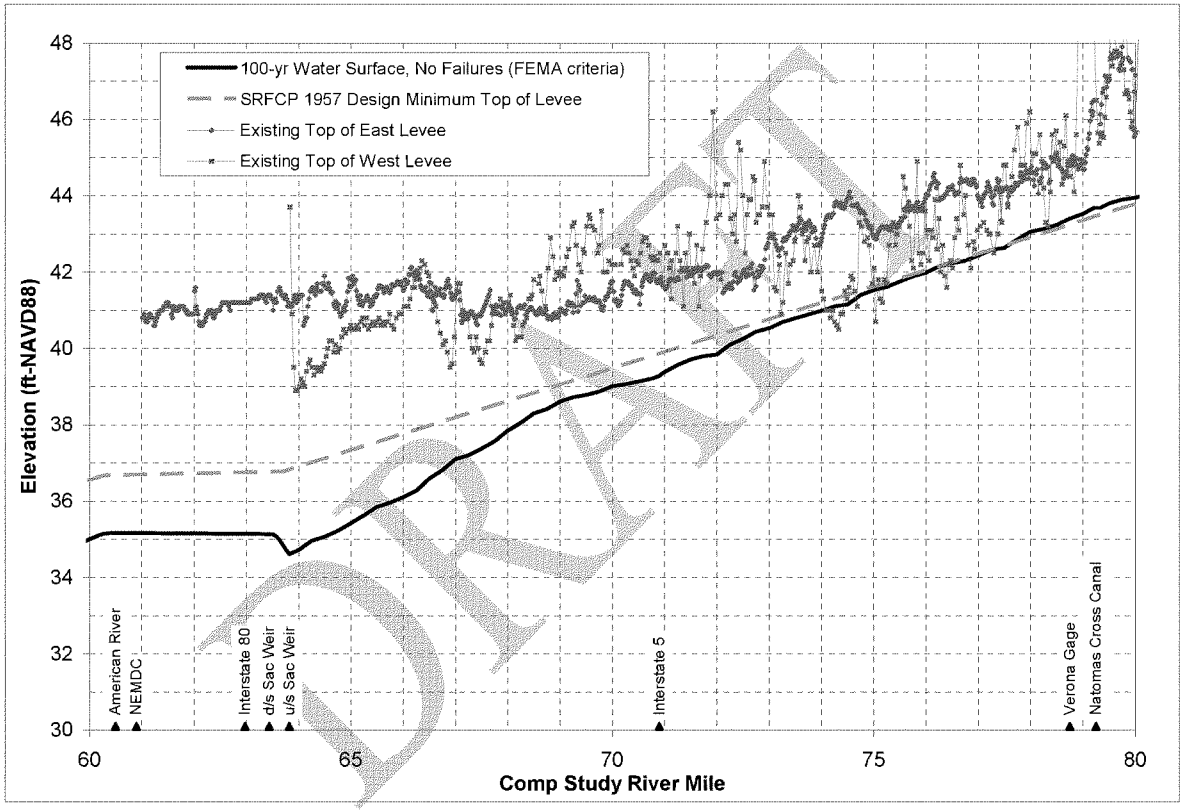

Figure 19. 100-year Water Surface Profile – Sacramento River Natomas Reach

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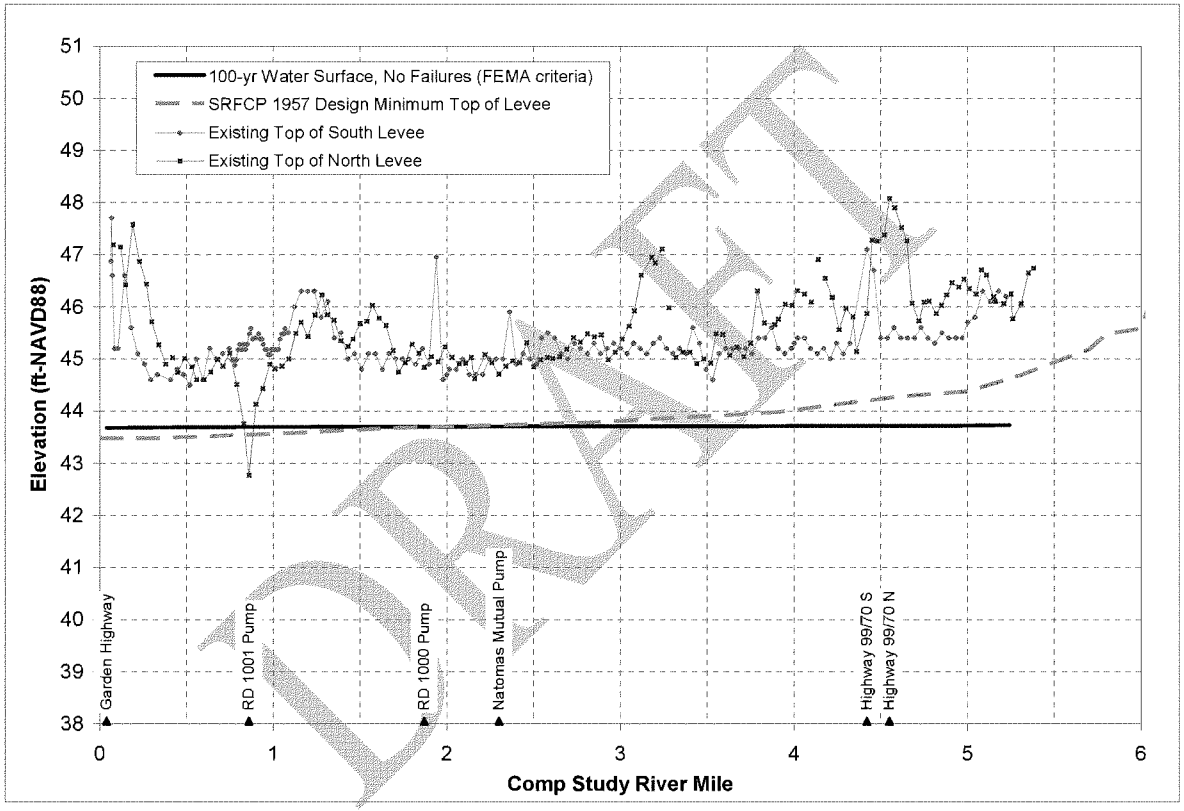

Figure 20. 100-year Water Surface Profile – Natomas Cross Canal

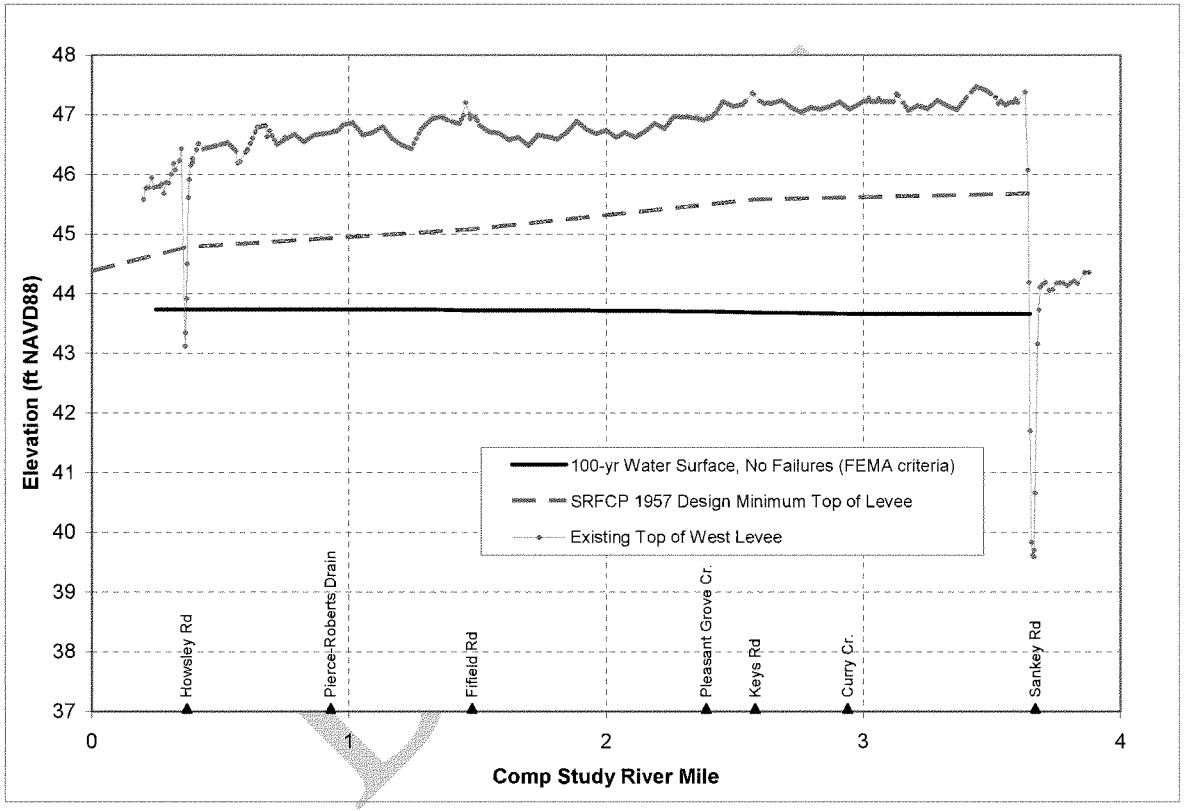

Figure 21. 100-year Water Surface Profile – Pleasant Grove Creek Canal

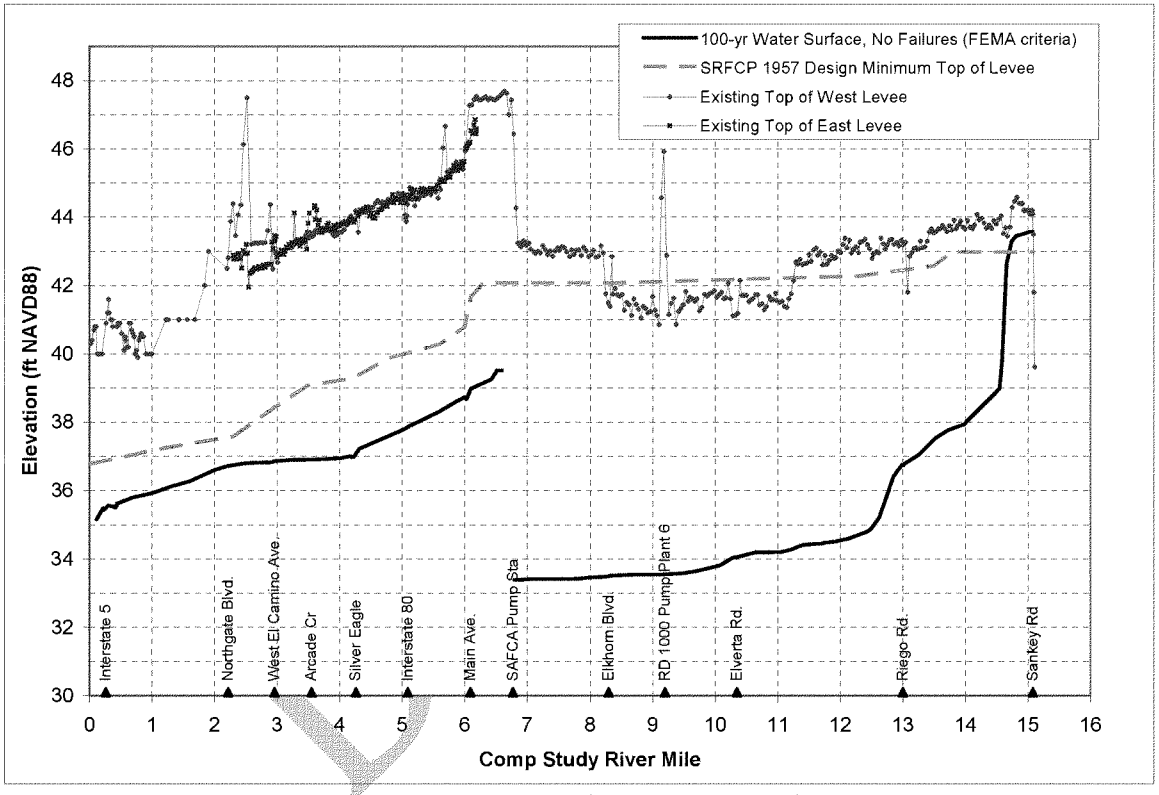

Figure 22. 100-year Water Surface Profile – NEMDC

400

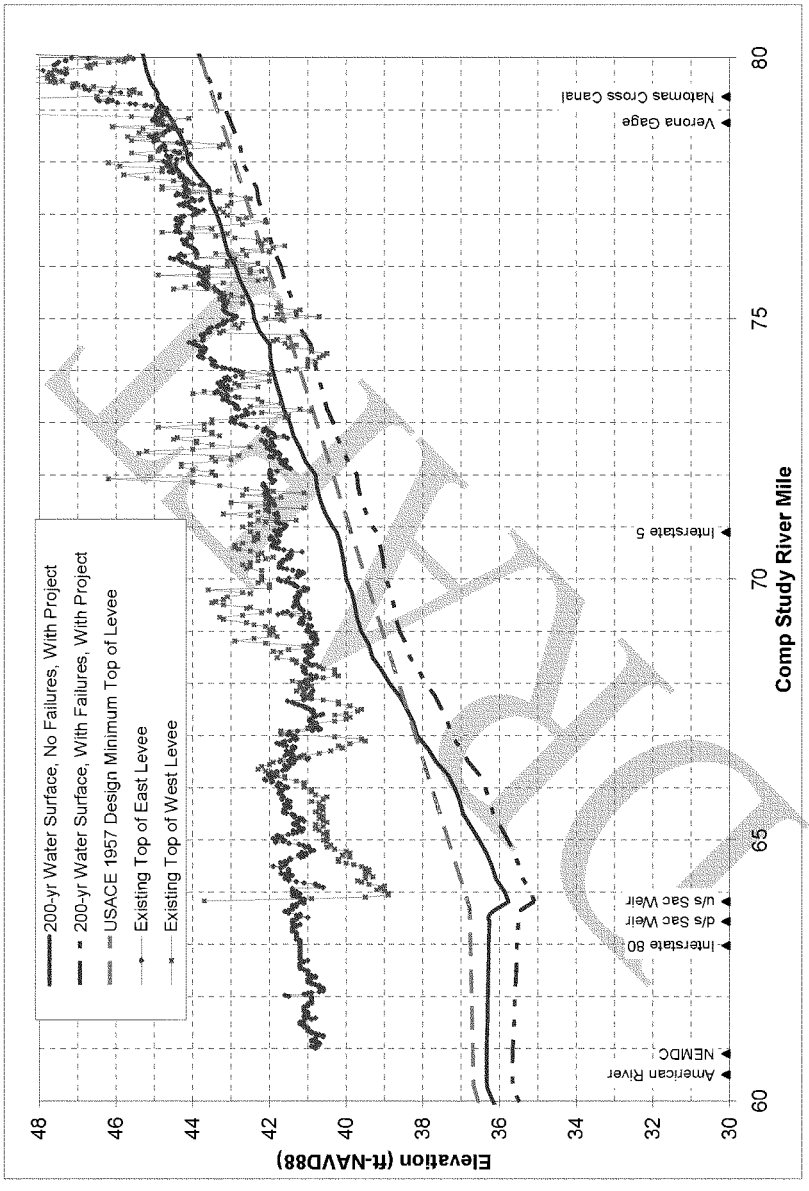

Figure 23. 200-year Water Surface Profile – Sacramento River Natomas Reach

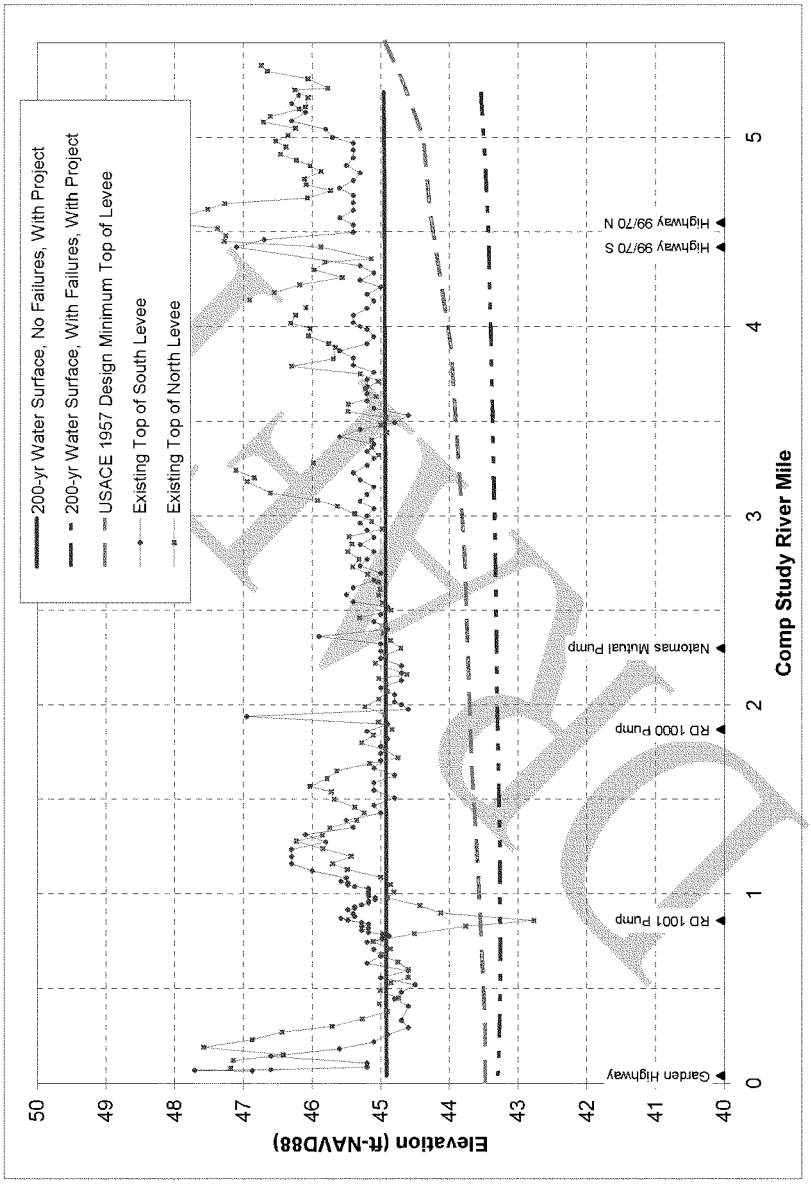

Figure 24. 200-year Water Surface Profile – Natomas Cross Canal

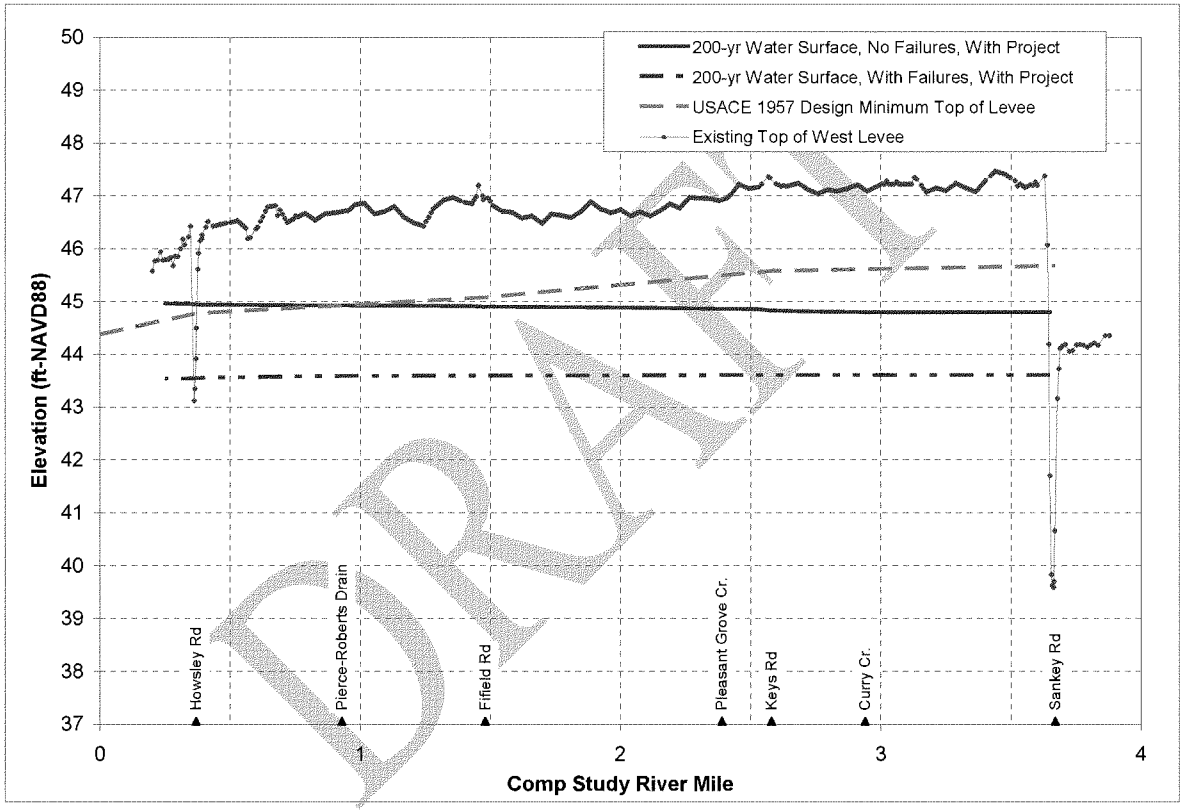

Figure 25. 200-year Water Surface Profile – Pleasant Grove Creek Canal

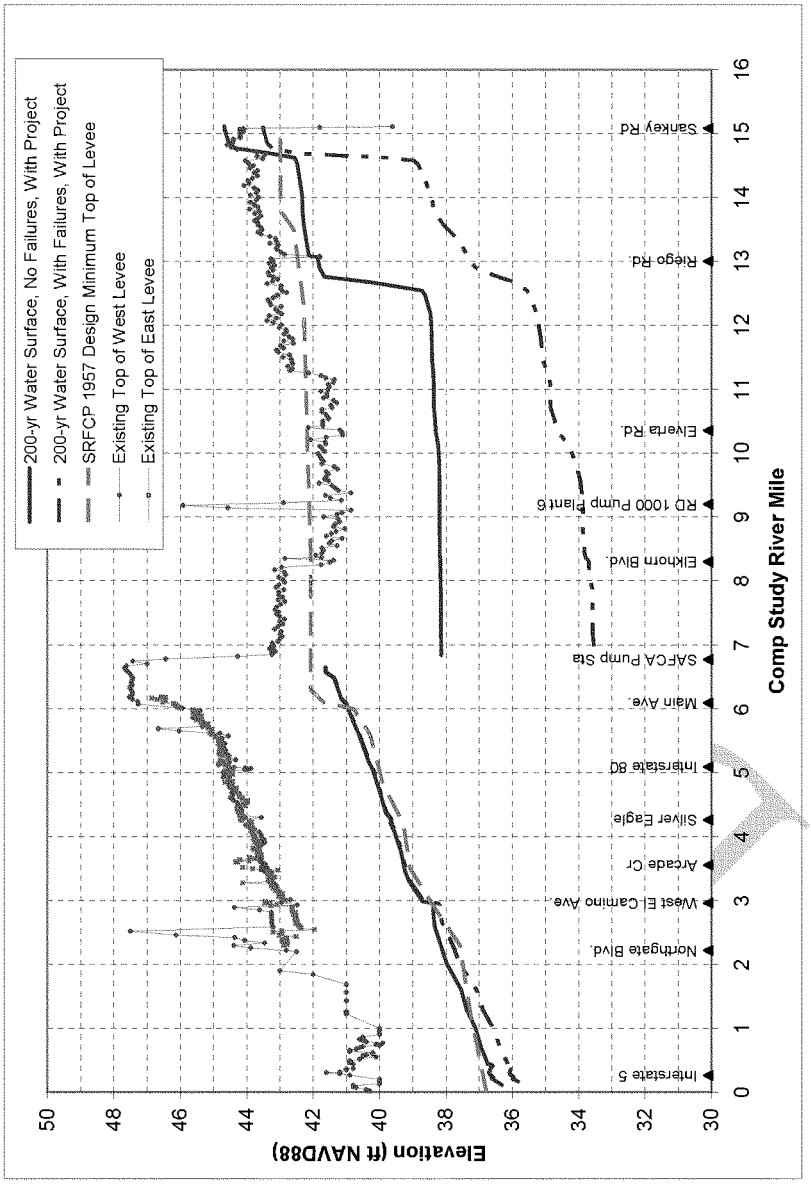

Figure 26. 200-year Water Surface Profile – NEMDC

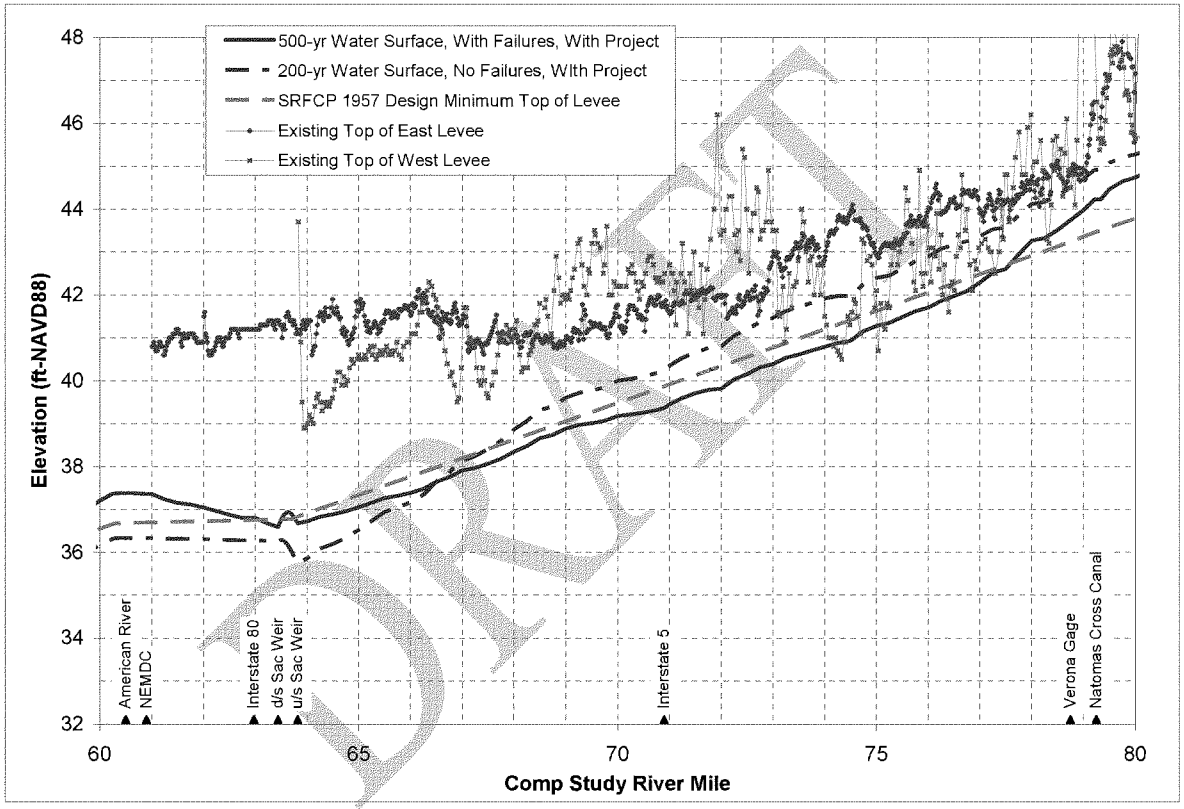

Figure 27. 500-year Water Surface Profile – Sacramento River Natomas Reach

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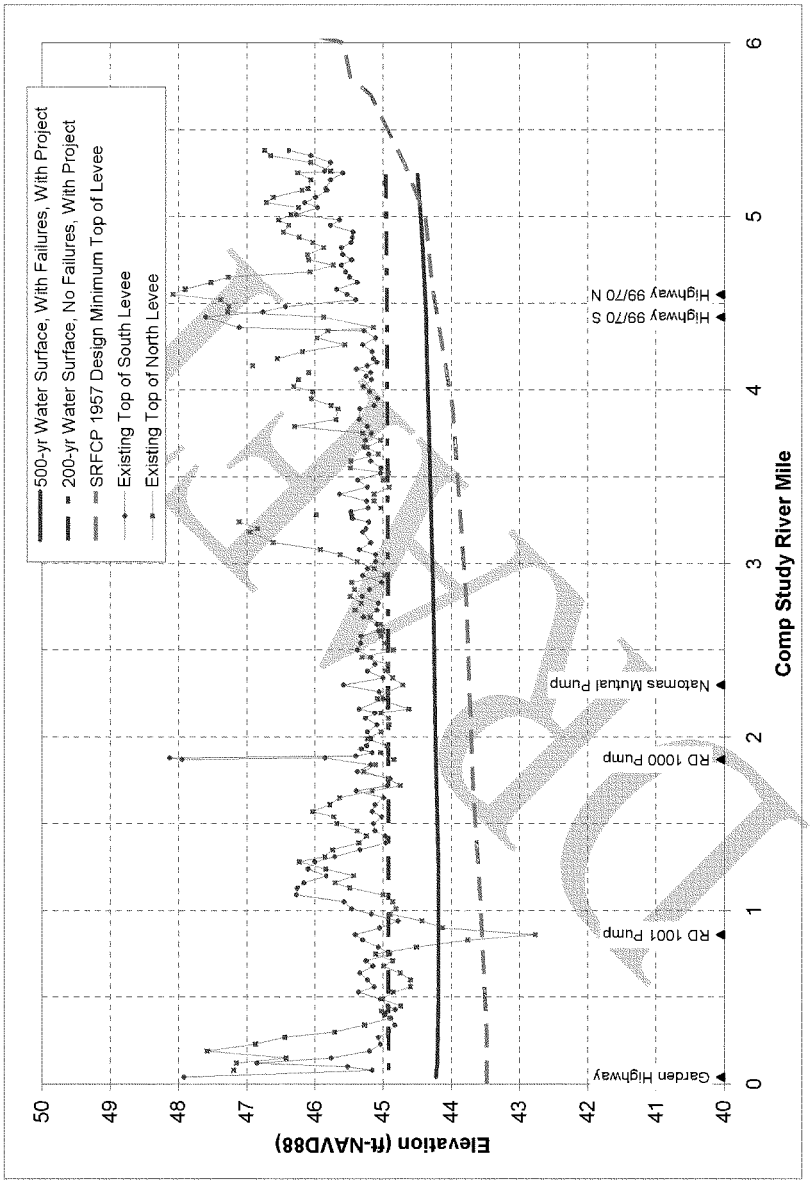

Figure 28. 500-year Water Surface Profile – Natomas Cross Canal

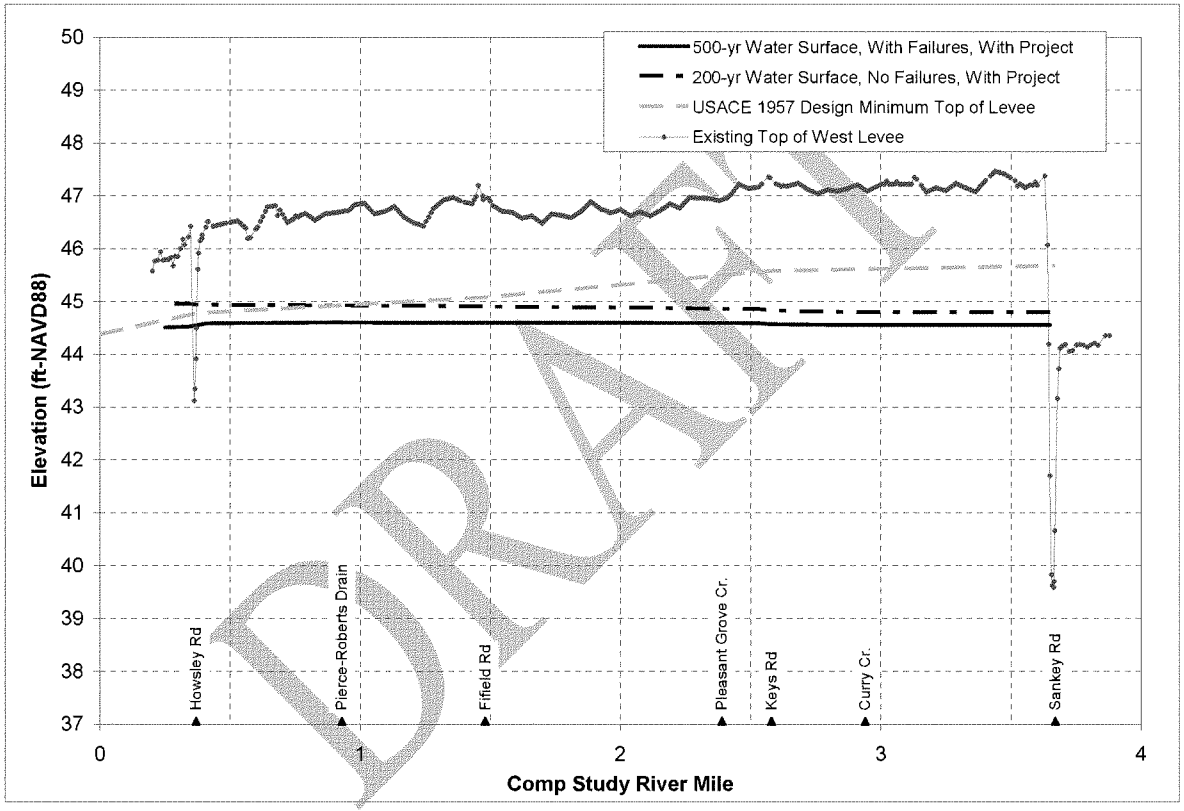

Figure 29. 500-year Water Surface Profile – Pleasant Grove Creek Canal

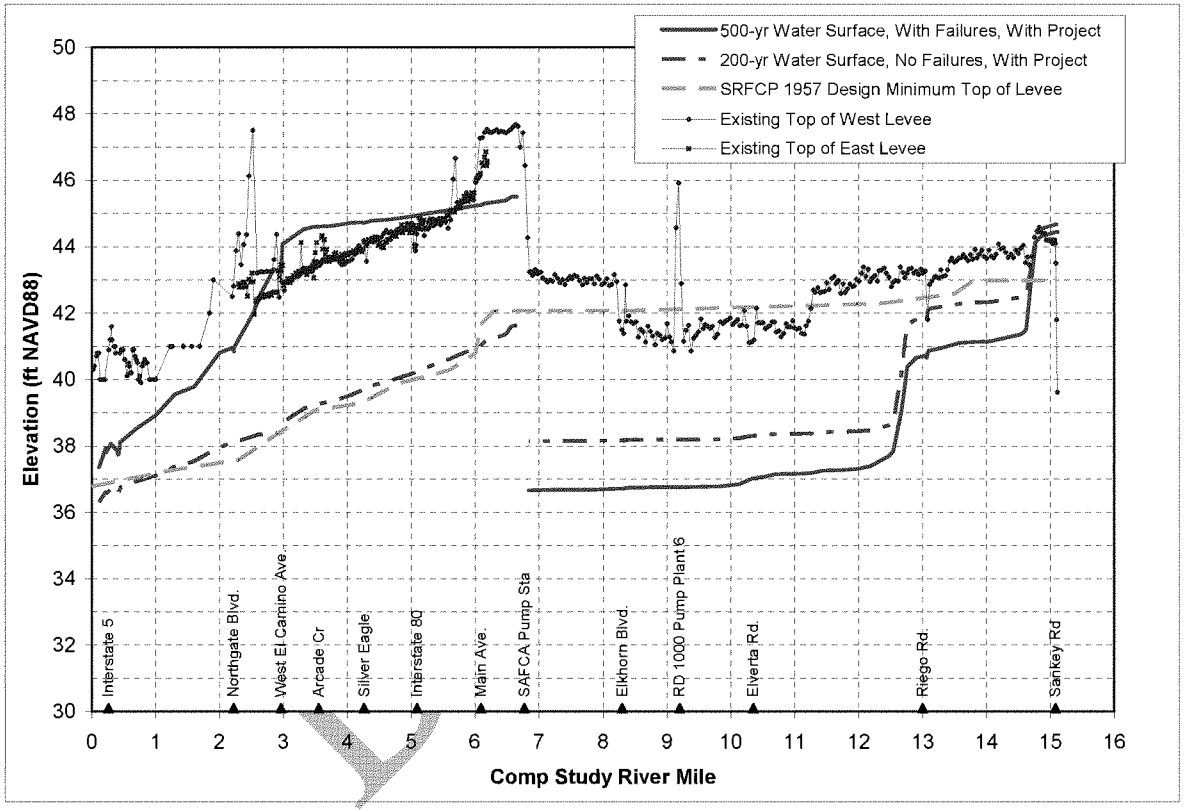

Figure 30. 500-year Water Surface Profile – NEMDC

MBK ENGINEERS

Quality Control Certification
for
Natomas Levee Improvement Program - Summary Report on Hydraulic Impact Analyses, Phase 4b Project

Certification of Internal Quality Control

I hereby certify that I have reviewed the January 11, 2010 draft report entitled *Natomas Levee Improvement Program - Summary Report on Hydraulic Impact Analyses, Phase 4b Project* and that the report adequately addresses and presents the impacts of the described project.

Joseph Countryman, P.E., MBK Engineers — January 11, 2010 Date

REGISTERED PROFESSIONAL ENGINEER
JOSEPH D. COUNTRYMAN
No. 20486
Exp. 9-30-2010
CIVIL
STATE OF CALIFORNIA

July 9, 2009 Memo from AECOM to NMFS re: SRA Habitat Mitigation for the Phase 2 and 3 Projects

EDAW | AECOM

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Memorandum

Date:	July 9, 2009
To:	Liz Holland, USACE, Karen McCartney and Madelyn Martinez, NMFS
From:	Chris Fitzer, EDAW/AECOM
Subject:	Shaded River Aquatic Habitat Mitigation Memo for SAFCA NLIP Phase 2 and 3 Projects
Distribution:	Peter Buck, SAFCA, Mike Eng, Steve Chainey, Debra Bishop, EDAW/AECOM

1 INTRODUCTION

Sacramento Area Flood Control Agency's (SAFCA) Natomas Levee Improvement Project (NLIP) will include, as part of the levee improvement construction, improvements to pumping plants and construction of drainage outfalls along the waterside of the Sacramento River east levee. Construction of these features necessitates the removal, and thus temporary and permanent impact of shaded riverine aquatic (SRA) along the Sacramento River. SAFCA has prepared a conceptual mitigation plan for the impacts to SRA. SRA mitigation will compensate for the loss of habitat for special-status fish and their prey along the Sacramento River.

Estimated losses of shaded riverine aquatic habitat from the Phase 2 and 3 SAFCA NLIP Projects will be mitigated for by the creation of SRA habitat along the waterside of the Sacramento River east levee. SRA habitat is the nearshore aquatic habitat occurring at the interface between a river and adjacent woody riparian habitat. The principal attributes of this cover type are: (1) an adjacent bank composed of natural substrates supporting riparian vegetation that either overhangs or protrudes into the water; and (2) water that contains variable amounts of submerged vegetation or woody debris, such as leaves, logs, branches, and roots and has variable depths, velocities, and currents. Riparian habitat provides structure and food for fish species including those that are state and/or federally listed. Shade decreases water temperatures in the river, while low overhanging branches can provide sources of food for fish by attracting terrestrial insects. As riparian areas mature and deteriorate, the leaves and branches fall into the river, creating structurally complex habitat consisting of in-stream woody material (IWM) that furnishes refugia for fish from predators, creates variable water velocities at a micro-scale used by a range of life stages, and provides habitat for fish and aquatic invertebrates.

SRA habitat creation will include the planting of native trees and shrubs on the waterside of the Sacramento River east levee in areas where there is currently no or limited canopy cover. As the trees mature, they will overhang the river, providing SRA habitat and associated functions. Replacement of SRA habitat that has been lost, primarily through anthropogenic causes, will result in more contiguous SRA habitat along the Sacramento River thereby improving the conditions for special-status fish that use this segment of the Sacramento River.

2 Mitigation Planning and Design

2.1 Mitigation Plan Summary

The SRA habitat mitigation site is located in Reach 1 along the Sacramento River east levee north of the areas where SRA habitat will be affected by the Phase 2 and 3 SAFCA NLIP Project (Phase 2 and 3 Project; Exhibit 1). SRA mitigation includes creating approximately 2.69 acres of SRA habitat. Creating approximately 2.69 acres of SRA habitat on the waterside of the Sacramento River east levee (Garden Highway levee) will provide compensatory mitigation for the loss of 1.89 acres of SRA habitat on the waterside of the Sacramento River east levee. The loss of SRA habitat on the Sacramento River east levee would result from the removal of riparian trees and shrubs on the waterside of the levee necessary for levee improvements in the Phase 2 and 3 Projects including: Pumping Plant No. 2 outfall reconstruction; modifications to Prichard and Elkhorn pumping plant infrastructure; and the construction of surface drain outlets to accommodate the rise of the adjacent levee (1.39 acres). Mitigation is also being conducted for the estimated loss of 0.5 acres of SRA from the construction of surface drain outlets in the Phase 2 SAFCA NLIP Project (Phase 2 Project). Estimates for SRA habitat impacts are considered conservatively high based on preliminary design plans. NMFS has determined that the trees and shrubs on the waterside of the NCC levee do not provide SRA habitat functions because the physical and hydrologic conditions associated with the NCC channel do not provide habitat value for federally listed fish species.

The creation of SRA habitat will compensate for losses through plantings along a segment of riverbank slope (the area from the waterline to the hinge of the levee terrace) and levee terrace (the bench from 10' waterside of the levee toe to the hinge of the riverbank slope) along the existing Sacramento River east levee adjacent to the Sacramento River. Following mitigation, this segment of river bank will provide more contiguous habitat for listed fish species that use the Sacramento River for rearing and as a migration corridor.

2.2 Mitigation Description

The SRA mitigation site will be created on the waterside of the Sacramento River east levee (Reach 1) from approximately 0.4 mile south of Sankey Road to approximately 0.7 mile north of Riego Road. (Exhibit 1) The Assessor's Parcel Numbers (APN) included in the mitigation site are 35-020-010, 35-020-014, 35-020-006, 35-020-005, 35-030-012, and the waterside portions of 35-020-019 and 35-030-008.

Portions of the mitigation site are currently sparsely vegetated with riparian trees and shrubs as well as a primarily nonnative herbaceous understory. Other areas are currently completely unvegetated, with large gaps in the continuity of the riparian forest corridor. SRA habitat creation will be focused in areas along the riverbank slope and the levee terrace where riparian vegetation does not currently exist (see Exhibits 2a, 2b, and 3). The existing USACE mitigation site shown in 2a is not part of the mitigation plan and will be avoided.

Portions of the riverbank slope at the mitigation site without SRA canopy cover will be planted with trees, shrubs, and willow cuttings. Depending upon site-specific conditions, this may include localized planting within riprap (angular rocks approximately 8–16 inches in diameter) and placement of soil. In areas of the riverbank slope where there is a layer of soil covering the riprap, willow cuttings will be planted in the spaces between the riprap (Exhibit 2a, "Willow Cuttings"). The portions of the levee terrace without riparian cover will be planted with native trees, shrubs, and herbaceous species. Prior to planting, areas will be treated with an approved broad-leaved selective herbicide (i.e., Milestone VM) to reduce the growth of invasive plants. An approximate 10-foot-wide portion of the levee terrace adjacent to toe of the levee (base of the slope from Garden Highway to the levee terrace) will remain unplanted to avoid an existing maintenance road.

2.3 Characteristics of Design Reference Site

Through modifications to the banks of the Sacramento River, including the construction of the Sacramento River east levee and the development of land on the riverbank, the natural riparian vegetation along the Sacramento River has been altered or lost in many places. There is, however, an approximately 1-mile segment of riverbank along the waterside of the east levee that is densely vegetated and serves as a reference site for the SRA mitigation area (see Exhibit 4). The reference site is located between the Sacramento/Sutter County line and the RD 1000 Pumping Plant No. 2 (near Prichard Lake Road) in Reaches 4a through 4b (see Exhibits 1 and 4). The reference site provides fairly uninterrupted canopy cover for the entire area on the waterside of the levee. This reference site was selected for the higher quality/quantity of SRA habitat that currently exist at this site compared to the mitigation site (e.g., amount of shade, cover, habitat, and botanical complexity), the similarity in constraints to the mitigation site (e.g., riverbank modified into a levee and resulting disconnected floodplain), and the proximity to the mitigation site. Because the existing maintenance road bisecting the mitigation site will need to be maintained, once plantings have matured, the canopy on the levee terrace portion of the mitigation site is expected to provide less cover than the reference site.

2.4 Compensation Ratios

The Phase 3 Project is conservatively estimated to impact approximately 1.39 acres of SRA habitat along the Sacramento River east levee. Phase 3 Project impacts would result from reconstruction of the Pumping Plant No. 2 outfall, modifications to Prichard and Elkhorn pumping plants, and the construction of new surface drainage outlets. There is also a conservative estimate of 0.5 acres of impacts on SRA habitat along the Sacramento River east levee from the construction of new surface drainage outlets in the Phase 2 Project.

The total impact area of 1.89 acres is a conservative estimate based on preliminary design plans and may be reduced in the future through additional impact avoidance and minimization efforts. Furthermore, some of the areas disturbed by Phases 2 and 3 Project construction will be replanted with native riparian vegetation, and a portion of the surrounding area that does not have riparian cover (trees and shrubs) may be enhanced with additional plantings providing SRA habitat. Detailed construction design plans will provide more information to enable the determination of how much of each impact/construction site will be available for planting or replanting following construction. This is anticipated to further reduce the estimated permanent area of impacts to SRA habitat from the Phase 2 and 3 Projects. The resource agencies will be immediately notified of any changes in the impact acreage calculations.

The NMFS requires a 1:1 compensation ratio for in-kind SRA mitigation, and a 3:1 compensation ratio for non-in-kind SRA mitigation. That is, impacts below the ordinary high-water mark (OHWM) must be mitigated at a 1:1 ratio with habitat created below the OHWM or at a 3:1 ratio with SRA habitat created above the OHWM; impacts above the OHWM can be mitigated at a 1:1 ratio with in-kind habitat created above the OHWM. NMFS determined that for the purpose of identifying impacts and mitigation requirements for the NLIP Project, the levee terrace hinge (location of the change in angle from the levee terrace to the riverbank slope) would serve as a surrogate for the OHWM.

The acreage of SRA impacts and mitigation below and above the OHWM is summarized in Table 1. The total amount of mitigation is estimated to be approximately 0.8 acre greater than what is required to mitigate the loss of SRA habitat in the Phase 2 and 3 Projects. This additional SRA acreage may be used to offset SRA impacts that may occur in other project phases, upon resource agency approval.

Table 1
Impact and Mitigation Acreages for Shaded Riverine Aquatic Habitat

Impacted Area	Impacted SRA (acres)	Mitigation Area (acres)
Above OHWM	1.68	1.59 (Levee Terrace)
Below OHWM	0.21	0.9 (Levee Slope)
Total	**1.89**	**2.69**

Source: Data compiled by EDAW in 2009

3 Implementation Plan

3.1 Resource Protection Measures

Best Management Practices for SRA Habitat Creation
The following measures shall be implemented to avoid and minimize potential adverse effects on water quality:

- All work within the existing floodway (i.e., waterside) of the Sacramento River shall not take place during the designated flood season (i.e., November 1 to April 15) and shall not begin until evaluation of upstream conditions (e.g., reservoir storage and snowpack) indicate that inundation of these areas is unlikely to occur.

- All local, state, and federal regulations and environmental requirements regarding turbidity-reduction measures shall be complied with, including the following: obtain and comply with relevant agency permits (e.g., DFG Streambed Alteration Agreement, Central Valley Regional Water Quality Control Board (CVRWQCB) Clean Water Act Section 401 Certification, Section 404 permit); develop and implement a storm water pollution prevention plan (SWPPP) that identifies specific best management practices (BMPs) to avoid and minimize impacts on water quality during construction activities; and comply with the conditions of the National Pollutant Discharge Elimination System (NPDES) general stormwater permit for construction activity. SAFCA shall file a notice of intent to discharge stormwater with the State Water Resources Control Board (SWRCB) prior to initiating construction activities. The SWPPP shall provide detailed construction timelines and a BMP monitoring and maintenance schedule. Standard erosion control measures shall be designed to reduce the potential for soil erosion and sedimentation of waterways and drainage channels.

At a minimum, the following specific BMPs are proposed for implementation:

- Conduct all work according to site-specific construction plans that identify areas for clearing, grading, and revegetation so that ground disturbance is minimized;

- Avoid native riparian and wetland vegetation wherever possible and identify vegetation to be retained for habitat maintenance (i.e., as identified through preconstruction biological surveys), cover cleared areas with mulches, install silt fences near riparian areas or waterways to control erosion and trap sediment, and reseed cleared areas with native vegetation;

- Stockpiling of construction materials, including portable equipment, vehicles and supplies, including chemicals, shall be restricted to the designated construction staging areas, exclusive of any riparian or wetland areas;

- All litter, debris, unused materials, equipment, and supplies shall be removed daily from any areas below the OHWM and deposited at an appropriate disposal or storage site;

- Stabilize disturbed soils of construction areas before the onset of the winter rainfall season;
- Stabilize and protect stockpiles from exposure to erosion and flooding.

The SWPPP also shall specify appropriate hazardous materials handling, storage, and spill response practices to reduce the possibility of adverse impacts from use or accidental spills or releases of contaminants. Specific measures applicable to the project include, but are not limited to, the following:

- SAFCA's contractors shall comply with all applicable SWRCB and CVRWQCB standards and other applicable water quality standards;
- Develop and implement strict on-site handling rules to keep construction and maintenance materials out of drainages and waterways;
- Conduct all refueling and servicing of equipment on the landside of the levee and with absorbent material or drip pans underneath to contain spilled fuel. Collect any fluid drained from machinery during servicing in leak-proof containers and deliver to an appropriate disposal or recycling facility;
- Maintain controlled construction staging, site entrance, concrete washout, and fueling areas on the landside of the levees or at least 100 feet away from waterways or wetlands to minimize accidental spills and runoff of contaminants in stormwater; and
- Maintain spill cleanup equipment in proper working condition. Clean up all spills immediately according to the spill prevention and response plan, and immediately (within 24 hours) notify NMFS, USFWS, DFG, and the CVRWQCB of any spills and cleanup procedures. Report all such spills, and the success of the efforts to clean them, in post-construction compliance reports.

The following measures shall be implemented to avoid and minimize potential direct adverse effects to special-status fish species:

- A worker awareness training program shall be conducted for construction crews before the start of construction activities. The program shall include a brief overview of sensitive fisheries and aquatic resources (including riparian habitats) on the project site, measures to minimize impacts on those resources, and conditions of relevant regulatory permits.
- Although no in-water work is projected, any in-water construction activities that occur shall be conducted during months when special-status fish species/sensitive life stages are least likely to be present or less susceptible to disturbance (e.g., July 1 to October 31). If any in-water work is to be conducted, a qualified biologist or resource specialist shall be present during such work to monitor construction activities and ensure compliance with mitigation requirements and terms and conditions of permits issued by regulatory agencies.

The following measure shall be implemented to avoid and minimize potential direct adverse effects to SRA:

- SAFCA would ensure that all construction activities located on the waterside of the Sacramento River east levee and/or NEMDC west levee, including clearing, pruning, and trimming of riparian vegetation, and/or removal of large woody debris (LWD) (especially vegetation and LWD that provides SRA habitat functions), are supervised by a qualified biologist to ensure these activities result in minimal loss of this vegetation/habitat types. All sensitive SRA habitats that are not specified to be affected by the proposed project would be identified and fenced off using orange construction fencing or similar materials. Sensitive SRA habitat information shall be incorporated

into project bid specifications along with a requirement for contractors to avoid these sensitive habitats. Any SRA habitat (including riparian vegetation and LWD) that is lost or disturbed as a result of project construction activities shall be restored, replaced, or rehabilitated on a no-net-loss basis using the specified compensations ratios (above).

3.2 Mitigation Design

Site preparation (particularly for the levee terrace) may include mowing to control invasive and noxious plants, clearing of invasive and noxious brush and trees, disking soil, and applying broadleaf selective herbicide to invasive and noxious plants. No off-site soil disposal is anticipated, with the exception of a small amount of surface soils with root fragments of rhizomatous invasive plants. A location for disposal of these soils has not been determined, but the soils will be disposed of at a location and in a manner to avoid any impacts on sensitive resources.

The SRA mitigation site will include the planting of native riparian trees, shrubs, and herbaceous species. Within the SRA mitigation site, the areas that will be planted vary depending on the characteristics of their unique locations and substrate characteristics (see Exhibits 2a and 2b). In general, three areas will be planted: (1) the levee terrace, (2) the riverbank slope, and (3) willow cuttings on the soil-covered riverbank slope (see Exhibit 3). The plantings will include native trees, shrubs, and herbaceous species suitable to the riparian zone and adapted to a range of inundation frequencies and durations. Tables 2 and 3 below include the plant species, sizes, typical spacing, and seed quantities that will be used for the three planting areas.

Table 2
Tree and Shrub Species Chosen for Planting the Three Regions of the SRA Mitigation Site

Region	Botanical Name	Common Name	Plant Size	Plant Spacing
Terrace Planting	*Acer negundo*	Boxelder	Treepot4	10 ft on center
	Populus fremonti	Cottonwood	Deepot	10 ft on center
	Quercus lobata	Valley oak	Treepot4	10 ft on center
	Baccharis glutinosa	Mule-fat	Deepot	10 ft on center
	Rosa california	California wild rose	Treeband	10 ft on center
	Artemesia douglasiana	Mugwort	Treeband	5 ft on center
	Carex barbarae	Santa Barbara sedge	Treeband	5 ft on center
	Clematis lasiantha	Pipestem clematis	Treeband	5 ft on center
	Rubus ursinus	California blackberry	Treeband	5 ft on center
Exposed Riprap Slope Planting	*Populus fremonti*	Cottonwood	Deepot	5 ft on center
	Salix gooddingii	Black willow	Deepot	5 ft on center
	Salix lasiolepis	Arroyo willow	Deepot	5 ft on center
Willow Cuttings (soil-covered slope)	*Salix gooddingii*	Black willow	Cutting	5 ft on center

Source: Data compiled by EDAW in 2009

Table 3
Herbaceous Species Chosen for the Seed Mix for the Terrace of the SRA Mitigation Site

Botanical Name	Common Name	Application Rate (lbs/acre)	Seeding Rate (PLS*/acre)
Artemesia douglasiana	*Mugwort*	5	72
Bromus carinatus	*California brome*	5	72
Carex barbarae	*Santa Barbara sedge*	5	72
Elymus glaucus	*Blue wildrye*	5	72
Leymus triticoides	*Creeping wildrye*	5	72

Notes: * Pure live seed (PLS) = (% germination X % purity)/100
Source: Data compiled by EDAW in 2009

The levee terrace will be planted with treepot, treeband, and deepot containers (Table 2) as well as seed mix for native grass and herbaceous species (Table 3). The majority of the riverbank slope consists of exposed 8- to 16-inch riprap. This region will be planted with deepot cottonwoods and willows (Table 2). The area of the riverbank slope that consists of riprap covered by roughly 12 inches of soil will be planted with willow cuttings in the spaces between the riprap. Additional soil may be added to aid in the establishment and proliferation of the cuttings.

All plant material will be obtained from reputable nurseries. The nurseries will include those that specialize in native revegetation material propagated from local genetic stock from within 200 miles of the Phase 2 and 3 Projects unless otherwise approved by a qualified ecologist.

3.3 Maintenance during Establishment Period

Table 4 presents the maintenance schedule for SRA; further details are provided below.

Table 4
Maintenance Schedule

Activity	Frequency
Site inspection	Inspect monthly during the first 6 months, then a minimum of twice per year for 3 years or until success criteria are met.
Weed Control	Spot spray one or two times per year during the spring and late summer as needed until year 3 success criteria are met.
Debris removal	Remove excessive thatch buildup, as needed for fire safety.

Source: Data compiled by EDAW in 2009

Maintenance activities within the SRA mitigation area will be conducted with the primary goal of ensuring the survival of all planted trees and shrubs and a native-plant understory. Weed control is crucial for achieving these goals; weeds must be controlled during the first 3 years so that they do not compete with planted or seeded native species. Weed control will continue for up to 3 years as needed or until success criteria are met (if longer than 3 years).

Weeds will be controlled through mechanical (e.g., string trimming, hand pulling) and chemical (selective herbicide registered for use near water) means, depending on site-specific variables (e.g., weed species size and invasiveness, topography, proximity to water's edge). All planted areas will be inspected twice per year, in the spring and summer/fall, and treated as necessary.

All planted areas will be irrigated with bubblers, drips lines, or spray heads. Successful plant establishment will be assured by a 3-year performance-based and legally enforceable contract awarded to a qualified revegetation contractor (see below), and by frequent site inspections by SAFCA of work in progress.

4 Monitoring Plan

4.1 Success Criteria

After the SRA mitigation site has been constructed and planted, a 3-year monitoring program will be conducted to determine the site's progress toward meeting established success criteria. The created habitat will be considered successful when it exhibits the success criteria specified in Table 5 below. A relative canopy cover of 15% at the end of the third year would provide partial SRA coverage. Over time, the trees and shrubs will mature and provide full SRA coverage consisting of a closed canopy and an understory with woody scrub vegetation.

Table 5
Shaded Riverine Aquatic Habitat Success Criteria

Year	Survival of Planted Trees and Shrubs (%)	Relative Canopy Cover (%)
1	85	5
2	85	10
3	80	15

Source: Data compiled by EDAW in 2009

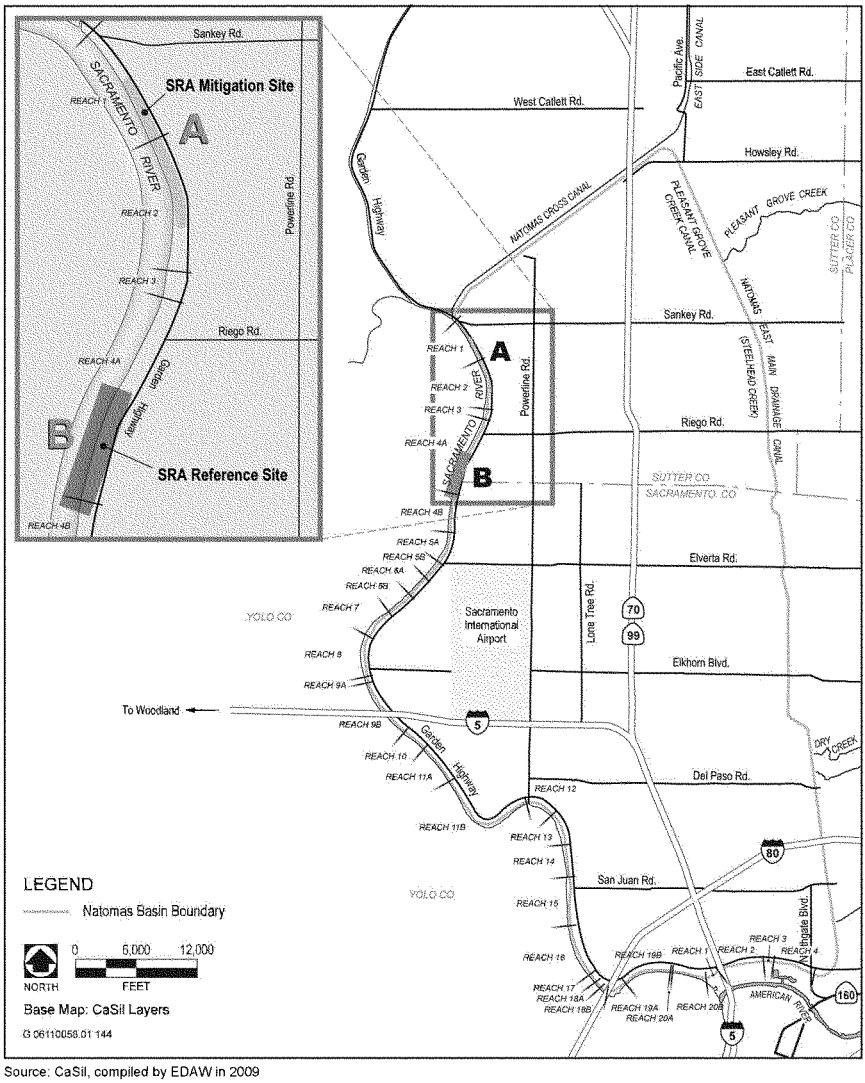
If a success criterion is not met during any monitoring year, replacement plantings or adaptive management techniques will be implemented, and that year's monitoring will be repeated the following year until each success criterion is met without additional intervention. Thus, the success criteria specified in year 3 must be reached without human intervention (e.g., irrigation, replacement planting).

4.2 Monitoring Methods and Schedule

Field assessments of SRA planting areas will be conducted twice per year. The timing of these assessments will be adjusted according to annual site-specific conditions, but assessments will generally occur in the spring and summer/fall. To measure percent survival of trees and shrubs, each plant will be inspected and the species of each live plant will be recorded. Qualitative assessments will be recorded to track the health and vigor of each species for use with adaptively managing the mitigation site.

To determine the success of the SRA plantings as a functioning ecosystem, percent canopy will be estimated each summer/fall by recording the extent of SRA habitat on aerial photographs, or using repeat transects or fixed radius plots at ground level. The timing of these assessments will be adjusted according to annual site-specific conditions, but assessments will generally occur in late summer or early fall while trees are still in full foliage. The results of these assessments will also be used to determine where replanting should occur, if necessary, to maintain sufficient SRA habitat.

Monitoring of SRA habitats will be recorded independently for each type of planted area (i.e., on the riprap slope below the levee terrace, on the soil-covered portion of the riverbank slope, and on the levee terrace) because they have slightly different planting regimes and maintenance needs specific to their unique location/type of planting. All monitoring will occur for 3 years or until the success criteria are met, whichever period is longer.



Source: CaSil, compiled by EDAW in 2009

SRA Mitigation Site Location **Exhibit 1**

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Source: Compiled by EDAW in 2009

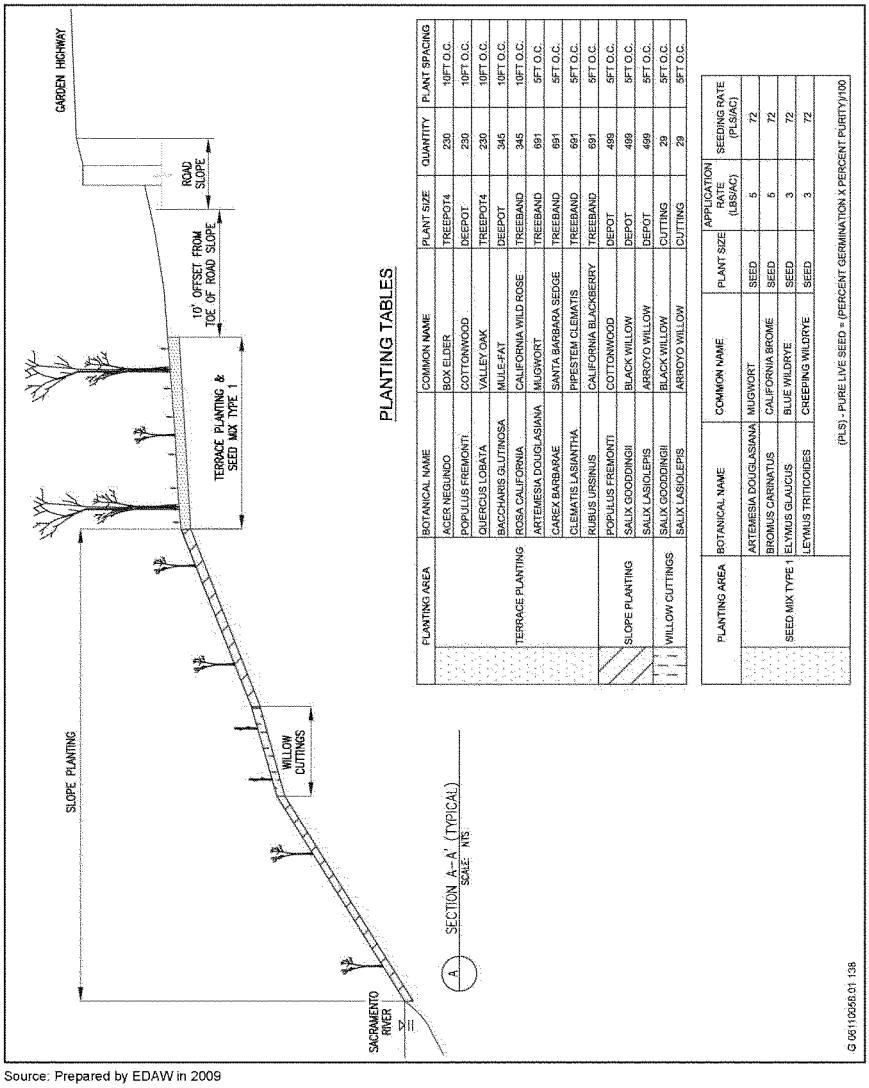
Shaded Riverine Aquatic Habitat Mitigation Site (Proposed Location) **Exhibit 2a**

EDAW | AECOM

Source: Compiled by EDAW in 2009

Shaded Riverine Aquatic Habitat Mitigation Site (Proposed Location) **Exhibit 2b**

EDAW | AECOM



Source: Prepared by EDAW in 2009

Typical SRA Mitigation Site Cross Section **Exhibit 3**

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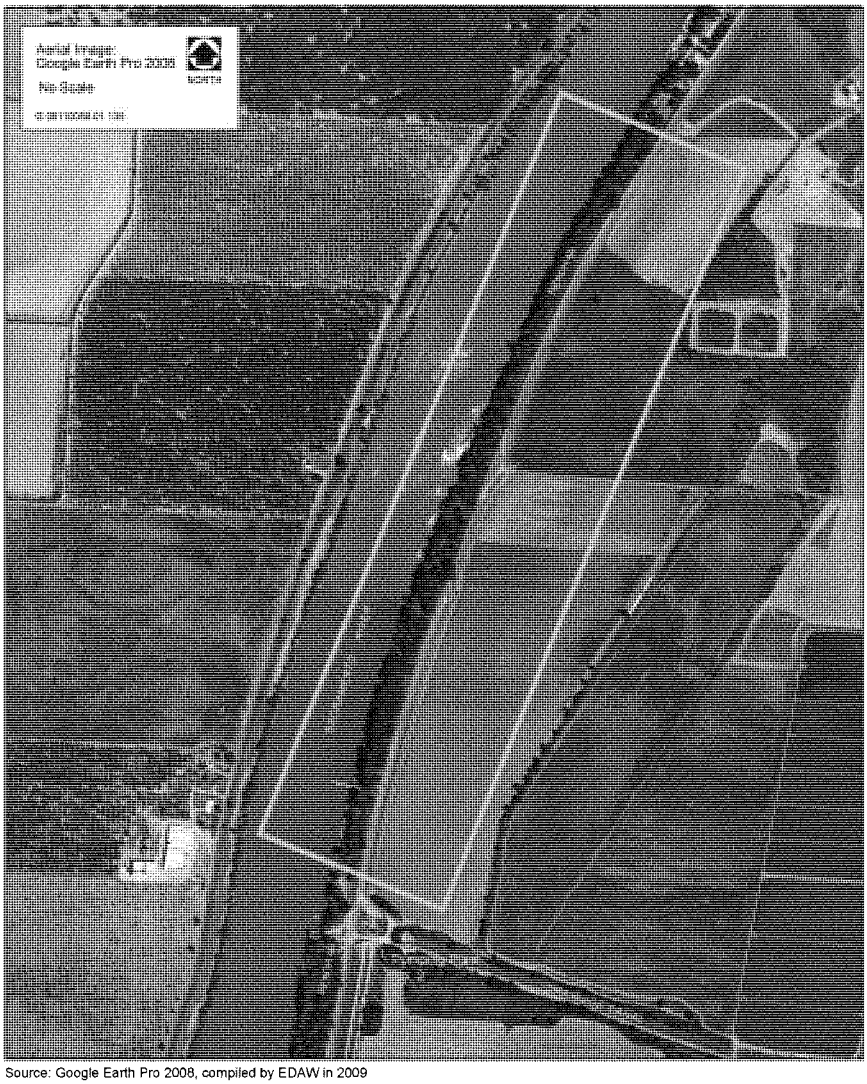

Source: Google Earth Pro 2008, compiled by EDAW in 2009

SRA Reference Site **Exhibit 4**

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C2 Evaluation of Potential NLIP Groundwater Impacts
(Luhdorff & Scalmanini Consulting Engineers)

Evaluation of Potential Groundwater Impacts Due to Proposed Construction for Natomas Levee Improvement Program

prepared for:

Sacramento Area Flood Control Agency
(SAFCA)

prepared by:

Luhdorff & Scalmanini,
Consulting Engineers

May 4, 2009

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Acronyms and Abbreviations

AFB	Air Force Base
af	acre-feet
af/ac/yr	acre-feet per acre per year
af/ft^2	acre-feet per square foot
afy	acre-feet per year
CVIGSM	Central Valley Integrated Groundwater and Surface Water Model
DWR	California Department of Water Resources
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ET	evapotranspiration
FAA	Federal Aviation Agency
ft	feet
ft/day	feet per day
ft/ft	feet per foot
GGS	giant garter snake
GPS	Global Positioning System
HEC	Hydrologic Engineering Center
HDR	HDR Engineering, Inc.
IGSM	Integrated Groundwater and Surface Water Model
lf	linear feet
LSCE	Luhdorff & Scalmanini, Consulting Engineers
M&H	Mead & Hunt
M&I	municipal and industrial
MBK	MBK Engineers
msl	mean sea level (based on NAVD88)
MW	Montgomery Watson
MWH	Montgomery Watson Harza
NARIGSM	North American River Integrated Groundwater and Surface Water Model
NAVD	North American Vertical Datum
NBC	Natomas Basin Conservancy
NBHCP	Natomas Basin Habitat Conservation Plan
NCC	Natomas Cross Canal
NCMWC	Natomas Central Mutual Water Company
NEMDC	Natomas East Main Drainage Canal
NGVD	National Geodetic Vertical Datum
NLIP	Natomas Levee Improvement Project
pers. comm.	personal communication
PGCC	Pleasant Grove Creek Canal
RD 1000	Reclamation District No. 1000
SACIGSM	Sacramento County Integrated Groundwater and Surface Water Model
SAFCA	Sacramento Area Flood Control Agency

Acronyms and Abbreviations (continued)

SCS	Soil Conservation Service
SIA	Sacramento International Airport
URS	URS Corporation
USACE	U.S. Army Corp of Engineers
VVA	Valley View Acres
WRIME	Water Resources & Information Management Engineering

1.0 Introduction

The Sacramento Area Flood Control Agency (SAFCA) requested that Luhdorff and Scalmanini, Consulting Engineers (LSCE) conduct an investigation of the potential groundwater impacts of levee improvements proposed by SAFCA along portions of the levees surrounding the Natomas Basin. These include the Sacramento River East Levee, the Natomas Cross Canal (NCC) South Levee, the Pleasant Grove Creek Canal (PGCC) West Levee, the Natomas East Main Drainage Canal (NEMDC) and Steelhead Creek West Levee, and the American River North Levee. Most of the proposed levee improvements will have no effect on groundwater, but there are potential effects due to land use changes, slurry cutoff walls, new or relocated canals, and borrow site excavation. LSCE (2008a) prepared a preliminary evaluation on the effects of proposed Sacramento River East Levee slurry cutoff walls in a previous report entitled *Evaluation of Potential Groundwater Impacts Due to Proposed Sacramento River East Levee Improvements with Emphasis on Reaches 2 and 3*. The information in this report updates and supercedes the contents of the previous report.

This report includes detailed water budgets prepared for the Natomas Basin to evaluate the groundwater impacts of all proposed SAFCA construction activities. The water budgets are partially based on the results of two existing numerical groundwater flow models that together simulate the North and South American Subbasins (including the Natomas Basin) in Sutter, Placer, and Sacramento Counties. Water Resources and Information Management Engineering, Inc. (WRIME) updated these models in 2007-2008 to better reflect existing and predicted future land and water use in the Natomas Basin. Some of the groundwater budget results summarized below are based on the 2030 simulations, which are summarized in LSCE (2008b). A groundwater budget for proposed SAFCA construction activities was calculated separately and was used to evaluate the cumulative impacts of these activities on existing and future groundwater conditions in the Natomas Basin and the North American Subbasin.

1.1 Report Revisions

This is a revised version of the report submitted to SAFCA on November 14, 2008. Revisions to this and other reports prepared for the Natomas Levee Improvement Project (NLIP) Phase 3 Project Environmental Impact Report (EIR)/Environmental Impact Statement (EIS) were necessary due to a requirement by the U.S. Army Corps of Engineers (USACE) that all elevations be converted from the NGVD 1929 vertical datum to the NAVD 1988 vertical datum. Revisions based on the datum change were made to one table and 13 figures in the report.

Other changes to the report were made to reflect updated plans for slurry cutoff walls surrounding the Natomas Basin. As of April 2009, planned mitigation for levee seepage calls for additional cutoff walls along a number of reaches the Sacramento River East Levee, the PGCC West Levee, the NEMDC West Levee, and the American River North Levee. However, many of these planned cutoff walls are shallower than those previously proposed.

Changes to the analysis of potential slurry cutoff wall impacts were also necessitated by recent revisions to a groundwater flow model prepared by Kleinfelder, Inc. (Kleinfelder) to estimate seepage beneath the Sacramento River East Levee with and without slurry cutoff walls. That analysis was originally summarized in a report entitled *Evaluation of Cutoff Walls Impact on Groundwater Recharge, Sacramento River East Levee, Natomas Levee Improvement Project, Sacramento and Sutter Counties, California.* (Kleinfelder, December 19, 2007). The revised report is dated April 21, 2009. The analysis of the potential groundwater impacts of slurry cutoff walls in this report is partially based on results of the 2009 Kleinfelder model.

1.2 Project Description

The analysis of groundwater impacts in this report relies on project descriptions for proposed SAFCA construction activities obtained from a variety of sources. These include the Draft and Final EIR for the NLIP prepared by EDAW (2007a and 2007b) and the Draft EIS prepared by USACE (2008). Design and engineering work for most of these projects is still in progress, so assumptions were made about the most likely configuration of each project. In cases where even preliminary project descriptions were not available, a conservative option was selected for analysis. Assumptions about many of these projects were provided primarily via personal communications (pers. comm.) with David Rader of EDAW and Marieke Armstrong of Mead & Hunt (M&H). Other information was provided by Wood Rodgers and the engineering team at Kleinfelder.

1.2.1 Levee Improvements

Groundwater impacts from proposed levee improvements are primarily limited to the potential effects of land use changes and slurry cutoff walls. Slurry cutoff walls and seepage berms are proposed mitigation measures to reduce problems of excess seepage beneath the levees, but no direct groundwater impacts are expected from seepage berms because they would be above the water table. The slurry cutoff walls are intended to reduce seepage beneath the levees, and impacts resulting from this reduction are addressed in this report. The location of the five levees discussed below are shown in **Figure 1-1**. A total of about 29 miles of slurry cutoff walls is currently proposed.

Sacramento River East Levee – Levee improvements will require land use changes, including removal of 20 acres of rice, 175 acres of field crops, and five acres of orchard. Slurry cutoff walls are proposed for 12 reaches (total of 10.1 miles) of the 18.1 mile length of the East Levee. These cutoff walls will range in depth from about 14 to 115 feet, with an average depth of about 65 feet.

Natomas Cross Canal South Levee – Proposed land use changes along the NCC South Levee will require removal of about five acres of rice fields. Slurry cutoff walls are being constructed for the entire length (about 5.4 miles) of the NCC. These cutoff walls are projected to be about 70 feet deep. Approximately 5,400 lineal feet (lf) of cutoff wall was installed in 2007, and another 3,600 lf was planned to be installed in 2008.

Pleasant Grove Creek Canal West Levee – The PGCC West Levee is about 3.3 miles long, and slurry cutoff walls ranging in depth from 20 to 50 feet are currently proposed for about

14,000 lf of the levee. Proposed land use changes along the PGCC West Levee would require removal of about 50 acres of rice fields.

Natomas East Main Drainage Canal West Levee – The NEMDC and Steelhead Creek West Levee is about 13.3 miles long. Improvements to the NEMDC West Levee are in the early planning stages, but slurry cutoff walls are being considered for about 8.7 miles of the levee. The estimated depths of these cutoff walls are range from 30 to 45 feet for the North NEMDC and 30 to 53 feet for the South NEMDC. Land use changes due to NEMDC levee improvements have not been evaluated, but irrigated agriculture is limited to the northern portion of the levee and effects are expected to be minimal.

American River North Levee – The American River North Levee is about 2.2 miles long in the Natomas Basin. Plans for improvements to this levee are in the very early planning stages, but slurry cutoff walls are under consideration for the entire length of the levee. Proposed cutoff walls would have an estimated depths of approximately 35 feet for Reaches 1 and 2 and 80 feet for Reaches 3 and 4. There is no irrigated agriculture in this area to be affected by levee improvements.

1.2.2 Canal Improvements

SAFCA is planning to construct one new canal in the Natomas Basin and relocate or improve three existing canals. This construction will necessitate land use changes, including the loss of irrigated agricultural land. Although seepage from existing canals has not been quantified, it is considered to be a significant contributor to groundwater recharge in the Natomas Basin. The new and relocated canals will be unlined and will result in an overall increase in the rate of canal seepage. The proposed locations of new and existing canals discussed below are shown on **Figure 1-1**.

Giant Garter Snake/Drainage Canal – SAFCA plans to construct a new Giant Garter Snake (GGS) and Drainage Canal east and roughly parallel to the Sacramento River East Levee. The GGS/Drainage Canal will be about 4.4 miles long and 50 feet wide at the waterline, and will be unlined. A total of 45 acres of the land where the GGS/Drainage Canal will be constructed is currently planted to field crops.

West Drainage Canal – The GGS/Drainage Canal begins at the terminus of the West Drainage Canal. A number of improvements to the West Drainage Canal are planned, including rerouting of about 4,700 lf of the existing canal. The overall length of the canal will increase from about 3.6 to 3.9 miles, and the average width at the waterline will increase from 30 to 72 feet.

Elkhorn Canal – The Elkhorn Canal, which is located east of the Sacramento River East Levee and northwest of the Sacramento International Airport (SIA), is about 3.8 miles long and 16 feet wide. SAFCA plans to relocate this canal to make room for levee improvements. The relocated canal will be about 4.2 miles long and 32 feet wide. Approximately one mile of the existing Elkhorn Canal is lined with concrete, and about 6,000 lf of the relocated canal is proposed to be lined. In addition, two sections of the relocated canal (total of about 3,950 lf), primarily through the Teal Bend Golf Course, would be piped.

Riverside Canal – This canal, which is located east of the Sacramento River East Levee in the southwestern corner of the Natomas Basin is about 3.7 miles long and seven feet wide. SAFCA plans to relocate the Riverside Canal to accommodate levee construction, and the new canal would be about 3.9 miles long and ten feet wide.

1.2.3 Borrow Sites

SAFCA will require several borrow sites in the Natomas Basin to obtain sufficient soil for the proposed levee and canal improvements. The locations of these borrow sites are shown on **Figure 1-1**.

Airport North Bufferlands – The Airport North Bufferlands borrow site consists of 737 acres owned by the SIA and located north of the airport. Approximately 630 acres of this site that had previously been planted to rice have recently been removed from rice cultivation or other land uses that would attract water fowl at the request of the Federal Aviation Agency (FAA) and is currently fallow. SAFCA plans to remove about four to six feet of borrow material and restore the site to non-irrigated grassland.

Brookfield Property – The Brookfield property consists of 353 acres at the northern tip of the Natomas Basin. Approximately 325 acres of this property is currently planted to rice, and SAFCA plans to restore it to rice cultivation after removing the borrow material. The current crop mix is about 50% regular rice and 50% wild rice (Jack DeWit, pers. comm., July 8, 2008). Up to six feet of soil will be excavated, including one foot of topsoil that will be stockpiled and replaced after borrow operations are complete. The property is currently irrigated with groundwater, but SAFCA plans to provide the infrastructure so that most of the property can be irrigated with surface water after removal of borrow material. Engineering work is still in progress, but SAFCA estimates that about 80 percent of the property would be irrigated with surface water in the future after reclamation is complete.

Fisherman's Lake – The Fisherman's Lake borrow site is located at the northern end of the existing Fisherman's Lake in the southwestern portion of the Natomas Basin. Engineering work has not been completed for this site, but SAFCA estimates that about 100 acres of land currently planted to rice would be used for borrow material and would be restored to managed marsh.

1.3 Potential Impacts

The purpose of this report is to evaluate the potential groundwater impacts of SAFCA's proposed construction activities. These potential impacts can be grouped into three general categories:

1) Changes in groundwater recharge. These will occur due to land use changes and canal improvements. Specifically, the conversion of land from irrigated to non-irrigated land uses will reduce groundwater recharge, and canal construction and widening will increase groundwater recharge.
2) Changes in groundwater flow. Groundwater flow beneath the levees surrounding the Natomas Basin will be reduced due to the proposed slurry cutoff walls. Reductions in groundwater flow will generally be in the form of:
   a) Reduced groundwater recharge from the Sacramento and American Rivers;
   b) Reduced subsurface inflow from the north beneath the NCC; or

c) Reduced subsurface outflow to the east beneath the PGCC and NEMDC.

3) Changes in groundwater pumping.

Other potential groundwater impacts include:

- Groundwater quality degradation in the Natomas Basin due to reduced inflow of good quality recharge from the River and reduced groundwater outflow; and
- Impacts to the yield of wells located along levees where the cutoff walls would be constructed.

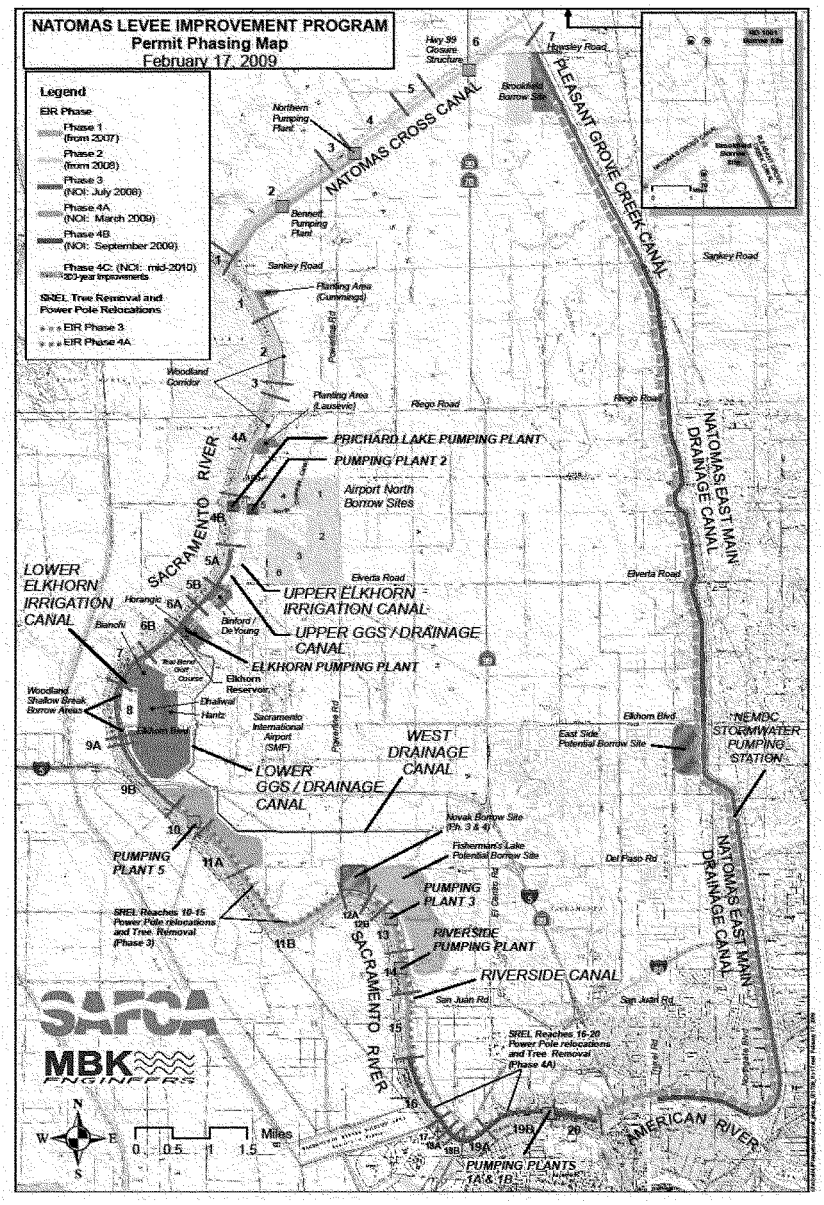

Figure 1-1
Proposed SAFCA Construction Locations for Natomas Levee Improvement Program

2.0 Hydrogeologic Conditions

2.1 Land Use and Water Supply

The Natomas Basin was used as the primary study area for the water budgets discussed below. As shown on **Figure 1-1**, the Natomas Basin is located on the east side of the Sacramento River, between the rural community of Pleasant Grove and the City of Sacramento, in Sutter and Sacramento counties. It consists of about 54,400 acres of agricultural and urban land surrounded by the Sacramento River on the west, the NCC on the north, the PGCC and the NEMDC on the east, and the American River on the south. Except for the SIA and the Teal Bend Golf Course, urban development in the area is primarily limited to the southeast corner of the Natomas Basin at present. This is expected to change in the future as several large developments are in the planning stages.

The Natomas Basin is surrounded by 42 miles of levees, which are maintained by Reclamation District No. 1000 (RD 1000). RD 1000 also operates and maintains a large drainage system within its boundaries to recirculate or dispose of agricultural and urban runoff. This system includes seven large pumping plants and 180 miles of canals and ditches.

Land use in the Natomas Basin is primarily agricultural, with rice being the primary crop. Approximately 28,700 acres were irrigated in 2004, and rice accounted for about 79 percent of the total. Other crops include alfalfa, clover, and oat hay; tomatoes and sugar beets; and crops such as wheat and safflower that are rotated with rice and tomatoes. Most of the agricultural land is irrigated by surface water diverted from the Sacramento River by Natomas Central Mutual Water Company (NCMWC). Much of the information provided below is based on the NCMWC Draft Groundwater Management Plan (2002) and the Integrated Water Resources Management Plan (American States Water Company, et al., 2006).

NCMWC operates three primary river diversions on the Sacramento River. Water is also diverted at two locations from the NCC. Water diverted from the NCC flows from north to south, while water diverted from the River flows generally from west to east, then south. NCMWC's surface water diversions average about 100,000 acre-feet per year (afy). This includes an estimated 10,000 afy diverted during the fall and winter to reflood fields for rice straw decomposition.

NCMWC completed the installation of a tailwater recirculation system in 1986 so that drainage water can be reused during the irrigation season to improve Sacramento River water quality, reduce river diversions, and increase overall efficiency. The recirculation system recaptures tailwater for re-use either directly to fields or back into the main irrigation canals. In recent years, NCMWC has relied heavily on recycled tailwater to supplement its Sacramento River entitlement. Tailwater is recycled partly because it cannot be discharged back to the Sacramento River due to water quality regulations. During a normal irrigation season, all agricultural drainage water is recirculated during the rice growing season, which typically ends in August.

The NCMWC Draft Groundwater Management Plan contains an estimate of 30,000 afy of recycled tailwater (NCMWC, 2002).

Approximately 3,300 acres of agricultural land are irrigated primarily with groundwater. This includes the entire northeastern portion of the Natomas Basin, which is not served by the existing NCMWC surface water distribution systems. The total groundwater pumpage in the Natomas Basin was estimated to be about 24,500 af in 2004 (LSCE, 2008b). Most of this was agricultural pumpage and included about 18,500 af in Sutter County and 6,000 af in Sacramento County.

The Natomas Basin Conservancy (NBC) currently owns over 4,000 acres of land in the Natomas Basin. The NBC began land acquisitions after completion of the Natomas Basin Habitat Conservation Plan (NBHCP) by the U.S. Fish and Wildlife Service and the California Department of Fish and Game in 1997. The NBHCP specified that lands be acquired for habitat conservation as mitigation for the effects of urban development in the Natomas Basin on endangered species and other wildlife. Under the terms of the NBHCP, NBC will ultimately acquire about 8,750 acres of land to mitigate the loss of approximately 17,500 acres slated for development. Most of the NBC mitigation lands have historically been planted to rice, and NBC plans to keep 50 percent of the lands in rice production and convert 25 percent to managed marsh and another 25 percent to upland habitat. As of 2004, approximately 475 acres had been converted to managed marsh.

Irrigated acreage within the Natomas Basin has decreased in recent years as more land has been converted to urban uses. Land use estimates indicate that the acreage irrigated with surface water decreased by about 4.7 percent per year between 1996 and 2006 (American States Water Company, et al., 2006). NCMWC land use data indicate that the amount of irrigated shareholder lands decreased by about 5.2 percent per year between 2004 and 2007.

2.2 Groundwater Basin and Subbasin Description

The Natomas Basin does not represent a groundwater basin or subbasin as defined by the California Department of Water Resources (DWR). It is located within the North American Subbasin, which is part of the Sacramento Valley Groundwater Basin. The North American Subbasin is located along the eastern edge of the Sacramento River Valley and encompasses about 351,000 acres in Sutter, Placer, and Sacramento counties. The North American Subbasin is bounded by the Bear River on the north, the Feather and Sacramento Rivers on the west, the American River on the south, and the approximate edge of the alluvial aquifer in the Sierra Nevada foothills on the east. The North American Subbasin and adjacent groundwater subbasins are shown on **Figure 2-1**.

2.3 Geology of the Natomas Basin

Prior to development, groundwater in the northern portion of the North American Subbasin flowed to the west and southwest from the Sierra Nevada toward the Feather and Sacramento Rivers. Most wells in the subbasin pump groundwater from either the volcanic Mehrten Formation or the overlying alluvial deposits, which have a westerly dip toward the axis of the valley. The following summary of geologic conditions in the Natomas Basin is based primarily

on the *Feasibility Report, American Basin Conjunctive Use Project* (DWR, 1997). This summary focuses on the shallow aquifers that could potentially be impacted by the proposed slurry cutoff walls.

The thickness of the fresh water-bearing deposits in the Natomas Basin increases from about 1,100 feet in the northeast to over 2,000 feet in the southwest. These deposits can be divided into upper and lower aquifer systems. The division between the two aquifer systems is inexact due to data limitations and the difficulty in accurately determining formation contacts. DWR (1997) indicates that the upper aquifer system consists of saturated Laguna Formation and younger sediments that collectively extend to a depth of 200 to 300 feet. For purposes of this study, the upper zone is defined as the upper 300 feet of the aquifer system, and the lower zone is assumed to extend from a depth of 300 feet to the base of fresh water.

The upper aquifer system in the Natomas Basin generally appears to be unconfined or semi-confined due to the presence of clay and silt confining layers within and underlying the upper zone. Sands and gravels in the upper zone are generally thin and laterally discontinuous, and there are thick sequences of fine-grained strata between the more permeable aquifer materials.

The youngest geologic units in the Natomas Basin are flood basin deposits and alluvium. Laterally extensive exposures generally occur along the western margin, adjacent to and within the active channels of the Sacramento River. The flood basin deposits are predominantly fine-grained sediments that have accumulated in flood basins along the major rivers of the Sacramento Valley. The flood basin deposits consist primarily of silt and clay, which yield little water to wells. The flood basin deposits also contain local lenses of sand and gravel deposited by the migrating ancestral river channels. These lenses have high permeabilities and can yield large quantities of groundwater to wells. The thickness of the flood basin deposits in the subbasin ranges up to 100 feet (Olmstead and Davis, 1961).

The alluvium consists primarily of sand, gravel, and silt, with minor amounts of clay, deposited in Recent geologic time (last 10,000 years) by the Sacramento River. Although the alluvium is highly permeable, it is too thin to represent a significant groundwater source. Most high-yield wells completed in the recent alluvium also draw groundwater from underlying formations.

Underlying the alluvium, the Riverbank and Modesto formations of Pleistocene age consist of a heterogeneous mixture of silt, sand, gravel, and clay. The units exhibit large variability in grain size over short distances, both laterally and vertically. The maximum combined thickness of the two units is 50 to 75 feet in the subbasin. On average, these units have moderate permeability but contain some coarser zones with high permeability (Olmstead and Davis, 1961).

The Laguna Formation of Pliocene age and the Turlock Lake Formation of early Pleistocene-age underlie the Riverbank and Modesto formations. Both formations consist primarily of a heterogeneous mixture of interbedded silt, clay, and sand. They contain a few gravel lenses, which are poorly sorted and have relatively low permeability. In general, these two formations are more fine-grained than overlying units, although it is difficult to determine subsurface contacts from drillers' logs. Wells completed in clean Laguna Formation sands and gravels can

produce significant quantities of groundwater. The combined thickness of the two units in the subbasin is probably less than 200 feet.

The lower aquifer system consists of non-marine, Mehrten Formation deposits and includes a smaller percentage of coarse-grained sediments. However, individual coarse-grained zones in the lower aquifer are typically thicker than in the upper aquifer. In some areas, the lower aquifer is further divided into two distinct units. The upper unit is comprised of gray to black andesitic sand and associated lenses of stream gravel containing andesitic cobbles and boulders interbedded with thicker blue or brown clay. The lower unit has been described as a dense, hard, gray tuff breccia. It is composed of angular pieces and blocks of andesite in a cemented matrix of andesite, devitrified lapilli, and ash derived from volcanic eruptions in the Sierra Nevada. Based on information from DWR monitoring wells, the Mehrten Formation is at least 900 feet thick near the Sacramento Airport, and the typical lower unit gray tuff does not occur at that location. The lower zone exhibits more confinement than the upper zone but is still considered to be semi-confined. There is a delayed response to imposed stresses in the upper aquifer, indicating hydraulic interconnection between these water-bearing strata.

2.4 Aquifer Hydraulic Conductivity

The ability of an aquifer to transmit water is measured by its hydraulic conductivity (which is closely related to permeability) and saturated thickness; the product of these two parameters is commonly known as aquifer transmissivity. The hydraulic conductivity of alluvial aquifer materials varies over many orders of magnitude, with fine-grained materials (clay and silt) at the bottom of the range and coarse-grained materials (sand and gravel) at the top. Most groundwater flow occurs through sand units, which are much more common in the subsurface than gravels. The hydraulic conductivity of sands is highly variable, depending on grain size, sorting, and cementation.

Long-term, constant-rate pumping tests are the preferred method for estimating hydraulic conductivity and other aquifer properties. Other field methods include short-term pumping tests and slug tests. If borehole logs are available, equations that estimate hydraulic conductivity based on grain-size distribution can be used in the absence of test data. The most common of these is the Kozeny-Carman equation (Kozeny, 1927 and Carman, 1937 and 1956) which has been used by Kleinfelder and URS Corporation (URS) to estimate the hydraulic conductivity of geologic materials beneath the east levee.

As further discussed below, the hydraulic conductivity of sand units underlying the levees is a primary input and the source of greatest uncertainty for models used to estimate seepage beneath the levees. A summary of hydraulic conductivity estimates for the Natomas Basin is provided in **Table 2-1**. The estimates vary by more than an order of magnitude, from 14 to 488 feet per day (ft/day), with a mean of 116 ft/day and a median of 51 ft/day. Values at the low end of the range were estimated by Kleinfelder using the Kozeny-Carman equation, and the highest value was estimated from a short-term pumping test. LSCE estimated a hydraulic conductivity of 36 ft/day based on an aquifer test conducted in the Paulson well in southern Sutter County (LSCE, 2008b).

Groundwater flow models that encompass the North American Subbasin also have relatively high hydraulic conductivities in the Natomas Basin. Hydraulic conductivity estimates used in

numerical groundwater flow models are typically adjusted during the calibration process. A groundwater flow model of the Sacramento Valley developed by DWR (1978) used hydraulic conductivity estimates of 51 to 139 ft/day for the upper layer of the model in the Natomas Basin. The groundwater models discussed in Chapter 4 have hydraulic conductivities in the upper layer ranging from 33 to 118 ft/day in the Natomas Basin.

Table 2-1
Hydraulic Conductivity Estimates in Natomas Basin

Estimated By	Location	Hydraulic Conductivity (ft/day)	Material Type	Source
Kleinfelder (2007)[1]	-	14	Sand with 3-7% silt	Kozeny-Carman equation
	-	28	Sand with 0-2% silt	Kozeny-Carman equation
URS (2007)[2]	STA 217+00	56	Sand to silty-sand	Kozeny-Carman equation
		283	Gravel	Kozeny-Carman equation
LSCE	Bianchi Wells 1 and 2	33-49	Sand to silty-sand	Estimated from specific capacity
	Lennar Westlake Well 1	488	Fine to coarse sand with gravel	2-hour pump test (11/21/00) in well perforated 112-132 ft.
	Lennar Paulson Well	36	Sand to silty-sand	36-hour pump test (7/3/07) in well perforated 185-397 ft.
DWR (1978)[3]	Node 37 (Sutter County)	51	Mixed	Sacramento Valley groundwater flow model
	Node 43 (Sacramento County)	139	Mixed	Sacramento Valley groundwater flow model
WRIME	Sutter County portion of Natomas Basin	86-118	Mixed	Layer 1 of North American River IGSM model
	Sacramento County portion of Natomas Basin	33-53	Mixed	Layer 1 of Sacramento County IGSM model
Average		**116**		
Median		**51**		

1. Kleinfelder, Inc. 2007. Basis of Design Report, Sacramento River East Levee Reaches 1 Through 4B (Draft)
2. URS Corporation, 2007. Preliminary Geotechnical Reevaluation Report, Sacramento River East Levee (Draft)
3. DWR. 1978. Evaluation of Groundwater Resources: Sacramento Valley

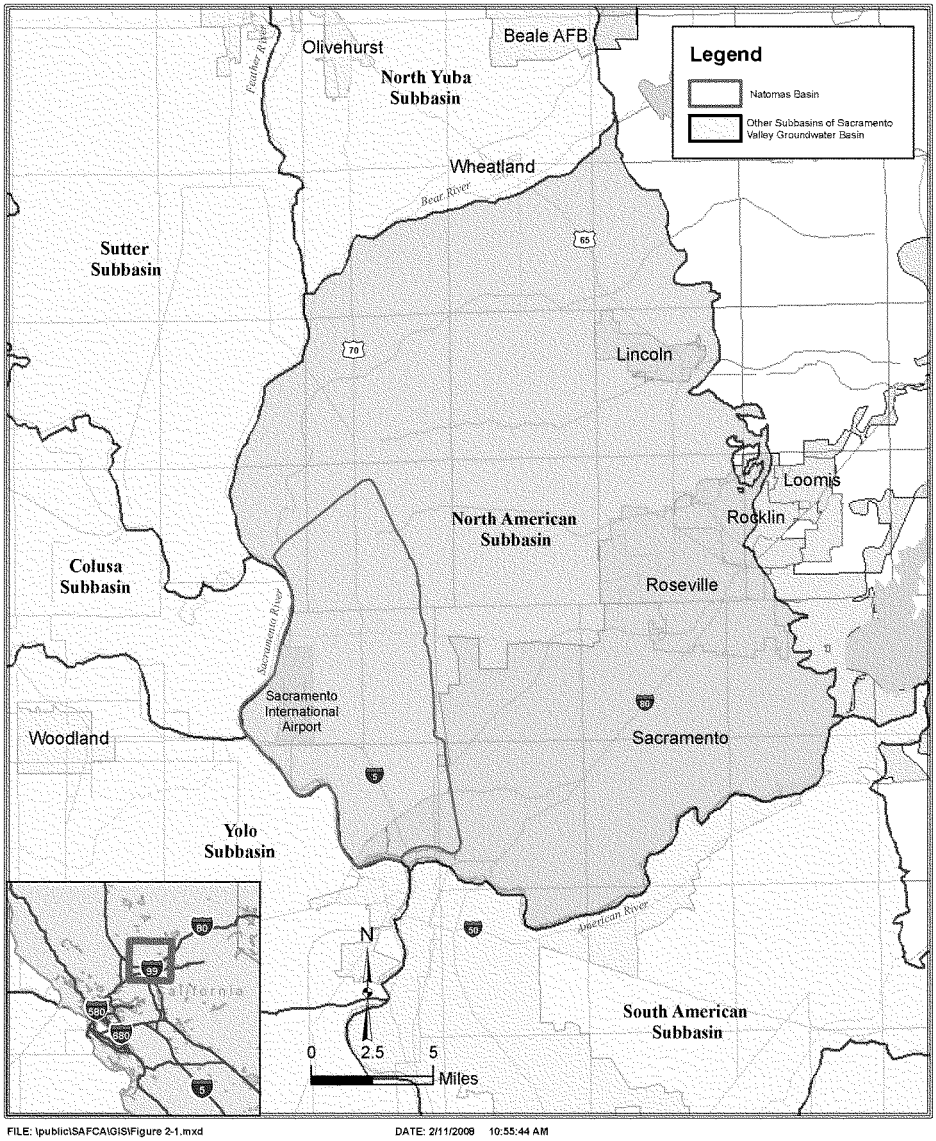

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Figure 2-1
Location of North American Subbasin and Adjoining Subbasins of the Sacramento Valley Groundwater Basin

3.0 Groundwater Levels and Flow

3.1 Sacramento River East Levee Piezometers

DWR has conducted groundwater level monitoring at a number of wells in the Natomas Basin since 1948. DWR monitored approximately 20 wells in 2003 but only 7 wells in 2007. In addition to the wells monitored by DWR, a series of shallow piezometers was constructed along the Sacramento River East Levee in the Natomas Basin to collect groundwater level data for previous investigations of seepage beneath the levee. A total of 38 piezometers has been installed along the levee since 1991, and at least some groundwater level data are available for 27 of these. Groundwater elevations measured in these piezometers have been plotted in order to determine the location and seasonal fluctuations of gaining and losing reaches along the Sacramento River East Levee. The 27 piezometers with water level data include four installed by Kleinfelder in 1998, 13 installed by USACE in 2001, and ten installed by Kleinfelder in 2004. The construction of the piezometers is summarized in **Table 3-1**, and the piezometer locations are shown on **Figure 3-1**. The piezometers range in depth from 12 to 90 feet, but most are between 25 and 50 feet deep. Many of the piezometers are paired based either on depth (shallow vs. deep) or location (closer to the River vs. further away). The latter pairings are particularly useful to show the direction and magnitude of the hydraulic gradient near the River.

Water level measurements at the piezometers have been intermittent, resulting in varying periods of record for water level data between 1999 and 2007. Data from the USACE piezometers are the most useful because the wellhead elevations have been surveyed and manual water level measurements are available. The USACE piezometers have a period of record from January 2002 to October 2003.

The Kleinfelder piezometers were not surveyed at the time of installation, and those installed in 1998 have a short period of record (December 2005 to April 2006). The piezometers installed by Kleinfelder in 2001 have a longer period of record (October 2004 to July 2006). There are no manual measurements available for these piezometers, however, and some of the transducer data are questionable as discussed below. The Kleinfelder piezometers were surveyed by LSCE on February 28 and 29, 2008 using survey-grade Global Positioning System (GPS) equipment with a vertical accuracy of at least one inch. The survey results are shown in **Table 3-1**. No bollards were installed to protect these piezometers, and two of them (PZ-4 and PZ-7) had been destroyed (apparently by farm equipment) by the time of the survey.

Data from the shallow levee piezometers were combined with other water level data to prepare contour maps of equal groundwater elevation for the North American Subbasin and more detailed maps for the Natomas Basin. The contour maps were prepared prior to the GPS survey of the Kleinfelder piezometers; therefore, data from these piezometers were not used to create the contour maps. Hydrographs were also prepared showing groundwater elevations in 23 piezometers and estimated stage in the Sacramento River adjacent to the piezometers. These contour maps and hydrographs were used to evaluate gaining and losing conditions along the

Sacramento River and to estimate the hydraulic gradient between the River and the shallow aquifer.

3.2 Groundwater Elevation Contour Maps

Groundwater elevations and flow directions in the study area are illustrated on groundwater elevation contour maps. DWR (1997) includes spring water level contour maps for the years 1950, 1960, 1965, 1970, 1977, 1980, 1985, 1990, and 1992. As noted by DWR, groundwater generally flowed in a southwesterly direction (from the foothills toward the axis of the valley) under pre-development conditions. Groundwater levels began to decline during the 1940s (or earlier), and the 1960 water level contour map shows three pumping depressions. From north to south, these were located east of Nicolaus, near Pleasant Grove, and near the eastern edge of the Natomas Basin along the Sutter-Sacramento County line. By 1965, the pumping depression east of Nicolaus had largely disappeared, but the pumping depression near Pleasant Grove had deepened and merged with that along the eastern edge of the Natomas Basin. The 1980 DWR contour map shown on **Figure 3-2** indicates that, by 1980, the pumping depression southeast of Pleasant Grove had deepened to about –30 feet msl and merged with a deeper pumping depression beneath McClellan Air Force Base (AFB) in Sacramento County. These pumping depressions are centered about three miles east of the eastern edge of the Natomas Basin. Note that elevations shown on **Figures 3-2** and **3-3** are based on the NGVD 1929 vertical datum. These are copies of historical water level contour maps that cannot be converted to a newer datum. All other elevations in this report are based on the NAVD 1988 datum.

A fall 1997 groundwater elevation contour map for all of Sacramento County prepared by the Sacramento County Water Resources Division and reproduced in NCMWC (2002) is shown on **Figure 3-3**. This contour map indicates that the McClellan AFB pumping depression was linked with two other pumping depressions centered beneath the City of Elk Grove and east of the City of Galt. The Elk Grove pumping depression is the largest and deepest of the three, with a groundwater elevation below –70 feet msl at the center. The Pleasant Grove and McClellan AFB pumping depressions are located in the North American Subbasin; the other two depressions are located in the South American Subbasin.

The DWR and Sacramento County groundwater elevation contour maps were developed using data from wells of variable and often unknown perforated intervals. These composite maps must be considered approximations that do not reflect the fact that groundwater elevations can be significantly different in wells of different depths. Hydrographs of DWR's multiple-completion monitoring wells show that deeper wells in the area typically have lower groundwater elevations than shallower wells because most groundwater pumping occurs from deeper zones, which are more confined. Upper zone groundwater elevation contour maps were prepared for this study, as discussed below.

Water level data for wells completed in the upper zone in the North American Subbasin were evaluated to select recent periods with sufficient data for contouring purposes. Because the primary focus of this investigation is on groundwater flow in the Natomas Basin, contour maps were prepared for periods for which data from the USACE levee piezometers (the only piezometers with surveyed wellhead elevations prior to 2008) were available, and spring and fall

contour maps were prepared for 2003. Two versions of the 2003 contour maps were created, one showing the entire subbasin and another showing a more detailed view of the Natomas Basin. Data from about 90 wells were used to prepare each map. The subbasin-scale groundwater elevation contour maps have a contour interval of ten feet; the more detailed maps have a two-foot contour interval. The periods selected for groundwater elevation contour maps, area of coverage, and the number of wells used for each map are as follows:

- **Figure 3-4:** Spring 2003 (North American Subbasin),
- **Figure 3-5**: Spring 2003 (Natomas Basin),
- **Figure 3-6**: Fall 2003 (North American Subbasin),
- **Figure 3-7**: Fall 2003 (Natomas Basin).

The spring 2003 groundwater elevation contour map for the North American Subbasin (**Figure 3-4**) shows that the direction of groundwater flow in the upper zone in most of the subbasin is toward the pumping depression centered in the McClellan AFB area, which had a minimum elevation of about –40 feet msl based on data from McClellan AFB monitoring wells. The northeastern portion of the subbasin is the only area where the groundwater flow direction was not toward the McClellan AFB pumping depression on **Figure 3-4**. The direction of groundwater flow in the northeastern area is toward the Bear and Feather Rivers, which indicates that both rivers were gaining in the spring of 2003. A gaining reach occurs when groundwater levels are higher than the river stage, creating a gradient for groundwater to flow to the river. Losing conditions occur when the river stage is higher than groundwater levels adjacent to the river, which results in recharge from the River to the aquifer.

The Sacramento River west of the Natomas Basin appeared to be a losing reach in spring 2003. Groundwater elevations shown on **Figure 3-4** range from about 20 feet msl in the northern and northwestern portions of the Natomas Basin to about –15 feet msl in the southeastern corner. The direction of groundwater flow was easterly toward the McClellan AFB pumping depression. The hydraulic gradient was relatively flat especially in the northern half of the study area (about three ft/mile) but became much steeper along the eastern edge (up to 20 ft/mile).

In order to provide additional detail on groundwater elevations and flow directions in the Natomas Basin, the spring 2003 water level data were re-contoured with a contour interval of two feet. The resulting map, shown on **Figure 3-5**, confirms that the direction of groundwater flow was easterly across most of the Natomas Basin. All reaches of the Sacramento River appeared to be losing in the spring of 2003, but the magnitude of the hydraulic gradient near the River gradually increases from north to south. In the northern portion of the Natomas Basin, the hydraulic gradient for flow away from the River was less than three ft/mile. In the southern portion, the easterly hydraulic gradient increased to about nine ft/mile.

The fall 2003 groundwater elevation contour map shown on **Figure 3-6** is generally similar to the spring 2003 map, and the direction of groundwater flow was essentially the same during both periods. Comparison of the two contour maps indicates that fall groundwater levels along the Sacramento River were five to ten feet lower than in the spring, but levels at these two times were similar in the eastern portion of the Natomas Basin. Fall 2003 groundwater levels were

also similar to spring levels in the McClellan AFB pumping depression but were about ten feet lower than in the spring in the pumping depression in southwestern Placer County.

Figure 3-7 shows fall 2003 groundwater levels in the Natomas Basin re-contoured with a contour interval of two feet. Although groundwater levels in fall 2003 were lower along the Sacramento River than in the spring, the general direction of groundwater flow was still easterly in most of the study area. The only exception is the northern portion of the Natomas Basin where the direction of groundwater flow was to the south-southwest parallel to the Sacramento River. These reaches of the River appear to be neutral (no significant gain or loss) in fall 2003. Losing conditions prevailed in the southern reaches, but the gradient for flow away from the River was less steep than in the spring.

3.3 Hydrographs of Groundwater Levels and River Stage

Water level hydrographs were prepared for the shallow piezometers along the Sacramento River East Levee in order to evaluate seasonal variations in gaining and losing conditions. In addition to groundwater elevation data from the levee piezometers, river stage estimates are also shown on the hydrographs. Under separate contract for SAFCA, MBK Engineers (MBK) used stage data from the Verona, Bryte, and I Street gages (**Figure 3-8**) to estimate the daily average stage at each piezometer location based on a linear interpolation (Mike Archer, MBK, pers. comm., January 22, 2008). One source of error in the stage estimates is that tidal effects at the Bryte and I Street gages do not propagate upstream to the Verona gage. However, MBK checked the estimates against stage profiles simulated with a calibrated Hydrologic Engineering Center (HEC) surface water model, and concluded that the stage estimates were reasonable.

Hydrographs of groundwater elevations in the shallow piezometers and estimated Sacramento river stage are shown from north to south on **Figures 3-9** through **3-16**. Where piezometers are paired based on distance from the River, data from both piezometers are plotted on the same hydrograph using different symbols. As discussed above, losing conditions occur when groundwater elevations are lower than river stage. For the paired piezometers, a gradient away from the River indicates losing conditions, while a gradient toward the River indicates gaining conditions. The groundwater level data are color coded on the hydrographs, with data showing losing conditions plotted in red and data showing gaining conditions plotted in blue. For the piezometers with surveyed elevations, stage estimates can also be compared with measured groundwater elevations to indicate gaining or losing conditions at unpaired piezometer locations. The groundwater level data plotted on these hydrographs are also color coded to show gaining or losing conditions. Uncertainty in the data is highlighted by the fact that a number of hydrographs show gaining conditions in the spring and fall of 2003 even in the southern half of the Natomas Basin, while the groundwater elevation contour map (**Figure 3-8**) shows losing conditions in this area.

During the winter when the river stage is high, all hydrographs show losing conditions and steep gradients for groundwater flow away from the River. The results are much more variable during the rest of the year when the river stage is lower. Hydraulic gradients are relatively flat during periods of low stage, and gradient reversals appear to be common. Gaining conditions are most likely to occur during the summer and fall when the river stage is lowest. There is more

uncertainty about the determination of gaining or losing conditions during the summer and fall because groundwater levels and river stage are similar during these periods. There is also uncertainty during periods of rapidly declining stage because groundwater levels decline at a slower rate than river stage. Continuous data would be needed during these periods to accurately determine the fluctuations between gaining and losing conditions.

Gaining and losing reaches vary by both location and time. URS (2003) indicated that river stage was approximately nine to ten feet above groundwater levels at high stage and one to three feet below groundwater levels at low stage at the northernmost USACE piezometer (2F-01-15N). At the southernmost USACE piezometer (2F-01-19S), river stage was approximately four to five feet above groundwater levels at high stage and one to 1.5 feet below groundwater levels at low stage. For USACE paired piezometers 2F-01-26N and 28N, URS noted that groundwater levels were about 1.25 feet higher in the piezometer closer to the River during high stage and generally similar during low stage. For paired piezometers 2F-01-68N and 69N, URS indicated that groundwater levels were about three feet higher in the piezometer closer to the River during high stage and generally similar during low stage. URS also noted that groundwater levels tended to lag river stage by several days (URS, 2003). The individual hydrographs are discussed below.

Figure 3-9 shows hydrographs of the northernmost piezometers. This includes USACE piezometer 2F-01-15N in Reach 2 and paired Kleinfelder piezometers PZ-7 and PZ-8 in Reach 4a. The hydrograph of 2F-01-15N shows losing conditions during periods of high stage in the winter and spring and gaining conditions during the rest of the year. This is the deepest of the levee piezometers with a screened interval of 80 to 90 feet. This makes the comparison with river stage less valid, but there are no nearby shallow piezometers to show the head difference between shallow and deeper zones. Paired piezometers PZ-7 and PZ-8 show losing conditions during a limited period of record (intermittent from October 13, 2004 to July 12, 2006). The fact that the groundwater elevations were notably lower than the stage estimates for all periods suggests inaccuracies in either the stage estimates, the wellhead elevation, or the water level measurements. The indication of consistently losing conditions should be considered questionable since most other piezometers show a mix of gaining and losing conditions.

Figure 3-10 shows hydrographs of paired USACE piezometers 2F-01-26N and 28N in Reach 4b and paired Kleinfelder piezometers PZ-5D and PZ-6D in Reach 6b. Both piezometer pairs show generally losing conditions during the winter and spring and consistently gaining conditions during the summer and fall. The continuous transducer data from the Kleinfelder piezometers clearly show losing conditions at high stage and gaining conditions at low stage during the winter and spring. This effect is especially noticeable from December 2004 to May 2005 but also occurred during the winter and spring of 2005-2006.

Figure 3-11 show hydrographs of unpaired USACE piezometers 2F-01-51N in Reach 8 and 2F-01-49N in Reach 9a, and **Figure 3-12** show hydrographs of unpaired USACE piezometers 2F-01-56N in Reach 9b and 2F-01-62N in Reach 11b. Compared against estimated river stage, all four piezometers show mostly losing conditions except during periods of rapidly fluctuating stage in the spring and periods of very low stage during the fall. The spring of 2003 was the longest period of gaining conditions during the 22-month period of record.

Figure 3-13 shows hydrographs of paired Kleinfelder PZ-3 and PZ-4 and USACE piezometers 2F-01-68N and 69N in Reach 11b. Piezometers PZ-3 and PZ-4 show losing conditions based on groundwater level data during the entire period of record (October 13, 2004 to October 7, 2006). As for piezometers PZ-7 and PZ-8, the fact that the groundwater elevations were notably lower than the stage estimates for all periods suggests inaccuracies in either the stage estimates, the wellhead elevation, or the water level measurements. The indication of consistently losing conditions should be considered questionable since most other piezometers show a mix of gaining and losing conditions. The data from paired USACE piezometers 2F-01-68N and 69N in Reach 11b are more similar to piezometers in other reaches, with losing conditions occurring during periods of high stage and a mixture of gaining and losing conditions during the rest of the year. Gaining conditions occurred primarily in the spring of 2002 and during periods of lowest stage.

Figure 3-14 shows hydrographs of unpaired USACE piezometers 2F-01-05S in Reach 13 and 2F-01-15S in Reach 15 compared with estimated stage. Most of the data from 2F-01-05S appear to be questionable, with low groundwater levels in the spring and higher levels during the summer, especially in 2002. The data from USACE piezometer 2F-01-15S in Reach 13 track the estimated stage much more closely, but the estimated stage appears to be low relative to the groundwater levels. In particular, the indication of gaining conditions during almost all of 2002 is probably incorrect. The stage estimates appear to be more accurate from December 2002 through October 2003, with losing conditions during periods of high or rising stage and gaining conditions during periods of low or declining stage.

Figure 3-15 shows hydrographs of unpaired USACE piezometers 2F-01-17S and 2F-01-19S in Reach 16 compared with estimated stage. Both piezometers have similar hydrographs, and the estimated stage tracks the groundwater data closely. The hydrographs generally show losing conditions during periods of high or rising stage and gaining conditions during periods of low or declining stage.

Figure 3-16 shows hydrographs of paired Kleinfelder piezometers in Reaches 18b and 19a. The transducers in Kleinfelder piezometers PZ-1 and PZ-2 were not working during most of the monitoring period. Almost all of the data that were collected in January and June-August 2005 show gaining conditions, which is inconsistent with the other piezometers. Water level measurements in paired Kleinfelder piezometers LMW-1 and LMW-4 were made manually, but the measurements made prior to January 2006 appear to be too high when compared with the estimated stage. The measurements made from December 2005 to April 2006 appear to be more reasonable but were made only during periods of high stage. The groundwater level data indicate losing conditions throughout this period.

Depths to water measured in the USACE piezometers located on the land side levee toe typically range from about six feet during the winter to about 18 feet during the summer and fall. This represents a seasonal fluctuation of only about 12 feet. Similarly high groundwater levels and small seasonal fluctuations have been observed at DWR's multiple-completion wells elsewhere in the Natomas Basin. The small seasonal fluctuations are due to a combination of the buffering effect of recharge from the River and from rice fields throughout the Natomas Basin and the fact that most pumping is from deeper zones. Recharge from rice irrigation in the summer months

keeps shallow groundwater levels high and is a primary factor in the gaining conditions observed at many of the levee piezometers during periods of low stage.

3.4 Hydraulic Gradient Estimates

The differences in hydraulic head between the paired piezometers and also between the unpaired piezometers and the estimated River stage are tabulated in **Table 3-2**, and these head differences were used to estimate the hydraulic gradient. Losing conditions are indicated by positive head differences and hydraulic gradients, and negative values indicate gaining conditions. Head differences were calculated for the entire period of record and range from about –3 feet to more than 11 feet. For paired piezometers that have been surveyed, head differences were calculated based on both groundwater data and stage estimates.

Average annual head differences and hydraulic gradients were calculated for each individual or paired piezometer based on the most recent 12-month period for which data are available. Due to the problems with some of the piezometer data discussed above, hydraulic gradients were not calculated for USACE piezometer 2F-01-15S and Kleinfelder piezometers PZ-1, PZ-2, LMW-1, and LMW-4. For the two sets of paired USACE piezometers, gradients were estimated by comparing the estimated stage with head in the piezometer closest to the River. Because more data were available from the USACE piezometers during the winter and spring, an average hydraulic gradient was calculated for each month. The monthly gradients were then averaged to determine the average hydraulic gradient for the 12-month period.

As shown in **Table 3-2**, the minimum hydraulic gradient at each piezometer location ranged from –0.0098 to 0.0003 ft/ft, with an average of –0.0039 ft/ft. The minimum hydraulic gradient was negative at all but one site, which indicates gaining conditions. The maximum hydraulic gradient ranged from 0.0054 to 0.0239 ft/ft, with an average of 0.0161 ft/ft. The magnitude of the average maximum hydraulic gradient (0.0239 ft/ft) is more than twice as large as the average minimum gradient (–0.0098 ft/ft) because the gradient is steeper during periods of high stage.

Average monthly hydraulic gradients were calculated for 13 piezometer locations (individual or paired), and an average annual gradient was calculated by averaging the monthly values. As shown in **Table 3-2**, the average annual hydraulic gradient at each piezometer ranged from 0.0006 to 0.0089 ft/ft. All of the average annual hydraulic gradients were positive, which indicates that all reaches exhibited losing conditions over the 12-month period. Although the groundwater elevation contour maps show steeper gradients in the southern portion of the Natomas Basin, there are too many sources of error in the gradient estimates to allow quantification of these spatial variations.

The average annual hydraulic gradient for all piezometers shown in **Table 3-2** was 0.0032 ft/ft or about 17 ft/mile. This represents the estimated average annual gradient for seepage loss from the River to the shallow aquifer based on a combination of piezometer data and estimated stage. This gradient is almost twice as steep as the maximum gradient east of the Sacramento River shown on the spring and fall 2003 groundwater elevation contour maps for the Natomas Basin (**Figures 3-5** and **3-7**). The groundwater contour maps are based on groundwater data only and have too large a scale to show the gradient between these closely spaced piezometers. The

steeper gradient near the River calculated above is also due to the low permeability of the riverbed and the fact that the greatest head differences between surface water and groundwater occur during periods of high stage.

Table 3-1
Construction of Sacramento River East Levee Piezometers in Natomas Basin

Well ID	NLIP Station	River Mile (Approx)	Levee Mile (Approx)	Land Side Offset (Approx.) (ft)	Ground Surface Elevation (ft msl)[1]	Wellhead Elevation (ft msl)[1]	Screened Interval (ft)	Northing (ft)[2]	Easting (ft)[2]	Installed By	Date Drilled
2F-01-15N	98+30	76.8	1.9	0	27.38	29.18	80 - 90	2037443	6678210	USACE	2001
2F-01-26N	195+00	74.9	3.7	0	28.44	31.26	45 - 46	2028392	6675030	USACE	2001
2F-01-28N	196+35	74.9	3.7	250	29.79	31.03	38 - 48	2028227	6675252	USACE	2001
2F-01-51N	394+00	71.0	7.5	200	25.66	25.36	30 - 37	2011639	6667053	USACE	2001
2F-01-49N	402+13	70.9	7.6	0	27.67	27.29	40 - 60	2010756	6666969	USACE	2001
2F-01-56N	466+76	69.7	8.8	100	25.43	27.79	30 - 40	2005770	6670729	USACE	2001
2F-01-62N	541+43	68.2	10.3	50	27.16	29.34	33 - 43	2000269	6675756	USACE	2001
2F-01-68N	611+56	67.0	11.6	50	24.95	24.78	30 - 40	1997685	6680572	USACE	2001
2F-01-69N	611+59	67.0	11.6	200	23.99	23.79	26 - 36	1997813	6680474	USACE	2001
2F-01-05S	679+40	65.9	12.9	100	24.03	23.50	25 -35	1996993	6686228	USACE	2001
2F-01-15S	760+30	64.3	14.4	0	26.78	29.33	25 - 35	1988983	6687344	USACE	2001
2F-01-17S	787+77	63.7	14.9	100	21.81	21.56	30 - 40	1986284	6687689	USACE	2001
2F-01-19S	812+34	63.2	15.4	250	22.55	25.16	35 - 45	1984077	6688570	USACE	2001
LMW-1	867+30	62.2	16.5	Land Side	23.28	40.06	20 - 25	1980996	6692226	Kleinfelder	Oct. 1998
LMW-4	867+30	62.2	16.5	Water Side	22.28	40.36	20 - 25	1980918	6692285	Kleinfelder	Oct. 1998
LMW-2	867+30	62.2	16.5	Land Side	20.68	40.06	40 - 45	1980996	6692226	Kleinfelder	Oct. 1998
LMW-3	867+30	62.2	16.5	Water Side	21.88	40.36	40 - 45	1980918	6692285	Kleinfelder	Oct. 1998
PZ-7[3]	140+00	76.1	2.7	0	23.78	-	32 - 33	2033745	6676601	Kleinfelder	Oct. 2004
PZ-8	140+00	76.1	2.7	100	21.88	23.91	32 - 33	2033576	6676663	Kleinfelder	Oct. 2004
PZ-5S	310+00	72.7	5.9	0	36.28	37.71	11 - 12	2018478	6670369	Kleinfelder	Oct. 2004
PZ-5D	310+00	72.7	5.9	0	36.28	37.71	34 - 35	2018478	6670369	Kleinfelder	Oct. 2004
PZ-6S	310+00	72.7	5.9	100	32.48	33.78	12 - 13	2018489	6670533	Kleinfelder	Oct. 2004
PZ-6D	310+00	72.7	5.9	100	32.48	33.78	30.5 - 31.5	2018489	6670533	Kleinfelder	Oct. 2004
PZ-3	570+00	67.8	10.8	0	27.28	28.56	29.5 - 30.5	1998067	6676831	Kleinfelder	Oct. 2004
PZ-4[3]	570+00	67.8	10.8	100	25.68	-	32 - 33	1998216	6676951	Kleinfelder	Oct. 2004
PZ-1	850+00	62.5	16.1	0	23.28	25.81	32 - 33	1981001	6690265	Kleinfelder	Oct. 2004
PZ-2	850+00	62.5	16.1	100	21.48	24.11	31 - 32	1980925	6690401	Kleinfelder	Oct. 2004

1. Vertical datum = NAVD88
2. Horizontal datum = NAD83, California State Plane Zone 2.
3. Destroyed.

Table 3-2
Hydraulic Gradients Along Sacramento River East Levee Based on Groundwater Elevations in Shallow Piezometers and Estimated Stage

Reach	NLIP Station	Monitoring Location		Distance[1] (ft)	Period of Record	Period for Annual Average	Head Difference (ft)[2]			Hydraulic Gradient (ft/ft)[2]		
		River Side	Land Side				Min	Max	Annual Average[3]	Min	Max	Annual Average[3]
2	98+30	River	2F-01-15N	370	01/07/02 - 10/28/03	11/01/02 - 10/31/03	-2.70	8.83	0.47	-0.0073	0.0239	0.0013
4a	140+00	PZ-7	PZ-8	100	10/13/04 - 07/05/06	08/01/05 - 07/31/06	-0.35	1.31	0.89	-0.0035	0.0131	0.0089
4b	195+00	2F-01-26N	2F-01-28N	220	01/07/02 - 10/28/03	11/01/02 - 10/31/03	-0.40	1.26	0.20	-	-	-
	196+35	River	2F-01-26N	260		11/01/02 - 10/31/03	-0.35	5.40	1.29	-0.0014	0.0208	0.0050
6b	310+00	PZ-5D	PZ-6D	100	10/14/04 - 07/12/06	08/01/05 - 07/31/06	-0.42	2.03	0.37	-0.0042	0.0203	0.0037
8	394+00	River	2F-01-51N	600	01/07/02 - 10/28/03	11/01/02 - 10/31/03	-1.83	9.92	1.82	-0.0030	0.0165	0.0030
9a	402+13	River	2F-01-49N	260	01/07/02 - 10/28/03	11/01/02 - 10/31/03	-1.47	6.28	0.99	-0.0057	0.0241	0.0038
9b	466+76	River	2F-01-56N	330	01/07/02 - 10/28/03	11/01/02 - 10/31/03	-1.34	4.98	0.77	-0.0041	0.0151	0.0023
11b	541+43	River	2F-01-62N	300	01/07/02 - 10/28/03	11/01/02 - 10/31/03	-2.95	3.45	0.33	-0.0098	0.0115	0.0011
	570+00	PZ-3	PZ-4	100	10/13/04 - 10/07/06	10/01/05 - 09/30/06	0.03	1.54	0.60	0.0003	0.0154	0.0060
	611+56	2F-01-68N	2F-01-69N	160	01/07/02 - 10/28/03	11/01/02 - 10/31/03	-0.53	2.94	0.44	-	-	-
	611+59	River	2F-01-68N	500		11/01/02 - 10/31/03	-1.95	7.13	0.54	-0.0039	0.0143	0.0011
13	679+40	River	2F-01-05S	520	03/05/02 - 09/30/03	10/01/02 - 09/30/03	-2.14	10.71	2.30	-0.0041	0.0206	0.0044
15	760+30	River	2F-01-15S	270	01/07/02 - 10/28/03	11/01/02 - 10/31/03	-0.97	1.92	-0.11	-	-	-
16	787+77	River	2F-01-17S	370	01/07/02 - 10/28/03	11/01/02 - 10/31/03	-0.76	2.90	0.29	-0.0020	0.0078	0.0008
	812+34	River	2F-01-19S	550	01/07/02 - 10/28/03	11/01/02 - 10/31/03	-0.97	2.96	0.32	-0.0018	0.0054	0.0006
18b	850+00	PZ-1	PZ-2	100	01/20/05 - 08/19/05	01/20/05 - 08/19/05	-1.21	1.06	-0.78	-	-	-
19a	867+30	LMW-4	LMW-1	100	02/03/99 - 04/24/06	11/01/05 - 10/31/06	-1.73	8.86	1.80	-	-	-
						Average	**-1.22**	**4.64**	**0.70**	**-0.0039**	**0.0161**	**0.0032**

1. Approximate distance between paired piezometers or between unpaired piezometers and Sacramento River.
2. Positive head differences and gradients indicate losing conditions (flow away from the River); negative values indicate gaining conditions.
3. The annual average was calculated from monthly averages to adjust for seasonal variations in the measurement frequency.

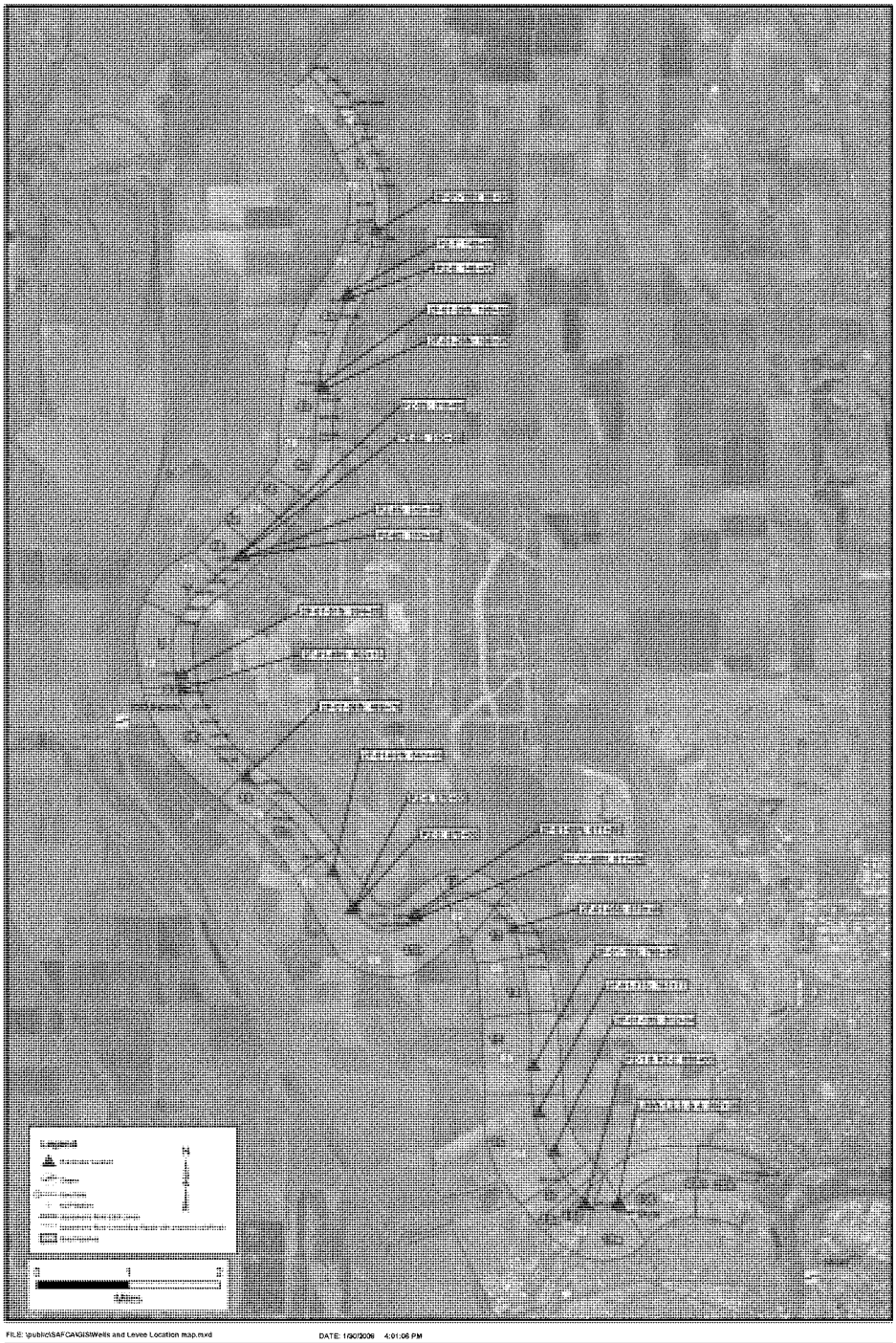

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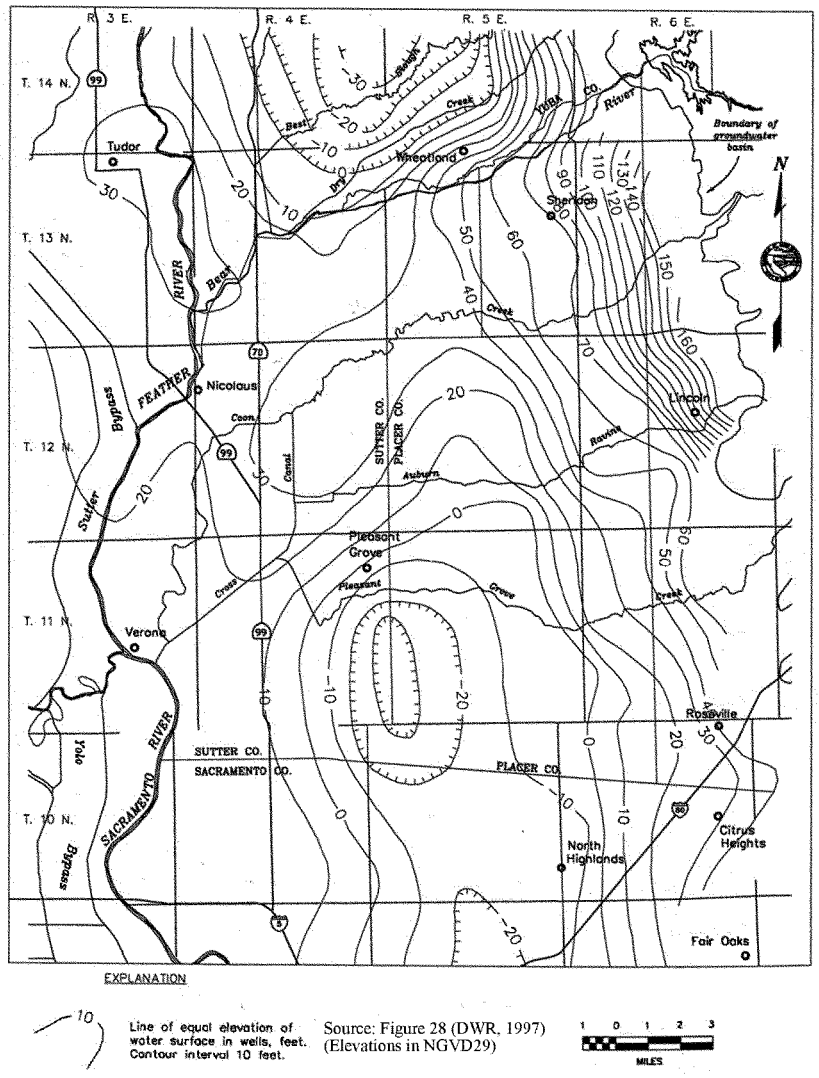
Figure 3-1
Piezometer Locations Along Sacramento



FILE: \\server_pe2900\Public\Sutter Pointe 07-1-012\GIS\Figure 4-4 Spring 1980 GWE contours.mxd Date: 4/3/2009

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Figure 3-2
Spring 1980 Groundwater Elevation Contours
Multiple Zone Wells in North American Subbasin

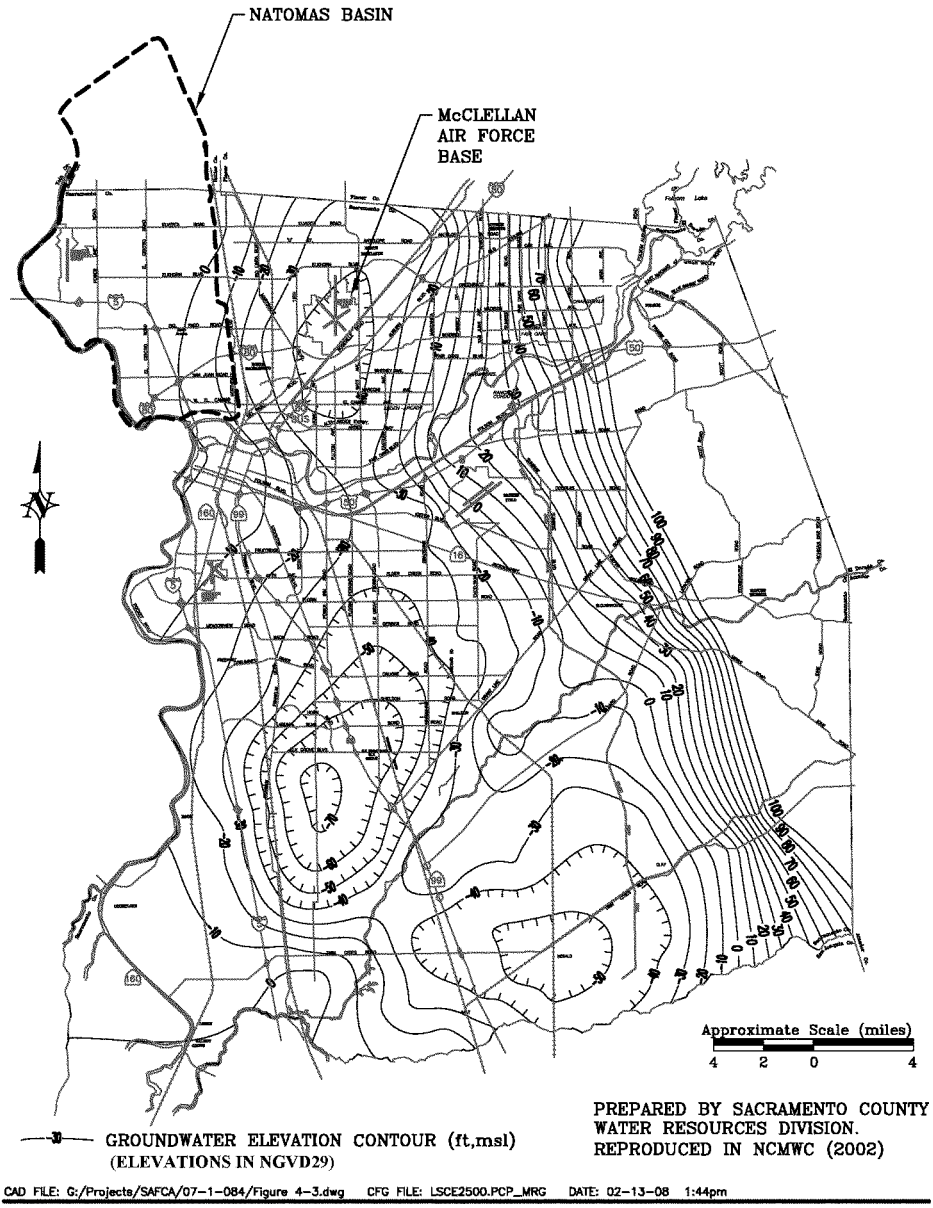

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Figure 3-3
Fall 1997 Groundwater Elevation Contours Multiple Zone Wells in Sacramento County

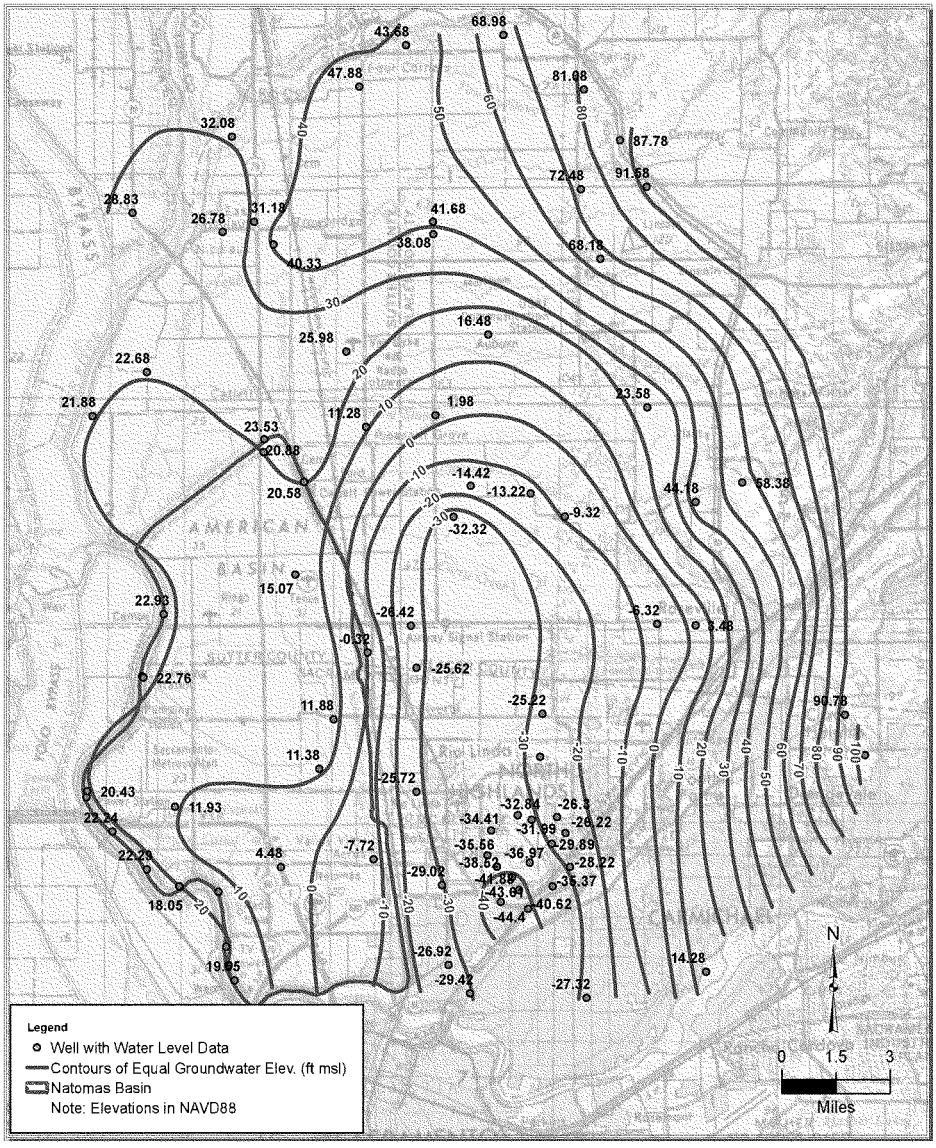

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Figure 3-4
Spring 2003 Groundwater Elevations Contours for Uppper Zone Wells in North American Subbasin

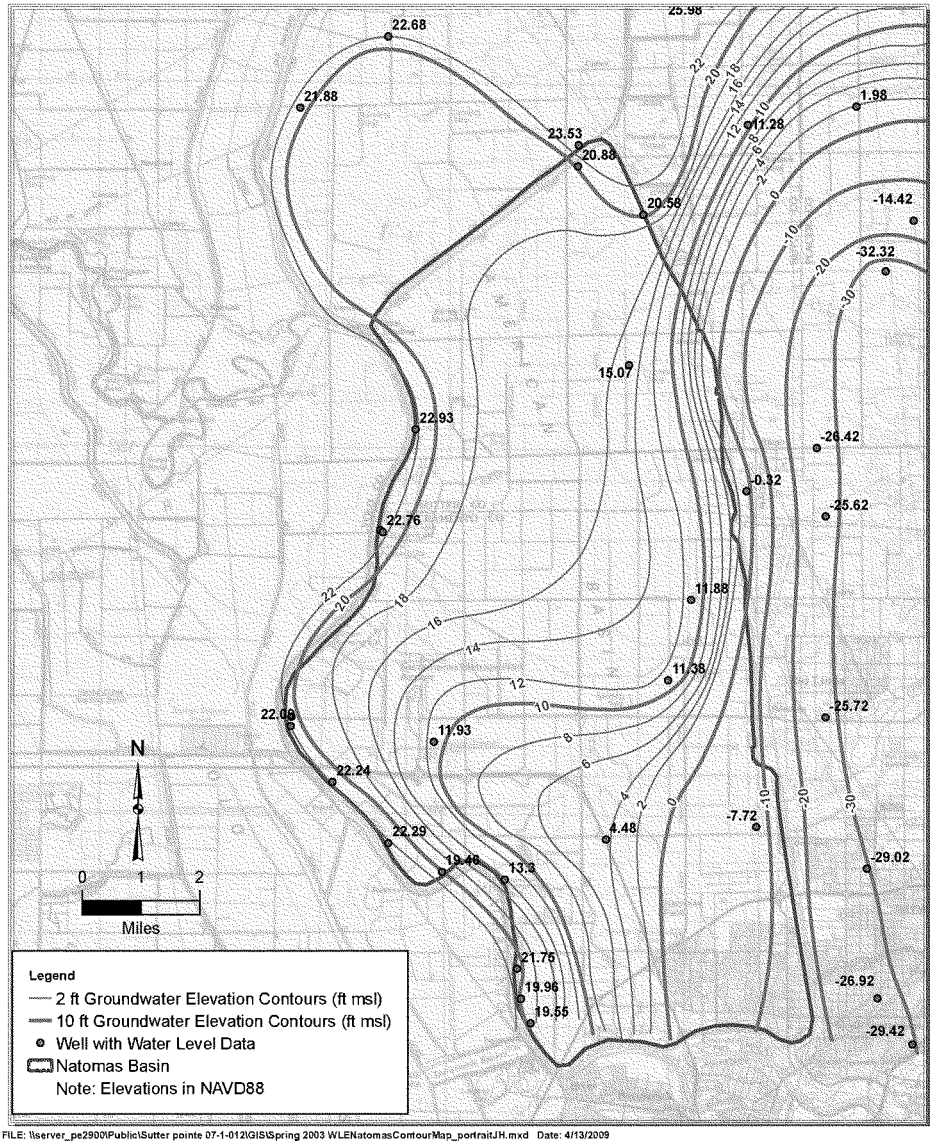

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Figure 3-5
Spring 2003 Groundwater Elevation Contours for Upper Zone Wells in Natomas Basin

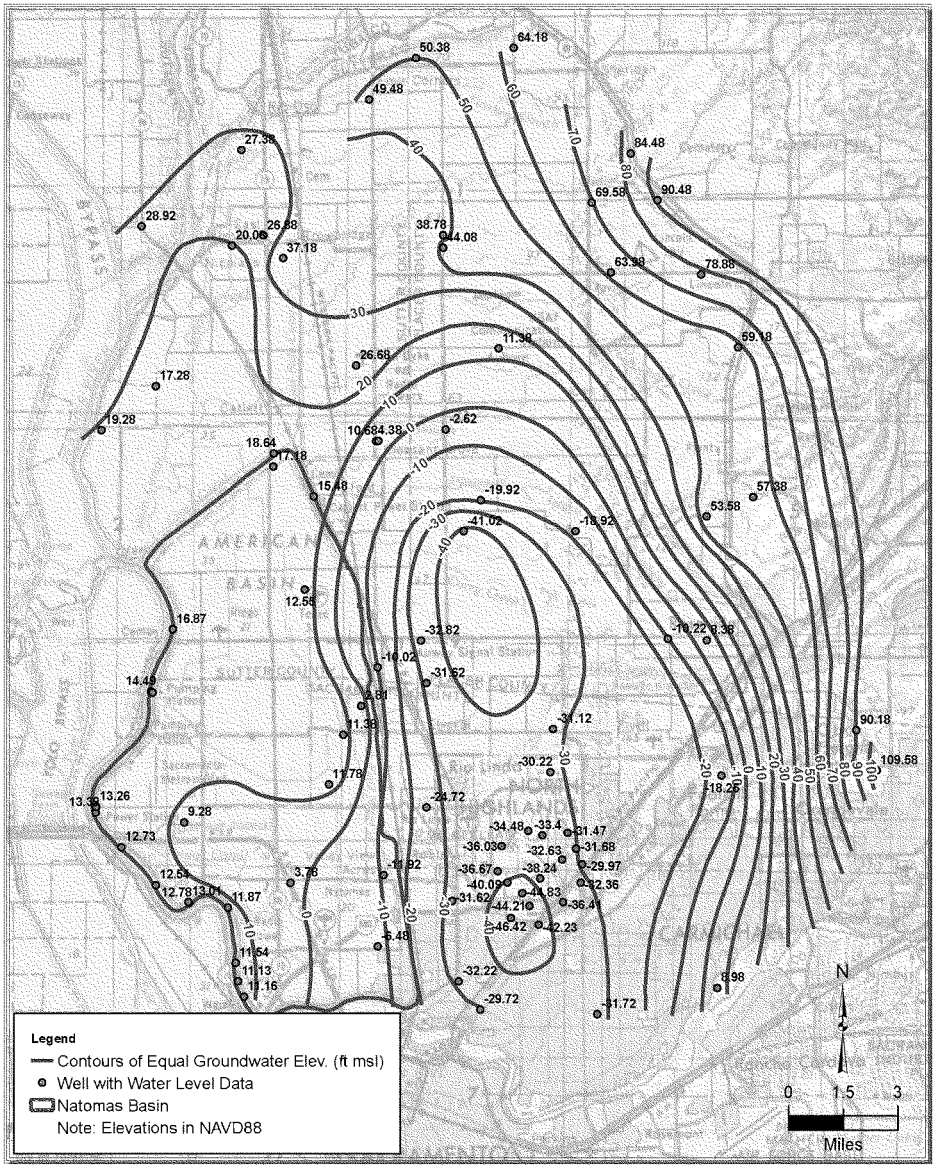

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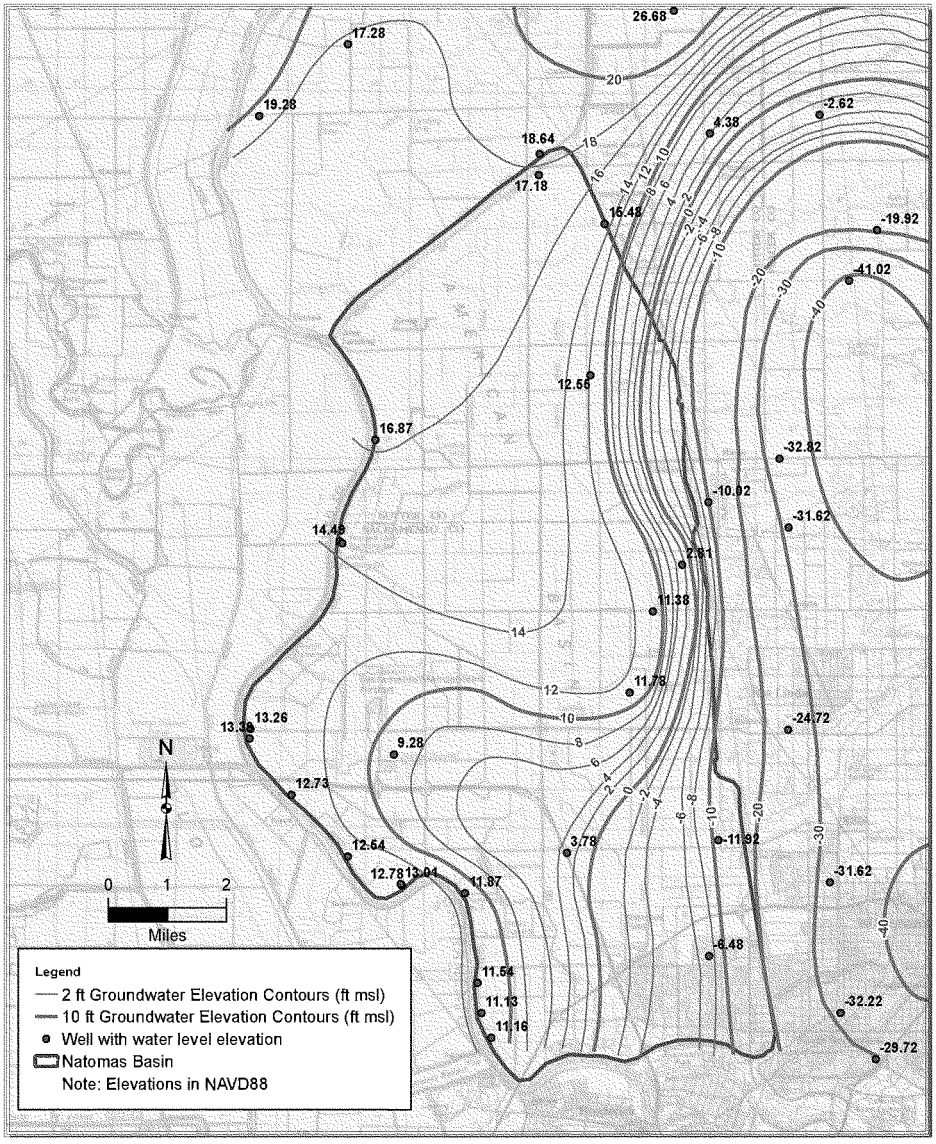
Figure 3-6
Fall 2003 Groundwater Elevations Contours for Upper Zone Wells in North American Subbasin



FILE: \\server_pe2900\Public\Sutter pointe 07-1-012\GIS\Fall 2003 WLENatomasContourMap_portraitJH.mxd Date: 4/13/2009

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Figure 3-7
Fall 2003 Groundwater Elevation Contours for Upper Zone Wells in Natomas Basin

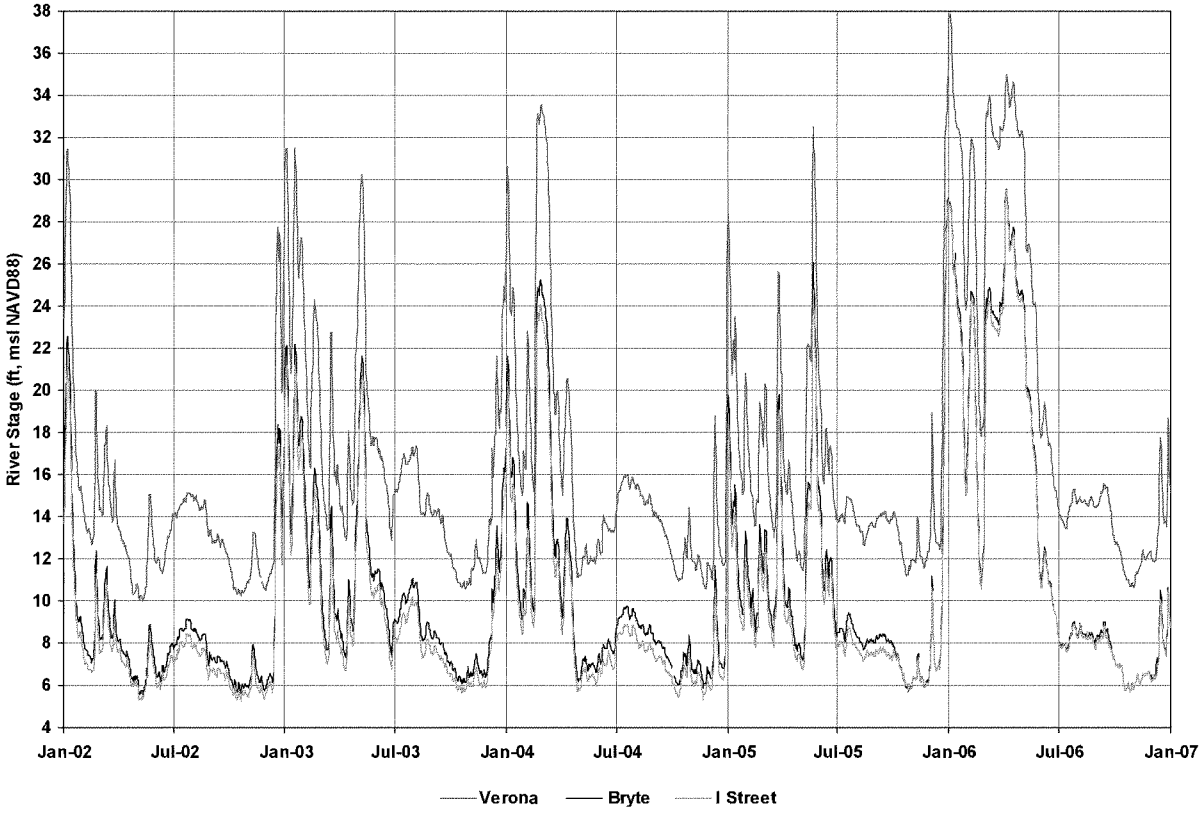

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Figure 3-8
Hydrographs of Sacramento River Stage at the Verona, Bryte, and I Street Gages

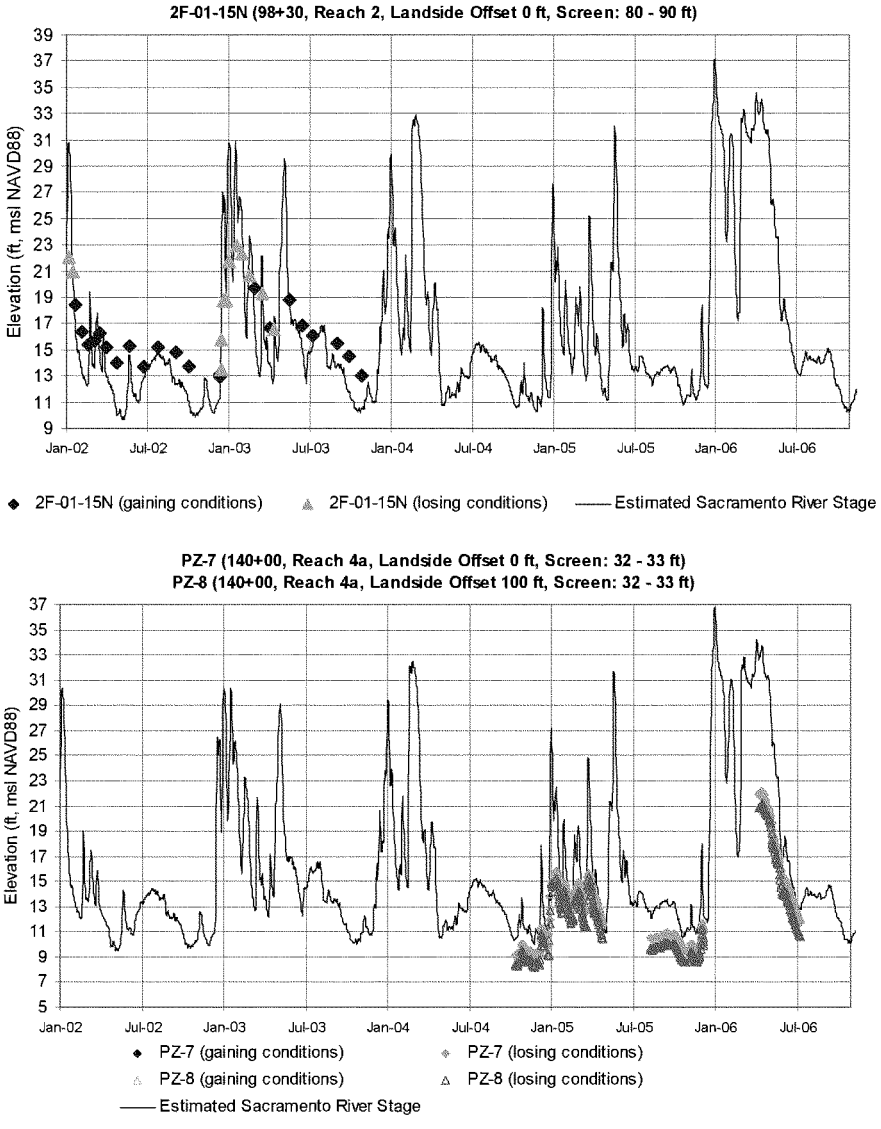

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Figure 3-9
Hydrographs of Groundwater Elevations in Levee Piezometers and Estimated Stage in Reaches 2 and 4a

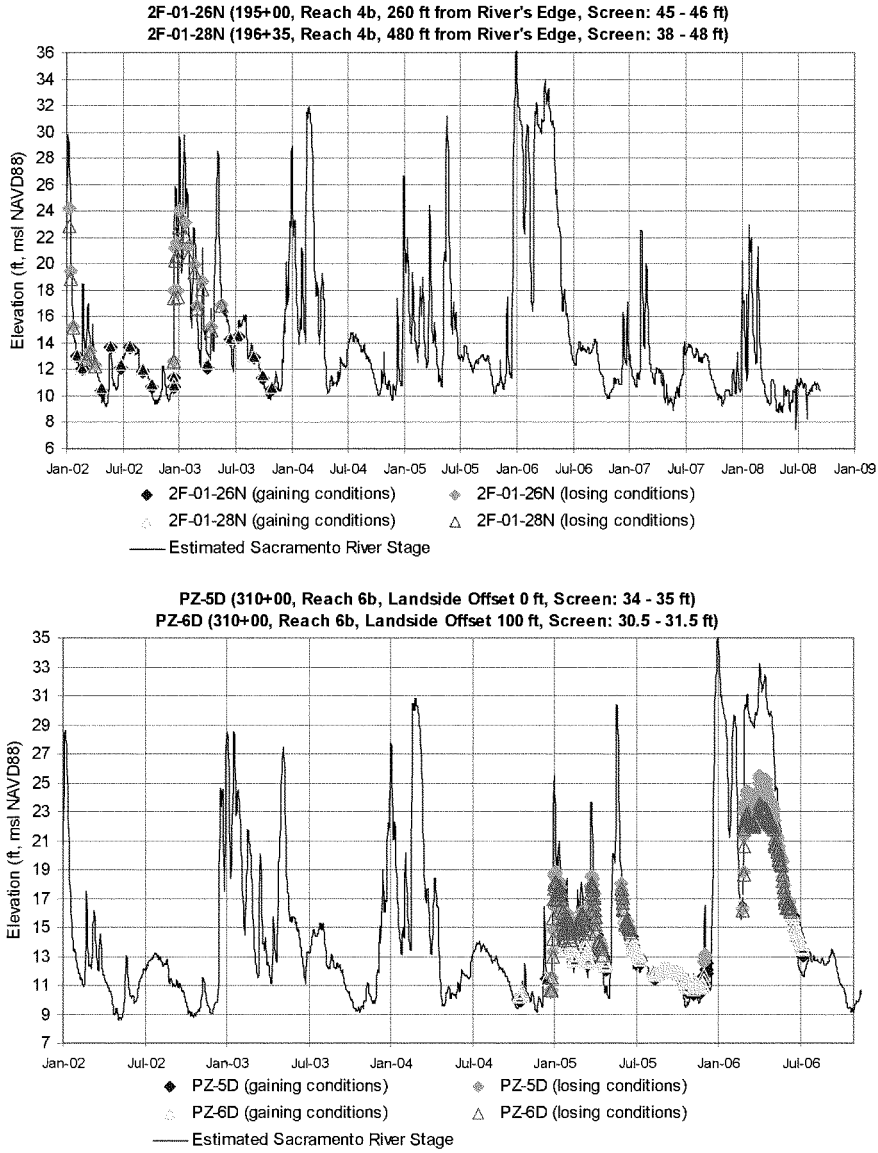

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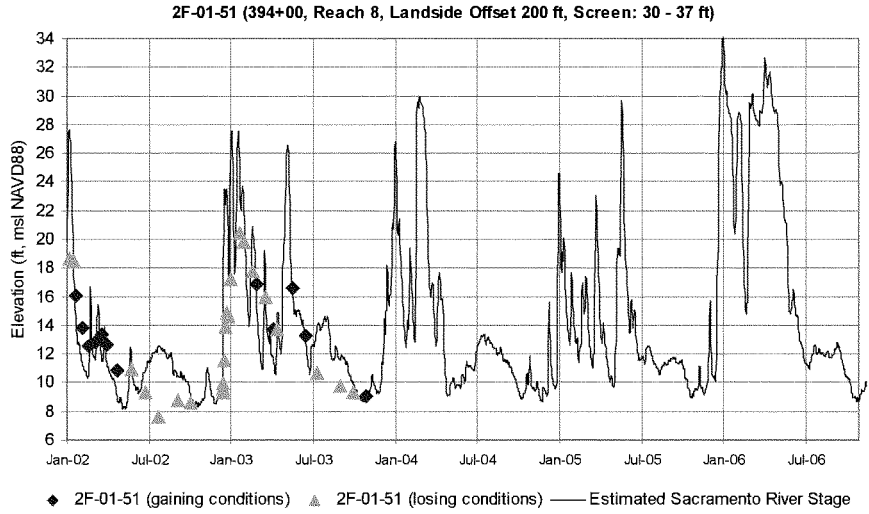
Figure 3-10
Hydrographs of Groundwater Elevations in Levee Piezometers and Estimated Stage in Reaches 4b and 6b



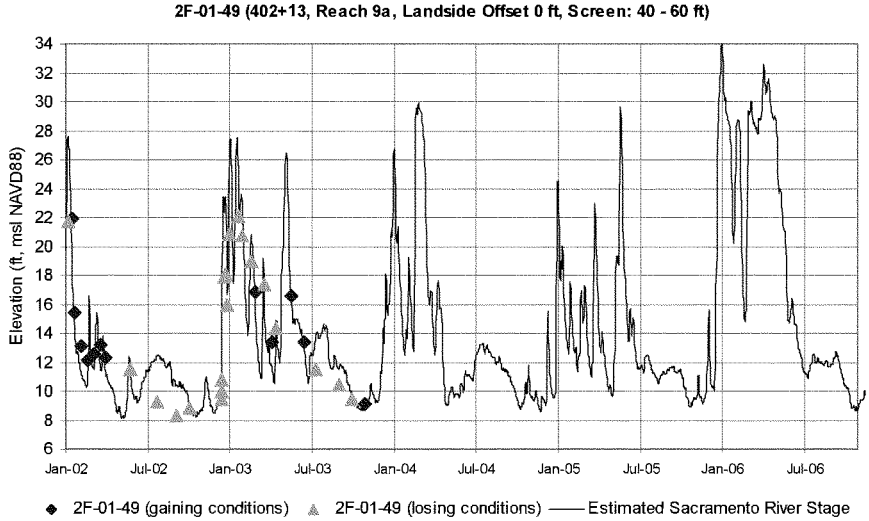


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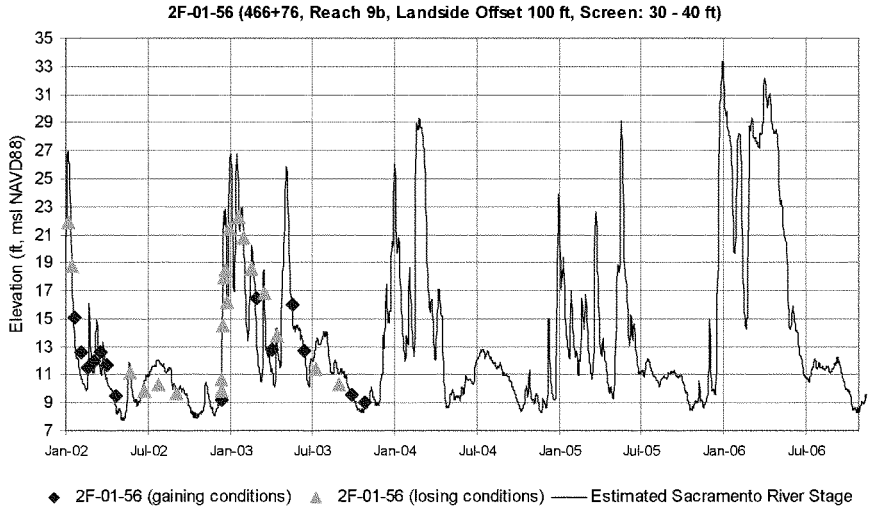
Figure 3-11
Hydrographs of Groundwater Elevations in Levee Piezometers and Estimated Stage in Reaches 8 and 9a



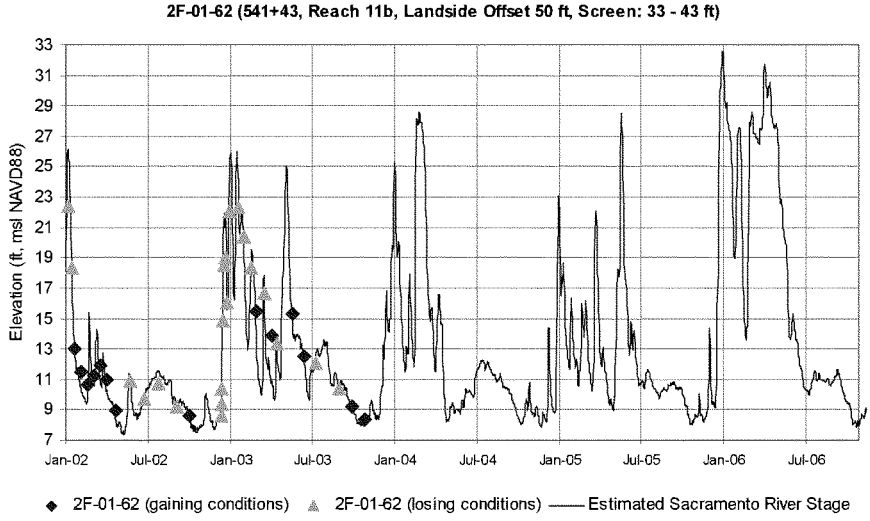


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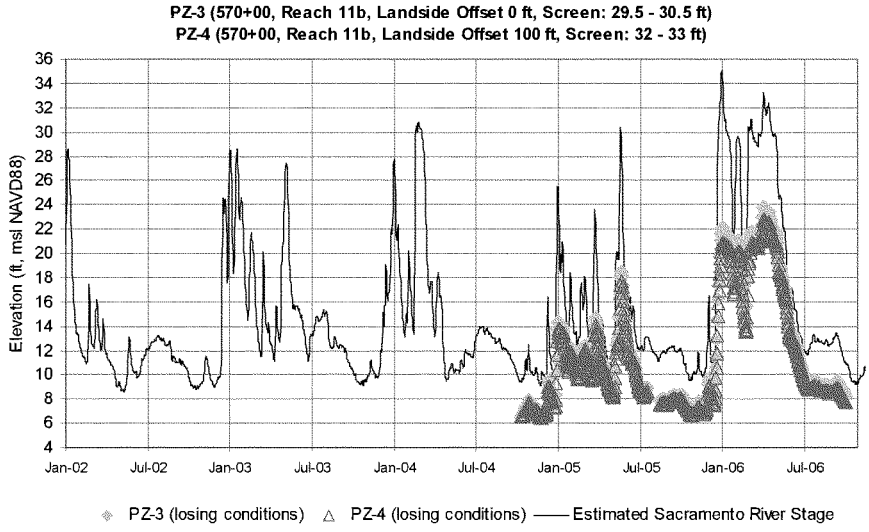
Figure 3-12
Hydrographs of Groundwater Elevations in Levee Piezometers and Estimated Stage in Reaches 9b and 11b



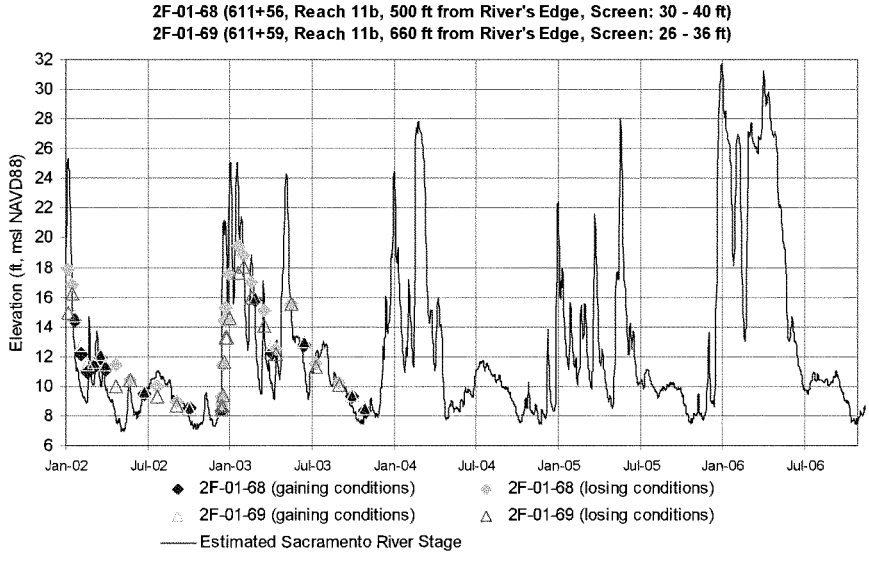


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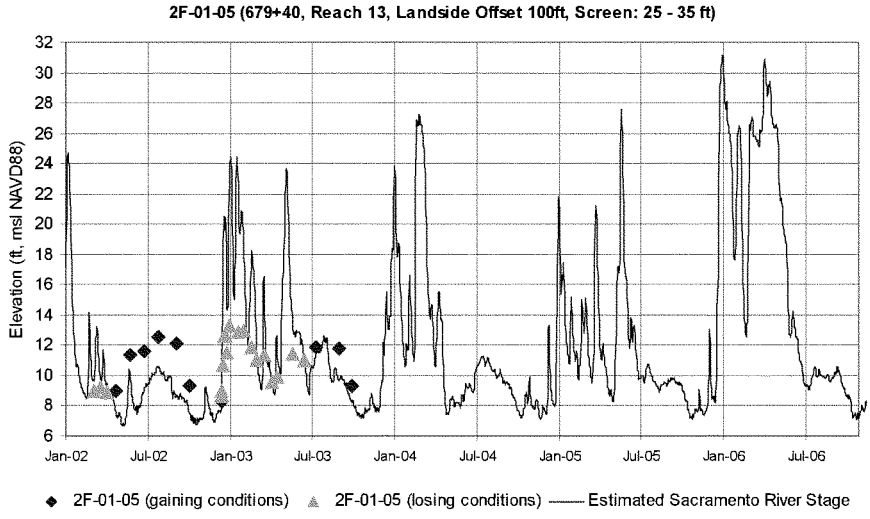
Figure 3-13
Hydrographs of Groundwater Elevations in Levee Piezometers and Estimated Stage in Reach 11b



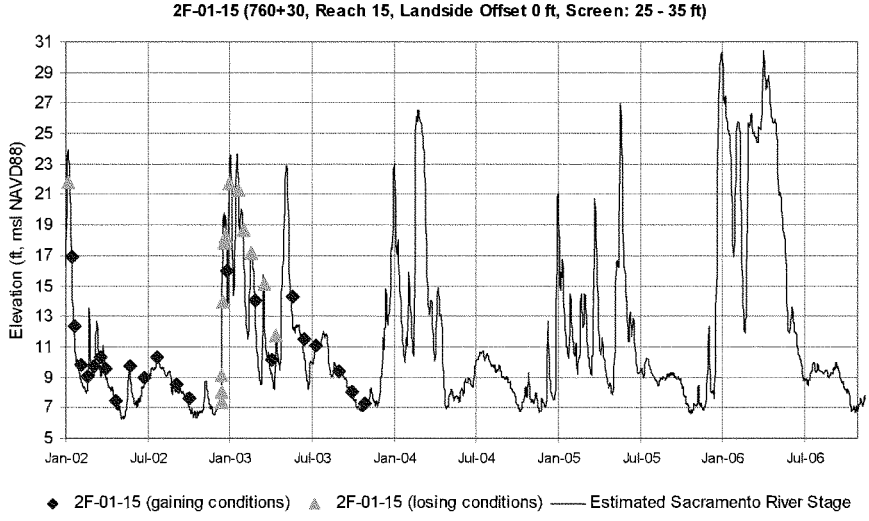


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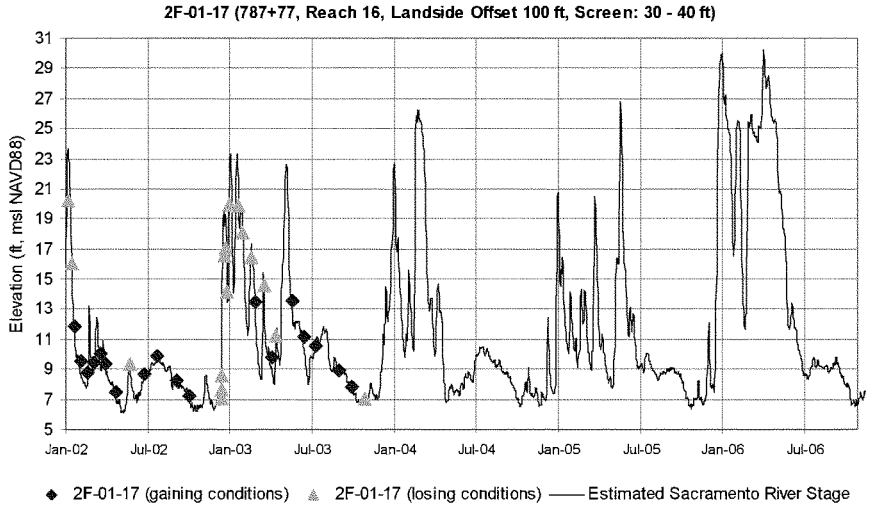
Figure 3-14
Hydrographs of Groundwater Elevations in Levee Piezometers and Estimated Stage in Reaches 13 and 15



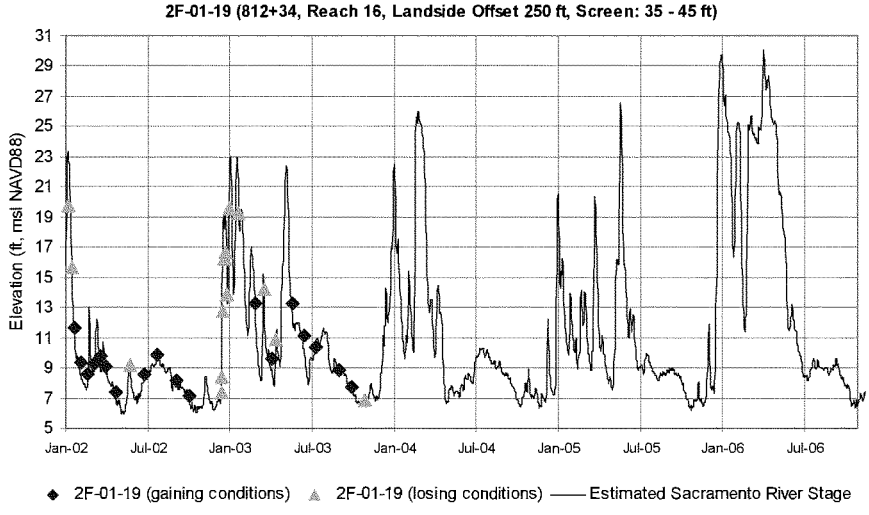


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Figure 3-15
Hydrographs of Groundwater Elevations in Levee Piezometers and Estimated Stage in Reach 16

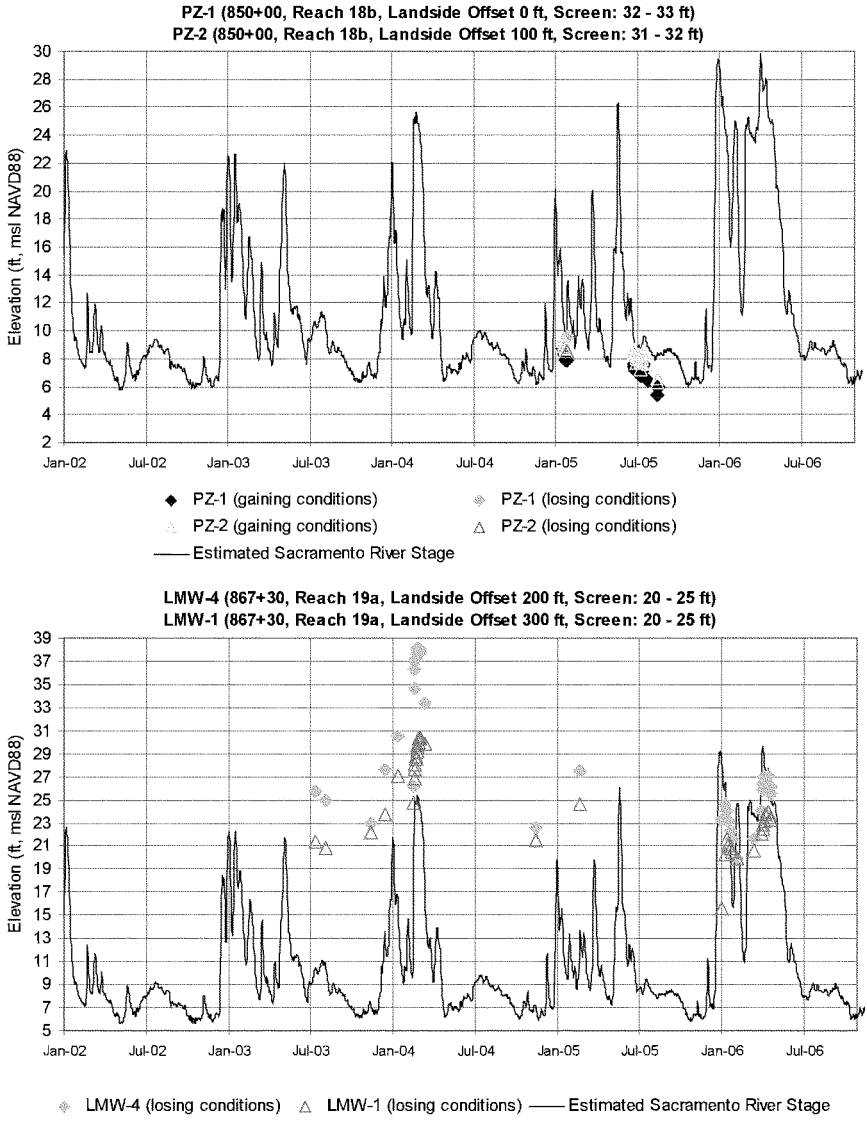

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Figure 3-16
Hydrographs of Groundwater Elevations in Levee Piezometers and Estimated Stage in Reaches 18b and 19a

4.0 Water Budgets for Existing and Future Groundwater Conditions in the Natomas Basin

4.1 IGSM Models

In order to evaluate the cumulative effects of SAFCA's proposed construction activities on groundwater conditions, a pair of existing numerical groundwater flow models were used to simulate groundwater conditions in the North American Subbasin and calculate groundwater budgets for the Natomas Basin. The models are based on the Integrated Groundwater and Surface Water Model (IGSM) platform developed by Montgomery Watson, Inc. (MW) in the 1990s. As discussed below, model results were used to calculate groundwater budgets for existing conditions (based on 2004) and future conditions (based on 2030).

The Sacramento County IGSM model is referred to as the SACIGSM and was originally developed by MW in 1993. The SACIGSM was updated by MW in 1995 and by WRIME in 2005, 2007, and 2008. The IGSM model for the Sutter/Placer County portion of the North American Subbasin is referred to as the North American River (NAR) IGSM and was originally developed by MW in 1995. The NARIGSM was subsequently updated by DWR (1997) and MW (2001). The grids used for both models are shown on **Figure 4-1**.

The IGSM models were updated most recently by WRIME in 2008 to reflect more current conditions in the Natomas Basin in order to simulate the groundwater impacts of the proposed Sutter Pointe Specific Plan development in southeastern Sutter County, which were summarized in the *Sutter Pointe Specific Plan Groundwater Supply Assessment* prepared by LSCE (2008b) . WRIME linked the NARIGSM and SACIGSM models and used them to simulate the effect of variations in the rate, timing, and location of pumping to supply the proposed Sutter Pointe development along with other land use and pumping projected for a 35-year simulation period that included different water year types.

IGSM is a finite element, quasi three-dimensional numerical groundwater flow model that simulates all major components of the hydrologic cycle. These include precipitation, runoff, evaporation, consumptive use, groundwater recharge, groundwater extraction and injection, and subsurface inflow and outflow along the model boundaries. As indicated in the model name, the simulation also includes interactions between surface water (streams and lakes) and groundwater. The primary components of the groundwater budget calculated by IGSM are:

Inflows

- Deep percolation from rainfall and irrigation applied water;
- Recharge due to stream seepage;
- Recharge from other sources such as irrigation canals and recharge ponds;
- Boundary inflows from outside the model area; and
- Subsurface inflows from adjacent model areas.

Outflows

- Groundwater pumping;
- Outflow to streams and rivers;
- Subsurface outflows to adjacent model areas; and
- Boundary outflows.

4.1.1 Sacramento County IGSM Model

The Sacramento County IGSM model covers most of Sacramento County and includes portions of northern San Joaquin County and western Amador County (**Figure 4-1**). The model is physically represented as a three-layer system consisting of the following layers: 1) the uppermost layer represents the unconfined or semi-confined aquifer system consisting of alluvial sediments that overlie the Mehrten Formation, 2) the middle layer represents the confined aquifer system of the Mehrten Formation, and 3) the lowermost layer represents groundwater of generally poorer quality in marine sediments underlying the Mehrten Formation. Near the southern boundary of the Natomas Basin, Layer 1 is about 200 feet thick and is overlain and underlain by aquitards with thicknesses of about 60 and 130 feet, respectively. Layer 2 starts at a depth of about 360 feet and is over 1,500 feet thick in this area. Layering of the SACIGSM model in the southern portion of the Natomas Basin is shown on **Figure 4-2** (see **Figure 4-1** for cross-section location). All groundwater pumping is simulated in the two upper layers.

Boundary conditions were established to designate heads for all boundary nodes and allow for surface and subsurface flows through the model boundaries. Boundary conditions reported by WRIME (2007) are as follows:

- The eastern boundary of the model is a no flow boundary but incorporates surface-water inflow to the model based on ungaged watersheds.

- General head conditions are used for the southern boundary (along the Mokelumne River). The heads for this boundary are obtained from the Stanislaus Basin IGSM, which has a simulation period ending in 1993, and values of head in nodes along this boundary in 1995 to 2004 use values from 1993.

- The western model boundary is along the Sacramento River. The northern section (north of Pocket Road) uses general head boundary conditions provided by the Central Valley IGSM (CVIGSM). The southern section of the western boundary (south of Pocket Road) is simulated as a constant head boundary. Both the general head and constant head conditions are interpolated from prior model nodes to the updated SACIGSM nodes for the western boundary. Because the general heads in the prior SACIGSM stop in 1995, the updated SACIGSM uses the 1995 values for subsequent years (1996 to 2004).

- General head conditions are used for the northern model boundary. These heads are provided by the NARIGSM, which was run concurrently with the SACIGSM. The linkage between the two models was done by correlating the boundary nodes of the models, updating the NARIGSM from monthly to daily time steps, and using the 1995 general heads in the NARISGM for subsequent years (1996 to 2004).

4.1.2 North American River IGSM Model

As shown on **Figure 4-1**, the NARIGSM includes the portions of eastern Sutter County and western Placer County that comprise the northern two-thirds of the North American Subbasin. This includes the Sutter County portion of the Natomas Basin. In 2001, the NARIGSM was refined to better assess groundwater impacts resulting from the water supply project and program alternatives being considered for the Regional Water Master Plan (MWH, 2001). The data sets that were updated included land use, streamflow, agricultural demand, surface-water diversions, urban water demand, groundwater pumping, precipitation, and groundwater levels.

The layering of the NARIGSM is similar to that of the SACIGSM. In the Sutter County portion of the Natomas Basin, Layer 1 extends from about 80 to 300 feet in depth and is overlain and underlain by aquitards. Layer 2 extends from about 420 to 1,400 feet in depth.

The boundaries for the NARIGSM were developed based on a combination of geological, hydrological, and political boundaries. MWH (1995) describes the original model boundaries as follows:

- The western model boundary is the Feather and Sacramento Rivers, which are an important source of recharge that create a groundwater divide in the upper aquifer system. General head conditions are used for this boundary based on the regional CVIGSM.

- The southern model boundary follows the Placer/Sacramento and Sutter/Sacramento County lines, and extends from the Sacramento River in the west to the eastern edge of the groundwater basin. This boundary is also the northern boundary of the SACIGSM. General head conditions are used for this boundary. As described above, the SACIGSM was linked to the NARIGSM to achieve consistent heads along this boundary.

- The eastern model boundary represents the geologic boundary between the Sacramento Valley Groundwater Basin and the Sierra Nevada foothills. No flow conditions are used for this boundary.

- The northern model boundary is the Bear River, which coincides with the Placer/Yuba and Sutter/Yuba County lines. General head conditions are used for this boundary based on the regional CVIGSM.

4.2 Model Inputs

Both the calibration and the future conditions simulations were run for a 35-year simulation period based on 1970-2004 hydrologic conditions. This was a period of approximately average precipitation, which included three single-dry years and three periods of multiple-dry years based on DWR's Sacramento River Basin Index. Initial conditions (starting heads) for the beginning of the calibration period were established using historical groundwater levels published by DWR to generate regional groundwater level contour maps and assign initial (September/October

1969) groundwater levels to each model node. Initial conditions for the 2030 simulation are discussed in Section 4.4 below.

The IGSM models simulate transient conditions whereby hydraulic heads and groundwater flow can vary with time. Discretization over time occurs by dividing the continuous simulation period into time steps. Both models originally used monthly time steps, but have since been updated to use daily time steps (WRIME, 2007). Some model inputs such as streamflow and precipitation are daily, while others such as surface-water deliveries and municipal and industrial (M&I) groundwater pumping are monthly. Agricultural water demands are estimated by the model based on historical crop acreage, soil moisture requirements, effective rainfall, potential evapotranspiration (ET), and irrigation efficiency.

The aquifer properties required by the model include hydraulic conductivity, storage coefficient, and specific yield for each layer. In the Natomas Basin, the hydraulic conductivity used for Layer 1 ranges from 33 to 118 ft/day across the Natomas Basin. Hydraulic conductivities are lower in Layer 2 (15-20 ft/day) and Layer 3 (3-12 ft/day).

Specific yield values used in the models range from 0.08 to 0.12 for the NARIGSM and from 0.04 to 0.20 for the SACIGSM. Storage coefficients in the Natomas Basin area ranged from 1.4×10^{-4} to 1.4×10^{-3} in Layer 1 to 3.5×10^{-5} to 3.0×10^{-4} in Layer 2, and 3.0×10^{-5} to 3.0×10^{-3} in Layer 3.

4.2.1 Simulation of Streams

To simulate streamflow, the IGSM models calculate a water balance for each stream element. The stream elements are a series of one-dimensional line elements that are used to describe the stream system in the model area. The gain or loss due to stream-aquifer interaction is computed based on head in the stream (stage) and head in the underlying aquifer (WRIME, 2006). The stream stage is computed using stage-discharge relationships at the corresponding stream node. Input data for the stream system include:

- Stream configuration;
- Stream node elevation;
- Stream channel cross section;
- Stage-discharge relationship;
- Stream inflows at boundary (including surface-water flow entering the model area and also gains or losses of the stream system due to stream-aquifer interaction);
- Tributary inflows;
- Wastewater discharges to streams; and
- Streamflow diversions that remove water from the stream system.

In the Natomas Basin, only the Sacramento and American Rivers are simulated as streams (recharge from smaller streams and canals is included in areal recharge estimate discussed below).

4.2.2 Areal Recharge

The IGSM models account for a number of processes in the soil zone, including ET, direct runoff, infiltration, and deep percolation from rainfall and applied water (WRIME, 2006). ET is computed based on crop consumptive use requirements and available soil moisture. Direct runoff from rainfall and applied water is computed using a modified Soil Conservation Service (SCS) runoff curve number method. Input data for simulation of hydrologic processes in the soil zone include (MW, 1995; WRIME, 2006):

- Initial soil moisture;
- Rainfall;
- Land use category;
- SCS hydrologic soil group;
- Minimum soil moisture requirements for each crop type;
- Crop consumptive use (amount of applied water consumptively used to satisfy ET or soil moisture requirements);
- Root zone depth for each crop; and
- Surface drainage pattern.

The two primary sources of water to the soil zone in agricultural and urban areas are precipitation and applied water. Agricultural areas in the NARIGSM area tend to have the largest amount of deep percolation due to the volume of irrigation water applied to rice fields in addition to the natural rainfall, while the amount of deep percolation from non-irrigated areas is relatively small (MW, 1995).

Water infiltrating beyond the soil zone (deep percolation) results in groundwater recharge. IGSM models simulate the vadose zone with the mathematical equation of unsaturated flow solved numerically at every time step (WRIME, 2006). The vadose zone is divided into a number of discrete layers of specified thickness; the water passing through the soil zone becomes the inflow to the uppermost vadose zone layer. This process repeats until the outflow from the last vadose zone layer becomes inflow to the first layer of the aquifer system. As discussed further in Chapter 5, deep percolation is a significant inflow component of the overall groundwater budget.

4.2.3 Model Calibration

Calibration is the process of adjusting parameters used in the model so that the model approximates the observed behavior of the aquifer system, especially measured groundwater levels. After the model is calibrated, it can be used to evaluate the response of the aquifer system to new or changing stresses. The original model calibration period for both IGSM models was water years 1970-1990. For the current versions of the models, the calibration period has been extended to water years 1970-1995 for the NARIGSM (MWH, 2001) and to 1970-2004 for the SACIGSM (WRIME, 2007).

During the calibration process, model generated heads were compared against measured water levels at selected calibration wells. In total, 81 calibration wells were used for the NARIGSM,

and 138 wells were used for calibration of the SACIGSM. The models were found to generally produce simulated water levels that were in good agreement with observed values under various hydrologic conditions. For the northern portion of the SACIGSM model, including the Sacramento County portion of the Natomas Basin, WRIME (2007) reported that 76 percent of the simulated heads fell within ten feet of observed heads.

Since they were last calibrated (2001 for the NARIGSM and 2007 for the SACIGSM), a number of changes have been made to both models. A check of the calibration was performed in fall 2007 after the refinement of the hydraulic conductivity values in the Natomas Basin to match recent aquifer test data provided by LSCE. Additional updates and refinements were made to the models through late 2007 and early 2008, but were considered to have only a minor effect on the calibration.

Since the models are an approximation of the physical system, they do not exactly reproduce observed groundwater levels. Although the calibration was considered acceptable for the primary intended purpose of the model (regional planning), there are notable differences between measured and simulated heads in the Natomas Basin. In particular, calibration hydrographs included in LSCE (2008b) and WRIME (2007) show declining heads at some of the Natomas Basin calibration wells over the 1970-2004 period. This is not supported by actual data, which generally show stable or increasing water levels since the early 1980s except for small seasonal fluctuations.

4.3 Water Budget for Existing Conditions

The groundwater budget for existing conditions in the Natomas Basin is based on the final water year of the 1970-2004 calibration period for the SACIGSM model. For the NARIGSM model, the calibration period ended in 1995, but the simulation period was extended to 2004 to create the water budget. Although a number of other IGSM simulations have been conducted for different purposes, the calibration period simulation was considered the best available representation of existing groundwater conditions in the Natomas Basin.

The groundwater budget for the end of the calibration simulation (2004) is shown in **Table 4-1** and summarized below The results are grouped into inflow and outflow components, and the change in storage represents the difference between the inflow and outflow.

Inflow Components

- Deep Percolation – This includes infiltration from precipitation, applied irrigation water, seepage from ditches and canals, and recharge from smaller streams. Deep percolation is assumed to be greatest from agricultural land planted to rice. A deep percolation rate of 1.32 acre-feet per acre per year (af/ac/yr), not including precipitation, was estimated for rice in the Natomas Basin (WRIME, 2008). The simulated deep percolation shown in **Table 4-1** totaled 31,429 af in 2004.

- Net Recharge from Streams – The direction of flow between streams and the underlying aquifer can vary seasonally or by reach. Flow from a stream to the aquifer system (losing

conditions) is classified as inflow to the groundwater basin, and flow from the aquifer system to a stream (gaining conditions) is classified as outflow. For the Natomas Basin, only flow to and from the Sacramento and American Rivers is included in this component. Although there is some seasonal variation, all reaches of the Sacramento and American Rivers were simulated as losing in 2004. The simulated net recharge from streams shown in **Table 4-1** was 6,469 afy for the Sacramento River and 1,086 afy for the American River.

- Net Boundary Inflow – This represents groundwater inflow or outflow through model boundaries. The Sacramento River forms the western boundary of both IGSM models, and positive values of boundary inflow represent groundwater flow from the west beneath the Sacramento River. Boundary inflow from the west shown in **Table 4-1** totaled 10,365 afy. Available water level data do not show a noticeable gradient for significant groundwater flow beneath the Sacramento River from the west. Therefore, some of this boundary inflow, especially that which occurs in Layer 1, may actually represent additional recharge from the Sacramento River.

- Subsurface Inflow – This component represents groundwater inflow from one model subregion to another. As shown in **Table 4-1**, there is a small amount of inflow from the north beneath the NCC (241 afy) and a larger amount of inflow from the south beneath the American River (2,714 afy).

Outflow Components

- Subsurface Outflow – This component represents groundwater outflow from one model subregion to another. For the 2004 simulation, there was a large amount of outflow from the Natomas Basin to the east (21,738 afy), as shown in **Table 4-1**.

- Groundwater Pumping – This represents the largest outflow component and, in the Natomas Basin, is primarily for agricultural use. The simulated groundwater pumping shown in **Table 4-1** is 35,537 afy.

Change in Storage

- Change in Storage – The basic equation for a water budget is:

  Inflow – Outflow = Change in Storage.

  A positive change in storage indicates rising groundwater levels while a negative change in storage indicates declining groundwater levels. As discussed above, hydrographs indicate that groundwater levels in the Natomas Basin are generally stable but show small fluctuations in response to climatic conditions. 2004 was classified as a normal year based on DWR's Sacramento River Basin Index, but precipitation in the Sacramento area was slightly below average. The simulated change in storage shown in **Table 4-1** is –4,971 afy.

This reduction in groundwater storage means that simulated heads were declining at the end of the calibration simulation. A decline in groundwater storage of almost 5,000 afy divided by the area of the Natomas Basin represents a small decrease in storage on a per acre basis (less than 0.1 af/ac/yr). As discussed above, the specific yield used in the model ranges from 0.04 to 0.20. Assuming a specific yield of 0.10, the simulated decrease in storage equates to an average decrease in head of about one foot.

4.4 Simulation of Future Conditions

The water budget for future conditions discussed below is based on a simulation conducted by WRIME to estimate the effect of proposed land and water use changes due to proposed developments in the North American Subbasin on groundwater conditions in 2030. For this scenario, the IGSM models were run for a 35-year simulation period based on 1970-2004 hydrologic conditions. As discussed above, this was a period of approximately average precipitation, which included three single-dry years and three periods of multiple-dry years based on DWR's Sacramento River Basin Index. This simulation represents proposed future land and water uses in the Natomas Basin, including the Sutter Pointe development at buildout (labeled Scenario 2B in LSCE, 2008b).

The 2030 simulation is based on estimated conditions in the groundwater basin in 2030 without SAFCA's construction activities. Future water supply conditions for northern Sacramento County were primarily based on Urban Water Management Plans for individual water districts in the area. As reported by WRIME (2007), most of the plans indicate a significant transition from groundwater to surface-water utilization to meet municipal water demands. Future water supply conditions for Placer County were based on several sources including the *Western Placer County Groundwater Management Plan* prepared by MWH (2007) on behalf of the City of Roseville, City of Lincoln, Placer County Water Agency, and California American Water. Water demand and supply data for proposed developments such as Placer Vineyards and Placer Ranch were obtained from the Specific Plan, EIR, or Notice of Preparation for each development.

The 2030 water budget presented below is based on Scenario 2B in LSCE (2008b), which includes full buildout of the Sutter Pointe development along with the other developments in the North American Subbasin discussed above. All agricultural land uses in the proposed development areas are simulated as being replaced by M&I land uses by 2030. Groundwater usage in the Sutter Pointe area is projected to be 13,072 afy in a normal year, which represents about 52 percent of the total demand M&I water demand, with the remainder supplied by surface water.

4.4.1 Water Budget for Future Conditions

The groundwater budget for the simulation of future conditions (2030) without SAFCA's planned construction is shown in **Table 4-1**. The future conditions water budget is based on the last 23 years of the simulation period (1982-2004). Precipitation during this period was approximately average, and this period includes nine wet years, four normal years, two single-dry years, and two multiple-dry periods (1987-1992 and 2001-2002) based on the Sacramento River 40-30-30 Index.

There are significant differences between the water budgets for the 2004 and 2030 simulations shown in **Table 4-1**. Many of these differences are due to much higher heads east of the Natomas Basin in 2030 due to the planned transition from groundwater to surface water to meet M&I demands in northern Sacramento County. Heads are also higher in most of the Natomas Basin due in part to reduced pumping outside of the Sutter Pointe area. Higher heads result in less recharge from streams, less boundary inflow, and less subsurface outflow for the Natomas Basin water budget.

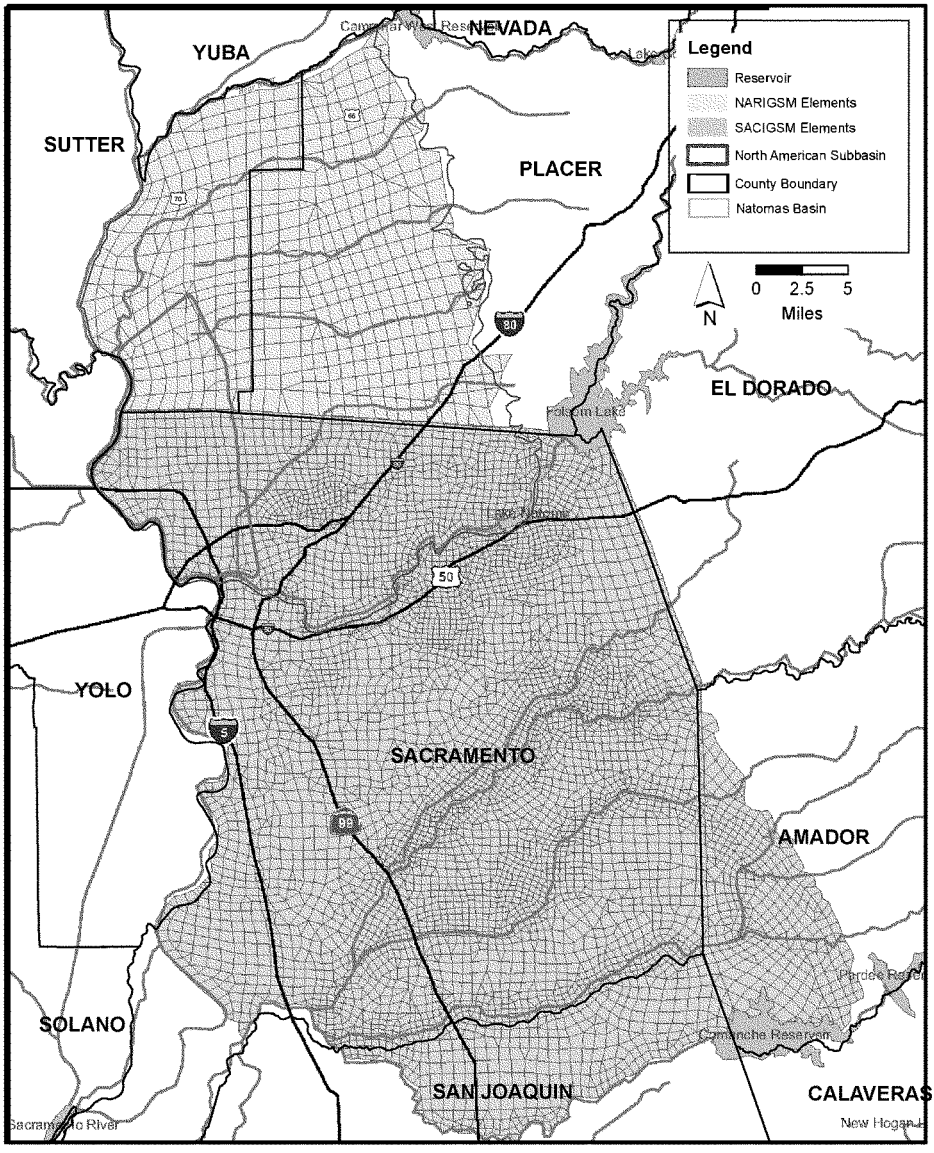
There are also differences between the values shown in **Table 4-1** for the 2030 simulation and the Scenario 2B results summarized in LSCE (2008b). These differences occurred because the latter simulation included an area of about 1,000 acres east of the Natomas Basin in southern Sutter County, which was removed from the area used for the water budget in **Table 4-1**. Due to the additional area, deep percolation and groundwater pumping were 2,300 and 3,000 afy higher, respectively, for the Scenario B water budget (LSCE, 2008b).

The inflow components shown in **Table 4-1** are deep percolation (27,187 afy), which represents a reduction of 4,242 afy from 2004 due to increased urbanization. Recharge from streams is 1,100 afy for the Sacramento River and –500 afy for the American River. The negative recharge for the American River indicates that it is simulated as a gaining reach for this model run. The total net recharge from streams (600 afy) is 6,955 afy lower than for the 2004 simulation. Boundary inflow from the west in 2030 (3,700 afy) is 6,665 afy lower than in 2004. Subsurface inflow from the north (3,700 afy) is 745 afy higher, however, due primarily to drawdown caused by proposed Sutter Pointe pumping in southern Sutter County. The 2030 simulation also shows only 1,200 afy of subsurface outflow to the east (20,538 afy less than in 2004) and 800 afy of subsurface outflow to the south due to expected pumping reductions in the southern portion of the Natomas Basin. The total pumpage in the 2030 simulation is 31,615 afy, which is 3,922 afy lower than in 2004. The average change in storage was 1,572 afy, which indicates generally increasing heads over the simulation period.

Table 4-1
Simulated Groundwater Budgets for Natomas Basin
(Not Including SAFCA Activities)

	Water Budget Component	2004 Simulation[1] (afy)	2030 Simulation[2] (afy)	Difference (afy)
Inflow	Deep Percolation (Including Canal Seepage)	31,429	27,187	4,242
	Recharge from Sacramento River	6,469	1,100	5,369
	Recharge from American River	1,086	-500	1,586
	Boundary Inflow from West	10,365	3,700	6,665
	Subsurface Inflow from North	241	3,700	-3,459
	Subsurface Inflow from South	2,714	0	2,714
	Total Inflow	**52,304**	**35,187**	**17,117**
Outflow	Groundwater Pumping	35,537	31,615	3,922
	Subsurface Outflow to East	21,738	1,200	20,538
	Subsurface Outflow to South	0	800	-800
	Total Outflow	**57,275**	**33,615**	**23,660**
Inflow minus Outflow	**Change in Storage**	**-4,971**	**1,572**	**-6,543**

1. Based on final year of calibration simulation (LSCE, 2008b).
2. Based on 1982-2004 average for Sutter Pointe Project Scenario 2B (LSCE, 2008b).



FILE: C:\Temp\SAFCA\Figure 7-1 Model Grids.mxd Date: 8/6/2008

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Figure 4-1
Model Grids for SACIGSM and NARIGSM Groundwater Flow Models

5.0 Effects of SAFCA Construction Activities

Most of SAFCA's proposed levee improvements will have no effect on groundwater in the Natomas Basin, but the proposed slurry cutoff walls are intended to reduce seepage beneath the levees and will affect groundwater conditions. Some of SAFCA's construction activities will involve land use changes that will reduce groundwater recharge. This reduction will be at least partially offset by seepage from new and relocated canals, which will increase groundwater recharge. Finally, water supply changes at the Brookfield property borrow site will result in a large reduction in groundwater pumping. A summary of assumptions about proposed SAFCA construction activities used to prepare water budgets and evaluate impacts is provided in **Table 5-1**. The groundwater impacts of proposed slurry cutoff walls are addressed in Chapter 6; the groundwater impacts of SAFCA's other proposed construction activities are summarized below.

5.1 Deep Percolation from Irrigated Agricultural Land

Most groundwater recharge in the Natomas Basin results from deep percolation of applied irrigation water. As shown in **Table 5-2**, estimates of applied water for various crops range from 2.5 af/ac/yr for field crops, grains, and hay to 6.5 af/ac/yr for rice (LSCE, 2008b). Most of this water is consumed by ET but some goes to tailwater runoff and deep percolation. The amount of deep percolation is estimated to range from about ten percent of applied water for field crops (0.25 af/ac/yr) to 17 percent of applied water for orchards (0.68 af/ac/yr). These estimates represent deep percolation from irrigation only; they do not include deep percolation from direct precipitation in the winter and spring. Deep percolation from precipitation was estimated to be about 0.23 af/ac/yr and is not included in the estimates because it would occur regardless of land use (except for areas covered by pavement or other impermeable materials). Estimates of deep percolation from applied water for other crops include 0.77 af/ac/yr for rice, 0.41 af/ac/yr for grains and hay, and 0.61 af/ac/yr for pasture (LSCE, 2008b).

5.2 Land Use Changes Due to Levee Construction

Proposed levee construction activities that will affect land use include raising levees, modifying levee slopes, and adding seepage berms. As summarized in **Table 5-1**, planned improvements to the Sacramento River East Levee will require about 486.5 acres of land and will result in the loss of about 20 acres of rice, 175 acres of field crops, and five acres of orchard (EDAW, 2008). Proposed improvements to other levees are expected to result in the loss of an additional five acres of rice along the NCC South Levee and 50 acres of rice along the PGCC West Levee. Improvements to the NEMDC West Levee are still in the design phase, but irrigated crop land is limited to the northern portion of this levee and any changes in agricultural land use are expected to be small. No agricultural land would be affected by improvements to the American River North Levee, which is located within the City of Sacramento.

Table 5-3 shows existing and future agricultural land uses affected by proposed levee improvements and the resulting change in deep percolation from applied water. The estimated

loss of deep percolation is 74 afy for the Sacramento River East Levee, seven afy for the NCC South Levee, and 66 afy for the PGCC West Levee.

5.3 Effects of Canal Improvements

Construction of the new GGS/Drainage Canal and relocation/improvement of three existing canals will increase groundwater recharge in the Natomas Basin. The new GGS/Drainage Canal and most of the relocated canals will be unlined, which will result in additional seepage from the canals to the underlying aquifer. Canal construction activities will also necessitate land use changes, including the loss of some irrigated agricultural land. The assumptions shown in **Table 5-1** were used to estimate the effects of land use changes and seepage from the canals for the water budget. For canals that would be relocated, this includes the total length of the existing and relocated canals, the length of any lined or piped segments, the approximate width of the canals at the waterline, existing land uses for the area where the relocated canal would be constructed, and the proposed future land uses for the existing canal that would be removed.

5.3.1 Giant Garter Snake/Drainage Canal

The new GGS/Drainage Canal will be about 23,200 feet (4.4 miles) long and will extend from the west end of the West Drainage Canal at the south to Pumping Plant No. 2 (east of the Pritchard Lake Pumping Plant) at the north (**Figure 1-1**). The new canal will be entirely unlined, with an average width at the waterline of about 50 feet including benches.

Construction of the GGS/Drainage Canal and associated infrastructure will require about 58.5 acres of land, as indicated in **Table 5-1**. Approximately 45 acres of this area is currently planted to field crops such as corn (EDAW, 2008). As shown in **Table 5-3**, the total amount of deep percolation that will be lost due to the removal of these field crops is estimated to be 11 afy.

The loss of deep percolation of applied water would be offset by increased seepage from the canal. Kleinfelder (2009) used the SEEP/W groundwater flow model to estimate seepage from a two-mile segment of the new GGS/Drainage canal. The canal was simulated with a ten-foot width and an underlying soil hydraulic conductivity of 10^{-5} cm/sec. The canal was simulated as being filled with about five feet of water from May through December, but some seepage was also assumed to occur during the winter. The Kleinfelder seepage estimate was 1.4 af/1,000 lf or 1.4×10^{-4} af per square foot of wetted canal area (af/ft^2). For the total length (23,200 lf) and average width (50 feet) of the GGS/Drainage Canal, this represents a seepage rate of 162 afy, as shown in **Table 5-4**. As discussed below, the estimated seepage rate per wetted area (1.4×10^{-4} af/ft^2) was also used to estimate increased seepage due to relocation or improvement of the West Drainage Canal, the Elkhorn Canal, and the Riverside Canal.

5.3.2 West Drainage Canal

The West Drainage Canal is located south of I-5 and the SIA (**Figure 1-1**) and is about 19,000 feet long. Approximately 4,700 lf of this canal is proposed to be relocated. The existing canal is unlined, and the relocated segment of the canal is also planned to be unlined. In addition to the partial relocation, SAFCA plans to widen the entire canal from about 30 feet to 72 feet, including a bench area that will be planted to tules (EDAW, 2008; M&H, 2008). As shown in **Table 5-1**,

only about 1.5 acres of the area where the relocated canal will be constructed is currently planted to field crops. The loss of deep percolation from applied water due to the canal relocation is estimated to be 0.4 afy (**Table 5-3**).

Canal seepage was estimated using the seepage rate calculated from the Kleinfelder model for the GGS/Drainage Canal (1.4×10^{-4} af/ft^2). As shown in **Table 5-4**, seepage from the existing West Drainage Canal was estimated to be about 80 afy. Due to lengthening and widening of the canal, the future seepage rate is projected to be 208 afy, which represents an increase of 128 afy.

5.3.3 Elkhorn Canal

The existing Elkhorn Canal is located just east of the Sacramento River East Levee (**Figure 1-1**) and is about 19,850 feet (3.8 miles) long and 16 feet wide. Approximately one mile of the existing canal is concrete lined. The canal is being relocated farther east to make room for levee widening and other improvements. The relocated canal will be about 22,300 feet long and 32 feet wide. Approximately 6,100 lf of the relocated canal are planned to be lined, and another 2,950 lf would be piped. This includes the 2,050 lf alignment crossing the Teal Bend Golf Course and another 900 lf adjacent to an area of existing homes (M&H, 2008).

As shown in **Table 5-1**, relocation of the Elkhorn Canal and associated infrastructure will require about 30 acres of land. Most of the area where the new canal will be constructed is currently planted to irrigated crops. As shown in **Table 5-3**, there are about 15 acres of field crops, three acres of orchard, and 11 acres of grain, hay, and pasture. The loss of deep percolation due to removal of these crops is estimated to be 11 afy.

Canal seepage was estimated similarly to the West Drainage Canal, using the seepage rate calculated from the Kleinfelder model for the GGS/Drainage Canal (1.4×10^{-4} af/ft^2). As shown in **Table 5-4**, seepage from the existing Elkhorn Canal was estimated to be about 33 afy. The seepage rate of the relocated canal is projected to be 59 afy, which represents an increase of 27 afy.

5.3.4 Riverside Canal

The existing Riverside Canal is located just east of the southern portion of the Sacramento River East Levee in the Natomas Basin (**Figure 1-1**) and is about 19,600 feet (3.7 miles) long and seven feet wide. The Riverside Canal is also being relocated farther east to make room for levee improvements. The relocated canal is planned to be about 20,550 feet long and ten feet wide (M&H, 2008).

As shown in **Table 5-1**, relocation of the Riverside Canal and associated infrastructure will require about 54 acres of land. Most of the area where the new canal will be constructed is currently planted to irrigated crops. As shown in **Table 5-3**, there are about four acres of rice, 33 acres of field crops, six acres of orchard, and seven acres of grains, hay, and pasture. The loss of deep percolation due to removal of these crops is estimated to be 21 afy.

Canal seepage was again estimated using the seepage rate calculated from the Kleinfelder model for the GGS/Drainage Canal (1.4×10^{-4} af/ft^2). As shown in **Table 5-4**, seepage from the

existing Riverside Canal was estimated to be 19 afy. The seepage rate of the relocated canal is projected to be 29 afy, which represents an increase of ten afy.

5.4 Effects of Borrow Sites

Excavation of the three borrow sites that will be the primary source of soil for SAFCA's proposed levee improvements and other construction activities will have effects on groundwater recharge in the Natomas Basin. **Table 5-1** includes a summary of assumptions about the borrow sites that were used for water budget estimates. These include the area of each borrow site and existing and proposed future land uses.

5.4.1 Airport North Bufferlands

The Airport North Bufferlands is a 737-acre site located north of the SIA (**Figure 1-1**). Approximately 630 acres of this site that had previously been planted to rice has recently been removed from rice cultivation or other land uses that would attract water fowl by the SIA. SAFCA plans to remove about four to six feet of borrow material from this site, which is currently considered non-irrigated grassland. Topsoil will be stockpiled and replaced after borrow operations are complete, and future land uses are not expected to change after reclamation of the site. As shown in **Table 5-3**, there will be no change in deep percolation from this site as a result of SAFCA's activities.

5.4.2 Brookfield Property

The Brookfield property consists of 353 acres at the northern tip of the Natomas Basin. Approximately 325 acres of this property is currently planted to rice, and SAFCA plans to restore most of this site to rice cultivation. Up to six feet of soil will be excavated, including one foot of topsoil that will be stockpiled and replaced after borrow operations are complete.

SAFCA plans to return about 286 acres of the Brookfield property to rice cultivation after construction activities are complete. The remaining 39 acres of rice fields would be lost due to construction along the PGCC West Levee and other factors. As shown in **Table 5-3**, an estimated 51 afy of deep percolation will be lost due to the conversion of rice land to other uses. The Brookfield property is currently irrigated entirely with groundwater, but SAFCA plans to provide the infrastructure so that most of the borrow site can be irrigated with surface water in the future. Engineering work is still in progress, but current estimates are that about 80 percent of the property would be irrigated with surface water rather than groundwater after reclamation (M&H, 2008). The current crop mix is about 50 percent regular rice and 50 percent wild rice (Jack DeWit, pers. comm., July 8, 2008). Regular rice and wild rice have estimated water demands of 6.5 and 6.0 af/ac/yr, respectively. Therefore, current groundwater pumpage to irrigate this property is estimated to be about 2,030 afy. This would be reduced by 1,625 afy due to the planned transition from groundwater to surface water.

In addition to increasing heads in the vicinity of the Brookfield site, the reduction in pumping would also result in increased groundwater outflow from the northern portion of the Natomas Basin. An analytical groundwater model based on the Theis (1935) equation for groundwater flow in a confined aquifer was used to estimate the amount of water level recovery that would

occur due to the reduced pumping. An aquifer transmissivity of 7,620 ft^2/day and a storage coefficient of 0.001 were used for this simulation based on LSCE (2008b). The maximum simulated water level recovery beneath the Brookfield property was about 17 feet at the end of the irrigation season in September. At the midpoint of the PGCC West Levee (south of the Brookfield property), the simulated recovery ranged from 1.6 to 7.6 feet, with an average annual value of 3.8 feet. This would result in an average increase in the hydraulic gradient for flow to the east of about 4.4 x 10^{-5} ft/ft. The increase in subsurface outflow was estimated using Darcy's Law (Darcy, 1856), which can be written as:

$$Q = KAi$$

where: Q = volumetric flow rate,
K = hydraulic conductivity of the porous medium,
A = cross-sectional area of the porous medium, and
i = hydraulic gradient.

The cross-sectional area was estimated based on the assumption that almost all of the flow would occur in the upper 400 feet of the aquifer system. Using this equation, the increase in subsurface outflow from the Natomas Basin was predicted to be 76 afy.

5.4.3 Fisherman's Lake

Fisherman's Lake – The Fisherman's Lake borrow site is located at the northern end of Fisherman's Lake in the southwestern portion of the Natomas Basin. Engineering work has not been completed for this site, but the current estimate is that about 400 acres of land would be used for borrow material.

As shown in **Table 5-1**, current land uses on this site are 49 acres of rice, 266 acres of field crops, and 85 acres of managed marsh. After reclamation, there would be about 175 acres of managed marsh and 225 acres of non-irrigated grassland or woodland. As shown in **Table 5-3**, the creation of managed marsh will result in an increase in deep percolation of 51 afy. Overall, however, there will be a net loss in deep percolation of 15 afy due to the conversion of field crops to non-irrigated grassland.

5.5 Summary

This chapter summarized the groundwater impacts of SAFCA's proposed construction activities, with the exception of slurry cutoff walls, which are addressed in Chapter 6. The above analysis included three types of groundwater impacts:

- Land use changes due to levee and canal improvements and borrow sites will result in the conversion of some irrigated agricultural land to non-irrigated land uses, which will reduce groundwater recharge from deep percolation of applied water. The total loss of deep percolation from applied water is estimated to be 256 afy, as shown in **Table 5-3**.
- The new and relocated canals would result in increased groundwater recharge due to additional canal seepage. The total estimated increase in canal seepage is 327 afy, as shown in **Table 5-4**.

- There will be a large reduction in groundwater pumping due to the planned shift in water supply from groundwater to surface water for 80 percent of the Brookfield property. The reduction in pumping is estimated to be about 1,625 afy. This will result in higher heads and increased groundwater outflow in the northern portion of the Natomas Basin.

Table 5-1
SAFCA Construction Assumptions for Water Budget Estimates

	Total Length (ft)	Slurry Cutoff Walls		Canals		Total Area (ac)	Existing Agricultural Land Uses	Future Land Uses	Notes/Sources
		Length (ft)	Average Depth (ft)	Length of Lined or Piped Segments (ft)	Average Width at Waterline (ft)				
Levees									
Sacramento River East Levee	96,000	53,450	65	-	-	486.5	20 ac rice, 175 ac field crops, 5 ac orchard	Levee	HDR (April 17, 2009); Land use based on EDAW Table 3
NCC South Levee	28,700	28,700	70	-	-	148.5	5 ac rice	Levee	Kleinfelder (2008), Land use based on EDAW Table 3
PGCC West Levee	17,400	14,010	38	-	-	89.5	50 ac rice	Levee	Wood Rodgers (2009), land use based on EDAW Table 3
NEMDC West Levee (North)	35,700	22,840	37	-	-	-	South NEMDC - none; North NEMDC - unknown	Levee	Wood Rodgers (2009)
NEMDC West Levee (South)	31,900	23,100	45	-	-	-	South NEMDC - none; North NEMDC - unknown	Levee	Wood Rodgers (2009)
American River North Levee	11,600	11,560	55	-	-	-	None	Levee	HDR (April 17, 2009)
Canals									
GGS/Drainage Canal	23,200	-	-	0	50	58.5	45 ac field crops	-	Width (M&H, 7-15-08); Land use based on EDAW Table 3
West Drainage Canal (Existing)	19,000	-	-	0	30	7	-	Managed grassland	4,700 LF section to be relocated
West Drainage Canal (Relocated)	20,600	-	-	0	72	8	1.5 ac field crops	-	Relocated section = 6,300 LF, rest widened to 72 ft.
Elkhorn Canal (Existing)	19,850	-	-	5,280	16	30	-	Levee	Length & width (M&H, 7-15-08)
Elkhorn Canal (Relocated)	22,300	-	-	9,050	32	34	15 ac field crops, 3 ac orchard, 11 ac other	-	Land use estimated by LSCE based on 2004 land use map from LSCE (2008b)
Riverside Canal (Existing)	19,600	-	-	0	7	50	-	Levee	
Riverside Canal (Relocated)	20,550	-	-	0	10	54	12 ac rice, 102 ac field crops, 17 ac orchard, 24 ac other	-	Land use estimated by LSCE based on 2004 land use map from LSCE (2008b)
Borrow Sites									
Airport North Bufferlands	-	-	-	-	-	737	Previously planted to rice but currently non-irrigated at request of FAA.	Managed grassland	Acreage (M&H, 7-15-08); current land uses per SAFCA
Brookfield Property	-	-	-	-	-	353	325 ac rice irrigated w/ 100% groundwater (1/2 & 1/2 reg. & wild rice)	286 ac rice irrigated w/ 20% groundwater, 80% surface water	Assumption of 286 ac in rice in future based on work on adjacent PGCC west levee (M&H, 2008)
Fisherman's Lake	-	-	-	-	-	400	49 ac rice, 266 ac field crops, 85 ac marsh	175 ac managed marsh, 225 ac grass-land or woodland	Acreage, land use from Marieke Armstrong, M&H (7-18-08)

Table 5-2
Deep Percolation from Applied Water in the Natomas Basin

Crop	Applied Water[1] (af/ac/yr)	Deep Percolation from Applied Water[2]	
		(af/ac/yr)	(%)
Rice or managed marsh	6.5	0.77	12%
Field and Row Crops	2.5	0.25	10%
Orchard	4.0	0.68	17%
Grains and Hay	2.5	0.41	16%
Pasture	4.8	0.61	13%

1. Source: LSCE (2008b).
2. Source: LSCE 2008b. Estimated as total deep percolation minus deep percolation from precipitation.

Table 5-3
Effects of Land Use Changes Due to Proposed SAFCA Construction on Deep Percolation

SAFCA Construction Activity	Existing Agricultural Land Uses (ac)				Future Agricultural Land Uses (ac)		Loss of Deep Percolation from Applied Water (afy)				Total Loss of Deep Percolation from Applied Water (afy)
	Rice[1]	Field Crops	Orchard	Grains, Hay, and Pasture	Rice or Managed Marsh	Other	Rice[2]	Field Crops[3]	Orchard[4]	Grains, Hay, and Pasture[5]	
Levee Improvements:											
Sacramento River East Levee	20	175	5	0	0	0	15	44	3	0	63
NCC South Levee	5	0	0	0	0	0	4	0	0	0	4
PGCC West Levee	50	0	0	0	0	0	39	0	0	0	39
NEMDC West Levee[6]	0	0	0	0	0	0	0	0	0	0	0
American River North Levee	0	0	0	0	0	0	0	0	0	0	0
Subtotal	**75**	**175**	**5**	**0**	**0**	**0**	**58**	**44**	**3**	**0**	**105**
Canals:											
GGS/Drainage Canal	0	45	0	0	0	0	0	11	0	0	11
West Drainage Canal	0	1.5	0	0	0	0	0	0.4	0	0	0.4
Elkhorn Canal	0	15	3	11	0	0	0	4	2	5	11
Riverside Canal	4	33	6	7	0	0	3	8	4	3	19
Subtotal	**4**	**95**	**9**	**18**	**0**	**0**	**3**	**24**	**6**	**8**	**41**
Borrow Sites:											
Airport North Bufferlands	0	0	0	0	0	0	0	0	0	0	0
Brookfield Property	325	0	0	0	286	0	30	0	0	0	30
Fisherman's Lake	134	266	0	0	173	0	-30	67	0	0	36
Subtotal	**459**	**266**	**0**	**0**	**459**	**0**	**0**	**67**	**0**	**0**	**67**
Total	**538**	**536**	**14**		**459**	**0**	**61**	**134**	**10**	**8**	**213**

1. Includes 85 ac of managed marsh at the Fisherman's Lake borrow site.
2. Deep percolation from applied water estimated to be 0.77 af/ac/yr for rice and managed marsh by LSCE (2008b).
3. Deep percolation from applied water estimated to be 0.25 af/ac/yr for field crops by LSCE (2008b).
4. Deep percolation from applied water estimated to be 0.68 af/ac/yr for orchards by LSCE (2008b).
5. Deep percolation from applied water estimated to be 0.41 af/ac/yr for grains/hay and 0.61 af/ac/yr for pasture by LSCE (2008b). A weighted average of 0.47 af/ac was used above.
6. Design of NEMDC levee improvements is in the early stages, and there is no current estimate of land use changes due to levee constructiion. An estimate of 50 ac of rice based on the PGCC was also used for the NEMDC because land uses west of the northern portion of the NEMDC are similar to the PGCC. Land uses west of the southern portion of the NEMDC are urbanized or vacant.

Table 5-4
Effects of SAFCA's Proposed Canal Construction on Canal Seepage

Canal Name		Total Length (ft)	Length of Lined or Piped Segments (ft)	Length of Unlined Portion (ft)	Width at Waterline (ft)	Area at Waterline[1] (ft^2)	Seepage Rate per Sq. Foot[2] ($af/ft^2/yr$)	Total Seepage Rate (afy)	Seepage Increase (afy)
GGS/Drainage Canal	New	23,200	0	23,200	50	1,160,000	1.4E-04	162	162
West Drainage Canal	Existing	19,000	0	19,000	30	570,000	1.4E-04	80	
	Relocated	20,600	0	20,600	72	1,483,200	1.4E-04	208	128
Elkhorn Canal	Existing	19,850	5,280	14,570	16	233,120	1.4E-04	33	
	Relocated	22,300	9,050	13,250	32	424,000	1.4E-04	59	27
Riverside Canal	Existing	19,600	0	19,600	7	137,200	1.4E-04	19	
	Relocated	20,550	0	20,550	10	205,500	1.4E-04	29	10
Total	**Existing**	**58,450**	**5,280**	**53,170**		**940,320**		**132**	
	New or Relocated	**86,650**	**9,050**	**77,600**		**3,272,700**		**458**	**327**

1. Area of unlined portion only.
2. Based on results of Kleinfelder (2009) seepage model for portion of GGS/Drainage Canal.

6.0 Effects of Slurry Cutoff Walls

Slurry cutoff walls are currently proposed for a total of about 29 miles of the levees surrounding the Natomas Basin. This includes about ten miles of the Sacramento River East Levee, all (5.4 miles) of the NCC South Levee, 2.7 miles of the PGCC West Levee, 4.3 miles of the northern NEMDC West Levee, 4.1 miles of the southern NEMDC West Levee, and all (2.2 miles) of the American River North Levee. Proposed seepage mitigation including slurry cutoff walls is summarized in **Table 6-1** for the Sacramento River East Levee and in **Table 6-2** for the NCC South Levee, the PGCC West Levee, the NEMDC West Levee, and the American River North Levee. The proposed cutoff wall locations are shown on **Figure 6-1**.

Groundwater flow beneath the levees with and without the proposed cutoff walls was estimated by various methods. These methods and the resulting estimates are discussed in this section. Groundwater flow beneath the Sacramento River East Levee and the NCC South Levee with and without slurry cutoff walls was estimated by both URS and Kleinfelder using the SEEP/W groundwater flow model. The most recent estimates were made by Kleinfelder and are summarized below. LSCE used a spreadsheet model to develop a revised estimate for the Sacramento River East Levee.

No modeling has been done to estimate the impacts of proposed slurry cutoff walls along the other three levees that surround the Natomas Basin. For these areas, groundwater flow without slurry cutoff walls was estimated based on the IGSM models discussed in Chapter 4. Two different simulations were used for this purpose: one representing existing conditions based on 2004 data, and the other representing future conditions in 2030. Based on the model results, estimates of groundwater flow per cross-sectional area were developed. For the reaches where slurry cutoff walls are proposed, the estimated flow per cross-sectional area was reduced by a fixed percentage based on the Kleinfelder model results for the Sacramento River East Levee.

6.1 Sacramento River East Levee

Measures proposed to mitigate seepage problems beneath the Sacramento River East Levee are shown in **Table 6-1**. The current plan includes some form of mitigation for all reaches. Slurry cutoff walls are currently proposed for 13 reaches, seepage berms are proposed for 13 reaches, relief wells are proposed for ten reaches, and jet grouting is proposed at one reach. The reaches where cutoff walls are proposed are shown in **Figure 6-1**.

6.1.1 Kleinfelder Model

Kleinfelder (2009) used the SEEP/W groundwater flow model to estimate seepage beneath the Sacramento River East Levee with and without slurry cutoff walls and summarized the results in a report entitled *Evaluation of Cutoff Walls Impact on Groundwater Recharge, Sacramento River East Levee, Natomas Levee Improvement Project, Sacramento and Sutter Counties, California.* SEEP/W is a two-dimensional, finite-element model based on Darcy's Law (Darcy, 1856). As discussed in Chapter 5, the inputs to Darcy's equation are the hydraulic conductivity, the

hydraulic gradient, and the cross-sectional area for groundwater flow. SEEP/W has the capability to simulate flow in multiple layers, and a separate hydraulic conductivity is required for each layer. Hydraulic conductivities used in the Kleinfelder model ranged from 0.028 ft/day for clay to 283 ft/day for gravel. The maximum hydraulic conductivity used for the permeable layers in most reaches was 14 ft/day (representing sand). The Kleinfelder model was based on a previous mitigation plan that included a total of 42,300 lf of slurry cutoff walls in 12 reaches.

The SEEP/W model allows both steady-state and transient simulations to be conducted. As discussed below, a transient simulation was conducted for one station, but the results were not used in the overall seepage estimate. The reported model results were based on steady-state simulations conducted for four stations, which were considered to be representative of the different geologic conditions observed on geologic profiles created from borehole data. The modeled stations were located at Stations 27+00 in Reach 1, 70+00 in Reach 2, 217+00 in Reach 4b, and 353+00 in Reach 7b. Model results from these stations were applied to other reaches with similar geology. The percentage of the entire length of the Sacramento River East Levee represented by each modeled station was 11 percent for Station 27+00, 23 percent for Station 70+00, 42 percent for Station 217+00, and 24 percent for Station 353+00.

Kleinfelder used an "average" groundwater elevation of 17.25 ft msl for all simulations. This was compared against river stage at the Verona gage ranging from 17.25 to 34.25 ft msl in one-foot increments to calculate the gradient between the River and shallow groundwater. The steady-state model was run separately for each stage height, and the estimated seepage was multiplied by the number of days that the stage was calculated to be at each elevation based on data from 1995-2007. The lowest stage height (17.25 ft msl) had the longest duration (20 days/year), and the three highest stage heights (32.25, 33.25, and 34.25 ft msl) each had a duration of ten days/year.

Since almost all of the groundwater flow occurs in the sand layers, the model is very sensitive to the hydraulic conductivity used for sands. A hydraulic conductivity of 14 ft/day was used for sand layers in three of the four modeled reaches, and the calculated seepage rate was relatively low (2.6 to 13.4 afy/1,000 lf) in these reaches. Hydraulic conductivities of 56 and 283 ft/day were used for sand and gravel, respectively, at Station 217+00, and the resulting seepage rate was much higher (129 afy/1,000 lf). These seepage estimates were multiplied by the length of each reach to estimate the total seepage, and the results are shown in **Table 6-3**. The total seepage was estimated to be about 5,650 afy without slurry cutoff walls using this approach.

The model was rerun for Stations 70+00 and 353+00 with the slurry cutoff walls in place to estimate the effect of the cutoff walls. A hydraulic conductivity of 2.8×10^{-3} ft/day was estimated for the cutoff walls. For Station 70+00, the cutoff wall was assumed to fully penetrate the permeable sand layer and a seepage reduction of 85 percent was calculated. At Station 353+00, the cutoff wall was assumed to not fully penetrate the permeable sand layer and was calculated to reduce seepage by only 40 percent. The model results for the four stations were multiplied by one of these percentages to estimate the impacts of the other cutoff walls. The 85 percent reduction was used for reaches where the cutoff wall was considered to fully penetrate the permeable sand layer, and the 40 percent reduction was used for reaches where the wall

would not be fully penetrating. As shown in **Table 6-3**, the total amount of groundwater flow that would be blocked by the eight miles of proposed slurry cutoff walls is about 1,320 afy.

A transient version of the model was created for Station 70+00 to check the results of the steady-state simulations. The transient model was run with and without the slurry cutoff walls for a one-year period divided into 34 time steps. Groundwater elevations and river stage were allowed to fluctuate based on stage measured at the Verona gage and groundwater levels at USACE piezometer 2F-01-15N. Seepage without the cutoff wall calculated with the transient model was three times higher than that calculated with the steady-state model. Seepage through the cross-sectional area where the cutoff wall would be constructed was about four times higher with the transient model as compared to the steady-state model. On a percentage basis, the calculated flow reduction for the transient model was about 70 percent, which is less than the 85 percent reduction calculated with the steady-state model.

Overall, the Kleinfelder transient model results appear to be more realistic than the steady-state results. This would be expected since steady-state models require an assumption of equilibrium conditions and cannot simulate conditions that vary with time. For this reason, transient model results are considered more accurate for most applications. However, steady-state model results had to be used for Kleinfelder's overall seepage estimate shown in **Table 6-3** because only one station was simulated with the transient model. As discussed below, some of the Kleinfelder transient model results were used for LSCE's evaluation of cutoff wall impacts on seepage from the River and head changes in private wells along the east levee.

On a percentage basis, the transient and steady-state models showed varying results for flow reductions caused by the cutoff walls. Based on the transient model, a flow reduction of 70 percent due to horizontal flow through a fully-penetrating cutoff wall was considered to be a reasonable estimate. This estimate is considered to be conservative in that it does not account for increased vertical flow beneath the cutoff walls or horizontal flow around the cutoff walls. A three-dimensional model would be expected to show a somewhat smaller flow reduction due to the cutoff walls.

6.1.2 LSCE Seepage Estimates

Since almost all of the groundwater flow beneath the levees occurs in the permeable sand and gravel layers, a seepage estimate equivalent to the SEEP/W model can be obtained by simply calculating groundwater flow in the sand and gravel layers using Darcy's equation. An updated version of the estimate made by LSCE (2008a) is summarized in **Table 6-4** and discussed in this section. As noted above, Darcy's equation states that the volumetric rate of groundwater flow is equal to the product of the hydraulic conductivity, the cross-sectional area, and the hydraulic gradient (Darcy, 1856). Groundwater flow for 57 reaches or sub-reaches was estimated separately and then summed to estimate the total net recharge from the River. The term "net recharge" is used because the hydraulic gradient used for the simulations is an average value that accounts for the fact that the Sacramento River fluctuates between gaining and losing conditions over the course of the year. On an annual basis, however, all reaches of the Sacramento River in the Natomas Basin appear to be losing, as discussed above in Chapter 3.

For these seepage estimates, groundwater flow in fine to medium sands was estimated separately from that in coarse sands and gravels. For each category, the hydraulic conductivity and gradient were assumed to be constant for all reaches. Hydraulic conductivities used in the model are based on estimates summarized in **Table 2-1**. A hydraulic conductivity of 28 ft/day was used for the fine to medium sands, which is higher than the estimate used by Kleinfelder for three of the stations simulated with the SEEP/W model (14 ft/day). A hydraulic conductivity of 140 ft/day was used for coarse sands and gravels, which is within the range of estimates used by Kleinfelder for similar materials at Station 217+00 (56 to 283 ft/day).

The hydraulic gradient used for the Darcy's Law estimate was 0.0032 ft/ft based on the average annual value estimated in LSCE (2008a). As discussed in Section 4, this hydraulic gradient accounts for the large seasonal fluctuations observed in the hydrographs of groundwater levels and estimated stage. Steep positive gradients (losing conditions) occurring during periods of rising and high stage are partially offset by shallow negative gradients (gaining conditions) during periods of declining and low stage. Although the groundwater contour maps show that the gradient is steeper in the southern portion of the Natomas Basin, the piezometer data and stage estimates were not accurate enough to allow this spatial variability to be quantified.

For each reach, the saturated thickness of permeable sands and gravels was estimated from the geologic profiles, which contain data for the upper 100 to 120 feet of the aquifer system. The permeable saturated thickness for fine to medium sands ranged from eight to 80 feet, with an average of 46 feet. The permeable saturated thickness for coarse sands and gravels ranged from zero to 53 feet, with an average of seven feet. These thicknesses were multiplied by the length of each reach to estimate the cross-sectional area for groundwater flow. Because the overall length of the Sacramento River East Levee is about 18 miles, the total cross-sectional area is very large (about 5.8 million square feet or 134 acres).

As shown in **Table 6-4**, the estimated groundwater flow in each reach ranges by several orders of magnitude, from one to about 2,200 afy. The total estimated groundwater flow in the shallow aquifer without slurry cutoff walls is 8,450 afy. Although the coarse sand and gravel layers account for only 23 percent of the total saturated thickness, groundwater flow in these layers accounts for 60 percent of the total estimated flow. The total flow is about 50 percent more than was estimated by Kleinfelder using the steady-state SEEP/W model but is less than would be expected had Kleinfelder applied its transient model to all reaches.

The estimated effect of the slurry cutoff walls was partially based on the Kleinfelder transient model results. The estimate of a 70 percent reduction in groundwater flow obtained with the transient model was used for reaches where the cutoff wall fully penetrated the permeable sand layer. LSCE's interpretation of the geologic profiles indicates that the slurry cutoff walls will only be fully penetrating for portions of five of the 13 reaches where cutoff walls are proposed. For the other eight reaches, a 70 percent flow reduction was assumed for the depth of the cutoff wall and no flow reduction below the bottom of the cutoff wall. Using this approach, the effect of the cutoff walls is estimated to range from two to 70 percent of the total flow in these reaches. The estimated flow reduction due to all proposed cutoff walls is 884 afy, as shown in **Table 6-4**. This represents a reduction of about ten percent of the total estimated recharge from the Sacramento River.

The estimate of slurry cutoff wall impacts in **Table 6-4** is based on existing groundwater conditions in the Natomas Basin. In order to estimate impacts in 2030, the hydraulic gradient was increased to reflect the steeper gradient that would occur in the northern portion of the Natomas Basin primarily due to pumping to supply the proposed Sutter Pointe development. As shown in **Table 6-5**, the magnitude of the predicted increase ranges from a maximum of 0.0018 ft/ft in Reaches 2 and 3 to zero in Reaches 14 through 20. The total estimated recharge from the River without slurry cutoff walls would increase to 9,340 afy, and the estimated flow reduction due to all proposed cutoff walls would increase to 992 afy. These flow reductions are also summarized in **Table 6-6**, which shows the estimated groundwater flow through the cross-sectional area of the proposed slurry cutoff walls with and without the walls for all levees surrounding the Natomas Basin based on existing/2004 and future/2030 conditions.

Like the Kleinfelder model results, the reduction in flow due to the proposed slurry cutoff walls calculated by LSCE is conservative because the model only accounts for horizontal flow through the cutoff walls. Increased vertical flow beneath the cutoff walls and increased horizontal flow around the ends of the cutoff walls are not included in the model, which means that the actual flow reduction would be less than simulated. The reduction in groundwater flow beneath the levee due to the cutoff walls equates to reduced recharge from the Sacramento River to the Natomas Basin. During periods when the River is losing, heads will be lower on the land side of the levee and higher on the river side due to the impedance caused by the cutoff walls and the resultant reduction in groundwater flow. Flow that would be impeded by the cutoff walls would be expected to remain in the River, which will provide a benefit to downstream users.

6.2 Natomas Cross Canal South Levee

6.2.1 Kleinfelder Model

Slurry cutoff walls are currently under construction along the NCC South Levee as summarized in **Table 6-2**. Seepage beneath the NCC South Levee with and without slurry cutoff walls was estimated by Kleinfelder using the SEEP/W groundwater flow model. The model results are included in a report entitled *Evaluation of Cutoff Walls Impact on Groundwater Recharge, Natomas Cross Canal South Levee, Natomas Levee Improvement Project, Sacramento and Sutter Counties, California* (Kleinfelder, 2008) and are summarized below.

Hydraulic conductivities used in the model ranged from 0.028 ft/day for clay to 28 ft/day for sand. The maximum hydraulic conductivity is an order of magnitude less than the 283 ft/day used for some reaches of the Sacramento River East Levee because boreholes drilled along the NCC South Levee did not encounter significant gravel lenses. However, the permeable sand layers were assigned a hydraulic conductivity of 28 ft/day, which is double that used for the model of the Sacramento River East Levee.

Kleinfelder conducted both steady state and transient simulations were conducted for the NCC South Levee, but the results of the transient simulations were not used for the overall seepage estimate. The reported model results were based on steady-state simulations conducted for three stations, which were considered to be representative of the different geologic conditions observed on geologic profiles created from borehole data. The modeled stations were located at Stations 135+00 (Reach 4), 183+00 (Reach 5), and 213+00 (Reach 6). Stations 135+00 and

183+00 were modeled as having two relatively thin sand layers separated by a clay layer. Station 213+00 was modeled as having a single thicker sand layer. Model results from these stations were applied to other reaches with similar geology. The percentage of the entire length of the NCC South Levee represented by each modeled station was 35 percent for Station 135+00, 40 percent for Station 183+00, and 25 percent for Station 213+00.

An "average" depth to water of 7.5 feet was used for all simulations. This equates to a groundwater elevation of about 27.6 to 34.6 ft msl and was compared against NCC stage ranging from about 19.6 to 36.6 ft msl in one-foot increments to calculate the gradient between the canal and shallow groundwater. The steady-state model was run separately for each stage height, and the estimated seepage was multiplied by the number of days that the stage was calculated to be at each elevation based on data from the Sacramento River Verona gage for 1995-2007. The lowest stage height (19.6 ft msl) had the longest duration (about 20 days/year), and the three highest stage heights (34.6, 35.6, and 36.6 ft msl) each had a duration of about ten days/year.

Unlike its seepage model of the Sacramento River East Levee, Kleinfelder modeled all three stations of NCC South Levee using the same hydraulic conductivity (28 ft/day) for the most permeable layers. Therefore, the simulated seepage for the NCC was much less variable. Station 135+00 had the lowest estimated seepage rate (3.1 afy/1,000 lf). Station 183+00 had a seepage rate of 9.8 afy/1,000 lf, and Station 213+00 had a seepage rate of 9.1 afy/1,000 lf. These seepage estimates were multiplied by the length of each reach, and the total seepage was estimated to be about 218 afy without slurry cutoff walls using this approach.

The model was rerun for all three stations with the slurry cutoff walls in place to estimate the effect of the cutoff walls on seepage from the NCC. A hydraulic conductivity of 2.8×10^{-3} ft/day was assumed for the cutoff walls. For Station 135+00, the cutoff wall was assumed to fully penetrate both sand layers, resulting in an estimated seepage reduction of 90 percent. For Station 183+00, however, the cutoff wall was assumed to penetrate only the upper sand layer, which resulted in an estimated seepage reduction of 30 percent. For Station 213+00, the cutoff wall was assumed to fully penetrate the single sand layer, which also resulted in an estimated seepage reduction of 90 percent. The model results for the four stations were multiplied by one of these percentages to estimate the impacts of the other cutoff walls, and the total amount of groundwater flow that would be blocked by the slurry cutoff walls along the NCC South Levee under existing conditions was estimated to be 126 afy. This represents 90 percent of the flow through the cutoff wall cross section and 58 percent of the total flow calculated by the model. A flow reduction of 90 percent is considered to be high, and the flow reduction estimated from Kleinfelder's transient simulation for the Sacramento River East Levee was used for LSCE's seepage estimates discussed below.

6.2.2 LSCE Seepage Estimates

The Kleinfelder model of the NCC provides an estimate of canal seepage by does not include groundwater flow from the north into the Natomas Basin (beneath the NCC). As discussed in Chapter 4, this flow was estimated to be 241 afy based on the 2004 IGSM simulation. As shown in **Table 6-6**, the total flow into the Natomas Basin from the north is estimated as the sum of the groundwater flow estimated by the IGSM model and canal seepage estimate with the SEEP/W

model (218 afy). Approximately 80 afy of this flow is estimated to pass through the cross-sectional area of the proposed slurry cutoff walls, and a flow reduction of 70 percent was assumed due to the cutoff walls. The total estimated flow reduction shown in **Table 6-6** is 56 afy, or 12 percent of the total flow.

The impacts of slurry cutoff walls along the NCC South Levee were estimated similarly for 2030 conditions in **Table 6-6**. Seepage from the NCC was assumed to be relatively constant in future years, but groundwater flow beneath the NCC South Levee was estimated to be much larger (about 3,700 afy) in 2030 (**Table 4-1**) due primarily to steeper gradients caused by proposed M&I pumping in the Sutter County portion of the Natomas Basin. It is assumed that almost all of this flow would occur in the upper 400 feet of the aquifer system. Flow through the cross-sectional area where cutoff walls are proposed was estimated to be 686 afy, and a 70 percent flow reduction due to the slurry cutoff walls was again assumed. The estimated flow reduction for the 2030 simulation is 480 afy.

6.3 Pleasant Grove Creek Canal West Levee

Proposed slurry cutoff walls along the PGCC West Levee are summarized in **Table 6-2**, and the cutoff wall locations are shown on **Figure 6-1**. As discussed above, no modeling has been done to estimate the impacts of proposed slurry cutoff walls along the PGCC West Levee, the NEMDC West Levee, and the American River North Levee. For these levees, groundwater flow without slurry cutoff walls was estimated based on the IGSM groundwater model results discussed in Chapter 4. Based on the model results, an estimate of groundwater flow per cross-sectional area was developed for the 2004 and 2030 simulations (**Table 6-6**). For the reaches where slurry cutoff walls are proposed, flow through the cross-sectional area of the cutoff walls was reduced by a fixed percentage (70 percent) based on the Kleinfelder transient model results for the Sacramento River East Levee.

As discussed in Chapter 4, the IGSM model results show relatively large volumes of groundwater outflow from the Natomas Basin to the east beneath the PGCC and NEMDC for the 2004 simulation. The model results indicate much less outflow in 2030 due to higher heads east of the Natomas Basin resulting from the planned transition from groundwater to surface water to meet M&I demands in northern Sacramento County.

Flow beneath the PGCC West Levee with and without slurry cutoff walls is estimated in **Table 6-6**. Groundwater flow to the east beneath the levee without cutoff walls was estimated to be 4,512 afy based on the 2004 IGSM simulation and 233 afy based on the 2030 simulation. It was assumed that almost all of this flow occurs in the upper 400 feet of the aquifer system, which corresponds to Layer 1 and the upper portion of Layer 2 of the IGSM models. The slurry cutoff walls along the PGCC West Levee were assumed to be about 14,000 feet long with an average depth of 38 feet. Groundwater flow through this cross section without the cutoff walls was estimated to be 341 afy and 19 afy, based on the 2004 and 2030 simulations, respectively. The estimated flow reduction due to the slurry cutoff walls is assumed to be 70 percent or 238 afy for the 2004 simulation and 13 afy for the 2030 simulation. These flow reductions will be at least partially offset by the estimated increase in groundwater outflow beneath the PGCC due to pumping reductions planned for the Brookfield borrow site.

6.4 Natomas East Main Drainage Canal West Levee

Proposed slurry cutoff walls along the NEMDC West Levee are summarized in **Table 6-2**, and the cutoff wall locations are shown on **Figure 6-1**. The impacts of proposed slurry cutoff walls along the NEMDC West Levee were estimated similarly to the PGCC West Levee in **Table 6-6**. Groundwater flow to the east beneath the northern and southern portions of the NEMDC West Levee was estimated separately. For the northern NEMDC West Levee, groundwater flow to the east beneath the levee without cutoff walls was estimated to be 9,132 afy based on the IGSM 2004 simulation and 504 afy based on the 2030 simulation. As for the PGCC, it was assumed that almost all of this flow occurs in the upper 400 feet of the aquifer system. The slurry cutoff walls along the northern NEMDC West Levee were assumed to be 22,800 feet long and an average of 37 feet deep. Groundwater flow through this cross-sectional area without the cutoff walls was estimated to be 541 afy and 30 afy, based on the 2004 and 2030 simulations, respectively. A 70 percent flow reduction due to the slurry cutoff walls was again assumed based on the Kleinfelder transient simulation for the Sacramento River East Levee. The estimated flow reduction is 378 afy for the 2004 simulation and 21 afy for the 2030 simulation.

For the southern NEMDC West Levee, groundwater flow to the east beneath the levee without cutoff walls was estimated to be 8,156 afy based on the IGSM 2004 simulation and 450 afy based on the 2030 simulation, as shown in **Table 6-6**. The slurry cutoff walls along the southern NEMDC West Levee were assumed to be 23,100 feet long and an average of 45 feet deep. Groundwater flow through this cross-sectional area without the cutoff walls was estimated to be 665 afy and 37 afy, respectively, based on the 2004 and 2030 simulations. The estimated flow reduction is 466 afy for the 2004 simulation and 26 afy for the 2030 simulation.

6.5 American River North Levee

Slurry cutoff walls are currently proposed for the entire length of the American River North Levee, as shown on **Table 6-2** and **Figure 6-1**. The impacts of these slurry cutoff walls were estimated similarly to the PGCC and NEMDC West Levees in **Table 6-6**. This was assumed to be a generally losing reach under current conditions, and recharge from the American River to the Natomas Basin was estimated to be 1,086 afy based on the IGSM 2004 simulation. For the 2030 simulation, the direction of groundwater flow is indicated to be toward the River (gaining conditions), and simulated groundwater flow to the River was 500 afy. For both simulations, it was assumed that almost all of the flow to and from the River occurs in the upper 200 feet of the aquifer system. Planning for slurry cutoff walls along the American River North Levee is in the early stages, but cutoff walls are currently proposed to extend the entire length of the levee (11,560 lf) and average 55 feet deep.

Groundwater flow through the cross-sectional area where cutoff walls are proposed was estimated to be 301 afy away from the River for the 2004 simulation and –139 afy toward the River for the 2030 simulation. A 70 percent flow reduction due to the slurry cutoff walls was again assumed based on the Kleinfelder transient simulation for the Sacramento River East Levee. The estimated reduction in flow from the River was 211 afy for the 2004 simulation as shown in **Table 6-6**. The estimated reduction in flow to the River was 97 afy for the 2030 simulation.

6.6 Summary

The proposed slurry cutoff walls are expected to reduce groundwater flow beneath the levees as intended. Cutoff wall impacts shown in **Table 6-6** were estimated separately based on simulations of existing (or 2004) and future (2030) conditions. Estimates were based on models by Kleinfelder (2009) and LSCE (2008a) and IGSM model results (WRIME, 2007 and LSCE, 2008b). The predicted impacts of cutoff walls beneath each of the five levees surrounding the Natomas Basin are based on both the existing/2004 and future/2030 results because the impact varies both by location and simulation period. The results show that the impact to groundwater supplies in the Natomas Basin is greatest due to proposed cutoff walls along the Sacramento River East Levee. For the entire Natomas Basin, reduced recharge from the Sacramento and American Rivers is largely offset by reduced groundwater outflow to the east for the 2004 simulation. The total predicted impact of all slurry cutoff walls is only 68 afy based on "existing" or 2004 conditions.

The impact of slurry cutoff walls is predicted to be greater based on future/2030 conditions due to several factors. Gradients are expected to be steeper in the northern portion of the Natomas Basin due to pumping to supply the proposed Sutter Pointe development. This will increase groundwater flow beneath the Sacramento River East Levee and the NCC South Levee, and there will be a corresponding increase in flow reductions caused by slurry cutoff walls. At the same time, the IGSM model predicts less groundwater outflow to the east beneath the PGCC and NEMDC West Levees due to reduced pumping east of the Natomas Basin. The total predicted impact of all slurry cutoff walls increases to 1,315 afy for the future/2030 scenario.

There are also potential groundwater impacts east of the Natomas Basin, primarily because the proposed slurry cutoff walls beneath the PGCC and NEMDC West Levees will reduce groundwater outflow to the east. These impacts are predicted to occur primarily under existing conditions (based on the 2004 simulation) because the gradient for groundwater flow to the east is estimated to be much steeper under existing/2004 conditions. As shown in **Table 6-6**, the reduction in groundwater outflow beneath the PGCC and NEMDC West Levees is estimated to be 1,082 afy based on the 2004 simulation. The predicted reduction in groundwater outflow to the east decreases to 60 afy for the 2030 simulation.

As discussed above, these estimates of slurry cutoff wall impacts are conservative in that they do not account for increased vertical flow beneath the cutoff walls or horizontal flow around the cutoff walls. A three-dimensional model would be expected to show somewhat smaller flow reductions due to the cutoff walls.

Table 6-1
Proposed Mitigation for Seepage Beneath Sacramento River East Levee

Reach	Stations	Proposed Mitigation[1]	Length of Reach (ft)	Length of Cutoff Wall[1] (ft)	Cutoff Wall Platform Elevation[2] (ft msl)	Cutoff Wall Bottom Elevation[2] (ft msl)	Depth of Cutoff Wall (ft)
1	0+00 to 2+00	None	200	-	-	-	-
	2+00 to 26+00	Cutoff Wall	2,400	2,400	34	7	27
	26+00 to 46+00	Cutoff Wall	2,000	2,000	34	12	22
	46+00 to 48+00	Cutoff Wall	200	200	34	-27	61
2	48+00 to 98+00	Cutoff Wall	5,000	5,000	34	-27	61
	98+00 to 100+00	Cutoff Wall	200	200	33	-15	48
3	100+00 to 105+00	Cutoff Wall	500	500	33	-15	48
	105+00 to 109+00	Cutoff Wall	400	400	33	10	23
	109+00 to 110+00	Cutoff Wall 100-foot Berm	100	100	33	10	23
4a	110+00 to 142+00	Cutoff Wall 100-foot Berm	3,200	3,200	33	10	23
	142+00 to 187+00	Cutoff Wall 100-foot Berm	4,500	4,500	32	-5	37
	187+00 to 190+00	Cutoff Wall 300-foot Berm	300	300	32	-5	37
4b	190+00 to 201+50	Cutoff Wall 300-foot Berm	1,150	1,150	32	-25	57
	201+50 to 214+00	Cutoff Wall 300-foot Berm	1,250	1,250	32	18	14
	214+00 to 224+00	Cutoff Wall 500-foot Berm	1,000	1,000	32	18	14
	224+00 to 228+00	Cutoff Wall 300-foot Berm	400	400	32	18	14
5a	228+00 to 231+00	Cutoff Wall 300-foot Berm	300	300	35	-40	75
	231+00 to 250+00	Cutoff Wall	1,900	1,900	35	-40	75
	250+00 to 263+00	Cutoff Wall	1,300	1,300	35	-30	65
5b	263+00 to 280+00	Cutoff Wall	1,700	1,700	35	-5	40
6a	280+00 to 303+00	Cutoff Wall	2,300	2,300	35	-80	115
6b	303+00 to 320+00	Cutoff Wall	1,700	1,700	35	-80	115
	320+00 to 330+00	Cutoff Wall	1,000	1,000	35	-85	120
7	330+00 to 345+00	Cutoff Wall	1,500	1,500	35	-85	120
	345+00 to 362+00	Cutoff Wall	1,700	1,700	35	-50	85
8	362+00 to 373+00	Cutoff Wall	1,100	1,100	35	-50	85
	373+00 to 402+00	Cutoff Wall	2,900	2,900	35	-60	95
9a	402+00 to 407+00	Cutoff Wall	500	500	35	-50	85
9b	407+00 to 425+00	Cutoff Wall	1,800	1,800	35	-60	95
	425+00 to 438+00	Cutoff Wall	1,300	1,300	35	-55	90
	438+00 to 456+00	Cutoff Wall	1,800	1,800	35	-50	85
	456+00 to 464+00	Cutoff Wall	800	800	35	-60	95
	464+00 to 468+00	Cutoff Wall 100-foot Berm w/ Relief Wells	400	400	35	-60	95

Table 6-1 (continued)
Proposed Mitigation for Seepage Beneath Sacramento River East Levee

Reach	Stations	Proposed Mitigation[1]	Length of Reach (ft)	Length of Cutoff Wall[1] (ft)	Cutoff Wall Platform Elevation[2] (ft msl)	Cutoff Wall Bottom Elevation[2] (ft msl)	Depth of Cutoff Wall (ft)
10	468+00 to 495+00	100-foot Berm w/ Relief Wells	2,700	-	-	-	-
11a	495+00 to 535+00	100-foot Berm w/ Relief Wells	4,000	-	-	-	-
11b	535+00 to 635+00	500-foot Berm	10,000	-	-	-	-
12a	635+00 to 650+00	500-foot Berm	1,500	-	-	-	-
	650+00 to 655+00	Cutoff Wall	500	500	35	-35	70
12b	655+00 to 667+00	Cutoff Wall	1,200	1,200	35	-35	70
13	667+00 to 671+00	Cutoff Wall	400	400	35	-35	70
	671+00 to 678+00	Cutoff Wall Relief Wells	700	700	35	-35	70
	678+00 to 681+50	Cutoff Wall 100-foot Berm w/ Relief Wells	350	350	35	-35	70
13	681+50 to 698+00	100-foot Berm w/ Relief Wells	1,650	-	-	-	-
	698+00 to 700+00	Cutoff Wall 100-foot Berm w/ Relief Wells	200	200	35	-40	75
14	700+00 to 701+00	Cutoff Wall 100-foot Berm w/ Relief Wells	100	100	35	-40	75
	701+00 to 732+00	Cutoff Wall	3,100	3,100	35	-40	75
15	732+00 to 735+00	Cutoff Wall 100-foot Berm w/ Relief Wells	300	300	35	-40	75
	735+00 to 769+50	100-foot Berm w/ Relief Wells	3,450	-	-	-	-
	769+50 to 780+00	100-foot Berm w/ Relief Wells	1,050	-	-	-	-
16	780+00 to 832+00	Relief Wells	5,200	-	-	-	-
17	832+00 to 842+00	100-foot Berm w/ Relief Wells	1,000	-	-	-	-
18a	842+00 to 848+00	100-foot Berm w/ Relief Wells	600	-	-	-	-
18b	848+00 to 857+00	100-foot Berm w/ Relief Wells	900	-	-	-	-
19a	857+00 to 875+00	100-foot Berm w/ Relief Wells	1,800	-	-	-	-
19b	875+00 to 925+00	Relief Wells	5,000	-	-	-	-
20a	925+00 to 925+50	Jet Grouting at Pump Plant	50	-	-	-	-
20b	925+50 to 960+00	None	3,450	-	-	-	-
			96,000	53,450			

1. Proposed mitigation and length of cutoff walls based on HDR Technical Memorandum (April 17, 2009).
2. Vertical datum = NAVD88.

Table 6-2
Proposed Slurry Cutoff Wall Locations Along Natomas Cross Canal, Pacific Grove Creek Canal, Natomas East Main Drainage Canal, and American River

Levee	Reach	Stations	Proposed Mitigation	Length of Reach (ft)	Length of Cutoff Wall (ft)	Cutoff Wall Bottom Elevation (ft msl)	Depth of Cutoff Wall (ft)
Natomas Cross Canal South Levee	1	00+00 to 5+70	Cutoff Wall	570	570	-28	70
	2	5+70 to 105+00	Cutoff Wall	9,930	9,930	-28	70
	3	105+00 to 123+00	Cutoff Wall	1,800	1,800	-28	70
	4	123+00 to 173+00	Cutoff Wall	5,000	5,000	-38	70
	5	173+00 to 195+00	Cutoff Wall	2,200	2,200	-38	70
	6	195+00 to 280+00	Cutoff Wall	8,500	8,500	-38	70
	7	280+00 to 287+00	Cutoff Wall	700	700	-38	70
	Subtotal			28,700	28,700		
Pacific Grove Creek Canal West Levee	1	287+37 to 356+20	Cutoff Wall	6,883	6,883	-10	45
	2	356+20 to 390+00	None	3,380	-	-	-
	3a	390+00 to 430+00	Cutoff Wall	4,000	4,000	15	20
	3b	430+00 to 461+31	Cutoff Wall	3,131	3,131	-15	50
	Subtotal			17,394	14,014		
Natomas East Main Drainage Canal (North)	8	645+00 to 675+65	None	3,065	-	-	-
	7	576+00 to 645+00	Cutoff Wall	6,900	6,900	10-15	35-40
	6	555+00 to 576+00	None	2,100	-	-	-
	5	505+00 to 555+00	Cutoff Wall	5,000	5,000	15	30
	4	467+00 to 505+00	None	3,800	-	-	-
	3	425+00 to 467+00	Cutoff Wall	4,200	4,200	0	45
	2	386+17 to 425+00	None	3,883	-	-	-
	1	318+75 to 386+17	Cutoff Wall	6,742	6,742	10	35
	Subtotal			35,690	22,842		
Natomas East Main Drainage Canal (South)	7c	305+65 to 318+75	Cutoff Wall	1,310	1,310	-10	53
	7b	265+50 to 305+65	None	4,015	-	-	-
	7a	235+00 to 265+50	None	3,050	-	-	-
	6	196+00 to 235+00	Cutoff Wall	3,900	3,900	-10	53
	5	154+00 to 196+00	Cutoff Wall	4,200	4,200	13	30
	4	114+00 to 154+00	Cutoff Wall	4,000	4,000	-10	53
	3	71+00 to 114+00	Cutoff Wall	4,300	4,300	13	30
	2	17+00 to 71+00	Cutoff Wall	5,400	5,400	-10	53
	1	00+00 to 17+00	None	1,700	-	-	-
	Subtotal			31,875	23,110		
American River North Levee	4	73+10 to 115+60	Cutoff Wall	4,250	4,250		80
	3	63+10 to 73+10	Cutoff Wall	1,000	1,000		80
	2	16+10 to 63+10	Cutoff Wall	4,700	4,700		35
	1	0+00 to 16+10	Cutoff Wall	1,610	1,610		35
	Subtotal			11,560	11,560		
Total Length				125,219	100,226		

Table 6-3
Kleinfelder Model Results: Estimated Groundwater Flow Beneath Sacramento River East Levee in Natomas Basin With and Without Slurry Cutoff Walls[1]

Reach	Stations		Seepage Based on Simulated Station	Length of Reach (ft)	Seepage Without Cutoff Walls (afy)	Seepage With Cutoff Walls (afy)	Impact of Cutoff Walls	
	Start	End					(afy)	(%)
1	00+00	48+00	27+00	4,800	19	19	0	0
2	48+00	100+00	70+00	5,200	14	2	12	85
3	100+00	110+00	70+00	1,000	3	0.4	2.6	85
4a	110+00	120+00	70+00	1,000	3	3	0	0
4a	120+00	190+00	353+00	7,000	95	95	0	0
4b	190+00	228+00	217+00	3,800	490	490	0	0
5a	228+00	263+00	70+00	3,500	10	10	0	0
5b	263+00	280+00	27+00	1,700	6	6	0	0
6	280+00	330+00	217+00	5,000	650	100	550	85
7a	330+00	345+00	353+00	1,500	20	3	17	85
7b	345+00	362+00	353+00	1,700	23	3	20	85
8	362+00	402+00	353+00	4,000	55	8	47	85
9	402+00	430+00	353+00	2,800	38	38	0	0
9	430+00	468+10	353+00	3,800	50	8	42	85
10	468+10	495+00	217+00	2,690	350	210	140	40
11	495+00	635+00	217+00	14,000	1810	1810	0	0
12	635+00	640+00	217+00	500	65	65	0	0
12	640+00	667+00	70+00	2,700	7	7	0	0
13	667+00	700+00	353+00	3,300	45	30	15	40
14	700+00	732+00	70+00	3,200	8	8	0	0
15	732+00	780+00	217+00	4,800	620	375	245	40
16	780+00	832+00	217+00	5,200	675	675	0	0
17	832+00	842+00	217+00	1,000	130	80	50	40
18	842+00	857+00	217+00	1,500	195	120	75	40
19a	857+00	875+00	217+00	1,800	235	140	95	40
19b	875+00	925+00	70+00	5,000	15	8	7	40
20a	925+00	925+50	27+00	50	0.2	0.2	0	0
20b	925+50	960+00	27+00	3,550	13	13	0	0
Total				**96,090**	**5,650**	**4,330**	**1,320**	**23**

1. Based on Table 5 in Kleinfelder (2009). Shading indicates reaches with proposed cutoff walls.

Table 6-4
Darcy's Law Estimate of Groundwater Recharge from Sacramento River to Natomas Basin With and Without Slurry Cutoff Walls
(Based on Existing Conditions)

Reach	Stations	Proposed Mitigation Includes Cutoff Wall	Length of Reach (ft)	Length of Cutoff Wall (ft)	Cutoff Wall Depth (ft)	Cutoff Wall Bottom Elev. (ft msl)	Average Ground-Water Elev. (ft)	Saturated Fine/Medium Sand Thickness		Saturated Coarse Sand & Gravel Thickness		Permeable Area (length x thickness)				Hydraulic Conductivity[2]		Hydraulic Gradient[3] (ft/ft)	Estimated Flow Without Cutoff Walls			Flow Through Cross-Sectional Area of Cutoff Walls (afy)	Estimated Flow With Cutoff Walls			Impact of Cutoff Walls	
												Fine/Medium Sand Area		Coarse Sand & Gravel Area									Flow Through Cutoff Walls[4] (afy)	Flow Beneath/ Around Cutoff Walls (afy)	Total Flow (afy)		
								Total (ft)	To Base of Wall (ft)	Total (ft)	To Base of Wall (ft)	Total (sq. ft)	To Base of Wall (sq. ft)	Total (sq. ft)	To Base of Wall (sq. ft)	Fine/ Medium Sand (ft/day)	Coarse Sand & Gravel (ft/day)		Fine/ Medium Sand (afy)	Coarse Sand & Gravel (afy)	Total Flow (afy)						
1	0+00 to 2+00	No	200	-	-	-	19.8	35	-	0	-	7,000	N/A	0	N/A	28	140	0.0032	5	0	5	0	0	5	5	0	0
	2+00 to 26+00	Yes	2,400	2,400	27	7	19.8	35	0	0	0	84,000	0	0	0	28	140	0.0032	63	0	63	0	0	63	63	0	0
	26+00 to 46+00	Yes	2,000	2,000	22	12	19.8	26	0	0	0	52,000	0	0	0	28	140	0.0032	39	0	39	0	0	39	39	0	0
	46+00 to 48+00	Yes	200	200	61	-27	19.8	64	11	0	0	12,800	2200	0	0	28	140	0.0032	10	0	10	2	0	8	8	1	12
2	48+00 to 98+00	Yes	5,000	5,000	61	-27	19.8	67	22	0	0	335,000	110,000	0	0	28	140	0.0032	252	0	252	83	25	169	194	58	23
	98+00 to 100+00	Yes	200	200	48	-15	19.8	30	17	0	0	6,000	3,400	0	0	28	140	0.0032	5	0	5	3	1	2	3	2	40
3	100+00 to 105+00	Yes	500	500	48	-15	19.8	21	19	0	0	10,500	9,500	0	0	28	140	0.0032	8	0	8	7	2	1	3	5	63
	105+00 to 109+00	Yes	400	400	23	10	19.8	13	0	0	0	5,200	0	0	0	28	140	0.0032	4	0	4	0	0	4	4	0	0
	109+00 to 110+00	Yes	100	100	23	10	19.8	11	0	0	0	1,100	0	0	0	28	140	0.0032	1	0	1	0	0	1	1	0	0
4a	110+00 to 142+00	Yes	3,200	3,200	23	10	19.3	43	0	14	0	137,600	0	44,800	0	28	140	0.0032	103	168	271	0	0	271	271	0	0
	142+00 to 187+00	Yes	4,500	4,500	37	-5	19.3	60	5	30	0	270,000	22,500	135,000	0	28	140	0.0032	203	507	709	17	5	693	698	12	2
	187+00 to 190+00	Yes	300	300	37	-5	19.3	27	0	11	0	8,100	0	3,300	0	28	140	0.0032	6	12	18	0	0	18	18	0	0
4b	190+00 to 201+50	Yes	1,150	1,150	57	-25	18.8	50	25	5	2	57,500	28,750	5,750	2,300	28	140	0.0032	43	22	65	30	9	35	44	21	33
	201+50 to 214+00	Yes	1,250	1,250	14	18	18.8	55	25	15	0	68,750	31,250	18,750	0	28	140	0.0032	52	70	122	23	7	99	106	16	13
	214+00 to 224+00	Yes	1,000	1,000	14	18	18.8	65	0	25	0	65,000	0	25,000	0	28	140	0.0032	49	94	143	0	0	143	143	0	0
	224+00 to 228+00	Yes	400	400	14	18	18.8	40	0	0	0	16,000	0	0	0	28	140	0.0032	12	0	12	0	0	12	12	0	0
5a	228+00 to 231+00	Yes	300	300	75	-40	17.3	34	8	0	0	10,200	2,400	0	0	28	140	0.0032	8	0	8	2	1	6	6	1	16
	231+00 to 250+00	Yes	1,900	1,900	75	-40	17.3	22	22	0	0	41,800	41,800	0	0	28	140	0.0032	31	0	31	31	9	0	9	22	70
	250+00 to 263+00	Yes	1,300	1,300	65	-30	17.3	27	10	0	0	35,100	13,000	0	0	28	140	0.0032	26	0	26	10	3	17	20	7	26
5b	263+00 to 280+00	Yes	1,700	1,700	40	-5	17.3	27	0	0	0	45,900	0	0	0	28	140	0.0032	34	0	34	0	0	34	34	0	0
6a	280+00 to 303+00	Yes	2,300	2,300	115	-80	17.3	65	65	35	15	149,500	149,500	80,500	34,500	28	140	0.0032	112	302	414	242	73	173	245	169	41
6b	303+00 to 320+00	Yes	1,700	1,700	115	-80	17.8	55	55	20	20	93,500	93,500	34,000	34,000	28	140	0.0032	70	128	198	198	59	0	59	138	70
	320+00 to 330+00	Yes	1,000	1,000	120	-85	17.8	55	55	20	20	55,000	55,000	20,000	20,000	28	140	0.0032	41	75	116	116	35	0	35	81	70
7	330+00 to 345+00	Yes	1,500	1,500	120	-85	17.8	70	70	19	19	105,000	105,000	28,500	28,500	28	140	0.0032	79	107	186	186	56	0	56	130	70
	345+00 to 362+00	Yes	1,700	1,700	85	-50	17.8	46	0	0	0	78,200	0	0	0	28	140	0.0032	59	0	59	0	0	59	59	0	0
8	362+00 to 373+00	Yes	1,100	1,100	85	-50	17.8	32	32	0	0	35,200	35,200	0	0	28	140	0.0032	26	0	26	26	8	0	8	18	70
	373+00 to 402+00	Yes	2,900	2,900	95	-60	17.8	33	33	0	0	95,700	95,700	0	0	28	140	0.0032	72	0	72	72	22	0	22	50	70
9a	402+00 to 407+00	Yes	500	500	85	-50	17.8	40	40	0	0	20,000	20,000	0	0	28	140	0.0032	15	0	15	15	5	0	5	11	70
9b	407+00 to 425+00	Yes	1,800	1,800	95	-60	17.3	30	30	0	0	54,000	54,000	0	0	28	140	0.0032	41	0	41	41	12	0	12	28	70
	425+00 to 438+00	Yes	1,300	1,300	90	-55	17.3	38	38	0	0	49,400	49,400	0	0	28	140	0.0032	37	0	37	37	11	0	11	26	70
	438+00 to 456+00	Yes	1,800	1,800	85	-50	17.3	25	25	0	0	45,000	45,000	0	0	28	140	0.0032	34	0	34	34	10	0	10	24	70

Table 6-4 (continued)
Darcy's Law Estimate of Groundwater Recharge from Sacramento River to Natomas Basin With and Without Slurry Cutoff Walls
(Based on Existing Conditions)

Reach	Stations	Proposed Mitigation Includes Cutoff Wall	Length of Reach (ft)	Length of Cutoff Wall (ft)	Cutoff Wall Depth (ft)	Cutoff Wall Bottom Elev. (ft msl)	Average Ground-Water Elev. (ft)	Saturated Fine/Medium Sand Thickness		Saturated Coarse Sand & Gravel Thickness		Permeable Area (length x thickness)				Hydraulic Conductivity[2]		Hydraulic Gradient[2] (ft/ft)	Estimated Flow Without Cutoff Walls			Flow Through Cross-Sectional Area of Cutoff Walls (afy)	Estimated Flow With Cutoff Walls			Impact of Cutoff Walls	
								Total (ft)	To Base of Wall (ft)	Total (ft)	To Base of Wall (ft)	Fine/Medium Sand Area		Coarse Sand & Gravel Area		Fine/ Medium Sand (ft/day)	Coarse Sand & Gravel (ft/day)		Fine/ Medium Sand (afy)	Coarse Sand & Gravel (afy)	Total Flow (afy)		Flow Through Cutoff Walls[4] (afy)	Flow Beneath/ Around Cutoff Walls (afy)	Total Flow (afy)		
												Total (sq. ft)	To Base of Wall (sq. ft)	Total (sq. ft)	To Base of Wall (sq. ft)												
9b	456+00 to 464+00	Yes	800	800	95	-60	17.3	34	34	0	0	27,200	27,200	0	0	28	140	0.0032	20	0	20	20	6	0	6	14	70
	464+00 to 468+00	Yes	400	400	95	-60	17.3	43	43	0	0	17,200	17,200	0	0	28	140	0.0032	13	0	13	13	4	0	4	9	70
10	468+00 to 495+00	No	2,700	-	-	-	17.3	28	-	22	-	75,600	N/A	59,400	N/A	28	140	0.0032	57	223	280	0	0	280	280	0	0
11a	495+00 to 535+00	No	4,000	-	-	-	17.3	32	-	53	-	128,000	N/A	212,000	N/A	28	140	0.0032	96	796	892	0	0	892	892	0	0
11b	535+00 to 635+00	No	10,000	-	-	-	17.3	32	-	53	-	320,000	N/A	530,000	N/A	28	140	0.0032	240	1,990	2,230	0	0	2,230	2,230	0	0
12a	635+00 to 650+00	No	1,500	-	-	-	12.8	65	-	0	-	97,500	N/A	0	N/A	28	140	0.0032	73	0	73	0	0	73	73	0	0
	650+00 to 655+00	Yes	500	500	70	-35	12.8	58	19	0	0	29,000	9,500	0	0	28	140	0.0032	22	0	22	7	2	15	17	5	23
12b	655+00 to 667+00	Yes	1,200	1,200	70	-35	12.8	58	19	0	0	69,600	22,800	0	0	28	140	0.0032	52	0	52	17	5	35	40	12	23
13	667+00 to 671+00	Yes	400	400	70	-35	13.3	58	19	0	0	23,200	7,600	0	0	28	140	0.0032	17	0	17	6	2	12	13	4	23
	671+00 to 678+00	Yes	700	700	70	-35	13.3	58	19	0	0	40,600	13,300	0	0	28	140	0.0032	30	0	30	10	3	20	23	7	23
	678+00 to 681+50	Yes	350	350	70	-35	13.3	58	19	0	0	20,300	6,650	0	0	28	140	0.0032	15	0	15	5	1	10	12	3	23
	681+50 to 698+00	No	1,650	-	-	-	13.3	57	-	0	-	94,050	N/A	0	N/A	28	140	0.0032	71	0	71	0	0	71	71	0	0
	698+00 to 700+00	Yes	200	200	75	-40	13.3	57	27	0	0	11,400	5,400	0	0	28	140	0.0032	9	0	9	4	1	5	6	3	33
14	700+00 to 701+00	Yes	100	100	75	-40	14.8	57	0	0	0	5,700	0	0	0	28	140	0.0032	4	0	4	0	0	4	4	0	0
	701+00 to 732+00	Yes	3,100	3,100	75	-40	14.8	50	0	7	0	155,000	0	21,700	0	28	140	0.0032	116	81	198	0	0	198	198	0	0
15	732+00 to 735+00	Yes	300	300	75	-40	15.8	57	27	0	0	17,100	8,100	0	0	28	140	0.0032	13	0	13	6	2	7	9	4	33
	735+00 to 769+50	No	3,450	-	-	-	15.8	60	-	15	-	207,000	N/A	51,750	N/A	28	140	0.0032	155	194	350	0	0	350	350	0	0
	769+50 to 780+00	No	1,050	-	-	-	15.8	60	-	15	-	63,000	N/A	15,750	N/A	28	140	0.0032	47	59	106	0	0	106	106	0	0
16	780+00 to 832+00	No	5,200	-	-	-	14.8	58	-	12	-	301,600	N/A	62,400	N/A	28	140	0.0032	226	234	461	0	0	461	461	0	0
17	832+00 to 842+00	No	1,000	-	-	-	13.8	73	-	2	-	73,000	N/A	2,000	N/A	28	140	0.0032	55	8	62	0	0	62	62	0	0
18a	842+00 to 848+00	No	600	-	-	-	12.8	75	-	0	-	45,000	N/A	0	N/A	28	140	0.0032	34	0	34	0	0	34	34	0	0
18b	848+00 to 857+00	No	900	-	-	-	12.3	75	-	0	-	67,500	N/A	0	N/A	28	140	0.0032	51	0	51	0	0	51	51	0	0
19a	857+00 to 875+00	No	1,800	-	-	-	10.3	80	-	0	-	144,000	N/A	0	N/A	28	140	0.0032	108	0	108	0	0	108	108	0	0
19b	875+00 to 925+00	No	5,000	-	-	-	8.3	60	-	0	-	300,000	N/A	0	N/A	28	140	0.0032	225	0	225	0	0	225	225	0	0
20a	925+00 to 925+50	No	50	-	-	-	6.3	20	-	2	-	1,000	N/A	100	N/A	28	140	0.0032	1	0	1	0	0	1	1	0	0
20b	925+50 to 960+00	No	3,450	-	-	-	4.3	24	-	2	-	82,800	N/A	6,900	N/A	28	140	0.0032	62	26	88	0	0	88	88	0	0
Average							16	46	20	7	2																
Total			96,000	53,450								4,466,400	1,084,850	1,357,600	119,300				3,353	5,096	8,450	1,262	379	7,187	7,566	884	10

1. Hydraulic conductivity based on estimates in Table 2-1.
2. Hydraulic gradient based on annual average value in Table 3-2.
3. Assumes a 70% reduction in flow through the cutoff wall based on the Kleinfelder transient model results (Kleinfelder, 2009).

Table 6-5
Darcy's Law Estimate of Groundwater Recharge from Sacramento River to Natomas Basin With and Without Slurry Cutoff Walls
(Including Increase in Hydraulic Gradient Due to Additional Pumping in 2030)

Reach	Stations	Proposed Mitigation Includes Cutoff Wall	Length of Reach (ft)	Length of Cutoff Wall (ft)	Cutoff Wall Depth (ft)	Cutoff Wall Bottom Elev. (ft msl)	Average Ground-Water Elev. (ft)	Saturated Fine/Medium Sand Thickness		Saturated Coarse Sand & Gravel Thickness		Permeable Area (length x thickness)				Hydraulic Conductivity[2]		Increase in Hydraulic Gradient[3]	Hydraulic Gradient Including Sutter Pointe Pumping	Estimated Flow Without Cutoff Walls			Flow Through Cross-Sectional Area of Cutoff Walls	Estimated Flow With Cutoff Walls			Impact of Cutoff Walls	
												Fine/Medium Sand Area		Coarse Sand & Gravel Area														
								Total (ft)	To Base of Wall (ft)	Total (ft)	To Base of Wall (ft)	Total (sq. ft)	To Base of Wall (sq. ft)	Total (sq. ft)	To Base of Wall (sq. ft)	Fine/ Medium Sand (ft/day)	Coarse Sand & Gravel (ft/day)			Fine/ Medium Sand (afy)	Coarse Sand & Gravel (afy)	Total Flow (afy)		Flow Through Cutoff Walls[4] (afy)	Flow Beneath/ Around Cutoff Walls (afy)	Total Flow (afy)	(afy)	(%)
1	0+00 to 2+00	No	200	-	-	-	19.8	35	-	0	-	7,000	N/A	0	N/A	28	140	0.0010	0.0042	7	0	7	0	0	7	7	0	0
	2+00 to 26+00	Yes	2,400	2,400	27	7	19.8	35	0	0	0	84,000	0	0	0	28	140	0.0010	0.0042	82	0	82	0	0	82	82	0	0
	26+00 to 46+00	Yes	2,000	2,000	22	12	19.8	26	0	0	0	52,000	0	0	0	28	140	0.0010	0.0042	51	0	51	0	0	51	51	0	0
	46+00 to 48+00	Yes	200	200	61	-27	19.8	64	11	0	0	12,800	2200	0	0	28	140	0.0010	0.0042	13	0	13	2	1	10	11	2	12
2	48+00 to 98+00	Yes	5,000	5,000	61	-27	19.8	67	22	0	0	335,000	110,000	0	0	28	140	0.0018	0.0050	391	0	391	128	39	263	301	90	23
	98+00 to 100+00	Yes	200	200	48	-15	19.8	30	17	0	0	6,000	3,400	0	0	28	140	0.0018	0.0050	7	0	7	4	1	3	4	3	40
3	100+00 to 105+00	Yes	500	500	48	-15	19.8	21	19	0	0	10,500	9,500	0	0	28	140	0.0018	0.0050	12	0	12	11	3	1	4	8	63
	105+00 to 109+00	Yes	400	400	23	10	19.8	13	0	0	0	5,200	0	0	0	28	140	0.0018	0.0050	6	0	6	0	0	6	6	0	0
	109+00 to 110+00	Yes	100	100	23	10	19.8	11	0	0	0	1,100	0	0	0	28	140	0.0018	0.0050	1	0	1	0	0	1	1	0	0
4a	110+00 to 142+00	Yes	3,200	3,200	23	10	19.3	43	0	14	0	137,600	0	44,800	0	28	140	0.0011	0.0043	140	228	367	0	0	367	367	0	0
	142+00 to 187+00	Yes	4,500	4,500	37	-5	19.3	60	5	30	0	270,000	22,500	135,000	0	28	140	0.0011	0.0043	274	686	960	23	7	937	944	16	2
	187+00 to 190+00	Yes	300	300	37	-5	19.3	27	0	11	0	8,100	0	3,300	0	28	140	0.0011	0.0043	8	17	25	0	0	25	25	0	0
4b	190+00 to 201+50	Yes	1,150	1,150	57	-25	18.8	50	25	5	2	57,500	28,750	5,750	2,300	28	140	0.0011	0.0043	58	29	88	41	12	47	59	29	33
	201+50 to 214+00	Yes	1,250	1,250	14	18	18.8	55	25	15	0	68,750	31,250	18,750	0	28	140	0.0011	0.0043	70	95	165	32	10	133	143	22	13
	214+00 to 224+00	Yes	1,000	1,000	14	18	18.8	65	0	25	0	65,000	0	25,000	0	28	140	0.0011	0.0043	66	127	193	0	0	193	193	0	0
	224+00 to 228+00	Yes	400	400	14	18	18.8	40	0	0	0	16,000	0	0	0	28	140	0.0011	0.0043	16	0	16	0	0	16	16	0	0
5a	228+00 to 231+00	Yes	300	300	75	-40	17.3	34	8	0	0	10,200	2,400	0	0	28	140	0.0005	0.0037	9	0	9	2	1	7	7	1	16
	231+00 to 250+00	Yes	1,900	1,900	75	-40	17.3	22	22	0	0	41,800	41,800	0	0	28	140	0.0005	0.0037	36	0	36	36	11	0	11	25	70
	250+00 to 263+00	Yes	1,300	1,300	65	-30	17.3	27	10	0	0	35,100	13,000	0	0	28	140	0.0005	0.0037	30	0	30	11	3	19	22	8	26
5b	253+00 to 280+00	Yes	1,700	1,700	40	-5	17.3	27	0	0	0	45,900	0	0	0	28	140	0.0005	0.0037	40	0	40	0	0	40	40	0	0
6a	280+00 to 303+00	Yes	2,300	2,300	115	-80	17.3	65	65	35	15	149,500	149,500	80,500	34,500	28	140	0.0003	0.0035	121	327	448	261	78	187	265	183	41
6b	303+00 to 320+00	Yes	1,700	1,700	115	-80	17.8	55	55	20	20	93,500	93,500	34,000	34,000	28	140	0.0003	0.0035	76	138	214	214	64	0	64	150	70
	320+00 to 330+00	Yes	1,000	1,000	120	-85	17.8	55	55	20	20	55,000	55,000	20,000	20,000	28	140	0.0003	0.0035	45	81	126	126	38	0	38	88	70
7	330+00 to 345+00	Yes	1,500	1,500	120	-85	17.8	70	70	19	19	105,000	105,000	28,500	28,500	28	140	0.0002	0.0034	84	115	199	199	60	0	60	139	70
	345+00 to 362+00	Yes	1,700	1,700	85	-50	17.8	46	0	0	0	78,200	0	0	0	28	140	0.0002	0.0034	63	0	63	0	0	63	63	0	0
8	362+00 to 373+00	Yes	1,100	1,100	85	-50	17.8	32	32	0	0	35,200	35,200	0	0	28	140	0.0002	0.0034	28	0	28	28	8	0	8	20	70
	373+00 to 402+00	Yes	2,900	2,900	95	-60	17.8	33	33	0	0	95,700	95,700	0	0	28	140	0.0002	0.0034	75	0	75	75	23	0	23	53	70
9a	402+00 to 407+00	Yes	500	500	85	-50	17.8	40	40	0	0	20,000	20,000	0	0	28	140	0.0001	0.0033	16	0	16	16	5	0	5	11	70
9b	407+00 to 425+00	Yes	1,800	1,800	95	-60	17.3	30	30	0	0	54,000	54,000	0	0	28	140	0.0001	0.0033	42	0	42	42	13	0	13	30	70
	425+00 to 438+00	Yes	1,300	1,300	90	-55	17.3	38	38	0	0	49,400	49,400	0	0	28	140	0.0001	0.0033	39	0	39	39	12	0	12	27	70
	438+00 to 456+00	Yes	1,800	1,800	85	-50	17.3	25	25	0	0	45,000	45,000	0	0	28	140	0.0001	0.0033	35	0	35	35	11	0	11	25	70

Table 6-5 (continued)
Darcy's Law Estimate of Groundwater Recharge from Sacramento River to Natomas Basin With and Without Slurry Cutoff Walls
(Including Increase in Hydraulic Gradient Due to Additional Pumping in 2030)

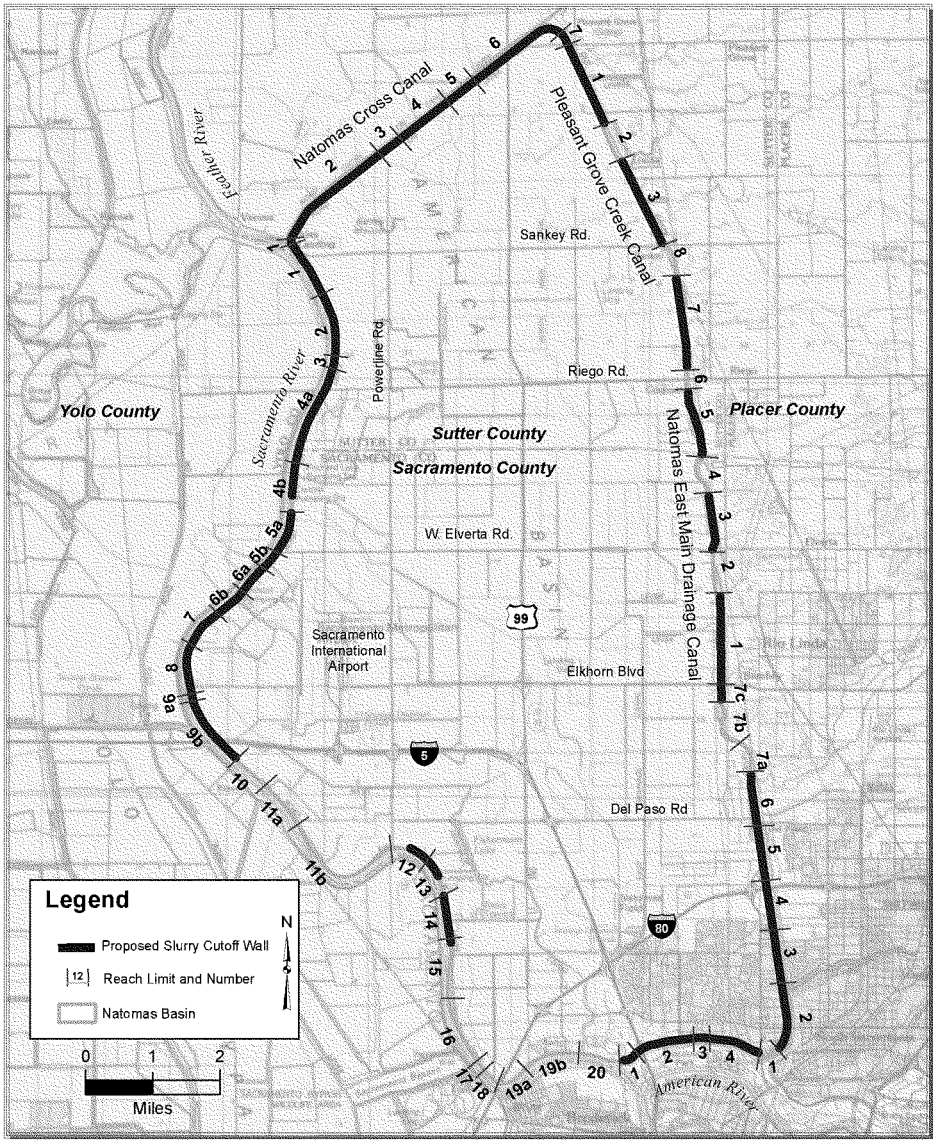
Reach	Stations	Proposed Mitigation Includes Cutoff Wall	Length of Reach (ft)	Length of Cutoff Wall (ft)	Cutoff Wall Depth (ft)	Cutoff Wall Bottom Elev. (ft msl)	Average Ground-Water Elev. (ft)	Saturated Fine/Medium Sand Thickness		Saturated Coarse Sand & Gravel Thickness		Permeable Area (length x thickness)				Hydraulic Conductivity[2]		Increase in Hydraulic Gradient[3] (ft/ft)	Hydraulic Gradient Including Sutter Pointe Pumping (ft/ft)	Estimated Flow Without Cutoff Walls			Flow Through Cross-Sectional Area of Cutoff Walls (afy)	Estimated Flow With Cutoff Walls				Impact of Cutoff Walls	
												Fine/Medium Sand Area		Coarse Sand & Gravel Area										Flow Through Cutoff Walls[1] (afy)	Flow Beneath/ Around Cutoff Walls (afy)	Total Flow (afy)		
								Total (ft)	To Base of Wall (ft)	Total (ft)	To Base of Wall (ft)	Total (sq. ft)	To Base of Wall (sq. ft)	Total (sq. ft)	To Base of Wall (sq. ft)	Fine/ Medium Sand (ft/day)	Coarse Sand & Gravel (ft/day)			Fine/ Medium Sand (afy)	Coarse Sand & Gravel (afy)	Total Flow (afy)					(afy)	(%)
9b	456+00 to 464+00	Yes	800	800	95	-60	17.3	34	34	0	0	27,200	27,200	0	0	28	140	0.0001	0.0033	21	0	21	21	6	0	6	15	70
	464+00 to 468+00	Yes	400	400	95	-60	17.3	43	43	0	0	17,200	17,200	0	0	28	140	0.0001	0.0033	13	0	13	13	4	0	4	9	70
10	468+00 to 495+00	No	2,700	-	-	-	17.3	28	-	22	-	75,600	N/A	59,400	N/A	28	140	0.0001	0.0033	59	232	291	0	0	291	291	0	0
11a	495+00 to 535+00	No	4,000	-	-	-	17.3	32	-	53	-	128,000	N/A	212,000	N/A	28	140	0.0001	0.0033	99	824	923	0	0	923	923	0	0
11b	535+00 to 635+00	No	10,000	-	-	-	17.3	32	-	53	-	320,000	N/A	530,000	N/A	28	140	0.0001	0.0033	249	2,060	2,308	0	0	2,308	2,308	0	0
12a	635+00 to 650+00	No	1,500	-	-	-	12.8	65	-	0	-	97,500	N/A	0	N/A	28	140	0.0001	0.0033	76	0	76	0	0	76	76	0	0
	650+00 to 655+00	Yes	500	500	70	-35	12.8	56	19	0	0	28,000	9,500	0	0	28	140	0.0001	0.0033	23	0	23	7	2	15	17	5	23
12b	655+00 to 667+00	Yes	1,200	1,200	70	-35	12.8	56	19	0	0	66,600	22,800	0	0	28	140	0.0001	0.0033	54	0	54	18	5	36	42	12	23
13	667+00 to 671+00	Yes	400	400	70	-35	13.3	58	19	0	0	23,200	7,600	0	0	28	140	0.0001	0.0033	18	0	18	6	2	12	14	4	23
	671+00 to 678+00	Yes	700	700	70	-35	13.3	58	19	0	0	40,600	13,300	0	0	28	140	0.0001	0.0033	31	0	31	10	3	21	24	7	23
	678+00 to 681+50	Yes	350	350	70	-35	13.3	58	19	0	0	20,300	6,650	0	0	28	140	0.0001	0.0033	16	0	16	5	2	11	12	4	23
	681+50 to 698+00	No	1,650	-	-	-	13.3	57	-	0	-	94,050	N/A	0	N/A	28	140	0.0001	0.0033	73	0	73	0	0	73	73	0	0
	698+00 to 700+00	Yes	200	200	75	-40	13.3	57	27	0	0	11,400	5,400	0	0	28	140	0.0001	0.0033	9	0	9	4	1	5	6	3	33
14	700+00 to 701+00	Yes	100	100	75	-40	14.8	57	0	0	0	5,700	0	0	0	28	140	0.0000	0.0032	4	0	4	0	0	4	4	0	0
	701+00 to 732+00	Yes	3,100	3,100	75	-40	14.8	50	0	7	0	155,000	0	21,700	0	28	140	0.0000	0.0032	116	81	198	0	0	198	198	0	0
15	732+00 to 735+00	Yes	300	300	75	-40	15.8	57	27	0	0	17,100	8,100	0	0	28	140	0.0000	0.0032	13	0	13	6	2	7	9	4	33
	735+00 to 769+50	No	3,450	-	-	-	15.8	60	-	15	-	207,000	N/A	51,750	N/A	28	140	0.0000	0.0032	155	194	350	0	0	350	350	0	0
	769+50 to 780+00	No	1,050	-	-	-	15.8	60	-	15	-	63,000	N/A	15,750	N/A	28	140	0.0000	0.0032	47	59	106	0	0	106	106	0	0
16	780+00 to 832+00	No	5,200	-	-	-	14.8	56	-	12	-	301,600	N/A	62,400	N/A	28	140	0.0000	0.0032	226	234	461	0	0	461	461	0	0
17	832+00 to 842+00	No	1,000	-	-	-	13.8	73	-	2	-	73,000	N/A	2,000	N/A	28	140	0.0000	0.0032	55	8	62	0	0	62	62	0	0
18a	842+00 to 848+00	No	600	-	-	-	12.8	75	-	0	-	45,000	N/A	0	N/A	28	140	0.0000	0.0032	34	0	34	0	0	34	34	0	0
18b	848+00 to 857+00	No	900	-	-	-	12.3	75	-	0	-	67,500	N/A	0	N/A	28	140	0.0000	0.0032	51	0	51	0	0	51	51	0	0
19a	857+00 to 875+00	No	1,800	-	-	-	10.3	80	-	0	-	144,000	N/A	0	N/A	28	140	0.0000	0.0032	108	0	108	0	0	108	108	0	0
19b	875+00 to 925+00	No	5,000	-	-	-	8.3	60	-	0	-	300,000	N/A	0	N/A	28	140	0.0000	0.0032	225	0	225	0	0	225	225	0	0
20a	925+00 to 925+50	No	50	-	-	-	6.3	20	-	2	-	1,000	N/A	100	N/A	28	140	0.0000	0.0032	1	0	1	0	0	1	1	0	0
20b	925+50 to 960+00	No	3,450	-	-	-	4.3	24	-	2	-	82,800	N/A	6,900	N/A	28	140	0.0000	0.0032	62	26	88	0	0	88	88	0	0
Average							16	46	20	7	2																	
Total			96,000	53,450								4,466,400	1,084,850	1,357,600	119,300					3,781	5,560	9,341	1,417	425	7,924	8,349	992	11

1. Hydraulic conductivity based on estimates in Table 2-1.
2. Hydraulic gradient based on annual average value in Table 3-2.
3. Assumes a 70% reduction in flow through the cutoff wall based on the Kleinfelder transient model results (Kleinfelder, 2009).

Table 6-6
Effects of Proposed Slurry Cutoff Walls on Groundwater Flow

Levee	Time Period	Total Length of Levee (ft)	Saturated Thickness for Ground-Water Flow (ft)	Cross-Sectional Area for Flow (ft^2)	Total Flow Without Cutoff Walls[1] (afy)	Flow per Cross-Sectional Area (afy/ft^2)	Length of Proposed Cutoff Walls (ft)	Average Depth of Cutoff Walls (ft)	Cross-Sectional Area of Cutoff Walls (ft^2)	Flow Through Cross-Sectional Area of Cutoff Walls (afy)	Flow Through, Beneath, or Around Cutoff Walls (afy)	Flow Reduction Due to Cutoff Walls[8] (afy)	(%)
Sacramento River East Levee	Existing	96,000	200	19,200,000	8,450[2]	4.40E-04	53,500	65	3,474,300	1,262	7,566	884	10
	2030				9,341[3]	4.40E-04				1,417	8,349	992	11
NCC South Levee	2004	28,700	400	11,480,000	459[4]	4.00E-05	28,700	70	2,009,000	80	403	56	12
	2030				3,918[5]	3.41E-04				686	3,438	480	12
PGCC West Levee	2004	17,400	400	6,957,600	-4,451[6]	-6.40E-04	14,000	38	532,500	-341	-4,212	-238	5
	2030				-246[7]	-3.53E-05				-19	-233	-13	5
NEMDC West Levee (North)	2004	35,700	400	14,276,000	-9,132[6]	-6.40E-04	22,800	37	845,200	-541	-8,753	-378	4
	2030				-504[7]	-3.53E-05				-30	-483	-21	4
NEMDC West Levee (South)	2004	31,900	400	12,750,000	-8,156[6]	-6.40E-04	23,100	45	1,040,000	-665	-7,690	-466	6
	2030				-450[7]	-3.53E-05				-37	-425	-26	6
American River North Levee	2004	11,600	200	2,312,000	1,086[6]	4.70E-04	11,600	55	640,400	301	875	211	19
	2030				-500[7]	-2.16E-04				-139	-403	-97	19
Total (Existing or 2004)					**-11,743**					**97**	**-4,106**	**68**	
Total (2030)					**11,559**					**1,879**	**10,244**	**1,315**	
Total (All)		**221,300**					**153,700**		**8,541,400**				

1. Positive values indicate groundwater inflow; negative values indicate goundwater outflow.
2. Source of total flow estimate = Table 6-4.
3. Source of total flow estimate = Table 6-5.
4. Source of total flow estimate = groundwater inflow from 2004 IGSM simulation (241 afy) plus canal seepage estimated by Kleinfelder (218 afy).
5. Source of total flow estimate = groundwater inflow from 2030 IGSM simulation (3,700 afy) plus canal seepage estimated by Kleinfelder (218 afy).
6. Source of total flow estimate = IGSM 2004 simulation.
7. Source of total flow estimate = IGSM 2030 simulation.
8. Increased groundwater inflow (or decreased outflow) shown as positive value; increased outflow (or decreased inflow) is shown as negative. 70% flow reduction assumed for slurry cutoff walls based on Kleinfelder (2009).



FILE: \\server_pe2900\Public\SAFCA\GIS\Fig 6-1 SlurryCutoffLocation map.mxd Date: 5/4/2009

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Figure 6-1
Proposed Slurry Cutoff Walls Surrounding Natomas Basin

7.0 Groundwater Impacts of SAFCA Construction Activities

The effects of SAFCA's proposed construction activities on groundwater conditions in the Natomas Basin were evaluated using the water budget approach discussed above. Water budget impacts resulting from land use changes and canal construction were addressed in Chapter 5, and water budget impacts due to proposed slurry cutoff walls were addressed in Chapter 6. All of the predicted impacts of SAFCA's activities are summarized in **Table 7-1** for existing/2004 conditions and in **Table 7-2** for future/2030 conditions. This chapter also addresses cumulative impacts for 2004 and 2030 conditions based on the groundwater budgets calculated by the IGSM models.

7.1 Levee Improvements

Groundwater impacts from proposed levee improvements are primarily limited to the effects of land use changes and slurry cutoff walls. No direct groundwater impacts are expected from increasing the height or width of levees, modifying levee slopes, or building seepage berms because all of this construction would be above the water table.

Proposed land use changes will result in the loss of about 20 acres of rice, 175 acres of field crops, and five acres of orchard along the Sacramento River East Levee. Other land use changes include the loss of five acres of rice along the NCC South Levee and 50 acres of rice along the PGCC West Levee. As shown in **Tables 7-1** and **7-2**, these changes are estimated to reduce deep percolation from applied water by a total of 105 afy.

Estimated reductions in groundwater flow beneath the levees due to the proposed slurry cutoff walls are shown in **Table 6-6** based both on simulations of "existing" (or 2004) and future (2030) conditions. Estimated inflow reductions for existing conditions shown in **Table 7-1** include 105 afy of deep percolation, 1,095 afy of recharge from the Sacramento and American Rivers, and 56 afy of inflow to the Natomas Basin beneath the NCC. The total estimated inflow reduction is 1,256 afy. The reduction in subsurface outflow from the Natomas Basin beneath the PGCC and NEMDC is estimated to be 1,083 afy. The estimated effect of all proposed slurry cutoff walls based on the simulation of existing conditions will be to reduce groundwater storage in the Natomas Basin by about 173 afy.

Estimated inflow reductions for 2030 conditions shown in **Table 7-2** include 105 afy of deep percolation, 895 afy of recharge from the Sacramento and American Rivers, and 480 afy of inflow to the Natomas Basin beneath the NCC. The total estimated inflow reduction is 1,480 afy. The reduction in subsurface outflow from the Natomas Basin beneath the PGCC and NEMDC is estimated to be 60 afy. The estimated effect of all proposed slurry cutoff walls based on the 2030 simulation would be to reduce groundwater storage in the Natomas Basin by about 1,420 afy.

7.2 Canal Improvements

The construction of the new GSS/Drainage Canal and relocation and improvements to the West Drainage Canal, the Elkhorn Canal, and the Riverside Canal will affect deep percolation from applied water (due to land use changes) and seepage from the canals. For all four canals, deep percolation is estimated to decrease by 41 afy and canal seepage is estimated to increase by 327 afy (**Tables 7-1** and **7-2**). The net effect of proposed canal construction would be to increase groundwater storage in the Natomas Basin by about 285 afy.

7.3 Borrow Sites

Excavation and reclamation of the Brookfield and Fisherman's Lake borrow sites is expected to have an indirect effect on groundwater conditions due to proposed land use and water supply changes. No such changes are planned for the Airport North Bufferlands borrow site.

At the Brookfield borrow site, approximately 325 acres are currently planted to rice, and SAFCA plans to restore about 286 acres to rice cultivation after construction activities are complete. As shown in **Tables 7-1** and **7-2**, an estimated 30 afy of deep percolation will be lost at this site due to the reduction in irrigated acreage. The Brookfield site is currently irrigated entirely with groundwater, but SAFCA plans to provide the infrastructure so that about 80 percent of the borrow site can be irrigated with surface water after reclamation. This transition would reduce groundwater pumping by about 1,625 afy. Groundwater levels will increase due to the reduced pumping, resulting in an increase in subsurface outflow beneath the PGCC of about 76 afy.

At the Fisherman's Lake borrow site, about 400 acres of land would be used for borrow material, including 49 acres currently planted to rice, 266 acres of field crops, and 85 acres of managed marsh. After reclamation, there would be about 175 acres of managed marsh and 225 acres of non-irrigated grassland or woodland. The predicted net loss in deep percolation is 36 afy at this site, as shown in **Tables 7-1** and **7-2**.

The reduction in groundwater pumping at the Brookfield site more than offsets the loss of deep percolation at all borrow sites. The net effect of excavation and reclamation of all borrow sites would be to increase groundwater storage by about 1,483 afy.

7.4 Summary of SAFCA Groundwater Impacts

The totals at the bottom of **Tables 7-1** and **7-2** show the combined effect of SAFCA's proposed construction activities based on exising/2004 and future/2030 conditions, respectively. For both simulations, deep percolation is estimated to decrease by 213 afy, seepage from canals is estimated to increase by 327 afy, and groundwater pumping is estimated to decrease by 1,625 afy. Other changes for existing/2004 conditions include decreases in net recharge from streams (1,095 afy), subsurface inflow (56 afy), and subsurface outflow (1,007 afy). Summing these terms results in an increase in groundwater storage in the Natomas Basin of 1,595 afy for existing/2004 conditions, which means that groundwater levels would be expected to increase slightly due to all construction activities. The reduction in subsurface outflow would have a slightly negative effect on groundwater levels and storage east of the Natomas Basin.

The totals at the bottom of **Table 7-2** show the combined effect of SAFCA's proposed construction activities based on future conditions in 2030. Estimated changes in deep percolation, seepage from canals, and groundwater pumping are the same as for existing/2004 conditions. The estimated reduction in net recharge from streams (895 afy) is smaller than for the 2004 simulation, and the reduction in subsurface inflow (480 afy) is larger. Groundwater storage in the Natomas Basin is predict to increase due to the proposed construction, but by a smaller amount (348 afy). Subsurface outflow to the east is predicted to increase slightly in 2030 (by 16 afy). These small changes would have a slightly positive effect on groundwater levels and storage in and near the Natomas Basin.

7.5 Cumulative Effects

The cumulative impacts of SAFCA's construction activities on existing groundwater conditions based on the 2004 and 2030 IGSM simulation are shown in **Tables 7-3** and **7-4**. On these tables, the estimated SAFCA impacts discussed above are added to the groundwater budget for the Natomas Basin discussed in Chapter 4. The 2004 groundwater budget showed a total groundwater inflow to the Natomas Basin of 52,304 afy without the effects of SAFCA's activities and 51,267 afy including the proposed construction (**Table 7-3**). There is a similar reduction in groundwater outflow from 57,275 afy without SAFCA's construction activities to 54,643 afy including the construction. The simulated reduction in groundwater storage for 2004 is 4,971 afy without SAFCA, which represents an average water level decline of about one foot. The decrease in groundwater storage would be smaller (3,376 afy) due to SAFCA's construction activities. Overall, SAFCA's proposed construction would have a small positive impact on groundwater supplies in the Natomas Basin based on existing conditions. Outside of the Natomas Basin, the predicted reduction in groundwater outflow to the east (1,007 afy) would have a small negative impact on groundwater levels and storage within the cones of depression east of the Natomas Basin, but groundwater outflow is still estimated to be large (20,731 afy).

The estimate of the cumulative impacts of SAFCA's construction activities based on the simulation of future (2030) groundwater conditions is summarized in **Table 7-4**. The 2030 groundwater budget shows that the total groundwater inflow to the Natomas Basin without the effects of SAFCA's activities (35,187 afy) would decrease to 33,926 afy including SAFCA proposed construction. This is offset by a reduction in groundwater outflow from 33,615 afy without SAFCA's construction activities to 32,006 afy including SAFCA's activities. The simulation shows an increase in groundwater storage in 2030 of 1,572 afy without SAFCA. The results indicate that, on average, SAFCA's construction activities will have a positive effect on groundwater levels in the Natomas Basin, resulting in an additional increase in storage of 348 afy (to 1,920 afy). Subsurface outflow to the east is predicted to be much smaller in 2030 (only 1,200 afy without SAFCA's construction activities), but would increase by 16 afy due to SAFCA's proposed construction. Overall, SAFCA's activities would have a slightly positive effect on groundwater levels and storage within and east of the Natomas Basin in 2030.

Table 7-1
Groundwater Budget for Proposed SAFCA Construction Activities Based on Existing Conditions

SAFCA Construction Activity	Inflow (afy)[1]					Outflow (afy)[1]			Change in Storage (afy)
	Deep Percolation	Net Recharge from Streams	Seepage from Canals	Subsurface Inflow	Total Inflow	Subsurface Outflow	Groundwater Pumping	Total Outflow	
Levee Improvements[2]									
Sacramento River East Levee	-63	-884	0	0	**-947**	0	0	**0**	-
NCC South Levee	-4	0	0	-56	**-60**	0	0	**0**	-
PGCC West Levee	-39	0	0	0	**-39**	-238	0	**-238**	-
NEMDC West Levee (North)	0	0	0	0	**0**	-378	0	**-378**	-
NEMDC West Levee (South)	0	0	0	0	**0**	-466	0	**-466**	-
American River North Levee	0	-211	0	0	**-211**	0	0	**0**	-
Subtotal	**-105**	**-1,095**	**0**	**-56**	**-1,256**	**-1,083**	**0**	**-1,083**	**-173**
Canal Improvements									
New GGS/Drainage Canal	-11	0	162	0	**151**	0	0	**0**	-
West Drainage Canal	0	0	128	0	**127**	0	0	**0**	-
Elkhorn Canal relocation	-11	0	27	0	**16**	0	0	**0**	-
Riverside Canal relocation	-19	0	10	0	**-9**	0	0	**0**	-
Subtotal	**-41**	**0**	**327**	**0**	**285**	**0**	**0**	**0**	**285**
Borrow Sites									
Airport North	0	0	0	0	**0**	0	0	**0**	-
Brookfield	-30	0	0	0	**-30**	76	-1,625	**-1,549**	-
Fisherman's Lake	-36	0	0	0	**-36**	0	0	**0**	-
Subtotal	**-67**	**0**	**0**	**0**	**-67**	**76**	**-1,625**	**-1,549**	**1,483**
Total	**-213**	**-1,095**	**327**	**-56**	**-1,037**	**-1,007**	**-1,625**	**-2,632**	**1,595**

1. Increased groundwater inflow (or decreased outflow) shown as a positive value; increased outflow (or decreased inflow) is shown as negative.
2. Effect of slurry cutoff walls represent existing/2004 results from Table 6-6.

Table 7-2
Groundwater Budget for Proposed SAFCA Construction Activities Based on Future (2030) Conditions

SAFCA Construction Activity	Inflow (afy)[1]					Outflow (afy)[1]			Change in Storage (afy)
	Deep Percolation	Net Recharge from Streams	Seepage from Canals	Subsurface Inflow	Total Inflow	Subsurface Outflow	Groundwater Pumping	Total Outflow	
Levee Improvements[2]									
Sacramento River East Levee	-63	-992	0	0	**-1,055**	0	0	**0**	-
NCC South Levee	-4	0	0	-480	**-484**	0	0	**0**	-
PGCC West Levee	-39	0	0	0	**-39**	-13	0	**-13**	-
NEMDC West Levee (North)	0	0	0	0	**0**	-21	0	**-21**	-
NEMDC West Levee (South)	0	0	0	0	**0**	-26	0	**-26**	-
American River North Levee	0	97	0	0	**97**	0	0	**0**	-
Subtotal	**-105**	**-895**	**0**	**-480**	**-1,480**	**-60**	**0**	**-60**	**-1,420**
Canal Improvements									
New GGS/Drainage Canal	-11	0	162	0	**151**	0	0	**0**	-
West Drainage Canal	0	0	128	0	**127**	0	0	**0**	-
Elkhorn Canal relocation	-11	0	27	0	**16**	0	0	**0**	-
Riverside Canal relocation	-19	0	10	0	**-9**	0	0	**0**	-
Subtotal	**-41**	**0**	**327**	**0**	**285**	**0**	**0**	**0**	**285**
Borrow Sites									
Airport North	0	0	0	0	**0**	0	0	**0**	-
Brookfield	-30	0	0	0	**-30**	76	-1,625	**-1,549**	-
Fisherman's Lake	-36	0	0	0	**-36**	0	0	**0**	-
Subtotal	**-67**	**0**	**0**	**0**	**-67**	**76**	**-1,625**	**-1,549**	**1,483**
Total	**-213**	**-895**	**327**	**-480**	**-1,261**	**16**	**-1,625**	**-1,609**	**348**

1. Increased groundwater inflow (or decreased outflow) shown as a positive value; increased outflow (or decreased inflow) is shown as negative.
2. Effect of slurry cutoff walls represent 2030 results from Table 6-6.

Table 7-3
Groundwater Budget for Natomas Basin Showing Effect of SAFCA Activities on Existing Groundwater Conditions (Based on 2004 Simulation)

	Water Budget Component	2004 Simulation[1] (afy)	Impact of SAFCA Activities (afy)	2004 Simulation Plus SAFCA Activities (afy)
Inflow	Deep Percolation (Including Canal Seepage)	31,429	114	31,543
	Recharge from Sacramento River	6,469	-884	5,585
	Recharge from American River	1,086	-211	875
	Boundary Inflow from West	10,365	0	10,365
	Subsurface Inflow from North	241	-56	185
	Subsurface Inflow from South	2,714	0	2,714
	Total Inflow	**52,304**	**-1,037**	**51,267**
Outflow	Groundwater Pumping	35,537	-1,625	33,912
	Subsurface Outflow to East	21,738	-1,007	20,731
	Total Outflow	**57,275**	**-2,632**	**54,643**
Inflow minus Outflow	**Change in Storage**	**-4,971**	**1,595**	**-3,376**

1. Based on final year (2004) of calibration simulation (LSCE, 2008b).

Table 7-4
Groundwater Budget for Natomas Basin Showing Effect of SAFCA Activities on Future Groundwater Conditions (Based on 2030 Simulation)

	Water Budget Component	2030 Simulation[1] (afy)	Impact of SAFCA Activities (afy)	2030 Simulation Plus SAFCA Activities (afy)
Inflow	Deep Percolation (Including Canal Seepage)	27,187	114	27,301
	Recharge from Sacramento River[2]	1,100	-992	108
	Recharge from American River	-500	97	-403
	Boundary Inflow from West	3,700	0	3,700
	Subsurface Inflow from North	3,700	-480	3,220
	Subsurface Inflow from South	0	0	0
	Total Inflow	**35,187**	**-1,261**	**33,926**
Outflow	Groundwater Pumping	31,615	-1,625	29,990
	Subsurface Outflow to East	1,200	16	1,216
	Subsurface Outflow to South	800	0	800
	Total Outflow	**33,615**	**-1,609**	**32,006**
Inflow minus Outflow	**Change in Storage**	**1,572**	**348**	**1,920**

1. Based on 1982-2004 average for Sutter Pointe Project Scenario 2B (LSCE, 2008b).

8.0 Effects on Groundwater Quality and Private Wells

8.1 Potential Groundwater Quality Impacts

The primary potential groundwater quality impact of SAFCA's proposed construction activities is a slight reduction in groundwater recharge to the Natomas Basin, including stream recharge and deep percolation from rice fields and other irrigated farmland. This recharge is generally of high quality, especially the stream recharge, which typically has very low salinity and few contaminants. Seepage from canals is another source of good quality recharge, and this will increase due to SAFCA's proposed canal construction. Water recharged via deep percolation has somewhat higher salinity than river water due to the use of recycled tailwater and the effects of ET.

As estimated above, the combined effect of SAFCA's proposed construction activities on existing groundwater conditions would be to reduce low-salinity recharge from rivers and canals by 768 afy and reduce groundwater outflow beneath the PGCC and NEMDC by 1,007 afy. The combined effect of these inflow and outflow reductions would be expected to slightly increase salt accumulation in the Natomas Basin and have a small effect on groundwater quality east of the Natomas Basin. However, these reductions represent less than two percent and five percent of the total estimated groundwater inflow and outflow to and from the Natomas Basin, and the water quality impacts are not expected to be measurable.

For future groundwater conditions in 2030, the combined effect of SAFCA's proposed construction activities would be to reduce low-salinity groundwater recharge from rivers and canals by 568 afy and groundwater outflow to the east by 16 afy. Again, the overall effect of these changes on future groundwater quality would be small.

In the vicinity of the Brookfield borrow site, groundwater quality would improve due to the transition from groundwater to surface water for about 80 percent of the rice acreage. Groundwater quality would improve in this area because deep percolation from fields irrigated with surface water will have lower salinity than from fields irrigated with groundwater.

The slurry cutoff walls will be constructed primarily of soil mixed with bentonite, but Portland cement may be used as an additive in some cases. Bentonite is a naturally occurring form of clay, and Portland cement is made from limestone and clay. Neither bentonite nor cured Portland cement are water soluble, and grouts composed of both materials are widely used in the water well industry. Both bentonite and cement are used to construct seals in wells drilled for various purposes, including drinking water supply. No groundwater contamination would be expected due to construction of the proposed slurry cutoff walls and other improvements proposed for the levees surrounding the Natomas Basin.

Although SAFCA's proposed construction activities would cause slight groundwater quality impacts in some areas and improvements in other areas, the effects would be too small to be

measurable. The overall effect of SAFCA's proposed construction on future groundwater quality in the Natomas Basin can be considered negligible.

8.2 Potential Impacts to Private Wells

8.2.1 Private Well Locations and Construction

For the *Sacramento River Basinwide Water Management Plan*, DWR reviewed drillers' logs in the Natomas Basin and reported that average well depths were 149 feet for domestic wells, 313 feet for irrigation wells, 378 feet for industrial wells, and 308 feet for municipal wells (DWR, 2003c). The majority of the wells in the Natomas Basin are either domestic or agricultural wells, which typically extract groundwater from the upper aquifer system as defined above.

Figure 8-1 shows wells with known or estimated locations in and near the Natomas Basin. "Private wells" shown along the Sacramento River East Levee and the NCC South Levee are primarily domestic wells mapped by M&H (Stephen Sullivan, pers. comm., January 23, 2008) but include some irrigation wells. Well numbers provided for these wells correspond to numbers assigned by M&H. Similar mapping of private wells along the PGCC and NEMDC West Levees is still in progress, and well locations along the eastern edge of the Natomas Basin shown on **Figure 8-1** are estimated based on parcel boundaries. Only a portion of the estimated well locations in the Valley View Acres (VVA) community, located along the NEMDC north of Del Paso Road and east of Sorento Road, are shown on the map due to the high density of domestic wells in this area.

In addition to domestic wells, **Figure 8-1** also shows wells with water level data mapped by LSCE based on locations provided by DWR and other sources. Symbols used for these wells indicate the depth zone (upper, lower, multiple, and unknown). Most of these are agricultural wells, M&I wells, or monitoring wells. If available, the wells are numbered based on the last four digits of the State Well Number.

Approximately 138 private wells along the Sacramento River East Levee have been mapped by M&H (2008), and these are grouped by depth and type in **Table 8-1**. There are 103 domestic wells, 15 irrigation wells, and 20 wells used for other or unknown purposes in this area. Monitoring and municipal wells are not included on this table. All of the domestic wells are less than 300 feet deep, and 84 percent are between 100 and 200 feet deep. All but one of the irrigation wells are also less than 300 feet deep, with six wells between 100 and 200 feet deep and eight wells between 200 and 300 feet deep. The average depth of the private wells along the Sacramento River East Levee is 158 feet. As reported by LSCE (2008a), approximately two-thirds of these wells are located on the river side of the levee and one-third on the land side. The average depth of these wells is 151 feet on the river side of the levee and 163 feet on the land side. The land side wells are slightly deeper on average because they include more irrigation wells.

As shown in **Table 8-1**, nine wells along the NCC South Levee were mapped by M&H (2008). These include one domestic well and eight irrigation wells. The domestic well is between 100 and 200 feet deep. One of the irrigation wells is between 100 and 200 feet deep, three are

between 200 and 300 feet deep, two are between 300 and 400 feet deep, and two are of unknown depth. The average depth of wells with depth information is 260 feet.

There are about 150 residences in the VVA community, situated on about 300 acres of land west of the NEMDC. The VVA community is supplied by groundwater, and each residence is assumed to have a domestic well. Compilation of construction information for these wells is still in progress, but M&H has provided drillers' logs for 27 VVA wells to date. These wells range in depth from 65 to 290 feet, with an average of 122 feet. Most of the drillers' logs do not show the perforated interval, but it is expected to be below the depth of the cutoff wall proposed for this portion of the NEMDC West Levee (53 feet) for almost all wells.

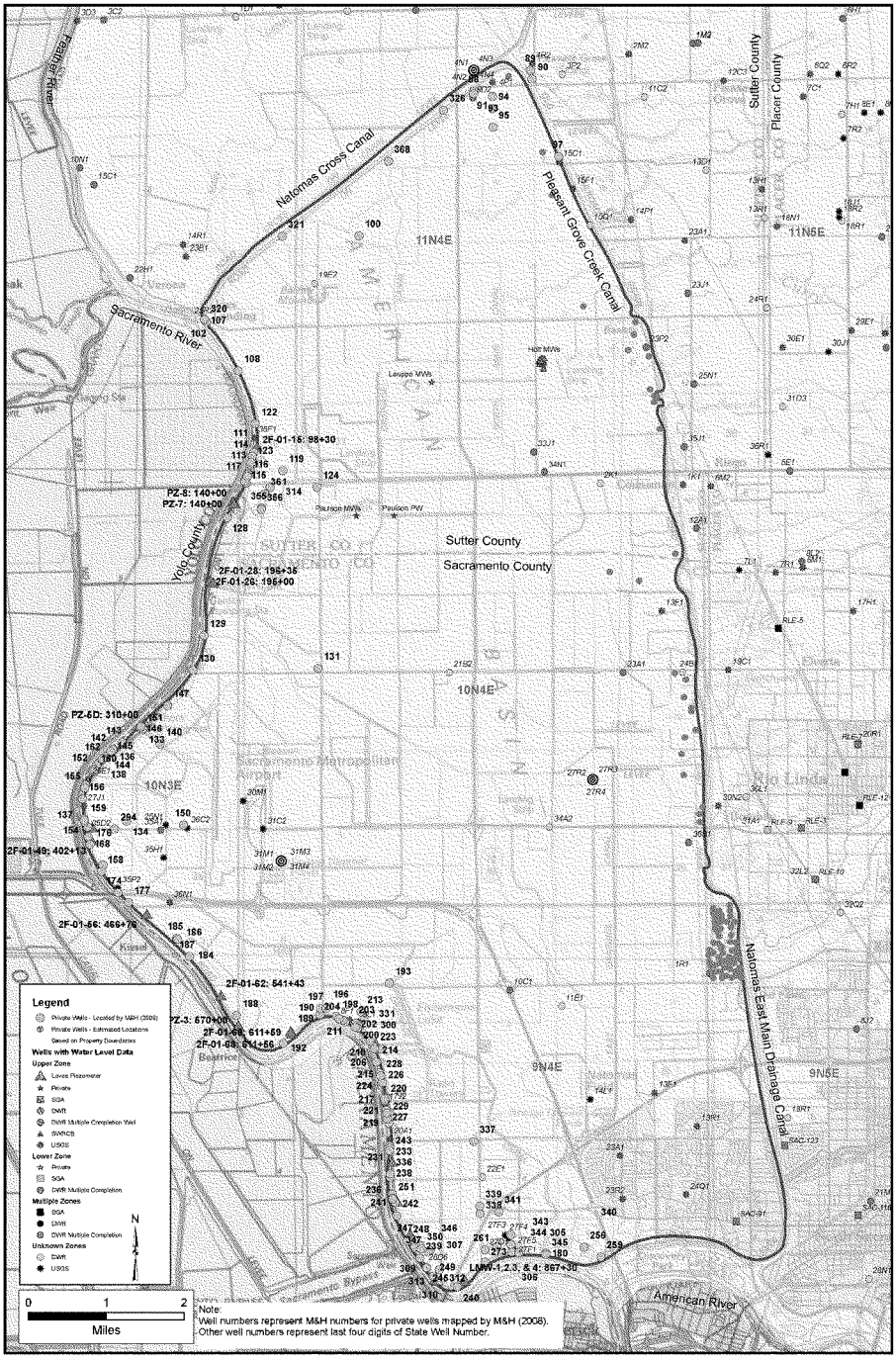
8.2.2 Potential Impacts

Kleinfelder (2009) estimated the water level changes due to the slurry cutoff walls along the Sacramento River East Levee using the steady-state and transient versions of the seepage model discussed above. The transient version of the model is considered to be more accurate, and the changes in head due to the proposed slurry cutoff wall along one reach of the Sacramento River East Levee predicted by the transient model are shown on **Figure 8-2**. On the river side of the levee, the predicted effects of the cutoff walls are negligible at low stage, and there would be a slight increase in head (less than one foot) at high stage. On the land side of the levee, the Kleinfelder simulation shows that heads would be from one to 6.5 feet lower (average of 2.2 feet) due to the cutoff wall during the winter months when the direction of groundwater flow is away from the River. During the rest of the year, the direction of groundwater flow is toward the River because gaining conditions are simulated with the model. Under these conditions, land side groundwater levels are predicted to be up to 1.5 feet higher (average of 0.9 foot) with the cutoff wall in place. These small effects are considered to be negligible even for the shallowest domestic wells (less than 100 feet deep). No measurable decreases in well yields or increases in pumping costs are expected due to slurry cutoff walls along the Sacramento River East Levee.

Similar modeling has not been conducted for wells along the PGCC or NEMDC, but cutoff walls would be expected to have similarly small effects near the eastern edge of the Natomas Basin. Since the general direction of groundwater flow in this area is to the east, static groundwater levels will increase slightly west of the levee and decrease slightly east of the levee. Shallow wells on either side of the levee could experience slightly lower pumping water levels because the cutoff wall will act as a low permeability boundary that will reduce the aerial extent and increase the depth of the cone of depression. This effect will be small because the production zone for most wells is below the bottom of the proposed cutoff walls. No measurable decreases in well yields or increases in pumping costs are expected due to the slurry cutoff walls. Overall, no measurable effects on groundwater levels or quality are expected for wells in or near the Natomas Basin due to SAFCA's proposed construction activities.

Table 8-1
Depths of Private Wells Along Sacramento River East Levee and Natomas Cross Canal South Levee

Levee	Well Type	Well Depth						Total
		0-100 ft	100-200 ft	200-300 ft	300-400 ft	> 400 ft	Unknown	
Sacramento River East Levee	Domestic	10	87	6	0	0	0	103
	Irrigation	0	6	8	0	1	0	15
	Other/Unknown	6	6	6	0	0	2	20
	Subtotal	**16**	**99**	**20**	**0**	**1**	**2**	**138**
Natomas Cross Canal South Levee	Domestic	0	1	0	0	0	0	1
	Irrigation	0	1	3	2	0	2	8
	Subtotal	**0**	**2**	**3**	**2**	**0**	**2**	**9**
Total		**16**	**101**	**23**	**2**	**1**	**4**	**147**



FILE: \\server_pe2900\Public\SAFCA\GIS\Well Location map.mxd Date: 5/4/2006

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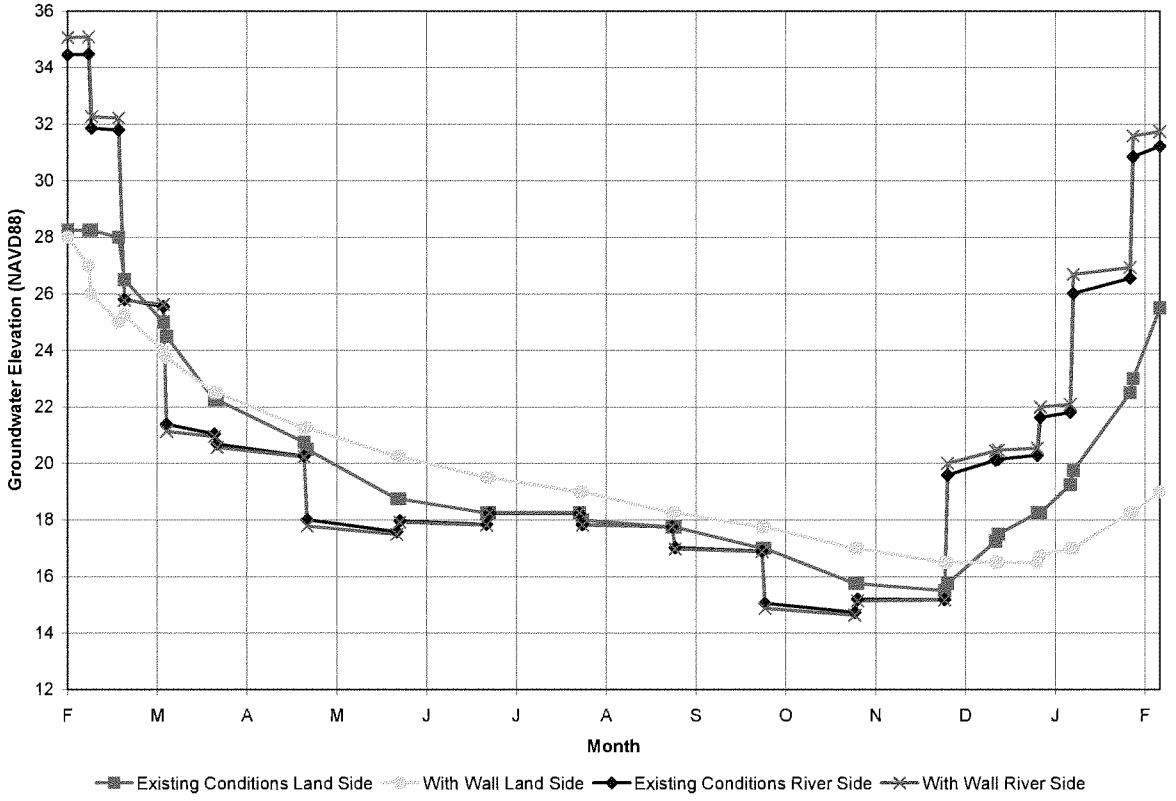
Figure 8-1
Wells In and Near the Natomas Basin



Y:\SAFCA\Cutoff Wall Impacts (2009)\plate 25_05-01-09.xls\Est GW Table Ele

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Figure 8-2
Simulated Groundwater Elevations from Kleinfelder Transient Model With and Without Slurry Cutoff Walls

9.0 Summary of Potential Impacts

Most of SAFCA's proposed levee improvements will have no effect on groundwater in the Natomas Basin, but the proposed slurry cutoff walls are intended to reduce seepage beneath the levees and will affect groundwater conditions. Some of SAFCA's construction activities will involve land use changes that will reduce groundwater recharge. This reduction will be at least partially offset by seepage from new and relocated canals, which will increase groundwater recharge. Finally, water supply changes at the Brookfield property borrow site will result in a large reduction in groundwater pumping.

The effects of SAFCA's proposed construction activities on groundwater conditions in the Natomas Basin were evaluated using the water budget approach and other methods discussed above. Potential impacts resulting from land use changes and canal construction were addressed in Chapter 5, potential impacts due to proposed slurry cutoff walls were addressed in Chapter 6, and the potential cumulative impacts were addressed in Chapter 7. The analysis of potential impacts to groundwater quality and private wells was discussed in Chapter 8. Each of these potential impacts is summarized below.

9.1 Potential Water Budget Impacts

9.1.1 Levee Improvements

Groundwater impacts from proposed levee improvements are primarily limited to the effects of land use changes and slurry cutoff walls. No direct groundwater impacts are expected from increasing the height or width of levees, modifying levee slopes, building seepage berms, or other construction above the water table.

Proposed land use changes for all five levees will result in the loss of about 75 acres of existing rice, 175 acres of field crops, and five acres of orchard. These changes are estimated to reduce deep percolation from applied water by a total of 105 afy.

Groundwater flow reductions due to the slurry cutoff walls were estimated based on simulations of "existing" (or 2004) and future (2030) conditions. The combined effect of all proposed slurry cutoff walls along the levees surrounding the Natomas Basin for existing/2004 conditions is estimated to reduce groundwater inflow by 1,256 afy and groundwater outflow by 1,083 afy, resulting in a reduction in groundwater storage in the Natomas Basin of about 173 afy (**Table 7-1**). For 2030 conditions, groundwater inflow is predicted to be reduced by 1,480 afy and groundwater outflow by 60 afy, resulting in a reduction in groundwater storage of about 1,420 afy (**Table 7-2**).

9.1.2 Canal Improvements

The construction of the new GSS/Drainage Canal and relocation and improvements to the West Drainage Canal, the Elkhorn Canal, and the Riverside Canal will affect deep percolation from

applied water (due to land use changes) and seepage from the canals. For all four canals, deep percolation is estimated to decrease by 41 afy and canal seepage is estimated to increase by 327 afy. The net effect of proposed canal construction would be to increase groundwater storage in the Natomas Basin by about 285 afy (**Tables 7-1** and **7-2**).

9.1.3 Borrow Sites

Excavation of two of the three primary borrow sites is expected to have an indirect effect on groundwater conditions due to proposed land use and water supply changes. At the Brookfield borrow site, approximately 325 acres are currently planted to rice, and SAFCA plans to restore about 286 acres to rice cultivation after construction activities are complete. At the Fisherman's Lake borrow site, about 400 acres of land would be used for borrow material, including 49 acres currently planted to rice, 266 acres of field crops, and 85 acres of managed marsh. After reclamation, there would be about 175 acres of managed marsh and 225 acres of non-irrigated grassland or woodland. No land use changes are planned at the Airport North Bufferlands borrow site due to airport safety considerations. The predicted net loss in deep percolation for all borrow sites is 67 afy.

The Brookfield borrow site is currently irrigated entirely with groundwater, but SAFCA plans to provide the infrastructure so that about 80 percent of the borrow site can be irrigated with surface water after reclamation. This transition would reduce groundwater pumping in the Natomas Basin by about 1,625 afy. The reduction in groundwater pumping at the Brookfield site more than offsets the loss of deep percolation at all borrow sites. The reduced pumping would also result in slightly increased groundwater outflow from the northern portion of the Natomas Basin. The net effect of excavation and reclamation of all borrow sites will be to increase groundwater storage by about 1,483 afy (**Tables 7-1** and **7-2**).

9.1.4 Summary of Potential Water Budget Impacts

The combined effects of SAFCA's proposed construction activities for both existing and future conditions include estimated decreases in deep percolation (213 afy) and groundwater pumping (1,625 afy) and an increase in seepage from canals (327 afy). The effect on other water budget components varies between the existing/2004 and future/2030 simulations. For the existing/2004 period, there are predicted decreases in net recharge from streams (1,095 afy), subsurface inflow (56 afy), and subsurface outflow (1,083 afy), and groundwater storage is estimated to increase by 1,596 afy. This means that groundwater levels in the Natomas Basin would be expected to increase slightly due to SAFCA's construction activities. The estimated reduction in subsurface outflow (1,007 afy) would result in a small decrease in groundwater levels and storage east of the Natomas Basin.

For the 2030 period, decreases in groundwater inflow include net recharge from streams (895 afy) and subsurface inflow (480 afy). There would be a smaller increase groundwater storage (348afy) and a small increase in subsurface outflow (16 afy) as compared to the existing/2004 simulation. These changes would have a slight positive effect on groundwater levels in or near the Natomas Basin.

The cumulative impacts of SAFCA's proposed construction activities on existing and future groundwater conditions were based primarily on the 2004 and 2030 IGSM simulations discussed in Chapter 4. The 2004 simulation results show a reduction in groundwater storage of 4,971 afy in the Natomas Basin without SAFCA's construction; this equates to an average head decline of about one foot. The decrease in groundwater storage would be smaller (3,376 afy) due to SAFCA's construction activities. Subsurface outflow from the Natomas Basin to the east would decrease from 21,738 to 20,731 afy due to SAFCA's activities. Overall, SAFCA's activities would have a small positive impact on groundwater supplies in the Natomas Basin and a small negative impact on groundwater conditions east of the Natomas Basin.

The 2030 IGSM simulation provides an estimate of the cumulative impacts of SAFCA's construction activities on future groundwater conditions. The results of the 2030 simulation show a positive change in groundwater storage in the Natomas Basin of 1,572 afy, which would increase slightly to 1,920 afy due to SAFCA's activities. There would be a very small increase in groundwater outflow (from 1,200 to 1,216 afy). Overall, the cumulative impact of SAFCA's proposed construction activities on future groundwater levels in and near the Natomas Basin is predicted to be slightly positive.

9.2 Potential Water Quality Impacts

This investigation also included a summary of potential impacts to groundwater quality due to SAFCA's construction activities. The primary potential groundwater quality impact will be a slight reduction in groundwater recharge to the Natomas Basin, including stream recharge and deep percolation from rice fields and other irrigated farmland. This recharge is generally of high quality, especially the stream recharge, which has very low salinity. Seepage from canals is another source of good quality recharge, and increased seepage due to SAFCA's proposed canal construction will offset some of the reductions in groundwater recharge due to slurry cutoff walls. In the vicinity of the Brookfield borrow site, groundwater quality would improve due to the transition from groundwater to surface water for about 80 percent of the rice acreage. No groundwater contamination would be expected due to construction of the proposed slurry cutoff walls and other improvements proposed for the levees surrounding the Natomas Basin.

SAFCA's proposed construction activities would cause slight groundwater quality degradation in some areas and improvements in other areas. The overall effect would likely be a slight increase in salt accumulation in the aquifers underlying the Natomas Basin. However, this impact would be too small to be measurable.

9.3 Potential Impacts to Private Wells

The majority of the domestic wells along the Sacramento River East Levee are between 100 and 200 feet deep, and irrigation wells in this area are slightly deeper. The average depth of the domestic and irrigation wells along the Sacramento River East Levee is 158 feet. Evaluation of well construction along the PGCC and NEMDC is still in progress, but there are about 150 residences in the VVA community with mostly shallow domestic wells. The drillers' logs for wells in this area that have been cataloged to date show an average well depth of 122 feet. Most of the drillers' logs do not show the perforated interval, but it is expected to be below the depth

of the cutoff wall proposed for this portion of the NEMDC West Levee (53 feet) for almost all wells.

Kleinfelder estimated the water level changes due to the slurry cutoff walls along the Sacramento River East Levee using the SEEP/W groundwater model. On the river side of the levee, the predicted effect of the cutoff wall is negligible at low stage, and there would be a slight increase in head (less than one foot) at high stage. On the land side of the levee, the model results show that, on average, heads would be about 2.2 feet lower during the winter months and 0.9 foot higher during the rest of the year with the cutoff wall in place. In both cases, any impacts would be small enough to be considered negligible even for the shallowest domestic wells (less than 100 feet deep). No measurable decrease in groundwater levels or well yields or increase in pumping costs is expected due to the slurry cutoff walls.

Although similar modeling has not been conducted for wells along the PGCC or NEMDC, cutoff walls would be expected to have similarly small effects in this area. Static groundwater levels will increase slightly west of the levee and decrease slightly east of the levee. Shallow wells on either side of the levee could experience slightly lower pumping water levels because the cutoff wall will act as a low permeability boundary. This effect will be small because the production zone for most wells is below the depth of the proposed cutoff walls. No measurable decreases in well yields or increases in pumping costs are expected due to slurry cutoff walls. Overall, no measurable effects on groundwater levels or quality are expected for wells in or near the Natomas Basin due to SAFCA's proposed construction activities.

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December 19, 2007
Revised April 21, 2009
File No.: 72834

Mr. Timothy Washburn
SAFCA
1007 7th Street, 7th Floor
Sacramento, CA 95814

Subject: **Evaluation of Cutoff Walls Impact on Groundwater Recharge**
Sacramento River East Levee
Natomas Levee Improvement Project
Sacramento and Sutter Counties, California

Dear Mr. Washburn:

This Memorandum is a revised version of a draft memorandum submitted to you on December 19, 2007. The analyses and data presented in December 2007 memo have been converted to the North American Vertical Datum (NAVD 88). The updated memorandum does not reflect any changes to the proposed remedial design and/or site subsurface characterization model that may have occurred since December 2007.

One of the design alternatives considered for remediation of the Sacramento River East Levee from Reach 1 to Reach 20 includes construction of cutoff walls through an adjacent levee. These soil-bentonite (SB) walls are proposed to mitigate underseepage concerns and reduce exit seepage gradients to the acceptable levels, according to the established project criteria.

A concern has been raised that the SB walls could potentially impede seepage from the river through the levee foundation and adversely impact groundwater recharge landward of the levee. To address these concerns, we have performed simplified seepage analyses to estimate seepage flow from the river into the aquifer under both existing conditions and with cutoff walls in place.

Based on the design recommendations provided by Kleinfelder, the SB wall material should have permeability of about 5×10^{-7} cm/sec or lower and will extend at least 5 feet into a fine grained layer(s) underneath the permeable near surface foundation layer. To account for the variability of the slurry and the potential for construction defects, for this study the SB wall was modeled with and average overall permeability of 1×10^{-6} cm/sec.

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In addition, we have evaluated potential seepage loss from the proposed Giant Garter Snake ditch. This new 2 mile long unlined canal will be located approximately 500 to 1,000 feet landward of the levee toe and will follow the existing levee alignment between Stations 200+00 and 305+00. In general, the canal will be filled with water during summer month and will be dry during the winter months. During periods of time when the canal is filled with water, seepage through its bottom and side slopes may temporarily affect the groundwater table in the area.

General Assumptions

- Idealized stratigraphic models at Stations 27+00, 70+00, 217+00, and 353+00 were selected to represent the range of subsurface conditions along the Sacramento River East Levee. Analyses at Station 217+00 are based on the stratigraphy model developed by URS, as presented in the URS "Draft Subsurface Investigation Report for Sacramento River East Levee, Natomas General Reevaluation Report" prepared for US Army Corps of Engineers, Sacramento District, dated 18 July 2007. Analyses at Stations 27+00, 70+00, and 353+00 are based on the models developed by Kleinfelder as presented in the Draft Basis of Design Report (Kleinfelder, 2007).
- Total length and location of the SB wall were estimated based on the information provided in the Final Draft Basis of Design Report dated December 18, 2007 and in the Alternatives Analysis Report for Seepage Mitigation Revision 1 dated September 24, 2007. Two representative cross-sections (Stations 70+00 and 353+00) have been selected to represent the proposed wall locations and depths.
- Seepage analyses were completed using steady state and transient analysis procedures with the finite element program SEEP/W version 6.17, provided with the GeoStudio 2004 package. These analyses do not account for 3-D effects, such as flow around the cutoff wall.
- Typical seasonal river level fluctuations were estimated based on the information provided by the Department of Water Resources (DWR), Division of Flood Management (http://cdec.water.ca.gov/queryStation.html) for the Sacramento River gage at Verona. River stage data recorded at Verona from 11/26/1995 to 11/26/2007 are presented on Plates 1 through 5 and summarized in a tabular form on Plate 6.
- Elevation of the groundwater table landward of the levee was estimated based on piezometer data obtained from "Final Observation Wells Report II: for Reaches North and South of Powerline Road", prepared by URS.
- All elevations in this memorandum are referenced in North American Vertical Datum (NAVD 88). Elevations referenced in previous reports and other sources of information are based on the National Geodetic Vertical Datum (NGVD 29). To correct from NGVD29 datum to NAVD88 datum elevations should be adjusted by 2.28 feet (NAVD88 = NGVD29 + 2.28 feet).
- River gage data reported by DWR was in the United States Engineering Datum (USED). In the Sacramento and San Joaquin River Basins, the adjustment from USED to NGVD29 varies from gaging station to gaging station within a range of 2.48 feet to 3.2 feet. According to the DWR website, the commonly used adjustment, when not otherwise known, is 3.0 feet. Elevations reported in USED

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are approximately 3 feet higher than elevations reported in NGVD29 and 0.72 feet lower than elevations reported in NAVD88.

- Seepage parameters selected for this study are consistent with those presented in the Basis of Design Report. Permeability values used in each analysis case are shown on plates presenting the results.
- Only recharge due to seepage from the river was considered. The model does not account for flow into or out of the system due to precipitation, pumping or regional groundwater flow that maybe occurring from a direction parallel to the levee axis.

Analysis Approach

We have performed simplified seepage analyses to estimate seepage flow from the river into the aquifer under both existing conditions and with cutoff walls in place we have further evaluated the impact of the proposed canal construction and operation based on the methodology outlined below. The following sections of this memo discuss analysis assumptions and details and present the results.

1. Review available historical data and develop representative average river level and ground water table hydrographs.
2. Perform series of steady state seepage analyses at four representative cross-sections to estimate seepage through levee foundation under the existing conditions as a function of river elevation. Boundary conditions used in steady state seepage modeling simulations are defined below. Fixed-head boundary conditions set to the water surface elevations were applied along the boundary nodes of the upstream slope, river bottom, and the upstream (riverside) vertical edge of the model. Nodes along the bottom of the model were modeled as no flow boundary (zero total flux boundary condition). Infinite elements with fixed-head boundary conditions were used along the right vertical edge of the model. The total head along the vertical edge was set to an estimated groundwater table elevation landward of the levee. The landside slope of the levee and the ground surface were modeled as potential seepage exit surfaces.
3. Using results from Steps 1 and 2 for each representative cross-section estimate seepage flow under the existing conditions over a typical year report seepage quantities in acre-feet per year per 1,000 feet of levee.
4. Using results from Step 3 and subsurface condition profiles at the landside toe of the levee, estimate seepage flow under the existing conditions over the entire length of the levee. Report seepage quantities in acre-feet per year.
5. Perform series steady state seepage analyses at two representative cross-sections (Stations 70+00 and 353+00) to estimate seepage through the levee foundation with a cutoff wall in place as a function of river elevation.
6. Using results from Steps 1 and 5, for Stations 70+00 and 353+00 estimate seepage flow with a cutoff wall in place over a typical year. Report seepage quantities in acre-feet per year per 1,000 feet of levee.
7. Using results from Steps 4 and 6, calculate reduction in seepage quantities at Stations 70+00 and 353+00 due to the cutoff wall.

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8. Using river and groundwater table hydrographs from Step 1, perform transient seepage analyses at Station 70+00 with and without the cutoff wall. The purpose of this analysis is two-fold: 1) better understand the impact of the cutoff wall on the recharge of the aquifer throughout the year; 2) verify percent reduction estimated based on the steady state analysis.
9. Using results from Steps 4 and 7 and subsurface condition profiles at the landside toe of the levee, estimate impact of the cutoff wall construction over the entire length of the levee. Report seepage quantities in acre-feet per year.
10. Perform transient analysis at Station 70+00 with the cutoff wall and canal to estimate seepage from the canal during a typical year.

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Analysis Results

Step1

Historical data recorded by the Sacramento River gage station at Verona from 11/26/1995 to 11/26/2007 are plotted on Plates 1 through 5. We have estimated typical number of days per year that river level remains at a given elevation as presented on Plate 6. The water surface rarely exceeds Elevation 35. The highest water surface included in our analyses was El. 34.25. Based on historical data, the water surface remains at this level approximately 1% of the year. We have also developed a representative (approximately average) annual river hydrograph (river level as a function of time) as shown graphically on Plate 7 and in tabular format on Plate 8. Transient seepage analyses utilized this hydrograph as a time-dependent boundary condition on the river side of the model.

Data from piezometer 2F-01-15N located north of Powerline Road indicates that the ground water elevation varies throughout the year from about 5 to 15 feet below ground level (see Attachment A). Based on the piezometer data, we have developed a representative groundwater table hydrograph as shown on Plate 7. Transient seepage analyses utilized this hydrograph as a time-dependent boundary condition on the landside of the model. For our steady state analyses we have set the groundwater table at 7 feet below ground surface, or Elevation 17.25.. Our assumption of Elevation 17.25 is also supported by the groundwater contour maps from County of Sacramento, Department of Water Resources for the spring and fall. The groundwater contours immediately landward of the levee near Reach 4B indicate groundwater elevations greater than 10 feet but generally less than 20.

Steps 2 and 3

Estimated seepage quantities through the levee foundation as a function of river elevation under the existing conditions (no cutoff wall) at Stations 27+00, 70+00, 217+00, and 353+00 are summarized in Table 1 and presented on Plate 9. A range of river levels above the ground water table was considered in the analyses. As discussed in Step 1, the highest river level considered was El. 34.25. Seepage analyses results for WSE at Elevation 34.25 are presented graphically on Plates 10 through 13. As shown in Table1 and graphically on Plate 9, the seepage quantities increase two orders of magnitude as the river level rises from Elevation 17.25 to 34.25. These results also indicate Station 217+00 provides the greatest contribution to the aquifer recharge landward of the levee. For a given river stage, estimated seepage quantities at Station 217+00 are approximately 100 times greater than the estimated quantities at the other three stations. Seepage quantities at Stations 27+00, 70+00, and 353+00 are approximately the same order of magnitude. The higher seepage quantities at Station 217+00 are primarily due to the presence of thick highly permeably sand and gravel layers in the foundation.

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The second result worth noting is the aquifer only recharges when the river level is above the groundwater elevation. When the river elevation is below the groundwater table (Elevation 17.25), the direction of the seepage flow in the model is reversed, indicating flow out of the aquifer.

Table 1
Estimated Seepage Quantities Versus River Stage
Existing Conditions

Model Elevation	27+00 Flow Existing Conditions	70+00 Flow Existing Conditions	217+00 Flow Existing Conditions	353+00 Flow Existing conditions
17.25	-4.98E-11	8.61E-03	1.51E+00	-3.69E-12
18.25	8.53E-02	4.31E-02	6.06E+00	3.88E-01
19.25	1.71E-01	7.75E-02	1.21E+01	7.78E-01
20.25	2.56E-01	1.12E-01	1.82E+01	1.17E+00
21.25	3.41E-01	1.46E-01	2.42E+01	1.56E+00
22.25	4.26E-01	1.81E-01	3.03E+01	1.95E+00
23.25	5.13E-01	2.15E-01	3.63E+01	2.35E+00
24.25	5.99E-01	2.50E-01	4.24E+01	2.74E+00
25.25	6.84E-01	2.85E-01	4.85E+01	3.14E+00
26.25	7.70E-01	3.19E-01	5.45E+01	3.53E+00
27.25	9.24E-01	3.54E-01	6.07E+01	3.92E+00
28.25	1.08E+00	3.89E-01	6.68E+01	4.87E+00
29.25	1.43E+00	5.17E-01	7.33E+01	6.09E+00
30.25	1.93E+00	8.47E-01	7.97E+01	7.47E+00
31.25	2.60E+00	1.40E+00	8.62E+01	9.05E+00
32.25	3.26E+00	2.10E+00	9.28E+01	1.08E+01
33.25	4.08E+00	2.99E+00	9.95E+01	1.28E+01
34.25	5.07E+00	4.21E+00	1.06E+02	1.51E+01
Total Flux Acre ft/yr/1000ft	3.9	2.6	129.4	13.2

Notes: 1. All fluxes in ft^3/day/ft unless noted otherwise.
2. Elevations in the seepage models were adjusted to a nearest mesh node. Model Elevations are lower than elevations in NAVD88 by 0.03 feet.

Step 4

The total length of the Sacramento River East Levee between Station 0+00 (Reach 1) and Station 960+00 (Reach 20) is approximately 18.1 miles. The general profile for the subsurface conditions along the levee crown/landside toe is provided in Attachment B. In general, the subsurface conditions profile is comprised of five units. These strata listed in order of increasing depth include: existing levee, surficial clay/fine grain soil blanket, silty and clayey sand layer, clean sand layer, gravel layer, and a lower clay/lower permeability soil region. As shown in Table 2, conditions at Station 27+00 are representative of approximately 1.8 miles or 11 percent of the entire length of the Sacramento River East Levee. Conditions at Station 70+00 are representative of

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approximately 4 miles or 23 percent of the entire length of the Sacramento River East Levee. Conditions at Station 217+00 are representative of approximately 7.6 miles or 42 percent of the entire length of the Sacramento River East Levee. Conditions at Station 353+00 are representative of approximately 4.7 miles or 24 percent of the entire length of the Sacramento River East Levee. Accordingly, the total estimated flow from the Sacramento River through the levee foundation between Station 0+00 and Station 960+00 is approximately 5,650 acre-feet per year.

Table 2
Estimated Seepage Quantities, Entire East Levee
Existing Conditions

Reach	Stations	Representative Station	Length of Stretch (ft)	Seepage without Cutoff Wall (ac-ft/yr)
1	00+00 to 48+00	27+00	4,800	19
2	48+00 to 100+00	70+00	5,200	14
3	100+00 to 110+00	70+00	1,000	3
4a	110+00 to 120+00	70+00	1,000	3
4a	120+00 to 190+00	353+00	7,000	95
4b	190+00 to 228+00	217+00	3,800	490
5a	228+00 to 263+00	70+00	3,500	10
5b	263+00 to 280+00	27+00	1,700	6
6	280+00 to 330+00	217+00	5,000	650
7	330+00 to 345+00	353+00	1,500	20
7	345+00 to 362+00	353+00	1,700	23
8	362+00 to 402+00	353+00	4,000	55
9a	402+00 to 430+00	353+00	2,800	38
9b	430+00 to 468+10	353+00	3,810	50
10	468+10 to 495+00	217+00	2,690	350
11	495+00 to 635+00	217+00	14,000	1810
12	635+00 to 640+00	217+00	500	65
12	640+00 to 667+00	70+00	2,700	7
13	667+00 to 700+00	353+00	3,300	45
14	700+00 to 732+00	70+00	3,200	8
15	732+00 to 780+00	217+00	4,800	620
16	780+00 to 832+00	217+00	5,200	675
17	832+00 to 842+00	217+00	1,000	130
18	842+00 to 857+00	217+00	1,500	195
19a	857+00 to 875+00	217+00	1,800	235
19b	875+00 to 925+00	70+00	5,000	15
20a	925+00 to 925+50	27+00	50	.2
20b	925+50 to 960+00	27+00	3,450	13
Total Seepage ac-ft/year				**5,650**

Steps 5 and 6

Cutoff soil-bentonite (SB) walls are currently proposed at thirteen locations along the east levee, as summarized in Table 3. The total length of the proposed SB walls is

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approximately 8 miles. The proposed depth of the wall varies from location to location based on the subsurface conditions and the required underseepage mitigation. Idealized cross-sections at Stations 70+00 and 353+00 were selected to represent the range of conditions at the proposed cutoff wall locations. At Station 70+00 where the surficial clay blanket is relatively thin and the underlying permeable layer is relatively shallow, the wall would completely penetrate the sand layer and key into the clay layer beneath. On the other hand at Station 353+00, only a partially penetrating cutoff wall is required. Proposed depth of the wall relative to the estimated bottom of the permeable layer at each location is presented in Table 3.

Table 3
Proposed Cutoff Wall Locations

Reach	Stations	Length of Stretch	Proposed depth of wall, Elevation	Depth of Sand layer, Elevation	Representative station for wall impact evaluation
2	48+00 to 100+00	5,200	-25	-25	70+00
3	100+00 to110+00	1,000	-25	-10	70+00
6	280+00 to 330+00	5,000	-70	-65	70+00
7	330+00 to 362+00	3,200	-60	-50	70+00
8	362+00 to 402+00	4,000	-60	-50	70+00
9	430+00 to 468+00	3,800	-70	-45	70+00
10	468+10 to 495+00	2,690	-25	-70	353+00
13	667+00 to 700+00	3,300	-20	-100	353+00
15	732+00 to 780+00	4,800	-10	-100	353+00
17	832+00 to 842+00	1,000	-25	-100	353+00
18	842+00 to 857+00	1,500	-25	-100	353+00
19a	857+00 to 875+00	1,800	-25	-100	353+00
19b	875+00 to 925+00	5,000	-25	-40	353+00

We have performed a series of steady state seepage analyses to estimate seepage quantities through the levee foundation with an SB wall in place. The analyses results for Stations 70+00 and 353+00 with the river WSE at Elevation 34.25 are presented on Plates 14 and 15. Total flow through a flux section located immediately landward of the SB wall was calculated with and without the cutoff wall in place. The two results were compared to estimate the groundwater recharge effects of the cutoff wall. Seepage quantities as a function of river stage are summarized in Table 4.

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Table 4
Estimated Seepage Quantities versus River Stage
With and Without Cutoff Wall

River Elevation (ft)	70+00 Flow Existing Conditions	70+00 Flow With Cutoff Wall	353+00 Flow Existing Conditions	353+00 Flow With Cutoff Wall
17.25	8.61E-03	4.56E-03	-3.69E-12	-5.97E-13
18.25	4.31E-02	2.29E-02	3.89E-01	3.90E-01
19.25	7.75E-02	4.14E-02	7.78E-01	7.80E-01
20.25	1.12E-01	6.00E-02	1.17E+00	1.17E+00
21.25	1.46E-01	7.87E-02	1.56E+00	1.56E+00
22.25	1.81E-01	9.75E-02	1.96E+00	1.96E+00
23.25	2.15E-01	1.16E-01	2.35E+00	2.35E+00

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Table 4 (Cont.)

River Elevation (ft)	70+00 Flow Existing Conditions	70+00 Flow With Cutoff Wall	353+00 Flow Existing Conditions	353+00 Flow With Cutoff Wall
24.25	2.50E-01	1.36E-01	2.74E+00	2.74E+00
25.25	2.85E-01	1.55E-01	3.14E+00	3.13E+00
26.25	3.19E-01	1.74E-01	3.53E+00	3.52E+00
27.25	3.54E-01	1.93E-01	3.92E+00	3.92E+00
28.25	3.89E-01	2.13E-01	4.87E+00	4.31E+00
29.25	5.17E-01	2.33E-01	6.09E+00	4.70E+00
30.25	8.47E-01	2.54E-01	7.47E+00	5.12E+00
31.25	1.40E+00	2.75E-01	9.05E+00	5.59E+00
32.25	2.10E+00	2.95E-01	1.08E+01	6.06E+00
33.25	2.99E+00	3.16E-01	1.28E+01	6.54E+00
34.25	4.21E+00	3.37E-01	1.51E+01	7.02E+00
Total Flux Acre ft/yr/1000ft	2.6	0.4	13.4	8.4

Notes: 1. All fluxes in ft^3/day/ft unless noted otherwise.
2. Elevations in the seepage models were adjusted to a nearest mesh node.

Step 7

Based on the results of steady state seepage analyses presented in Table 4, the cutoff wall could potentially reduce seepage through the foundation by 40 to 85 percent depending on the subsurface conditions and the proposed depth of the wall. At the locations where the wall fully penetrates the permeable sand layer (Station 70+00) seepage quantities could be reduced by approximately 85 percent. At the locations, where the cutoff is shallow and only partially penetrates the sand layer (Station 353+00), the reduction would be approximately 40 percent.

Step 8

To verify and validate steady state seepage analyses described above, we have performed transient seepage analyses for Station 70+00. The purpose of these analyses was to better understand effects of seasonal groundwater table fluctuations on the estimated seepage quantities with and without the cutoff wall and more accurately model typical river conditions throughout the year. Time-dependent boundary conditions assigned to the riverside and the landside of the model as shown on Plate 16 and summarized in a tabular form on Plate 8 were used in these analyses. Seepage quantity computations were performed at 34 time steps, starting in February and ending a year later.

Transient seepage analyses results are presented on Plates 17 through 20. Existing seepage flow regime during typical winter and summer conditions is illustrated on Plates

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17 and 18 respectively. Seepage conditions with the cutoff wall in place are shown on Plates 19 and 20. The plates show calculated seepage velocity vectors which illustrate the direction and the amount of flow - the larger the arrow, the higher the velocity and the larger the flow. A consistent scale was used on all four plates for easier visual comparison. The results indicate seepage occurs primarily through the permeable foundation sand layer and the existing sand levee. The flow is significantly higher during the elevated river stages (winter). Further, conditions may exist during the year when the river water surface is lower than the groundwater table. During these periods of time, the direction of the flow is reversed indicating seepage flow toward the river as illustrated on Plate 18.

Seepage quantities through the levee foundation with and without the cutoff wall as a function of time are presented on Plate 21. Positive seepage quantities indicate flow from the river landward of the levee while the negative sign indicates flow in the opposite direction. As shown on Plate 21, construction of the cutoff wall impedes flow in both direction and as a result may prevent flow into the river during the summer months.

Based on the transient seepage analyses, flow through the levee foundation at Station 70+00 without the wall is estimated at 5.6 acre-ft/year per 1,000 feet of the levee. Seepage through the levee foundation with the wall in place is approximately 1.7 acre-ft/year per 1,000 feet. Compared to the steady state analyses results for the same station, the transient seepage analyses indicate higher seepage quantities. For example, as shown in Table 4, steady-state seepage quantities estimated for Station 70+00 are 2.6 acre-ft/year per 1,000 feet for the existing conditions and approximately 0.4 acre-ft/year per 1,000 feet of the levee with the cutoff wall in place. The estimated reduction in flow due to the wall is comparable for both types of analyses. Based on the transient analysis, the seepage quantities would be reduced by about 70% compared to 85% estimated from the steady-state seepage analyses. Accordingly, we conclude the steady state seepage analyses conservatively approximate the effect of the cutoff walls.

Step 9

The overall effect of the cutoff wall construction can be estimated based on the information presented in Table 5.

Table 5
Estimated Seepage Quantities through Levee Foundation
Reaches 1 through 20

Reach	Stations	Representative Station	Stretch Length (ft)	Seepage without Cutoff Wall (ac-ft/yr)	Percent reduction based on cross section	Seepage with Cutoff Wall (ac-ft/yr)	Is Cutoff Wall Proposed at this Location?
1	00+00 to 48+00	27+00	4,800	19	0	19	N
2	48+00 to 100+00	70+00	5,200	14	85	2	Y
3	100+00 to 110+00	70+00	1,000	3	85	.4	Y
4a	110+00 to 120+00	70+00	1,000	3	0	3	N

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Table 5 (Cont.)

Reach	Stations	Representative Station	Stretch Length (ft)	Seepage without Cutoff Wall (ac-ft/yr)	Percent reduction based on cross section	Seepage with Cutoff Wall (ac-ft/yr)	Is Cutoff Wall Proposed at this Location?
4a	120+00 to 190+00	353+00	7,000	95	0	95	N
4b	190+00 to 228+00	217+00	3,800	490	0	490	N
5a	228+00 to 263+00	70+00	3,500	10	0	10	N
5b	263+00 to 280+00	27+00	1,700	6	0	6	N
6	280+00 to 330+00	217+00	5,000	650	85	100	Y
7a	330+00 to 345+00	353+00	1,500	20	85	3	Y
7b	345+00 to 362+00	353+00	1,700	23	85	3	Y
8	362+00 to 402+00	353+00	4,000	55	85	8	Y
9	402+00 to 430+00	353+00	2,800	38		38	N
9	430+00 to 468+10	353+00	3,800	50	85	8	Y
10	468+10 to 495+00	217+00	2,690	350	40	210	Y
11	495+00 to 635+00	217+00	14,000	1810	0	1810	N
12	635+00 to 640+00	217+00	500	65	0	65	N
12	640+00 to 667+00	70+00	2,700	7	0	7	N
13	667+00 to 700+00	353+00	3,300	45	40	30	Y
14	700+00 to 732+00	70+00	3,200	8	0	8	N
15	732+00 to 780+00	217+00	4,800	620	40	375	Y
16	780+00 to 832+00	217+00	5,200	675	0	675	N
17	832+00 to 842+00	217+00	1,000	130	40	80	Y
18	842+00 to 857+00	217+00	1,500	195	40	120	Y
19a	857+00 to 875+00	217+00	1,800	235	40	140	Y
19b	875+00 to 925+00	70+00	5,000	15	40	8	Y
20a	925+00 to 925+50	27+00	50	.2	0	.2	N
20b	925+50 to 960+00	27+00	3,550	13	0	13	N
Total Seepage				**5,650**		**4,330**	

The results presented in Table 5 indicate the construction of cutoff walls could potentially reduce the groundwater aquifer recharge landward of the levee by approximately 20-25%. Seepage through the levee foundation without the wall is estimated at 5,650 acre-feet per year. Seepage with the SB cutoff wall in place is approximately 4,330 acre-feet per year. The resulting impact to the groundwater recharge is approximately 1,300 acre-feet per year. In our opinion, these results are likely conservative and represent the upper-bound estimate. The actual impact is likely lower, due to 3-D effects that cannot be assessed with the existing modeling.

Step 10

A new 2 mile long canal will be constructed along the east levee between Stations 200+00 and 305+00. This canal, shown in plan in Attachment C, will be located approximately 500 to 1,000 feet landward of the levee toe and will follow the existing

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levee alignment. In general, the canal will be filled with water during summer months and will be dry during the winter months (See Plate 7).

We have evaluated the impact of the canal operation on the groundwater conditions in the area. Transient analyses were performed to estimate seepage quantities from and into the canal at various times throughout the year. The analyses were performed for Station 70+00 with a cutoff wall in place. The canal cross-section was incorporated into the transient analysis model described in Step 8 above as a 8 feet deep and 10 feet wide ditch with 3H:1V side slopes positioned 1,000 ft landward of the levee. The canal was assumed to be filled with up to 5 feet of water from May through November and was allowed to seep in the winter, modeled as a free seepage discharge face. The canal operation was modeled as another time-dependent boundary condition applied, as shown on Plate 22. The canal will be excavated through the surficial clay blanket which consists primarily of CL with some CH and ML soils with percent fines between 50 and 70 percent. The permeability of this layer is estimated at 10^{-5} cm/sec. This permeability was assigned to the surface layer to represent base-case conditions. The clay blanket thickness varies across the site and excavation of the canal may result in a complete removal of the surficial clay at some locations. To account for variability in subsurface conditions and the possibility of a complete removal of the clay blanket, we have conducted a sensitivity analysis with permeability of the surface layer increased by one order of magnitude (10^{-4} cm/sec). The results of this analysis provide an upper bound estimate of seepage losses from the canal.

Seepage quantities were calculated using a flux line placed along the perimeter of canal cross-section. Positive and negative quantities indicate flow from and into the ditch, respectively. The estimated seepage quantities as a function of time are shown on Plate 23. Based on the results of the transient analyses, seepage loss is estimated at 1.4 acre-t/year per 1,000 feet of the canal for base-case conditions. Only positive flow (flow from the canal) was considered in these computations. Seepage loss over the entire length of the canal is estimated at 15 acre-ft per year. The upper bound estimate is approximately 90 acre-ft per year.

We have also evaluated the combined impact of the cutoff wall construction and the canal operation on the groundwater table in the vicinity of the levee. This evaluation was performed based on the results of transient seepage analysis described in Steps 8 and 10. Seepage quantities as a function of time are shown graphically on Plate 24. Positive and negative quantities indicate flow from and into the river, respectively. Seepage quantities were calculated using a flux line placed immediately landside of the cutoff wall. In addition, groundwater table elevation was estimated as a function of time at the location halfway between the existing levee and the proposed canal. The results, provided on Plate 25, indicate minimal impact of the canal during winter months. However, during summer months groundwater table elevation in the immediate vicinity of the proposed wall locations could increase by as much as 3 feet. This increase is likely due to the combined effect of the cutoff wall preventing backflow into the river and the additional inflow from the canal.

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Conclusions

The key findings and conclusions presented in this memorandum are as follows:

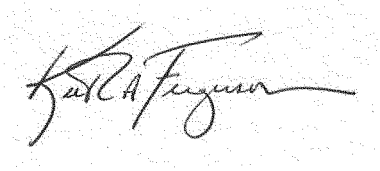
- Under the existing conditions seepage from the Sacramento River through the levee foundation along Sacramento River East Levee between Stations 00+00 and 960+00 is estimated to be about 5,650 acre-ft/year.
- At the proposed wall locations seepage flow could be reduced locally by up 85 percent, depending on stratigraphy and proposed wall depth.
- The overall impact of the proposed cutoff walls is estimated at approximately 1,300 acre-ft/year (20 percent reduction of the total recharge rate)
- The cutoff wall could impede seepage flow towards the river in the summer months when the river level is low.
- Construction of an irrigation canal may increase aquifer recharge by approximately 15 to 90 acre-ft per year.
- Construction of the cutoff wall and the canal may locally increase the groundwater levels up to 3 feet in the summer months.

Due to the limitations of the model, the analyses can only provide an order-of-magnitude estimate of the seepage quantities. Additional analyses with a three-dimensional model such as MODFLOW are recommended to properly characterize groundwater flow regime in the area account for 3-Dimensional effects and quantify the impact of the proposed SB cutoff wall on the aquifer recharge.

If you have questions regarding this design or require additional information, please contact either Elena Sossenkina at (303) 237-6601 or the undersigned.

Sincerely,

KLEINFELDER WEST, INC.



Keith A. Ferguson, PE
Principal Engineer

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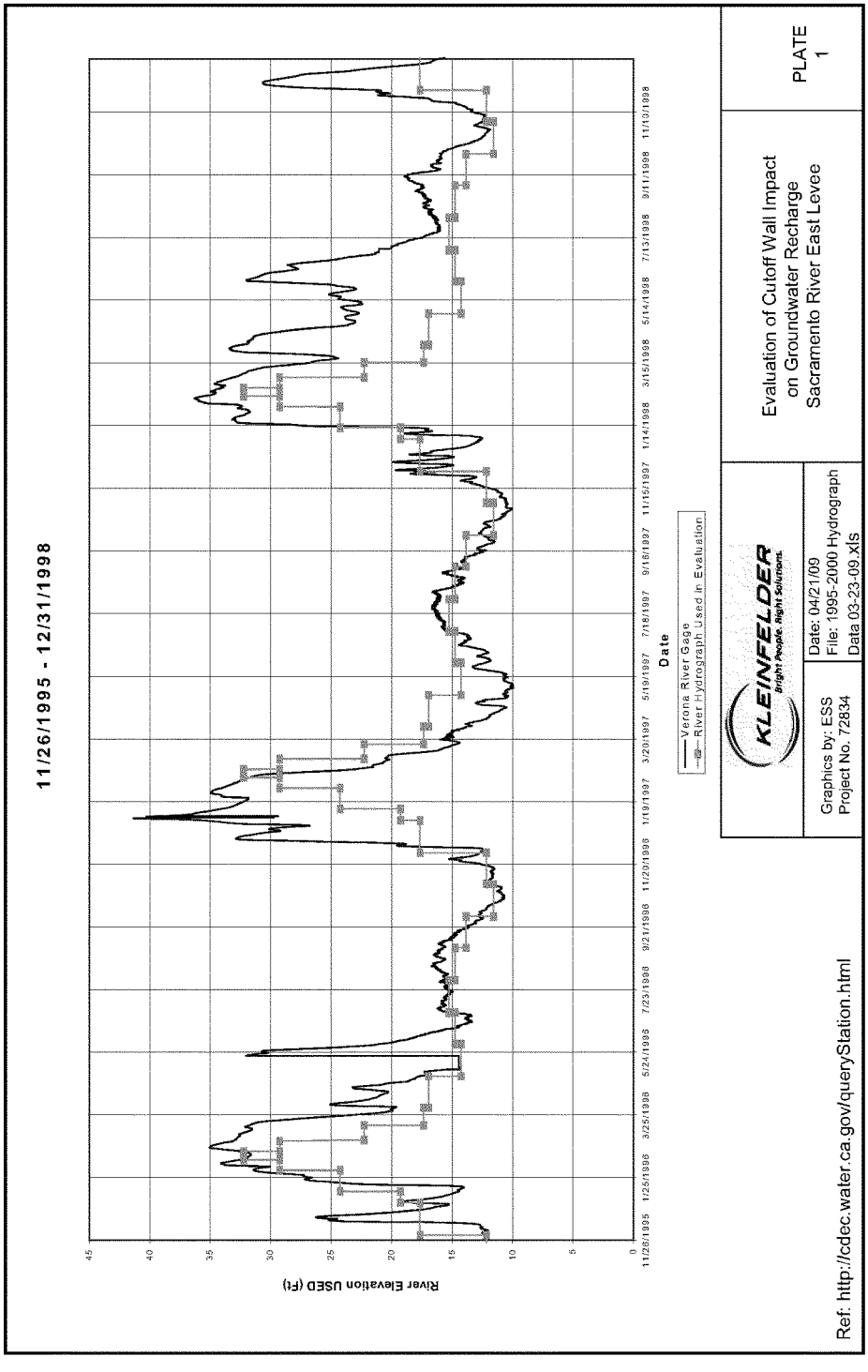
PLATES


11/26/1995 - 12/31/1998
River Elevation USED (Ft)
Date
Verona River Gage
River Hydrograph Used in Evaluation
Ref: http://cdec.water.ca.gov/queryStation.html
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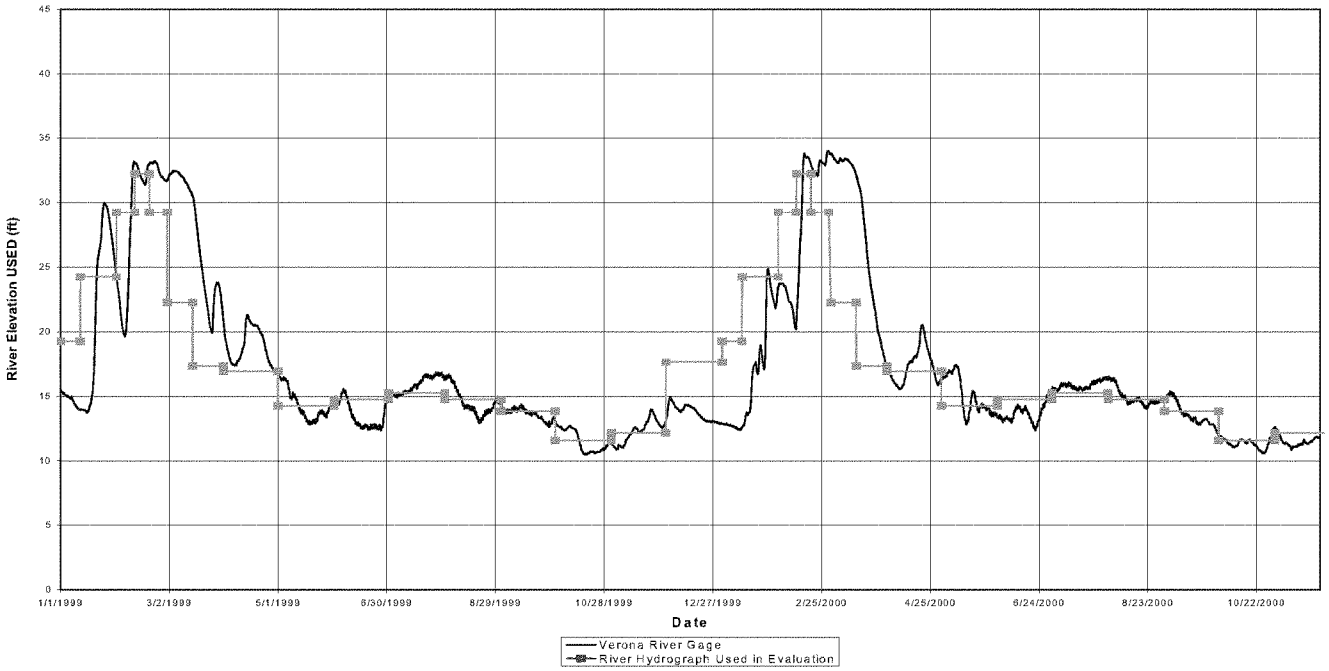
Graphics by: ESS
Project No. 72834
Date: 04/21/09
File: 1995-2000 Hydrograph
Data 03-23-09.xls
Evaluation of Cutoff Wall Impact
on Groundwater Recharge
Sacramento River East Levee
PLATE
1

01/01/1999 - 11/26/2000



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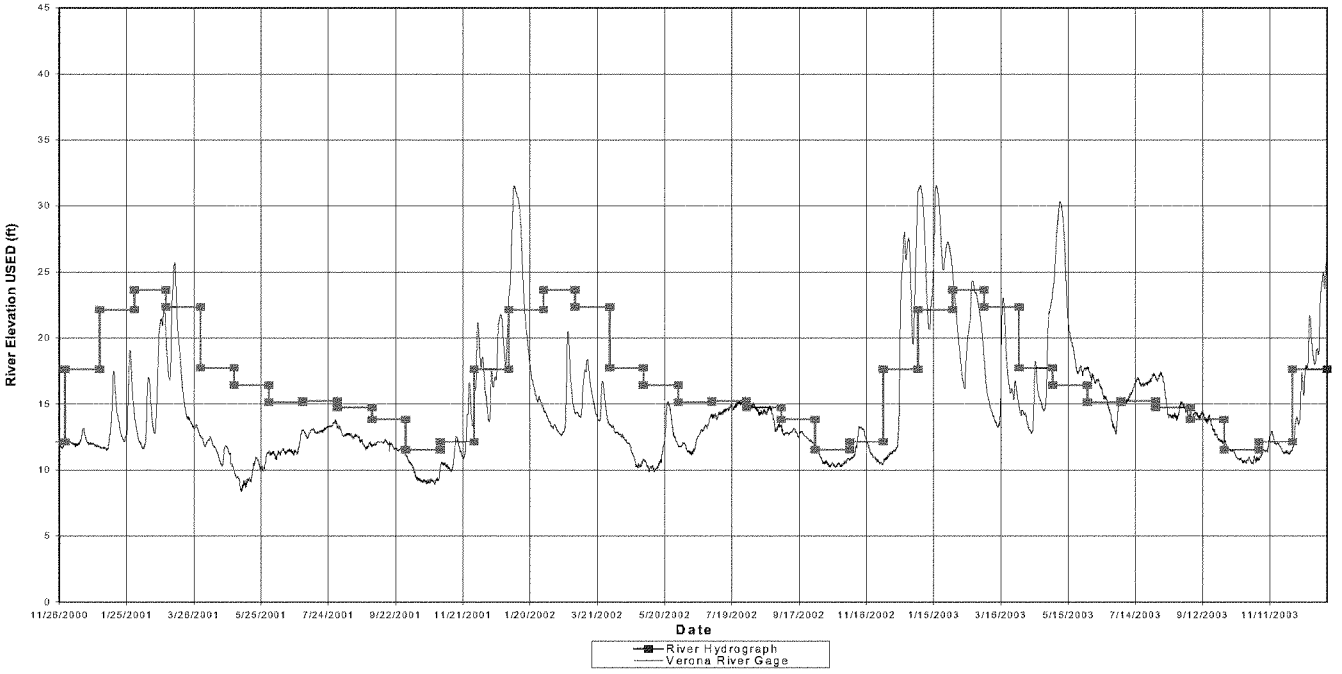
Date: 04/21/09
File: 1995-2000 Hydrograph Data 03-23-09.xls

Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee

PLATE 2

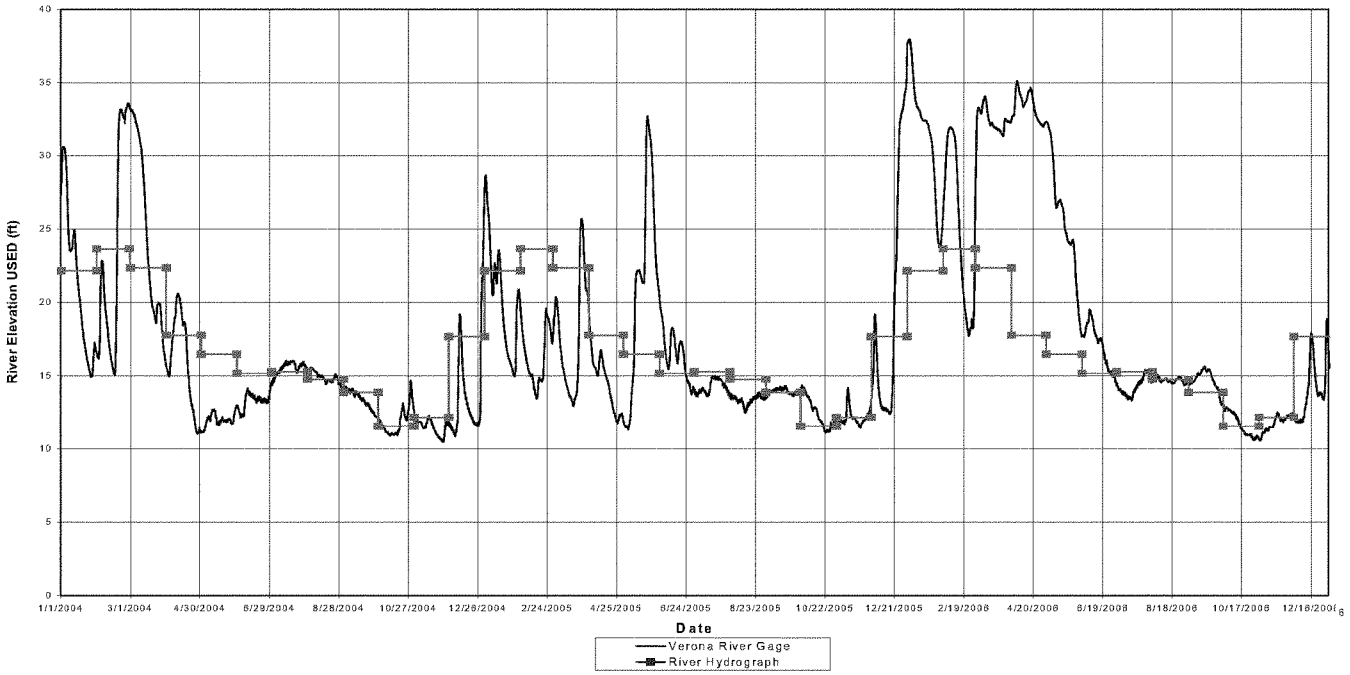
Ref: http://cdec.water.ca.gov/queryStation.html

11/26/2000 - 12/31/2003



KLEINFELDER Bright People. Right Solutions.		Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee	PLATE 3
Graphics by: ESS Project No. 72834	Date: 04/21/09 File: 00-07 Hydrograph Data 03-2309.xls		

Ref: http://cdec.water.ca.gov/queryStation.html



Ref: http://cdec.water.ca.gov/queryStation.html

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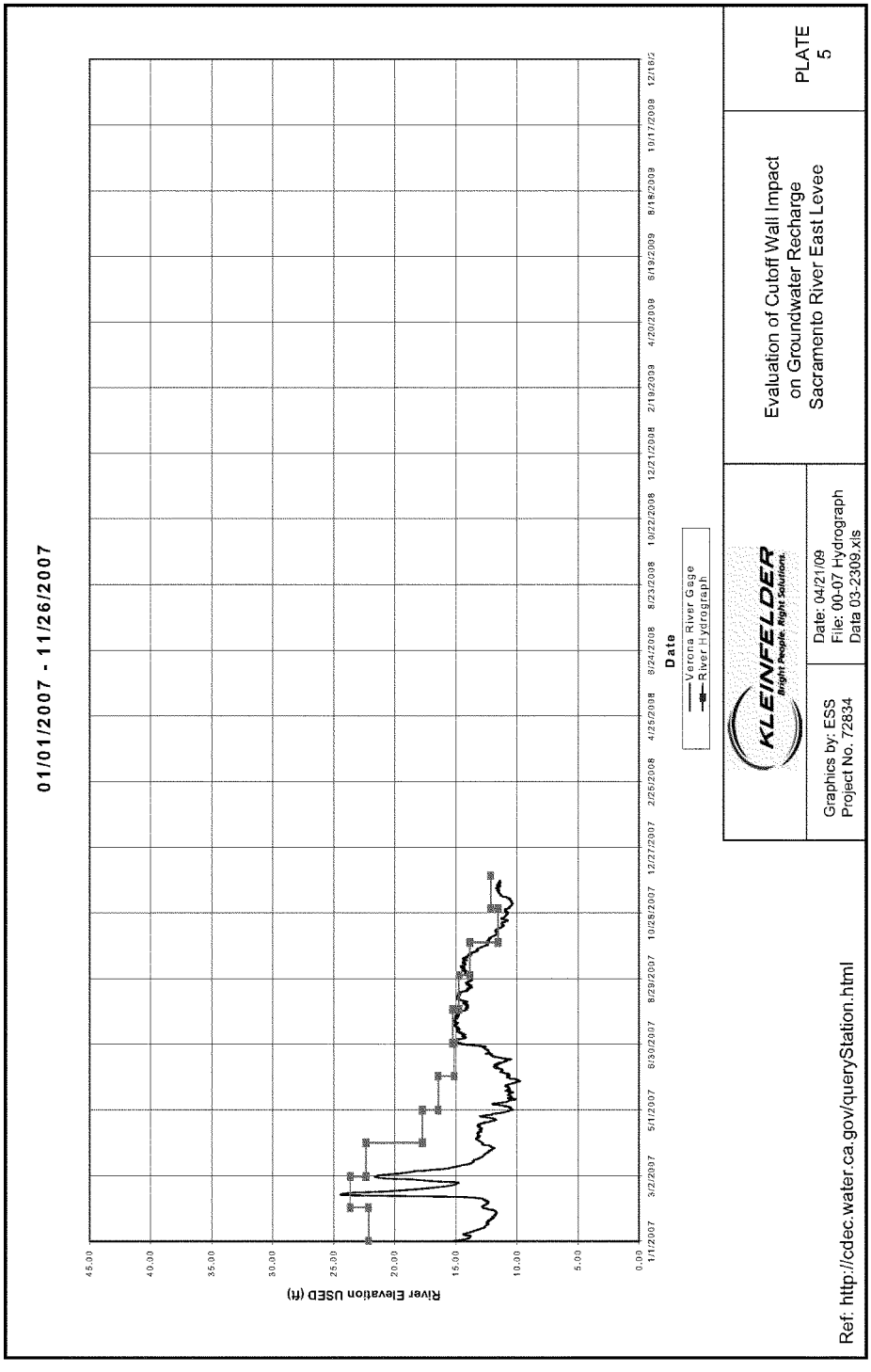
Graphics by: ESS
Project No. 72834

Date: 04/21/09
File:00-07 Hydrograph
Data 03-2309.xls

Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee

PLATE 4


01/01/2007 - 11/26/2007
River Elevation USED (ft)
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
1/1/2007
3/2/2007
5/1/2007
6/30/2007
8/29/2007
10/28/2007
12/27/2007
2/26/2008
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2/19/2009
4/20/2009
6/19/2009
8/18/2009
10/17/2009
Date
Verona River Gage
River Hydrograph
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Graphics by: ESS
Project No. 72834
Date: 04/21/09
File: 00-07 Hydrograph
Data 03-2309.xls
Evaluation of Cutoff Wall Impact
on Groundwater Recharge
Sacramento River East Levee
PLATE
5
Ref: http://cdec.water.ca.gov/queryStation.html

Sacramento River Elevation in Ft

Elevation	% of days per year river at given El.	Days per year river at El.	Elevation	% of days per year river at given El.	Days per year river at El.
8	0.0	0	25	1.2	4
9	0.5	2	26	0.8	3
10	1.2	4	27	1.0	4
11	8.2	30	28	0.8	3
12	12.4	45	29	0.7	3
13	12.3	45	30	0.8	3
14	12.5	45	31	1.2	4
15	11	40	32	2.6	10
16	7.8	29	33	2.9	10
17	5.4	20	34	1.4	5
18	3.5	13	35	0.8	3
19	2.3	8	36	0.2	1
20	1.8	7	37	0.1	0.4
21	1.9	7	38	0.1	0.4
22	1.5	6	39	0.0	0
23	1.4	5	40	0.0	0
24	1.7	6	41	0.0	0

Notes:

1. Historical river elevations in Plates 1-5 are reported in the USED datum. Elevations reported above are using NAVD88 datum. Satistics are based on data from the Verona River Gage obtained from http://cdec.water.ca.gov/queryStation.html from the period 11/26/1995-11/26/2007.
2. Elevations in the seepage models were adjusted to a nearest mesh node. Model Elevations are lower than elevations in NAVD88 by 0.03 feet.

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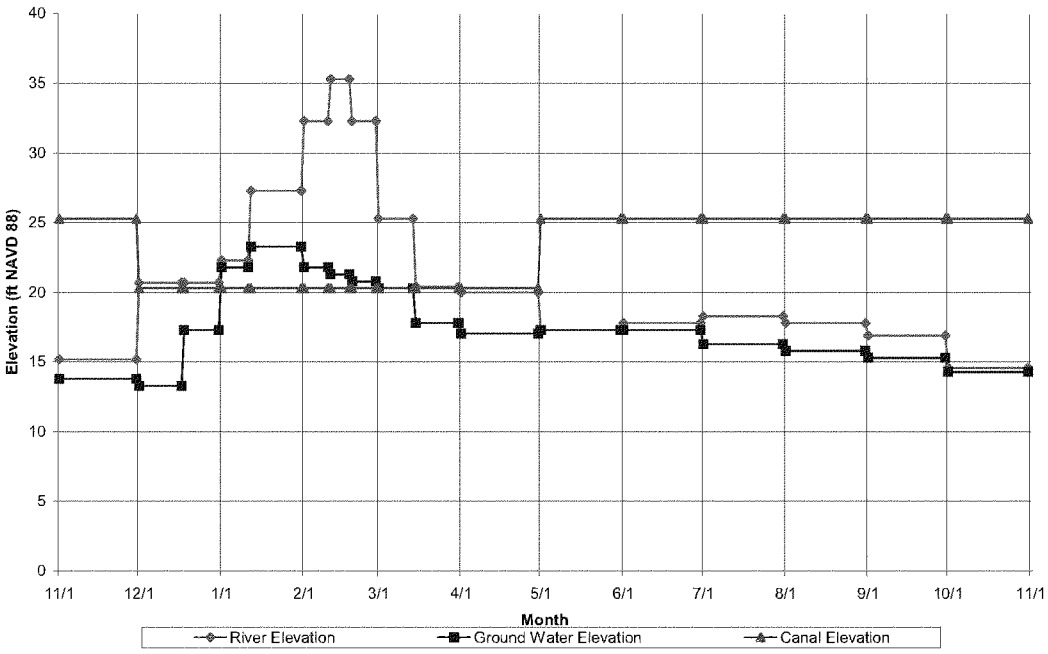
Date: 04/21/09
File: SacRiverCutoffWall Eval_04-07-09.ppt

Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee

PLATE 6

Groundwater, River, and Canal Hydrographs



Note: Elevations in the seepage models were adjusted to a nearest mesh node. Model Elevations are lower than elevations in NAVD88 by 0.03 feet.

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Graphics by: ESS
Project No. 72834

Date: 04/21/09
File: TransientTimeStep Elevs 03-20-09

Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee

PLATE 7

Transient Time Step Table

Time Step	Date	River Elevation	Ground Water Elevation	Canal Elevation
1	2/11	35.25	21.25	20.25
2	2/18	35.25	21.25	20.25
3	2/19	32.25	20.75	20.25
4	2/28	32.25	20.75	20.25
5	3/1	25.25	20.25	20.25
6	3/14	25.25	20.25	20.25
7	3/15	20.35	17.75	20.25
8	3/31	20.35	17.75	20.25
9	4/1	19.95	17.00	20.25
10	4/30	19.95	17.00	20.25
11	5/1	17.25	17.25	25.25
12	5/31	17.25	17.25	25.25
13	6/1	17.75	17.25	25.25
14	6/30	17.75	17.25	25.25
15	7/1	18.25	16.25	25.25
16	7/31	18.25	16.25	25.25
17	8/1	17.75	15.75	25.25
18	8/31	17.75	15.75	25.25
19	9/1	16.85	15.25	25.25
20	9/30	16.85	15.25	25.25
21	10/1	14.55	14.25	25.25
22	10/31	14.55	14.25	25.25
23	11/1	15.15	13.75	25.25
24	11/30	15.15	13.75	25.25
25	12/1	20.65	13.25	20.25
26	12/17	20.65	13.25	20.25
27	12/18	20.65	17.25	20.25
28	12/31	20.65	17.25	20.25
29	1/1	22.25	21.75	20.25
30	1/11	22.25	21.75	20.25
31	1/12	27.25	23.25	20.25
32	1/31	27.25	23.25	20.25
33	2/1	32.25	21.75	20.25
34	2/10	32.25	21.75	20.25

Note: Elevations in the seepage models were adjusted to a nearest mesh node. Model Elevations are lower than elevations in NAVD88 by 0.03 feet.

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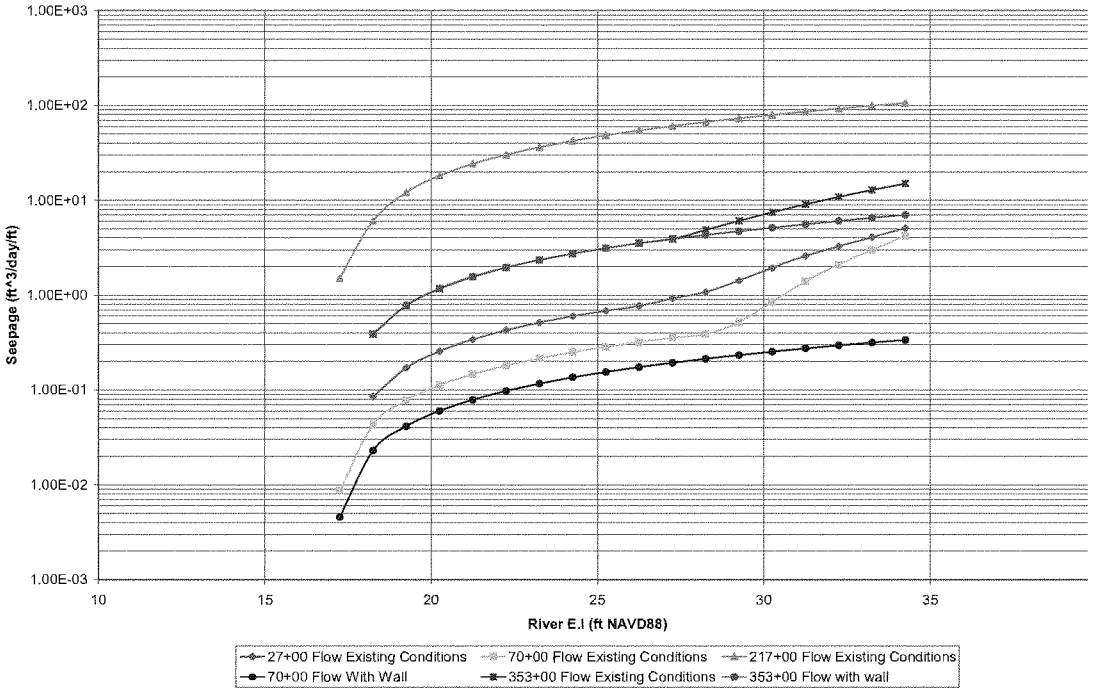
Graphics by: ESS
Project No. 72834

Date: 04/21/09
File: TransientTimeStep Elevs 03-23-09.xls

Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee

PLATE 8

Estimated Seepage vs River El.



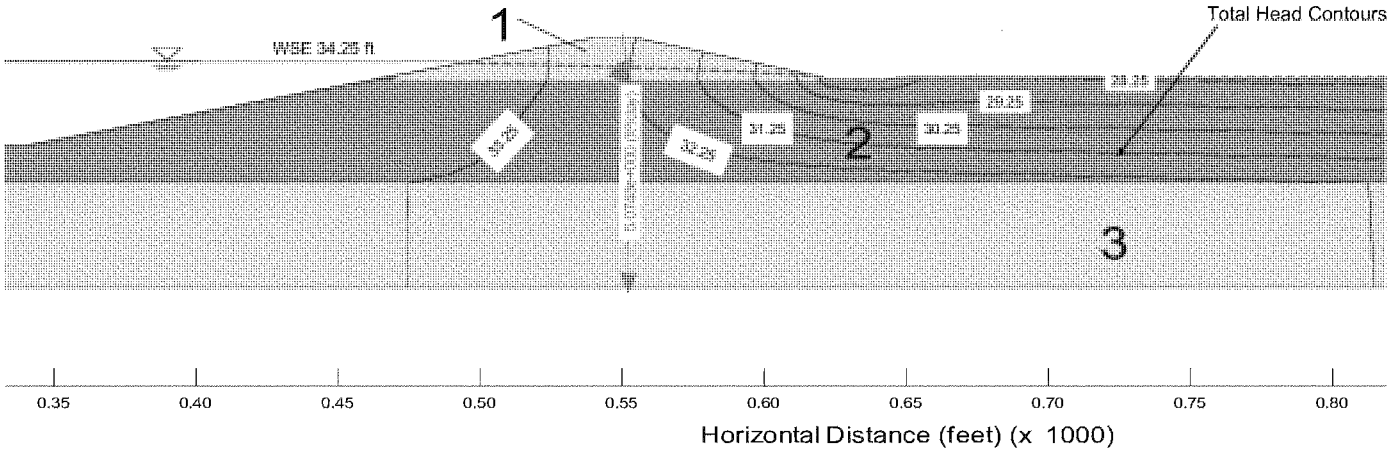
Note: Elevations in the seepage models were adjusted to a nearest mesh node. Model Elevations are lower than elevations in NAVD88 by 0.03 feet.

KLEINFELDER Bright People. Right Solutions.		Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee	PLATE 9
Graphics by: ESS Project No. 72834	Date: 04/21/09 File: 00-07 Hydrograph Data 03-23-09.xls		

STA 27+00, steady-state analysis, existing conditions
Total Flow: 3.9 acre ft/yr/1000 ft

Hydraulic Conductivity (Kh) and Anisotropy Ratio (Kv:Kh)

Material #1 Hyd K Fn: 7 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #2 Hyd K Fn: 5 Clay Ks=0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.25
Material #3 Hyd K Fn: 7 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25



Note: Elevations in the seepage models were adjusted to a nearest mesh node. Model Elevations are lower than elevations in NAVD88 by 0.03 feet.

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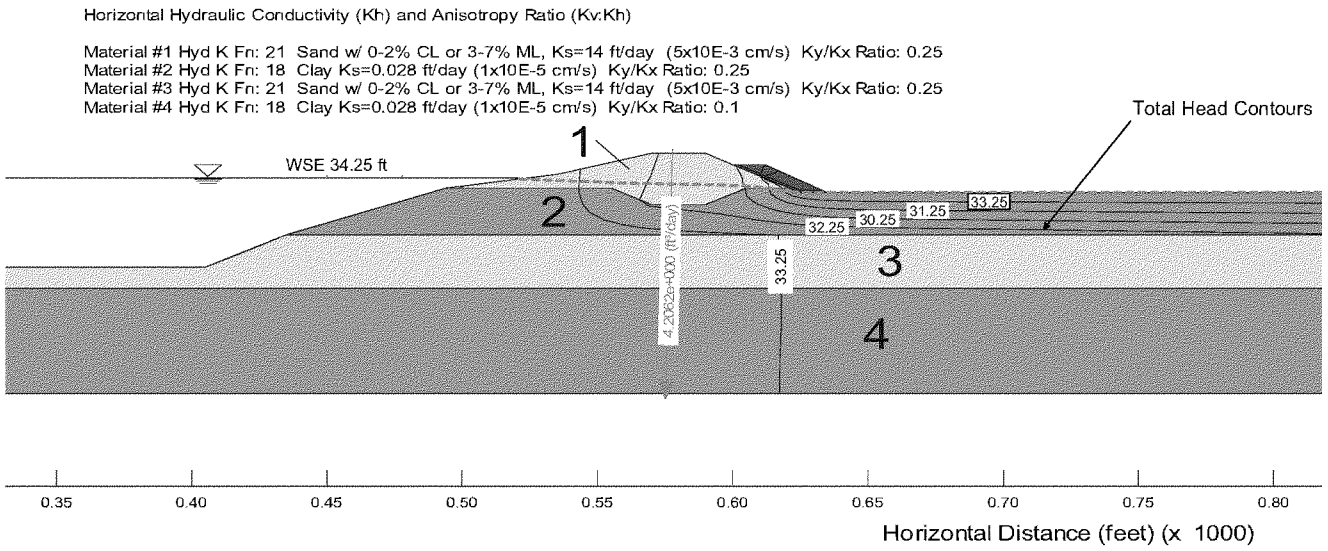
Project No. 72834

Date: 04/21/09
File: 27+00_Plate10

Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee

PLATE 10

STA 70+00, steady-state analysis, existing conditions
Total Flow: 2.6 acre ft/yr/1000 ft



Note: Elevations in the seepage models were adjusted to a nearest mesh node. Model Elevations are lower than elevations in NAVD88 by 0.03 feet.

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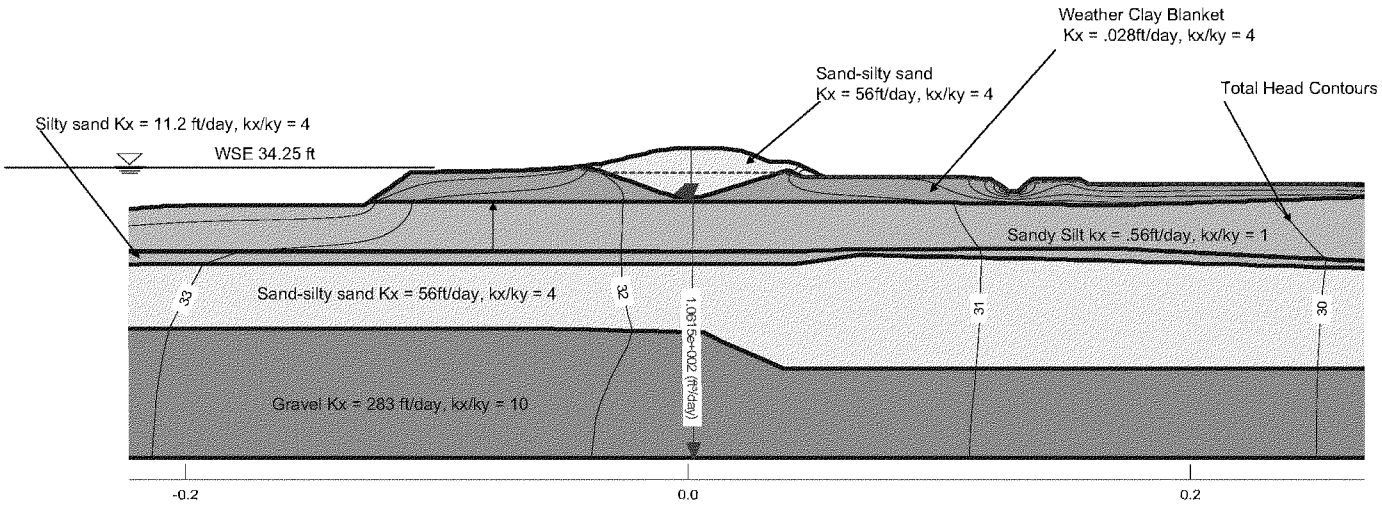
Graphics by: ESS
Project No. 72834

Date: 04/21/09
File: 70+00_Plate11

Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee

PLATE 11

STA 217+00, steady-state analysis, existing conditions
Total Flow: 129 acre ft/yr/1000 ft
Ref: URS model 217+00 from Sac Levees report 2007



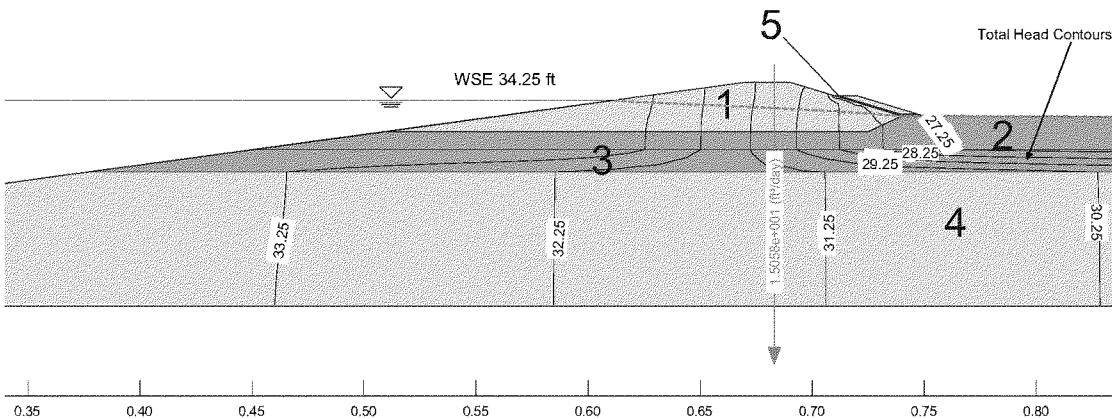
Note: Elevations in the seepage models were adjusted to a nearest mesh node. Model Elevations are lower than elevations in NAVD88 by 0.03 feet.

KLEINFELDER Bright People. Right Solutions.		Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee	PLATE 12
Graphics by: ESS Project No. 72834	Date: 04/21/09 File: 217+00_Plate12		

STA 353+00, steady-state analysis, existing conditions
Total Flow: 13.4 acre ft/yr/1000 ft

Horizontal Hydraulic Conductivity (Kh) and Anisotropy Ratio (Kv:Kh)

Material #1 Hyd K Fn: 9 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #2 Hyd K Fn: 7 Silt Ks=0.56 ft/day (2x10E-4 cm/s) Ky/Kx Ratio: 1
Material #3 Hyd K Fn: 5 Clay Ks=0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.1
Material #4 Hyd K Fn: 9 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #5 Hyd K Fn: 8 Drainage Rock Ks=2800 ft/day (10 cm/s) Ky/Kx Ratio: 1



Note: Elevations in the seepage models were adjusted to a nearest mesh node. Model Elevations are lower than elevations in NAVD88 by 0.03 feet.

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Graphics by: ESS
Project No. 72834

Date: 04/21/09
File: 353+00_Plate13

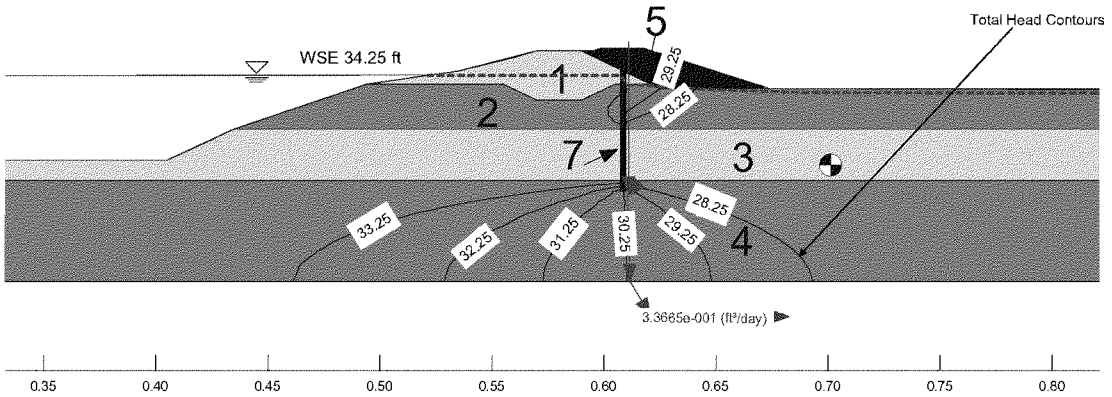
Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee

PLATE 13

STA 70+00, steady-state analysis, adjacent levee, with wall
Total Flow: 0.4 acre ft/yr/1000 ft

Horizontal Hydraulic Conductivity (Kh) and Anisotropy Ratio (Kv:Kh)

Material #1 Hyd K Fn: 10 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #2 Hyd K Fn: 7 Clay Ks=0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.25
Material #3 Hyd K Fn: 10 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #4 Hyd K Fn: 7 Clay Ks=0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.1
Material #5 Hyd K Fn: 8 Silt Ks= 0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.25
Material #7 Hyd K Fn: 11 Cutoff wall Ks = 0.0028ft/day (1.0x10-6 cm/sec) Ky/Kx Ratio: 1



Note: Elevations in the seepage models were adjusted to a nearest mesh node. Model Elevations are lower than elevations in NAVD88 by 0.03 feet.

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Graphics by: ESS
Project No. 72834

Date: 04/21/09
File: 70+00_Plate14

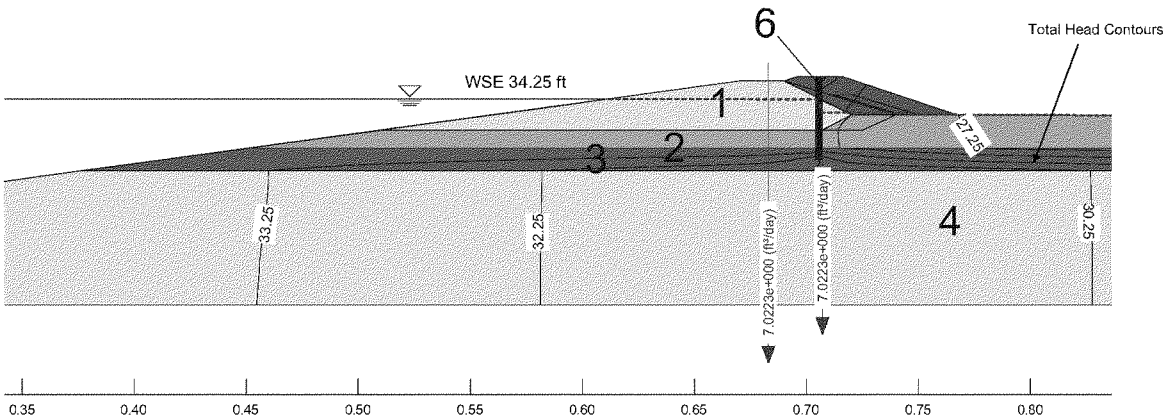
Evaluation of Cutoff Wall Impact on Groundwater Recharge
Sacramento River East Levee

PLATE 14

STA 353+00, steady-state analysis, adjacent levee, with wall
Total Flow: 8.4 acre ft/yr/1000 ft

Horizontal Hydraulic Conductivity (Kh) and Anisotropy Ratio (Kv:Kh)

Material #1 Hyd K Fn: 9 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #2 Hyd K Fn: 7 Silt Ks=0.56 ft/day (2x10E-4 cm/s) Ky/Kx Ratio: 1
Material #3 Hyd K Fn: 5 Clay Ks=0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.1
Material #4 Hyd K Fn: 9 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #6 Hyd K Fn: 10 Cutoff wall Ks = 0.0028 ft/day (1.0x10-6 cm/sec) Ky/Kx Ratio: 1



Note: Elevations in the seepage models were adjusted to a nearest mesh node. Model Elevations are lower than elevations in NAVD88 by 0.03 feet.

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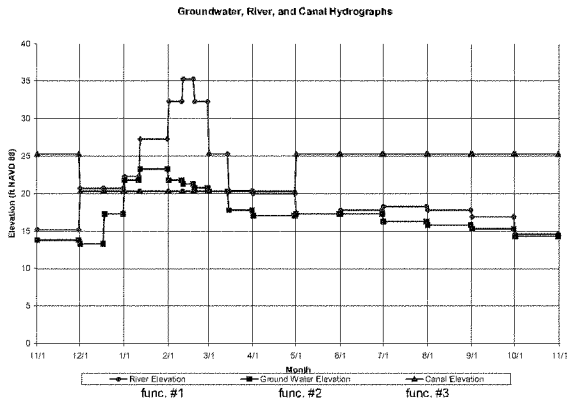
Graphics by: ESS
Project No. 72834

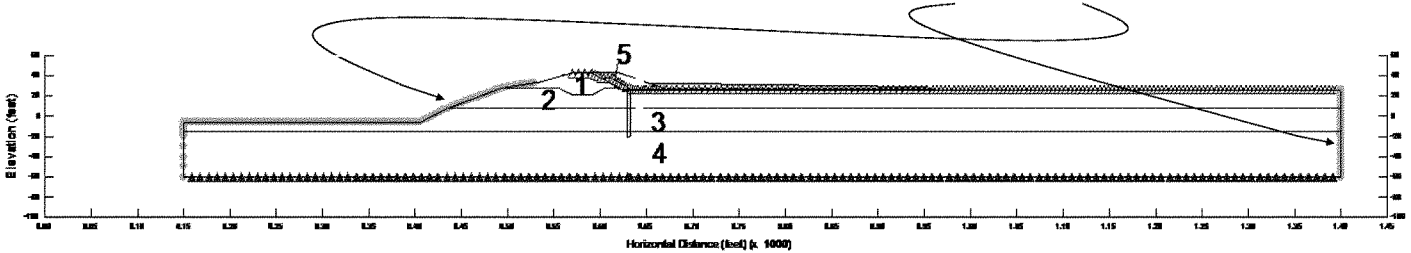
Date: 04/21/09
File: 353+00_Plate15

Evaluation of Cutoff Wall Impact on Groundwater Recharge
Sacramento River East Levee

PLATE 15

STA 70+00, boundary conditions
Transient analysis, existing conditions





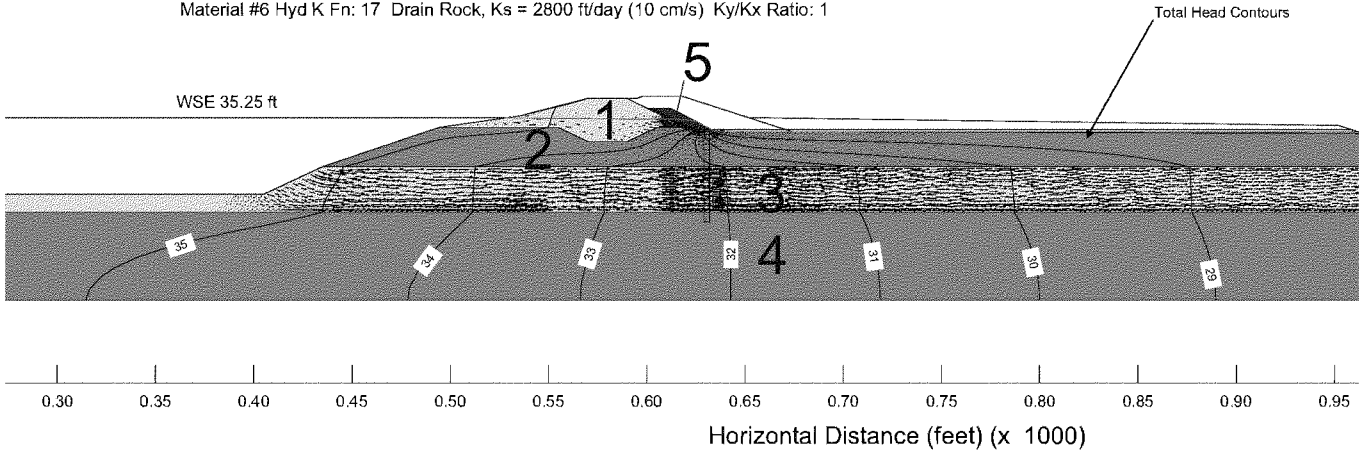
Note: Elevations in the seepage models were adjusted to a nearest mesh node. Model Elevations are lower than elevations in NAVD88 by 0.03 feet.

KLEINFELDER Bright People. Right Solutions.		Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee	PLATE 16
Graphics by: ESS Project No. 72834	Date: 04/21/09 File: 70+00_Plate16_BC		

STA 70+00, transient analysis, existing conditions
Time Step: 2 (Winter)

Horizontal Hydraulic Conductivity (Kh) and Anisotropy Ratio (Kv:Kh)

Material #1 Hyd K Fn: 21 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #2 Hyd K Fn: 18 Clay Ks=0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.25
Material #3 Hyd K Fn: 21 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #4 Hyd K Fn: 18 Clay Ks=0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.1
Material #5 Hyd K Fn: 19 Silt Ks= 0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.25
Material #6 Hyd K Fn: 17 Drain Rock, Ks = 2800 ft/day (10 cm/s) Ky/Kx Ratio: 1



Note: Elevations in the seepage models were adjusted to a nearest mesh node. Model Elevations are lower than elevations in NAVD88 by 0.03 feet.

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Graphics by: ESS
Project No. 72834

Date: 04/21/09
File: Tyler's adjusted run_ NAVD88

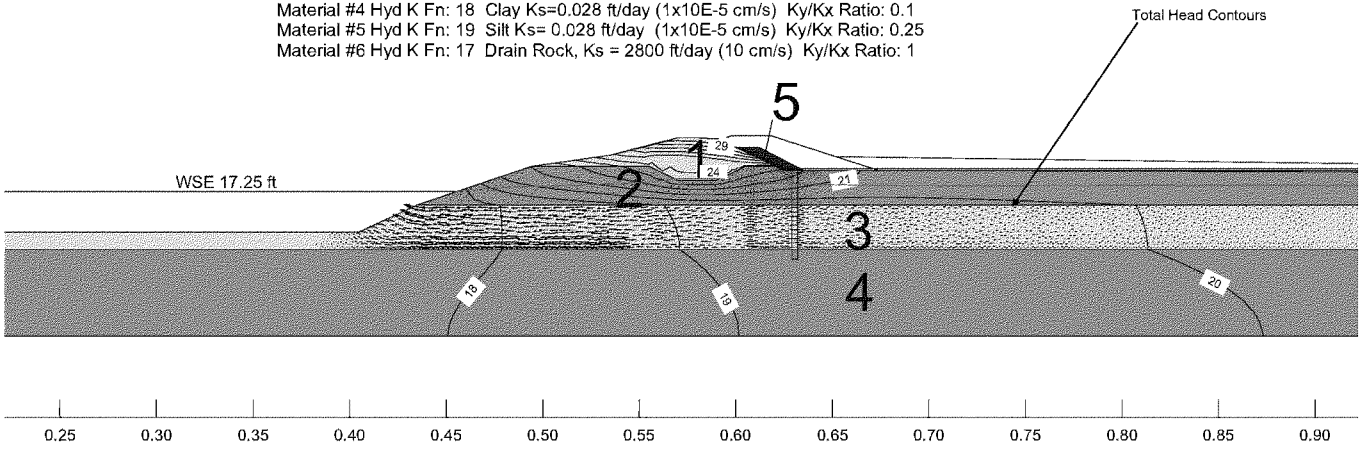
Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee

PLATE 17

STA 70+00, transient analysis, existing conditions
Time Step: 11 (Summer)

Horizontal Hydraulic Conductivity (Kh) and Anisotropy Ratio (Kv:Kh)

Material #1 Hyd K Fn: 21 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #2 Hyd K Fn: 18 Clay Ks=0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.25
Material #3 Hyd K Fn: 21 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #4 Hyd K Fn: 18 Clay Ks=0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.1
Material #5 Hyd K Fn: 19 Silt Ks= 0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.25
Material #6 Hyd K Fn: 17 Drain Rock, Ks = 2800 ft/day (10 cm/s) Ky/Kx Ratio: 1



Note: Elevations in the seepage models were adjusted to a nearest mesh node. Model Elevations are lower than elevations in NAVD88 by 0.03 feet.

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Graphics by: ESS
Project No. 72834

Date: 04/21/09
File: Tyler's adjusted run_ NAVD88

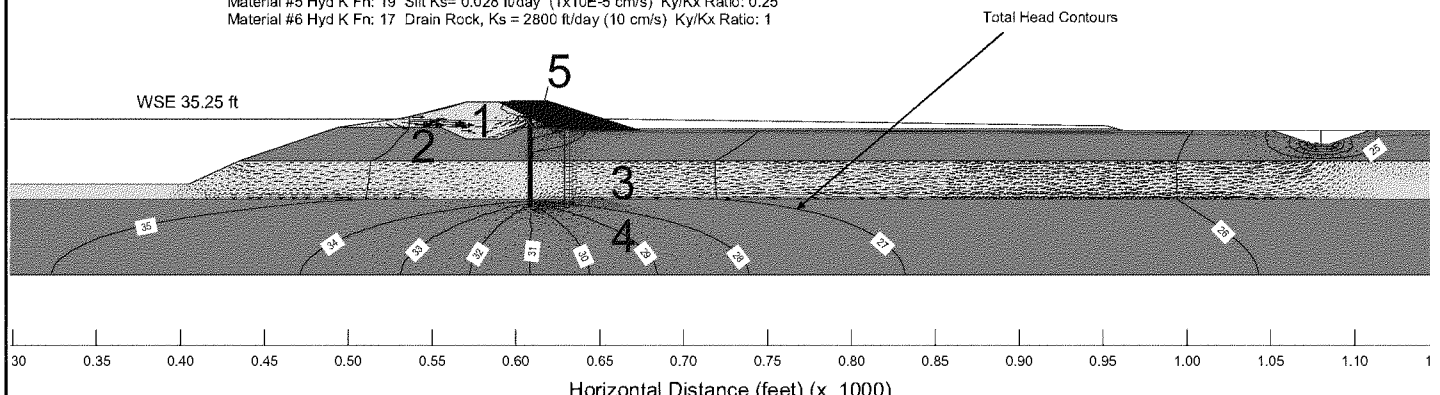
Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee

PLATE 18

STA 70+00, transient analysis with cutoff wall
Time Step: 2 (Winter)

Horizontal Hydraulic Conductivity (Kh) and Anisotropy Ratio (Kv:Kh)

Material #1 Hyd K Fn: 21 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #2 Hyd K Fn: 18 Clay Ks=0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.25
Material #3 Hyd K Fn: 21 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #4 Hyd K Fn: 18 Clay Ks=0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.1
Material #5 Hyd K Fn: 19 Silt Ks= 0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.25
Material #6 Hyd K Fn: 17 Drain Rock, Ks = 2800 ft/day (10 cm/s) Ky/Kx Ratio: 1



Note: Elevations in the seepage models were adjusted to a nearest mesh node. Model Elevations are lower than elevations in NAVD88 by 0.03 feet.

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Graphics by: ESS
Project No. 72834

Date: 04/21/09
File: Tyler's Original NAVD88 Transient with canal

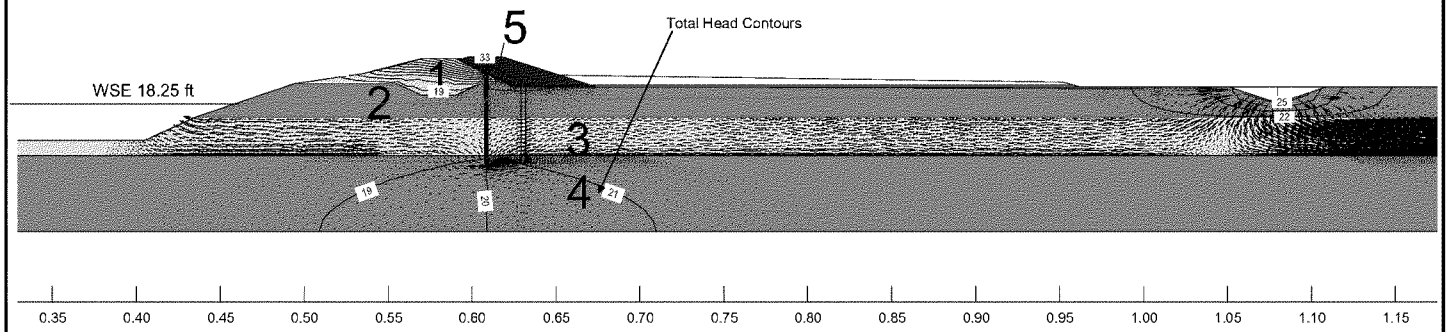
Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee

PLATE 19

STA 70+00, transient analysis with cutoff wall
Time Step: 16 (Summer)

Horizontal Hydraulic Conductivity (Kh) and Anisotropy Ratio (Kv:Kh)

Material #1 Hyd K Fn: 21 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #2 Hyd K Fn: 18 Clay Ks=0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.25
Material #3 Hyd K Fn: 21 Sand w/ 0-2% CL or 3-7% ML, Ks=14 ft/day (5x10E-3 cm/s) Ky/Kx Ratio: 0.25
Material #4 Hyd K Fn: 18 Clay Ks=0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.1
Material #5 Hyd K Fn: 19 Silt Ks= 0.028 ft/day (1x10E-5 cm/s) Ky/Kx Ratio: 0.25
Material #6 Hyd K Fn: 17 Drain Rock, Ks = 2800 ft/day (10 cm/s) Ky/Kx Ratio: 1



Note: Elevations in the seepage models were adjusted to a nearest mesh node. Model Elevations are lower than elevations in NAVD88 by 0.03 feet.

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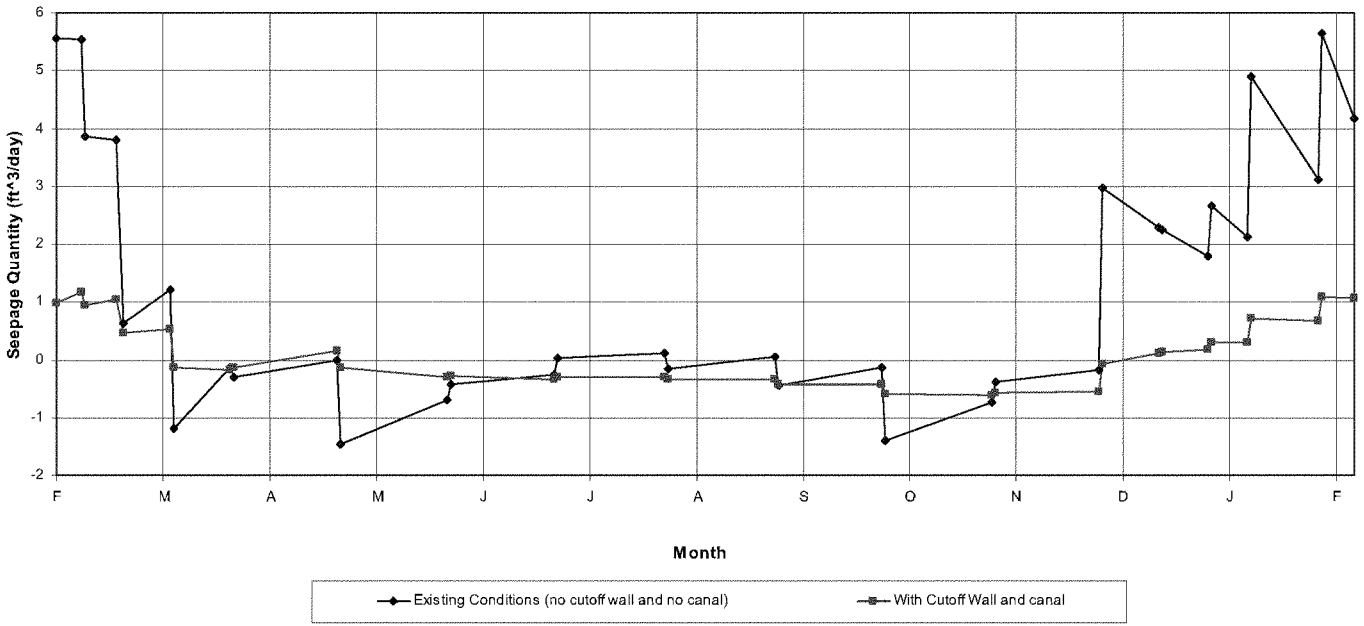
Graphics by: ESS
Project No. 72834

Date: 04/21/09
File: Tyler's Original NAVD88 Transient with canal

Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee

PLATE 20

Cutoff Wall Impact on Seepage Quantities



Notes:
1. Seepage quantities were calculated using a flux line placed approximately 40 feet from the landside of the cutoff wall. Positive and negative quantities indicate flow from and into the river, respectively.
2. Elevations in the seepage models were adjusted to a nearest mesh node. Model Elevations are lower than elevations in NAVD88 by 0.03 feet.

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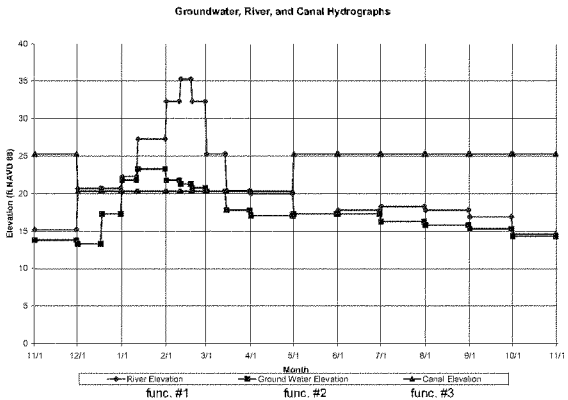
Project No. 72834

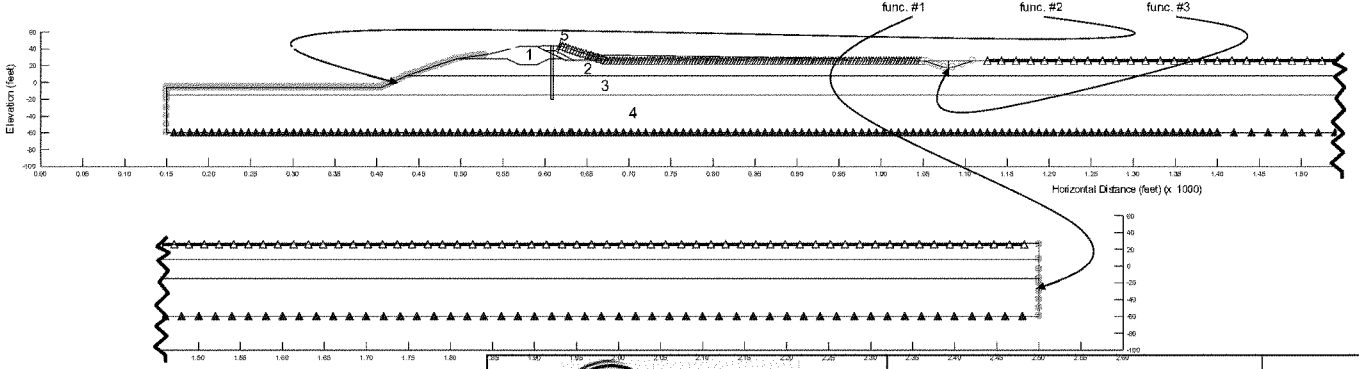
Date: 04/21/09
File: plate 21

Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee

PLATE 21

STA 70+00, boundary conditions,
Transient analysis with cutoff wall and canal





Note: Elevations in the seepage models were adjusted to a nearest mesh node. Model Elevations are lower than elevations in NAVD88 by 0.03 feet.

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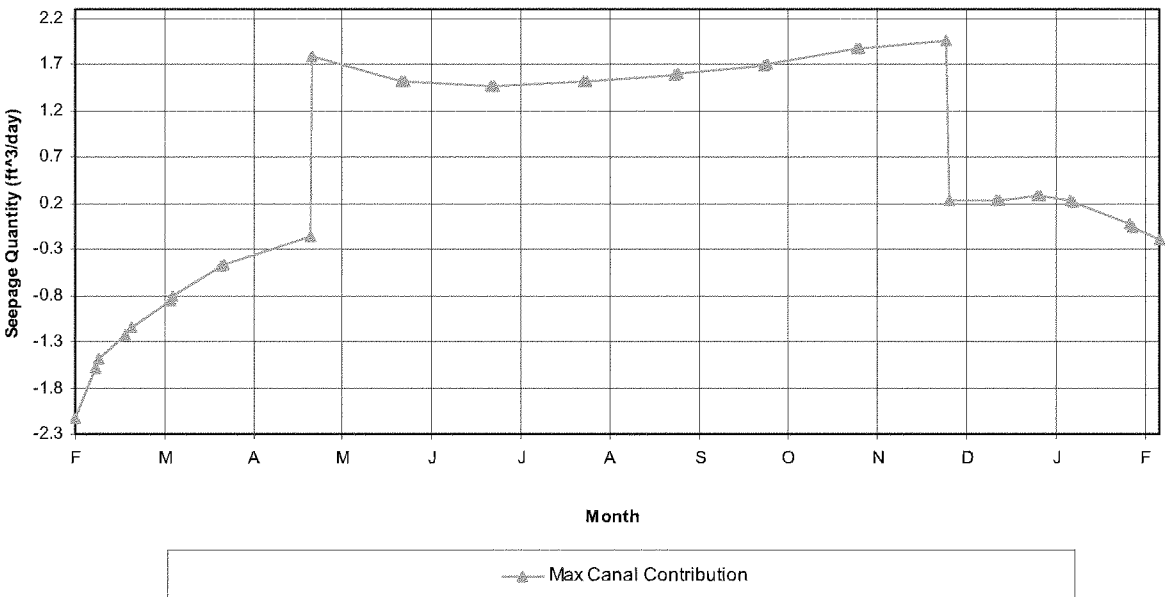
Project No. 72834

Date: 04/21/09
File: 70+00-Plate22_BC

Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee

PLATE 22

Canal Contribution to Groundwater Recharge



Notes:
1. Seepage quantities were calculated using a flux line placed along the perimeter of the canal cross section. Positive and negative quantities indicate flow from and into the canal, respectively.
2. Elevations in the seepage models were adjusted to a nearest mesh node. Model Elevations are lower than elevations in NAVD88 by 0.03 feet.

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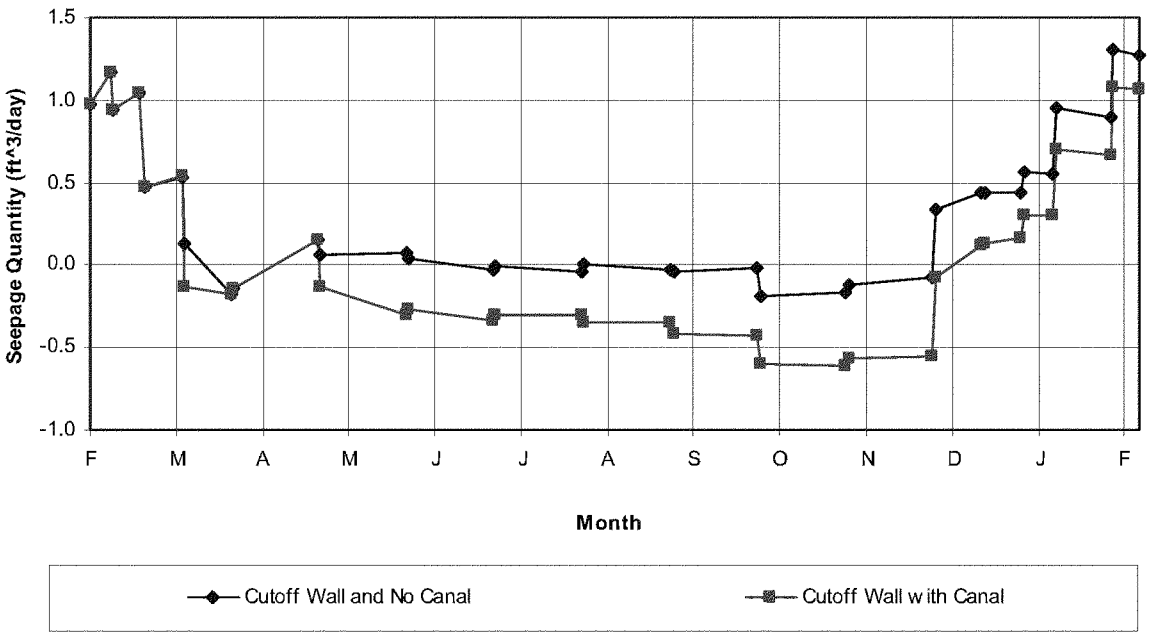
Project No. 72834

Date: 04/21/09
File: plate 23

Evaluation of Cutoff Wall Impact on Groundwater Recharge
Sacramento River East Levee

PLATE 23

Combined Impact of Cutoff Wall and Canal on Seepage Quantities



Note:
1. Seepage quantities were calculated using a flux line placed approximately 40 feet from the landside of the cutoff wall. Positive and negative quantities indicate flow from and into the river, respectively.
2. Elevations in the seepage models were adjusted to a nearest mesh node. Model Elevations are lower than elevations in NAVD88 by 0.03 feet.

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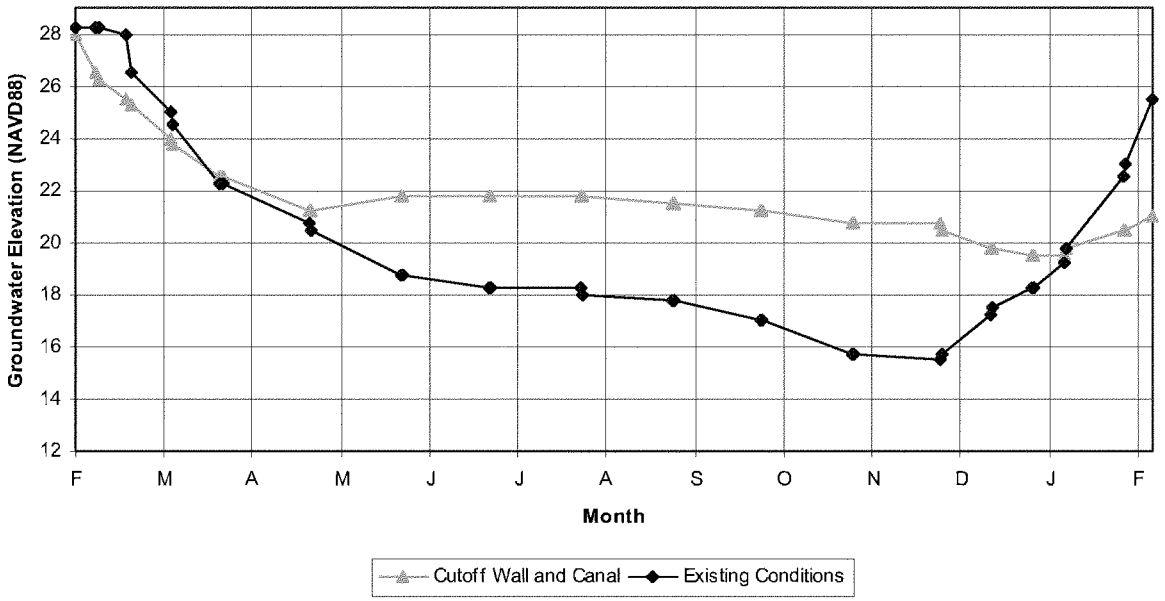
Project No. 72834

Date: 04/21/09
File: plate 24

Evaluation of Cutoff Wall Impact on Groundwater Recharge
Sacramento River East Levee

PLATE 24

Estimated Groundwater Table Elevation



Note:
1. Groundwater table elevation estimated at the locations halfway between the existing levee and the canal (~187 ft from levee toe).
2. Elevations in the seepage models were adjusted to a nearest mesh node. Model Elevations are lower than elevations in NAVD88 by 0.03 feet.

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Project No. 72834

Date: 04/21/09
File: plate 25

Evaluation of Cutoff Wall Impact on Groundwater Recharge Sacramento River East Levee

PLATE 25

ATTACHMENT A

PIEZOMETER DATA
AND
GROUNDWATER ELEVATION CONTOUR MAP

FINAL OBSERVATION WELLS REPORT II
For Reaches North and South of Powerline Road

AMERICAN RIVER WATERSHED PROJECT (COMMON FEATURES), CALIFORNIA SACRAMENTO RIVER LEVEE AND BERM STRENGTHENING

Contract No.: DACW05-00-D-0003
Specifications No.:
Drawing File No.:

Prepared by:
URS.

Prepared For:

US Army Corps of Engineers
Sacramento District

24 November 2003

AUTHORITY: WATER RESOURCES DEVELOPMENT ACT OF 1996

General Observations

No major storm events causing high river stages occurred during the entire monitoring period. During both winters, the river stage rose between 15 and 20 feet. The river stages and piezometer levels were generally highest in December through the end of January and gradually decreased after January.

The results of the monitoring program are discussed and evaluated herein in three parts: a general review of the monitoring results, a comparison of river stages and piezometer levels, and a qualitative correlation between analysis results and monitoring results. Conclusions and recommendations are presented subsequently.

General Review of Monitoring Results

A continuous record of monitoring results of river stages and landside piezometer levels was obtained during this monitoring program. Only the relatively deep USACE piezometers gave meaningful results. The RD-1000 piezometers were installed too high to yield meaningful data during this period of relatively low river stages.

As noted, no significant high-river-stage events occurred during the monitoring period. Nevertheless, the piezometer data showed significant rises in the groundwater levels in response to higher river stages. The piezometer levels were always well below the ground surface on the landside of the levee, consequently no evidences of upward seepage were expected, and none were observed.

Comparisons of Piezometer Levels to River Stages

The first comparison is between piezometer levels at the landside levee toe and river stages, made for two locations. The Verona (VON) gage is located near 2F-01-15 (North of Powerline Road) as shown in Figure 2-1. The correlation between river stage recorded at VON and ground water level recorded at piezomter 2F-01-15 is depicted in Figure 5-1. Also shown in this figure is the comparison of piezometer 2F-01-19 with two gages, Bryte (BRY) and RD1000, which are located south of Powerline (see Figure 2-1). The findings from these comparisons are shown in Figure 5-1 and they indicate the following:

2F-01-15 N:

Two distinct trends are evident.

- The river stages were approximately 1 to 3 feet below the ground water levels in the piezometer during low river stage.
- The river stages were approximately 9 to 10 feet above the ground water levels in the piezometer during high river stage.
- Note that Piezometer 2F-01-15 N is installed in an area of reported incidences of seepage and boils.

2F-01-19 S:

Two distinct trends are evident.

- The river stages were approximately 1 to 1.5 feet below the ground water levels in the piezometer during low river stage.
- The river stages were approximately 4 to 5 feet above the ground water levels in the piezometer during high river stage.
- Note that no incidence of seepage and boils were reported at the location of this piezometer

The subsurface conditions at these two piezometer locations are shown in Figures 5-1 b and 5-1c. The sand aquifer in 2F-01-15N and 2F-01-19S starts at depths of 73.5 feet and 32.5 feet, respectively. The soil above the sand aquifer is fine grained soil consisting of clay, silt, and silty sand. The difference between the river stage and water level at the piezometer during the peak river stage is higher for piezometer 2F-01-15N for than piezometer 2F-01-19 S. The reason for the more pronounced time lag in Piezometer 2F-01-15 N is probably caused by the thicker and less pervious blanket which slows the percolation time.

Comparison of Water Levels between Near-field and Far-field Piezometers

The second comparison is between piezometer levels at different distances from the landside levee toe and river stages, at two locations. This comparison was made for piezometers relatively aligned in a transverse direction to the river.

1. Piezometers 2F-01-26 and 2F-01-28 (both north of Powerline Road) are located on the landside toe and about 250 feet from the landside levee toe, respectively. The comparison of the two readings is shown in Figure 5-2.

The ground water level at the near-toe piezometer is generally about 1.25 ft higher than the far-field piezometer during high river stage, while the ground water levels are similar during low river stage.

2. Piezometers 2F-01-68 and 2F-01-69 (both north of Powerline Road) are located about 50 feet and 200 feet, respectively, from the levee toe. The comparisons of these readings are shown in Figure 5-3.

The ground water level at the near-toe piezometer is generally about 3.0 feet higher than the far-field piezometer during high river stage, while the water levels are generally similar during low river stage.

Qualitative Correlation between Monitoring Results and Analysis Results

This correlation was made qualitatively only, using results of previous underseepage analyses (URS 2002d and 2002e). The scope of the monitoring program did not include additional underseepage analyses.

First, there was an apparent slight time lag of not more than several days between river stage peaks and piezometer level peaks, as seen in Figure 5-1. This amount of time lag was expected based on transient seepage analyses. Considering that a high river stage typically lasts several days, use of steady-state underseepage analyses is justified and is not expected to lead to any significant conservatism in analysis results.

Second, as expected, the measured piezometer levels resemble the river stages but show lower amplitude. This is expected as a result of seepage head losses in the aquifer between the seepage entrance point and the landside measuring location. For the same reason, the piezometer levels farther from the levee toe are lower than those near the levee.

Conclusions

The monitoring results demonstrate the rapid response of landside seepage conditions to changes in river stages. The groundwater response to higher river stage has a short time lag and relatively smaller attenuation of the peaking amplitudes. The results did not allow any correlation between measured flood stage and surface seepage effects, because of the lack of high river stages during the monitoring period.

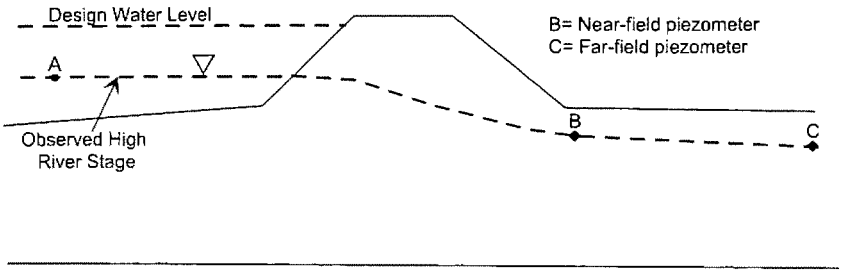


Figure 5-4- Schematic of Locations of Near-field and Far-field Piezometers

Nevertheless, the river stage, near-field and far-field piezometer readings are providing a window into a better assessment of the far-field boundary conditions and overall calibration of the model. As far as numerical seepage modeling is concerned, the observed water levels at points A, B, and C can be used for the calibration. This calibration will serve to minimize the uncertainty in selecting the appropriate boundary conditions, especially the far-field boundary condition and to provide insight into the estimate of the in-situ permeability of the soil. This calibrated model can then be used to predict the seepage response of the levee system for higher design water level.

Recommendations

Two recommendations are drawn from this monitoring program:

- We recommend the continuation of the piezometer and river stage monitoring program. However, the frequency of the monitoring program could be revisited. We also recommend that only Sacramento River and I-Street gages be monitored.

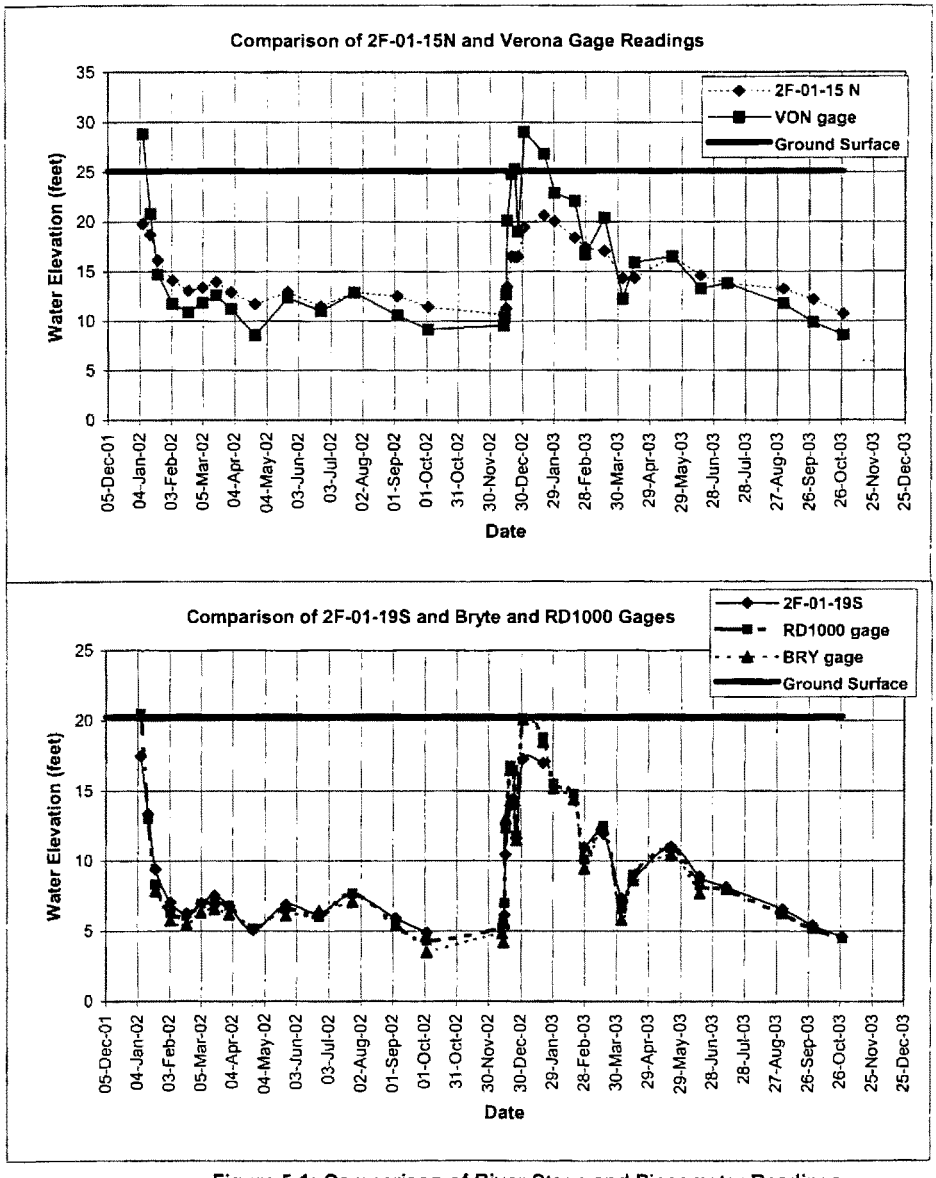
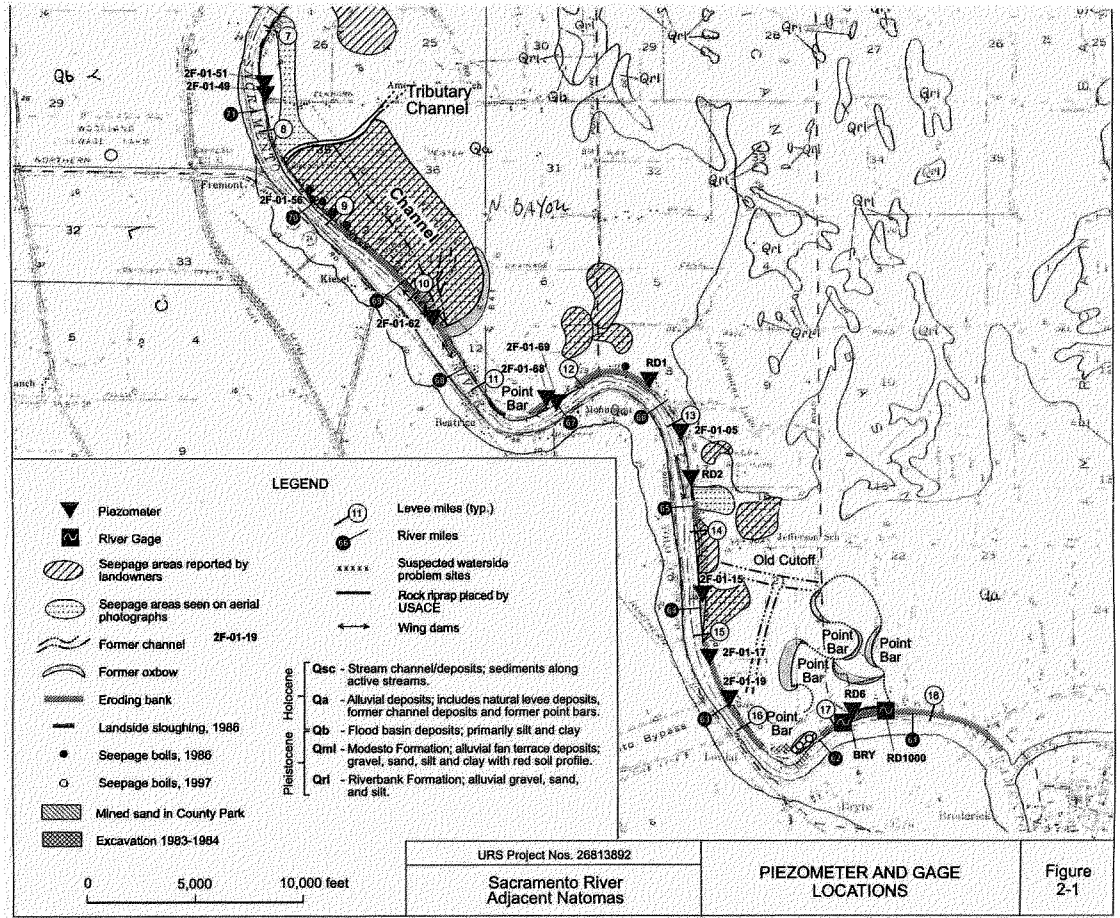
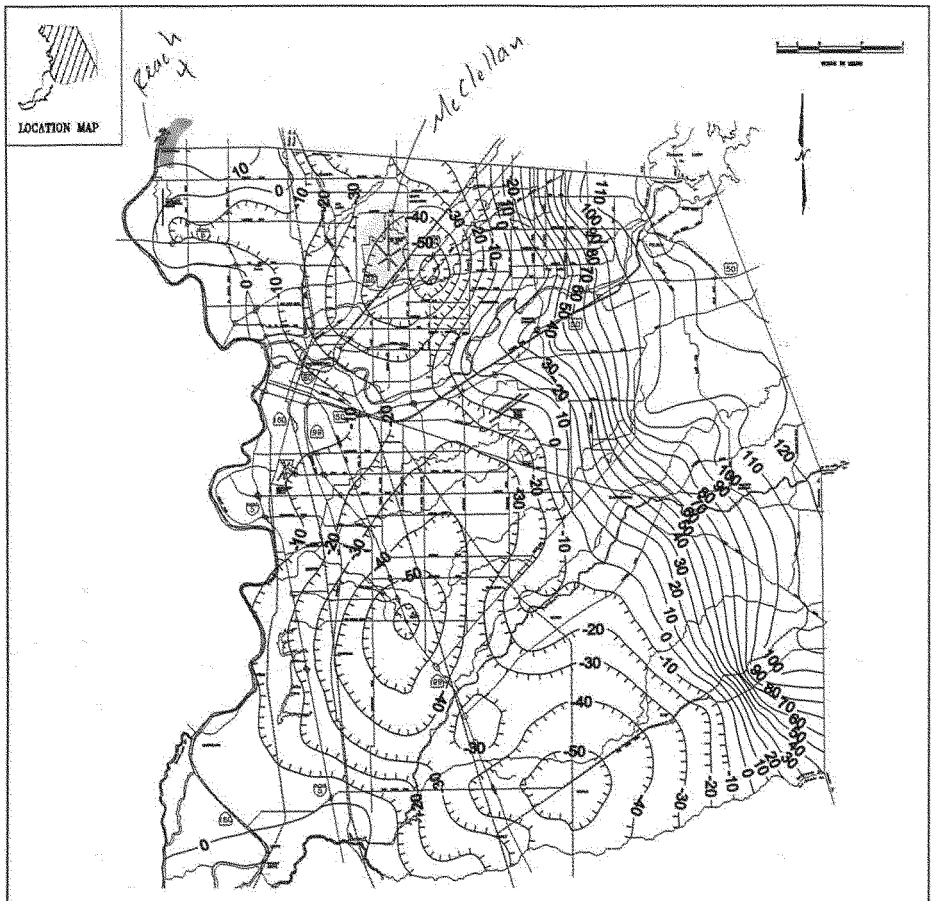


Figure 5-1: Comparison of River Stage and Piezometer Readings


Tributary Channel
Channel
Point Bar
Old Cutoff
Point Bar
Point Bar
Point Bar
Point Bar
2F-01-51
2F-01-49
2F-01-56
2F-01-62
2F-01-69
2F-01-68
2F-01-05
2F-01-15
2F-01-17
2F-01-19
RD1
RD2
RD6
BRY
RD1000
Fremont
Natomas
Beatrice
LEGEND
Piezometer
River Gage
Seepage areas reported by landowners
Seepage areas seen on aerial photographs
Former channel
Former oxbow
Eroding bank
Landside sloughing, 1986
Seepage boils, 1986
Seepage boils, 1997
Mined sand in County Park
Excavation 1983-1984
Levee miles (typ.)
River miles
Suspected waterside problem sites
Rock riprap placed by USACE
Wing dams
Holocene
Qsc - Stream channel/deposits; sediments along active streams.
Qa - Alluvial deposits; includes natural levee deposits, former channel deposits and former point bars.
Qb - Flood basin deposits; primarily silt and clay
Pleistocene
Qml - Modesto Formation; alluvial fan terrace deposits; gravel, sand, silt and clay with red soil profile.
Qrl - Riverbank Formation; alluvial gravel, sand, and silt.
0
5,000
10,000 feet
URS Project Nos. 26813892
Sacramento River
Adjacent Natomas
PIEZOMETER AND GAGE LOCATIONS
Figure 2-1
26813892.00000/112003/pos



SACRAMENTO COUNTY, CALIFORNIA

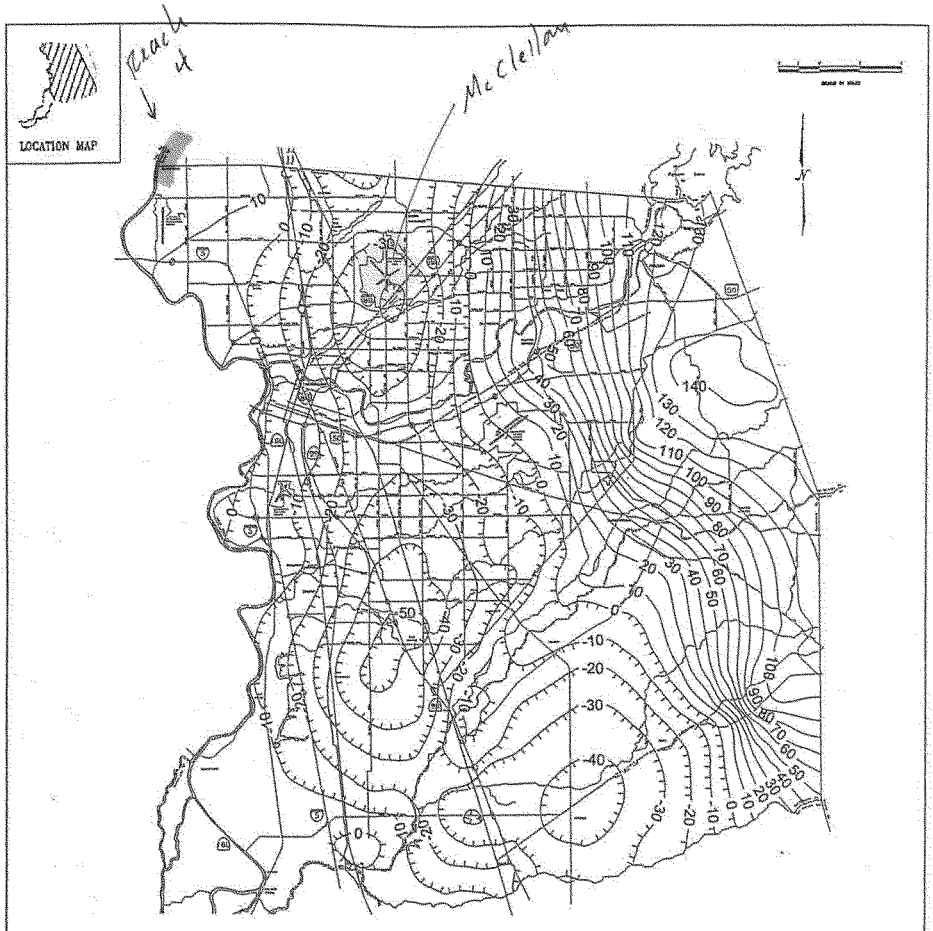
GROUNDWATER ELEVATIONS
FALL 2003
MEAN SEA LEVEL

COUNTY OF SACRAMENTO PUBLIC WORKS AGENCY DEPARTMENT OF WATER RESOURCES

FALL 2003

DRAWN: MARCH 2004
BY: T. Crick

NOTE: THIS GROUND WATER CONTOUR MAP IS FOR COMPARISON PURPOSES ONLY. SPECIFIC INFORMATION SHOULD BE OBTAINED BY INDEPENDENT INVESTIGATION.


LOCATION MAP
McClellan
SACRAMENTO COUNTY, CALIFORNIA
GROUNDWATER ELEVATIONS
SPRING 2003
MEAN SEA LEVEL
COUNTY OF SACRAMENTO
PUBLIC WORKS AGENCY
DEPARTMENT OF WATER RESOURCES
SPRING 2003
DRAWN: JULY 2003
BY: T. Crick
NOTE: THIS GROUND WATER CONTOUR MAP IS FOR COMPARISON PURPOSES ONLY. SPECIFIC INFORMATION SHOULD BE OBTAINED BY INDEPENDENT INVESTIGATION.

ATTACHMENT B

SUBSURFACE PROFILE
SACRAMENTO RIVER EAST LEVEE

LOG LEGEND

Exploration Number

Percent Gross (Material passing No. 200 sieve)

Bioreccurrent (Bioreclined) using 3 in. O.D. California Sampler

Groundwater Level (at time of drilling)

CH, Moderate to high plasticity Organic Silts and Clays

CH, Fat Clay

MH, Elastic Silt

OL, Low plasticity Organic Silts and Clays

CL, Lean Clay; Sandy Lean Clay

ML, Silt, Sandy Silt

SC, Clayey Sand

SM, Silty Sand; Silty Sand with Gravel

SP, Poorly Graded Sand; Poorly Graded Sand with Gravel

SP-SC, Poorly Graded Sand with Clay

SP-SM, Poorly Graded Sand with Silt

SW, Well Graded Sand; Well Graded Sand with Gravel

SW-SC, Well Graded Sand with Clay

SW-SM, Well Graded Sand with Silt

GC, Clayey Gravel

GM, Silty Gravel; Silty Gravel with Sand

GP, Poorly Graded Gravel; Poorly Graded Gravel with Sand

GP-GC, Poorly Graded Gravel with Clay

GP-GM, Poorly Graded Gravel with Silt

GW, Well Graded Gravel; Well Graded Gravel with Sand

GW-GC, Well Graded Gravel with Clay

GW-GM, Well Graded Gravel with Silt

Total Depth of Exploration Data Completed

0.23 Kleinfelder Calculated Seepage Gradient at 100-YR, WSE

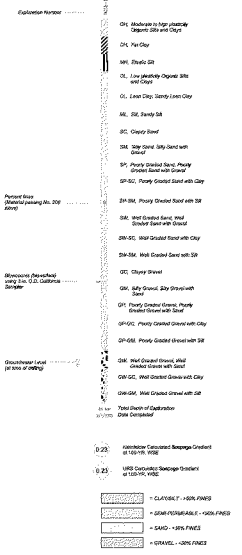
0.23 URS Calculated Seepage Gradient at 100-YR, WSE

= CLAYSILT - >50% FINES

= SEMI-PERMEABLE - >50% FINES

= SAND - >50% FINES

= GRAVEL - >50% FINES



Notes:

1. Base drawings for these levee profiles, obtained in August 2005 from the Sacramento District U.S. Army Corps of Engineers (USACE) and used with their permission, include stick logs of previous explorations, a levee crown profile, a landside levee toe profile, notes regarding levee performance and completed levee improvements, and elevation scale based on the 1929 National Geodetic Vertical Datum (NGVD, 1929).

2. Logs of the following explorations were added to the USACE base drawings: Kleinfelder 2006 borings (SRE-06-XX); Kleinfelder 2005 borings (SRB-XX); Kleinfelder 2003/2004 Borings S-03-1, S-03-2, S-03-3, S-03-4.

3. Locations of explorations shown are approximate. See Plate 2A through 2E for approximate plan locations of explorations.

4. The log legend shown applies to Kleinfelder 2005 borings (SRB-XX) and Kleinfelder 2006 borings (SRE-06-XX). Caution is advised in using the legend for interpretation of other explorations.

5. Logs represent general soil conditions observed at the point of exploration on the date indicated. Refer to Kleinfelder's 2005 report and Kleinfelder's 2006 report for more detail on the Kleinfelder 2005 borings (SRB-XX) and 2006 borings (SRE-06-XX).

6. Lines separating strata on logs represent approximate boundaries only. Actual transitions may be gradual.

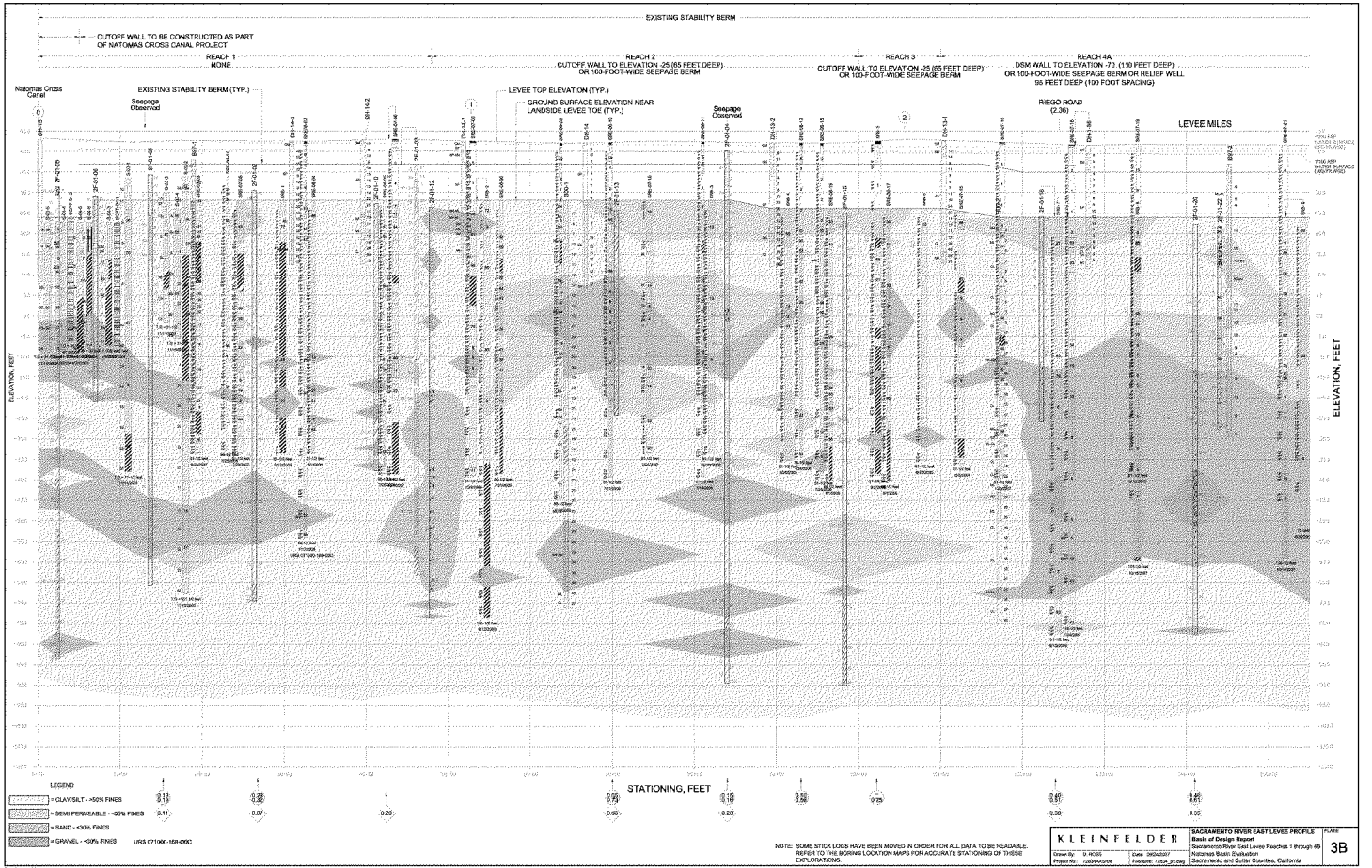
7. No warranty is provided as to the continuity of soil conditions between individual sample locations.

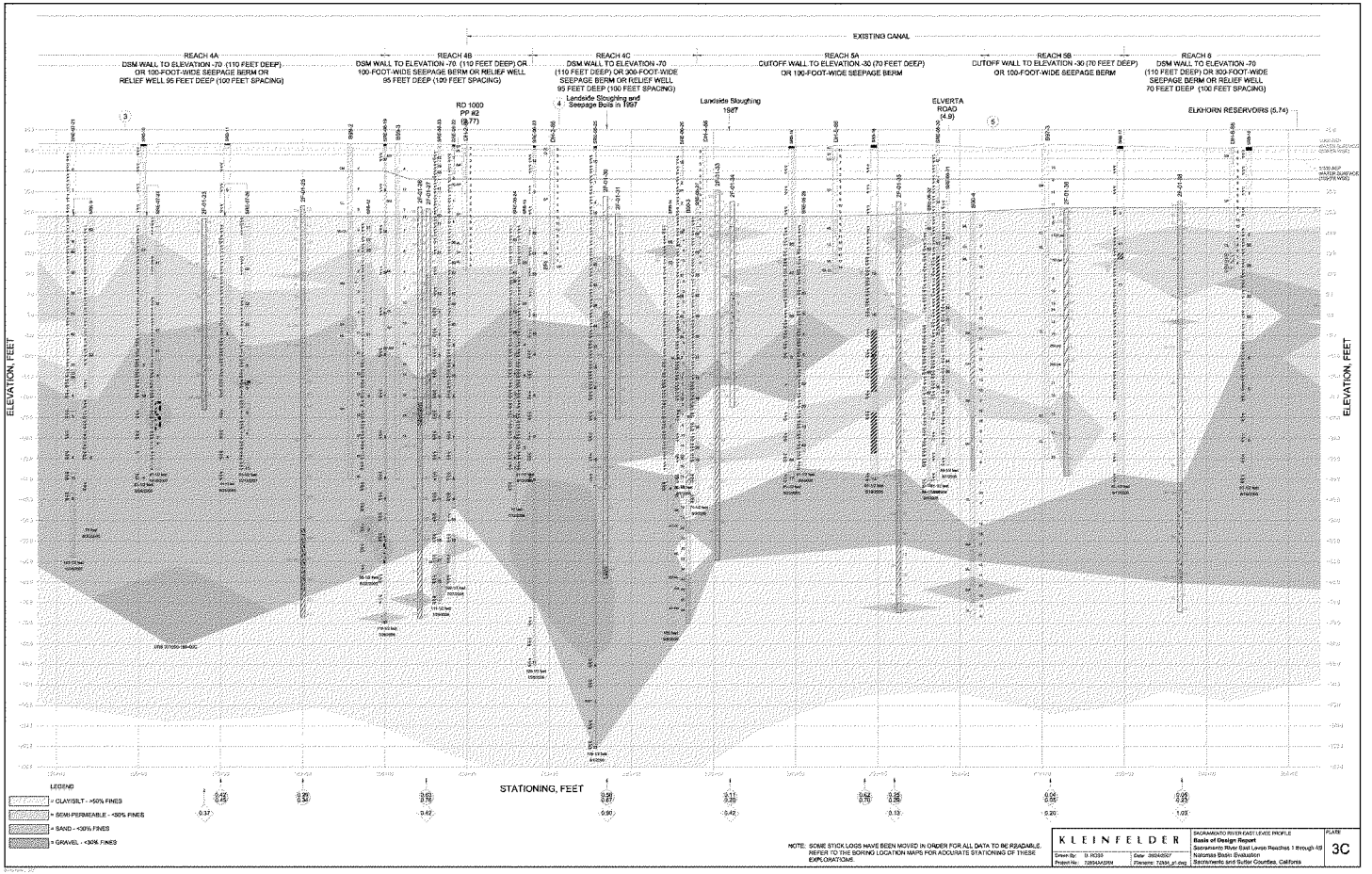
8. Approximate top of boring elevations for Kleinfelder 2006 borings (SRE-06-XX) were obtained using GPS equipment survey; Kleinfelder 2005 borings (SRB-XX) were estimated using topographic data obtained by USACE 1997.

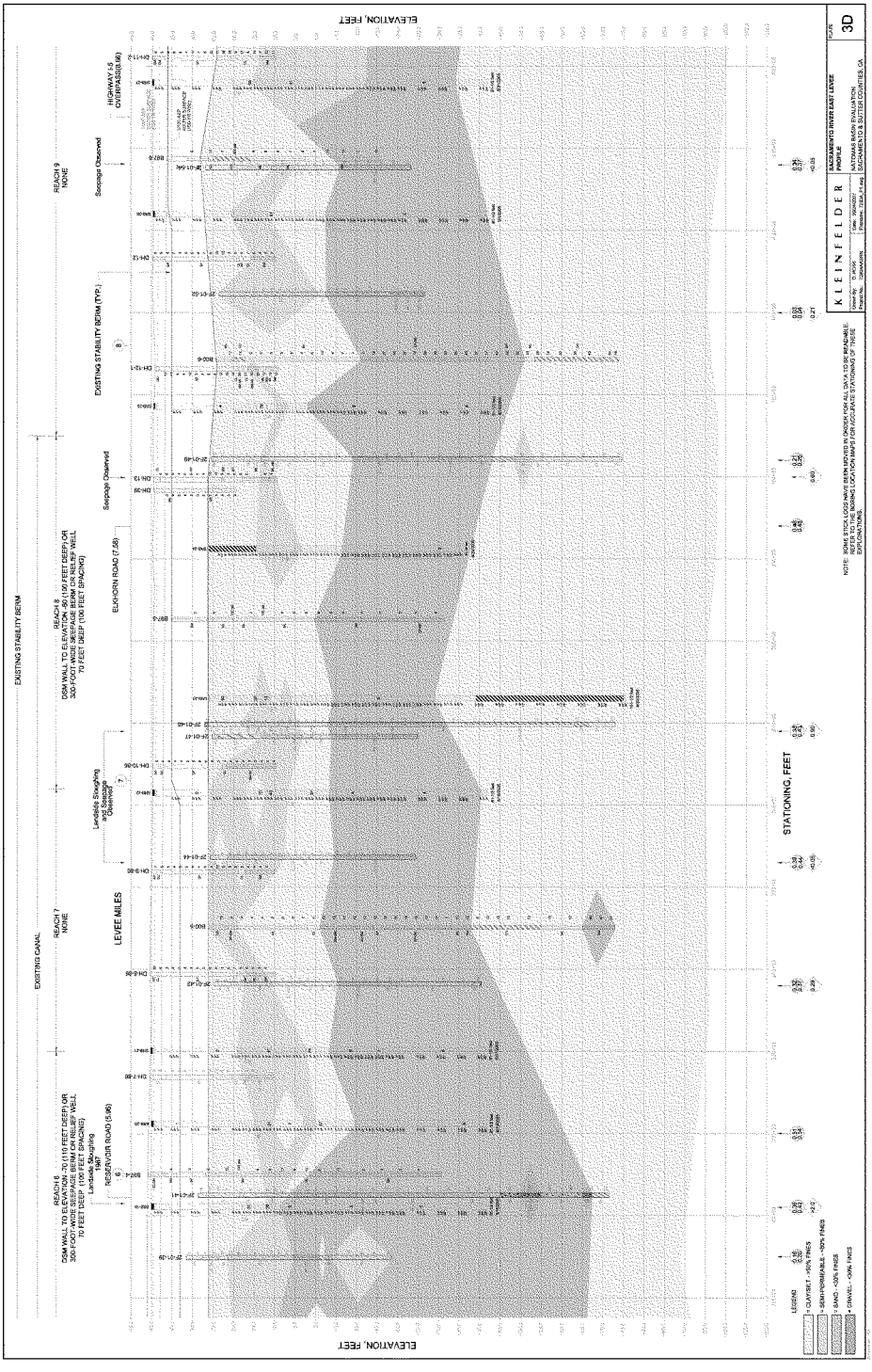
9. The 1/100 AEP and 1/200 AEP water surface profiles shown were provided by MBK Engineerson August 18, 2006. See report for an explanation of these profiles and conditions.

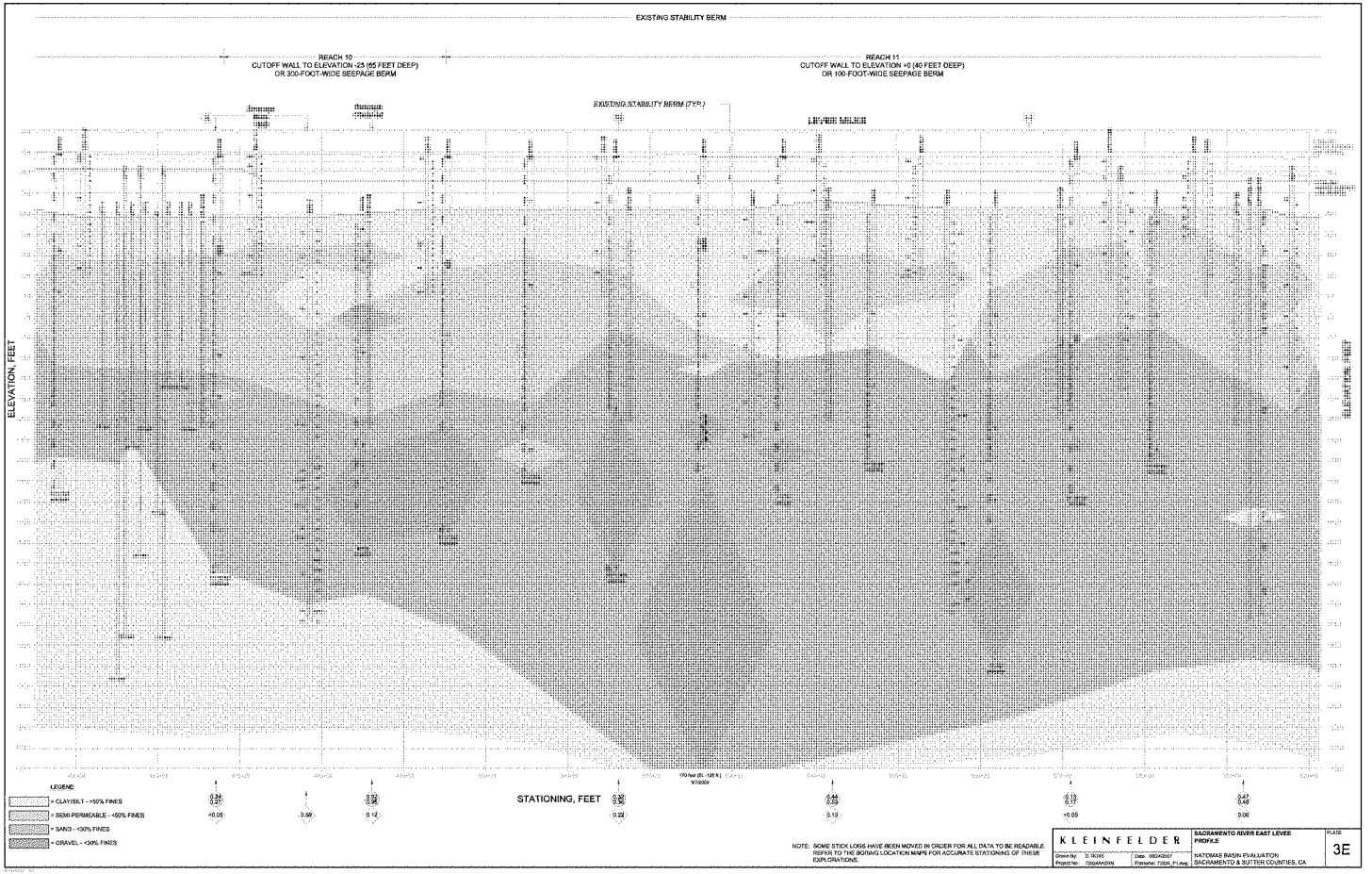
10. Details regarding completed levee improvements have been added to those already on the USACE levee profile base drawings and were obtained from the USACE. Extents of completed levee improvements shown are approximate and are the same as indicated on the USACE profiles. Refer to USACE as-built drawings for actual extents.

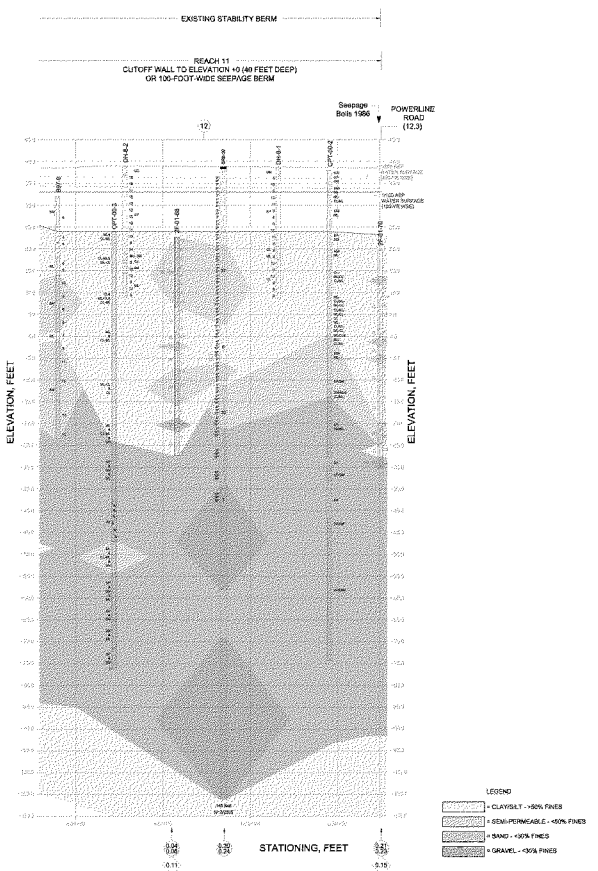
KLEINFELDER		SACRAMENTO RIVER EAST LEVEE Basis of Design Report Sacramento River East Levee Reaches 1 through 49 Natomas Basin Evaluation Sacramento and Sutter Counties, California	PLATE 3A
Drawn By: D. HUSS Project No.: 72834A/GSN	Date: 09/24/2007 Filename: 72834_P1.dwg		


EXISTING STABILITY BERM
CUTOFF WALL TO BE CONSTRUCTED AS PART OF NATOMAS CROSS CANAL PROJECT
REACH 1
NONE
REACH 2
CUTOFF WALL TO ELEVATION -25 (65 FEET DEEP) OR 100-FOOT-WIDE SEEPAGE BERM
REACH 3
CUTOFF WALL TO ELEVATION -25 (65 FEET DEEP) OR 100-FOOT-WIDE SEEPAGE BERM
REACH 4A
DSM WALL TO ELEVATION -70 (110 FEET DEEP) OR 100-FOOT-WIDE SEEPAGE BERM OR RELIEF WELL 95 FEET DEEP (100 FOOT SPACING)
Natomas Cross Canal
EXISTING STABILITY BERM (TYP.)
Seepage Observed
LEVEE TOP ELEVATION (TYP.)
GROUND SURFACE ELEVATION NEAR LANDSIDE LEVEE TOE (TYP.)
Seepage Observed
RIEGO ROAD (2.36)
LEVEE MILES
ELEVATION, FEET
STATIONING, FEET
LEGEND
= CLAY/SILT - >50% FINES
= SEMI PERMEABLE - <50% FINES
= SAND - <30% FINES
= GRAVEL - <30% FINES
URS 071000-168+00C
NOTE: SOME STICK LOGS HAVE BEEN MOVED IN ORDER FOR ALL DATA TO BE READABLE. REFER TO THE BORING LOCATION MAPS FOR ACCURATE STATIONING OF THESE EXPLORATIONS.
KLEINFELDER
SACRAMENTO RIVER EAST LEVEE PROFILE
Basis of Design Report
Sacramento River East Levee Reaches 1 through 4B
Natomas Basin Evaluation
Sacramento and Sutter Counties, California
PLATE
3B


EXISTING CANAL
REACH 4A
DSM WALL TO ELEVATION -70 (110 FEET DEEP) OR 100-FOOT-WIDE SEEPAGE BERM OR RELIEF WELL 95 FEET DEEP (100 FEET SPACING)
REACH 4B
DSM WALL TO ELEVATION -70 (110 FEET DEEP) OR 100-FOOT-WIDE SEEPAGE BERM OR RELIEF WELL 95 FEET DEEP (100 FEET SPACING)
REACH 4C
DSM WALL TO ELEVATION -70 (110 FEET DEEP) OR 300-FOOT-WIDE SEEPAGE BERM OR RELIEF WELL 95 FEET DEEP (100 FEET SPACING)
REACH 5A
CUTOFF WALL TO ELEVATION -30 (70 FEET DEEP) OR 100-FOOT-WIDE SEEPAGE BERM
REACH 5B
CUTOFF WALL TO ELEVATION -30 (70 FEET DEEP) OR 100-FOOT-WIDE SEEPAGE BERM
REACH 6
DSM WALL TO ELEVATION -70 (110 FEET DEEP) OR 300-FOOT-WIDE SEEPAGE BERM OR RELIEF WELL 70 FEET DEEP (100 FEET SPACING)
RD 1000 PP #2 (9.77)
Landside Sloughing and Seepage Boils in 1997
Landside Sloughing 1997
ELVERTA ROAD (4.9)
ELKHORN RESERVOIRS (5.74)
ELEVATION, FEET
STATIONING, FEET
LEGEND
= CLAY/SILT - >50% FINES
= SEMI-PERMEABLE - <50% FINES
= SAND - <30% FINES
= GRAVEL - <30% FINES
NOTE: SOME STICK LOGS HAVE BEEN MOVED IN ORDER FOR ALL DATA TO BE READABLE. REFER TO THE BORING LOCATION MAPS FOR ACCURATE STATIONING OF THESE EXPLORATIONS.
KLEINFELDER
SACRAMENTO RIVER EAST LEVEE PROFILE
Basis of Design Report
Sacramento River East Levee Reaches 1 through 4B
Natomas Basin Evaluation
Sacramento and Sutter Counties, California
PLATE 3C

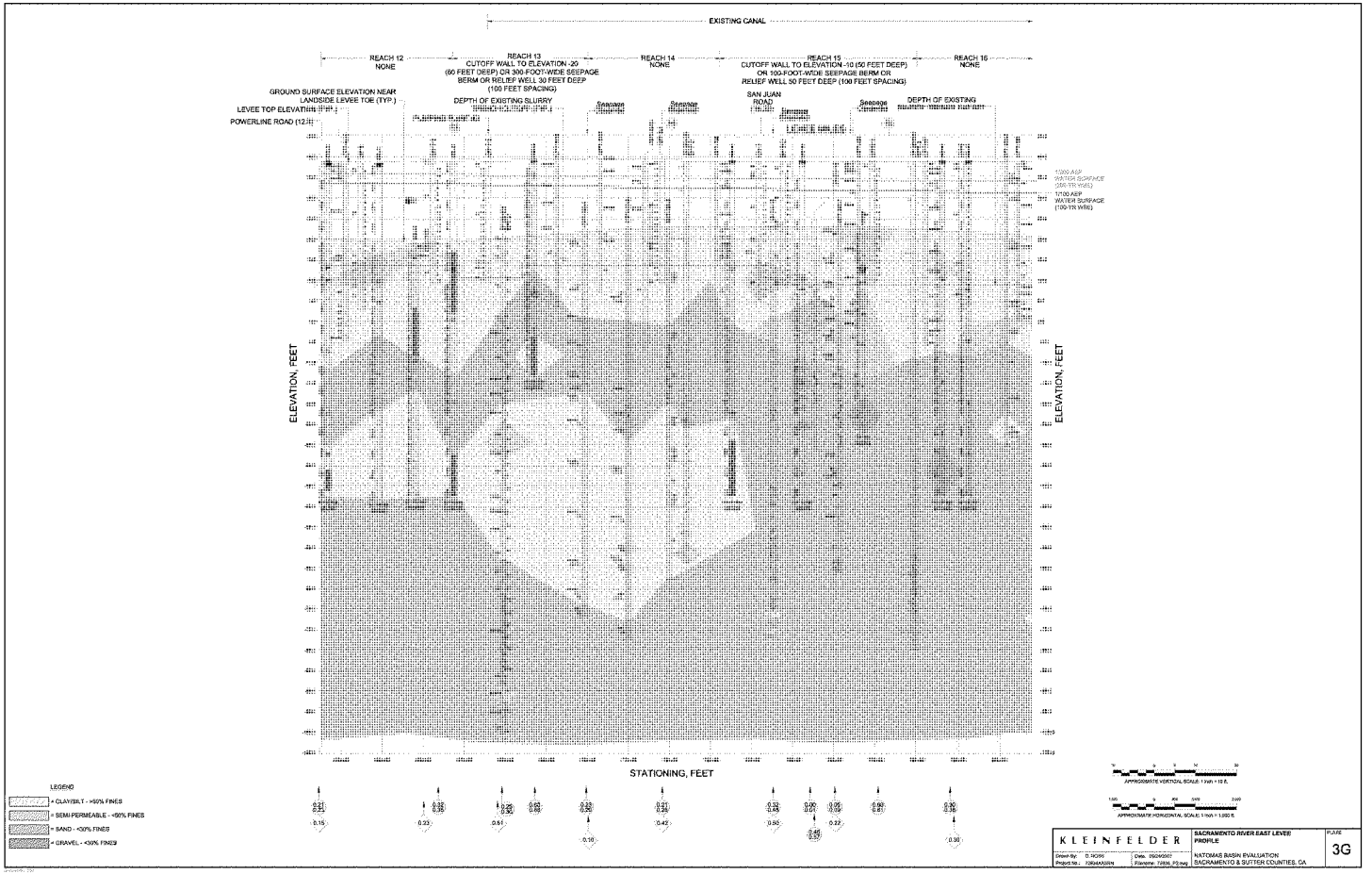

ELEVATION, FEET
STATIONING, FEET
LEVEE MILES
EXISTING STABILITY BERM
EXISTING CANAL
REACH 6
DSM WALL TO ELEVATION -70 (110 FEET DEEP) OR 300-FOOT-WIDE SEEPAGE BERM OR RELIEF WELL 70 FEET DEEP (100 FEET SPACING)
REACH 7
NONE
REACH 8
DSM WALL TO ELEVATION -60 (100 FEET DEEP) OR 300-FOOT-WIDE SEEPAGE BERM OR RELIEF WELL 70 FEET DEEP (100 FEET SPACING)
REACH 9
NONE
RESERVOIR ROAD (5.96)
Landside Sloughing 1987
Landside Sloughing and Seepage Observed
ELKHORN ROAD (7.58)
Seepage Observed
EXISTING STABILITY BERM (TYP.)
Seepage Observed
HIGHWAY I-5 OVERPASS(8.66)
LEGEND
= CLAYSILT - >50% FINES
= SEMI-PERMEABLE - <50% FINES
= SAND - <50% FINES
= GRAVEL - <50% FINES
NOTE: SOME STICK LOGS HAVE BEEN MOVED IN ORDER FOR ALL DATA TO BE READABLE. REFER TO THE BORING LOCATION MAPS FOR ACCURATE STATIONING OF THESE EXPLORATIONS.
KLEINFELDER
SACRAMENTO RIVER EAST LEVEE
PROFILE
NATOMAS BASIN EVALUATION
SACRAMENTO & SUTTER COUNTIES, CA
3D

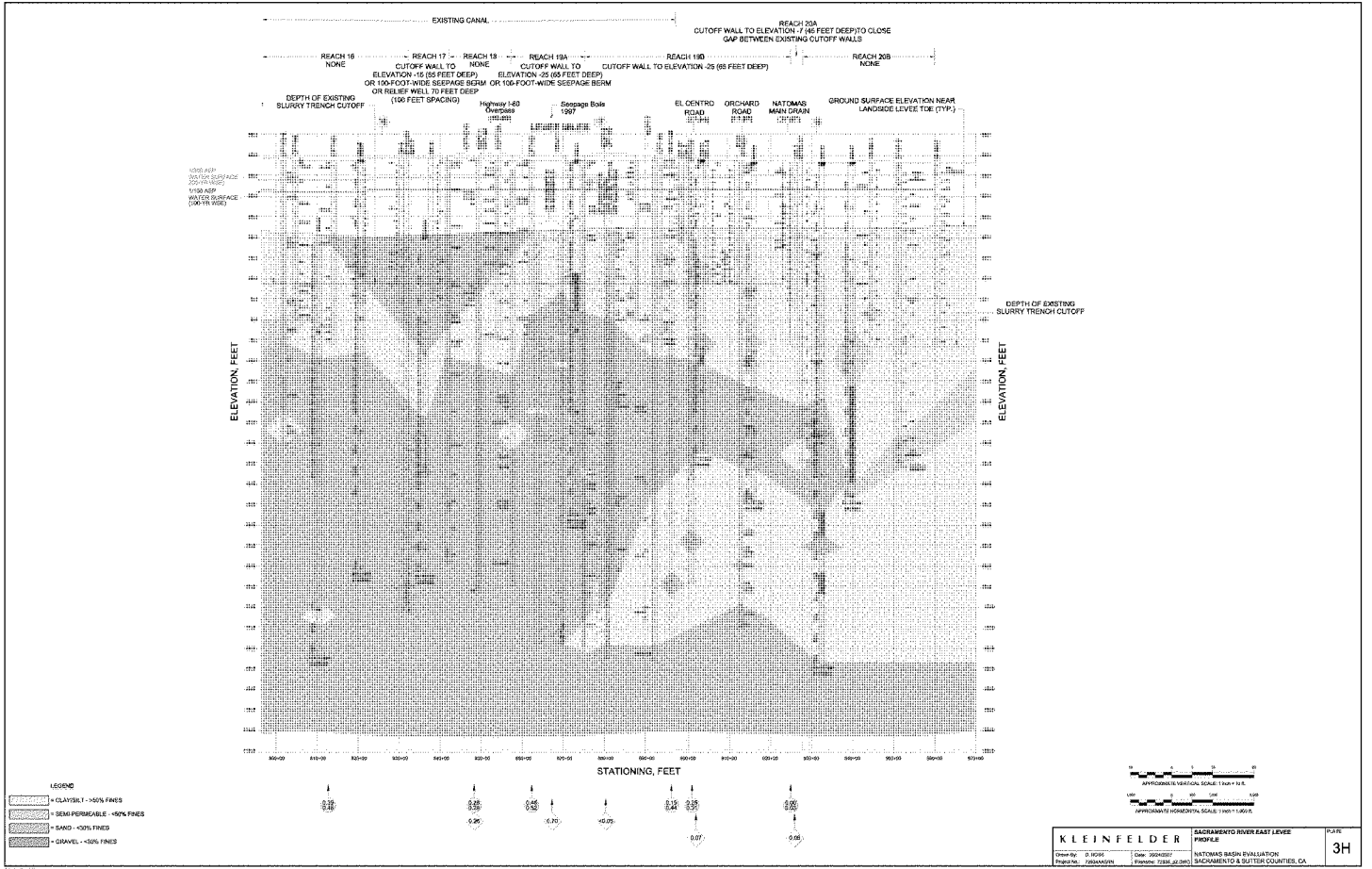

EXISTING STABILITY BERM
REACH 10
CUTOFF WALL TO ELEVATION -25 (65 FEET DEEP)
OR 300-FOOT-WIDE SEEPAGE BERM
REACH 11
CUTOFF WALL TO ELEVATION +0 (40 FEET DEEP)
OR 100-FOOT-WIDE SEEPAGE BERM
EXISTING STABILITY BERM (TYP.)
LEVEE CREST
ELEVATION, FEET
ELEVATION, FEET
LEGEND
= CLAY/SILT - >50% FINES
= SEMI-PERMEABLE - <50% FINES
= SAND - <30% FINES
= GRAVEL - <30% FINES
STATIONING, FEET
NOTE: SOME STICK LOGS HAVE BEEN MOVED IN ORDER FOR ALL DATA TO BE READABLE. REFER TO THE BORING LOCATION MAPS FOR ACCURATE STATIONING OF THESE EXPLORATIONS.
KLEINFELDER
SACRAMENTO RIVER EAST LEVEE
PROFILE
NATOMAS BASIN EVALUATION
SACRAMENTO & SUTTER COUNTIES, CA
PLATE
3E



NOTE: SOME STICK LOGS HAVE BEEN MOVED IN ORDER FOR ALL DATA TO BE READABLE. REFER TO THE BORING LOCATION MAPS FOR ACCURATE STATIONING OF THESE EXPLORATIONS.

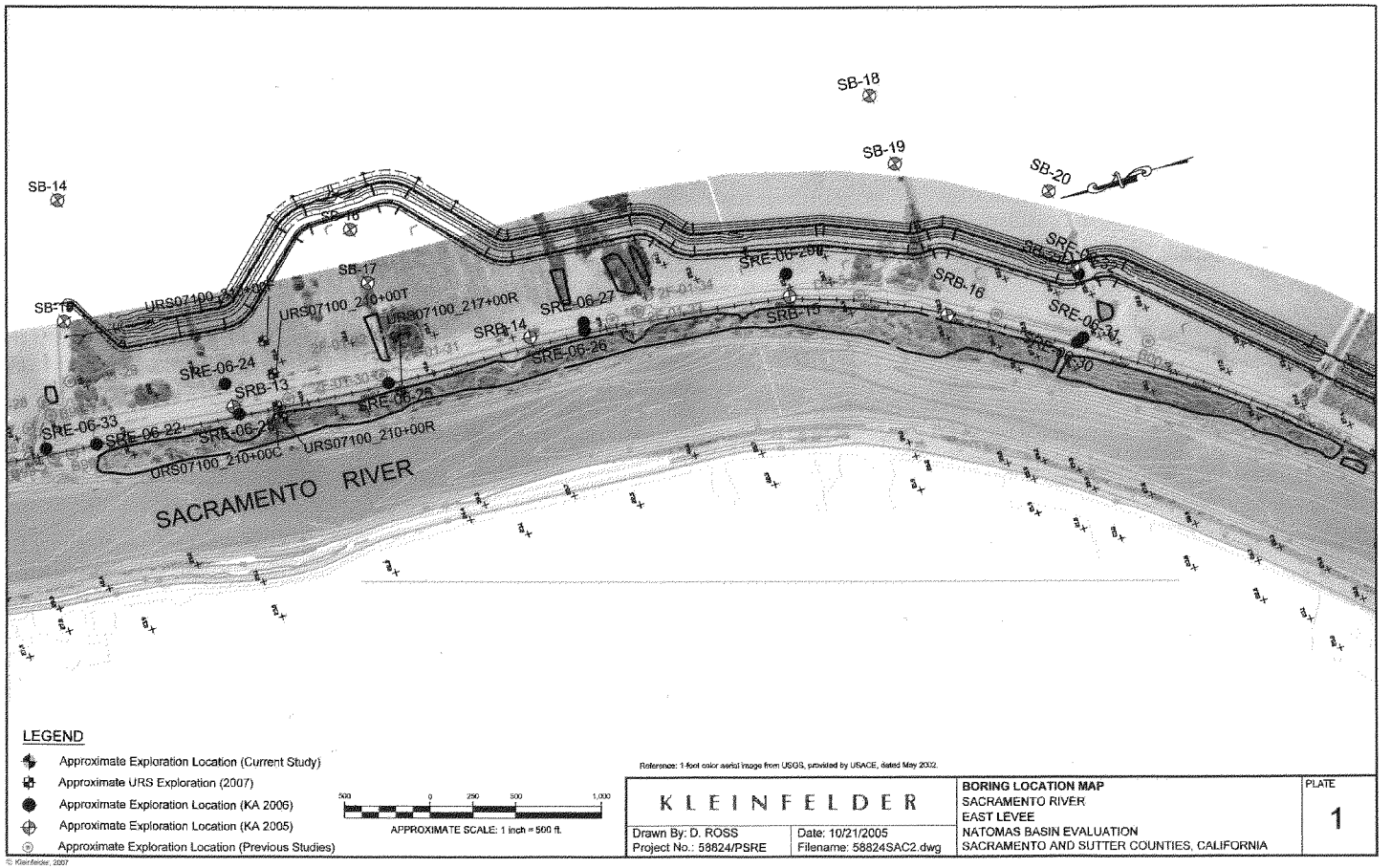
KLEINFELDER		SACRAMENTO RIVER EAST LEVEE PROFILE	PLATE
Drawn By: D. ROSS	Date: 09/04/2007	NATOMAS BASIN EVALUATION	3F
Project No. 72834AASRN	Filename: 72834_P1.DWG	SACRAMENTO & SUTTER COUNTIES, CA	


EXISTING CANAL
REACH 12
NONE
REACH 13
CUTOFF WALL TO ELEVATION -20
(60 FEET DEEP) OR 300-FOOT-WIDE SEEPAGE
BERM OR RELIEF WELL 30 FEET DEEP
(100 FEET SPACING)
REACH 14
NONE
REACH 15
CUTOFF WALL TO ELEVATION -10 (50 FEET DEEP)
OR 100-FOOT-WIDE SEEPAGE BERM OR
RELIEF WELL 50 FEET DEEP (100 FEET SPACING)
REACH 16
NONE
GROUND SURFACE ELEVATION NEAR
LANDSIDE LEVEE TOE (TYP.)
LEVEE TOP ELEVATION
POWERLINE ROAD (12.5)
DEPTH OF EXISTING SLURRY
Seepage
Seepage
SAN JUAN
ROAD
Seepage
DEPTH OF EXISTING
1:200 AEP
WATER SURFACE
(200-YR WSE)
1:100 AEP
WATER SURFACE
(100-YR WSE)
ELEVATION, FEET
ELEVATION, FEET
STATIONING, FEET
LEGEND
= CLAY/SILT - >50% FINES
= SEMI-PERMEABLE - <50% FINES
= SAND - <30% FINES
= GRAVEL - <30% FINES
APPROXIMATE VERTICAL SCALE: 1 inch = 10 ft.
APPROXIMATE HORIZONTAL SCALE: 1 inch = 1,000 ft.
KLEINFELDER
SACRAMENTO RIVER EAST LEVEE
PROFILE
NATOMAS BASIN EVALUATION
SACRAMENTO & SUTTER COUNTIES, CA
PLATE
3G


EXISTING CANAL
REACH 20A
CUTOFF WALL TO ELEVATION -7 (45 FEET DEEP)TO CLOSE GAP BETWEEN EXISTING CUTOFF WALLS
REACH 16
NONE
REACH 17
CUTOFF WALL TO ELEVATION -15 (55 FEET DEEP) OR 100-FOOT-WIDE SEEPAGE BERM OR RELIEF WELL 70 FEET DEEP (100 FEET SPACING)
REACH 18
NONE
REACH 19A
CUTOFF WALL TO ELEVATION -25 (65 FEET DEEP) OR 100-FOOT-WIDE SEEPAGE BERM
REACH 19B
CUTOFF WALL TO ELEVATION -25 (65 FEET DEEP)
REACH 20B
NONE
DEPTH OF EXISTING SLURRY TRENCH CUTOFF
Highway I-80 Overpass
Seepage Boils 1997
EL CENTRO ROAD
ORCHARD ROAD
NATOMAS MAIN DRAIN
GROUND SURFACE ELEVATION NEAR LANDSIDE LEVEE TOE (TYP.)
1/100 AEP WATER SURFACE (100-YR WSE)
DEPTH OF EXISTING SLURRY TRENCH CUTOFF
ELEVATION, FEET
STATIONING, FEET
LEGEND
= CLAY/SILT - >50% FINES
= SEMI-PERMEABLE - <50% FINES
= SAND - <30% FINES
= GRAVEL - <30% FINES
APPROXIMATE VERTICAL SCALE: 1 inch = 10 ft.
APPROXIMATE HORIZONTAL SCALE: 1 inch = 1,000 ft.
KLEINFELDER
SACRAMENTO RIVER EAST LEVEE PROFILE
NATOMAS BASIN EVALUATION
SACRAMENTO & SUTTER COUNTIES, CA
PLATE
3H

ATTACHMENT C

PROPOSED CANAL PLAN



LEGEND

- Approximate Exploration Location (Current Study)
- Approximate URS Exploration (2007)
- Approximate Exploration Location (KA 2006)
- Approximate Exploration Location (KA 2005)
- Approximate Exploration Location (Previous Studies)

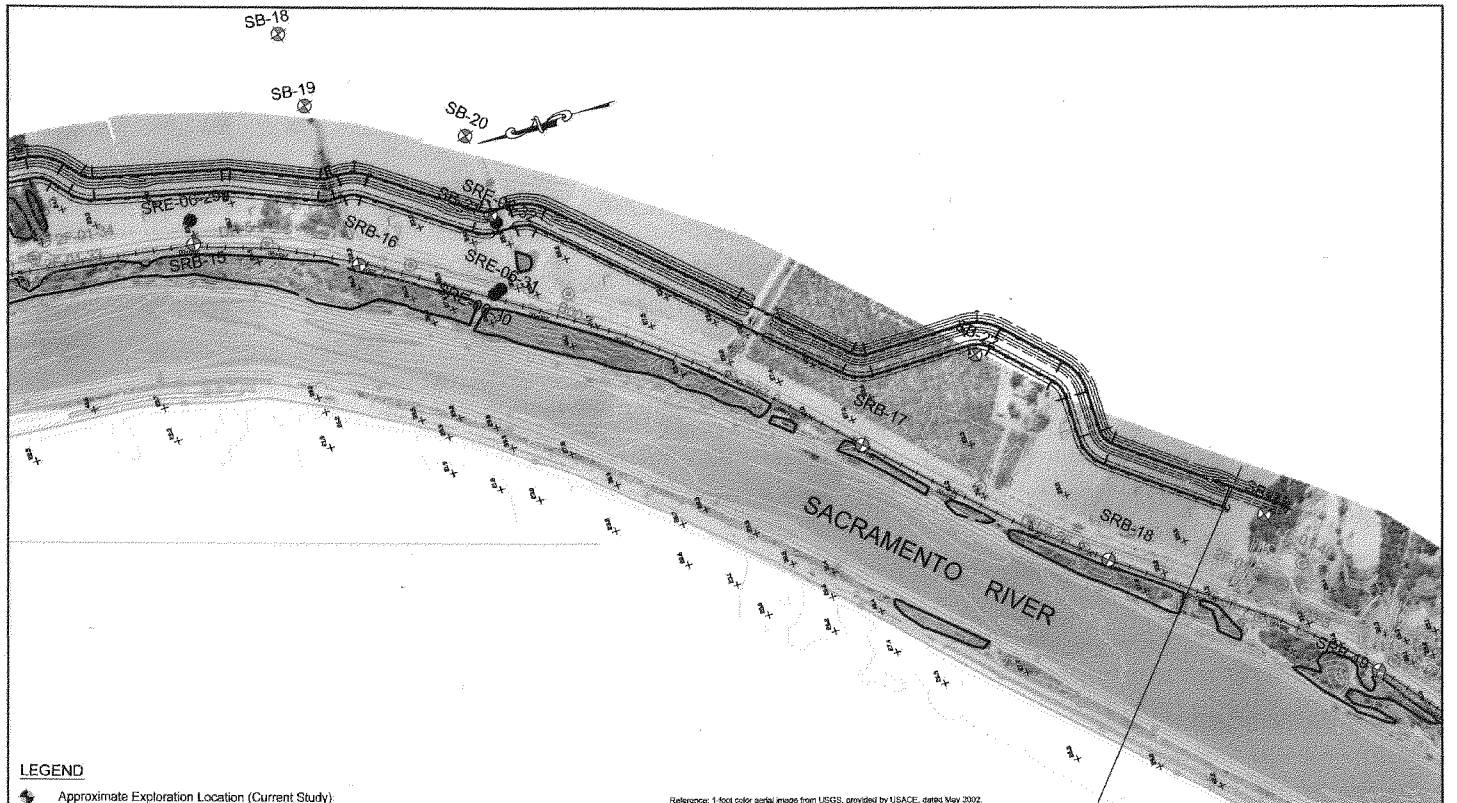
500 0 250 500 1,000

APPROXIMATE SCALE: 1 inch = 500 ft.

Reference: 1-foot color aerial image from USGS, provided by USACE, dated May 2002.

© Kleinfelder, 2007

KLEINFELDER		BORING LOCATION MAP SACRAMENTO RIVER EAST LEVEE NATOMAS BASIN EVALUATION SACRAMENTO AND SUTTER COUNTIES, CALIFORNIA	PLATE 1
Drawn By: D. ROSS	Date: 10/21/2005		
Project No.: 58824/PSRE	Filename: 58824SAC2.dwg		



© Kleinfelder, 2007

C4 Potential Impacts of Phase 4b Project Slurry Cutoff Walls
(Luhdorff & Scalmanini Consulting Engineers)

TECHNICAL MEMORANDUM

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

DATE: January 28, 2010 **FILE NO.:** 07-1-084

TO: David Rader, AECOM
John Bassett, SAFCA
Timothy Washburn, SAFCA

FROM: Glenn Browning

SUBJECT: POTENTIAL IMPACTS OF SLURRY CUTOFF WALLS PROPOSED FOR PHASE 4B OF THE NATOMAS LEVEE IMPROVEMENT PROGRAM

The proposed locations and depths of some of the slurry cutoff walls recommended by consultants of the Sacramento Area Flood Control Agency (SAFCA) for the levees surrounding the Natomas Basin continue to change as the engineering and design work for the Natomas Levee Improvement Program (NLIP) proceeds. The groundwater impacts of slurry cutoff walls as proposed in April 2009 were evaluated in a report prepared by Luhdorff & Scalmanini, Consulting Engineers (LSCE) on May 4, 2009, entitled *Evaluation of Potential Groundwater Impacts Due to Proposed Construction for Natomas Levee Improvement Program*. That analysis has now been updated to reflect current slurry cutoff wall recommendations. The evaluation discussed below is focused on construction activities planned for Phase 4b but includes all slurry cutoff walls proposed as of December 2009 so that cumulative impacts can be estimated.

Currently Proposed Slurry Cutoff Walls

Proposed construction activities under Phase 4b include slurry cutoff walls along the following levees:

- Sacramento River East Levee (SREL) Reaches 16 through 20 (entire length);
- North Natomas East Main Drainage Canal (NEMDC) West Levee (Reaches 8, 12, 14, and 15); and
- American River North Levee (ARNL) Reaches 1 through 4 (entire length).

These and other currently proposed slurry cutoff walls are summarized below.

Sacramento River East Levee

Currently proposed cutoff wall locations and depths along all reaches of the SREL were provided by HDR (December 17, 2009) based on recommendations made by Kleinfelder (see **Table 1**). The reaches where cutoff walls are proposed based on the April and December 2009 recommendations are shown on **Figure 1**. Major changes since April 2009 include several

reaches of the SREL where previously proposed cutoff walls would no longer be constructed based on current recommendations:

- Reaches 4B and 5A (Stations 214+00 to 229+00);
- Reach 9B (Stations 460+00 to 468+00);
- Reach 13 (Stations 679+50 to 700+00);
- Reach 14 (Stations 700+00 to 732+00); and
- Reach 15 (Stations 735+00 to 780+00).

Cutoff walls were not previously proposed for Reaches 16 through 20, but current recommendations call for cutoff walls to potentially be constructed along these five reaches (the Phase 4b construction area). Due to relatively deep sands in this area, the proposed depth of the cutoff walls proposed for Reach 16 through the northern portion of Reach 19B is 117 feet. The proposed depth of cutoff walls in the remaining reaches ranges from 81 to 109 feet.

There were also a number of changes to the depths of previously proposed cutoff walls. The locations and depths of all currently proposed slurry cutoff walls along the SREL are shown in **Table 1**. With the addition of slurry cutoff walls along Reaches 16 through 20, the total length of proposed cutoff walls along all reaches of the SREL increased from 53,450 feet in April 2009 to 64,583 feet in December 2009.

Table 1 also shows the estimated average groundwater elevation based on groundwater elevation contour maps for spring and fall 2003 included in LSCE (2009). Due to the buffering effect of the Sacramento River, groundwater elevations are relatively constant along the SREL except for seasonal fluctuations. Groundwater elevations in this area were documented in LSCE (2009) based on data from a number of shallow piezometers along the SREL. The 2003 groundwater elevations provide a reasonable approximation of both current (2010) and expected future (2030) groundwater elevations in this area. In order to estimate groundwater flow with and without the cutoff walls, as discussed below, the average saturated thickness of the aquifer materials through which the cutoff walls in each reach would be constructed was estimated based on these groundwater elevations. An average saturated thickness of 52 feet for all cutoff wall locations along the SREL was estimated by calculating the total saturated cross-sectional area (about 3,387,000 square feet) and dividing by the total length of the proposed cutoff walls.

Other Levees

Currently proposed cutoff wall locations and depths along the Natomas Cross Canal (NCC), the Pleasant Grove Creek Canal (PGCC), the NEMDC, and the ARNL are shown in **Table 2**. This information was provided by Wood Rodgers (December 16, 2009) for the NCC, PGCC, and NEMDC and by HDR (December 17, 2009) for the ARNL, based on recommendations made by Kleinfelder. Major differences between this and the April 2009 plan include two changes to cutoff walls along the NEMDC North: a cutoff wall is now proposed along Reach 15, and the cutoff wall previously proposed along Reach 10 has been dropped. The currently proposed cutoff walls are deeper in Reaches 8 and 14 and shallower in Reach 12. There are also several changes to cutoff walls proposed along the NEMDC South. Previously proposed cutoff walls

have been dropped from Reaches 3 and 5, and a new cutoff wall has been added in Reach 7B. For the ARNL, the recommended cutoff wall depths have increased for Reaches 1 and 2 and decreased for Reaches 3 and 4. The reaches where cutoff walls are proposed based on the April and December 2009 recommendations are shown on **Figure 1**.

Existing groundwater elevations along these levees were also estimated based on the average of groundwater elevation shown on contour maps for spring and fall 2003 included in the LSCE (2009) report. Although groundwater elevations are more variable away from the Sacramento River, the 2003 groundwater elevations provide the best available approximation of existing conditions over this large area. Because groundwater elevations are significantly lower beneath the eastern edge of the Natomas Basin, several of the cutoff walls proposed for the PGCC and NEMDC are now expected to be entirely above the average water table elevation. However, there is uncertainty about these groundwater elevations because shallow piezometers have not been installed along these canals.

Groundwater elevations are projected to change in future years, and estimates for future conditions are based on a 2030 simulation conducted with the groundwater flow models used to estimate groundwater elevations and flow for the LSCE (2009) report. These simulations were conducted by WRIME using two groundwater flow models based on the Integrated Groundwater and Surface Water Model (IGSM) platform, as summarized in WRIME (2007) and LSCE (2008). The North American River IGSM and the Sacramento County IGSM models were linked to conduct these simulations. The results of the 2030 simulation showed lower groundwater elevations beneath the NCC and the PGCC due to increased pumping to supply the proposed Sutter Point development in the northern portion of the Natomas Basin. Groundwater elevations were predicted to be higher beneath the NEMDC and the ARNL due to the planned reduction in groundwater pumping east and south of the Natomas Basin. The average saturated thicknesses of the shallow aquifer materials above the tip (bottom) of the cutoff walls in each reach based on estimated groundwater elevations under existing and future conditions are shown in **Table 2**.

The slurry cutoff wall under construction along the NCC is planned to run the entire length of the NCC South Levee (28,700 feet), but a portion of the wall beneath and adjacent to the Highway 99 bridge may not be constructed. The cutoff wall along the NCC will range in depth from 56 to 80 feet (measured from the top of the levee), and the entire length of the wall will extend below the water table through an average saturated thickness of about 52 feet under existing conditions. Groundwater levels are predicted to be lower beneath the NCC and the PGCC in 2030, as discussed above, and the estimated saturated thickness to the tip of the cutoff wall along the NCC is about six feet less (46 feet) under future conditions.

Slurry cutoff walls are currently planned for about 14,000 linear feet of the PGCC West Levee, and cutoff wall depths from the top of the levee would range from 25 feet in Reach 3 to 47 feet in Reach 1. The cutoff wall proposed for Reach 3 would not extend below the estimated average water table elevation. The average saturated thickness for all cutoff wall depths along the PGCC is estimated to be about 13 feet for existing conditions and nine feet for future conditions.

Slurry cutoff walls are currently planned for four reaches of the North NEMDC West Levee (about 21,700 linear feet). Cutoff wall depths would range from 15 feet in Reach 12 to 62 feet in Reach 8 (measured from the top of the levee). The tip of the cutoff wall proposed for Reach 12 would be above the estimated average water table elevation, but cutoff walls proposed for the other three reaches would be partially saturated. The average saturated thickness to the tips of the cutoff walls for all four reaches is estimated to be about five feet for existing conditions and 17 feet for future conditions.

Slurry cutoff walls are currently planned for four reaches of the South NEMDC West Levee (18,775 linear feet) and would range in depth from 33 to 73 feet below the top of the levee. The tips of the proposed cutoff walls would be below the estimated average water table elevation for portions of two reaches (2A and 4A) based on existing conditions and above the average water table elevation for the other reaches. Since groundwater elevations are expected to be higher in future years, only the cutoff wall proposed for Reach 7C is predicted to be unsaturated in 2030. The estimated average saturated thickness for all reaches is about two feet for existing conditions and 17 feet for future conditions.

Slurry cutoff walls are currently planned for the entire length of the ARNL (11,571 feet) and would range in depth from 44 to 60 feet below the top of the levee. The shallowest cutoff walls (44 to 45 feet deep) would be located in Reaches 1A, 1B, and 2A, and the tips of these cutoff walls would extend only one to three feet below the estimated average water table elevation under existing conditions. The estimated saturated thickness above the cutoff wall tips would increase to 14 or 15 feet under future conditions. Cutoff walls proposed for Reaches 2B, 3, and 4 would be 60 feet deep and would extend below the estimated average water table elevation for 10 to 15 feet under existing conditions and 30 feet under future conditions. The average saturated thickness of all cutoff wall depths along the ARNL is estimated to be is about eight feet for existing conditions and 25 feet for future conditions.

Potential Impacts of Slurry Cutoff Walls

In the LSCE (2009) report, the groundwater impacts of SAFCA's proposed construction activities were evaluated using a water budget approach. Recharge from the Sacramento River represents the majority of the groundwater inflow into the Natomas Basin, and the total amount of recharge was estimated by LSCE using Darcy's Law (Darcy, 1856). Groundwater flow beneath the other levees surrounding the Natomas Basin was based on the results of the IGSM simulations discussed above (WRIME, 2007 and LSCE, 2008). Flow estimates for existing and future conditions were based on simulations of 2004 and 2030 groundwater conditions, respectively.

Slurry cutoff walls that extend below the water table will reduce groundwater flow into or out of the Natomas Basin. Estimates of groundwater flow reductions due to slurry cutoff walls are shown in **Table 3**, which is revised from Table 6-6 in the LSCE (2009) report. These estimates are based in part on a two-dimensional transient groundwater flow model used by Kleinfelder to estimate flow reductions due to the cutoff wall proposed for a portion of Reach 2 of the SREL.

The hydraulic conductivity of the cutoff walls is recommended by Kleinfelder to be a maximum of $5x10^{-7}$ cm/sec, but the Kleinfelder model used a larger hydraulic conductivity ($1x10^{-6}$ cm/sec) to account for potential irregularities in the walls. The model results indicate that flow through the cross-sectional area of the cutoff walls would be reduced by about 70 percent due to the walls (Kleinfelder, 2009).

As shown in **Table 3**, recharge from the Sacramento River is estimated to be 8,450 acre-feet per year (afy) under existing conditions based in part on the hydraulic gradients calculated using groundwater elevations measured in shallow piezometers and estimated River stage at each piezometer location. The flow is projected to increase to about 9,340 afy in 2030 due to steeper hydraulic gradients resulting from increased groundwater pumping within the Natomas Basin, especially in the Sutter Pointe area. Flow through the cross-sectional area of the proposed slurry cutoff walls is estimated to be about 1,490 afy under existing conditions and 1,650 afy under 2030 conditions. It is assumed that the proposed cutoff walls would reduce this flow by 70 percent based on the results of the Kleinfelder (2009) model discussed above. The total estimated flow reduction shown in **Table 3** is 1,044 afy for existing conditions and 1,154 afy for 2030 conditions; both reductions represent about 12 percent of the total estimated groundwater flow beneath the SREL.

Groundwater flow into the Natomas Basin also occurs from the north beneath the NCC. As shown in **Table 3**, this flow is estimated to be about 460 afy under existing conditions and is projected to increase to about 3,920 afy due to the steeper hydraulic gradient expected as a result of increased pumping in 2030. Flow through the cross-sectional area of the cutoff walls is estimated to be 59 afy under existing conditions and 450 afy under future conditions. Based on a 70 percent flow reduction due to the cutoff walls, groundwater flow into the Natomas Basin beneath the NCC South Levee would be reduced by 42 afy (9 percent of the total) under existing conditions and 315 afy (8 percent of the total) under future conditions.

Groundwater typically flows out of the Natomas Basin to the east beneath the PGCC and NEMDC. As summarized in **Table 3**, groundwater flow to the east beneath the PGCC without cutoff walls was estimated to be about 4,450 afy for existing conditions and 250 afy for future conditions. The reduced outflow in 2030 is partially based on an assumption of greatly reduced pumping in the area east of the Natomas Basin in future years due to the planned transition from groundwater to surface water supply. This would allow water levels to recover and reduce the gradient for groundwater outflow from the Natomas Basin beneath the PGCC and NEMDC. In the immediate vicinity of the PGCC, however, groundwater levels are predicted to be lower in 2030 due to pumping by proposed municipal wells in the Sutter Pointe area.

Currently proposed slurry cutoff walls along the PGCC West Levee would be about 14,000 feet long with an average depth of 36 feet. Because most of this depth is above the estimated average water table elevation, groundwater flow through this cross-sectional area without cutoff walls is estimated to be only 119 afy under existing conditions and four afy under future conditions. The estimated flow reduction due to the slurry cutoff walls is 83 afy (two percent of the total) for existing conditions and three afy (one percent of the total) for future conditions.

Estimates of flow beneath the North and South NEMDC West Levees with and without slurry cutoff walls under existing and future conditions are summarized in **Table 3**. As for the PGCC, groundwater outflow to the east beneath the NEMDC (both North and South) is expected to be lower in 2030 based primarily on the assumption of greatly reduced pumping east of the Natomas Basin in future years.

Groundwater flow to the east beneath the NEMDC North without cutoff walls was estimated to be about 9,130 afy for existing conditions and 500 afy for future conditions. Currently proposed slurry cutoff walls along the NEMDC North would be about 21,700 linear feet with an average depth of 43 feet. Most of this depth will be above the estimated average water table elevation, and groundwater flow through this cross-sectional area without cutoff walls is estimated to be only 72 afy under existing conditions and 13 afy under future conditions. The estimated flow reduction due to the proposed slurry cutoff walls is 50 afy (one percent of the total) for existing conditions and nine afy (two percent of the total) for future conditions.

Groundwater flow to the east beneath the NEMDC South without cutoff walls is estimated to be about 8,160 afy under existing conditions and 450 afy under future conditions. Currently proposed slurry cutoff walls along the NEMDC South would be about 18,880 linear feet with an average depth of 54 feet. Most of this depth will be above the estimated average water table elevation, and groundwater flow through this cross-sectional area without cutoff walls is estimated to be only 29 afy under existing conditions and 11 afy under future conditions. The estimated flow reduction due to the slurry cutoff walls is 20 afy (less than one percent of the total) for existing conditions and eight afy (two percent of the total) for future conditions.

The IGSM model results indicate that recharge from the American River is the primary source of groundwater inflow to the Natomas Basin beneath the ARNL. Groundwater inflow beneath the ARNL is estimated to be about 1,090 afy under existing conditions. For future conditions, the results of the 2030 IGSM simulation indicates that groundwater levels in this area will increase enough that this reach of the American River will become a gaining reach, with groundwater flowing toward the River from the north. The estimated groundwater outflow in 2030 is 500 afy.

Slurry cutoff walls are proposed for the entire length of the ARNL with an average depth of 55 feet. Most of this depth is above the estimated average water table elevation under existing conditions, and groundwater inflow through this cross-sectional area without cutoff walls is estimated to be only 46 afy. More of the cutoff walls would be saturated under future conditions, and groundwater outflow is estimated to be 63 afy. For existing conditions, the estimated reduction in groundwater inflow due to the slurry cutoff walls is 32 afy (three percent of the total). For future conditions, the estimated reduction in groundwater outflow due to the cutoff walls is 44 afy (nine percent of the total).

On a cumulative basis, slurry cutoff walls proposed for the levees surrounding the Natomas Basin will reduce the net groundwater inflow to the Natomas Basin. As shown in **Table 3**, the estimated total flow reduction is 963 afy under existing conditions. This is considerably more than was estimated in the LSCE (2009) report (68 afy) for two reasons:

- The length and depth of proposed cutoff walls has increased along the Sacramento River, which is the primary source of recharge to the Natomas Basin; and
- Fewer cutoff walls are currently proposed along the NEMDC (both North and South), which results in a smaller reduction in groundwater outflow from the Natomas Basin.

The estimated total flow reduction is 1,404 afy under future conditions, which is only slightly more than the estimated flow reduction in the LSCE (2009) report (1,315 afy). The estimated flow reduction is greater for future conditions primarily because of the increased gradient for groundwater inflow from the west (beneath the SREL) and the north (beneath the NCC) predicted by 2030. Some of this additional flow would be blocked by proposed slurry cutoff walls along the SREL and the NCC.

The proposed slurry cutoff walls will result in slightly lower groundwater elevations on the land side of the SREL and NCC and slightly higher groundwater elevations on the water side of those levees. Proposed slurry cutoff walls along the PGCC and NEMDC will have the opposite effect, i.e. water levels will be slightly higher on the land side and slightly lower on the water side. As further discussed below, these changes are not expected to be measurable in most of the domestic and irrigation wells near the levees.

Potential Impacts of All Proposed SAFCA Construction Activities

In the LSCE (2009) report, the effects of SAFCA's proposed construction activities were evaluated for both existing and future conditions using a water budget to estimate the total impact of SAFCA's activities on groundwater conditions in the Natomas Basin. Although slurry cutoff walls will have the greatest effect on groundwater conditions, as discussed above, there will also be effects due to:

- Land use changes associated with proposed levee improvements, canal improvements, and borrow site excavation;
- Increased seepage from canals due to proposed canal improvements; and
- Reduced groundwater pumping at the Brookfield borrow site due to the planned transition to surface water supply.

Assumptions that were used to estimate changes to the water budget due to these construction activities are summarized in **Table 4**, which is revised from Table 5-1 in LSCE (2009). This table has been updated to show currently proposed cutoff walls lengths and depths, but data were not available to update other estimates shown in the table. Any changes to these estimates are assumed to be relatively small. Changes to the groundwater budget for the Natomas Basin due to SAFCA's proposed construction activities are summarized in **Table 5** for existing conditions and **Table 6** for future conditions.

Levee Improvements

Groundwater impacts from proposed levee improvements are primarily limited to the effects of slurry cutoff walls and land use changes. No direct groundwater impacts are expected from

increasing the height or width of levees, modifying levee slopes, or building seepage berms because all of this construction would be above the water table. Based on data summarized in the LSCE (2009) report, proposed land use changes will result in the loss of about 20 acres of rice, 175 acres of field crops, and five acres of orchard along the SREL. Other land use changes include the loss of five acres of rice along the NCC South Levee and 50 acres of rice along the PGCC West Levee. As shown in **Tables 5** and **6**, these changes are estimated to reduce deep percolation from applied water by a total of 105 afy.

In addition to deep percolation, estimated inflow reductions for existing conditions shown in **Table 5** include recharge from the Sacramento and American Rivers (1,076 afy) and inflow to the Natomas Basin beneath the NCC (42 afy). The total estimated inflow reduction is 1,222 afy. The reduction in subsurface outflow from the Natomas Basin beneath the PGCC and NEMDC is estimated to be 154 afy. The estimated effect of all proposed levee improvements would be to reduce groundwater storage in the Natomas Basin by about 1,068 afy based on existing conditions.

Estimated inflow reductions for future conditions are shown in **Table 6** and include deep percolation (105 afy), recharge from the Sacramento and American Rivers (1,109 afy), and inflow to the Natomas Basin beneath the NCC (315 afy). The total estimated inflow reduction is 1,529 afy. The reduction in subsurface outflow from the Natomas Basin beneath the PGCC and NEMDC is estimated to be 20 afy. The estimated effect of all proposed levee improvements based on future conditions would be to reduce groundwater storage in the Natomas Basin by about 1,509 afy.

Canal Improvements

The construction of the new GSS/Drainage Canal and relocation and improvements to the West Drainage Canal, the Elkhorn Canal, and the Riverside Canal will affect deep percolation from applied water (due to land use changes) and seepage from the canals. For all four canals, deep percolation is estimated to decrease by 41 afy and canal seepage is estimated to increase by 327 afy (**Tables 5** and **6**). The net effect of proposed canal construction would be to increase groundwater storage in the Natomas Basin by about 285 afy.

Borrow Sites

Excavation and reclamation of the Brookfield and Fisherman's Lake borrow sites is expected to have an indirect effect on groundwater conditions due to proposed land use and water supply changes. No such changes are planned for the Airport North Bufferlands borrow site.

At the Brookfield borrow site, approximately 325 acres are currently planted to rice, and SAFCA plans to restore about 286 acres to rice cultivation after construction activities are complete. As shown in **Tables 5** and **6**, an estimated 30 afy of deep percolation will be lost at this site due to the reduction in irrigated acreage. The Brookfield site is currently irrigated entirely with groundwater, but SAFCA plans to provide the infrastructure so that about 80 percent of the

borrow site can be irrigated with surface water after reclamation. This transition would reduce groundwater pumping on the Brookfield property by about 1,625 afy. Groundwater levels will increase due to the reduced pumping, resulting in an increase in subsurface outflow beneath the PGCC of about 76 afy.

At the Fisherman's Lake borrow site, about 400 acres of land would be used for borrow material, including 49 acres currently planted to rice, 266 acres of field crops, and 85 acres of managed marsh. After reclamation, there would be about 175 acres of managed marsh and 225 acres of non-irrigated grassland or woodland. The predicted net loss in deep percolation is 36 afy at this site, as shown in **Tables 5** and **6**.

The reduction in groundwater pumping at the Brookfield site more than offsets the loss of deep percolation at all borrow sites. The net effect of excavation and reclamation of all borrow sites would be to increase groundwater storage by about 1,483 afy.

Summary of Impacts to Groundwater Flow and Storage

The totals at the bottom of **Tables 5** and **6** show the estimated combined effect of SAFCA's proposed construction activities based on existing and future groundwater conditions, respectively. For both periods, deep percolation is estimated to decrease by 213 afy; seepage from canals is estimated to increase by 327 afy; and groundwater pumping is estimated to decrease by 1,625 afy. Other changes for existing conditions (**Table 5**) include decreases in net recharge from streams (1,076 afy), subsurface inflow (42 afy), and subsurface outflow to the east (78 afy). Summing these terms results in an increase in groundwater storage in the Natomas Basin of 700 afy for existing conditions, which means that groundwater levels would be expected to increase slightly due to all proposed construction activities.

The totals at the bottom of **Table 6** show the combined effect of SAFCA's proposed construction activities based on future conditions in 2030. Estimated changes in deep percolation, seepage from canals, and groundwater pumping are the same as for existing conditions. The estimated reduction in net recharge from streams (1,109 afy) is similar to existing conditions, and the reduction in subsurface inflow (315 afy) is larger. Subsurface outflow to the east is predicted to increase slightly (by 56 afy). Future groundwater storage in the Natomas Basin is predicted to increase due to the proposed construction, but by a smaller amount (259 afy).

The small increase in groundwater storage predicted due to SAFCA's proposed construction activities under both existing and future conditions would have a slightly positive effect on groundwater levels and storage in the Natomas Basin. The effect on subsurface outflow to the east would be slightly negative for existing condition and slightly positive for future conditions.

Effects on Groundwater Quality

The primary potential groundwater quality impact of SAFCA's proposed construction activities is a slight reduction in groundwater recharge to the Natomas Basin, including stream recharge

and deep percolation from rice fields and other irrigated farmland. This recharge is generally of high quality, especially the stream recharge, which typically has very low salinity and few contaminants. Water recharged via deep percolation has somewhat higher salinity than river water due to the use of recycled tailwater and the effects of evapotranspiration. Some of these reductions would be offset by increased seepage from canals, which is another source of good quality recharge.

As estimated above, the combined effect of SAFCA's proposed construction activities on existing groundwater conditions would be to reduce recharge from rivers and canals by 1,076 afy and reduce groundwater outflow beneath the PGCC and NEMDC by 78 afy. The combined effect of these inflow and outflow reductions would be expected to slightly increase salt accumulation in the Natomas Basin and east of the Natomas Basin. However, these reductions represent only about two percent of the total estimated groundwater inflow to the Natomas Basin and less than 0.4 percent of the total estimated groundwater outflow from the Natomas Basin, and the water quality impacts are not expected to be measurable.

For future groundwater conditions, the combined effect of SAFCA's proposed construction activities would be to reduce groundwater recharge from rivers and canals by 1,109 afy. Groundwater outflow to the east is predicted to increase by 56 afy. Again, the overall effect of these changes on future groundwater quality would be small.

Effects on Private Wells

The locations of private wells near the levees surrounding the Natomas Basin mapped by Mead and Hunt (M&H, December 28, 2009) are shown on **Figure 2**. These well locations are approximate based primarily on information shown on Well Completion Reports obtained from the Department of Water Resources (DWR). This mapping is incomplete because Well Completion Reports are not available for all wells, many wells with Well Completion Reports could not be located, and field surveys have not been conducted to confirm well locations in most areas. In areas that contain a high density of domestic wells, such as Reaches 16-18 of the SREL, the majority of the domestic wells have not been mapped. Most of the wells shown on **Figure 2** are used for either domestic or irrigation purposes; but industrial, municipal, and monitoring wells are also included.

Table 7 summarizes the water supply wells mapped by M&H within one mile of the levees where slurry cutoff walls are proposed to be constructed during Phase 4b. This table shows only water supply wells; monitoring wells are ignored for this analysis. The table includes 27 wells along Reaches 16 through 20 of the SREL; 26 wells along Reaches 8, 12, 14, and 15 of the NEMDC North; and seven wells along Reaches 1-4 of the ARNL.

Shallow wells on either side of the levee could experience slightly lower pumping water levels because the cutoff walls will act as low permeability barriers that could reduce the areal extent and increase the depth of the cone of depression that forms around a pumped well. This effect would only occur when the production zone of the well is above the tip of the adjacent cutoff

wall. This effect would not occur and no decrease in well yield or increase in pumping cost would be expected when the production zone of the well is below the tip of the slurry cutoff walls. That is the case for almost all irrigation, industrial, and municipal wells because those wells are typically much deeper than the deepest cutoff walls proposed for the levees surrounding the Natomas Basin. As discussed below, it is also the case for all domestic wells mapped along the NEMDC North and the ARNL and for most of the mapped domestic wells along Reaches 16-20 of the SREL. There are a few shallow domestic wells along the SREL that have the potential to be impacted by relatively deep cutoff walls proposed for those reaches. As summarized below, however, any impacts are expected to be small.

Sacramento River East Levee

A more detailed map of private wells along Reaches 16 through 20 of the SREL is presented on **Figure 3**. The water supply wells mapped by M&H in this area (green circles) are summarized in **Table 7**:

- Reach 16 – 11 domestic wells and one irrigation well;
- Reach 18 – one domestic and one irrigation well;
- Reach 19A – one domestic well;
- Reach 19B – four domestic wells, three irrigation wells, and three municipal wells; and
- Reach 20 – one domestic and one "lake" well.

Reaches 19A through 20 of the SREL are highly urbanized, and some of the mapped domestic and irrigation wells in this area are probably unused or abandoned. However, it is assumed that almost all of the properties containing houses along Reaches 16-18 and most of the water side properties in Reaches 19A and 19B rely on domestic wells for water supply. This means that the existing mapping based on DWR Well Completion Reports shows only a small percentage of the wells in this area. The 65 orange circles on **Figure 3** represent house locations shown on Google Earth that do not have a previously mapped well on the property. Only one potential well location is shown on properties that contain multiple houses, although some of these may contain multiple wells. A few of the water side properties in Reach 19B are connected to the City of Sacramento (City) water distribution system, but most still use domestic wells for water supply (M&H, 2010). The construction features of the unmapped wells are unknown but would logically be similar to those of nearby mapped wells.

The 18 domestic wells mapped along Reaches 16-20 of the SREL range in depth from 90 to 180 feet, with an average of 131 feet. As shown in **Table 7**, eight of those wells are located on the water side of the levee and ten are on the land side. Slurry cutoff walls will result in slightly higher groundwater levels on the upgradient side of the cutoff wall and slightly lower water levels on the downgradient side. However, there is some uncertainty about whether the direction of groundwater flow is consistently to the east or varies seasonally in this area. Hydrographs of water levels measured in shallow piezometers in Reaches 16 and 18 included in LSCE (2009) indicate that groundwater flows away from the Sacramento River in the winter and spring but may flow toward the River in the summer and fall. In contrast, groundwater elevation contour maps prepared for 2003 show groundwater flow to the east in both the spring and fall (LSCE,

2009). It is possible that the gradient reversal indicated on the hydrographs occurs only in the uppermost zone, while the flow direction is consistently to the east in deeper zones tapped by water supply wells. If that is the case, there would be a slightly greater likelihood of impacts for the land side wells.

Measurable impacts due to slurry cutoff walls are considered unlikely at most of the wells along Reaches 16-20 of the SREL for one or more of the following reasons:

- The well is considerably deeper than the tip of the adjacent cutoff wall;
- The top of the perforated interval is below or only slightly above the tip of the proposed cutoff wall;
- The well is located relatively far away from the levee;
- The well is unused; or
- The well is scheduled for replacement because it is within the footprint of proposed levee improvements.

Most of the wells mapped along Reaches 16-20 of the SREL will not be impacted by proposed slurry cutoff walls due the well depth, construction, or distance from the levee. One irrigation well (in Reach 18) is within the proposed levee construction footprint and is currently scheduled for replacement. The replacement well will be deep enough to avoid potential cutoff wall impacts. Some of the other wells within the construction footprint shown on **Figure 3** may also be replaced, but this has not yet been determined.

A few of the mapped and unmapped wells along Reaches 16-20 of the SREL have a potential to be impacted by planned slurry cutoff walls because they do not meet at least one of the above criteria. However, any decreases in well yield or other impacts to private wells due to the proposed slurry cutoff walls would be expected to be small. Well capacity data are limited in Reaches 16-20, but the capacities of domestic wells located further north along the SREL average more than 60 gallons per minute (gpm) based on initial well test results shown on Well Completion Reports. The only well capacity estimate available for a domestic well in Reaches 16-20 shown in **Table 7** is also 60 gpm. With such high capacities, domestic wells only need to pump for a few minutes a day to meet normal water demands. This results in very localized individual cones of depression that would must likely not reach the adjacent cutoff wall. If a cone of depression does reach the cutoff wall, there could be some additional drawdown and decrease in pumping capacity. Due to the short pumping cycles, however, any impacts would not be expected to be measurable.

NEMDC North

There are 13 domestic wells, 11 irrigation wells, and two industrial wells that have been mapped by Mead & Hunt along Reaches 8, 12, 14, and 15 of the NEMDC North within one mile of the levee. The irrigation and industrial wells range in depth from 133 to 952 feet, with an average of 359 feet. These wells are too deep to be impacted by the slurry cutoff walls proposed for this area.

The 13 domestic wells mapped along the NEMDC North range in depth from 96 to 220 feet, with an average of 153 feet. Five of these wells are located on the land side (west) of the levee and eight are located east of the canal. Most of the drillers' logs available for these domestic wells do not show perforated intervals, but the top of the perforations would likely be below the tip of the adjacent cutoff wall for almost all wells. The depths of the proposed cutoff walls range from about 20 to 60 feet below the toe of the levee. Most of the cutoff wall depths would be above the estimated average water table elevation. As discussed above, the average saturated thickness for the proposed cutoff walls in all four reaches is estimated to be only about five feet for existing conditions and 17 feet for future conditions. The combination of relatively deep wells and relatively shallow cutoff walls means that no impacts to nearby domestic wells would be expected.

American River North Levee

As shown in **Table 7**, nine wells along Reaches 1-4 of the ARNL were mapped by M&H (2008). These include two domestic wells, three irrigation wells, and two municipal wells. Five wells are located on the land side of the North Levee, and two wells are located on the water side. This area is within the City limits, and some of the mapped domestic and irrigation wells may be unused or abandoned. The slurry cutoff walls proposed for this area are relatively shallow, and no impacts to nearby wells are expected.

Summary

The effects of SAFCA's proposed construction activities on groundwater conditions were evaluated in the LSCE (2009) report. That evaluation has been updated in this memorandum due to changes in the proposed locations and depths of slurry cutoff walls to be constructed along the levees surrounding the Natomas Basin during Phase 4b. The impacts of slurry cutoff walls on groundwater flow were evaluated for both existing conditions and future conditions in 2030 because groundwater levels are predicted to change in future years due to changes in groundwater pumping patterns.

Slurry cutoff walls along the SREL and the NCC South Levee will reduce groundwater inflow to the Natomas Basin beneath those levees, and slurry cutoff walls along the PGCC and NEMDC will reduce groundwater outflow from the Natomas Basin. On a cumulative basis, all proposed slurry cutoff walls will reduce the net groundwater inflow to the Natomas Basin. The estimated total flow reduction is about 960 afy under existing conditions and 1,400 afy under future conditions.

In addition to slurry cutoff walls, groundwater flow and storage will also be affected by other proposed construction activities, as summarized in LSCE (2009). Deep percolation from irrigated farmland will decrease due to land use changes, seepage from canals will increase due to canal improvements, and groundwater pumping will decrease due to the planned transition to surface water supply at the Brookfield borrow site. The net effect of all proposed construction activities will be a slight increase in groundwater levels and storage in the Natomas Basin (about

700 afy for existing conditions and 260 afy for future conditions). The effect on subsurface outflow to the east would be slightly negative for existing condition (-80 afy) and slightly positive for future conditions (60 afy).

There would also be small effects on groundwater quality because the proposed construction activities would result in slight groundwater quality degradation in some areas and improvements in other areas. The primary impact would be increased salt accumulation in the Natomas Basin (due to reduced groundwater inflow from the west and north) and east of the Natomas Basin (due to reduced groundwater outflow to the east). However, these reductions represent a small percentage of the total estimated groundwater inflow and outflow, and the water quality impacts are not expected to be measurable.

Well construction data and approximate locations are available for a number of private domestic and irrigation wells near the levees surrounding the Natomas Basin. However, well construction details and locations have not been determined for the majority of the domestic wells along Reaches 16-20 of the SREL. Shallow wells on either side of the levee could experience slightly lower pumping water levels because the cutoff walls will act as low permeability barriers that will reduce the areal extent and increase the depth of the cone of depression. This effect would only occur when the production zone of the well is above the tip of the adjacent cutoff wall. No decreases in well yields or increases in pumping costs are expected when the production zone of the well is below the tip of the slurry cutoff wall. That is the case for almost all irrigation, industrial, and municipal wells because those wells are much deeper than the deepest cutoff walls proposed for the levees surrounding the Natomas Basin. As discussed below, it is also the case for all domestic wells mapped along the NEMDC North and the ARNL and most of the domestic wells along Reaches 16-20 of the SREL.

There are a few mapped and unmapped domestic wells along Reaches 16-20 of the SREL that have the potential to be impacted by relatively deep slurry cutoff walls proposed for those reaches. However, any decreases in well yield or other impacts to private wells due to the proposed cutoff walls would be expected to be small. One of the main reasons for this is that available well capacity data indicate that domestic well capacities along the SREL average more than 60 gpm. With such high capacities, domestic wells only need to pump for a few minutes a day to meet normal water demands. This will result in very localized cones of depression that may even not reach the adjacent cutoff wall. If a cone of depression does reach the cutoff wall, there will be some additional drawdown and decrease in well yield, but this is not expected to be measurable.

References

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Attachments

Tables:

Table 1	Proposed Mitigation for Seepage Beneath Sacramento River East Levee
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Table 1
Proposed Mitigation for Seepage Beneath Sacramento River East Levee

Reach	Stations	Length of Reach (ft)	Proposed Mitigation[1]	Length of Cutoff Wall[1] (ft)	Depth of Cutoff Wall[1] (ft)	Cutoff Wall Platform Elevation[2] (ft msl)	Cutoff Wall Bottom Elevation[2] (ft msl)	Average Ground-Water Elevation[3] (ft msl)	Saturated Thickness to Tip of Cutoff Wall (ft)	Saturated Cross-Sectional Area of Cutoff Wall (sq ft)
1	0+00 to 2+00	200	None	-	-	-	-	19.3	-	-
	2+00 to 26+00	2,400	Cutoff Wall	2,400	27	34	7	19.3	12	29,400
	26+00 to 38+20	1,220	Cutoff Wall	1,220	22	34	12	19.3	7	8,845
	38+20 to 46+00	780	Cutoff Wall	780	27	39	12	19.3	7	5,655
	46+00 to 48+00	200	Cutoff Wall	200	66	39	-27	19.3	46	9,250
2	48+00 to 77+00	2,900	Cutoff Wall	2,900	66	39	-27	19.0	46	133,400
	77+00 to 98+00	2,100	Cutoff Wall	2,100	65	38	-27	19.0	46	96,600
	98+00 to 100+00	200	Cutoff Wall	200	53	38	-15	19.0	34	6,800
3	100+00 to 104+00	400	Cutoff Wall	400	53	38	-15	19.0	34	13,600
	104+00 to 105+00	100	Cutoff Wall & Berm	100	53	38	-15	19.0	34	3,400
	105+00 to 108+00	300	Cutoff Wall & Berm	300	28	38	10	19.0	9	2,700
	108+00 to 110+00	200	Cutoff Wall & Berm	200	27	37	10	19.0	9	1,800
4a	110+00 to 142+00	3,200	Cutoff Wall & Berm	3,200	27	37	10	18.5	9	27,200
	142+00 to 190+00	4,800	Cutoff Wall & Berm	4,800	37	37	0	18.5	19	88,800
4b	190+00 to 191+50	150	Cutoff Wall & Berm	150	37	37	0	18.0	18	2,700
	191+50 to 201+50	1,000	Cutoff Wall & Berm	1,000	62	37	-25	18.0	43	43,000
	201+50 to 214+00	1,250	Cutoff Wall & Berm	1,250	19	37	18	18.0	0	0
	214+00 to 228+00	1,400	Seepage Berm	-	-	-	-	18.0	-	-
5a	228+00 to 229+50	150	Seepage Berm	-	-	-	-	16.5	-	-
	229+50 to 232+50	300	Cutoff Wall & Berm	300	78	38	-40	16.5	57	16,950
	232+50 to 239+00	650	Cutoff Wall	650	78	38	-40	16.5	57	36,725
	239+00 to 245+00	600	Cutoff Wall	600	61	38	-23	16.5	40	23,700
	245+00 to 249+00	400	Cutoff Wall	400	53	38	-15	16.5	32	12,600
	249+00 to 263+00	1,400	Cutoff Wall	1,400	48	38	-10	16.5	27	37,100
5b	263+00 to 280+00	1,700	Cutoff Wall	1,700	48	38	-10	16.5	27	45,050

Table 1 (continued)
Proposed Mitigation for Seepage Beneath Sacramento River East Levee

Reach	Stations	Length of Reach (ft)	Proposed Mitigation[1]	Length of Cutoff Wall[1] (ft)	Depth of Cutoff Wall[1] (ft)	Cutoff Wall Platform Elevation[2] (ft msl)	Cutoff Wall Bottom Elevation[2] (ft msl)	Average Ground-Water Elevation[3] (ft msl)	Saturated Thickness to Tip of Cutoff Wall (ft)	Saturated Cross-Sectional Area of Cutoff Wall (sq ft)
6a	280+00 to 287+00	700	Cutoff Wall	700	48	38	-10	16.5	27	18,550
	287+00 to 303+00	1,600	Cutoff Wall	1,600	108	38	-70	16.5	87	138,400
6b	303+00 to 315+00	1,200	Cutoff Wall	1,200	108	38	-70	16.5	87	103,800
	315+00 to 322+00	700	Cutoff Wall	700	113	38	-75	16.5	92	64,050
	322+00 to 330+00	800	Cutoff Wall	800	108	38	-70	16.5	87	69,200
7	330+00 to 332+00	200	Cutoff Wall	200	108	38	-70	16.5	87	17,300
	332+00 to 336+80	480	Cutoff Wall	480	118	38	-80	16.5	97	46,320
	336+80 to 348+00	1,120	Cutoff Wall & Berm	1,120	118	38	-80	16.5	97	108,080
	348+00 to 353+50	550	Cutoff Wall & Berm	550	88	38	-50	16.5	67	36,575
	353+50 to 362+00	850	Cutoff Wall	850	88	38	-50	16.5	67	56,525
8	362+00 to 374+00	1,200	Cutoff Wall	1,200	88	38	-50	17.5	68	81,000
	374+00 to 382+50	850	Cutoff Wall	850	93	38	-55	17.5	73	61,625
	382+50 to 402+00	1,950	Cutoff Wall	1,950	88	38	-50	17.5	68	131,625
9a	402+00 to 407+00	500	Cutoff Wall	500	88	38	-50	17.5	68	33,750
9b	407+00 to 438+00	3,100	Cutoff Wall	3,100	88	38	-50	17.5	68	209,250
	438+00 to 457+00	1,900	Cutoff Wall	1,900	78	38	-40	17.5	58	109,250
	457+00 to 460+00	300	Cutoff Wall & Berm	300	98	38	-60	17.5	78	23,250
	460+00 to 468+00	800	Seepage Berm	-	-	-	-	17.5	-	-
10	468+00 to 495+00	2,700	Seepage Berm	-	-	-	-	17.5	-	-
11a	495+00 to 535+00	4,000	Seepage Berm	-	-	-	-	17.5	-	-
11b	535+00 to 635+00	10,000	Seepage Berm	-	-	-	-	17.5	-	-
12a	635+00 to 653+00	1,800	Seepage Berm	-	-	-	-	13.0	-	-
	653+00 to 654+00	100	Cutoff Wall & Berm	100	83	41	-42	13.0	55	5,500
	654+00 to 655+00	100	Cutoff Wall	100	83	41	-42	13.0	55	5,500
12b	655+00 to 667+00	1,200	Cutoff Wall	1,200	83	41	-42	12.5	55	65,400

Table 1 (continued)
Proposed Mitigation for Seepage Beneath Sacramento River East Levee

Reach	Stations	Length of Reach (ft)	Proposed Mitigation[1]	Length of Cutoff Wall[1] (ft)	Depth of Cutoff Wall[1] (ft)	Cutoff Wall Platform Elevation[2] (ft msl)	Cutoff Wall Bottom Elevation[2] (ft msl)	Average Ground-Water Elevation[3] (ft msl)	Saturated Thickness to Tip of Cutoff Wall (ft)	Saturated Cross-Sectional Area of Cutoff Wall (sq ft)
13	667+00 to 678+50	1,150	Cutoff Wall	1,150	76	41	-35	13.0	48	55,200
	678+50 to 679+50	100	Cutoff Wall & Berm	100	76	41	-35	13.0	48	4,800
	679+50 to 700+00	2,050	Seepage Berm	-	-	-	-	13.0	-	-
14	700+00 to 732+00	3,200	Seepage Berm	-	-	-	-	14.5	-	-
15	732+00 to 780+00	4,800	Seepage Berm	-	-	-	-	16.0	-	-
16	780+00 to 799+00	1,900	Cutoff Wall & Berm	1,900	117	41	-76	15.5	92	173,850
	799+00 to 832+00	3,300	Cutoff Wall, Berm, & Relief Wells	3,300	117	41	-76	15.5	92	301,950
17	832+00 to 842+00	1,000	Cutoff Wall, Berm, & Relief Wells	1,000	117	41	-76	13.5	90	89,500
18a	842+00 to 848+00	600	Cutoff Wall, Berm, & Relief Wells	600	117	41	-76	13.0	89	53,400
18b	848+00 to 857+00	900	Cutoff Wall, Berm, & Relief Wells	900	117	41	-76	13.0	89	80,100
19a	857+00 to 875+00	1,800	Cutoff Wall, Berm, & Relief Wells	1,800	117	41	-76	10.5	87	155,700
19b	875+00 to 878+00	300	Cutoff Wall, Berm, & Relief Wells	300	117	41	-76	6.5	83	24,750
	878+00 to 886+00	800	Cutoff Wall	800	117	41	-76	6.5	83	66,000
	886+00 to 895+50	900	Cutoff Wall	900	109	41	-68	6.5	75	67,050
	895+50 to 904+50	950	Cutoff Wall	950	100	41	-59	6.5	66	62,225
	904+50 to 925+00	2,050	Cutoff Wall	2,050	81	41	-40	6.5	47	95,325
20a	925+00 to 925+50	50	Cutoff Wall	50	81	41	-40	2.0	42	2,100
20b	925+50 to 956+83	3,133	Cutoff Wall	3,133	81	41	-40	0.0	40	125,320
	Total	95,683		64,583						3,387,495

1. Proposed mitigation and length of cutoff walls based on HDR table (December 17, 2009).
2. Vertical datum = NAVD88.
3. Based on average of spring and fall 2003 groundwater elevations shown on Figures 3-5 and 3-7 (LSCE, May 2009).

Table 2
Proposed Slurry Cutoff Wall Locations Along Natomas Cross Canal, Pleasant Grove Creek Canal, Natomas East Main Drainage Canal, and American River[1]

Levee	Reach	Stations	Proposed Mitigation	Length of Reach (ft)	Length of Cutoff Wall (ft)	Depth of Cutoff Wall (ft)	Cutoff Wall Tip Elevation (ft msl)	Existing Conditions				2030 Conditions			
								Estimated Average Ground-water Elevation[2] (ft msl)	Saturated Thickness to Tip of Cutoff Wall[2] (ft)	Saturated Cutoff Wall Cross-Sectional Area (sq ft)	Average Saturated Thickness to Tip of Cutoff Wall (ft)	Estimated Average Ground-water Elevation[3] (ft msl)	Saturated Thickness to Tip of Cutoff Wall[3] (ft)	Saturated Cutoff Wall Cross-Sectional Area (sq ft)	Average Saturated Thickness to Tip of Cutoff Wall (ft)
Natomas Cross Canal South Levee	1	0+00 to 5+70	Cutoff Wall	570	570	75	-33	19	52	29,498		15	48	27,360	
	2	5+70 to 105+00	Cutoff Wall	9,930	9,930	70	-28	18	46	459,263		13	41	407,130	
	3	105+00 to 123+00	Cutoff Wall	1,800	1,800	70	-28	18	46	83,250		12	40	72,000	
	4	123+00 to 173+00	Cutoff Wall	5,000	5,000	80	-38	18	56	280,000		12	50	250,000	
	5	173+00 to 195+00	Cutoff Wall	2,200	2,200	80	-38	18	56	123,750		12	50	110,000	
	6	195+00 to 280+00	Cutoff Wall	8,500	8,500	80	-38	19	57	484,500		13	51	433,500	
	7	280+00 to 287+00	Cutoff Wall	700	700	56	-14	21	35	24,325		13	27	18,900	
	Subtotal			**28,700**	**28,700**					**1,484,585**	**51.7**			**1,318,890**	**46.0**
Pleasant Grove Creek Canal West Levee	1	287+37 to 357+00	Cutoff Wall	6,963	6,963	47	-8	19	27	186,260		10	18	125,334	
	2	357+00 to 391+00	None	3,400	-	-	-	14	0	0		6	0	0	
	3	391+00 to 461+31	Cutoff Wall	7,031	7,031	25	14	6	0	0		3	0	0	
	Subtotal			**17,394**	**13,994**					**186,260**	**13.3**		**0**	**125,334**	**9.0**
Natomas East Main Drainage Canal (North)	15	645+00 to 675+65	Cutoff Wall	3,065	3,065	45	-15	-3	12	36,780		0	15	45,975	
	14	576+00 to 645+00	Cutoff Wall	6,900	6,900	45	-15	-4	11	75,900		0	15	103,500	
	13	555+00 to 576+00	None	2,100	-	-	-	-3	0	0		0	0	0	
	12	505+00 to 555+00	Cutoff Wall	5,000	5,000	15	15	-3	0	0		0	0	0	
	11	467+00 to 505+00	None	3,800	-	-	-	-1	0	0		0	0	0	
	10	425+00 to 467+00	None	4,200	-	-	-	-3	0	0		1	0	0	
	9	386+10 to 425+00	None	3,890	-	-	-	-6	0	0		1	0	0	
	8	318+75 to 386+10	Cutoff Wall	6,735	6,735	62	-32	-9	24	0		2	34	228,990	
	Subtotal			**35,690**	**21,700**					**112,680**	**5.2**			**378,465**	**17.4**

Table 2 (continued)
Proposed Slurry Cutoff Wall Locations Along Natomas Cross Canal, Pleasant Grove Creek Canal, Natomas East Main Drainage Canal, and American River[1]

Levee	Reach	Stations	Proposed Mitigation	Length of Reach (ft)	Length of Cutoff Wall (ft)	Depth of Cutoff Wall (ft)	Cutoff Wall Tip Elevation (ft msl)	Existing Conditions				2030 Conditions			
								Estimated Average Ground-water Elevation[2] (ft msl)	Saturated Thickness to Tip of Cutoff Wall[2] (ft)	Saturated Cutoff Wall Cross-Sectional Area (sq ft)	Average Saturated Thickness to Tip of Cutoff Wall (ft)	Estimated Average Ground-water Elevation[3] (ft msl)	Saturated Thickness to Tip of Cutoff Wall[3] (ft)	Saturated Cutoff Wall Cross-Sectional Area (sq ft)	Average Saturated Thickness to Tip of Cutoff Wall (ft)
Natomas East Main Drainage Canal (South)	7c	305+65 to 318+75	Cutoff Wall	1,310	1,310	33	10	-10	0	0		3	0	0	
	7b	265+50 to 305+65	Cutoff Wall	4,015	4,015	43	0	-11	0	0		3	3	12,045	
	7a	235+00 to 265+50	None	3,050	-	-	-	-14	0	0		4	0	0	
	6	196+00 to 235+00	Cutoff Wall	3,900	3,900	47	0	-15	0	0		5	5	19,500	
	5	154+00 to 196+00	None	4,200	-	-	-	-17	0	0		6	0	0	
	4b	140+00 to 154+00	Cutoff Wall	1,400	1,400	54	-10	-18	0	0		7	17	23,800	
	4a	114+00 to 140+00	Cutoff Wall	2,600	2,600	63	-20	-19	2	3,900		7	27	70,200	
	3	73+50 to 114+00	None	4,050	-	-	-	-19	0	0		8	0	0	
	2b	55+00 to 73+50	Cutoff Wall	1,850	1,850	53	-10	-19	0	0		10	20	37,000	
	2a	17+00 to 55+00	Cutoff Wall	3,800	3,800	73	-30	-19	11	41,800		10	40	152,000	
	1	0+00 to 17+00	None	1,700	-	-	-	-15	0	0		11	0	0	
	Subtotal			**31,875**	**18,875**					**45,700**	**2.4**			**314,545**	**16.7**
American River North Levee	4	73+21 to 115+71	Cutoff Wall	4,250	4,250	60	-20	-11	10	40,375		10	30	127,500	
	3	63+21 to 73+21	Cutoff Wall	1,000	1,000	60	-20	-7	13	13,000		10	30	30,000	
	2	37+00 to 63+21	Cutoff Wall	2,621	2,621	60	-20	-5	15	39,315		10	30	78,630	
		16+21 to 37+00	Cutoff Wall	2,079	2,079	45	-5	-5	1	1,040		10	15	31,185	
	1b	2+63 to 16+21	Cutoff Wall	1,358	1,358	45	-5	-3	3	3,395		10	15	20,370	
	1a	0+00 to 2+63	Cutoff Wall	263	263	44	-4	-2	2	526		10	14	3,682	
	Subtotal			**11,571**	**11,571**					**97,651**	**8.4**			**291,367**	**25.2**
Total				**125,230**	**94,840**					**1,926,876**				**2,428,601**	

1. Estimated cutoff wall locations and depths provided by Wood Rodgers (2009) for NCC, PGCC, and NEMDC. Estimates for American River North Levee provided by HDR (2009).
2. Based on average groundwater elevation shown on spring and fall 2003 contour maps (Figures 3-5 & 3-7, LSCE, May 2009).
3. Based on 2030 groundwater elevation contours simulated by IGSM model, Scenario 2B (Figure 6-11, LSCE, 2008).

Table 3
Potential Effects of Slurry Cutoff Walls on Groundwater Flow

Levee	Time Period	Total Length of Levee (ft)	Saturated Thickness for Ground-Water Flow (ft)	Cross-Sectional Area for Flow (ft^2)	Total Flow Without Cutoff Walls[1] (afy)	Flow per Cross-Sectional Area (afy/ft^2)	Length of Proposed Cutoff Walls (ft)	Average Depth of Cutoff Walls (ft)	Estimated Saturated Depth of Cutoff Walls[8] (ft)	Saturated Cross-Sectional Area of Cutoff Walls (ft^2)	Flow Through Cutoff Walls (afy)	Flow Through, Beneath, or Around Cutoff Walls (afy)	Flow Reduction Due to Cutoff Walls[9] (afy)	(%)
Sacramento River East Levee	Existing	96,000	200	19,200,000	8,450 [2]	4.40E-04	64,583	76	52	3,387,378	1,491	7,406	1,044	12
	2030				9,341 [3]	4.87E-04					1,648	8,187	1,154	12
NCC South Levee	Existing	28,700	400	11,480,000	459 [4]	4.00E-05	28,700	75	52	1,484,651	59	417	42	9
	2030				3,918 [5]	3.41E-04			46	1,318,765	450	3,603	315	8
PGCC West Levee	Existing	17,394	400	6,957,600	-4,451 [6]	-6.40E-04	13,994	36	13	186,260	-119	-4,367	-83	2
	2030				-246 [7]	-3.53E-05			9	125,386	-4	-243	-3	1
NEMDC West Levee (North)	Existing	35,690	400	14,276,000	-9,132 [6]	-6.40E-04	21,700	43	5	112,623	-72	-9,081	-50	1
	2030				-504 [7]	-3.53E-05			17	378,448	-13	-495	-9	2
NEMDC West Levee (South)	Existing	31,875	400	12,750,000	-8,156 [6]	-6.40E-04	18,875	54	2	45,678	-29	-8,135	-20	0
	2030				-450 [7]	-3.53E-05			17	314,458	-11	-442	-8	2
American River North Levee	Existing	11,560	200	2,312,000	1,086 [6]	4.70E-04	11,571	55	8	97,659	46	1,054	32	3
	2030				-500 [7]	-2.16E-04			25	291,358	-63	-456	-44	9
Total (Existing)					**-11,743**					**5,314,249**	**1,376**	**-5,013**	**963**	
Total (2030)					**11,559**					**5,815,793**	**2,006**	**10,155**	**1,404**	
Total (All)		**221,219**		**66,975,600**			**159,423**							

1. Positive values indicate groundwater inflow; negative values indicate goundwater outflow.
2. Source of total flow estimate = Table 6-4 (LSCE, May 2009).
3. Source of total flow estimate = Table 6-5 (LSCE, May 2009).
4. Source of total flow estimate = groundwater inflow from 2004 IGSM simulation (241 afy) plus canal seepage estimated by Kleinfelder (218 afy) (LSCE, May 2009).
5. Source of total flow estimate = groundwater inflow from 2030 IGSM simulation (3,700 afy) plus canal seepage estimated by Kleinfelder (218 afy) (LSCE, May 2009).
6. Source of total flow estimate = IGSM 2004 simulation (LSCE, May 2009).
7. Source of total flow estimate = IGSM 2030 simulation (LSCE, May 2009).
8. Existing conditions based on average of spring and fall 2003 groundwater elevations shown on Figures 3-5 and 3-7 (LSCE, May 2009). For all levees except SREL, 2030 groundwater elevations based on Scenario 2B IGSM simulation (Figure 6-11, LSCE, 2008). For SREL, 2030 groundwater elevations assumed to be the same as existing conditions.
9. Increased groundwater inflow (or decreased outflow) shown as positive value; increased outflow (or decreased inflow) is shown as negative. 70% flow reduction assumed for slurry cutoff walls based on Kleinfelder (2009).

Table 4
SAFCA Construction Assumptions for Water Budget Estimates

	Total Length (ft)	Slurry Cutoff Walls		Canals		Total Area (ac)	Existing Agricultural Land Uses	Future Land Uses	Notes/Sources
		Length (ft)	Average Depth (ft)	Length of Lined or Piped Segments (ft)	Average Width at Waterline (ft)				
Levees									
Sacramento River East Levee	96,000	64,583	76	-	-	486.5	20 ac rice, 175 ac field crops, 5 ac orchard	Levee	HDR (December 17, 2009); Land use based on EDAW Table 3
NCC South Levee	28,700	28,700	75	-	-	148.5	5 ac rice	Levee	Kleinfelder (2008), Land use based on EDAW Table 3
PGCC West Levee	17,394	13,994	36	-	-	89.5	50 ac rice	Levee	Wood Rodgers (December 16, 2009), land use based on EDAW Table 3
NEMDC West Levee (North)	35,690	21,700	43	-	-	-	South NEMDC - none; North NEMDC - unknown	Levee	Wood Rodgers (December 16, 2009)
NEMDC West Levee (South)	31,875	18,875	54	-	-	-	South NEMDC - none; North NEMDC - unknown	Levee	Wood Rodgers (December 16, 2009)
American River North Levee	11,560	11,560	55	-	-	-	None	Levee	HDR (December 17, 2009)
Canals									
GGS/Drainage Canal	23,200	-	-	0	50	58.5	45 ac field crops	-	Width (M&H, 7-15-08); Land use based on EDAW Table 3
West Drainage Canal (Existing)	19,000	-	-	0	30	7	-	Managed grassland	4,700 LF section to be relocated
West Drainage Canal (Relocated)	20,600	-	-	0	72	8	1.5 ac field crops	-	Relocated section = 6,300 LF, rest widened to 72 ft.
Elkhorn Canal (Existing)	19,850	-	-	5,280	16	30	-	Levee	Length & width (M&H, 7-15-08)
Elkhorn Canal (Relocated)	22,300	-	-	9,050	32	34	15 ac field crops, 3 ac orchard, 11 ac other	-	Land use estimated by LSCE based on 2004 land use map from LSCE (2008b)
Riverside Canal (Existing)	19,600	-	-	0	7	50	-	Levee	
Riverside Canal (Relocated)	20,550	-	-	0	10	54	12 ac rice, 102 ac field crops, 17 ac orchard, 24 ac other	-	Land use estimated by LSCE based on 2004 land use map from LSCE (2008b)
Borrow Sites									
Airport North Bufferlands	-	-	-	-	-	737	Previously planted to rice but currently non-irrigated at request of FAA.	Managed grassland	Acreage (M&H, 7-15-08); current land uses per SAFCA
Brookfield Property	-	-	-	-	-	353	325 ac rice irrigated w/ 100% groundwater (1/2 & 1/2 reg. & wild rice)	286 ac rice irrigated w/ 20% groundwater, 80% surface water	Assumption of 286 ac in rice in future based on work on adjacent PGCC west levee (M&H, 2008)
Fisherman's Lake	-	-	-	-	-	400	49 ac rice, 266 ac field crops, 85 ac marsh	175 ac managed marsh, 225 ac grass-land or woodland	Acreage, land use from Marieke Armstrong, M&H (7-18-08)

Table 5
Groundwater Budget for Proposed SAFCA Construction Activities Based on Existing Conditions

SAFCA Construction Activity	Inflow (afy)[1]					Outflow (afy)[1]			Change in Storage (afy)
	Deep Percolation	Net Recharge from Streams	Seepage from Canals	Subsurface Inflow	Total Inflow	Subsurface Outflow	Groundwater Pumping	Total Outflow	
Levee Improvements[2]									
Sacramento River East Levee	-63	-1,044	0	0	**-1,106**	0	0	**0**	-
NCC South Levee	-4	0	0	-42	**-45**	0	0	**0**	-
PGCC West Levee	-39	0	0	0	**-39**	-83	0	**-83**	-
NEMDC West Levee (North)	0	0	0	0	**0**	-50	0	**-50**	-
NEMDC West Levee (South)	0	0	0	0	**0**	-20	0	**-20**	-
American River North Levee	0	-32	0	0	**-32**	0	0	**0**	-
Subtotal	**-105**	**-1,076**	**0**	**-42**	**-1,222**	**-154**	**0**	**-154**	**-1,068**
Canal Improvements									
New GGS/Drainage Canal	-11	0	162	0	**151**	0	0	**0**	-
West Drainage Canal	0	0	128	0	**127**	0	0	**0**	-
Elkhorn Canal relocation	-11	0	27	0	**16**	0	0	**0**	-
Riverside Canal relocation	-19	0	10	0	**-9**	0	0	**0**	-
Subtotal	**-41**	**0**	**327**	**0**	**285**	**0**	**0**	**0**	**285**
Borrow Sites									
Airport North	0	0	0	0	**0**	0	0	**0**	-
Brookfield	-30	0	0	0	**-30**	76	-1,625	**-1,549**	-
Fisherman's Lake	-36	0	0	0	**-36**	0	0	**0**	-
Subtotal	**-67**	**0**	**0**	**0**	**-67**	**76**	**-1,625**	**-1,549**	**1,483**
Total	**-213**	**-1,076**	**327**	**-42**	**-1,003**	**-78**	**-1,625**	**-1,703**	**700**

1. Increased groundwater inflow (or decreased outflow) shown as a positive value; increased outflow (or decreased inflow) is shown as negative.
2. Effect of slurry cutoff walls represent existing results from Table 3.

Table 6
Groundwater Budget for Proposed SAFCA Construction Activities Based on Future (2030) Conditions

SAFCA Construction Activity	Inflow (afy)[1]					Outflow (afy)[1]			Change in Storage (afy)
	Deep Percolation	Net Recharge from Streams	Seepage from Canals	Subsurface Inflow	Total Inflow	Subsurface Outflow	Groundwater Pumping	Total Outflow	
Levee Improvements[2]									
Sacramento River East Levee	-63	-1,154	0	0	**-1,216**	0	0	**0**	-
NCC South Levee	-4	0	0	-315	**-319**	0	0	**0**	-
PGCC West Levee	-39	0	0	0	**-39**	-3	0	**-3**	-
NEMDC West Levee (North)	0	0	0	0	**0**	-9	0	**-9**	-
NEMDC West Levee (South)	0	0	0	0	**0**	-8	0	**-8**	-
American River North Levee	0	44	0	0	**44**	0	0	**0**	-
Subtotal	**-105**	**-1,109**	**0**	**-315**	**-1,529**	**-20**	**0**	**-20**	**-1,509**
Canal Improvements									
New GGS/Drainage Canal	-11	0	162	0	**151**	0	0	**0**	-
West Drainage Canal	0	0	128	0	**127**	0	0	**0**	-
Elkhorn Canal relocation	-11	0	27	0	**16**	0	0	**0**	-
Riverside Canal relocation	-19	0	10	0	**-9**	0	0	**0**	-
Subtotal	**-41**	**0**	**327**	**0**	**285**	**0**	**0**	**0**	**285**
Borrow Sites									
Airport North	0	0	0	0	**0**	0	0	**0**	-
Brookfield	-30	0	0	0	**-30**	76	-1,625	**-1,549**	-
Fisherman's Lake	-36	0	0	0	**-36**	0	0	**0**	-
Subtotal	**-67**	**0**	**0**	**0**	**-67**	**76**	**-1,625**	**-1,549**	**1,483**
Total	**-213**	**-1,109**	**327**	**-315**	**-1,311**	**56**	**-1,625**	**-1,569**	**259**

1. Increased groundwater inflow (or decreased outflow) shown as a positive value; increased outflow (or decreased inflow) is shown as negative.
2. Effect of slurry cutoff walls represent 2030 results from Table 3.

Table 7

Private Wells Mapped Along Reaches Where Slurry Cutoff Walls Are Proposed During Phase 4b[1]

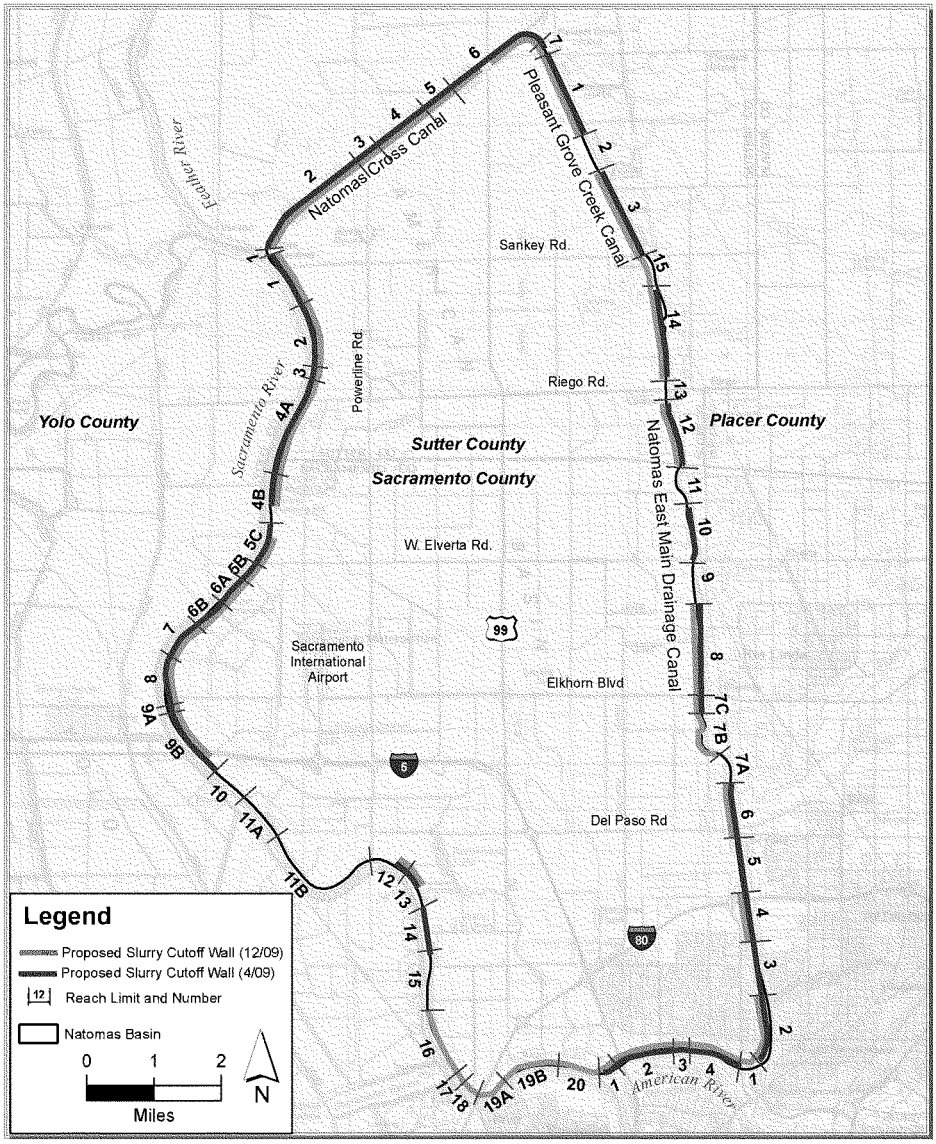
Levee	Reach	M&H Well ID	Location Relative to Levee	Intended Use	Cutoff Wall Tip Elevation (NAVD88)	Cutoff Wall Depth from Levee Toe (ft bgs)	Depth of Completed Well (ft)	Perforated Interval (ft)	Min. Casing Diameter (in)	Capacity Estimate on Log (gpm)	Status
SREL	16	246	Water Side	Domestic	-76	100	115	85-92	8	-	
		241	Water Side	Domestic	-76	100	160	110-130	5	-	
		251	Water Side	Domestic	-76	100	140	-	6.625	-	
		242	Water Side	Domestic	-76	100	140	-	6.625	-	
		247	Water Side	Domestic	-76	100	90	72-84	6	-	
		248	Water Side	Domestic	-76	100	148	-	6.625	-	
		291	Land Side	Domestic	-76	100	152	-	6.625	60	
		346	Land Side	Domestic	-76	100	120	100-120	6	-	
		347	Land Side	Domestic	-76	100	120	100-120	6	-	
		350	Land Side	Domestic	-76	100	150	130-150	5.5	-	
		285	Land Side	Irrigation	-76	100	250	87-250	8	-	
		239	Water Side	Domestic	-76	100	180	-	8	-	
	18	313	Land Side	Domestic	-76	100	120	100-120	5.5	-	
		277	Land Side	Irrigation	-76	100	147	89-137	14	-	To Be Replaced
	19A	240	Water Side	Domestic	-76	100	120	80-120	8	-	
	19B	273	Land Side	Domestic	-40	64	144	120-144	8	-	Within const. footprint
		261	Land Side	Domestic	-68	92	113	92-112	8.625	-	
		262	Land Side	Domestic	-59	83	105	-	3	-	Unused or abandoned
		265	Land Side	Irrigation	-59	83	120	80-120	10.75	300	
		264	Land Side	Irrigation	-59	83	320	-	10	-	
		268	Land Side	Municipal	-59	83	430	190-420	16	-	Within const. footprint
		269	Land Side	Domestic	-40	64	100	-	8	-	
		266	Land Side	Municipal	-59	83	470	220-460	16	2300	
		267	Land Side	Municipal	-59	83	500	330-490	16	300	
		260	Land Side	Irrigation	-76	100	412	92-336	10	900	
	20	180	Land Side	Domestic	-40	64	145	-	16	-	
		256	Land Side	Lake	-40	64	293	-	10	450	
NEMDC North	8	449	Land Side	Domestic/Irr.	-32	60	135	-	8	-	
		484	E. of Canal	Domestic	-32	60	220	-	NA	-	
		450	Land Side	Irrigation	-32	60	240	90-158	8	1350	

Table 7 (continued)

Private Wells Mapped Along Reaches Where Slurry Cutoff Walls Are Proposed During Phase 4b[1]

Levee	Reach	M&H Well ID	Location Relative to Levee	Intended Use	Cutoff Wall Tip Elevation (NAVD88)	Cutoff Wall Depth from Levee Toe (ft bgs)	Depth of Completed Well (ft)	Perforated Interval (ft)	Min. Casing Diameter (in)	Capacity Estimate on Log (gpm)	Status
NEMDC North	12	433	Land Side	Irrigation	15	20	700	430-450	14	-	
		435	Land Side	Irrigation	15	20	952	249-952	12	3200	
		438	Land Side	Irrigation	15	20	370	112-128	14	-	
		436	E. of Canal	Irrigation	15	20	285	100-120	12	-	
		439	E. of Canal	Fish Farm	15	20	330	120-330	12.75	-	
	14	421	Land Side	Irrigation	-15	50	200	-	14	2300	
		427	Land Side	Irrigation	-15	50	290	-	14	-	
		429	Land Side	Domestic	-15	50	165	-	6	-	
		430	Land Side	Domestic	-15	50	152	-	6	-	
		425	E. of Canal	Irrigation	-15	50	200	100-124	12	-	
		426	E. of Canal	Irrigation	-15	50	133	-	12	-	
		431	E. of Canal	Domestic	-15	50	205	-	6.25	-	
	15	406	Land Side	Domestic	-15	55	154	-	8	-	
		407	Land Side	Domestic	-15	55	150	-	8	-	
		413	Land Side	Irrigation	-15	55	350	250-350	10.75	290	
		400	E. of Canal	Domestic	-15	55	96	-	NA	-	
		402	E. of Canal	Domestic	-15	55	107	-	NA	-	
		405	Water Side	Irrigation	-15	55	320	-	12	-	
		410	E. of Canal	Domestic	-15	55	197	174-197	6	-	
		411	E. of Canal	Domestic	-15	55	151	-	8	17	
		414	E. of Canal	Domestic	-15	55	150	95-120	6	16	
		403	E. of Canal	Domestic	-15	55	107	-	6	-	
		404	E. of Canal	Industrial	-15	55	192	-	8	-	
ARNL	1	259	Land Side	Irrigation	-5	27	123	105-115	14	-	
	2	508	Land Side	Irrigation	-20	42	218	-	14	2020	
	3	515	Land Side	Irrigation	-20	42	170	-	14	-	
		519	Water Side	Domestic	-20	42	183	168-178	8.625	170	
	4	733	Land Side	Municipal	-20	42	316	146-292	12	-	
		739	Land Side	Municipal	-20	42	375	112-352	14	-	
		742	Land Side	Domestic	-20	42	49	-	6	-	

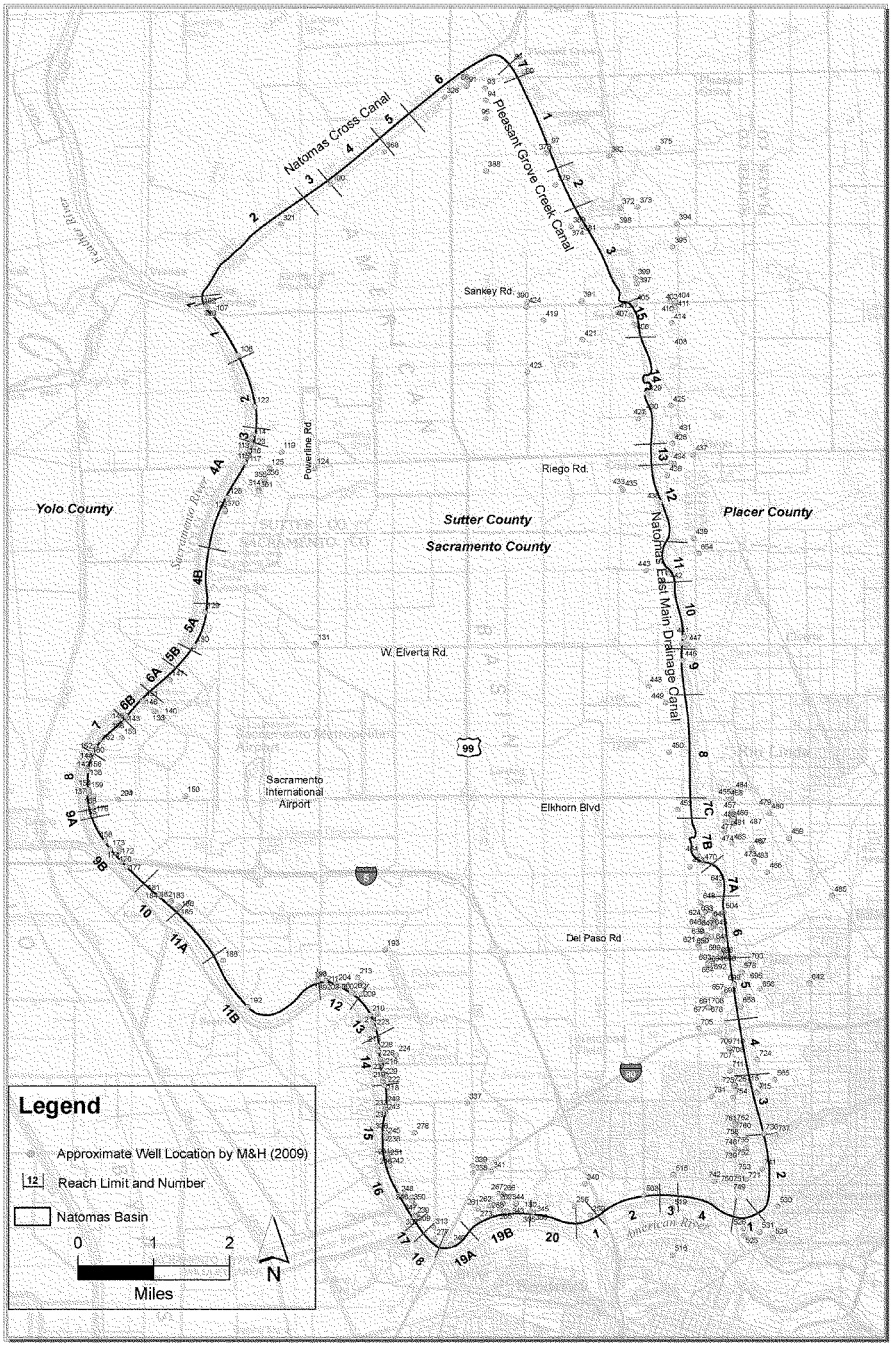
1. Wells mapped by Mead and Hunt (M&H, 2009).



FILE: \\server_pe2900\Public\SAFCA\GIS\Figure 1 Proposed Slurry Cutoff Wall.mxd Date: 1/26/2010

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

Figure 1
Proposed Slurry Cutoff Walls Surrounding Natomas Basin



FILE: \\server_pe2900\Public\SAFCA\GIS\Figure 2 Private Well.mxd Date: 1/28/2010

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Figure 2
Private Wells Mapped for Natomas Levee Improvement Program

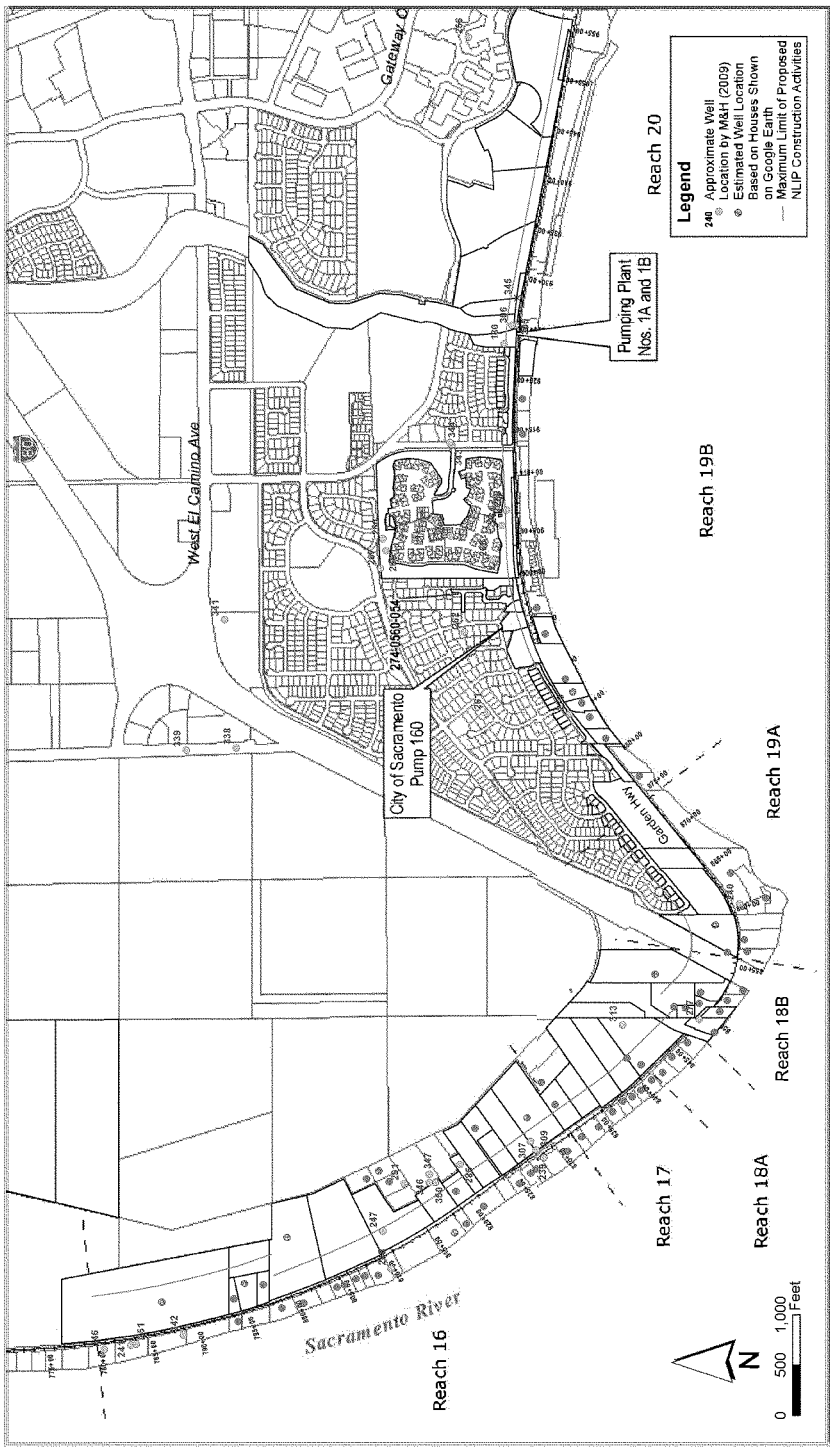


Figure 3
Estimated Locations of Private Wells Along Sacramento River East Levee Reaches 16-20

Technical Memorandum

northwest hydraulic consultants
3950 industrial boulevard, suite 100c
west sacramento, ca 95691
(916) 371-7400
(916) 371-7475 (fax)

DATE: April 15, 2009 PROJECT: 50439

TO: John Bassett, P.E., SAFCA
Jonathan Kors, P.E. Wood Rodgers

FROM: Joey Howard, P.E. (#C53319), Brady McDaniel (#C73468), Bryce Cruey

RE: **Natomas Levee Improvement Project**
Natomas East Main Drainage Canal Erosion Protection Design

1. INTRODUCTION

This memorandum briefly describes the erosion protection designs **nhc** developed to treat two erosion sites along the westerly levee of the Natomas East Main Drainage Canal (NEMDC). The erosion assessments are described in a technical memorandum to SAFCA (**nhc** 2008). Erosion sites are located along the NEMDC downstream of SAFCA Pump Station 15 at the Dry Creek confluence and near the confluence with Arcade Creek.

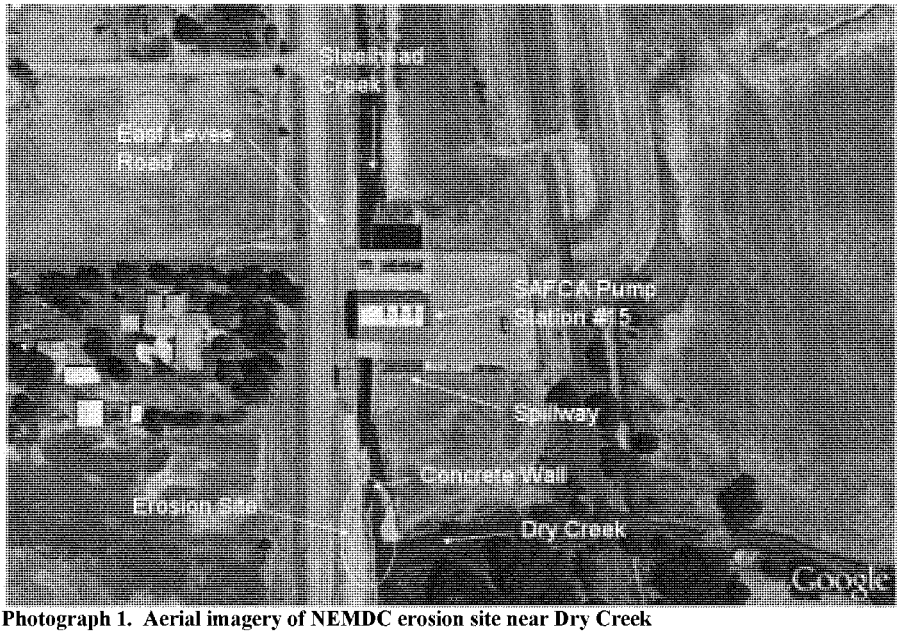
2. NEMDC at Dry Creek Confluence Erosion Site

In 1996, SAFCA constructed a pump station in the NEMDC upstream of the confluence with Dry Creek. The pump station discharge infrastructure includes a 20ft wide concrete low flow channel along the right portion of the NEMDC (looking downstream) and three 72-inch discharge pipes spanning the remainder of the channel. Outflow from the three 72-inch discharge pipes outlet to a 30 foot long rock slope that is sloped at 3 horizontal to 1 vertical. An aerial view of the site is shown in photograph 1. As part of the NEMDC Units 2A and 3C Levee Improvement Project, SAFCA armored the right bank concrete retaining wall with rock riprap. The rock extends from about 20 feet upstream of the downstream end of the concrete retaining wall and about 200 feet downstream of the downstream end of the concrete retaining wall (JCE 1995, Spinks 1997). The Stone Protection Detail on sheet D-2 of the as-built plans (Spinks 1997) show the rock placed at a 3 horizontal to 1 vertical slope and at a thickness of 18 inches above the waterline and 24 inches below the waterline. The detail also shows a 5-foot thick rock key along the toe of the stone protection.

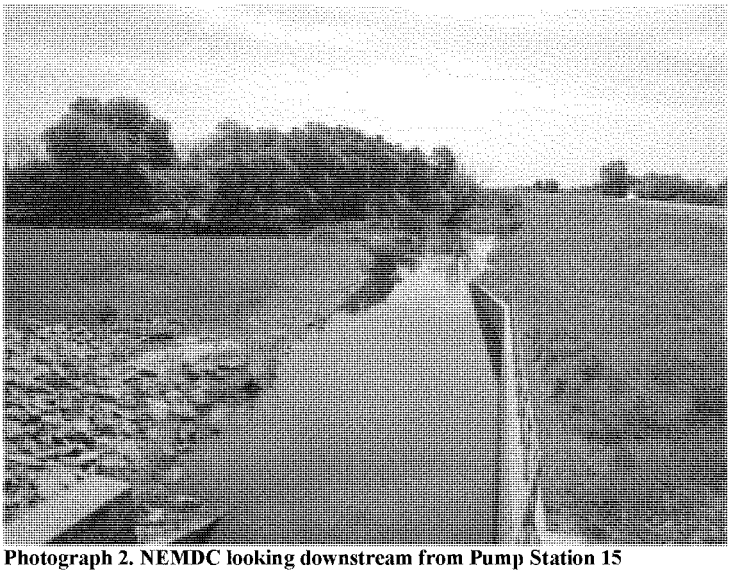
During field visits in 2008 and 2009, **nhc** observed that the slope and the thickness of the stone protection are not consistent with the details shown on the as-built plans (Spinks 1997). Much of the stone protection appears to have launched into the channel and lies near the slope toe. **nhc** estimated the rock slope protection to slope at about 1 horizontal to 1 vertical and observed numerous gaps between the stone protection that exposed the stream bank material. The rock slope protection appears to be comprised of rock with a b-axis of about 10 to 18 inches long. Photographs 2, 3, and 4 illustrate the slope and exposed stream bank material and rock slope protection.

nhc calculated a stable riprap gradation by applying the 100-year and 500-year hydraulic model results (MBK 2008) to the U.S. Army Corps of Engineers method for rock slope protection (USACE 1994). The rock gradation estimated using this method was smaller than the rock riprap observed in the field. This observation suggests that the scour producing flow characteristics are not captured by the hydraulic model or that the scour producing flow events do not occur during these flow scenarios. Scour producing flow conditions likely occur during seasonal high flows when the pump station and spillway are in operation and flow conditions are variable. Scour may also occur when water levels are relatively low in the NEMDC and inflows from Dry Creek are relatively high.

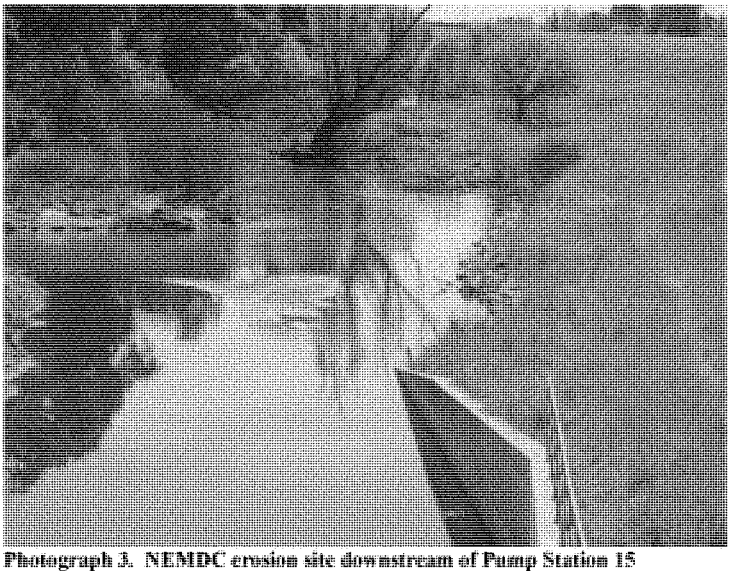
nhc recommends rock slope protection with the gradation shown in Table 1 to adequately protect the bank from erosion and protect the toe from scour. **nhc**'s recommended rock slope protection measures are shown on the plans and details in Attachment A.



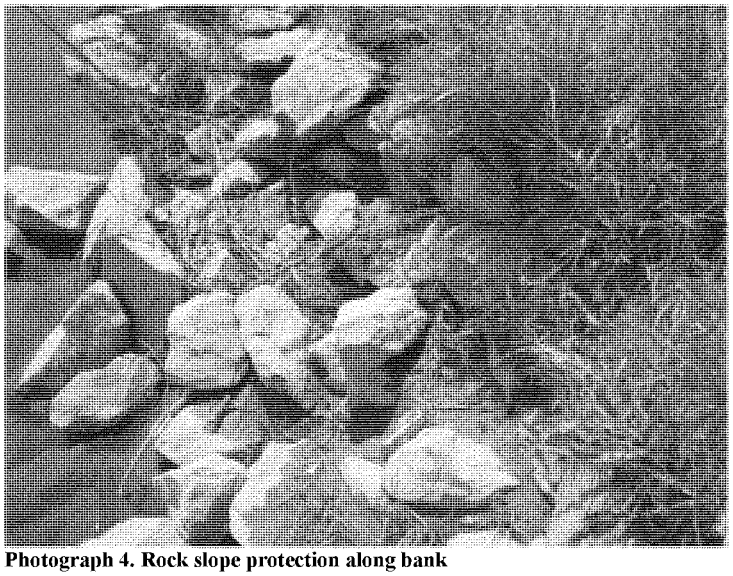
Photograph 1. Aerial imagery of NEMDC erosion site near Dry Creek



Photograph 2. NEMDC looking downstream from Pump Station 15



Photograph 3. NEMDC erosion site downstream of Pump Station 15



Photograph 4. Rock slope protection along bank

Table 1. Rock slope protection gradation for NEMDC near Dry Creek

Percent Lighter by Weight	Max Weight, lbs	Min Weight, lbs
100	463	185
50	137	93
15	69	29

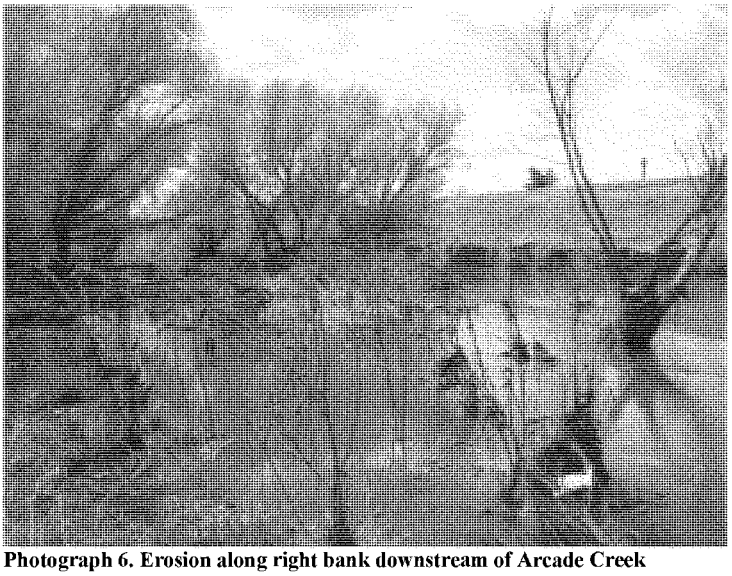
3. NEMDC at Arcade Creek Confluence Erosion Site

A portion of the west bank lies inside the 3:1 template and is actively eroding. The upstream limit of the erosion site is about 200 feet downstream of the confluence with Arcade Creek and extends downstream from this point about 130 feet. Photograph 5 shows an aerial view of the site. Vegetation on the opposite bank (left bank) appears to constrict the flow near the erosion site and direct moderate and high flows towards the erosion site. Bank erosion along the right bank is shown in Photographs 6 and 7.

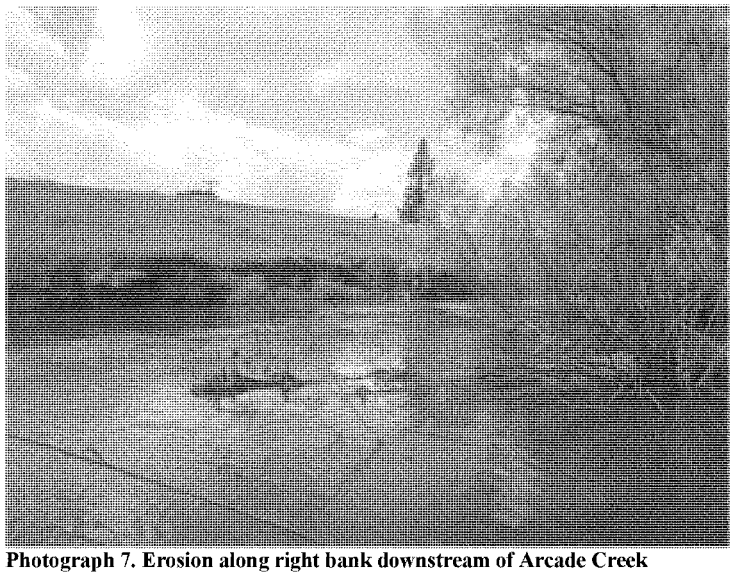
nhc proposes to stabilize this site by lining the actively eroding portion of the stream with rock slope protection. The banks upstream and downstream of the erosion site are nearly vertical and are susceptible to erosion due to block failure. **nhc** extended the bank protection about 110 feet upstream and about 130 feet downstream from of the erosion site to transition into more stable portions of the bank. The stable rock size as calculated using the US Army Corps of Engineers method for calculating slope protection is smaller that their recommended minimum size to prevent theft and vandalism of revetment. Hence, **nhc** 's proposed rock gradation is based on the US Corps of Engineers recommended size to prevent theft and vandalism. The proposed gradation is shown in

Table 2. Plans and details with the rock slope protection design is provided in Attachment B.

Photograph 5. Aerial view of NEMDC erosion site near Arcade Creek



Photograph 6. Erosion along right bank downstream of Arcade Creek



Photograph 7. Erosion along right bank downstream of Arcade Creek

Table 2. Rock slope protection gradation for NEMDC near Arcade Creek

Percent Lighter by Weight	Max Weight, lbs	Min Weight, lbs
100	292	117
50	86	58
15	43	18

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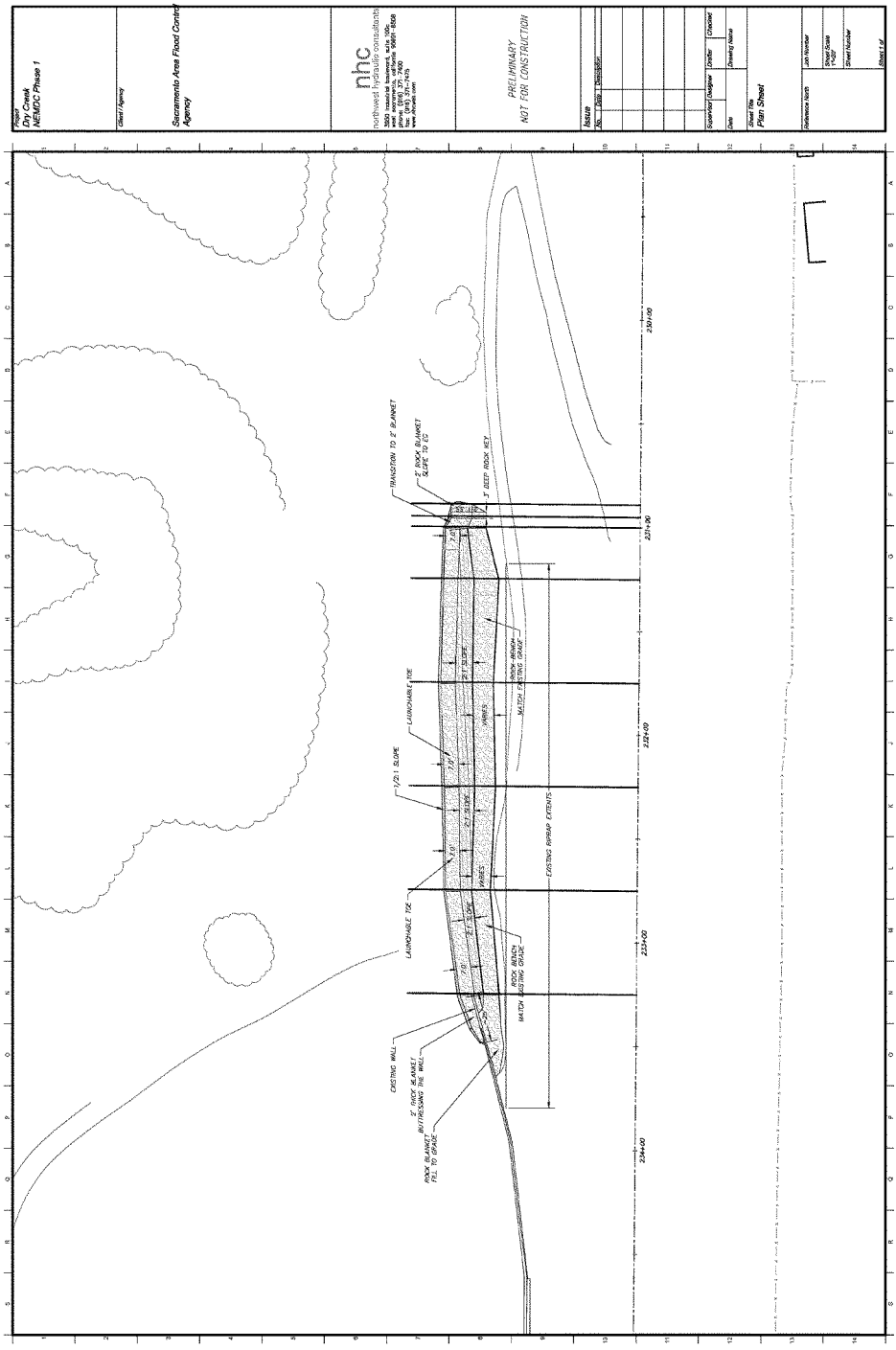
Attachment A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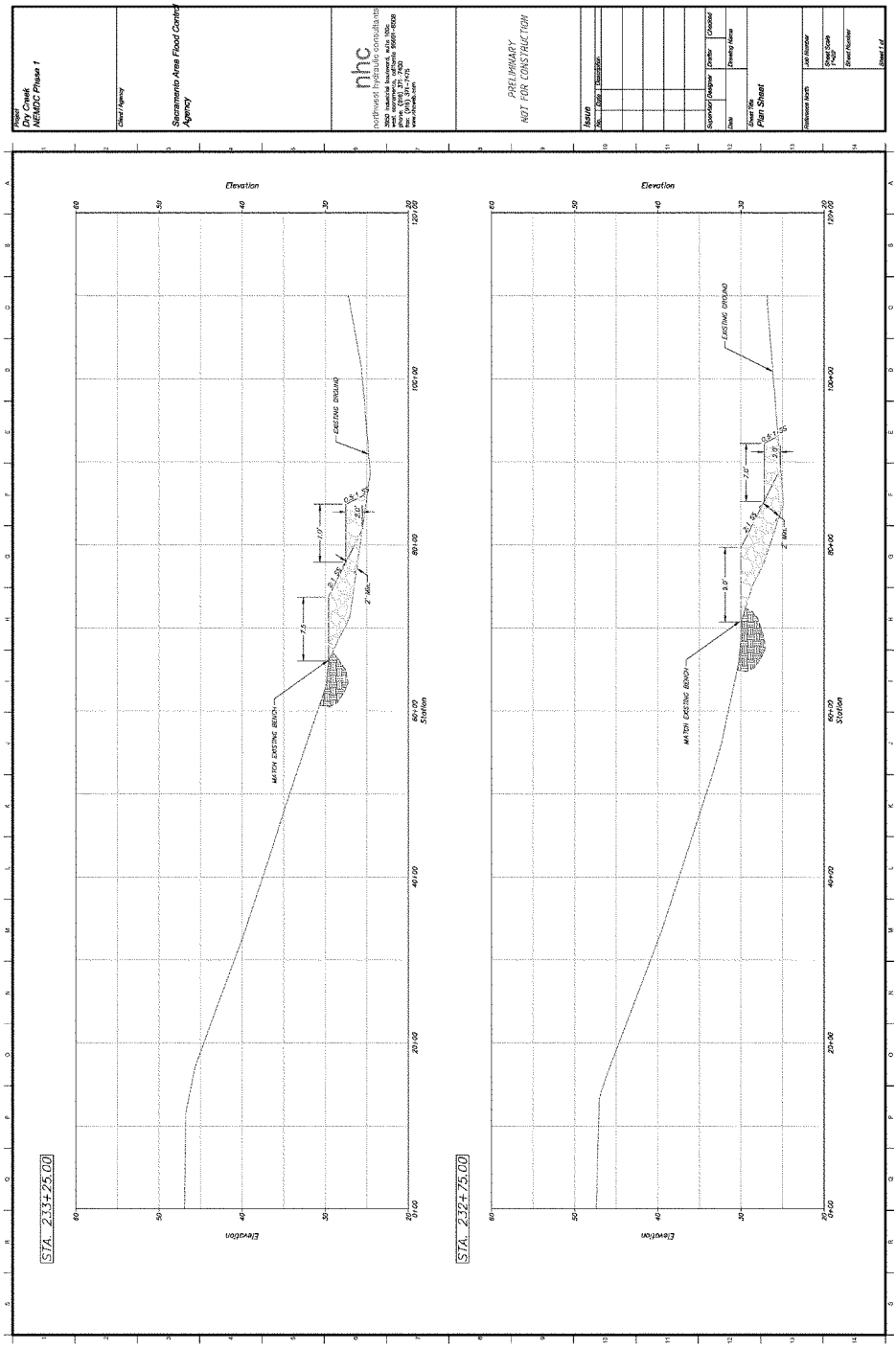
Dry Creek
NEMDC Phase 1
Client / Agency
Sacramento Area Flood Control Agency
nhc
northwest hydraulic consultants
PRELIMINARY
NOT FOR CONSTRUCTION
Issue
Sheet Title
Plan Sheet
TRANSITION TO 2' BLANKET
2' ROCK BLANKET SLOPE TO EG
3' DEEP ROCK KEY
LAUNCHABLE TOE
1/2:1 SLOPE
ROCK BENCH
MATCH EXISTING GRADE
EXISTING RIPRAP EXTENTS
EXISTING WALL
2' ROCK BLANKET
INTERLOCKING THE WALL
ROCK BLANKET
FILL TO GRADE
2:1 SLOPE
VARIES
230+00
231+00
232+00
233+00
234+00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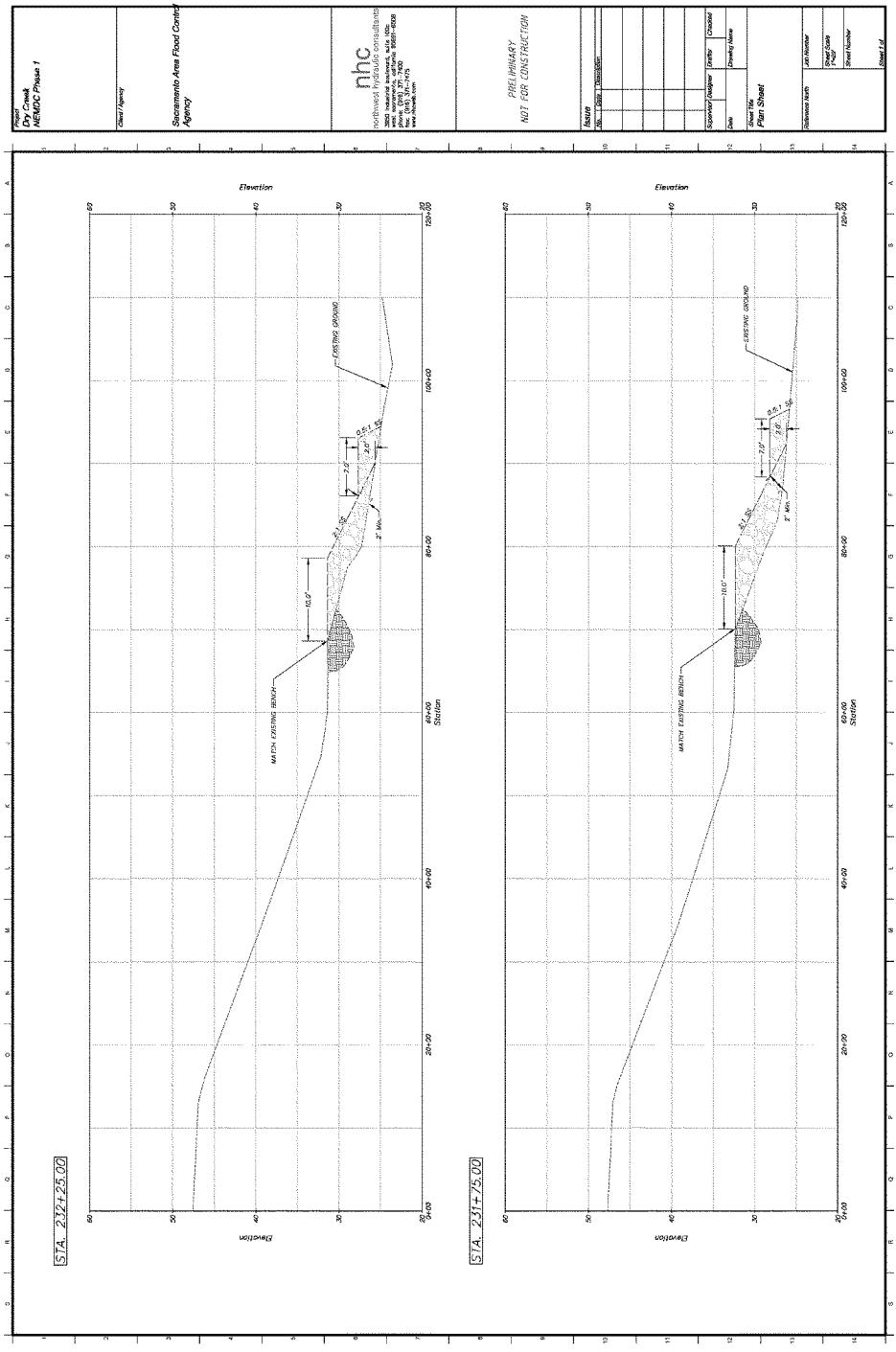
Dry Creek
NEMDC Phase 1
Client/Agency
Sacramento Area Flood Control Agency
nhc
northwest hydraulic consultants
Issue
PRELIMINARY
NOT FOR CONSTRUCTION
Sheet Title
Plan Sheet
Elevation
Station
EXISTING GROUND
MATCH EXISTING BENCH
STA. 233+25.00
STA. 232+75.00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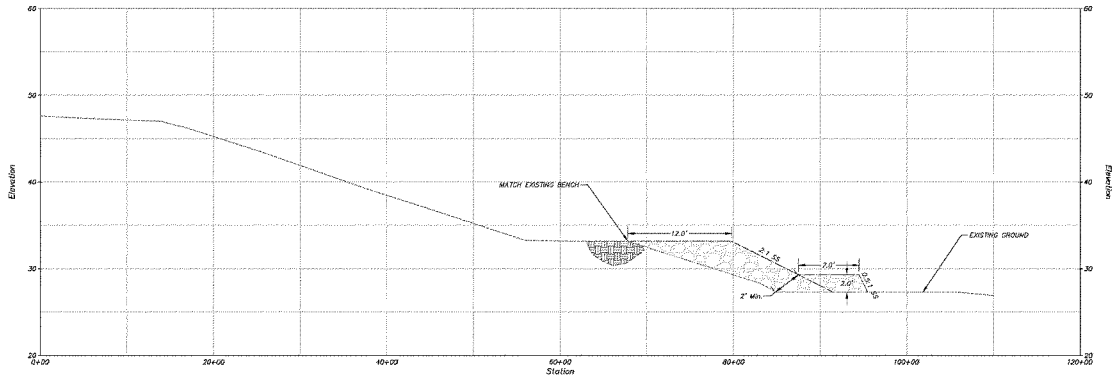
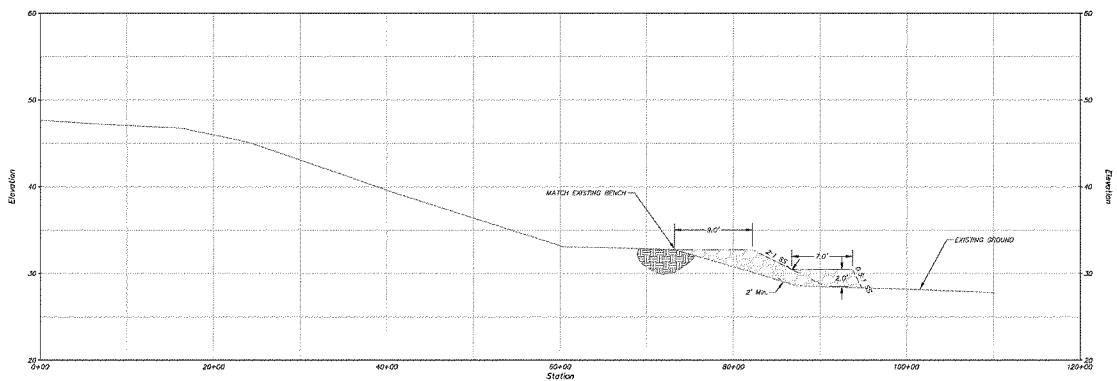
Dry Creek
NEMDC Phase 1
Client/Agency
Sacramento Area Flood Control Agency
nhc
northwest hydraulic consultants
PRELIMINARY
NOT FOR CONSTRUCTION
Sheet Title
Plan Sheet
Elevation
Station
EXISTING GROUND
MATCH EXISTING BENCH
STA. 232+25.00
STA. 231+75.00

STA. 231+25.00



STA. 231+00.00



Project
Dry Creek
NEMDC Phase 1

Client / Agency
Sacramento Area Flood Control Agency

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3950 industrial boulevard, suite 100c
west sacramento, california 95691-6008
phone: (916) 371-7400
fax: (916) 371-7475
www.nhcweb.com

PRELIMINARY
NOT FOR CONSTRUCTION

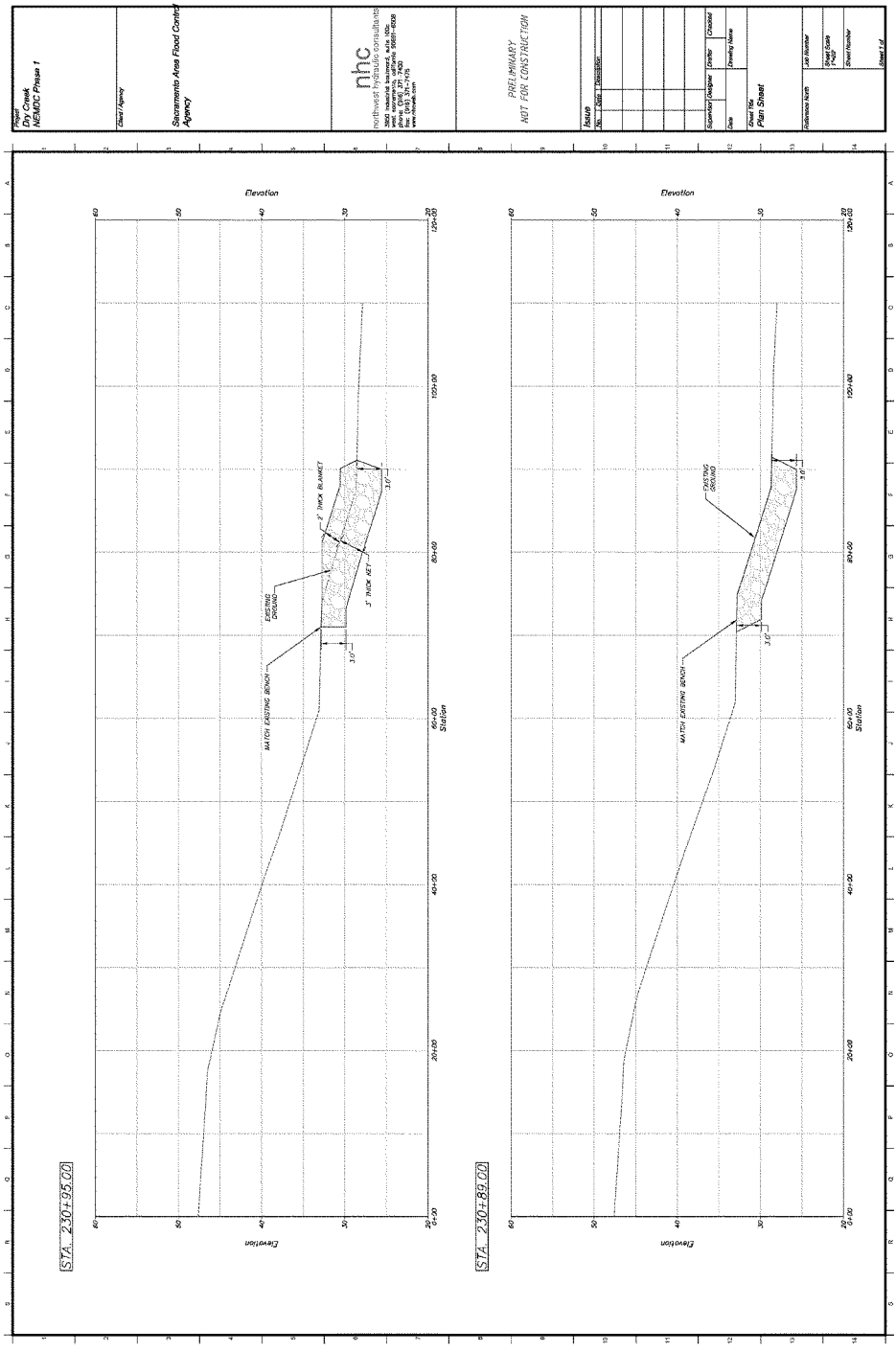
Issue

No.	Date	Description

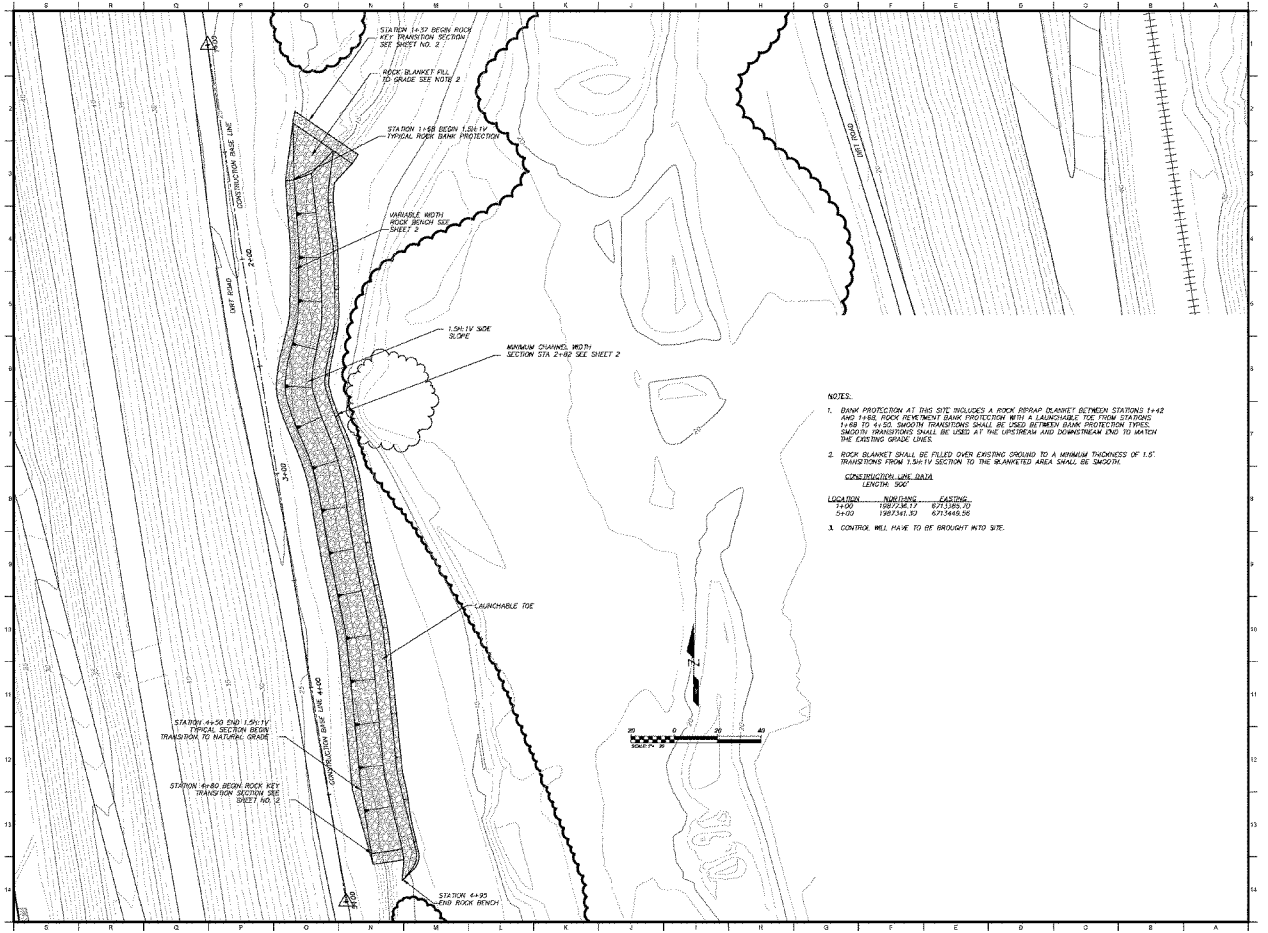
Supervisor	Designer	Drafter	Checked
Date		Drawing Name	

Sheet Title
Plan Sheet

Reference North	Job Number
	Sheet Scale 1"=20'
	Sheet Number
	Sheet 1 of


Project
Dry Creek
NEMDC Phase 1
Client/Agency
Sacramento Area Flood Control Agency
nhc
northwest hydraulic consultants
PRELIMINARY
NOT FOR CONSTRUCTION
Issue
No. Date Description
Drawing Name
Plan Sheet
Elevation
STA. 230+95.00
STA. 230+89.00
5" THICK BLANKET
5" THICK KEY
EXISTING GROUND
MATCH EXISTING BENCH
3.0'
Station
Sheet 1 of

Attachment B



NOTES:

1. BANK PROTECTION AT THIS SITE INCLUDES A ROCK RIPRAP BLANKET BETWEEN STATIONS 1+42 AND 1+68, ROCK REVETMENT BANK PROTECTION WITH A LAUNCHABLE TOE FROM STATIONS 1+68 TO 4+50. SMOOTH TRANSITIONS SHALL BE USED BETWEEN BANK PROTECTION TYPES. SMOOTH TRANSITIONS SHALL BE USED AT THE UPSTREAM AND DOWNSTREAM END TO MATCH THE EXISTING GRADE LINES.
2. ROCK BLANKET SHALL BE FILLED OVER EXISTING GROUND TO A MINIMUM THICKNESS OF 1.5'. TRANSITIONS FROM 1.5H:1V SECTION TO THE BLANKETED AREA SHALL BE SMOOTH.

CONSTRUCTION LINE DATA
LENGTH: 500'

LOCATION	NORTHING	EASTING
1+00	1987736.17	6713385.70
5+00	1987341.30	6713449.56

3. CONTROL WILL HAVE TO BE BROUGHT INTO SITE.

Project
ARCADE CREEK
NEMDC Phase 1

ROCK REVETMENT
BANK ARMORING

Client / Agency

Sacramento Area Flood Control Agency

nhc
northwest hydraulic consultants
3850 industrial boulevard, suite 100c
west sacramento, california 95691-6006
phone: (916) 371-7400
fax: (916) 371-7475
www.nhcweb.com

PRELIMINARY
NOT FOR CONSTRUCTION

Issue

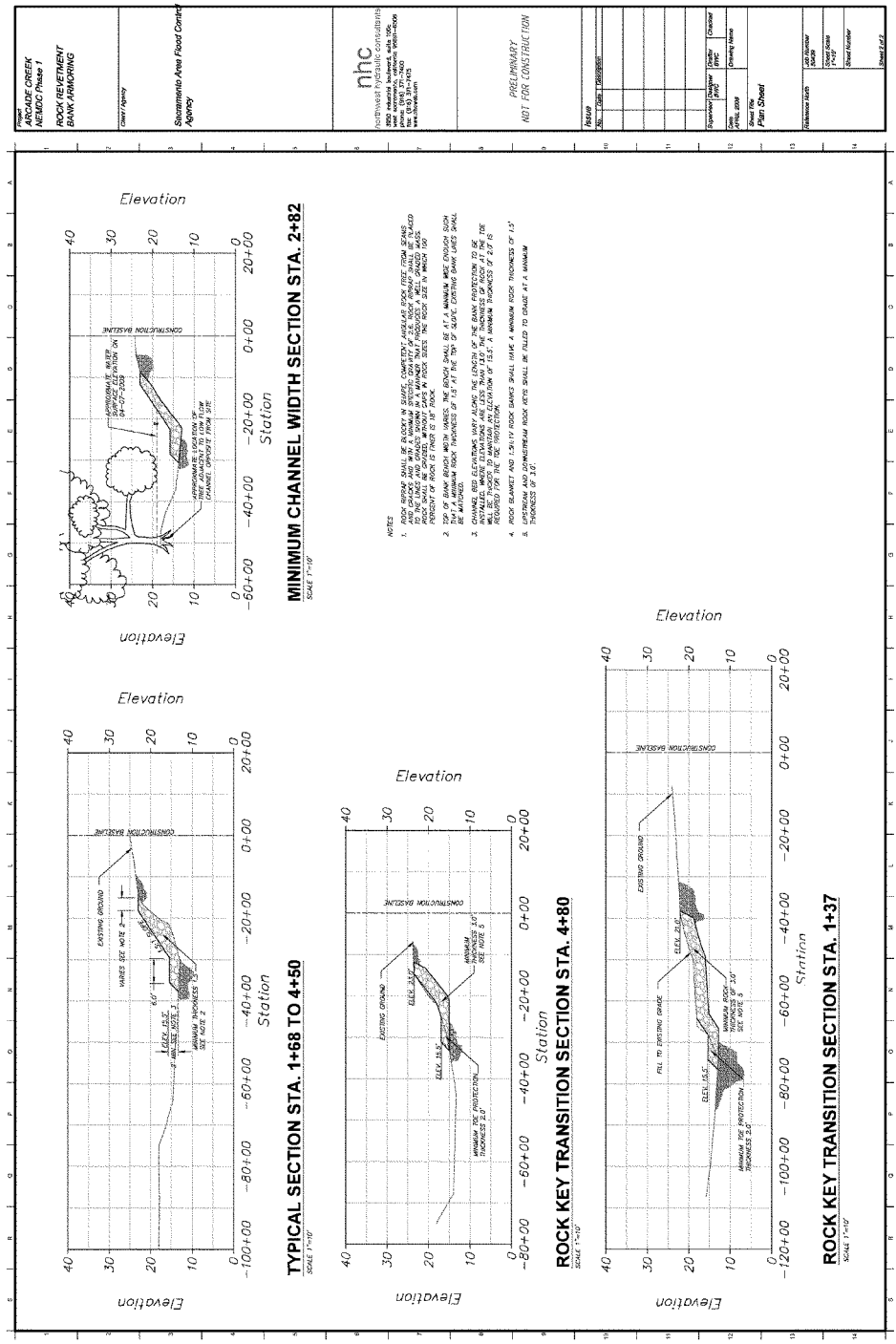
No.	Date	Description

Supervisor	Designer	Drafter	Checked
	BWC	BWC	

Date: APRIL 2008
Drawing Name:

Sheet Title
Plan Sheet

Reference North
Job Number: 50439
Sheet Scale: 1"=20'
Sheet Number
Sheet 1 of 2


Project
ARCADE CREEK
NEMOC Phase 1
ROCK REVETMENT
BANK ARMORING
Client/Agency
Sacramento Area Flood Control Agency
nhc
Northwest Hydraulic Consultants
PRELIMINARY
NOT FOR CONSTRUCTION
Sheet Title
Plan Sheet
Elevation
Station
CONSTRUCTION BASELINE
EXISTING GROUND
TYPICAL SECTION STA. 1+68 TO 4+50
SCALE 1"=10'
MINIMUM CHANNEL WIDTH SECTION STA. 2+82
SCALE 1"=10'
ROCK KEY TRANSITION SECTION STA. 4+80
SCALE 1"=10'
ROCK KEY TRANSITION SECTION STA. 1+37
SCALE 1"=10'
NOTES

Draft Pleasant Grove Creek Canal Erosion Analysis
(Northwest Hydrologic Consultants)

Technical Memorandum

northwest hydraulic consultants
3950 industrial boulevard, suite 100c
west sacramento, ca 95691
(916) 371-7400
(916) 371-7475 (fax)

DATE: July 3, 2008 PROJECT: 50439

TO: John Bassett, P.E., SAFCA
Jonathan Kors, P.E. Wood Rodgers

FROM: Ken Rood/Brian Wardman
Joey Howard, P.E. (#C53319)

RE: **Natomas Levee Improvement Project**
(DRAFT) Pleasant Grove Creek Canal Erosion Analysis

INTRODUCTION

This memorandum reports our erosion analysis for the Pleasant Grove Cross Canal (PGCC) West Levee along the Natomas Basin. The objective of the analysis is to review erosion processes, evaluate the significance of erosion at design floods to levee stability, and provide concept-level recommendations to address erosion that might prevent certification.

BACKGROUND

The "*Natomas Levee Evaluation Program: Erosion Assessment (February 2006)*" provided an initial reconnaissance of the PGCC (Subreaches 1 and 2). No active erosion sites were identified along the West Levee and no repairs were recommended, other than maintenance (beaver dams; tree fall). We re-inspected the West Levee of the PGCC in May 2008 and again did not identify any active erosion sites. Given the lack of active erosion, our analysis has focused on predicting whether or not the erosion that might occur during the design flood, either from in-channel velocities and stresses or from wind waves, is significant to levee stability.

Our results rely on the hydrology and water surface elevations provided by MBK Engineers (2008) in their Supplemental Report, additional model output not included in their report (such as velocities) and the results of a third flood scenario developed by MBK Engineers. We also relied on the wind wave analysis included in Mead and Hunt (2008).

EXISTING PGCC WEST LEVEE CONDITIONS

The PGCC West Levee extends about 3.3 miles south southeast from its junction with the Natomas Cross Canal to its terminus at Sankey Road. Natomas Road sits on the top of the levee and armors the crest with asphalt concrete. Levee crest elevations and design water surface profiles for the PGCC are provided by MBK Engineers (2008). The 200-year water level in the PGCC is a maximum of 45.2 feet NAVD88; new level crest elevations will be set to 48.2 feet NAVD88. The existing crest elevations are up to 1.5 feet below the new design elevation at the northern end of the PGCC West levee, near the Natomas Cross Canal.

Existing waterside slopes are generally steeper than 3:1 (horizontal to vertical). The slope from the edge of the Natomas Road to the west side of the inspection road along the toe of the levee was usually a little less than 2:1 and the side slope was steepest near the top of the levee. Overall slopes from the waterside levee crest to the far side of the inspection road (edge of the low flow channel) were generally less than 3:1. The waterside slope is covered with grass; levee soils appear to be poorly graded sands and sands with silt, assumed to be equivalent to a sandy loam (geotechnical results for the levee investigations are not yet available).

The PGCC is confined on the east side by a levee or railway embankment that appears to be several feet lower than the crest of the West Levee. The east levee is also breached by the three tributaries that flow into the PGCC, Curry Creek at Mile 2.8 (upstream of Key Road), Pleasant Grove Creek at Mile 2.3 (just downstream of Key Road) and the Pierce-Robert Drain at Mile 1.0 (between Fifield and Howsley Road). MBK Engineers (2008) provides 100- and 200-year inflow hydrographs for the three tributaries.

The bottom width of the PGCC increases from the south to the north. Near Sankey Road the bottom width is about 60 to 70 feet; by Key Road it is about 200 feet; and by Fifield Road, it 300 to 350 feet. The canal bottom, above the low flow channel, appears to be formed in silty clay soils and is covered by aquatic vegetation, reeds, and grasses. The low flow channel is cut into the canal bed adjacent to the inspection road; it is several feet deep and the bed appears to be formed in the local soils and is covered by a thick, saturated, mud where it was inspected.

The PGCC is crossed by a ford at Key Road and bridges at Fifield and Howsley Roads. The ford at Key Road is as much as five feet above the local channel bottom and includes a 4-foot diameter round CMP set near the bottom grade. Field inspection shows a small scour hole downstream of the culvert exit and no obvious evidence of failure of the roadway from overtopping or from scour downstream of the road. Rock riprap for wave protection has been placed on the southern side of Key Road, near both the west and east levees.

The Fifield and Howsley Road bridges are about 200 to 220 feet wide; embankments carry the roads from the east abutments across the canal to the levee or railway grade. The abutments of the Fifield Bridge are wrapped in riprap and riprap has been placed along the southern face of the road embankment and along the waterside edge of the east levee. Inspections show little evidence of recent scour at the piers or through the bridge section. The Howsley Road Bridge also has riprap placed for wind wave protection along the south side of the road embankment. Field inspection showed no evidence of scour at the right (east) abutment or piers but a deep section through the piers and old concrete footings near the left (west) abutment. Wading indicated deep exposure of the footings. Coarse rock on the channel bottom may have been placed as scour protection, suggesting past problems at the bridge. We did not complete a detailed inspection, given the water depths.

The PGCC includes the Howsley Gap at the Howsley Road Bridge crossing (MBK Engineers 2008). Here, the levee crest is lowered for approximately 100 feet on either side of the road centerline. Elevations are up to 3 feet below the existing local crest (43 feet NAVD88 in the middle of the gap compared to 46 to 46.5 feet NAVD88 on the nearby crest). The levee crest in the gap is reinforced with concrete; however the landslide slopes of the levee and the road embankment are not armored.

PROPOSED PGCC WEST LEVEE CONDITIONS

The proposed upgrades for the PGCC West Levee consist of constructing a 30-foot wide levee crest to the landside of the existing crest, placed so that a "theoretical" 3:1 levee slope from the crest to the inside edge of the inspection road lies within the existing slope. No re-grading of the waterside slope is proposed and concept drawings indicate that the existing roadway surface will remain. The levee crest will be raised as required and seepage protection constructed on the landside of the levee (Wood Rodgers 2008).

EROSION BY INSTREAM FLOWS

Erosion by instream flows may be a result of channel velocities that occur during the design flows, natural scour, contraction scour through bridge openings, or local scour around obstructions such as trees and pump stations. In general, our analysis of potential erosion by in-channel velocities is based on comparing predicted velocities to the permissible or allowable velocities appropriate for the levee slope materials and vegetation. Scour was evaluated from regime equations or by incorporating predicted velocities into equations that predict local scour.

IN-CHANNEL HYDRAULICS

MBK Engineers calculated the hydraulic conditions in the PGCC with their unsteady 1-D UNET model. Results are reported for 10 cross sections distributed upstream and downstream of the tributaries inflows and the two bridges (see Figure 1). Model inputs include tributary hydrographs and the Sacramento River hydrograph at the downstream end of the Natomas Cross Canal (NCC). Model outputs include section-averaged velocities, depths and water surface elevations over time. Velocity distributions within the sections are expected to be complex, particularly where the tributaries flow into the canal at right angles, but the model provides no details. Table 1 summarizes the highest velocities observed at five of the cross sections.

The velocities are quoted for three different scenarios. These are: 1) 200 year inflows with a 200 year flow in the Sacramento River (MBK Engineers, 2008); 2) 100 year inflows with a 100 year design flow in the Sacramento River (MBK Engineers, 2008); and 3) 200 year inflows with a 2 year flow in the Sacramento River. The last scenario was judged to be a reasonable worse case scenario that would produce the highest velocities in the PGCC. The PGCC is backwatered from the Sacramento River resulting in relatively low velocities throughout the canal for the three scenarios. The highest velocities are observed just downstream of Pleasant Grove Creek (R53 s1.48) and at the northern outlet (R55 s0) for the third scenario.

Table 1: Peak Velocities in the PGCC.

Cross-Section*	200 Year Inflow 200 Year Sac. River	100 Year Inflow 100 Year Sac. River	200 Year Inflow 2 Year Sac. River
R55 s0	2.4 ft/s	2.4 ft/s	3.3 ft/s
R55 s0.68	1.3 ft/s	1.3 ft/s	2.3 ft/s
R53 sS0	1.2 ft/s	1.2 ft/s	2.0 ft/s
R53 s1.48	2.8 ft/s	2.9 ft/s	3.1 ft/s
R51 s0	1.3 ft/s	1.6 ft/s	1.1 ft/s

*MBK Engineers' Sacramento River UNET Model (5/7/08)

PERMISSIBLE OR ALLOWABLE VELOCITIES

The general condition to be met for levee design and certification is no appreciable erosion during the base or design flood, in this case the 200-year peak flow.

Insert Figure 1 (MBK Engineers cross sections)

One approach to evaluating the erosion potential during extreme floods is to compare the hydraulic, bed and bank material and vegetation conditions observed in the PGCC to the design values for a "threshold" channel, where this refers to a channel where movements of its boundary materials are negligible during the design flood (see NRCS 2007 for further discussion). Design of such channels can be based on allowable velocities, shear stresses or tractive powers and there is a long history of guidance for design criteria and design procedures for these types of channels. Based on recommendations in the NRCS handbook and the inability to accurately calculate shear stresses under the design condition in the backwatered channel, we have adopted allowable velocities to evaluate potential erosion in the PGCC. The procedures in the NRCS handbook are intended for design of shallow irrigation canals excavated in unprotected earth or grass lined floodways and may not be strictly applicable to the PGCC.

In this section, the main interest is whether or not the grass-covered levee slopes will erode during the design flow; erosion of the stream bed is discussed in more detail in the next section. Review of NRCS (2007) and other literature suggests that the grasses observed on the bank will likely provide similar protection to that of various bunched or tufted grasses such as alfalfa, essentially a relatively low standard of erosion protection. Recommended allowable velocities are 3.5 ft/sec over erosion-resistant soils and 2.5 ft/sec over easily eroded soils. Reference to Fischenich (2001) suggests that the grasses are similar to Class C turf; typically having a stand height of approximately 6 inches and fair to good overall density. Quoted permissible velocities from Fischenich (2001) are 3.5 ft/s. This analysis suggests that 3.5 ft/sec is a good initial estimate of the permissible velocity for the grass-covered levee slopes.

Adjustments to the permissible velocities for the levee slopes are required for channel curvature, bank slope, depth of flow, and the frequency and duration of flow, as outlined in the SCS (1977) procedure for earthen canals (see summary in NRCS 2007). The PGCC is straight and the design floods are extreme, so no adjustments are required for curvature or frequency. The recommended factor for depth is 1.4 and for bank slope is 0.8. On this basis, the final permissible velocity is 3.9 ft/sec. The duration of high velocities is relatively short – less than one day – and the permissible velocity was not adjusted for this factor.

Based on the estimated permissible velocity and the maxima quoted in Table 1, the grass cover on the waterside levee slope should resist erosion during the design flow. Shear stress is generally recommended for design of grass-lined channels and such an approach might change the conclusions drawn from the permissible velocities.

We also examined permissible velocities for the levee soils, if they were exposed to design flow because of loss of vegetation or other factors. Assuming that the soils are a sandy loam (geotechnical investigations are not yet complete), the initial permissible velocity is 1.75 ft/sec, assuming clear water conditions during the design flow. Adopting the adjustments above, the final value for the soil on the levee slope is 2.0 ft/sec. These permissible velocities for the soil are exceeded at several sections in Table 1, suggesting erosion will occur along parts of the west levee if the grasses are disturbed or eroded.

One final consideration is that the velocities reported in Table 1 are section averages that do not account for velocity distribution or velocity fluctuations that occur near the channel boundaries. The highest velocities in the UNET model are reported where tributaries enter into the PGCC. These locations will also experience high turbulence due to the added momentum and mixing, which will increase the shear stress exerted on the PGCC levee slopes and could potentially exceed the erosional strength of the vegetated soil. We recommend adding bank protection to the west levee waterside slope near the confluences of the PGCC with Pleasant Grove and Curry

Creeks. This added bank protection would ideally extend from about 50 feet upstream of the confluence to approximately 100 feet downstream and consist of a layer of 6 to 8 inch quarry rock placed on the slope and covered by soil and grass vegetation.

BED OR CHANNEL SCOUR

Scour is defined as lowering of the bed below its normal level as a result of erosion during a significant flow. Scour that lowers bed levels adjacent to the waterside toe of the levee may result or contribute to slope failure and may also shorten seepage paths. Most scour analyses address bed adjustments in alluvium. The PGCC appears to be formed in local soils, with limited sediment inflows. Typical regime type scour equations may not provide good estimates of the scour that occurs without consideration of whether the bed is erodible by the imposed flows.

Naming conventions for different types of scour vary from one source to another. As discussed here, "natural" scour refers to lowering of the bed as a result of a large flow in the absence of other interference. "Contraction" (or general) scour refers to the scour that occurs in a bridge waterway opening when flood flows are constricted. "Local" scour occurs around obstructions such as bridge piers, trees, intakes, etc and is discussed further below.

Natural Scour

The potential for natural scour in the PGCC can be estimated by comparing regime depths appropriate for the design flows to observed depths. Where regime depths are greater that observed depths, scour might be expected, assuming that the bed is erodible by the imposed velocities and that high velocities last long enough to develop the scour. Downstream of Pleasant Grove Creek, the 200-year peak discharge is about 9,000 cfs and channel widths exceed 300 feet. Applying Lacey's equation (1929; see May et al 2002; TAC 2004), the regime depth for the 200-year peak can be estimated as:

$$y_R = q_R^{2/3}/F_{bo}^{1/3} \qquad (1)$$

where y_R is the regime depth (feet), q is the discharge intensity calculated from the 300 foot width, and F_{bo} is the silt factor, assumed to be 0.7 for this channel. Such a silt factor is for fine sand and provides a very conservative estimate of the regime depth. The regime depth is estimated to be about 14 feet based on equation (1). Similar regime depths for the 200-year flow are calculated from Simon and Albertson's (1963) regime equations for their Type 3 channel (cohesive bed and banks). Based on the regime depth and a Z-factor of 1.1 suitable for the straight channel of the PGCC, the scoured depth might reach a maximum of 15 feet. Such an estimate is likely conservative, as the canal does not appear to meet typical regime dimensions and the silt factor may be considerably larger the assumed value, reflecting erosion resistance.

The channel bottom in the lower half of the PGCC is at about 26 to 27 feet NAVD 88 (Psomas); 200-year water surface elevations are about 45 feet NAVD88 with 200-year water levels in the Sacramento River (MBK Engineers; Figure 32) and about 41 feet NAVD88 with 2-year water levels in the Sacramento River. Based on the above, minimum depths are about 14 to 15 feet. Given that observed depths equal or exceed estimated scour depths, that the bed materials are thought to be of low erodibility and that the duration of high velocities is relatively short, we anticipate no natural scour in the canal during the design scenarios discussed earlier.

Contraction Scour

Both the Howsley and Fifield Road Bridges constrict the width of the PGCC. A variety of approaches are available to assess the effect of the bridge constrictions on potential scour depths

through the opening. One is to calculate the potential scour depth in the bridge section from that in the upstream channel from a ratio of the discharge intensities (TAC 2004) as below:

$$y_B = y_R (q_B/q_R)^m \quad (2)$$

Here, y_R and q_R are as defined above, q_B is the discharge intensity through the bridge calculated from the 200-year peak flow and a width of 200 feet and y_B is the regime depth through the bridge. The superscript, m, is estimated to be 0.7. Given the adopted power, this approach is equivalent to that in the US FHWA manual (Richardson and Davis 1995). We have not further narrowed the bridge opening to reflect blockage by debris or factors.

Based on equation (2), the regime depth through the bridge is about 19 feet and the depth of scour might be a maximum of 20 feet. Such scoured depths would be below the bed at the two bridges, suggesting the potential for some scour during the design flood with 2-year water levels in the Sacramento River. The potential to achieve such scour depends on the erodibility of the bed and the duration of the peak velocities. Allowable velocities, based on assuming that the bed materials are silty clay are about 3.5 ft/sec (NRCS 2007). Adjusted for depth, the final permissible velocity is about 4.6 ft/sec. Reference to TAC (2004) suggests competent mean velocities of about 4 ft/sec for the flow depth, and assuming average erodibility for the bed material (TAC 2004). Based on quoted maximum average velocities near the bridge opening of 3.5 ft/sec, only limited scour would be expected through the openings.

The left (west) abutment of the Fifield Bridge is partly protected by riprap, and bed erosion is likely to be slow. On this basis, erosion at this abutment is unlikely to be a concern for the stability of the west levee. Further downstream, at the Howsley Road Bridge, the low flow channel is adjacent to the left (west) abutment, there are significant pier obstructions in the channel, riprap is lacking around the abutment, and the channel appears to have experienced scour in the past. We recommend either further investigations of scour potential through this opening or placing riprap around the left (west) abutment.

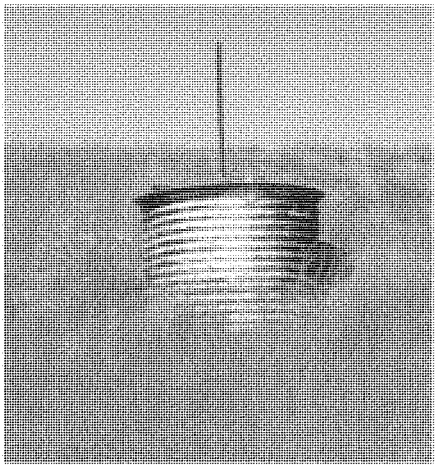
Local Scour

Obstructions such as piers, pump stations, and valve boxes (Figures 2 and 3) might also result in local scour holes during floods. These may be significant to erosion of the levee where the structures are on the levee slope or at the levee toe.

Figure 2: Typical Pump Station in PGCC

Figure 2 shows existing scour downstream of a pump station along the PGCC west levee. It is difficult to estimate the potential scour for the three-dimensional flow around the station during the design flow. A very conservative scour estimates was based on the results of Bormann and Julien (1991), which calculate the equilibrium depth of scour (below the bed) downstream of submerged grade control structures. The computed maximum depth of scour from their relationship is about 7 feet. This is certainly too large because it does not account for the high relative submergence and the small percentage of flow area disrupted by the pump station. However, assuming that the scour is similar to that resulting from a bridge pier, the depth of scour will be about equivalent to the width of the pump station, or at least a few feet. Such scour may result in significant steepening of the existing waterside levee slopes.

Given the low maximum velocities, their infrequent occurrence, and the resistant bed materials, scour will develop slowly, but will eventually erode into the toe of the levee slope. We recommend adding an apron of 8 inch to 10 inch rock on the levee slope behind the pump structures and along the downstream bank, with a launchable toe.



Maximum potential scour depths were also calculated for the valve boxes observed on the levee slopes (Figure 2). Based on Froelich's bridge scour equation (Fischenich and Landers 2000) a maximum depth of scour of about 2 feet is predicted around the valve boxes. The equation assumes cohesionless soil and neglects the added erosional resistance provided by the vegetation on the levee. If a scour hole forms around the structure, it will likely extend 6 to 10 feet downstream of the structure, with a top width of less than 6 feet (ASCE Sedimentation Manual, section 10.4 p 525). Given the low velocities, erosion resistance provided by the grass cover, and the increased size of the new levee section, we do not expect local scour around the valve boxes to affect the performance of the levee.

Figure 3: Typical Valve Box in PGCC

EROSION BY WIND WAVES

REVIEW OF PREVIOUS STUDIES

Mead & Hunt (2008) provided a wind wave analysis for the PGCC that used deepwater wave equations to compute maximum wave effects at three locations. Methods to estimate fetch lengths (based on the extent of the 500-year FEMA floodplain) and wind speeds are described in their memorandum.

Table 2 compares the Mead & Hunt computed wavelengths to their average channel depths (these depths are conservative). The table shows that wavelength-to-depth ratios (L/d) slightly exceed a value of 2.0 at the three sites. Typically, when the L/d ratio exceeds 2.0, the waves are assumed to be shallow water waves; deep water waves have L/d ratios less than 2.0. Unfortunately, the commonly used shallow water and deepwater wave equations do not agree for L/d ratios very close to 2.0. Hurdle and Stive (1989) provided a revised version of the 1984 Shore Protection

Manual wave equations that are asymptotic to the shallow water wave equations for high L/d ratios and to the deepwater wave equations for low L/d ratios but provided a more reasonable transition between the equations when the L/d ratio is near 2.0.

Table 2: Length-to-Depth Ratios of Mead and Hunt (2008) Computed Waves

Cross-Section	Average Depth, d (ft)	Reported Wave Period, T (s)	Calculated Wavelength, L† (ft)	L/d
287+00	17.00	3.0	46.1	2.7
377+00	17.00	2.8	40.2	2.4
456+00	17.00	3.2	52.2	3.0

†$L=T^2*g/(2*\pi)$, (Dean and Dalrymple, 2002)

We re-calculated the maximum wave heights at the three locations with the Hurdle and Stive (1989) wave height equation, using the fetch lengths, over-water wind speeds and other parameters reported by Mead & Hunt (2008). The results of the calculations are in Table 3; the revised total wave effects are now all less than 3 feet.

Table 3: nhc Revised Wind Wave Effects

Cross-Section	Wave Height (ft)	Run-up (ft)	Wind Surge (ft)	Setup (ft)	Total Wave Effect (ft)
287+00	2.56	1.5	0.7	0.4	2.7
377+00	2.15	1.6	0.6	0.3	2.5
456+00	2.62	1.7	0.8	0.4	2.9

Total water level (TWL) is the sum of the flood elevation and total wave effects. The new levee crest will be set to the calculated 200-year flood elevation (MBK Engineers 2008) plus three feet of freeboard. Based on this design condition, the levee will not be overtopped at the three analysis sites and we anticipate that the levee crest will be above the TWL along nearly all of the PGCC West Levee. On this basis, erosion will be mainly confined to the levee slope, as discussed in the next section. Two special sites where water levels overtop the levee crest are then discussed in the final section.

LEVEE SLOPE EROSION BY WIND WAVES

The theoretical basis for wind wave erosion along shorelines is not fully developed (Dean and Dalrymple, 2002). The process is complicated by the oscillatory and highly turbulent nature of the breaking waves coupled with the many unknowns prevalent in sediment transport applications. Although there are a variety of approaches for estimating wave induced erosion, these models tend to be simple. Previous experience (**nhc**, 2008) has shown that typical approaches used in coastal engineering applications are not well-suited for application in riverine environments. Given these difficulties, a simplistic geometric approach was developed to determine the theoretical worse case wind wave erosion.

The geometric approach used in this study follows the MKA method provided in the *Coastal Flood Hazard Mapping and Analyses for the Pacific Coast of the United States* (FEMA, 2004). This method estimates the maximum potential erosion on the riverside of the levee that could be expected due to wind waves during a single storm event. The change in shoreline position during a storm is calculated from the increase in the TWL due to the storm and an assumed equilibrium profile slope. For this particular application, we assumed that the eroded bench slope is horizontal and the eroded scarp face is vertical. This is consistent with the expected beach profile for fine

sand (slopes of approximately 20H:1V to 50H:1V) (Dean and Darlymple, 2002) and with wave cut benches observed on levees along the Sacramento River. Figure 4 shows this configuration.

The MKA approach assumes that the wave cut bench forms at the static water level (SWL), which is defined as the TWL minus the wave runup. Erosion is concentrated between the SWL and the TWL as the shoreline slope in this region is cut down to the equilibrium beach slope. The elevation of the wave runup decreases with the levee slope lowering the TWL and resulting in the formation of a vertical scarp face. (The wave runup on a vertical face is approximately equal to the breaking wave height.) In this study, the breaking wave height was larger than all runup values prompting the use of the breaking wave height to get a conservative maximum TWL value (TWL_{max}). The MKA approach (see FEMA 2004) predicts that the shoreward recession of the wave cut slope continues until it intersects the initial profile at the elevation of the TWL. For a horizontal bench and vertical scarp on an initial uniform slope, the recession distance is simply mH_b as shown in Figure 3.

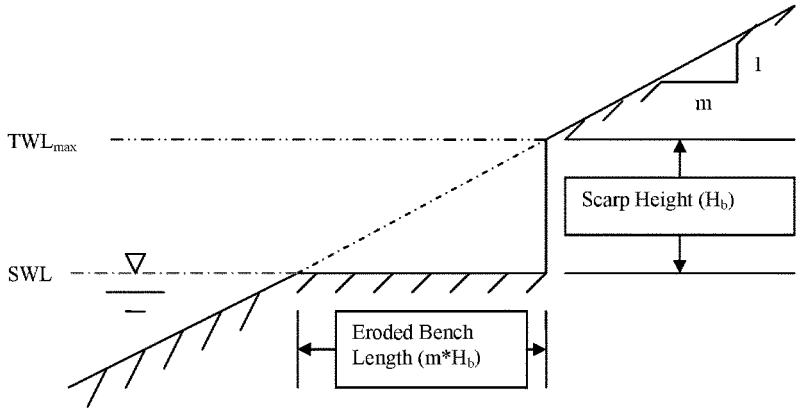


Figure 4: Basic Layout of Wave Cut Bench on Levee Slope

Table 4 provides the breaking wave heights and the maximum bench lengths that could potentially be cut by wind waves into the existing 2:1 levee slopes. Although the natural angle of repose for the levee material is much less than vertical, the assumption of a near vertical scarp is thought to be reasonable for a short duration of time (days). The wind duration necessary to maximize the wave heights is less than one hour and it is unlikely that sufficient erosion and transport of levee soils could occur in this time to develop the geometry shown in Figure 4, particularly if the waterside slopes remain grass-covered and the existing asphalt road is retained near the top of the slope where waves are likely to intersect.

Table 4: Selected Results of Wind Wave Erosion

Cross-Section	Breaking Wave Height H_B, ft	Duration of Maximum Wave Heights (hrs.)	Eroded Bench Length ($m*H_B$), ft
287+00	2.9	0.38	5.8
377+00	2.4	0.47	4.8
456+00	3.0	0.62	6.0

Despite the very conservative assumptions, the maximum length of erosion into the levee near the crest will not penetrate the levee slope to the theoretical 3:1 levee slope that will be the new levee face after the upgrades. As such, wind wave attack is not expected to cause significant erosion of the levee prism.

LEVEE CREST OVERTOPPING SITES

Two special cases of overtopping are discussed in the second following section: Howsley Gap, where the levee crest is lowered and the PGCC South Levee at Sankey Road. At these sites, the levee crest elevation is less than the TWL resulting in potential erosion of both the levee crest and the landside levee slope.

Levee Crest Erosion at Howsley Gap

MBK Engineers provided flow hydrographs through the Howsley gap for the 200 year design flood computed with their 1-D unsteady UNET model. Taking into account the low tailwater condition that would be apparent on the landside of the levees a steep energy slope would exist across the gap potentially forcing the water into critical flow velocities. Peak critical velocities were computed based on the flow hydrographs and gap section provided by MBK Engineers for conditions both with and without wind waves. The calculated velocities ranged between 9 ft/s and 11 ft/s.

The levee crest at the Howsley gap is armored with cast-in-place concrete which will adequately resist the erosive forces of the overtopping flow. However, the landside slope of the levee on either side of Howsley Road and the road embankment slopes are not armored. If flows are diverted onto these slopes, erosion will occur rapidly and potentially undercut the road, the concrete crest, or the landside slopes and cause catastrophic levee failure. It is therefore recommended that the landside levee slopes and the road embankments on either side of Howsley Road be armored. The pavement of Howsley Road immediately west of the PGCC should also be monitored to ensure adequate structural integrity.

PGCC South Levee

The PGCC South Levee near Sankey Road forms the end of the PGCC and ponds water in the southern part of the PGCC. Some of the water overflows the right (east) levee and passes through the Sankey Gap. Inspection of the South Levee indicates that it has rock armor buried beneath the soil on the waterside face but it does not appear to have any armoring on its crest or landside slopes (leading to Sankey Road). The elevation of the crest of the South Levee is up to 1.5 feet lower than the existing west levee and sits as low as 0.5 ft above the 200 year water surface elevation along part of the levee.

Velocities calculated for the design wind waves exceed 9 ft/s on the water side of the south levee and 3 ft/s on the land side slope with flow depths near 0.25 feet. The 9 ft/s and oscillatory nature of the waves could potentially erode to the levee crest and result in a breach that increased the

flows into Sankey Gap. We recommend that either this levee be raised or that the crest and landslide slope be armored with 12 inch rip rap.

CONCLUSIONS AND RECOMMENDATIONS

This memorandum reports on our erosion analysis for the West Levee of the Pleasant Grove Creek Canal. Our analysis addressed erosion that might result from in-channel hydraulics, natural, contraction and local scour, and erosion that result from wind waves, including overtopping. We have relied on MBK Engineers (2008) and Mead & Hunt (2008) for hydraulic and wind wave analysis to assist the erosion analysis.

Our inspections of the West Levee in October 2005 and in May 2008 both showed no evidence of active erosion. Consequently, we focused on predicting the erosion that might occur during the design flood, based on three scenarios developed by MBK Engineers. Where erosion appears to be significant to levee integrity, we have recommended concept-level protective works. The analytic techniques employ conservative assumptions, as documented in the memorandum.

Our review of the studies by Mead & Hunt suggested that their approach to calculating potential wave effects along the levee should be revised. Re-calculated wave heights resulted in total wave effects less than 3 feet, or less than the freeboard proposed by MBK Engineers (2008). This implies that there will be no wave overtopping of the levee crest after the upgrades are completed, except at two special locations – Howsley Gap and the South Levee at Sankey Road. Based on this revision, our wave erosion analysis addressed only the waterside levee slope.

In general, the erosion analysis suggests that the upgraded levee will not experience significant velocity, scour or wind wave erosion during the design flood. However, this conclusion is based on maintaining existing vegetation on the waterside slopes as the underlying levee soils appear to be susceptible to erosion without the grass cover (this conclusion may be revised when we review the geotechnical results). We also recommend some specific treatments along the West Levee to address local erosion issues. Further detailed investigations may alter some of our conclusions but we recommend the following as preliminary measures:

- Place riprap on the west levee waterside slopes opposite the confluences with Curry and Pleasant Grove Creeks. Such protection should extend from the toe to the top of slope for about 50 feet upstream and 100 feet downstream of the confluences. The rock can be covered with soil and grass.
- Place riprap around the left (west) abutment of the Howsley Road Bridge or carry out sufficient investigations to determine that it is not needed.
- Place rock or other protection along the Howsley Road embankment and along the landside of the West Levee near the Howsley Road gap to prevent erosion undermining the gap or affecting the landslide slope.
- Place riprap to armor the levee slopes and toe in the vicinity of pump stations, where potential scour might steepen levee slopes
- Raise the crest of the South Levee at Sankey Road or armor the levee crest and landside slopes to prevent wave overtopping erosion and diversion of additional flow to Sankey Gap from a partial levee breach.

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APPENDIX D

Biological Resources

D1 Programmatic Biological Opinion, October 9, 2008;
Amended Biological Opinion, May 6, 2009;
Appended Biological Opinion September 28, 2009;
Appended Biological Opinion May 10, 2010; and
Appended Biological Opinion October 12, 2010

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

In Reply Refer To:
81420-2008-F-0195-5

OCT 9 2008

Mr. Francis C. Piccola
Chief, Planning Division
U.S Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, California 95814

Subject: Section 7 Programmatic Formal Consultation on the Natomas Levee Improvement Program, Landside Improvements Project, Sacramento and Sutter Counties, California

Dear Mr. Piccola:

This is in response to the U.S. Army Corps of Engineers (Corps) June 9, 2008, request for consultation with the U.S. Fish and Wildlife Service (Service) on the proposed Natomas Levee Improvement Program, Landside Improvements Project (proposed project) in Sacramento and Sutter Counties, California. Your request was received in our office on June 11, 2008. This document represents the Service's programmatic biological opinion on the effects of the action to two federally-listed threatened species: the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) and the giant garter snake (*Thamnophis gigas*) and project-level biological opinion for Phase 2 work for the same species, in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act).

This biological opinion is based on information provided in the Corps' letter requesting consultation and their biological assessment. A complete administrative record is on file at the Sacramento Fish and Wildlife Office.

TAKE PRIDE IN AMERICA

CONSULTATION HISTORY

September 25, 2006. The Sacramento Area Flood Control Agency (SAFCA) had a meeting with the Service to briefly describe the conceptual Natomas Levee Improvement Project.

May 10, 2007. The SAFCA made a presentation of their Natomas Levee Improvement Program Conceptual Plan to the Natomas Joint Vision, which included staff from the Service, California Department of Fish and Game (CDFG), the City of Sacramento, the Sacramento International Airport (Airport), and the Corps. This presentation included additional details and conceptual project designs.

October 29, 2007. The Service and the CDFG sent a joint comment letter to SAFCA on the Natomas Levee Improvement Project's Draft Environmental Impact Report.

January 11, 2008. The SAFCA, the Corps, the Service, and CDFG began holding coordination meetings on the Natomas Levee Improvement Project to discuss project description and schedule.

January 24, 2008. The SAFCA, the Corps, the Service, and CDFG held a coordination meeting, which included John Roberts from the Natomas Basin Conservancy (TNBC) to discuss project effects.

March 28, 2008. The Service met with SAFCA and Congresswoman Doris Matsui to discuss the project and schedule of the project.

June 17, 2008. The SAFCA and the Corps held a meeting with CDFG and the Service to discuss work proposed for construction in 2009.

June 25, 2008. The Corps, EDAW, CDFG, and Service held a meeting to go over the effects of the project on specific cover-types.

July 2, 2008. The Service met again with Congresswoman Doris Matsui to discuss the schedule of the biological opinion.

July 9, 2008. The Service met with SAFCA, EDAW, CDFG, and the Corps to discuss endowments and easements for the conservation measures. The Service advised SAFCA that any thing other than a conservation easement for protection of compensation areas would take a great deal of time to work through.

July 10, 2008. The Corps, EDAW, SAFCA, CDFG, and Service held a meeting to discuss effects and schedule of the project.

July 15, 2008. The Service and Corps met with SAFCA to resolve schedule differences for the biological opinion. The Service committed to completing the biological opinion by September 24, 2008.

July 17, 2008. The Service provided a request via e-mail for 39 additional acres of managed marsh creation as part of the compensation strategy. This request was sent to EDAW, SAFCA, Corps, and CDFG.

July 21, 2008. The Service, Corps, EDAW, SAFCA, and CDFG met to discuss project effects and compensation strategy.

September 9, 2008. The SAFCA provided an updated compensation strategy based on landuse changes at borrow sites on Sacramento County Airport lands.

September 17, 2008. SAFCA, EDAW, and the Service had a meeting in which SAFCA proposed an idea to develop a compensation bank within the Natomas Basin.

September 19, 2008. The Service responded to the proposal submitted by SAFCA for a compensation bank and suggested that in order to provide a biological opinion to the Corps and SAFCA by September 24, 2008, SAFCA not include compensation banking as part of their project description. The Service also suggested that placing a conservation easement on ½ of the area borrowed at Brookfield would help compensate for effects due to the project.

September 21, 2008. SAFCA's consultant provided an e-mail which agreed to the Service's September 19, 2008, e-mail.

BIOLOGICAL OPINION

Description of Action Area

The proposed project area is located in the Natomas Basin in northern Sacramento and southern Sutter Counties, generally bounded by leveed reaches of the Natomas Cross Canal (NCC) on the north, the Sacramento River on the west, the American River on the south, and the Pleasant Grove Creek Canal (PGCC) and Natomas East Main Drainage Canal (NEMDC)/Steelhead Creek on the east. This project, which is part of the larger Natomas Levee Improvement Program (NLIP) being undertaken by SAFCA, consists of three construction phases, generally occurring between 2008 and 2011. Construction Phase 2 includes the 5.3-mile NCC south levee, the Sacramento River east levee from the NCC south levee to 2,000 feet south of the North Drainage Canal (Reaches 1-4B), the Elkhorn Main Irrigation Canal (Elkhorn Canal) between the North Drainage Canal and the Elkhorn Reservoir settling basin, the site of Reclamation District (RD) 1000 Pumping Plant No. 2, and adjacent land. Construction Phase 3 includes the Sacramento River east levee south of the limits of the Phase 2 improvements to just south of (I-5) (Reaches 5A–9B), the PGCC west levee, the NEMDC west levee between Elkhorn Boulevard and

Northgate Boulevard, the area between Elkhorn Reservoir and the West Drainage Canal where a new canal designed to provide drainage and associated giant garter snake habitat (referred to in this document as the "GGS/Drainage Canal") would be constructed, the portion of the West Drainage Canal north of Interstate 5 (I-5), the Elkhorn Canal downstream of Elkhorn Reservoir, and RD 1000 Pumping Plant No. 2. Construction Phase 4, which is still undergoing study, includes the Sacramento River east levee south of the limits of the Phase 3 improvements to the junction with the American River north levee (Reaches 10–20), the NEMDC west levee between Sankey Road and Elkhorn Boulevard, the Riverside Main Irrigation Canal (Riverside Canal), and the West Drainage Canal south of I-5 to Fisherman's Lake. Phase 1 of the project occurred during the summers of 2007 and 2008 and consisted of placing slurry wall along 9,700 linear feet of the Natomas Cross Canal (Service file number 1-1-07-F-0207).

Because the Corps and SAFCA only have a detailed project description for Phase 2 of the entire Natomas Levee Improvement Project, this biological opinion analyzes the landscape effects of the project for all Phases (2, 3, and 4) but will only analyze and provide incidental take coverage for Phase 2. Each subsequent phase will initiate section 7 consultation with the Service under the umbrella of this programmatic biological opinion.

Overview of NLIP Landside Improvements Project

The SAFCA is designing the NLIP in coordination with the Federal and state flood control project sponsors, the Corps, and the State of California Central Valley Flood Protection Board (formerly The Reclamation Board), to address the deficiencies in the Natomas levee system with a focus on achieving a 100-year level of flood protection by 2011. This will require improving the following landside conditions along the NCC south levee, the Sacramento River east levee, and the PGCC and NEMDC west levees:

- Inadequate freeboard—The NCC south levee and portions of the Sacramento River east levee are not high enough to provide at least 3 feet of freeboard above the 100-year water surface elevation. Additional reaches do not provide 3 feet of freeboard above the 200-year design water surface elevation.
- Underseepage and through-seepage vulnerability—Most of the levee reaches do not meet recently adopted Federal criteria for safely containing underseepage and through-seepage when the water surface in the adjacent channel reaches the 100-year elevation or, in some cases, the 200-year elevation.

The NLIP Landside Improvements project encompasses addressing freeboard deficiencies through levee raises; addressing seepage potential using a combination of seepage berms, cutoff walls, and relief wells; and acquiring additional right-of-way to construct the improvements and to prevent encroachment into the flood control system. In addition, the project has been designed to include an enlarged levee embankment (adjacent setback levee) along the land side of the existing Sacramento River east levee to minimize the need for substantial removal of vegetation and structural encroachments on the water side of this levee in compliance with Corps guidance. These improvements would include recontouring the levee slopes where necessary to provide a

3:1 horizontal-to-vertical (3H:1V) waterside slope and a 3H:1V (preferred) or 2H:1V (maximum) landside slope.

The specific goal of the NLIP Landside Improvements Project is to provide at least 100-year flood protection as quickly as possible while laying the groundwork to achieve at least urban-standard (200-year) flood protection over time.

Additional project objectives that influenced SAFCA's project design were to:

(1) use flood control projects in the vicinity of the Sacramento County Airport to facilitate better management of Airport lands to reduce hazards to aviation safety, and

(2) use flood control projects to enhance habitat quality and values by increasing the extent and connectivity of the lands in the Natomas Basin being managed to provide habitat for the giant garter snake, the Swainson's hawk, and other special-status species.

Recognizing the importance of securing maximum Federal support for the flood control project, SAFCA has explored implementation approaches that also advance the achievement of Federal aviation and wildlife protection objectives where complementary opportunities exist. Accordingly, the proposed project includes the following elements:

- The project would include construction of the GGS/Drainage Canal to provide giant garter snake habitat and some drainage infrastructure west of the Airport. Construction of these facilities would allow for dewatering of the ditch running along the western portion of the Airport runway system, which the airport recognizes as a flight safety hazard, by offsetting the effects on drainage and irrigation needs and giant garter snake habitat.

- The project would combine SAFCA's need for levee embankment and berm material with the Sacramento County Airport System's (SCAS) need to modify the condition and management of Airport bufferlands so as to reduce wildlife hazards affecting Airport operations in a manner that enhances the connectivity of areas managed specifically for their habitat value.

Existing Project Facilities and Potential Borrow Sites

Construction activities for all project phases would take place within the Natomas Basin, except for potential development of a borrow site on RD 1001 land northeast of the basin. The following subsections describe the existing flood control facilities, their general setting, and adjacent irrigation infrastructure and the potential borrow sources for the project as provided by the Corps in their Environmental Impact Statement for the proposed project.

Flood Control and Irrigation Facilities

Natomas Cross Canal South Levee

The NCC is a 5.3-mile-long channel that carries water from several tributary watersheds in western Placer County and eastern Sutter County to the Sacramento River. The NCC begins at the PGCC and East Side Canal and extends southwest to its confluence with the Sacramento River near the Sankey Road/Garden Highway intersection. During periods of flooding, the Sutter Bypass, Sacramento River, and NCC all contribute to raised water elevations that can affect the NCC levees. For engineering purposes, the south levee is divided into seven reaches. Much of the south levee contains an existing stability berm with an internal drainage system. Levee slopes are approximately 3H:1V on the water side and 2H:1V on the land side.

There is an approximately 80- to 100-foot maintenance access area on the landside of the levee through most of the NCC's length. Farms and rural residences are located on both sides of the NCC, with rice the primary crop under cultivation. The Lucich North and Frazer Habitat Preserves, maintained by TNBC, lie south of the NCC south levee from the eastern end of Reach 2 through the western end of Reach 6. A drainage canal, referred to as the Vestal Drain, runs parallel to the NCC south levee through much of Reach 2, approximately 100 feet from the landside levee toe. There is a private irrigation pump and irrigation canal at the landside levee toe in Reach 1. Natomas Central Mutual Water Company's (NMWC) Bennett Pumping Plant and RD 1000's Pumping Plant No. 4 are located in Reach 2, and the NMWC Northern Pumping Plant is located in Reach 3. The NMWC North Main Canal runs parallel to the levee through Reaches 4 and 5, approximately 100 feet from the landside levee toe.

Sacramento River East Levee

An 18-mile-long section of the east levee of the Sacramento River protects the west side of the Natomas Basin between the NCC and the American River. For planning purposes, the levee is divided into 20 reaches. Garden Highway is located on top of the levee crown within all 20 reaches. A drained, 10-foot-wide stability berm is present on the landside slope of the levee between the NCC and Powerline Road (Reaches 1–11). Cutoff walls to address through-levee seepage remediation were previously constructed through the levee in Reaches 12–20. The land uses along the levee vary from north to south. Along the landside, Reaches 1–13 are bordered mainly by private agricultural lands containing a few rural residences, Airport bufferlands, and two farmed TNBC parcels. Teal Bend Golf Club is west of the Airport, adjacent to the levee along Reach 6. The parcels bordering Reaches 14–18 contain more residences, several rural estates, and three TNBC parcels. The landside of Reaches 19 and 20 are bordered by residential subdivisions, a business park, the City of Sacramento's Natomas Oaks Park, undeveloped Costa Park site, and Shorebird Park.

Several irrigation canals, pipelines, wells, and pump stations exist along the Sacramento River east levee. The Elkhorn Canal and the Riverside Canal are key agricultural irrigation canals in the NMWC system. The Elkhorn Canal runs parallel to the Sacramento River east levee from the

North Drainage Canal in Reach 4B through Reach 8 and into the start of Reach 9 (1,250 feet south of Elkhorn Boulevard); this canal is supplied by the Prichard and Elkhorn Pumping Plants on the Sacramento River. The Riverside Canal extends from just north of Reach 13 to the middle of Reach 19 and is supplied by the Riverside Pumping Plant, on the Sacramento River just north of Radio Road. Several lateral canals connect to the Elkhorn and Riverside Canals. The existing Elkhorn and Riverside Canals are highline canals that use gravity flow to deliver water for irrigation by maintaining water levels above the surrounding ground levels. These canals have earthen embankments with side slopes that are nearly vertical, requiring regular maintenance. Approximately 1 mile of the existing Elkhorn Canal is concrete lined and the entire Riverside Canal is concrete lined.

In addition to the NMWC irrigation systems, there are several landowner-operated systems along the levee. These facilities are located primarily in Reaches 1–4A and 9–12, in areas not currently served by the NMWC systems. The areas are serviced by either well pumps on the landside or river pumps, which discharge into buried pipelines, small irrigation ditches, or directly onto fields. The distribution systems run along the landside toe of the levee to supply fields that slope away from the levee. There are approximately nine small pumping plants that provide water from the river and approximately 10 groundwater well pumps.

Several drainage pumping plants are operated by RD 1000 along the Sacramento River east levee. These facilities pump drain water from the main drainage canal system into the river. They include Pumping Plant No. 2, located in Reach 4B; Pumping Plant No. 5, located in Reach 10; Pumping Plant No. 3, located in Reach 13; and Pumping Plant No. 1, located in Reach 20A. Pumping Plant No. 2 was temporarily removed as part of an emergency levee repair in 2006 and would be replaced as an element of the proposed project in the 2009–2010 construction phases. In addition to these RD 1000 pumping stations, the City of Sacramento operates the Willow Creek drainage pumping station, which is located in Reach 19B.

Pleasant Grove Creek Canal West Levee

The PGCC west levee extends southerly from the east end of the NCC south levee to the north end of the NEMDC/Steelhead Creek levee near the Sankey Road crossing. The PGCC west levee protects the Natomas Basin from flood flows from Pleasant Grove Creek and other creeks in western Placer County, as well as from water that backs up in the NCC during high river stages in the Sacramento River. Levee slopes are generally 2H:1V on both the water side and land side of the levee. Natomas Road is located on top of the levee crown. No berms support this levee. A private canal extends parallel to the PGCC west levee for about 1,500 feet at the landside levee toe. Farms and scattered rural residences are located on the landside of the PGCC west levee, and a manufacturing facility and a railroad siding are located within several hundred feet of the levee, just south of Sankey Road.

Natomas East Main Drainage Canal

The 13.3-mile NEMDC/Steelhead Creek west levee extends southerly from the south end of the PGCC west levee near the Sankey Road crossing to Northgate Boulevard. The NEMDC west levee protects the Natomas Basin from flood flows from Arcade and Dry Creeks, as well as from water during high river stages in the American River. Natomas and East Levee Roads are located on top of the levee crown. Private canals extend parallel to portions of the NEMDC west levee landside levee toe. Farms and scattered rural residences are located on the land side of the northern portion of the NEMDC west levee (between Sankey Road and Elkhorn Boulevard), while the southern portion (generally south of Del Paso Road to Northgate Boulevard) is bordered by urban and commercial/industrial development.

The SAFCA NEMDC stormwater pumping station, a facility that is connected to the NEMDC/Steelhead Creek west levee and the Dry Creek north levee, is situated between Del Paso Road and Elkhorn Boulevard. Other pumping stations occur along the NEMDC west levee, including NMWC Pumping Plant Nos. 6 and 8, which pump water out of the Natomas Basin for in-basin drainage and flood control. RD 1000 operates Pumping Plant Nos. 6 and 8 and City of Sacramento operates Pump Station No. 102 on the NEMDC west levee.

Borrow Sites

Borrow sites are areas from which earthen materials would be removed for use in construction. Where borrow sites would be used over more than one construction season, the work would progress in cells that would be incrementally developed as habitat or returned to agricultural use as the borrow activities are completed. Several properties have been identified as likely sources of soil borrow, mainly for use in the improvements to the Sacramento River east levee. The SAFCA has identified the following preferred borrow sources for the construction of the flood control and irrigation infrastructure improvements for construction Phases 2, 3, and 4, and a redundant source that may be pursued if negotiations regarding the preferred sources are unsuccessful or additional quantities are found to be needed during construction:

- Brookfield property (Phases 2, and 3 preferred): Private property west of the PGCC at Fifield Road, which was in rice cultivation in 2008. Material from this property could be used along the NCC south levee and the upper reaches of the Sacramento River east levee in construction Phase 2 and on the PGCC west levee in construction Phases 3. While the overall property may be used as borrow during multiple years, no area of the property would be used for consecutive years. After the removal of borrow material, the land would be returned to rice cultivation in the same season or if too late to plant, then in the following season.

- Airport bufferlands north of the Airport complex (Phases 2 and 3 preferred, Phase 4 potential): Sacramento County property north of Elverta Road and west of Powerline Road. These lands could provide soil for use along the middle reaches of the Sacramento River east levee in construction Phases 2 and 3. They could also provide material for

construction in the lower reaches of the levee in construction Phase 4, if needed. While the overall property may be used as borrow during multiple years, no area of the property would be used for consecutive years. After the removal of borrow material, the borrow areas, which are currently either fallow agricultural lands or ruderal grassland, would be returned to fallow agricultural fields.

- Fisherman's Lake area (Phase 4 preferred): Privately owned parcels between TNBC-managed habitat areas. Several parcels, which are currently planted in rice, orchards, or field crops, may be suitable sources of borrow material for use in the lower reaches of the Sacramento River east levee and are strategically situated for creation of habitat that would link existing TNBC parcels.

- Krumenacher property (Phase 3 preferred): Private parcel at the intersection of East Levee Road and Elkhorn Boulevard. This parcel is a component of the Natomas Panhandle, identified in the Natomas Basin Habitat Conservation Plan (NBHCP) and development of this parcel is already covered by a July 25, 2007, biological opinion (1-1-06-F-0294). This land, which is primarily grassland, could provide a borrow source for the levee widening improvements to the NEMDC.

- Twin Rivers Unified School District (Phase 3 preferred): Material stockpiled on property owned by Twin Rivers Unified School District, immediately south of Krumenacher. This parcel is a component of the Natomas Panhandle, identified in the NBHCP, and development of this parcel is already covered by a July 25, 2007, biological opinion (1-1-06-F-0294). This material could provide a borrow source for the levee widening improvements to the NEMDC.

- Horangic/Private Property Northwest of Garden Highway and Reservoir Road (Phase 3 preferred): Private parcel located in Reach 6A along the Sacramento River east levee. The portion of this site that would not be in the levee footprint could provide borrow material for seepage berms in Reaches 5A–5B. The site would be shallow-graded for borrow material and returned to field crops.

- Binford deYoung/Private Property Southwest of Garden Highway and Elverta Road (Phase 3 preferred): Private parcel located in Reach 5B along the Sacramento River east levee. The portion of this site that would not be in the levee footprint could provide borrow material for seepage berms in Reaches 5A–5B. The site would be shallow-graded for borrow material and returned to field crops.

- Bianchi/Private Property Northwest of Garden Highway and Reservoir Road (Phase 3 potential): Private parcel located in Reach 7 along the Sacramento River east levee. This property could borrow material for levee construction south of the Teal Bend Golf Club. The site would be shallow graded for borrow material and returned to field crops.

- Pacific Terrace (Phase 3 preferred): A 276-acre site located north of I-5 and east of Schoolhouse Road. Approximately 120 acres of this site could be used for levee construction south of the Teal Bend Golf Club. The site would be shallow graded for borrow material and returned to field crops.

- Novak property (Phase 3 preferred, Phase 4 potential): A SAFCA-owned, 94-acre property located south of Del Paso Road and east of Powerline Road in Reach 12A along the Sacramento River east levee. The site could be used for levee construction south of the Teal Bend Golf Course. The site would be shallow graded for borrow material and returned to grassland or field crops.

- RD 1001 (Phase 4 potential): Existing and future borrow sites owned by RD 1001, about 5 miles northeast of the Natomas Basin along Pacific Avenue. Material from the sites could be used in constructing Phase 4.

Overview of the Project Elements

The elements of the proposed project are categorized into five broad, overlapping categories:
- levee raising and seepage remediation,
- improvements to major irrigation and drainage infrastructure,
- acquisition of right-of-way within the footprint of the proposed features, at borrow sites, and to prevent encroachment and provide for maintenance access along the land side of the flood control facilities,
- habitat development and management for giant garter snakes and Swainson's hawks, and
- additional actions to meet Federal Emergency Management Agency requirements: encroachment management and bridge crossing modifications.

Levee Raising and Seepage Remediation

General Methods - The following subsections provide an overview of the approaches to addressing freeboard deficiencies and seepage potential that would be used in various combinations on the NCC south levee and Sacramento River east levee, and the PGCC and NEMDC west levees.

Raising, Widening and Flattening Levees (Phases 2, 3 ,4)

The entire NCC south levee, much of the Sacramento River east levee and a portion of the PGCC west levee at Sankey Road lack the required 3 feet of freeboard above the 100-year water surface profile. To meet overall NLIP goals, SAFCA would increase the levee freeboard sufficiently in freeboard-deficient areas to meet the desired minimum of 3 feet of freeboard above the 200-year water surface profile. The levee height increases would be accomplished through raises of the existing NCC south levee or through construction of the raised adjacent setback levee adjacent to the existing Sacramento River east levee:

- Raise of existing levee (NCC south levee). For a minor raise of the levee crown elevation (typically 6 inches or less), the raise may be limited to the levee crown area, provided that there is enough existing crown width to accommodate the raise without narrowing the crown to a width that is less than the minimum requirement. For most of the NLIP levee raises, however, a greater crown raise is required and/or the levee slopes must be flattened. The required crown elevation would be met through a full levee raise. Full levee raises consist of an embankment raise from the landside or waterside toe (or both) upward to the increased crown elevation. This requires partially excavating the levee slope to provide a working platform for equipment, typically 10 feet wide, and rebuilding the levee to the appropriate elevation by benching the new embankment material into the existing embankment material.

- Adjacent setback levee (Sacramento River east levee). The proposed adjacent setback levee adjoining the Sacramento River east levee would be constructed with a crown elevation 3 feet above the 200-year water surface profile. In the upper reaches, where the existing levee has freeboard deficiencies of as much as 3 feet, the crown of the adjacent setback levee would be higher than the existing levee and Garden Highway roadway. In the lower reaches, where the existing levee has sufficient freeboard, the adjacent setback levee would be the same height as the existing levee.

The only levee segment that lacks adequate levee height that would be maintained at its current elevation is the PGCC west levee at Sankey Road because the flows through this levee segment into the interior of the Natomas Basin during a Federal Emergency Management Agency (FEMA) 100-year or "200-year" design event are not damaging and are subject to management as part of the basin's interior drainage system. Along the NEMDC west levee between Northgate Boulevard and Elkhorn Boulevard, the levee currently meets FEMA 100-year levee height requirements and also meets the "200-year" plus 3 feet of levee height design for the top of the levee profile.

The final levee configuration must meet the Corps criteria of a 20-foot-wide minimum crown, a 3H:1V waterside slope, and a 3H:1V (preferred) or 2H:1V (maximum) landside slope. Because the levees in most of the project reaches currently have landside slopes of 2H:1V, the proposed project includes flattening these slopes to at least a 3H:1V profile, and preferably 5H:1V. The PGCC west levee would be expanded on the land side to provide a levee width to encompass, at a minimum, a theoretical 3H:1V waterside slope, a crown width of at least 20 feet, and a landside slope of at least 3H:1V. The intent of the landside expansion is to preserve the existing Natomas Road and East Levee Road, which are County/City-maintained roads located on top of the existing PGCC and NEMDC west levees. Levee widening and slope flattening would also occur along the NEMDC west levee between Elkhorn Boulevard and the NEMDC stormwater pumping station.

Seepage Remediation

Underseepage problems can occur where levees are constructed on low-permeability foundation soil (silt and clay) underlain by a layer of higher permeability (sand and gravel). Excessive

underseepage makes the levee susceptible to failure during periods of high river stage. Under these conditions, seepage travels horizontally under the levee and then is forced vertically upward through the low-permeability foundation layer, often referred to as a "blanket." Failure of the blanket can occur either by uplift, a condition in which the blanket does not have enough weight to resist the confined pressure acting on the bottom of the blanket, or by piping (internal erosion) caused by water flowing under high vertical gradients through the erodible blanket and carrying fine soil particles out of the foundation materials. Through-seepage is seepage through a levee embankment that can occur during periods of high river stage. Depending on the duration of high water and the permeability of embankment soil, seepage may exit the landside face of the levee. Seepage can also pass directly through pervious layers in the levee if such layers are present. Under these conditions, the stability of the landside levee slope may be reduced.

During Phases 2–4, along the Sacramento River east levee, cutoff walls would be constructed through the adjacent levee in some reaches, and 100-foot-wide earthen seepage berms would be constructed in others for seepage remediation. Although portions of this reach of the Natomas perimeter levee system are considered susceptible to seismically induced ground shaking, such a condition would likely not cause deformation of the soil-bentonite (SB) walls in the adjacent levee because of its malleability and location farther away from the river channel, where levee failure is more likely to occur in association with seismically induced collapse of the river bank. Additionally, because an SB seepage cutoff wall is constructed lower in the levee section, it is not likely to be significantly affected by failure of the levee itself if the levee were to collapse. Relief wells cause the least amount of construction disturbance but require routine maintenance of the wells themselves and the drainage and pumping facilities necessary to support them. Seepage berms are feasible where there is sufficient room for construction.

Phase 2 includes the construction of a seepage cutoff wall through the levee crown of the NCC within Reaches 3–7. Phase 3 includes the construction of SB cutoff walls within the PGCC west levee where required to provide seepage remediation. Along the NEMDC west levee between the NEMDC stormwater pumping station and Northgate Boulevard, an SB or soil-cement-bentonite cutoff wall would likely be constructed.

Major Irrigation and Drainage Infrastructure Modifications

There are two major canal systems in the Natomas Basin: an irrigation system owned and operated by NMWC and a drainage system owned and operated by RD 1000. The NMWC pumps water into the basin to provide irrigation water to its shareholders for agricultural use within the basin. During winter (October–April), drainage is primarily rainfall runoff; during summer (May–September), drainage water from agricultural fields is typically recirculated for irrigation. Because the basin is surrounded by levees, all excess drainage within the basin must be pumped out. In general, irrigation water is pumped into the basin from the Sacramento River and NCC and returned to the perimeter rivers and canals via RD 1000's drainage system. In the southern part of the Natomas Basin, the City of Sacramento also operates several drainage pump stations that serve residential areas.

As a result of the planned levee improvements in the Natomas Basin, the irrigation canals currently at the toe of the Sacramento River east levee (the Elkhorn Canal and the Riverside Canal) would be replaced by new irrigation canals set back from the existing levee farther to the east. Where constraints exist, certain portions of the canals would be piped. The existing and proposed irrigation canals are highline canals, which means that the bottom of the canal is roughly equal to the surrounding ground elevation. Irrigation canals would be constructed high enough to raise water levels above the levels of the adjacent fields to allow for gravity flow into the fields.

A new drainage canal would be constructed to improve the connectivity of giant garter snake habitat between the North Drainage Canal and West Drainage Canal. The proposed GGS/Drainage Canal would be constructed with the top of bank roughly at existing ground level to facilitate drainage. Material excavated to construct the GGS/Drainage Canal would generally be used to construct the embankments of the adjacent highline irrigation canals. Some import and export of soil materials for levee construction would be required to accommodate the phasing of the activities. The following subsections provide an overview of these irrigation and drainage infrastructure modifications.

Relocation of the Elkhorn and Riverside Canals

General Construction Plan for Relocated Canals - The Elkhorn and Riverside Canals would be constructed with sufficient height to raise water levels above the levels of adjacent fields. Design water levels would be based on existing levels at service points along the alignments and the tops of embankments would provide for 1 foot of freeboard. To provide for stable banks, side slopes of 3H:1V would be used. The invert of canals would be lined with concrete to control vegetation and to allow for maintenance with minimal disturbance of aquatic habitat along the water's edge.

To avoid interruptions in service along the existing irrigation canals, the relocated canals would be constructed and operational before construction of planned levee improvements that would conflict with the existing irrigation canals. Thus, in any particular reach, the new canal would be constructed before the levee improvements in that same reach. Approximately half of the new Elkhorn Canal (North Drainage Canal to Elkhorn Reservoir) is planned for construction in Phase 2. The GGS/Drainage Canal from the North Drainage Canal to Elkhorn Reservoir also would be constructed in Phase 2, because this section would run parallel to and within the same right-of-way as the proposed Elkhorn Canal in this area. Concurrent construction of these new irrigation and drainage facilities would facilitate the use of excavated material from the GGS/Drainage Canal excavation for use as embankment material along the Elkhorn Canal. The remainder of the Elkhorn Canal and GGS/Drainage Canal would be constructed in Phase 3, and the new Riverside Canal would be constructed during the Phase 4.

Elkhorn Canal - Approximately 22,300 feet of the Elkhorn Canal would be relocated to accommodate the levee construction. This facility is a main irrigation canal that services NMWC Central and Elkhorn systems from the Prichard and Elkhorn Pumping Plants on the Sacramento River. Approximately 1 mile of the existing Elkhorn Canal is concrete lined, including segments

between Elverta Road and the Elkhorn Pumping Plant and also just north and south of Elkhorn Road; the remainder is earth lined.

The proposed alignment of the new Elkhorn Canal is based primarily on the extent of the planned levee improvements. The canal was sited as close as possible to the projected toe of the new levee (with allowance made for a 5H:1V landside levee slope). After this initial alignment was determined, a number of site-specific factors were considered and used to refine the alignment. The resulting alignment minimizes conflicts with known cultural resources sites and existing trees and is roughly parallel to the projected levee toe.

North of Elkhorn Reservoir, the maximum bottom width of the new canal would be 12 feet. The canal embankments would be approximately 7 feet tall with 15-foot-wide patrol roads along the top of the embankments with a two percent grade sloped down towards the canal. The vegetated side slopes would be 3H:1V to provide for stable banks. Overall, the width of the canal would be approximately 140 feet, with additional width required for a buffer and maintenance area for the canal construction north of Elkhorn Reservoir.

To minimize project impacts on the existing Teal Bend Golf Club, the alignment of the Elkhorn Canal through the golf course would be piped (approximately 3,200 feet). Two 36-inch pipes would be aligned parallel to the levee toe land side of the flood control facility corridor. This alignment would avoid existing golf course infrastructure to the extent possible.

South of Teal Bend, the Elkhorn Canal would return to an open channel parallel to the toe of the new levee. The majority of this reach of earthen canal has a design bottom width of 5 feet, with a minimum of 1 foot of levee height and 3H:1V side slopes. A 15–foot-wide patrol road would be located on the top of the field side of the canal; the other embankment would be 8 feet wide on the crown. The only portion of the new canal that would have a concrete-lined invert would be the 4,100-foot section where the existing canal is lined. The remaining 2,900 feet of new canal would be earthen-lined. To avoid impacts on existing residences, a second section (approximately 950 feet through the Mortensen and Breese properties) of the Elkhorn Canal may be piped using a single 36-inch pipe. The materials to construct the Elkhorn Canal would come primarily from the construction of the GGS/Drainage canal north of I-5. However, a small amount of import from the Airport north borrow sites is expected to be used to support construction of a portion of Phase 2 improvements.

Riverside Canal - Approximately 18,600 feet of the Riverside Canal would be relocated to accommodate the levee construction. This facility is a main irrigation canal that services NMWC Riverside system. The supply for this canal is the Riverside Pumping Plant. The canal flows south along the landside toe of the levee to approximately Bryte Bend Road. The canal south of Bryte Bend Road has not been used in recent years. The canal north of the Riverside Pumping Plant is supplied by relifted water at RD 1000's Pumping Plant No. 3. From Pumping Plant No. 3, the canal flows north approximately 950 feet and turns away from the levee. The entire existing Riverside Canal is concrete lined, although much of the concrete lining is broken and in poor condition.

Like the Elkhorn Canal alignment, the alignment of the Riverside Canal would be based primarily on the extent of the planned levee improvements. The canal would be sited as close as possible to the projected toe of the new levee (allowing for a 5H:1V landside levee slope). After this initial alignment is determined, a number of other factors would be considered and used to refine the alignment. One-half to three-quarters of a mile south of San Juan Road southward to I-80, there are a number of residences along the landside toe of the levee. To avoid bisecting these private properties, it is likely that the Riverside Canal alignment would follow the eastern property line of these parcels. The final alignment would also aim to minimize conflicts with existing trees and other site-specific constraints that are identified during design. Based on these site-specific factors and the variation of the proposed seepage remediation methods in different reaches, the alignment would be only roughly parallel to the projected levee toe. The proposed bottom width of the relocated Riverside Canal would be determined during final design to meet existing capacity needs.

Construction of the New GGS/Drainage Canal - The new GGS/Drainage Canal would enhance habitat functionality by permanently linking known giant garter snake population centers and TNBC properties in the northern and southern reserve areas that are managed for GGS habitat, thus, improving habitat connectivity between the North Drainage Canal and West Drainage Canal and augmenting movement opportunities for this species within the Natomas Basin. This would link emerging blocks of managed giant garter snake habitat in the vicinity of Prichard Lake north of the Airport and around Fisherman's Lake south of the Airport. In addition to providing giant garter snake habitat, the GGS/Drainage Canal would intercept flows from non-Airport property sources. Irrigation and drainage water currently flowing into the Airport West Ditch from non-Airport property would be incorporated into the GGS/Drainage Canal.

The GGS/Drainage Canal would generally extend parallel to the Sacramento River east levee, extending from the North Drainage Canal at the RD 1000 Pumping Plant No. 2 in the north to the West Drainage Canal in the south, approximately 1,000 feet south of Elkhorn Boulevard. The GGS/Drainage Canal construction would include reconstruction of the West Drainage Canal from I-5 to Fisherman's Lake. The length of the entire GGS/Drainage Canal, including the reconstruction, would be approximately 43,800 linear feet. The GGS/Drainage Canal would have a series of check structures along its length to maintain consistent water levels in the low-flow channel of the canal during the snake's active season (April–October). Supplemental water would be provided from NMWC irrigation system. The low-flow channel would have a top width of approximately 50 feet and an average depth of approximately 6 feet. Vegetation would be managed within the canal excavation and on the banks by mowing.

The portion of the GGS/Drainage Canal that would be constructed in Phase 2 is north of Elkhorn Reservoir would be parallel and approximately 30 feet west of the edge of the Elkhorn Canal. Thus, the alignment was based on the same factors as discussed above for the Elkhorn Canal. North of Reservoir Road the canal would be set back a minimum of 200 feet from the projected levee toe to minimize concerns of excessive seepage exit gradients in the bottom of the canal.

The canal in this location would have a 10-foot bottom width and vegetated 3H:1V side slopes. The canal would be approximately five feet deep with two percent grade sloped down towards the canal from the edge of the Elkhorn Canal embankment and the adjacent ground for a distance of 12 feet to allow for a patrol road. The depth would be sufficient to provide a minimum water depth of 4.5 feet with allowance for 1 foot of water level variance and a minimum of 1 foot of freeboard. The footprint of the GGS/Drainage Canal is approximately 50 feet wide. A 30-foot right-of-way would separate the proposed GGS/Drainage Canal from the proposed relocated Elkhorn Canal.

South of Elkhorn Reservoir, the new canal would be constructed with roughly the same proportions as the segment north of Elkhorn Reservoir, with one notable exception. Between the sedimentation basin and Walnut Road, for a total of 2,200 feet, a 15-foot-wide managed tule (*Scirpus acutus*) bench would be constructed alongside the main channel. This bench would typically be seasonally inundated with water, similar to a managed marsh, and which would drain into the main channel. The 5,900-foot segment of the canal between the southeastern corner of Teal Bend Golf Club and the West Drainage Canal would have a 50-foot-wide managed tule bench.

The GGS/Drainage Canal north of Teal Bend Golf Club would be managed primarily as a linear high-quality giant garter snake habitat and movement corridor, with stormwater drainage a secondary function during major storm events, which typically occur in the snake's inactive season. South of Teal Bend Golf Club, the canal would also serve as a primary giant garter snake habitat area and movement corridor, but the volume of stormwater drainage would increase in a southerly direction as the canal collects additional runoff as a result of the natural slope of the basin. Winter storm–related runoff exceeding the capacity of the West Drainage Canal south of I-5 would be pumped into the Sacramento River using RD 1000's Pumping Plant No. 3, consistent with existing stormwater management practice.

The shoreline and lower bank of the GGS/Drainage Canal (including the improved West Drainage Canal) would be planted or managed to promote tule/cattail (*Typha latifolia*) vegetation as suitable cover and foraging habitat for giant garter snake. However, management of the canal would also require removal of noxious aquatic weeds that obstruct the flow of water. A secure water supply would ensure that water of a suitable quality is present and flowing at low velocity in the canal during the active season of the giant garter snake, and that the water surface would be managed within a range of approximately 1 foot to provide consistent cover from predators along the tule fringe of canal banks. Input of supplemental canal water would begin at a diversion point on the North Drainage Canal at the north end of the new GGS/Drainage Canal. Other points of inflow may occur at downstream locations.

Removal of Airport West Ditch

To take advantage of common construction practices and to maximize the use of common facilities, the rearrangement of irrigation and drainage facilities required to provide for rerouting of flows that contribute to the Airport West Ditch would be undertaken in conjunction with these

proposed NLIP improvements in construction Phase 3. This work would include modifications and extension of existing irrigation infrastructure and modification of some local drainage conveyance facilities.

Removal of Culvert and Reconstruction at Pumping Plant No. 2

The project would include the removal of a deep culvert beneath the levee section at the RD 1000 Pumping Plant No. 2 location and the replacement of a relocated RD 1000 Pumping Plant No. 2, which was removed from the western end of the North Drainage Canal in response to underseepage observed during extended winter storms in January 2006.

Land Acquisition

Several of the measures described above would increase the footprint of the flood control system: levees would be widened on the land side as a result of raising, constructing an adjacent setback levee, and flattening the waterside and/or landside slopes. In addition, a 50- to 100-foot-wide access and maintenance corridor would be established at the landside toes of the levees. The proposed improvements also include woodland corridors and groves to replace trees that are removed from within the levee footprint and maintenance access areas, and canal construction east of the flood control features. The SAFCA also would acquire adjacent land for relocation of infrastructure from the flood control corridor and planned improvements outside the flood control corridor (e.g., the GGS/Drainage Canal), with appropriate easements provided to utility owners upon completion of the work. To meet its project footprint needs, SAFCA would acquire private lands in fee and would acquire an easement interest where the project features would be on Airport land (owned by Sacramento County). Where the project footprint would overlie land owned and managed by TNBC, SAFCA may either purchase the land in fee or obtain easements.

Additional Actions to Meet FEMA Requirements

Encroachment Management (Phases 3 and 4)

Corps levee guidance requires the removal of vegetation greater than 2 inches in diameter on the levee slopes and within 15 feet of the waterside and landside levee toes. The Corps levee guidance also requires an assessment of encroachments on the levee slopes, including utilities, fences, structures, retaining walls, driveways, and other features that penetrate the levee prism. Substantial encroachments are present on the Sacramento River east levee. One of the objectives of constructing an adjacent setback levee along the Sacramento River east levee is to facilitate acceptable management of existing vegetation and structural encroachments along the water side of this levee. By moving the hypothetical waterside slope of the levee (the "levee template") landward, the adjacent levee would significantly reduce most of the conflicts between these encroachments and applicable Corps levee operation and maintenance requirements. Should any of these existing encroachments be determined to reduce the integrity of the levee, increase flood risk unacceptably, or impede visibility or access to the waterside levee slope, the encroachments would need to be removed. Removal of some waterside slope encroachments may be required by

the end of 2011 to ensure that the levee system meets Federal criteria for the 100-year level of protection. Along the land side of the proposed adjacent setback levee, encroachment removal would typically be accomplished as part of the landside levee improvements. This activity would include the relocation of utility poles that are on the existing landside slope of the levee.

Bridge Crossings (Phase 4)

Under applicable Federal requirements, the plane of the northbound and southbound bridge crossings of SR 99/70 over the NCC must be 4 feet above the 100-year water surface elevation in the NCC. The 100-year water surface elevation is 44.4 NAVD 88. The soffit (underside) elevation of the northbound crossing is 44.9 NAVD 88, and the soffit elevation of the southbound crossing is 42.9 NAVD 88. Accordingly, during construction of Phase 4 the following options must be considered for implementation in conjunction with the California Department of Transportation:

(1) Raise both bridge crossings as necessary to meet minimum FEMA clearance requirements.
(2) Provide for installation of a closure structure across the southbound crossing in the event of a 100-year or greater flood.
(3) Replace the bridge rail structures on the east and west sides of the bridge crossings and modify the levees connecting to these structures to provide at least 4 feet of levee height above the 100-year water surface elevation. Under any of these options, at least the northbound crossing could remain open for use during a 100-year flood event.

Investigations to Aid Project Planning and Design

Geo-technical Investigations

Additional exploration of geotechnical conditions is anticipated to be required in Phases 2–4 along the NCC south levee, Sacramento River east levee, PGCC west levee, NEMDC/Steelhead Creek west levee, and American River north levee to facilitate refinement of design for flood facility improvements. Exploration of subsurface conditions would primarily be conducted by drilling borings. Borings along the levees would generally be drilled to depths of 60-120 feet below the ground surface using either a rubber-tire truck-mounted drill rig or an all-terrain drill rig equipped with an 8-inch-diameter hollow-stem auger and a 4-inch-diameter rotary wash drill bit. Hollow-stem augers would generally be used to drill through the levee fill and would be left in place to act as temporary casing and protection against hydraulic fracturing of the levee. Rotary wash drilling methods would be used below the augers. Borings located at and landward of the levee toe would be drilled using rotary wash drilling methods.
Exploration of potential borrow sites will also be required to assess suitability of the material. Such exploration could include boring methods similar to those described above, but to shallower depths (10–12 feet below grade). Test pit excavation would be conducted using a tire-mounted backhoe to depths of 10–12 feet below grade. The test pits would likely be 1–3 feet wide along dirt roadways and 3–6 feet wide in agricultural fields by about 10 feet long. Samples

would be obtained by hand with shovels from the excavated materials. When the bottom depth has been reached, the test pits would be loosely backfilled with the spoils with minor compaction effort. In the dirt roadways, the backfilled materials would be compacted with more effort to maintain drivability and safety.

Cultural Resources Investigations

Archeological surveys within potential flood control facility improvement footprints and potential borrow sites are required to facilitate project planning in Phases 2–4 and satisfy requirements under Section 106 of the National Historic Preservation Act. The surveys would include up to three stages of work. All excavation work in Stages 1 and 2 would be conducted with hand tools, such as shovels and trowels. Stage 1 entails digging shovel test pits 15 inches in diameter and up to 3 feet deep to evaluate the characteristics of subsurface material; these test pits would be backfilled immediately. Depending on archeological evidence found within the shovel test pits, Stage 2 work may be initiated to allow for a more thorough site investigation. This Phase would include excavation of 1-meter-square and 5-foot-deep test units. These test units may need to remain open for several days until examination can be completed. Any sites requiring deeper excavation to further investigate subsurface features identified in the first two stages would be included in Stage 3. This stage would require the use of machinery, such as a backhoe.

Conservation Strategy Overview

According to SAFCA, the project conservation strategy will support and significantly contribute towards the emergence of an urban habitat refuge in the Natomas Basin. The refuge is projected to occupy approximately 15,000 acres once the NBHCP objectives and other proposed conservation programs are completed. Through habitat creation, restoration, and preservation, SAFCA will increase the amount of protected habitat available for NBHCP-covered species. Further, SAFCA's proposed plan will consolidate large areas of habitat, assisting in the expansion of TNBC reserve blocks in the northwestern and southwestern regions of the Basin. Finally, the construction of new canals and the establishment of woodland corridors will greatly improve the connectivity between core habitat reserves that are distributed throughout the Basin, and substantially increase acreage and patch size of these critical habitats.

Overall, the proposed project is an opportunity to employ a landscape-scale vision, helping to advance the goals and objectives of the NBHCP and assist the Federal Aviation Administration (FAA), Corps, and the local Reclamation Districts in achieving their goals. The SAFCA's Natomas Landside Improvements Project presents a unique, one-time opportunity to reconfigure habitat and connective corridors in the Basin at a landscape scale.
Rather than a piecemeal approach to habitat protection, SAFCA's proposed project secures and expands the amount of habitat protected in the Basin, establishes the components that tie the preserves and disparate mitigation sites together in perpetuity under public ownership, and increases the quality and viability of this emerging urban reserve. Refer to the June 18, 2008, *Conceptual Mitigation, Management, and Monitoring Plan* document (prepared by EDAW for

SAFCA) for a more complete summary of the conceptual strategy for creating/enhancing/preserving, protecting, and managing habitats in the Natomas Basin in perpetuity. The following subsections provide an overview of the primary goals and landscape-level benefits of this habitat conservation strategy.

Increase Amount of Protected Habitat

While the project will result in loss and reconfiguration of landside habitats adjacent to the widened levees in the Natomas Basin, the proposed project has been specifically designed to minimize impacts to these landside habitats, and to avoid impacts to riparian habitats along the Sacramento River and NCC. The construction of an adjacent setback levee and installation of seepage cutoff walls enable SAFCA to retain the mature riparian tree corridor and numerous Swainson's hawk nests that are located along the waterside of the Natomas Basin levees. The project's conservation strategy includes the preservation, enhancement, and creation of over 1,300 acres of compensatory habitats in the Natomas Basin, including:

- 72.98 acres of created, managed marsh,
- 616.15 acres of created, managed grasslands,
- 154.37 acres of canals (16 canal miles) and associated uplands,
- 140.85 acres of landside valley oak woodlands and savannah (125 acres created and 15.85 acres preserved),
- 175 acres of preserved rice fields, and
- 150 acres or more of agricultural field crops.

The project will result in the creation of a larger contiguous area protected and managed for the giant garter snakes and Swainson's hawks than currently exists.

Expansion and Consolidation of Protected Habitat in the Natomas Basin

The project will consolidate large areas of habitat, assisting in the expansion and infill of TNBC reserve blocks in the northwestern and southwestern regions of the Basin. The SAFCA will acquire several properties to provide compensatory habitat, either in the form of preserved rice and agricultural crop fields or created managed marsh, managed grasslands, or landside woodlands. Many of these properties are contiguous with existing TNBC reserves or other completed or planned mitigation habitats. Protecting habitat adjacent to existing TNBC reserves and other mitigation sites creates a larger contiguous area managed for giant garter snake and Swainson's hawk than currently exists. This increases the habitat value, sustainability, and functions that these individual properties would otherwise provide in isolation, contributing to giant garter snake and Swainson's hawk recovery in the Basin.

Strengthen Connectivity between TNBC Reserves

The proposed enhancements of existing Basin landscapes are important to the successful implementation of the NBHCP, along with the acquisition and permanent protection of mitigation land. The connective canal and woodland corridors that SAFCA proposes to establish

and/or improve are enhancements that will aid in NBHCP implementation, providing TNBC with an opportunity to improve its overall performance towards the goals of the NBHCP. Canal corridors will provide enhanced habitat functionality by permanently linking TNBC properties in the north and Fisherman's Lake reserve areas that are managed for the giant garter snake and other covered species.

Mitigation, Management, and Monitoring Plan

A *Mitigation and Monitoring Plan* (MMP) and a *Long-Term Management Plan* (LTMP) for the compensatory habitat components are being prepared to guide SAFCA and its partners as they manage the compensatory land components in perpetuity. The MMP would address the habitat creation and preservation components of the NLIP Landside Improvements project. The MMP and LTMP would establish specific success criteria for the habitat components, specify remedial measures to be undertaken if success criteria are not met (e.g., adaptive management, physical adjustments, additional monitoring), and describe short- and long-term management and maintenance of the habitat lands. The MMP and LTMP would also describe the strategies for the long-term protection of these habitats and funding for the management as provided through appropriate mechanisms, which would be determined by SAFCA, the regulatory agencies, and other entities cooperating in the implementation of the project.

Plan Goal

The goal of the MMP and LTMP is to ensure that the conservation values of the preserved, restored, and created habitats are maintained in good condition in perpetuity. The MMP and LTMP would discuss specific management strategies designed to maintain the conservation values for each of the habitat mitigation components and identifies performance criteria used to determine the success of the mitigation habitats. The biological goals include: (1) the preservation of the abundance and diversity of native species, and particularly special-status species, in the mitigation habitats; (2) the protection of the habitat features from the effects of indiscriminate land uses that may adversely impact mitigation habitats; and (3) the restoration of any adverse condition within the mitigation habitat areas that may affect or potentially affect these areas.

Implementing Mechanisms for Long-Term Protection and Management

The MMP and LTMP would describe the framework for the protection and management of the mitigation habitat components of the NLIP Landside Improvements project. The actual implementation of this framework would be enacted through easements, stakeholder-specific management agreements or memoranda of understandings, and contractual agreements. These contractual agreements would focus on the management obligations specific to each management entity, and describe the demonstrated financial and legal assurances necessary to implement the MMP and LTMP to protect and manage the habitat mitigation components in perpetuity. These contractual agreements would be subject to review and approval by USFWS, Corps, and CDFG, and enforced by SAFCA, in perpetuity, and by Corps through permit issuance.

Management Entities for Project Features

Agencies and organizations anticipated to have management responsibility for proposed project features are SAFCA, RD 1000, NMWC, the Airport, and TNBC.

Sacramento Area Flood Control Agency
SAFCA would be responsible for the design and construction of all levee improvements, maintenance access and inspection roads and rights-of-way, replacement canals and associated drainage and irrigation structures, and habitat creation sites. In addition, SAFCA would be responsible for all necessary land acquisitions and easements to construct the project features and achieve the project objectives. However, once these project features are completed, most of the land or land management responsibility would be conferred by SAFCA to the other management entities described below. Memoranda of agreement, land ownership transfers, or management endowments and contracts would be used by SAFCA to transfer land management responsibility to the appropriate public agency or nonprofit land management organization. At the end of the project construction period, all project lands would be in public ownership and/or would be under the permanent control of a natural resource conservation entity.

Reclamation District 1000
The mission and purpose of RD 1000 is to operate and maintain the flood protection levees surrounding the Natomas Basin and to operate and maintain the internal drainage system to evacuate agricultural and urban stormwater and incidental runoff. The RD 1000 would be responsible for the management of the proposed levee improvements, reconstructed Pumping Plant No. 2, and drainage features. Typical maintenance activities include mowing grassland along levee slopes, berms, and rights-of-way, removing sediment and noxious aquatic weeds from the canals, and managing bank vegetation.

Natomas Central Mutual Water Company
The NMWC is a nonprofit mutual water company with the primary focus of keeping the water conveyance functioning to serve the company shareholders. Intensive maintenance to maximize agricultural irrigation services throughout the basin is generally conducted in a given year on only 10 percent of the approximately 100 miles in the Natomas Basin canal system operated by NMWC. The NMWC would be responsible for maintaining and managing the relocated Elkhorn and Riverside Canals and existing irrigation canals. The relocated canals would be maintained in the same manner as the existing canals. Typical maintenance activities include operating and repairing water control structures and barrier gates, periodically removing sediment and noxious aquatic weeds from the canals, repairing canal roads, managing bank vegetation, and mowing grassland along canal and road rights-of-way. However, the relocated Elkhorn and Riverside Canals would have improved levees, better water control structures, and wider roads and rights-of-way than the existing canals. These improvements are expected to ease annual canal management efforts, allowing for a proportionately greater focus on maintenance and operations and less need for system repair and dredging.

Sacramento County Airport System
The SCAS manages the Sacramento County–owned bufferlands outside the Airport Operations Area. All project components on land under SCAS management would remain in public ownership but project land must be protected in perpetuity for the benefit of the giant garter snake.

The Natomas Basin Conservancy
The TNBC acquires and manages land for the purpose of meeting the objectives of the NBHCP. To meet the mitigation goals of the NBHCP, developers of projects pay a mitigation fee to TNBC when they apply for building permits. The TNBC then uses the mitigation fees to acquire, restore, and manage mitigation lands to provide habitat for protected species and maintain agriculture in the Natomas Basin. The TNBC owns approximately 30 mitigation properties totaling more than 4,500 acres. Private land acquired by SAFCA and converted to managed marsh, preserved in rice, or used for woodland establishment would be conveyed to TNBC after creation of permanent habitats as marsh, woodlands, and habitat buffer zones. The SAFCA may also contract with TNBC for management elements of some habitat features (e.g., the GGS/Drainage Canal).

Stakeholder-Specific Management Agreements

The MMP will describe the framework for the design and management of the mitigation habitat components of the proposed project. The actual implementation of this framework will be enacted through Stakeholder-Specific Management Agreements. These contractual agreements will focus on the management obligations specific to each entity, and describe the demonstrated financial and legal assurances necessary to implement the MMP and protect and manage the habitat mitigation components in perpetuity. These contractual agreements will be subject to review and approval by the Service, Corps, and CDFG, and enforced by SAFCA, in perpetuity, and by Corps through permit issuance.

Funding Mechanism
Funding for implementation of the MMP and LTMP has been incorporated into the overall budget for implementation of the NLIP Landside Improvements project. SAFCA anticipates funding for project construction, monitoring, and long-term management will be provided through the Consolidated Capital Assessment District and existing Operations and Management District. The Consolidated Capital Assessment District was created to provide local cost share for flood control project within the Sacramento Urban Area. It was adopted on April 26, 2007, after voters who would be within the assessment district voted to approve the assessment. A portion of the District Assessment Fee would be encumbered to specifically implement the MMP and LTMP. This District funding source will sunset in 2037, at which point, the funding would transition into a non-wasting endowment. The endowment would be built over time through a 2-year advance of the fee into the account.

Project Phasing

The proposed project is comprised of three phases of construction, spanning approximately 3 years. Phase 2 of the NLIP Landside Improvements project, for which SAFCA is currently requesting a permit, is described and analyzed in detail in this permit application, while Phases 3 and 4, for which subsequent requests for permits will be submitted, are described and analyzed at a more general, program level of detail in this document.

Phase 2 Work

Table 1 summarizes the major elements of Phase 2 of the Landside Improvements project (proposed project) and the general timeframes in which the elements are expected to be implemented. Note that although seepage berms are depicted as the primary means of providing underseepage remediation along the Sacramento River east levee, the use of cutoff walls continues to be evaluated, and cutoff walls will likely be implemented instead of berms in several locations. Each of the main project elements are described in more detail below.

Levee Raising and Seepage Remediation

Natomas Cross Canal South Levee

The proposed project would include raising the entire NCC south levee (Station 0+00 to Station 287+50, Reaches 1 to 7) and would continue the construction of a seepage cutoff wall from the eastern terminus of the NCC South Levee Phase 1 Improvements (NCC Phase 1 Improvements) initiated in 2007 (Station 0+00 to Station 61+00, beginning of Reach 1 to approximately middle of Reach 2) to the eastern end of the NCC south levee (approximately Station 56+00 to Station 287+50, approximately the middle of Reach 2 to end of Reach 7). NCC Reaches correspond roughly to the following Stations: Reach 1 (Station 0 to Station 3); Reach 2 (Station 4 to Station 103), Reach 3 (Station 103 to Station 123), Reach 4 (Station 123 to Station 170), Reach 5 (Station 171 to Station 195), Reach 6 (Station 195 to Station 277), and Reach 7 (Station 278 to Station 287). Phase 2 would include the construction of the NCC south levee component, which is anticipated to occur over one construction seasons, beginning in May 2009 and ending in October 2009. The primary construction activities are described below.

Preparation for construction of the cutoff wall would begin with using scrapers (or other suitable equipment, depending on the slope) to clear and grub/strip the surface to a depth of 2 inches to remove low-growing vegetation, loose stone, and surface soils. The aggregate base from the operating road also would be removed and stockpiled for later reuse. Waste material would be hauled to an off-site location.

Table 1
Summary of the Major Elements of Phase 2 of the Proposed Project

Project Element	Proposed Activity and Timing
Levee raising and seepage remediation: NCC south levee	Raise and realign the NCC south levee to provide additional freeboard and more stable waterside and landside slopes and to reduce the need for removal of waterside vegetation. (May–October 2009) Construct a seepage cutoff wall through the levee crown in Reaches 3–7. (May–October 2009)
Levee raising and seepage remediation: Sacramento River east levee (adjacent setback levee)	Construct a raised adjacent setback levee from the NCC to just south of the North Drainage Canal (Reaches 1–4B) with a 100-foot seepage berm in Reach 4A and a 300-foot seepage berm in Reach 4B. (May–October 2009) Relocate utility poles. (November-December 2008)
Improvements to major irrigation and drainage infrastructure	Construct a new canal designed to provide drainage and associated giant garter snake habitat (the GGS/Drainage Canal) between the North Drainage Canal and Elkhorn Reservoir. (May–October 2009) Relocate the Elkhorn Canal (highline irrigation canal) between the North Drainage Canal and Elkhorn Reservoir in anticipation of the filling of the existing Elkhorn Canal at the toe of the Sacramento River east levee. (May–October 2009) Remove a deep culvert at the location of Pumping Plant No. 2. (May–October 2009)
Habitat enhancement, creation and management	Establish vegetative habitat features in the new GGS/Drainage Canal. (Fall 2009) Recontour and create habitat on lands used as borrow sources. (Fall 2009) Establish grassland on the adjacent setback levee slopes and seepage berms. (Fall 2009) Install woodland plantings to offset the loss of portions of tree groves in the landside levee footprint. (Fall 2008–Fall 2009)
Right-of-way acquisition	Acquire right-of-way through fee title or easement interest within the footprint of the project features, at the borrow sites and along the flood control system. (Before construction)

Notes: Elkhorn Canal = Elkhorn Main Irrigation Canal; GGS = Giant Garter Snake; NCC = Natomas Cross Canal

Construction of the cutoff wall would include degrading the existing levee to a depth equal to one-half its total height (approximately 9 feet). A 70-foot-deep cutoff wall would be constructed for a total length of 23,150 linear feet (2 million square feet), with the method of installation at the contractor's discretion. Given anticipated schedule constraints, a three-heading, double-shift

work schedule is anticipated. Material degraded to support cutoff wall construction would be compacted at the landside toe of the levee to support the levee raising operation described below. Unsuitable material generated from cutoff wall construction would be disposed of off-site.

Raising of the Natomas Cross Canal South Levee

Levee raising would occur throughout the entire length of the NCC to provide three feet of freeboard over the design water surface profile (this requires raising the levee approximately three feet). Throughout most of the NCC, this would be accomplished by setting the levee back towards the landside, such that there is a theoretical 3H:1V waterside slope extending from the existing waterside toe to the new waterside top. Following degrading of the levee for cutoff wall construction, the new levee crown would be constructed such that the actual waterside slope extends to meet the point of degrade on the waterside slope. This actual slope would be 3H:1V or flatter. The new levee crown would have a width of twenty feet and the new landside slope would be 3H:1V. Where an existing stability berm is present, it would be stripped and incorporated into the new levee prism. Any portion of the berm outside of the limits of new fill would be trimmed back to conform to the new landside 3H:1V slope. Where the berm is fully incorporated, it would be stripped and trimmed as necessary to accommodate placement of new fill material around it. Existing drain pipes exiting the berm would be extended to daylight landward of the new levee landside toe.

Throughout Reaches 6 and 7, Sutter County infrastructure (Howsley Road and related features) and private residences are close to the NCC south levee. To avoid the infrastructure and residences, between Station 215+00 and 245+00 (central portion of Reach 6, from just west of State Route (SR) 70/99 to just east of SR 70/99), the levee would be raised waterward, encroaching on the NCC channel approximately 30 feet. Between Stations 245+00 and 279+50 (remaining portion of Reach 6), the levee would be raised on the landside, similar to Stations 54+00 through 215+00 (approximately the middle of Reach 2 to initial portion of Reach 6). Smooth transition distances of up to 200–500 feet would link the waterward and landward raises.

Vegetation would be removed from the waterside slope in all locations above the elevation corresponding with the projection of the landside levee toe on the waterside slope. Between Station 0+00 and 54+00 (Reach 1 through first half of Reach 2), where there is significant vegetation on the waterside slope above this elevation, the levee would be set back an additional fifteen feet to provide a "root-free" zone on the levee slope, and the vegetation would remain.

Removal of Structures

Relocation of Howsley Road, the Morrison Canal, a roadway drainage pump station, and three residences and outbuildings would be required by landward levee raises in Reaches 6 and 7. If hydraulic modeling indicates that unacceptable hydraulic impacts would not result from waterside levee raising in Reaches 6 and 7, only two structures in Reach 7 (a residence and a semimobile trailer) would require relocation as a result of the proposed levee improvements.

Utility Modifications and Miscellaneous Work

Pipelines penetrate the NCC south levee at four locations: Odysseus Farms (Bolen Ranch); NMWC waterside Bennett Pumping Plant; NMWC Northern Pumping Plant; and RD 1000's landside Pumping Plant No. 4. None of these penetrations comply with current Corps regulations; therefore, the pipelines would be raised to have their inverts above the 200-year water surface elevation and would be equipped with waterside shutoff valves. If pipes are corroded, they may have to be replaced down the waterside slope of the levee.

As part of raising the pump station discharge pipelines that cross the NCC south levee, canals south of the levee would need to be relocated farther from the levee toe in the following locations: the RD 1000 Vestal Drain and NMWC Bennett Canal between Station 55+50 and Station 61+50 (middle of Reach 2) and the NMWC North Main Canal between Station 120+00 and Station 123+50 (end of Reach 3 to beginning of Reach 4) and between Station 216+00 and 218+00 (Reach 6, just west of SR 70/99). The ditch segments would be moved about 100 feet farther away from the levee toe. Some of this work may be accomplished by NMWC as part of its American Basin Fish Screen Project, but the timing of this NMWC project is uncertain. If the work is not accomplished by NMWC, SAFCA would relocate the canals at the time that the pipelines are raised.

Between Station 0+00 and Station 19+00 (beginning of Reach 1 through first eighth of Reach 2) of the NCC south levee, SAFCA intends to obtain a landside levee maintenance access area to match the 80- to 100-foot wide maintenance access area already established for the levee. This area is currently in active rice fields. Once the maintenance access area is established, this area would be filled to be above the agricultural field grade to prevent encroachment by farming operations into the maintenance access area and to provide an operating road at the levee toe. Between Station 99+00 and Station 124+00 (end of Reach 2 through Reach 3), a low-lying area between the levee's landside toe and an operating road for the Lucich North Habitat Preserve would be filled to raise the grade of the operating road at the landside toe.

In 1996, as part of SAFCA's NCC and PGCC Levee Project, 200 feet of floodwall was installed to raise the NCC levee around the State Route (SR) 99/70 bridges over the NCC. The top of wall for this floodwall is at elevation 44.80 feet (National Geodetic Vertical Datum 29). To conform to current levee criteria, the floodwall would need to be raised to elevation 49.3 feet.

Construction Staging Areas and Postconstruction Site Condition

Construction staging would take place in areas adjacent to the NCC south levee, within the maintenance access areas between Stations 0+00 and 56+00, 61+00 and 96+50, 99+00 and 216+00, and 251+00 and 281+00. Cutoff wall construction would require temporary establishment of three on-site slurry batch plants that would occupy about 1–2 acres each. Each batch plant site would likely contain tanks for water storage, a pug mill mixer, bulk bag supplies of bentonite, bentonite and cement storage silos, cyclone mixers, pumps, and generators. The sites would also include slurry tanks to store the blended slurries temporarily until they are

pumped to the work sites. Slurry constituents would be mixed with water at the batch plant and the mixture would be pumped from the tanks through pipes to the cutoff wall construction work sites.

After construction, the levee slopes and any previously vegetated areas disturbed during construction, including staging areas, would be seeded with a grass mix.

Sacramento River East Levee Reaches 1–4B

Phase 2 of construction would begin in 2009 for the Sacramento River east levee, which includes an adjacent levee extending from the northern end of Reach 1 at the NCC south levee through Reach 4B (approximately Station 0+00 to Station 226+00). Also included in Phase 2 is: installation of cutoff wall in Reach 2 of the adjacent levee; construction of a 100-foot seepage berm in Reach 4A and 300-foot berm in Reach 4B; planting of woodlands in a corridor and fallow fields extending from the lower end of Reach 1 through portions of Reach 4A; and reconstruction of the intersections of Sankey Road and Riego Road with Garden Highway.

An adjacent setback levee is proposed in lieu of in-place modification of the existing Sacramento River east levee, which has substantial structural and vegetation encroachments along its water side. The adjacent-levee raise would involve the construction of a new embankment adjacent to the existing levee. A minimum 5-foot-wide shoulder would extend from the landside edge of the crown of the existing levee to the water side of the new adjacent setback levee embankment. A 3H:1V slope would extend up to the crown of the adjacent setback levee. The crown would be at least 20 feet wide and would be topped with an aggregate base access road for inspection and maintenance. The adjacent setback levee would have a 5H:1V landside slope, except for approximately 5,000 feet in Reaches 2 and 3, which would be 3H:V1. It would be constructed of compacted random fill material from borrow sources and from the excavation of the existing landside stability berm.

It is assumed that a main construction staging area for this phase would be located on approximately 5 acres near Riego Road. The area would be fenced and would be used for the contractor's and engineer's construction trailers, parking for personnel, machine maintenance tools and parts, possibly water trucks, and the storage of fuels and other materials to be used for construction. The project right-of-way along the construction area also would be used for staging of construction materials and equipment. Personnel, equipment, and imported materials would reach the project site via SR 99/70, Sankey Road, Riego Road, and Elverta Road. The primary corridors where construction activity would take place are the adjacent levee alignment and existing dirt roads used for access to the work areas; soil borrow areas; and paved roads, including Powerline, Sankey, and Riego Roads.

Improvements to Reaches 1–4B are anticipated to occur over one construction season, beginning in May 2009 and ending in October 2009. The primary construction activities are described below.

Site Preparation (Tree Removal, Clearing, Grubbing, and Stripping)- Site preparation would entail removing trees and other large vegetation from the construction area and stripping the top 6 inches of material from the landside slope of the existing levee, the footprint of the adjacent setback levee, the seepage berm areas, and the 50-foot-wide permanent maintenance access corridor. Large roots and deleterious material would then be grubbed from the working area. To the extent feasible, trees that must be removed from within the footprint of the adjacent setback levee or berms would be relocated outside of the footprint to new woodland planting areas, where a substantial number of new trees would also be planted. Excess earth materials (organic soils, roots, and grass from borrow areas and the adjacent levee foundation and excavated material that does not meet levee embankment criteria) would be used in the reclamation of borrow areas or hauled off-site to landfills. Cleared vegetation (i.e., trees, brush) would be hauled off-site to landfills.

Relocation of Irrigation Ditch - Odysseus Farms, located at the junction of the NCC south levee and Sacramento River east levee, maintains a private irrigation ditch that is situated within the proposed footprint of the adjacent setback levee. This private irrigation ditch is situated along the top of an existing berm in Reach 1 within the proposed footprint of the adjacent setback levee. Before filling of the existing ditch, a new ditch would be constructed in Reach 1 to serve irrigation needs for agricultural uses of the land along this reach. The new ditch would be constructed from Station 0+00 to Station 25+00 and would be elevated, similar to the existing canal, to allow for gravity flow southward from the NCC. The relocated ditch would cross under Sankey Road through a culvert and meet the existing canal lateral at Station 25+00. The existing ditch would be drained and any unsuitable material from the ditch bottom would be excavated and hauled off-site. To maintain irrigation system continuity, this relocation work would need to be implemented prior to May 1, 2009, as facilities begin operations prior to May and are continually in operation through the end of summer, thus presenting limited opportunities for relocation during the levee construction work window.

Removal of Landside Structures and Other Facilities - Residences and other farm structures that are within the proposed footprint of the adjacent setback levee embankment, berms, and maintenance areas at Station 35+00 in Reach 1 (house, barn, and shed) would have to be removed or relocated farther from the flood control facilities before the start of levee construction. Irrigation facility collection/distribution boxes, wells, and standpipes within the footprint of the flood control features would be demolished and replaced as needed. Debris from structure demolition, power poles, utility lines, piping, and other materials requiring disposal would be hauled off-site to a suitable landfill. As feasible, demolished concrete could be sent to a concrete recycling facility. Wells and septic systems would be abandoned in accordance with the applicable state and county requirements. Some utility poles would be relocated after October 1, 2008, after permit issuance; the removal of other landside structures and facilities would not occur until May of 2009.

Excavation of Stability Berm and Inspection Trench
The existing stability berm along the levee would be excavated and the soil and drain rock would be stockpiled for use in the construction of the adjacent setback levee. The geotextile fabric from the drain layer would be discarded. A 3-foot-deep inspection trench would also be excavated along the foundation of the adjacent levee raise area after stripping has occurred. The purpose of this trench is to expose or intercept any undesirable underground features such as old drain tile, water or sewer lines, other debris, animal burrows, buried logs, or pockets of unsuitable material (e.g., sand lenses). After inspection, the trench would be backfilled and compacted as part of the embankment construction.

Construction of Adjacent Levee Raise and Cutoff Walls
Borrow material would be excavated from several locations in the project area and would be delivered to the levee construction sites by scrapers or haul trucks where it would be spread by motor graders and compacted by sheepsfoot rollers to build the adjacent levee up to a height equal to about two-thirds of the height of the existing levee. This would create a working platform for cutoff wall installation using an excavator with a long-stick boom capable of digging a trench to a maximum depth of approximately 80 feet. Bentonite slurry would be pumped into the trench during excavation to prevent caving. The soil excavated from the trench would be mixed with bentonite and backfilled into the trench to create the cutoff wall.

Reconstruction of Garden Highway at Intersections - The Garden Highway intersections at Sankey and Riego Roads would require reconstruction to accommodate the raised adjacent setback levee. It is anticipated that Garden Highway would be extended up and onto the widened adjacent levee at these locations to meet with the secondary roads. Approach embankments at the intersections would be enlarged and the entire intersections would be repaved. Intersecting roads would be raised at a slope of 15H:1V, extending the approach embankment approximately 350 feet outward from the levee. The side slopes of the raised embankments would be at a 3H:1V slope.

Installation of Surface Drainage Outlets across Garden Highway - Between the adjacent setback levee and the Garden Highway pavement, new storm drain facilities would be constructed to convey surface water beneath Garden Highway and toward the Sacramento River. A drainage swale collection system would convey runoff water to drop inlets located approximately 1,000 feet apart along an approximately 22,800-foot-long section of the improved levee, and new 12-inch diameter pipe laterals would convey the water beneath Garden Highway to the waterside slope berm. Excavation of a trench across Garden Highway and down the waterside levee slope would be required; those segments of Garden Highway where excavation occurs would have to be reconstructed. Single-lane traffic controls and through-traffic detours would be required during construction Phase 2. Drainage outlets would be located on the waterside levee berm, above the two-year ordinary high water mark. The construction of the drainage outlets entail the excavation of a 100 square foot area, of which the lower eighteen to twenty-four inches would be filled with a gravel/cobble mix, and the upper six to twelve inches would be an open depression. Water exiting the drainage outlets would settle in the depression, and then flow overland to the Sacramento River.

Site Restoration and Demobilization - Following construction, the levee slopes, seepage berms, maintenance access right-of-way, and any previously vegetated areas disturbed during construction would be seeded with a grass mix. Any construction debris would be hauled to an appropriate waste facility. Equipment and materials would be removed from the site, and staging areas and any temporary access roads would be restored to preproject conditions. Demobilization would likely occur in various locations as construction proceeds along the project alignment.

Major Irrigation and Drainage Infrastructure Modifications

Elkhorn Canal - The Phase 2 construction plan would include the new Elkhorn Canal from the North Drainage Canal to Elkhorn Reservoir, between Reach 4B and Reach 6B. On the north end, the new canal would be connected with the existing Prichard Pumping Plant outfall and an outlet to the North Drainage Canal would be constructed. An outfall to provide for connection to RD 1000 Pumping Plant No. 2, during its construction in Phase 3, would be incorporated into the Phase 2 canal construction to minimize the need for future canal disturbance. The discharge pipes from the Prichard Pumping Plant would be extended to the relocated canal. The outlet to the North Drainage Canal would be combined with the GGS/Drainage Canal outfall with a gated control structure in the irrigation canal and a piped outlet to the North Drainage Canal.

At the southern end, the relocated Elkhorn Canal would connect into an earthen-lined sediment basin. The sedimentation basin would consist of a number of watered, earthen-bottomed chambers separated by weirs, which may be concrete or rock covered. The basins would have 3H:1V embankments that are 15-foot-wide at the top to provide maintenance equipment access. The total area of basins including the embankments is approximately 9.6 acres, with nearly 3.3 acres of water surface. The proposed sediment basin would be connected to Elkhorn Reservoir with a temporary pipe and outfall structure. During construction Phase 3 (see below), Elkhorn Reservoir would be dewatered and piping from the Elkhorn Pumping Plant would be extended to the new sediment basin, at which time the Elkhorn Reservoir sediment basin would be abandoned and filled.

The GGS/Drainage Canal would be constructed parallel to and within the same right-of way as the Elkhorn Canal. These features would be constructed concurrently to facilitate the use of excavated material from the GGS/Drainage Canal for use as embankment material along the Elkhorn Canal.

The primary construction stages for Elkhorn Canal are described in the subsections below.

Clearing and Grubbing/Stripping

Preparation for canal construction would entail using bulldozers/scrapers to clear and grub/strip the surface to a depth of 4–6 inches and remove low-growing vegetation and loose surface soils. Suitable materials removed during this stage could be stockpiled. Unsuitable material would be wasted and hauled off-site. The right-of-way for the canal that would need to be cleared (including the GGS/Drainage Canal right-of-way) is approximately 225 feet wide.

Bulldozers/scrapers and front-end loaders would be used to excavate and move material. Water trucks would be used to control dust and dump trucks would be used to haul unsuitable materials away.

This phase of construction would commence immediately after mobilization and would most likely occur in multiple sections of the Elkhorn Canal and GGS/Drainage Canal alignments simultaneously.

Pump Discharge Pipe Extension

Because the Elkhorn Canal would be relocated farther from NMWC pumping plants than the existing canal, additional pipe would need to be installed to maintain the connections between the pumping plants and the irrigation canals. In particular, discharge pipes would need to be extended at Prichard Pumping Plant and Elkhorn Pumping Plant. Pipes would be transported to the site on flatbed trucks. Excavators and backhoes would be used to dig the pipe trenches and lay the sections of welded steel pipe and backfill the trench. The trench would be deep enough to provide for a minimum of 12 inches of cover. A small compactor would be used to compact the soil over the pipe. The construction of pipelines at the existing Prichard Pumping Plant would occur during Phase 2 of construction, and at the Elkhorn Pumping Plant pipeline construction would occur during Phase 3 of construction.

Prichard Pumping Plant Connection

A new concrete transition structure would be constructed at the north end of the existing Elkhorn Canal to connect the existing Prichard outfall box culvert to the new Elkhorn Canal. Three reinforced concrete discharge pipes, two 36-inch and one 30-inch, approximately 600 feet in length, would be constructed in parallel from the new transition structure to the proposed distribution box located approximately 250 feet south of the western end of the North Drainage Canal. These pipes would connect the Prichard Pumping Plant outfall to the distribution box. From the distribution box, two 54-inch reinforced concrete discharge pipes, approximately 30 feet long, would connect the box to the new Elkhorn Canal.

The concrete distribution box footprint would be approximately 25 foot by 30 foot. A 60-inch discharge pipe stub and 48-inch intake pipe stub would be constructed on the north side of the distribution box. These stubs will provide for future connections of the distribution box to the North Drainage Canal and Pumping Plant No. 2.

Water Control Facility Construction

New facilities that would be constructed include distribution boxes, gate valves, cast-in-place concrete headwalls and control structures, culverts, and a proposed earthen-lined sediment basin adjacent to Elkhorn Reservoir. Backhoes and excavators would be used to excavate material for the new facilities. Precast distribution boxes, pipes, and other appurtenances would be transported to the site on flatbed trucks. Other concrete facilities would be poured in place and concrete would be transported to the site in ready-mix and boom concrete pumper trucks. Small compactors would be used to compact fill material around the facilities.

Embankment and Access Road Construction

The existing Elkhorn Canal is a highline canal, and construction of its replacement would require little or no excavation but a large amount of borrow material. The bottom of the new Elkhorn Canal channel would be approximately at existing ground level. During construction, borrow material would be required to build up the embankments of the new canal, which would be approximately 4 feet above the channel bottom with 3H:1V side slopes. Bulldozers and graders would be used to move and shape the embankment material, sheepsfoot and smooth drum rollers would be used to compact the embankment material, and water trucks would be used on-site for dust control and moisture conditioning.

Canal Lining

The bottom 6 to 12 inches of the Elkhorn Canal channel would be lined with concrete to provide for maintenance between seasons while minimizing impacts on the adjacent canal banks. Ready-mix and concrete pumper trucks would be required to apply the concrete to the bottom of the channel. It is anticipated that approximately 3,000 cubic yards of concrete would be required in construction Phase 2 for the proposed Elkhorn Canal lining.

Irrigation Interconnections

This phase includes work required to interconnect the relocated Elkhorn Canal with the existing irrigation canals within the Natomas Basin. Excavators and backhoes would be used to trench any connectors and motor graders would be used to shape the embankments. A water truck would be used to control dust and provide moisture conditioning during the excavation and construction of the interconnection facilities. Canal interconnections would be performed before the abandonment of the existing Elkhorn Canal.

Central Main Flume Connection

A second concrete distribution box would be constructed to connect the Elkhorn Canal to the Central Main Flume. The box will be located at the intersection of the Elkhorn Canal with the Central Main Flume with a footprint that is approximately 19 feet by 49 feet and will be tied into the existing concrete flume. Three 48-inch slide gates would be constructed on both the north and south ends of the box to connect the box to the Elkhorn Canal both north and south of the flume. A 6 foot by 6 foot reinforced concrete box culvert on the east end of the distribution box would connect to an outfall structure and the end of the flume.

Erosion Control

Erosion control measures would be installed before the start of construction and would be maintained throughout the construction period to prevent sedimentation of adjacent waterways. A hydroseeding truck would be used at the end of construction to seed any disturbed area. Water trucks would be used throughout the construction period to control dust in any disturbed areas.

Irrigation Canal Abandonment

As the newly constructed canal is completed and operable, the existing Elkhorn Canal would be abandoned. Irrigation flows would be rerouted to the new canal and the existing canal would be dewatered and abandoned. The filling of the abandoned Elkhorn Canal in Reach 4B would take

place as part of Phase 2 of levee construction and in Reaches 5A to 6B would take place as part of the Phases 3 and 4 of levee construction. Portions of farm canals and other irrigation canals would be abandoned because of the relocation of the Elkhorn Canal. Such segments that are outside the footprint of the proposed levee improvements would be filled after the relocation of the Elkhorn Canal is completed. Dump trucks would be used to haul fill material to those canals, rollers would be used to compact the fill, and water trucks would be used for dust control.

Demobilization/Cleanup

This phase includes dismantling any temporary facilities, hauling away any leftover construction materials, and cleaning up the site. All disturbed areas would be reseeded and graded to drain. A front-end loader and dump trucks would be used to move materials. This phase of construction would also entail general cleanup and hauling away unused and waste materials. All construction equipment would be removed.

Scheduling for Phase 2 Construction of the Elkhorn Canal

The segment of the Elkhorn Canal from the Prichard Pumping Plant to the Elkhorn sedimentation basin would be constructed between May and October 2009. The segment of the Elkhorn Canal from the Central Main Flume to the Elkhorn sedimentation basin would be constructed between May and October 2009.

Phase 2 Construction on New GGS/Drainage Canal - The Phase 2 construction plan would include the construction of the GGS/Drainage Canal from the North Drainage Canal to the slough east of Elkhorn Reservoir, between Reach 4B and Reach 6B. The GGS/Drainage Canal and Elkhorn Canal would be parallel and separated by a 20-foot right-of-way access. The GGS/Drainage Canal would tie into the North Drainage Canal east of the proposed location of replacement RD 1000 Pumping Plant No. 2. Crossing of the Elkhorn Canal and tie-in to the North Drainage Canal are anticipated to be made via open, arching culverts (e.g., "Con-Arch" culverts) that allow the GGS/Drainage Canal to pass under the Elkhorn Canal and the access road on the south side of the North Drainage Canal without being confined to pipes.

Because portions of the GGS/Drainage Canal and the Elkhorn Canal would be constructed parallel within the same right-of way, they would be constructed concurrently during Phase 2 construction. This approach would facilitate the use of material from the GGS/Drainage Canal excavation for use as embankment material along the Elkhorn Canal. Construction of the GGS/Drainage Canal would include the same construction phases as described above for the Elkhorn Canal, with a few exceptions. Unlike the Elkhorn Canal, the GGS/Drainage Canal would not be concrete lined. The top of bank for the GGS/Drainage Canal would be approximately at existing ground level. During construction, a trench at least 6 feet deep and an average width of 55 feet would need to be excavated for the construction of the GGS/Drainage Canal. Reclamation would include planting tules on the sloped banks. Backhoes would be used to prepare the planting areas and a water truck would be used to control dust.

Removal of Culvert at Pumping Plant No. 2 Site - SAFCA would undertake a second phase of the levee repairs and facility removal adjacent to the RD 1000 Pumping Plant No. 2 site at the

west end of the North Drainage Canal as part of the proposed project. This phase of work would include: (1) excavating and removing approximately 400 feet of the existing levee section adjacent to the Pumping Plant No. 2 site to expose a deep culvert and possible voids under the levee, (2) removing the deep culvert, (3) reconstructing the levee adjacent to the pumping plant sump with levee embankment fill, and (4) demolishing, removing, and relocating the pumping plant remnants within the project footprint. The last activity, reconstruction of the pumping plant, would be conducted in the 2009 construction phase and is described in the next subsection. The project-related work would be confined to an area of approximately 2.3 acres. A stockpile and staging area of approximately 4.5 acres would be established near the work area.

Excavation limits would be extended to reconstruct the levee section adjacent to the sump and to reach areas where anomalies were identified during a geophysical investigation of the site. An area on the water side of the sheet pile wall would be excavated to lower the ground surface so as to reduce the loading on the sheet pile and excavation shoring system as the excavation takes place on the land side of the sheet piles. Excavated material would be stored on the site along the dewatered section of the North Drainage Canal, east of the abandoned sump, and in an adjacent agricultural field along the canal.

During excavation, the remnants of the pumping plant would be demolished and removed. This work includes relocation of a 36-inch irrigation supply pipe that is within the excavation limits. A temporary plastic fabric-lined ditch at the outfall of this pipe would also be relocated to provide for sufficient staging and stockpile areas. A short irrigation system 'outage' would be required to allow for relocation of the pipe and ditch.

Heavy equipment required for construction includes semi flatbed and/or box trucks to deliver equipment and materials; a crane to drive sheet pilings for additional shoring needs; dump trucks to haul debris, stockpile excavated levee material, and import select soil materials for levee reconstruction; two hydraulic excavators; two dozers for stripping and stockpiling material, a grader, water truck, and front-end loader for maintenance of haul roads and stockpiles; and a roller compactor for levee construction.

Habitat Enhancement, Development, and Management

Habitat enhancements and developments planned for Phase 2 of project construction include: the northern segments of the relocated Elkhorn Canal and the newly constructed GGS/Drainage Canal between the North Drainage Canal and Elkhorn Reservoir; the preservation and establishment of landside woodlands along the Sacramento River east levee; the creation of managed grasslands on the newly constructed levee slopes, seepage berms, access rights-of-ways, and canal embankments; and the preservation of rice land. Please refer to the June 18, 2008, *Conceptual Mitigation, Management, and Monitoring Plan* document (prepared by EDAW for SAFCA) for a more complete summary of the conceptual strategy for creating/enhancing/preserving, protecting, and managing habitats in the Natomas Basin in perpetuity.

The proposed project would offset temporary and permanent effects to habitat of listed species through the creation, enhancement, and preservation of habitat in the basin. The construction of the Elkhorn Canal and GGS/Drainage Canal, including their management elements, are described above in more detail. Design and management elements for the managed grasslands, landside woodlands, and rice fields are summarized below.

Managed Grasslands

Levee Slopes and Seepage Berms - Levee improvements would result in landside slopes that are less steep than the existing slopes, and several reaches of the Sacramento River east levee would have adjoining 80- to 300-foot-wide earthen seepage berms with a nearly flat slope (50H:1V or less). Parallel to the landside toe of enlarged levees and seepage berms would be maintenance access roads and seepage relief wells in some locations. Additional setback buffer lands would flank some of these features, and property acquisition for the proposed project may leave SAFCA with remnant portions of acquired parcels that are nonessential to flood control uses. With the exception of the crown of the levee, these areas would be managed as grassland. Most grassland would be mowed or grazed throughout the growing season, with an emphasis on mowing procedures and stubble height to optimize these areas for Swainson's hawk foraging habitat. However, the primary purpose and management priority of levees and seepage berms would continue to be flood risk reduction, for which RD 1000 has principal management and maintenance responsibility, and they would be maintained in accordance with Corps and Central Valley Flood Protection Board operations and maintenance requirements.

Canal Embankments - The side slopes of the new GGS/Drainage Canal and relocated Elkhorn and Riverside Canals would be flatter than typical canal slopes in the Natomas Basin and consistent (3H:1V), resulting in greatly reduced erosion and sedimentation. Vegetation on the banks could easily be mowed to a specified stubble height using cutter blades instead of the existing, high-disturbance practice of flail mowing or scraping vegetation from the banks and canal with a drag bucket. These improved canal maintenance practices would substantially reduce disturbance and incidental mortality of giant garter snakes that use bank and shoreline vegetation as cover and feeding habitat.

Landside Woodlands

Woodlands consisting of native riparian species would be planted east of the maintenance corridor along the Sacramento River east levee improvements. In Phase 2, tree and shrub species, including elderberry shrubs (*Sambucus mexicana*), would be planted on approximately 30 acres of existing cropland or fallow or currently unused sites. Groves would generally be at least 50-100 feet wide and several hundred feet long. Wide woodland corridors would promote successful nesting by a variety of native birds deeper within the grove canopy, where nest parasitism by crows, cowbirds, and starlings is less of a factor in breeding success. At maturity, stand structure would vary from closed canopy woodland to grassland savanna vegetation types.

Planting sites would require suitable soil conditions, water supply during a 3- to 5-year establishment phase, reduced risk of wildfire, and minimal depth to seasonally high groundwater or other natural water sources to sustain trees once irrigation ceases. A mixture of native riparian

species would be planted, but predominant species would be Valley oak (*Quercus kelloggii*), the primary tree species that would be affected by the proposed improvements to the Sacramento River east levee, and cottonwood (*Populus fremontii*), which is a preferred nest tree for Swainson's hawks in the basin and is faster growing than Valley oak. Establishment of woody vegetation would likely require more than one technique, including seeding in winter, flood irrigation, drip or agricultural-scale spray heads, cuttings, and acorn planting.

Where trees would be removed from existing groves to make way for the proposed flood control system features, they would be transplanted in new locations, including newly planted groves, to the extent feasible. The woodland planting areas would provide locations for transplanting any elderberry shrubs that would need to be moved from the proposed footprint of flood risk reduction improvements.

Rice Fields

Brookfield - The Brookfield property is a 353-acre private property that is located between Howsley Road and Fifield Road, west of the PGCC west levee. As of the summer of 2008, the property is currently in rice cultivation.

Up to 160 acres of the site may be utilized for borrow operations in Phase 2. After the completion of borrow excavation, the 160 acres would be returned to rice and at least ½ of the 353-acre site would be preserved in perpetuity. The removal of borrow material would entail excavating the site to a depth of up to approximately 6 feet, with an approximate net yield of approximately 3.6 million cubic yards of soil from the site. One foot of topsoil would be removed and stockpiled for reuse during reclamation of the site. This borrow material would be used for levee improvements along the NCC south levee (construction Phase 2), PGCC west levee (construction Phase 3), and possibly the NEMDC west levee (construction Phase 4); however, no area of the property would be used in consecutive years. Following the removal of borrow material for the levee construction, the site would be graded and returned to rice cultivation.

Currently, the site is irrigated from on-site wells. To provide irrigation to the site following the excavation of borrow material, the irrigation canal along the south side of the site would be deepened and reconfigured from the Brookfield site westward to the culvert under SR 99/70. Additionally, a field irrigation ditch would be constructed within the Brookfield site to provide irrigation water from the adjacent highline canal to the fields. Grading of the site would be performed at a slope that would allow the water to flow back to the drainage canals running along the west and south side of the property. The water from the eastern fields would be drained into a canal along the west side of the pasture land and into the southern drainage canal. The drainage channel along the west and south side of the property would be modified to allow the site to drain following borrow excavation.

Modifications include widening all canals to an 8-foot bottom width with 3H:1V side slopes. Specific canal improvements could include modification of approximately 4,480 feet of the

RD 1000 canal that borders the south end of the site, modification of 3,670 feet of the private north-south drainage ditch along the west edge of the property, creation of a 900-foot long drainage ditch along the west edge of the pasture lands, and modification of a 6,350 foot long section of the drainage canal along SR 99/70 from the RD 1000 canal south. Improvements of the drainage canal along SR 99/70 may require land acquisition of up to 25 acres to account for the additional width of the channel and flatter side slopes.

Reclamation of Other Borrow Sites

Borrow sites would provide material for Phase 2 flood control and irrigation infrastructure modifications. Following excavation of the borrow material, these sites would be reclaimed for postconstruction uses.

Airport North Borrow Sites - The Airport's north bufferlands have been historically farmed as rice fields and field crops. However, based on FAA requirements to reduce hazardous wildlife attractants near runways, the Airport has opted to not renew rice leases on its bufferlands. Thus, these lands are currently either fallow agricultural fields or ruderal grassland. After borrow activities, these sites would be returned to their current condition.

Cut depths for all the borrow sites would be approximately 4–6 feet. Following the excavation of the borrow sites, disturbed areas would be finish graded to standard irrigation slopes so that the sites would drain and not have any standing water in less than 10-year storm events. Excavated soils not used for borrow material, such as the organic surface layer or soils considered unsuitable for levee construction, would be stockpiled and respread on-site following excavation. Any unsuitable borrow material would be stockpiled on-site and graded back into the restoration of the site. Revegetation activities would include erosion control on excavated slopes (i.e., hydroseeding) and application of fertilizer.

Overview of Construction Phases 3 and 4

Table 2 summarizes the major elements of Phases 3 and 4 of the proposed project and the anticipated general timeframes in which the elements are expected to be implemented. Note that although seepage berms are depicted as the primary means of providing underseepage remediation along the Sacramento River east levee, the use of cutoff walls continues to be evaluated, and cutoff walls will likely be implemented instead of berms in several locations.

Levee Raising and Seepage Remediation

Sacramento River East Levee Reaches 5A–20A

Improvements to the Sacramento River east levee would continue in construction Phases 3 and 4, and would extend from Reach 5A (below Station 226+00) through Reach 20A (Station 925+50). It is anticipated that construction of improvements to the Sacramento River east levee would encompass Reaches 5A-9B in construction Phase 3 and Reaches 10-20A in construction Phase 4. The construction season is assumed to be mid-April – November for both construction phases. The following descriptions of design and construction of the improvements to the Sacramento

Table 2
Summary of the Major Elements of Phase 3 and 4

Project Element	Proposed Activity and Timing
Levee raising and seepage remediation: Sacramento River east levee (adjacent setback levee)	Construct an adjacent setback levee along Stations 55+00 to 68+00 in Reach 2 and from just south of the North Drainage Canal to the American River north levee (Reaches 5A–20B), raised where needed to provide adequate freeboard, with seepage berms, relief wells, and cutoff walls for seepage remediation as required (specific seepage remediation measures are still under study). (May 1, 2009–November 1, 2010)
Levee widening and flattening and seepage remediation: PGCC west levee	Widen the levee between Howsley Road and Sankey Road to allow for seepage remediation and flatten the levee on the water side to meet Corps criteria. Construct cutoff walls or seepage berms where required. (April–November 2009)
Levee widening and flattening and seepage remediation: NEMDC west levee	Widen levee and flatten slope between Elkhorn Blvd and NEMDC stormwater pumping station. (April–November 2009) Construct a seepage cutoff wall from NEMDC stormwater pumping station to Northgate Blvd where required. (April–November 2009)
Improvements to major irrigation and drainage infrastructure	Construct the new GGS/Drainage Canal between Elkhorn Reservoir and the West Drainage Canal, and improve the West Drainage Canal to provide enhanced giant garter snake habitat. (May 1–November 1, 2009) Implement Airport West Ditch improvements in connection with construction of the GGS/Drainage Canal to allow the Airport to decommission the agricultural irrigation function of this facility and eliminate the hazards currently associated with it. The Airport stormwater detention function provided by this ditch would continue. The ditch would therefore be recontoured as a gently sloping swale to facilitate periodic maintenance such as mowing. (May 1–November 1, 2009) Relocate the Riverside Canal and the Elkhorn Canal downstream of Elkhorn Reservoir (specific alignments to be determined) and fill the existing canals. (May 1–November 1, 2009, and May 1–November 1, 2010) Construct RD 1000 Pumping Plant No. 2. (April 1, 2009–September 1, 2010)
Habitat enhancement, creation and management	Establish habitat enhancements in the new GGS/Drainage Canal and improved West Drainage Canal. (Fall 2009) Recontour and create marsh and managed grassland on lands used as borrow sources. (Fall or spring after borrow excavation in 2009 and 2010) Establish grassland on the adjacent setback levee slopes and seepage berms. (Fall after construction in 2009 and 2010) Install woodland plantings to offset the loss of portions of tree groves in the landside levee footprint (locations to be determined). (Fall 2009 and 2010)
Additional actions to meet FEMA requirements: encroachment management on the Sacramento River east levee, and bridge crossing modifications at the NCC	Remove encroachments from a portion of the water side and land side of the Sacramento River east levee as needed to ensure that the levee can be certified as meeting the minimum requirements of the NFIP and Corps design criteria (specific criteria still under discussion). (Timing to be determined) Modify the SR 99/70 crossing of the NCC as needed to meet FEMA requirements. (Timing to be determined)
Right-of-way acquisition	Acquire right-of-way through fee title or easement interest within the footprint of the project features, at the borrow sites and along the flood control system. (Before construction)

Notes: Airport = Sacramento International Airport; Elkhorn Canal = Elkhorn Main Irrigation Canal; FEMA = Federal Emergency Management Agency; GGS = Giant Garter Snake; NCC = Natomas Cross Canal; NFIP = National Flood Insurance Progrn; PGCC = Pleasant Grove Creek Canal; RD = Reclamation District; Riverside Canal = Riverside Main Irrigation Canal; SR = State Route; Corps = U.S. Army Corps of Engineers

River east levee proposed for construction Phases 3 and 4 are described in less detail than construction Phase 2 (improvements to the NCC south levee and Sacramento River east levee Reaches 1–4B) because they are not as far along in the project design process.

Required Freeboard Increases and Proposed Underseepage Remediation - Levee crown raises are required to provide adequate freeboard above the 100-year design water surface elevation in Reaches 5A–10 and above the 200-year design water surface elevation in Reaches 11A and 11B. Downstream of Reach 11B (Powerline Road), there is adequate freeboard above the 200-year design water surface elevation, and levee crown raises are not required. Substantial structural encroachments and large amounts of woody vegetation are present on the waterside slope of the existing levee, and the adjacent setback levee is proposed to extend through Reaches 5A–19A to avoid the need for extensive removal of the existing vegetation and encroachments on the waterside slope to meet Corps criteria. The existing levee in Reaches 19B–20B already has a wide crown, and extensive residential development is located along the landside levee toe; therefore, construction of the adjacent setback levee is not proposed for these reaches. The adjacent setback levee would extend outward at least 11 feet from the landside edge of the existing levee crown and would have a 3H:1V landside slope.

Underseepage remediation is required in many of the reaches from 5A through 20A. Reach 20B has sufficient freeboard for the 200-year water surface elevation and a cutoff wall (constructed by Corps in 2000) that meets current design criteria. Because this wall was constructed to an adequate depth, this reach does not need additional seepage remediation. Based on the results of geotechnical investigations, engineering and cost considerations, and land use constraints, cutoff walls are proposed for Reaches 5A–20A.

Removal of Landside Structures and Vegetation - Removal of some residences, other structures, and woodland vegetation, including mature trees, would be required to create ample space for the adjacent setback levee, berms, and maintenance access corridor. It is anticipated that residences would be removed at Station 62+00 in Reach 2, Station 245+00 in Reach 5A, Station 368+00 in Reach 8, Station 436+50 in Reach 9A, Station 468+00 in Reach 10, and at several locations along Reaches 15 through 18.

Miscellaneous Construction Elements and Postconstruction Site Condition - Modifications of roadway intersections with Garden Highway, utility relocations, removal of pumps and wells, and relocation of private canals would be similar to these activities as described for the improvements to Sacramento River east levee Reaches 1–4B. As described for Reaches 1–4B, after construction, the levee slopes, seepage berms, maintenance access right-of-way, and any previously vegetated areas disturbed during construction would be seeded with a grass mix.

Pleasant Grove Creek Canal West Levee

The PGCC west levee is vulnerable to seepage and has stability concerns. The proposed project includes improvements to 17,400 feet of the PGCC west levee, beginning at the east end of the NCC improvements at Howsley Road and extending southerly to Sankey Road. Construction is

anticipated to proceed in Phases 3 and 4 on this component of the NLIP. Details of the proposed improvements will be developed based on additional geotechnical studies and cost analysis. The improvements are expected to consist of the following:

- widening of the levee to provide a minimum top width of 20 feet to accommodate safe lane widths for Natomas Road;
- flattening the water side of the levee to a 3H:1V slope;
- reconstructing the landside levee slope with new, select material to create a 3H:1V slope (the existing slope ranges from 2:1 to 2.5:1);
- from its intersection with Howsley Road and continuing one quarter mile south, raising the widened levee one to two-tenths of a foot to provide 3 feet of levee height on the 100-year design water surface profile; and
- constructing a SB cutoff wall through three separate reaches, totaling approximately 5,000 lineal feet, to coincide with areas where streams historically flowed east to west through the current PGCC alignment.

Irrigation and drainage canals at the landside toe of the existing levee would need to be relocated to the west to accommodate the berm construction. Several structures associated with the industrial facility near the southern end of the PGCC would need to be relocated.

The postproject site condition (grass-covered levee slopes and berms) and long-term maintenance practices would be as described above for the NCC south levee and Sacramento River east levee.

Natomas East Main Drainage Canal West Levee

The NEMDC west levee is vulnerable to seepage and has stability concerns. The proposed project includes improvements to the NEMDC west levee, beginning from Sankey Road south to Northgate Boulevard. Construction is anticipated to proceed in Phases 3 and 4 on this component of the NLIP. Details of the proposed improvements will be developed based on additional geotechnical studies and cost analysis. The improvements are expected to consist of the following:

- From the NEMDC pump station (between Elkhorn Boulevard and Del Paso Road) south to Northgate Boulevard, approximately 25,000 linear feet of cutoff wall is to be constructed to a depth of up to 80 feet from the levee crown. The existing maintenance easement on this stretch of the NEMDC will not accommodate levee reshaping or levee degrading beyond what is necessary to provide a minimum working platform for cutoff wall installation. Additionally, structures in close proximity of the landside levee toe make additional maintenance easement acquisition impractical. Where asphalt-concrete surfacing is present at the levee crown, it would be removed and disposed of off site. Following completion of the cutoff wall, the levee crown would be reconstructed and the operating road surface restored.

- North of the NEMDC pump station, to Elkhorn Boulevard, levee widening and slope flattening will occur similar to what is described for the PGCC west levee. These project components include:
  - widening of the levee to provide a minimum top width at least 20 feet to accommodate safe lane widths for Natomas and East Levee Roads;

- flattening the water side of the levee to a 3H:1V slope; and
- reconstructing the landside levee slope with new, select material to create a 3H:1V slope.

The postproject site condition and long-term maintenance practices would be as described above for the NCC south levee and Sacramento River east levee.

Major Irrigation and Drainage Infrastructure Modifications

Elkhorn and Riverside Canals

Construction Phases 3 and 4 would include the relocation of the remainder of the Elkhorn Canal (south of Elkhorn Reservoir) and the relocation of the Riverside Canal and would include the same construction phases as described for Phase 2. Timing of the new canal construction would be critical to avoid interruptions in irrigation service. The remainder of the relocated Elkhorn Canal, from Elkhorn Reservoir south, and the relocated Riverside Canal would be constructed before existing canals are filled in as part of the levee improvements in Reaches 6B–9A scheduled for construction Phase 3 and 12–20B scheduled for construction in Phase 4.

In addition to the general canal construction activities described for construction Phase 2, Elkhorn Reservoir would be dewatered and piping from the Elkhorn Pumping Plant would be extended to the new settling basin, at which time Elkhorn Reservoir would be abandoned and filled. The pipelines from the Elkhorn and Riverside Pumping Plants to the relocated irrigation canals would be constructed.

Phase 3 Construction of the New GGS/Drainage Canal

Phase 3 construction phase would include the construction of the GGS/Drainage Canal from north of Teal Bend Golf Course to the West Drainage Canal and improvements to the West Drainage Canal to enhance habitat value for giant garter snake. Because the GGS/Drainage Canal would be approximately 3.5–5.5 feet lower in elevation than the Elkhorn Canal, it would cross underneath the Elkhorn Canal, approximately 350 feet north of Elkhorn Reservoir, likely through a structure similar to that described above for the northern crossing. Reclamation would include planting tules on the sloped banks. In the portion of the canal below I-5, tules would be planted above the canal bench. Backhoes would be used to prepare the planting areas and a water truck would be used to control dust. A 2,200-foot-long section of the GGS/Drainage Canal between the sedimentation basin and Walnut Road as well as the 2,850-foot-long section of the existing West Drainage Canal would include a 15-foot-wide managed tule bench, which would typically be inundated with water and drain into the main channel. The 5,900-foot-long section between the southeastern corner of Teal Bend Golf Course and the West Drainage Canal would have a 50-foot-wide managed tule bench.

Removal of Airport West Ditch

As part of a safety survey conducted by the FAA for the Airport, the FAA expressed concern that the Airport West Ditch provides habitat for wildlife that potentially create a hazard to aircraft. The FAA recommended relocation of the ditch to alleviate the hazard. Additionally, a longstanding problem has existed with leakage from a 24-inch pipeline, resulting in marshy

conditions along its route, approximately 11,000 feet between the intake structure and delivery point at the Airport pumps. During the past year the Airport began receiving all of its domestic (drinking) water supply from the City of Sacramento via a pipeline and storage tank project. Two of the on-Airport water wells previously used to provide domestic water were connected to the Airport's landscape irrigation piping system, and the water supply to the "leaky underground pipe" was deactivated. All of the Airport's landscape irrigation needs are now provided on-site, and there is no need for the leaky pipe to remain in place. Irrigation water provided by NMWC still flows south through the Airport West Ditch, however, whereupon it is pumped to privately owned farms west of the Airport. The proposed project would include the construction of canal improvements to allow for decommissioning of the agricultural irrigation function of the ditch.

During storms, the Airport West Ditch receives stormwater runoff from a portion of the impervious surfaces on the west side of the Airport. Depending on the water volume, some of the stormwater is retained in the ditch until it can drain off-site to the Sacramento River. Therefore, the stormwater detention function of the Airport West Ditch must continue. In addition to the habitat-related safety issues, the ditch presents a physical obstruction hazard to planes that may leave the runway during adverse takeoff or landing situations. Therefore, the final stage of this project component would consist of regrading the Airport West Ditch to a gently sloping swale that can be easily maintained through mowing or other means. The more gradual gradient would also pose a lower threat to aircraft that may unexpectedly exit the runway.

To take advantage of common construction practices and to maximize the use of common facilities, the rearrangement of irrigation and drainage facilities required to provide for rerouting of flows that contribute to the Airport West Ditch would be accomplished along with the proposed NLIP improvements. The proposed GGS/ Drainage Canal would intercept many of the Airport West Ditch's off-site irrigation and drainage sources and reroute flows outside of the Airport Operations Area. The intent is to reroute year-round flows through the GGS/Drainage Canal. Additional irrigation infrastructure improvements required to reroute these flows would be implemented along with the GGS/Drainage Canal construction. Equipment that would be utilized in this reconfiguration includes excavators, loaders, compactors, dump trucks, water trucks, hydroseeding trucks, and generators.

Pumping Plant No. 2 Reconstruction and Relocation

Pumping Plant No. 2 would be reconstructed and relocated as part of the proposed project at the western end of the North Drainage Canal, approximately 900 feet east of the centerline of the levee in the vicinity of the intersection with the P6 Drain. Long discharge pipes would extend over the levee to the Sacramento River. The work is expected to take place in construction Phase 3. Two 42-inch steel discharge pipes, approximately 850 feet long, would connect the two 300-horsepower pumps from the pump station to a new concrete outfall structure in the Sacramento River. The new outfall structure would be constructed close to the location of the original Pumping Plant No. 2 outfall structure. Equipment required for construction of Pumping Plant No. 2 include an excavator, dozer, loader, crane, boom truck, pile driver, concrete pump, generator, and water truck.

Habitat Enhancement, Development, and Management

Habitat enhancements and developments planned for Phases 3 and 4 of project construction include: the southern segments of the relocated Elkhorn Canal and the newly constructed GGS/Drainage Canal between the Elkhorn Reservoir and the West Drainage Canal and the relocated Riverside Canal; additional establishment of landside woodlands along the Sacramento River east levee; continued creation of managed grasslands on the newly constructed levee slopes, seepage berms, access rights-of-ways, and canal embankments; the creation of managed marsh in the southern areas of the basin; and preservation of additional rice and agricultural upland cropland. Please refer to the June 18, 2008, *Conceptual Mitigation, Management, and Monitoring Plan* document (prepared by EDAW for SAFCA) for a more complete summary of the conceptual strategy for creating, enhancing, preserving, protecting, and managing habitats in the Natomas Basin in perpetuity. Similar to Phase 2, temporary and permanent effects to habitats of listed species that result from the implementation of Phases 3 and 4 would be offset through the creation, enhancement, and preservation of habitat in the basin.

Programmatic Biological Opinion Implementing Procedure

Because the Corps and SAFCA only have a detailed project description for Phase 2 of the entire Natomas Levee Improvement Project, this biological opinion analyzes the landscape effects of the project for all Phases (2, 3, and 4) but will only analyze and provide incidental take coverage for Phase 2. For each subsequent phase, the Corps will initiate section 7 consultation with the Service under the umbrella of this programmatic biological opinion. The following process will be used when implementing projects under this programmatic biological opinion:

1. The Corps will submit a letter requesting that the proposed phase be tiered to this programmatic biological opinion and provide the Service the following:
    a. Project maps, which includes reaches under construction, cover types within the construction/maintenance boundary.
    b. Project schedule.
    c. An inventory of any elderberry stems >1 inch diameter that are within 100 feet of project actions and the number of shrubs and stems that would be transplanted and when and where they would be transplanted.
    d. A description of how compensation measures from the preceding phase are being implemented and the schedule for completion of those measures.

2. The Service will review new information that may reveal effects not considered previously and review the information provided to determine whether the activities described under future Phases were programmatically analyzed in this document.

3. The Corps and SAFCA should involve the Service on Phase 3 and Phase 4 early in the process to allow the Service an opportunity to comment on project descriptions and expedite the completion of biological opinions for those phases.

Giant Garter Snake

Status of the Species

Listing. The Service published a proposal to list the giant garter snake as an endangered species on December 27, 1991 (56 FR 67046). The Service reevaluated the status of the snake before adopting the final rule, which listed as a threatened species on October 20, 1993 (58 FR 54053). Critical habitat has not been designated for the giant garter snake.

Description. The giant garter snake is one of the largest garter snakes species reaching a total length of approximately 64 inches (162 centimeters). Females tend to be slightly longer and proportionately heavier than males. Generally, the snakes have a dark dorsal background color with pale dorsal and lateral stripes, although coloration and pattern prominence are geographically and individually variable (Hansen 1980; Rossman *et al.* 1996).

Historical and Current Range. Giant garter snakes formerly occurred throughout the wetlands that were extensive and widely distributed in the Sacramento and San Joaquin Valley floors of California (Fitch 1940; Hansen and Brode 1980; Rossman and Stewart 1987). The historical range of the snake is thought to have extended from the vicinity of Chico, Butte County, southward to Buena Vista Lake, near Bakersfield, in Kern County (Fitch 1940; Fox 1948; Hansen and Brode 1980; Rossman and Stewart 1987). Early collecting localities of the giant garter snake coincide with the distribution of large flood basins, particularly riparian marsh or slough habitats and associated tributary streams (Hansen and Brode 1980). Loss of habitat due to agricultural activities and flood control have extirpated the snake from the southern one third of its range in former wetlands associated with the historic Buena Vista, Tulare, and Kern lake beds (Hansen 1980; Hansen and Brode 1980).

Upon Federal listing in 1993, the Service identified 13 separate populations of giant garter snakes, with each population representing a cluster of discrete locality records (Service 1993). The 13 populations largely coincide with historical flood basins and tributary streams throughout the Central Valley: (1) Butte Basin, (2) Colusa Basin, (3) Sutter Basin, (4) American Basin, (5) Yolo Basin/Willow Slough, (6) Yolo Basin/Liberty Farms, (7) Sacramento Basin, (8) Badger Creek/Willow Creek, (9) Caldoni Marsh/White Slough, (10) East Stockton--Diverting Canal & Duck Creek, (11) North and South Grasslands, (12) Mendota, and (13) Burrel/Lanare.

The known range of the giant garter snake has changed little since the time of listing. In 2005, giant garter snakes were observed at the City of Chico's wastewater treatment facility, approximately ten miles north of what was previously believed to be the northernmost extent of the species' range (D. Kelly pers. comm. 2006; E. Hansen pers. comm. 2006). The southernmost known occurrence is at the Mendota Wildlife Area in Fresno County. No sightings of giant garter snakes south of Mendota Wildlife Area within the historic range of the species have been made since the time of listing (Hansen 2002).

Essential Habitat Components. Endemic to wetlands in the Sacramento and San Joaquin valleys, the giant garter snake inhabits marshes, sloughs, ponds, small lakes, low gradient streams, and other waterways and agricultural wetlands, such as irrigation and drainage canals, rice fields and the adjacent uplands (Service 1999a). Essential habitat components consist of: (1) wetlands with adequate water during the snake's active season (early-spring through mid-fall) to provide food and cover; (2) emergent, herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat during the active season; (3) upland habitat with grassy banks and openings in waterside vegetation for basking; and (4) higher elevation uplands for over-wintering habitat with escape cover (vegetation, burrows) and underground refugia (crevices and small mammal burrows) (Hansen 1988). Snakes are typically absent from larger rivers and other bodies of water that support introduced populations of large, predatory fish, and from wetlands with sand, gravel, or rock substrates (Hansen 1988; Hansen and Brode 1980; Rossman and Stewart 1987). Riparian woodlands do not provide suitable habitat because of excessive shade, lack of basking sites, and absence of prey populations (Hansen 1988).

Foraging Ecology. Giant garter snakes are the most aquatic garter snake species and are active foragers, feeding primarily on aquatic prey such as fish and amphibians (Fitch 1941). Because the giant garter snake's historic prey species are either declining, extirpated, or extinct, the predominant food items are now introduced species such as carp (*Cyprinus carpio*), mosquito-fish (*Gambusia affinis*), larval and sub-adult bullfrogs (*Rana catesbiana*), and Pacific chorus frogs (*Pseudacris regilla*) (Fitch 1941; Hansen 1988; Hansen and Brode 1980, 1993; Rossman *et al.* 1996).

Reproductive Ecology. The giant garter snake breeding season extends through March and April, and females give birth to live young from late July through early September (Hansen and Hansen 1990). Although growth rates are variable, young typically more than double in size by one year of age, and sexual maturity averages three years in males and five years for females (Service 1993b).

Movements and Habitat Use. The giant garter snake is highly aquatic but also occupies a terrestrial niche (Service 1999a; Wylie *et al.* 2004a). The snake typically inhabits small mammal burrows and other soil and/or rock crevices during the colder months of winter (*i.e.*, October to April) (Hansen and Brode 1993; Wylie *et al.* 1995; Wylie *et al.* 2003a), and also uses burrows as refuge from extreme heat during its active period (Wylie *et al.* 1997; Wylie *et al.* 2004a). While individuals usually remain in close proximity to wetland habitats, the Biological Resource Division of the U.S. Geological Survey (BRD) has documented snakes using burrows as much as 165 feet (50 meters) away from the marsh edge to escape extreme heat, and as far as 820 feet (250 meters) from the edge of marsh habitat for over-wintering habitat (Wylie *et al.* 1997). Giant garter snakes have been observed tens to hundreds of meters distant from any water body in various types of habitat. Upland habitat is essential for snakes because it provides overwintering hibernacula and areas for which snakes to thermoregulate (regulate their body temperature), and small mammal burrows which are used by snakes for ecdysis (shedding of the skin). Upland habitat may be particularly important for neonates (newly born) giant garter snakes, which may

use the uplands more frequently than adults, possibly seeking terrestrial prey, such as earthworms or other insects.

In studies of marked snakes in the Natomas Basin, snakes moved about 0.25 to 0.5 miles (0.4 to 0.8 kilometers) per day (Hansen and Brode 1993). Total activity, however, varies widely between individuals; individual snakes have been documented to move up to 5 miles (8 kilometers) over a few days in response to dewatering of habitat (Wylie *et al.* 1997) and to use up to more than 8 miles (12.9 kilometers) of linear aquatic habitat over the course of a few months. Home range (area of daily activity) averages about 0.1 mile^2 (25 hectares) in both the Natomas Basin and the Colusa National Wildlife Refuge (NWR) (Wylie 1998a; Wylie *et al.* 2002), yet can be as large as 14.5 miles^2 (3744 hectares) (Wylie and Martin 2004).

Rice fields have become important habitat for giant garter snakes, particularly associated canals and their banks for both spring and summer active behavior and winter hibernation (Hansen 2004; Wylie 1998b). While within the rice fields, snakes forage in the shallow water for prey, utilizing rice plants and vegetated berms dividing rice checks for shelter and basking sites (Hansen and Brode 1993). In the Natomas Basin, habitat used consisted almost entirely of irrigation ditches and established rice fields (Wylie 1998a; Wylie *et al.* 2004b), while in the Colusa NWR, snakes were regularly found on or near edges of wetlands and ditches with vegetative cover (Wylie *et al.* 2003a). Telemetry studies also indicate that active snakes use uplands extensively, particularly where vegetative cover exceeds 50 percent in the area (Wylie 1998b).

Predators. Giant garter snakes are killed and/or eaten by a variety of predators, including raccoons (*Procyon lotor*), striped skunks (*Mephitis mephitis*), opossums (*Didelphis virginiansa*), bull frogs (*Rana catesbiana*), hawks (*Buteo* sp.), egrets (*Casmerodius albus, Egretta thula*), river otters (*Ludra canadensis),* and great blue herons (*Ardea herodias*) (Dickert 2003; Wylie *et al.* 2003c; G. Wylie pers. comm. 2006). Many areas supporting snakes have been documented to have abundant predators; however, predation does not seem to be a limiting factor in areas that provide abundant cover, high concentrations of prey items, and connectivity to a permanent water source (Hansen and Brode 1993; Wylie *et al.* 1995).

Reasons for Decline and Threats to Survival. The current distribution and abundance of the giant garter snake is much reduced from former times (Service 1999a). Prior to reclamation activities beginning in the mid- to late-1800s, about 60 percent of the Sacramento Valley was subject to seasonal overflow flooding providing expansive areas of snake habitat (Hinds 1952). Now, less than 10 percent, or approximately 319,000 acres (129,000 hectares), of the historic 4.5 million acres (1.8 million hectares) of Central Valley wetlands remain (U.S. Department of Interior 1994), of which very little provides habitat suitable for the giant garter snake. Loss of habitat due to agricultural activities and flood control have extirpated the snake from the southern one-third of its range in former wetlands associated with the historic Buena Vista, Tulare, and Kern lakebeds (Hansen 1980; Hansen and Brode 1980).

Valley flood wetlands are now subject to cumulative effects of upstream watershed modifications, water storage and diversion projects, as well as urban and agricultural development. The Central Valley Project (CVP), the largest water management system in California, created an ecosystem altered to such an extent that remaining wetlands depend on highly managed water regimes (U.S. Department of Interior 1994). Further, the implementation of CVP has resulted in conversion of native habitats to agriculture, and has facilitated urban development through the Central Valley (Service 1999a). For instance, residential and commercial growth with the Central Valley is consuming an estimated 15,000 acres of Central Valley farmland each year (American Farmland Trust 1999), with a project loss of more than one million acres by the year 2040 (USGS 2003). Environmental impacts associated with urbanization include loss of biodiversity and habitat, alternation of natural fire regimes, fragmentation of habitat from road construction, and degradation due to pollutants. Further, encroaching urbanization can inhibit rice cultivation (J. Roberts pers. comm. 2006). Rapidly expanding cities within the snake's range include Chico, Yuba City, the Sacramento area, Galt, Stockton, Gustine, and Los Banos.

Ongoing maintenance of aquatic habitats for flood control and agricultural purposes eliminates or prevents the establishment of habitat characteristics required by snakes (Hansen 1988). Such practices can fragment and isolate available habitat, prevent dispersal of snakes among habitat units, and adversely affect the availability of the snake's food items (Hansen 1988; Brode and Hansen 1992). For example, tilling, grading, harvesting and mowing may kill or injure giant garter snakes (Wylie *et al.* 1997). Biocides applied to control aquatic vegetation reduce cover for the snake and may harm prey species (Wylie *et al.* 1995). Rodent control threatens the snake's upland estivation habitat (Wylie *et al.* 1995; Wylie *et al.* 2004a). Restriction of suitable habitat to water canals bordered by roadways and levee tops renders snakes vulnerable to vehicular mortality (Wylie *et al.* 1997). Rolled erosion control products, which are frequently used as temporary berms to control and collect soil eroding from constriction sites, can entangle and kill snakes (Stuart *et al.* 2001; Barton and Kinkead 2005). Livestock grazing along the edges of water sources degrades water quality and can contribute to the elimination and reduction of available quality snake habitat (Hansen 1988; E. Hansen, pers. comm. 2006), and giant garter snakes have been observed to avoid areas that are grazed (Hansen 2003). Fluctuation in rice and agricultural production affects stability and availability of habitat (Paquine *et al.* 2006; Wylie and Casazza 2001; Wylie *et al.* 2003b, 2004b).

Other land use practices also currently threaten the survival of the snake. Recreational activities, such as fishing, may disturb snakes and disrupt thermoregulation and foraging activities (E. Hansen pers. comm. 2006). While large areas of seemingly suitable snake habitat exist in the form of duck clubs and waterfowl management areas, water management of these areas typically does not provide the summer water needed by the species (Beam and Menges 1997; Dickert 2005; Paquin *et al.* 2006).

Nonnative predators, including introduced predatory game fish, bullfrogs, and domestic cats, can threaten snake populations (Dickert 2003; Hansen 1986; Service 1993; Wylie *et al.* 1995; Wylie *et al.* 2003c). Nonnative competitors, such as the introduced water snake (*Nerodia fasciata*) in

the American River and associated tributaries near Folsom, may also threaten the giant garter snake (Stitt *et al.* 2005).

The disappearance of giant garter snakes from much of the west side of the San Joaquin Valley was approximately contemporaneous with the expansion of subsurface drainage systems in this area, providing circumstantial evidence that the resulting contamination of ditches and sloughs with drainwater constituents (principally selenium) may have contributed to the demise of giant garter snake populations. Dietary uptake is the principle route of toxic exposure to selenium in wildlife, including giant garter snakes (Beckon *et al.* 2003). Many open ditches in the northern San Joaquin Valley carry subsurface drainwater with elevated concentrations of selenium, and green sunfish (*Lepomis cyanellus*) have been found to have concentrations of selenium within the range of concentrations associated with adverse affects on predator aquatic reptiles (Hopkins *et al.* 2002; Saiki 1998). Studies on the effects of selenium on snakes suggest that snakes with high selenium loads in their internal organs can transfer potentially toxic quantities of selenium to their eggs (Hopkins *et al.* 2004) and also demonstrate higher rates of metabolic activity than uncontaminated snakes (Hopkins *et al.* 1999).

Status with Respect to Recovery. The draft recovery plan for the giant garter snake subdivides its range into four proposed recovery units (Service 1999a): (1) Sacramento Valley Recovery Unit; (2) Mid-Valley Recovery Unit; (3) San Joaquin Valley Recovery Unit; and (4) South Valley Recovery Unit.

The Sacramento Valley Unit at the northern end of the species' range contains sub-populations in the Butte Basin, Colusa Basin, and Sutter Basin (Service 1999a; Service 2006). Protected snake habitat is located on State refuges and refuges of the Sacramento National Wildlife Refuge (NWR) Complex in the Colusa and Sutter Basins. Suitable snake habitat is also found in low gradient streams and along waterways associated with rice farming. This northernmost recovery unit is known to support relatively large, stable sub-populations of giant garter snakes (Wylie *et al.* 1995; Wylie *et al.* 1997; Wylie *et al.* 2002; Wylie *et al.* 2003a; Wylie *et al.* 2004a). Habitat corridors connecting subpopulations, however, are either not present or not protected, and are threatened by urban encroachment.

The Mid-Valley Unit includes sub-populations in the American, Yolo, and Delta Basins (Service 1999a; Service 2006). The status of Mid-Valley sub-populations is very uncertain; each is small, highly fragmented, and located on isolated patches of limited quality habitat that is increasingly threatened by urbanization (E. Hansen 2002, 2004; Service 1993; Wylie 2003; Wylie and Martin 2004; Wylie *et al.* 2004b; Wylie *et al.* 2005; G. Wylie pers. comm. 2006). The American Basin sub-population, although threatened by urban development, receives protection from the Metro Air Park and Natomas Basin Habitat Conservation Plans, which share a regional strategy to maintain a viable snake sub-population in the Natomas Basin.

The San Joaquin Valley Unit, which includes sub-populations in the San Joaquin Basin, formerly supported large snake populations, but numbers have severely declined, and recent survey efforts indicate numbers are extremely low compared to Sacramento Valley sub-populations (Dickert

2002, 2003; Hansen 1988; Williams and Wunderlich 2003; Wylie 1998a). Giant garter snakes currently occur in the northern and central San Joaquin Basin within the Grassland Wetlands of Merced County and the Mendota Wildlife Area of Fresno County; however, these sub-populations remain small, fragmented, and unstable, and are probably decreasing (Dickert 2003, 2005; G. Wylie pers. comm., 2006).

The South Valley Unit included sub-populations in the Tulare Basin, however, agricultural and flood control activities are presumed to have extirpated the snake from the Tulare Basin (Hansen 1995). Comprehensive surveys for this area are lacking and where habitat remains, the giant garter snake may be present.

Since 1995, BRD has studied snake sub-populations at the Sacramento, Delevan, and Colusa NWRs and in the Colusa Basin Drain within the Colusa Basin, at Gilsizer Slough within the Sutter Basin, at the Badger Creek area of the Cosumnes River Preserve within the Badger Creek/Willow Creek area of the Delta Basin, and in the Natomas Basin within the American Basin (Hansen 2003, 2004; Wylie 1998a, 1998b, 2003; Wylie *et al.* 1995; Wylie *et al.* 2002; Wylie *et al.* 2003a, 2004a; Wylie *et al.* 2003b, 2004b). These areas contain the largest extant giant garter snake sub-populations. Outside of protected areas, however, snakes are still subject to all threats identified in the final rule. The other sub-populations are distributed discontinuously in small, isolated patches, and are vulnerable to extirpation by stochastic environmental, demographic, and genetic processes (Goodman 1987).

The draft recovery criteria require multiple, stable sub-populations within each of the four recovery units, with sub-populations well-connected by corridors of suitable habitat. This entails that corridors of suitable habitat between existing snake sub-populations be maintained or created to enhance sub-population interchange to offset threats to the species (Service 1999a). Currently, only the Sacramento Valley Recovery Unit is known to support relatively large, stable giant garter snake populations. Habitat corridors connecting sub-populations, even in the Sacramento Valley Recovery Unit, are either not present or not protected. Overall, the future availability of habitat in the form of canals, ditches, and flooded fields are subject to market-driven crop choices, agricultural practices, and urban development, and are, thus, uncertain and unpredictable.

Environmental Baseline

American Basin. The proposed project is located within the American Basin snake population, in the Mid Valley Recovery Unit (Service 1999a). Seventy-nine CNDDB (2007) records are known from the American Basin. These records include the Natomas Basin, the Middle-American Basin just north of the Natomas Cross Canal, Rio Oso and associated tributaries, as well as other locations within the Basin.

Within the greater American Basin, the Natomas Basin is bounded on the west by the Sacramento River levee, on the north by the Natomas Cross Canal (NCC), on the east by the Natomas East Main Drainage Canal (NEMDC), and on the south by the American River levee.

The NBHCP applies to the 53,537-acre (21,666-hectare) area interior to the toes of the levees surrounding the Natomas Basin, located in the northern portion of Sacramento County and the southern portion of Sutter County. The baseline analysis done for the NBHCP found that, as of 2001, the Natomas Basin supported approximately 24,567 acres (9,942 hectares) of aquatic giant garter snake habitat. Of that, approximately 96 acres (39 hectares) are ponds and seasonally wet areas, 22,693 acres (9,184 hectares) are rice fields, and 1,778 acres (720 hectares) are canals (CH2M Hill 2002).

The BRD conducted giant garter snake studies in the Natomas Basin, including areas owned and managed by The Natomas Basin Conservancy (TNBC) (Wylie 1998a; Wylie *et al.* 2000; Wylie *et al.* 2003b, 2004b). Eric Hansen is now over-seeing these surveys (Jones and Stokes 2005). Surveys have established the presence of giant garter snakes throughout the Basin, including nearly all the TNBC properties with suitable habitat for the snake. The TNBC's marsh and rice land preserves are being managed with the goal to maintain viable sub-populations of the giant garter snake and the NBHCP's other wetland dependent species. Density estimates in the Natomas Basin range from 6 to 64 snakes per mile (4 to 40 snakes per kilometer) depending on the trapping location (Wylie *et al.* 2004b). Wylie *et al.* (2003b) suggest that TNBC properties have the potential to provide habitat to sustain snake populations in the Natomas Basin. They propose that development of giant garter snake habitat on TNBC lands should proceed as quickly as practical. In the Sacramento Valley, water is being purchased from rice growers and exported to the south. Fallowing of land appears to reduce or eliminate snake capture success in adjacent canals (Wylie *et al.* 2004b). If land fallowed by water sales increases in the Basin, the habitat managed by TNBC becomes all the more important for protecting snake sub-populations (Wylie *et al.* 2004b). Also, development projects in the southern end of the Natomas Basin will eliminate local snake sub-populations, particularly when there is no avenue of escape from construction activity (Wylie *et al.* 2003b).

Biologists funded by the Sacramento Area Flood Control Agency are conducting population dynamics studies in the Middle-American Basin, which lies north of the NCC (Hansen 2003, 2004); the Natomas Basin lies to the south of the NCC. Most giant garter snakes in the Middle-American Basin occur near the NCC and Main Canal where more rice and aquatic habitat is available. However, no snakes have been found to move within or across the NCC itself, suggesting that snakes are not moving between the middle-American Basin and the Natomas Basin. If the NCC represents a barrier to movement within the greater American Basin, then giant garter snakes may be present in two separate and genetically isolated sub-populations, requiring separate conservation and management. This type of genetic differentiation is known in giant garter snakes as revealed by regional subdivision in mitochondrial DNA haplotypes (Paquin *et al.* 2006).

The BRD has conducted studies at Gilsizer Slough, surrounding lands, and associated irrigation canals (Wylie *et al.* 1995; Wylie *et al.* 1997). Giant garter snakes were shown to use canal, marsh, and rice habitat (Wylie *et al.* 1995; Wylie *et al.* 1997). Snakes were particularly associated with irrigated canals that had thickly vegetated slopes. Fifty-five percent of telemetered snakes used rice fields at some time (Wylie *et al.* 1997). Because of few recaptures

and no clearly defined capture/recapture events, estimation of total numbers of giant garter snakes in the Gilsizer area was not possible; however, BRD speculates that numbers may be in the hundreds. Much of the Gilsizer Slough area is protected by the State. Also, 162 acres (66 hectares) of the Slough is protected as a result of mitigation for the Wild Goose Gas Pipeline and State Route 70-Algodon Road Interchange projects.

Factors Affecting the Snake within the Action Area - A number of State, local, private, and unrelated Federal actions have occurred within the action area (Natomas Basin) and adjacent region affecting the environmental baseline of the species. Some of these projects have been subject to prior section 7 consultation. These actions have resulted in both direct and indirect effects to giant garter snake habitat within the region. Projects affecting the environment in and around the action area include bridge replacements over the NEMDC and Steelhead Creek at Main Avenue, the Lower Dry Creek and Robia Creek Levee Improvement project, the Lower Northwest Interceptor project, and the North Natomas Comprehensive Drainage project.

The Sacramento International Airport has recently changed landuse of lands they own north of the west runway. Until recently, this land had been leased to local farmers and has been actively farmed in rice. The Airport has not proposed any compensation nor have they initiated consultation with the Service in order to examine the effects the loss of this rice would have on giant garter snakes within the Natomas Basin. There is a loss of at least 617 acres of active rice that served as aquatic habitat for the giant garter snake on Airport property. The Airport has decided to not renew rice leases on this land based on a November 17, 2005, letter from the FAA which listed corrective actions they required the Sacramento County Airport to complete in order to avoid legal actions from the FAA. As of December 31, 2007, all of the leases for rice on SCAS lands were terminated. At the date of this biological opinion, the FAA has not initiated section 7 consultation with the Service on the effects to giant garter snakes of their Federal action to have the Sacramento County Airport terminate the rice leases.

On-going development within the Natomas Basin also affects the snake and its habitat. In February of 2002, the Service issued an incidental take permit (ITP) to the Metro Air Park Property Owners Association (MAPPOA) for development activities associated with the implementation of the Metro Air Park Habitat Conservation Plan (MAPHCP). On June 27, 2003, the Service issued ITPs to the City of Sacramento, Sutter County, and TNBC for activities associated with the implementation of the Final NBHCP (City of Sacramento *et al.* 2003). The TNBC is the plan operator responsible for acquiring and managing habitat mitigation lands for the MAPHCP and NBHCP. The MAPHCP and NBHCP permits authorized incidental take of the giant garter snake and several other species resulting from the development of 17,500 acres (7,082 hectares) of land in the Natomas Basin; of this, approximately 8,512 acres (3,445 hectares) is suitable giant garter snake habitat (*e.g.*, ponds, canals, and rice fields) (Service 2003). A key component of the MAPHCP and NBHCP's Operating Conservation Strategy (OCS) is the acquisition of 0.5 acre (0.2 hectare) of habitat mitigation lands for every acre of land developed within the permit areas. A total of 75 percent of the mitigation lands protected under the plans will be suitable for the giant garter snake, with 50 percent in rice fields and 25 percent restored to managed marsh. Once the MAPHCP and NBHCP permit areas have been built out,

approximately 6,562 acres (2,656 hectares) of habitat will have been acquired/restored and will be actively managed for the giant garter snake, including 4,375 acres (1,771 hectares) of rice fields and 2,187.5 acres (521 hectares) of managed marsh.

As of December 31, 2006, the City of Sacramento had authorized grading on 6,785 acres (2,746 hectares) in the NBHCP permit area; Sutter County had not issued any urban development permits in the NBHCP permit area. In September of 2003, MAPPOA graded 800 acres (324 hectares) of the Metro Air Park site to prepare the site for development. Of the disturbed area, 190.4 acres (77 hectares) will be immediately developed; the remaining area will revert to agricultural use until it is eventually developed. As of December 31, 2007, no additional land has been graded at Metro Air Park. As of December 31, 2007, TNBC had acquired 4,092 acres (1,656 hectares) of lands to mitigate the impacts of these two HCPs.

The Service and CDFG consider the entire Natomas Basin as potential habitat for the snake because the lands are of generally uniform character and capable of restoration. To survive in the Basin, giant garter snakes require large blocks of wetland and adjacent upland habitat distributed throughout three population centers and connected to each other through a system of canals and other aquatic features. Brode and Hansen (1992) stated that the Basin provides the most important habitat remaining for the snake and observed that snake habitat within the Basin occurs in three large areas that are separated by major highways. Area 1 is defined as lands north of I-5 and west of State Route 99/70 (SR 99/70). Important habitat areas include Prichard Lake, the North Drain Canal, and its associated rice fields. Area 2 is defined as the lands south and west of I-5, and it's most important habitat area is Fisherman's Lake. Area 3 is defined as the lands east of I-5 and SR 99/70. The most important component of Area 3 is "Snake Alley", an area comprised of the North Main Canal and its associated rice fields and irrigation ditches on the east side of SR 99/70. The authors hypothesized that snakes could move between the three areas through large box culverts under the major highways. Brode and Hansen (1992) attributed the snake's continued success in the Basin to the numerous irrigation ditches, rice fields, and especially the extensive network of irrigation canals, feeder canals, and drains. The authors concluded by presenting a conceptual conservation plan for the snake in the Basin. This plan was based upon a minimum of one core habitat in each of the geographic areas with connecting canals to ensure snakes could move between each of the three areas. The Corps and SAFCA's proposed project is located in portions of all three areas. Much of the borrow and construction would occur within Area 1 along the Sacramento River east levee and near the North Main Canal and Area 2 adjacent to Fisherman's Lake and along the West Drainage Canal.

The continuing practice of fallowing rice fields on and around Airport property due to FAA corrective actions letter, and throughout the Natomas Basin, threatens the viability of giant garter snake populations and the effectiveness of the NBHCP OCS. Irrigated rice is important as foraging, shelter, and basking habitat for the snake. Rice may serve a particularly important role for snakes in the Natomas Basin as compared to its role as habitat in other parts of the species range. Rice, and other wetlands, adjacent to the ditches and canals may serve as vital nursery habitat for young giant garter snakes and as "way stations" for snakes as they make their way through the extensive ditch and canal system in the Natomas Basin. In particular, rice may be an

important resource for juvenile giant garter snakes by providing large amounts of cover and small prey for the juveniles to feed on late in the summer.

According to the CNDDB (2008), there are 40 records of giant garter snakes within the Natomas Basin and all of them are within 5 miles of the proposed project. Giant garter snakes have been documented on and directly adjacent to portions of the project area and within canals and ditches in the general area that are hydrologically connected with the aquatic features on the proposed project site. As described in the *Movements and Habitat Use* section of this biological opinion, snakes can travel considerable distances over the course of days and years in both aquatic and uplands habitats.

The proposed project area contains habitat components suitable for giant garter snake feeding, resting, mating, and other essential behaviors, as well as for movement corridors. Because of the biology and ecology of the giant garter snake, the presence of suitable habitat within the proposed project, and observations of the species, the Service has determined that the giant garter snake is reasonably certain to occur within the action area and be affected by the proposed project.

Valley Elderberry Longhorn Beetle

Status of the Species

Listing. The beetle was listed as a threatened species under the Act on August 8, 1980 (45 FR 52803). Critical habitat for the species was designated and published in 50 CFR §17.95. Two areas along the American River in the Sacramento metropolitan area have been designated as critical habitat for the beetle. The first area designated as critical habitat for this species is along the lower American River at River Bend (formerly Goethe) and Ancil Hoffman parks (American River Parkway Zone) and the second area is at the Sacramento Zone, an area about a half mile from the American River downstream from the American River Parkway Zone. In addition, an area along Putah Creek, Solano County, and the area west of Nimbus Dam along the American River Parkway, Sacramento County, are considered essential habitat, according to *The Valley Elderberry Longhorn Beetle Recovery Plan* (USFWS 1984). These critical habitat areas and essential habitat areas within the American River parkway and Putah Creek support large numbers of mature elderberry shrubs with extensive evidence of use by the beetle.

Life History. The elderberry shrub (*Sambucus* sp.) is the sole host plant for the valley elderberry longhorn beetle. Elderberries are locally common components of the remaining riparian forest and savannah landscapes, and to a lesser extent the mixed chaparral-foothill woodlands, of the Central Valley. The occupancy rates of the beetle are reduced in non-riparian habitats (e.g., Talley *et al.* in press), indicating that riparian elderberry habitat an important habitat type for the beetle.

Use of elderberry shrubs by the beetle, a wood borer, is rarely apparent. Frequently, the only exterior evidence of the shrub's use by the beetle is an exit hole created by the larva emerging just prior to the pupal stage. Observations of elderberry shrubs along the Cosumnes River and in the

Folsom Lake area indicate that larval beetles can be found in elderberry stems with no apparent exit holes; the larvae either succumb prior to constructing an exit hole or not developed sufficiently to construct one. Larvae appear to be distributed in stems which are 1.0 inch or greater in diameter at ground level and can occur living stems. *The Valley Elderberry Longhorn Beetle Recovery Plan* (USFWS 1984) and Barr (1991) further describe the beetle's life history.

Population Structure. The beetle is a specialist on elderberry plants, and tends to have small population sizes and occurs in low densities (Barr 1991; Collinge *et al.* 2001). It has been observed feeding upon both blue and red elderberry (USFWS 1984, Barr 1991) with stems greater than or equal to one inch in diameter (Barr 1991). Sightings of the beetle are rare and in most circumstances, evidence of the beetle is derived from the observation of the exit holes left when adults emerge from elderberry stems. The beetle tends to occur in areas with higher elderberry densities, but has lower exit hole densities than a closely related species, the California elderberry longhorn beetle (Collinge *et al.* 2001).

Distribution and Range. When the beetle was listed in 1980, the species was known from less than ten localities along the American River, the Merced River, and Putah Creek. By the time the *Valley Elderberry Longhorn Beetle Recovery Plan* was prepared in 1984, additional occupied localities had been found along the American River and Putah Creek. As of 2005, the California Range wide distribution extends from the Sacramento River in Shasta County, southward to an area along Caliente Creek in Kern County (CNDDB 2005). The CNDDB contained 190 occurrences for this species in 44 drainages throughout the Central Valley. However, the number of records should be viewed with caution as a record does not necessarily indicate a unique population. In many cases, there are multiple records within close proximity to one another within the same watershed or river. For example, 24 records are known within two miles of the American River (CNDDB 2006).

The beetle is considered a poor disperser based on the spatial distribution of occupied shrubs (Barr 1991; Collinge *et al.* 2001). Huxel and Hastings (1999) used computer simulations of colonization and extinction patterns based on differing dispersal distances, and found that the short dispersal simulations best matched the 1997 census data in terms of site occupancy. This suggests that dispersal and colonization are limited to nearby sites. At spatial scales greater than 6.2 miles, such as across drainages, beetle occupancy appears to be strongly influenced by regional extinction and colonization processes, and colonization is constrained by limited dispersal (Collinge *et al.* 2001; Huxel and Hastings 1999). Except for one occasion, drainages examined by Barr that were occupied in 1991, remained occupied in 1997 (Collinge *et al.* 2001; Huxel and Hastings 1999). The one exception was Stoney Creek, which was occupied in 1991, but not in 1997. All drainages found by Barr (1991) to be unoccupied in 1991, were also unoccupied in 1997. Collinge *et al.* (2001) further found that while the proportions of occupancy were similar, the number of sites examined containing elderberry and the density of elderberry at sites had decreased since Barr (1991), resulting in fewer occupied sites and groups. Studies suggest that the beetle is unable to re-colonize drainages where the species has been extirpated, because of its limited dispersal ability (Barr 1991; Collinge *et al.* 2001). This data suggests that drainages unoccupied by the beetle remain unoccupied.

Reasons for Decline and Threats to Survival. The beetle continues to be threatened by habitat loss and fragmentation, predation by the non-native Argentine ants (*Linepithema humile*) (Holway 1998; Huxel 2000; Huxel and Hastings 1999; Huxel *et al.* 2001; Ward 1987), and possibly other factors such as pesticide drift, non-native plant invasion, improper burning regimes, off-road vehicle use, rip-rap bank protection projects, wood cutting, and over-grazing by livestock.

Habitat Loss - Habitat destruction is one of the most significant threats to the beetle. Riparian forests, the primary habitat for the beetle, have been severely depleted throughout the Central Valley over the last two centuries as a result of expansive agricultural and urban development (Huxel *et al.* 2001; Katibah 1984; Roberts *et al.* 1977; Thompson 1961). As of 1849, the rivers and larger streams of the Central Valley were largely undisturbed. They supported continuous bands of riparian woodland four to five miles in width along some major drainages, such as the lower Sacramento River, and generally about two miles wide along the lesser streams (Thompson 1961). Most of the riverine floodplains supported riparian vegetation to about the 100-year flood line (Katibah 1984).

A large human population influx occurred after 1849, however, and much of the Central Valley riparian habitat was rapidly converted to agriculture and used as a source of wood for fuel and construction to serve a wide area (Thompson 1961). The clearing of riparian forests for fuel and construction made this land available for agriculture (Thompson 1961). Natural levees bordering the rivers, once supporting vast tracts of riparian habitat, became prime agricultural land (Thompson 1961). As agriculture expanded in the Central Valley, needs for increased water supply and flood protection spurred water development and reclamation projects. Artificial levees, river channelization, dam building, water diversion, and heavy groundwater pumping further reduced riparian habitat to small, isolated fragments (Katibah 1984). In recent decades, these riparian areas have continued to decline as a result of ongoing agricultural conversion as well and urban development and stream channelization. As of 1989, there were over 100 dams within the Central Valley drainage basin, as well as thousands of miles of water delivery canals and streambank flood control projects for irrigation, municipal and industrial water supplies, hydroelectric power, flood control, navigation, and recreation (Frayer *et al.* 1989). Riparian forests in the Central Valley have dwindled to discontinuous strips of widths currently measurable in yards rather than miles.

Some accounts state that the Sacramento Valley supported approximately 775,000 to 800,000 acres of riparian forest as of approximately 1848, just prior to statehood (Smith 1977; Katibah 1984). No comparable estimates are available for the San Joaquin Valley. Based on early soil maps, however, more than 921,000 acres of riparian habitat are believed to have been present throughout the Central Valley under pre-settlement conditions (Huxel *et al* 2001; Katibah 1984). Another source estimates that of approximately 5,000,000 acres of wetlands in the Central Valley in the 1850s, approximately 1,600,000 acres were riparian wetlands (Warner and Hendrix 1985; Frayer *et al.* 1989).

Based on a California Department of Fish and Game riparian vegetation distribution map, by 1979, there were approximately 102,000 acres of riparian vegetation remaining in the Central Valley. This represents a decline in acreage of approximately 89 percent as of 1979 (Katibah 1984). More extreme figures were given by Frayer *et al.* (1989), who reported that woody riparian forests in the Central Valley had declined to 34,600 acres by the mid-1980s (from 65,400 acres in 1939).

An even more recent analysis, completed by The Central Valley Historic Mapping Project, observed similar decreases in the amount of riparian habitat (Geographic Information Center 2003). Loss of riparian habitat between 1900 and 1990 in the Central Valley was about 96% in the southern portion of the Valley (Kern County to Fresno County) (16,000 acres remaining), 84% in the middle Valley (Merced County to San Joaquin County) (21,000 acres remaining) and 80% in the northern Valley (Sacramento and Solano counties to Shasta County) (96,000 acres remaining). Although these studies have differing findings in terms of the number of acres lost (most likely explained by differing methodologies), they attest to a dramatic historic loss of riparian habitat in the Central Valley.

Habitat Fragmentation - Destruction of riparian habitat in central California has resulted not only in a significant acreage loss, but also has resulted in beetle habitat fragmentation. Fahrig (1997) states that habitat fragmentation is only important for habitats that have suffered greater than 80 percent loss. Riparian habitat in the Central Valley, which has experienced greater than 90 percent loss by most estimates, would meet this criterion as habitat vulnerable to effects of fragmentation. Existing data suggests that beetle populations, specifically, are affected by habitat fragmentation. Barr (1991) found that small, isolated habitat remnants were less likely to be occupied by beetles than larger patches, indicating that beetle subpopulations are extirpated from small habitat fragments. Barr (1991) and Collinge *et al.* (2001) consistently found beetle exit holes occurring in clumps of elderberry bushes rather than isolated bushes, suggesting that isolated shrubs do not typically provide long-term viable habitat for this species.

Habitat fragmentation can be an important factor contributing to species declines because: (1) it divides a large population into two or more small populations that become more vulnerable to direct loss, inbreeding depression, genetic drift, and other problems associated with small populations; (2) it limits a species' potential for dispersal and colonization; and (3) it makes habitat more vulnerable to outside influences by increasing the edge:interior ratio (Primack 1998).

Small, isolated subpopulations are susceptible to extirpation from random demographic, environmental, and/or genetic events (Shaffer 1981; Lande 1988; Primack 1998). While a large area may support a single large population, the smaller subpopulations that result from habitat fragmentation may not be large enough to persist over a long time period. As a population becomes smaller, it tends to lose genetic variability through genetic drift, leading to inbreeding depression and a lack of adaptive flexibility. Smaller populations also become more vulnerable to random fluctuations in reproductive and mortality rates, and are more likely to be extirpated by random environmental factors. When a sub-population becomes extinct, habitat fragmentation

reduces the chance of recolonization from any remaining populations. The effect of habitat fragmentation likely is exacerbated by the poor dispersal abilities of the beetle (Collinge *et al* 2001; Talley 2005).

Habitat fragmentation not only isolates small populations, but also increases the interface between habitat and urban or agricultural land, increasing negative edge effects such as the invasion of non-native species (Huxel *et al.* 2001; Huxel 2000) and pesticide contamination (Barr 1991). Several edge effect-related factors may be related to the decline of the beetle.

Predation - The invasive Argentine ant (*Linepithema humile*) is a potential threat to the beetle (Huxel 2000). This ant is both an aggressive competitor and predator on native fauna that is spreading throughout riparian habitats in California and displacing assemblages of native arthropods (Ward 1987; Human and Gordon 1997; Holway 1998). The Argentine ant requires moisture and it may thrive in riparian or irrigated areas. A negative association between the presence of the ant and beetle exit holes was observed along Putah Creek in 1997 (Huxel 2000). This aggressive ant could interfere with adult mating or feeding behavior, or prey on eggs and larvae (e.g., Way *et al.* 1992). Surveys along Putah Creek found beetle presence where Argentine ants were not present or had recently colonized, but the beetle was absent from otherwise suitable sites where Argentine ants had become well-established (Huxel, in prep.). Between 1998 and 2002, the number of sites infested by the Argentine ant increased by 3 along Putah Creek and the American River (30 sites total were examined) (Huxel 2000; Holyoak and Talley 2001). The Argentine ant has been expanding its range throughout California since its introduction around 1907, especially in riparian woodlands associated with perennial streams (Holway 1998; Ward 1987). Huxel (in prep.) concluded that, given the potential for Argentine ants to spread with the aid of human activities such as movement of plant nursery stock and agricultural products, this species may come to infest most drainages in the Central Valley along the valley floor, where the beetle is found.

The beetle is also likely preyed upon by insectivorous birds, lizards, and European earwigs (*Forficularia auricularia*) (Klasson *et al.* 2005). These three predators move freely up and down elderberry stems searching for food. The European earwig is a scavenger and omnivore that was often found feeding on tethered mealworm (*Tenebrio monitor*) larvae. The earwig may be common in riparian areas and it may lay its eggs in dead elderberry shrubs. The earwig, like the Argentine ant, requires moisture and is often found in large numbers in riparian and urban areas. Earwig presence and densities tended to be highest in mitigation sites likely because of the irrigation, although this needs to be statistically tested (Klasson *et al.* 2005).

Pesticide Drift - Direct spraying with pesticides and related pesticide drift is a potentially harmful factor for the beetle. A wide range of such spraying is done to control mosquitoes, crop diseases, and undesirable plants and insects. Although there have been no studies specifically focusing on the direct and indirect effects of pesticides on the beetle, evidence suggests that the species may be adversely affected by some pesticide applications. Commonly used pesticides within the range of the beetle include insecticides, most of which are broad-spectrum and likely toxic to the beetle; herbicides, which may harm or kill its host elderberry plants; and broad-spectrum

pesticides toxic to many forms of life. The greatest pesticide use occurs in the San Joaquin Valley. Four counties in this region had the highest use: Fresno, Kern, Tulare, and San Joaquin (CDPR 2006). The peak timing of application depends on the chemical agent and other factors including the activity period of the targeted pest insects; the use of the agents may coincide with the most vulnerable period of beetle adult activity, egg-laying and initial larval exposure on the outside of elderberry stems (Talley *et al.* 2006). The California Department of Pesticide Regulation (CDPR) in 1997 listed 239 pesticide active ingredients applied in proximity to locations of beetle (same square mile per Marovich and Kishaba 1997 cited in Talley *et al.* 2006). Pesticide active ingredients sold in California have averaged on the order of 600 million pounds per year since about 1998 (CDPR 2006).

Pesticide use reported to the CDPR is only a fraction of the pesticides sold in California each year. About two-thirds of the active ingredients sold in a given year are not subject to use reporting, including home-use pesticide products. Recent studies of major rivers and streams documented that 96 percent of all fish, 100 percent of all surface water samples and 33 percent of major aquifers contained one or more pesticides at detectable levels (Gilliom 1999). Pesticides were identified as one of the 15 leading causes of impairment for streams included on the Clean Water Act section 303(d) lists of impaired waters. Because the beetle occurs primarily in riparian habitat, the contamination of rivers and streams likely has affects on this species and its habitat. Given the amount and scope of pesticide use, along with unreported household and other uses, and the proximity of agriculture to riparian vegetation in the Central Valley, it appears likely that pesticides are affecting the beetle and its elderberry habitat.

Invasive Plant Species - Invasive exotic plant species may significantly alter the habitat of the beetle. Without adequate eradication and control measures these non-native species may eliminate elderberry shrubs and other native plants. Pest plants of major importance in Central Valley riparian systems include black locust (*Robinia pseudoacacia*), giant reed (*Arundo donax*), red sesbania (*Sesbania punicea*), Himalayan blackberry (*Rubus armeniacus*), tree of heaven (*Ailanthus altissima*), Spanish broom (*Spartium junceum*), Russian olive (*Eleagnus angustifolia*), edible fig (*Ficus carica*), and Chinese tallowtree (*Sapium sebiferum*). Non-woody invasives such as ripgut brome (*Bromus diandrus*), foxtail barley (*Hordeum murinum*), *Lolium multiflorum*, and starthistle/knapweed (*Centaurea* spp.) also may impair elderberry germination or establishment, or elevate the risk of fire. Invasive plant control efforts often are limited by funding, labor, coordination with landowners, and the resilience and spread of their target plants. No rangewide assessment has been completed on the overall degree of impact of invasive plants on the beetle and its habitat. However, there are a number of local efforts to control invasive riparian plant species. For example, the American River Parkway has invasive species removal efforts by Sacramento Weed Warriors (a community stewardship project associated with the California Native Plant Society) and others, and the Cosumnes River Preserve has a group of volunteers who regularly remove exotics and restore native habitats (Talley *et al.* 2006).

Other Threats - Several other factors may threaten the beetle including fire, flooding, and over-grazing by livestock. The condition of elderberry shrubs can be adversely affected by fire, which is often common at the urban-wildland interface. Brush fires initially have a negative effect on

shrub condition and, therefore, beetle larvae through direct burning and stem die-off. A year after fire, however, surviving elderberry resprout and display rapid stem growth (Crane 1989). Fires often scarify the hard elderberry seed coat leading to germination of seedlings the following season (Crane 1989). Frequent or repeated fire, however, may kill remaining shoots, root crowns and seeds, causing elderberry to be eliminated from an area for many years since recruitment by seeds is patchy and generally slow (Crane 1989). Elderberry shrubs appeared suitable for the beetle two to six years after burning, but were often uninhabited, with the presence of old, burned exit holes suggesting pre-burn occupancy and post-burn vacancy (Talley *et al.* 2006.). The post-fire lag in occupancy is likely the result of the limited movements of the beetle. Beetle occupancy occurred six to seven years post burn and, as in the alluvial plain of the American River Parkway, is about the same within the post-burn compared with unburned areas (Talley *et al.* in press). No quantitative studies of the net effects of fire on the v beetle have been undertaken (e.g., examining beetle and elderberry through time after burns or in areas with varying burn frequencies and magnitude).

The beetle can tolerate flooding of its riparian habitat. The animal has higher occupancy rates in riparian than non-riparian habitats, and associations between the beetle and proximity to rivers were either not observed or there was a weak positive correlation with nearness to the river (Halstead and Oldham 1990; Talley 2005; Talley *et al.* in press). These findings illustrate that the beetle is not likely harmed by flooding and that higher habitat quality may be associated with rivers. In addition, if elderberry, a facultative riparian shrub, can withstand flooding, then the beetle likely will survive these events. Most floods occur during winter or early spring when the beetle is in its early life history stages, so that the effects of floods are even less likely to affect the beetle. If the shrub is exposed to prolong flooding (i.e. anoxia) and becomes severely stressed, then the beetle may be affected. The duration and magnitude of flooding at which elderberry stresses is uncertain and the levels of stress that affect the beetle is also unknown. Elderberry shrubs have adaptations that plants use to persist with flooding such as lenticels and aerenchyma, demonstrating that it is probably at least somewhat flood tolerant. Finally, if an area is flooded too frequently so that elderberry cannot survive then no beetles would be able to inhabit the area (Talley 2005).

Another potential factor in the beetle's decline is the effects of inappropriate levels of livestock grazing, which can result in destruction of entire elderberry plants and inhibition of elderberry regeneration. Cattle, sheep and goats readily forage on new elderberry growth, and goats will consume even decadent growth. Well-manicured stands of elderberries, such as occurs due to livestock grazing, have generally been shown to have a relative absence of beetles (USFWS 1984). The effects on the beetle of both grazing and exotic plant invasions are likely significantly exacerbated by the problem of habitat fragmentation of elderberries. Such fragmentation increases the edge:interior ratio of habitat patches, thereby facilitating the adverse effects of these outside influences.

Environmental Baseline

The beetle currently inhabits the Central Valley from southern Shasta County south to Kern County in the San Joaquin Valley (Barr 1991; Talley *et al.* 2006). Within this range, there are approximately 190 records of the animal, largely based on exit holes, (CNDDB 2006; Talley *et al.* 2006).

The beetle was listed as a threatened species due to the loss of its riparian habitat (USFWS 1980). Quantifying the loss of elderberry shrubs as a result of the agricultural and urban development over the past 200 years is near impossible. However, recent studies have identified plant communities that are associated with elderberry (Vaghti *et al.* submitted) and estimating loss of these communities offers insight into the loss of the beetle and its habitat. Lang *et al.* (1989) observed fewer numbers of elderberry shrubs in the lower reach (i.e., between Sacramento and Colusa) of the Sacramento River than the northern reach (i.e., Chico to Red Bluff). They attributed this difference to the loss of elderberry shrubs and riparian habitat in the southern reach of the Sacramento River as a result of extensive flood control activities such as the construction and maintenance of levees. The Central Valley Historic Mapping Project (Geographic Information Center 2003) observed similar decreases in the amount of riparian habitat. Loss of riparian habitat between 1900 and 1990 in the Central Valley was about 96% in the southern portion of the Valley (Kern County to Fresno County) (16,000 acres remaining), 84% in the middle Valley (Merced County to San Joaquin County) (21,000 acres remaining) and 80% in the northern Valley (Sacramento and Solano counties to Shasta County) (96,000 acres remaining).

In addition to the riparian habitat loss described by Lang *et al.* (1989), both the number of sites with elderberry shrubs and the density of elderberry within sites decreased between studies of the same areas in 1991 and 1997 which resulted in a lower number of occupied sites and shrub groups (Barr 1991; Collinge *et al.* 2001). Holyoak and Talley (2001) investigated natural recruitment and mortality rates of elderberry at seven sites along Putah Creek and the American River that had been previously sampled by Collinge *et al.* (2001). They observed that mortality and recruitment rates were similar between the two areas, illustrating that elderberry shrubs likely replace themselves in these relatively undisturbed areas.

In the northern portion of the beetle's range along the Sacramento River and 13 of its tributaries (including lands in Butte, Placer, Sacramento, Shasta, Sutter, Tehama, Yolo and Yuba counties), the beetle occurs in drainages that function as distinct, relatively isolated metapopulations (Collinge *et al.* 2001). Half of the 14 drainages in the Sacramento Valley surveyed by Barr (1991) in 1991 and again by Collinge *et al.* (2001) in 1997 remained unoccupied in both studies. The beetle experienced extirpation in two drainages and neither were recolonized. Collinge *et al.* (2001) concluded that because of dispersal limitations, unoccupied drainages were likely to remain unoccupied and those where the resident beetle population became extirpated were not likely to be recolonized. One of the implications of their results for conservation was that there is little chance that natural populations would recover following declines (Collinge *et al.* 2001).

The increase in the amount of riparian habitat through restoration and compensation efforts is valuable, but remains small in comparison to estimated historic losses of the habitat. Approximately 50,000 acres of existing riparian habitat has been protected in the Sacramento and San Joaquin Valley since 1980. In addition, approximately 5,000 acres of habitat has been restored for the benefit of the beetle (including planting of elderberries) and another 1,600 acres of riparian habitat has been restored however, no elderberry plantings were included (Talley *et al.* 2006). An undetermined amount of additional habitat has been restored as a result of compensation for section 7 projects. Despite the efforts of a number of agencies and organizations, the 5,000 acres of restoration activities is less than 1 percent of the estimated 890,000 acres of the historic riparian habitat lost in the Central Valley. Loss of the beetle and its habitat continues, including conversion of agricultural lands, urban development and other activities that are often unreported. The ability of restoration and enhancement of conservation sites to fully compensate for adverse effects to the animal and its lost remnant natural habitat, is uncertain (Holyoak *et al.* in press).

Evidence of the beetle, in the form of exit holes, have been found within some of the elderberry shrubs which would be transplanted as part of work under Phase 2. Additionally, evidence of valley elderberry longhorn beetles was documented in the California Natural Diversity Database 2008, along the Sacramento River in the southern portion of the Natomas Basin. The action area contains components that can be used by the listed animal for feeding, resting, mating, and other essential behaviors. Therefore, the Service believes that the valley elderberry longhorn beetle is reasonably certain to occur within the action area because of the biology and ecology of the animal, the presence of suitable habitat in and adjacent to the action area, as well as recent observations of this listed species.

Effects of the Proposed Action

Giant garter snake

Direct Effects

Overall Project

Land use changes due to SAFCA's project include the permanent loss of up to 299.65 acres of row and field crop, 78.48 acres of fallow agricultural fields (some of which was previously active rice), 45.03 acres of orchard, 127.98 acres of rice, and 30.37 acres of open water and other non-canal wetlands. The project includes a gain of 89.11 acres of woodland, 356.12 acres of grassland, 72.98 acres of managed marsh, and 65.88 acres of canals.

Depending on how the grasslands are managed, the conversion of row crop and fallow agricultural fields to grassland could be beneficial to giant garter snakes. Agricultural areas typically have high levels of disturbance due to crop maintenance and harvesting activities. Mortality of snakes by farm equipment would be highly likely. Fallow agricultural fields may lack adequate cover for snakes and increase the risk of predation. Some of the grassland would

be created on the slopes of the new levees and berms. While these grasslands would be subject to greater human disturbance than non-levee grasslands, due to maintenance requirements from the Corps, they would still suffer less disturbance than an active agricultural field. Flood control structures need to allow easy visual inspection from the top of the levee during the spring and fall. While RDs have varying ways of complying with this requirement, SAFCA is proposing to have RD 1000 mow levee slopes to a height which would allow for visual inspection but also be high enough to reduce the chance of coming into contact with a snake. The Corps also requires that the levee slopes receive rodent control measures to keep ground burrowing mammals from burrowing into the sides of the levee. This could include grouting ground squirrel holes closed, which would remove potential hibernacula for giant garter snakes in the winter months to using a rodenticide which would lessen the number of ground squirrels in the area.

Giant garter snakes are not typically found in orchards because of the high amount of overstory cover, therefore there would be a benefit to giant garter snake due to the loss of 45.03 acres of orchard habitat. However, SAFCA proposes to create an additional 89.11 acres of woodland to compensate for effects to Swainson's hawk nesting trees. It is not expected that giant garter snakes will use dense woodland areas. Therefore, this represents a net loss of 44.08 acres of habitat that is not expected to be used by giant garter snakes.

Because of the project, 72.98 acres of rice would be permanently converted to an upland habitat type. The SAFCA has proposed to compensate for the loss of rice by creating 70 acres of managed marsh on 55 acres of existing rice fields and 15 acres of annual grassland near Fisherman's Lake. Overall there would be a loss of 127.98 acres of rice from the Natomas Basin. Additionally, there will be a temporary loss of rice within the Natomas Basin due to borrow excavation from the Brookfield site. A total of 353 acres of rice would be unavailable for giant garter snakes in the Natomas Basin for one year due to borrow activities. The loss of rice reduces the amount and availability of habitat, including summer water, for the snake. Due to the large amount of rice that has been fallowed in the Natomas Basin (37 percent loss of active rice between 2004 and 2007), any additional loss of rice, even for 1 season, has a direct effect on giant garter snakes. Flooded rice fields act as seasonal marshes and produce high numbers of tadpoles, frogs and mosquitofish. Effects associated with reduced available summer water in the form of rice field habitat also include displacement of individual giant garter snakes from familiar habitat areas and result in giant garter snakes foraging over a wider area. Giant garter snakes may move to other areas of suitable habitat, but will encounter increased mortality from vehicles, exposure to temperature extremes, predation, and human disturbance while migrating to new areas. Migrating snakes or snakes using a larger foraging area may displace resident snakes or compete for food and shelter resources with resident snakes, resulting in reduced survivorship and fecundity of both resident and immigrant snakes.

Adverse effects from the reduction of rice fields may be greatest for gravid females, juveniles, and neonate snakes. Gravid females spend significant time basking in mid to late summer while incubating young, and thus may have reduced survivorship or fecundity if displaced from familiar retreats and basking sites (giant garter snakes are live bearers and contribute significant resources to brooding offspring). Abundant food resources are also essential for females to both

recover body mass after giving birth and to survive the overwintering period when the snakes do not forage. Abundant food resources are also essential to the survival of juveniles and neonates. Giant garter snakes typically double their weight in the first year, with rapid growth likely necessary to reach a size class no longer susceptible to predation by non-native predatory fish and bullfrogs. The reduced availability of rice fields will result in less small prey for young snakes, which would inhibit growth, result in delayed sexual maturation and decreased births and recruitment of individuals into the population. This could potentially skew the age structure of the population to older giant garter snakes. Juveniles and neonates also rely on developing sufficient body mass prior to overwintering in order to survive long periods without foraging. Temporary or permanent loss of rice fields will not only remove habitat, but will also have adverse effects on reproduction, recruitment, and survival of the snake that will continue to affect giant garter snake populations well beyond the project time frame.

To offset the effects of the permanent loss of 127.98 acres of rice and the temporary effects to 356 acres of rice in the basin, SAFCA proposes to create 72.98 acres of managed marsh and permanently protect 175 acres of rice. Managed marsh has the capability to provide higher quality habitat for giant garter snakes because the habitat is available for the snake year round, will be subject to less human disturbance from farming activities, protected in perpetuity with a Conservation Easement, and will hold water for longer periods of time than a rice field typically does. Providing protection in perpetuity in the form of a Conservation Easement on 175 acres of rice fields would also benefit the snake because the rice farming at this site would be managed by TNBC and would assure more "snake-friendly" rice habitat than a typical rice field.

SAFCA proposes to affect 14 acres of irrigation and drainage canals that are vitally important for giant garter snakes both for foraging and movement within the basin. The loss of a canal within the basin even for a single season could have a large detrimental effect to giant garter snakes and their ability to access areas within the Natomas Basin for foraging and cover. To minimize any temporal effects of filling irrigation and drainage ditches, SAFCA has proposed to construct the replacement irrigation canals and GGS/Drainage Canal before most of the fill of existing ditches and canals occurs, providing some time for habitat development before the loss. In some cases these canals would be created a full year in advance of filling existing canals. Additionally, SAFCA has proposed to create better aquatic canal habitat for giant garter snakes by assuring that the new GGS/Drainage Canal would have a minimum water depth of 4.5 feet between April and October, which is the active season for the giant garter snake. This reliable water supply will provide a corridor between TNBC reserves in the Fisherman's Lake area and reserves along the North Drainage Canal in the northwestern portion of the Natomas Basin. About 31.24 acres of giant garter snake canal and 38.43 acres of irrigation canal would be created with this project. An integral part of the GGS/Drainiage Canal is 10.21 acres of the benches that would be created intermittently along the canal. These benches would be inundated in the summer months and allow for the growth of vegetation which would provide both cover and a food source for giant garter snakes. While the canal itself provides connectivity between two core areas for giant garter snakes, the benches along the canal would provide the food source, cover, and potential nursery grounds for snakes as they travel between the two areas.

SAFCA proposes to purchase long-term water contracts from NCMWC to provide water for both the managed marsh and GGS/Drainage Canal. While the Service expects the GGS/Drainage Canal to provide benefits to giant garter snakes in the Natomas Basin by providing connectivity and offsetting the effects of their project, there is some concern regarding the long term protection of the canal because the project description does not provide a Conservation Easement on this feature. The SAFCA has assured the Service that it can provide the necessary protection through another type of easement for the giant garter snake and the Service is willing to work with SAFCA to create the language for the easement that satisfies all of the interested parties. However, it is the Service's preference that a Conservation Easement be placed on this feature and if agreement cannot be reached on the language of the easement, than the Service will have to reanalyze their effects and the GGS/Drainage Canal would be viewed as a minimization measure for their effects not a compensation measure.

Phase 2 Construction

Phase 2 construction includes work along the NCC and reaches 1-4B along the Sacramento River east levee. The Corps and SAFCA have proposed to complete the majority of the work during the active season of the giant garter snake (May 1 to October 1). Construction during this time would occur in 61.1 acres of developed land, 139.6 acres of annual grassland, 645.5 acres of row and field crop and fallow agriculture, 1.5 acres of orchard, 185 acres of rice (25 would be a permanent effect, 160 acres would be a temporary effect), 2 acres of canals and ditches, 22 acres of open water and other non-canal wetlands, and 10.3 acres of woodland. At the end of the construction season the proposed land cover types will be 53.5 acres of developed land, 30 acres of created woodland, 15.85 acres of preserved woodland, 168 acres of levee slope grassland, 123 acres of grassland on seepage berms and canal embankments, 19 acres of irrigation canal, 13.5 acres of GGS/Drainage Canal, and 175 acres of preserved rice. The newly created cover-types with the project would protected from future development through either a flood control easement, conservation easement, or drainage easement.

Phase 2 construction would primarily occur between May 1 and October 1. The only components of Phase 2 work which would occur outside of the giant garter snake's active season would be relocation of power poles, relocation of private irrigation pipelines, canals, and wells, and the removal, transplantation, and/or planting of trees and elderberry shrubs that are located in the Phase 2 footprint. To reduce the likelihood of disturbing or killing a giant garter snake that may be overwintering in uplands that would be affected this winter, SAFCA has proposed to erect exclusionary fencing around the areas where they would be working prior to October 1. This fence would be monitored daily prior to and during construction to insure that there are no breaches that a snake could get through. This should remove the chance that project construction would kill giant garter snakes when they are working in the winter months.

The remainder of the project would be constructed during the active period (May 1 – October 1) for the snake, resulting in a decreased risk of direct mortality of snakes. However, given the number of acres of aquatic and upland giant garter snake habitat affected within Phase 2, it is highly likely effects to snakes would include removal of cover and basking sites, filling or crushing of burrows or crevices, obstructing snake movement, and decreasing the prey base, and

may result in the direct disturbance, displacement, injury, and/or mortality of snakes. Snakes may disperse across or may bask on existing roads, and thus may be killed or injured by construction equipment or other vehicles accessing the project site.

Compensation for the loss of rice in Phase 2 would occur during Phase 4 with the creation of 72.98 acres of managed marsh along the western boundary of Fisherman's Lake. The creation of managed marsh at this location would connect to existing TNBC Preserve lands which currently are in managed marsh which would enlarge a core area for giant garter snakes in the Natomas Basin. While the Service recognizes the benefit of enlarging managed marsh within the Fisherman's Lake area, there would be a temporal loss of aquatic habitat for giant garter snake between when rice is converted to upland in Phase 2 and when marsh is created in Phase 4. If for some reason the Corps and SAFCA either do not complete all the project phases or do not provide the 72.98 acres of managed marsh in 2011, then they would have to reinitiate consultation with the Service as outlined on page 79 of this biological opinion.

Within the construction of Phase 2, SAFCA has proposed to create canal habitat in advance of canal that would be filled in Phase 3. This helps to offset effects due to the filling of canal which would be a loss of aquatic habitat for snakes, by allowing the new canals to become established in advance and also allow vegetation to begin to grow along the banks, which would provide cover from predation for the giant garter snake.

Valley Elderberry Longhorn Beetle

Effects to the valley elderberry longhorn beetle may occur with the transplantation of elderberry shrubs outside of the footprint of the levee enlargement. Loss of an elderberry shrub or even a stem can result in direct mortality of valley elderberry longhorn beetles or affect valley elderberry longhorn breeding and feeding because adult beetles rely solely on elderberry flowers for food and must lay their eggs on elderberry stems to successfully reproduce.

All three phases of the project have potential to affect about 40 elderberry shrubs through transplantation. This action will adversely affect the valley elderberry longhorn beetle. Any beetle larvae occupying these plants are likely to be killed when the plants are removed. An additional number of elderberry shrubs would remain where they currently are however, construction work would occur within 100 feet but no closer than 20 feet from the dripline of an elderberry shrub.

Temporal loss of habitat will occur. Although mitigation for impacts on the beetle involve creation or restoration of habitat, it generally takes five or more years for elderberry plants to become large enough to support beetles, and it generally takes 25 years or longer for riparian habitats to reach their full value (USFWS 1994). Temporal loss of habitat will temporarily reduce the amount of habitat available to beetles and may cause fragmentation of habitat and isolation of subpopulations. In cases where the proposed project will reduce the canopy closure of riparian forests, an edge effect is created that could result in reduced habitat quality for the

beetles. Beetles disperse poorly and the systematic removal of elderberry shrubs from a relatively connected river corridor has adverse effects well outside of the project's footprint.

Proposed avoidance and minimization measures should minimize adverse effects resulting from elderberry stem trimming or elderberry transplantation.

Effects of Phase 2 Construction to Valley Elderberry Longhorn Beetle

Table 3 lists the elderberry shrub stem counts and sizes which would be transplanted as part of the Phase 2 construction. Effects to the valley elderberry longhorn beetle due to transplantation of these shrubs are described above. Elderberry shrubs would be transplanted and elderberry seedlings and associated natives would be planted at one of the following properties: Rio Ramaza, Cummings, or Lasuevic.

Table 3. Elderberry Stem Sizes and Compensation

Location	Stems (maximum diameter at ground level)	Exit Hole on Shrub (Yes or No)	Elderberry Seedling Ratio	Associated Native Plant Ratio	Number of Stems Observed	Required Elderberry Plantings	Required Associated Native Plant Plantings
Riparian	stems ≥1" & ≤3"	No	2:1	1:1	33	66	66
		Yes	4:1	2:1	57	228	456
Riparian	stems > 3" & <5"	No	3:1	1:1	16	48	48
		Yes	6:1	2:1	13	78	156
Riparian	stems > 5"	No	4:1	1:1	16	64	64
		Yes	8:1	2:1	16	128	256
Non-riparian	stems ≥1" & ≤3"	No	1:1	1:1	23	23	23
		Yes	2:1	2:1	5	10	20
Non-riparian	stems > 3" & <5"	No	2:1	1:1	8	16	16
		Yes	4:1	2:1	2	8	16
Non-riparian	stems > 5"	No	3:1	1:1	2	6	6
		Yes	6:1	2:1	1	6	12
Total replacement plantings						681	1,139
Total Elderberry shrubs to be transplanted						23	
1,820 /10 = 182 valley elderberry longhorn beetle credits or 7.52 acres							

Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local, or private actions affecting listed species that are reasonably certain to occur in the area considered in this biological opinion. Future Federal actions not related to this proposed action are not considered in determining the cumulative effects, but are subject to separate consultation requirements pursuant to section 7 of the Act.

The effectiveness of the NBHCP's Operating Conservation Strategy (OCS) relies on the City of Sacramento and Sutter County limiting development to a combined total of 15, 517 acres within their respective permit areas. The proposed project site is located outside the permitted development area, and SAFCA is not a permittee under the NBHCP; however, the plan assumes no significant new development in the basin outside of the City of Sacramento and Sutter County permit areas. The NBHCP outlines a carefully constructed OCS that balances reasonable development in the Basin with conservation of snake habitat in order to maintain a viable population of giant garter snakes in the basin and avoid jeopardy to this threatened species. The NBHCP and MAPHCP allow for urban development of certain areas (totaling up to 17,500 acres) in the Basin in return for the preservation of, and in some cases, restoration and management of 8,725 acres, in an interconnected preserve system, which when added to the baseline of agricultural and undeveloped lands in the basin, will conserve the Natomas Basin snake population. While the proposed project does not increase the number of developed acres beyond the 17,500 contemplated under the NBHCP and MAPHCP, it does change (in some cases, permanently) habitat types from one type to another. Loss of habitat which the 22 covered species of the NBHCPs may use include 299.65 acres of row and field crop, 78 acres of fallow fields, 45.03 acres of orchard, and 30.37 acres of open water and other non-canal wetlands. Increases in the following habitat types would occur with the project: 89.11 acres of woodland, 356.12 acres of grassland, 72.98 acres of managed marsh, and 65.88 acres of canal. While there would be a change in habitat types within the basin, the NBHCP covered species would still be able to use the habitats that SAFCA's project would be creating and development would be precluded from these areas through conservation easements, flood control easements, and drainage easements.

While SAFCA is not a signatory to the NBHCP, the plan sets forth a regional conservation strategy that covers the entire basin. The NBHCP's efficacy in maintaining a viable population of giant garter snake in the Basin depends, in significant part, on the retention of a sufficient amount of undeveloped acreage throughout the Basin, to support giant garter snake.[1] The NBHCP operates under the assumption that agricultural land in the Basin would continuously rotate between crop types, and therefore all land provides habitat for all 22 of the NBHCP covered species, including the giant garter snake.

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1 In NWF v. Norton, 2005 U.S. Dist LEXIS 33768, Judge Levi upheld the NBHCP and its strategy to protect the GGS in the Natomas Basin. However, in footnote 13 of the opinion, he cautioned that, "the Service and those seeking an ITP in the future will face an uphill battle if they attempt to argue that additional development in the basin beyond the 17,500 acres will not result in jeopardy" to the snake.

SAFCA's proposed project will directly affect existing land that has been preserved as mitigation for either the NBHCP or MAPHCP. During Phase 2 of the project, 1.63 acres of fallow row and grain crop would be affected at the Atkinson Preserve and 4.09 acres of alfalfa and 5.72 acres of wheat would be affected at the Huffman West Preserve. During Phase 4 of the project, 1.98 acres of alfalfa, 0.05 acre of developed, 0.83 acre of ruderal, and 0.48 acre of valley oak woodland would be affected at the Alleghany 50 Preserve and 0.044 acre of valley oak woodland and 0.00034 acre of riparian scrub would be affected at the Cummings Preserve. These areas would be replaced with levee slope covered in grassland. As provided for in the NBHCP (IV.C.2.c.(1)) SAFCA shall "pay for the value of replacing every acre of reserve land impacted." To accomplish this SAFCA has proposed to acquire existing TNBC land not currently dedicated to mitigation to offset acre-per-acre losses. This existing TNBC land would consist of rice, not the upland habitat types affected. The SAFCA will fund the perpetual maintenance, monitoring, and enhancement of these preserves for the benefit of the covered species. Because this land is currently and will be maintained in rice, this will benefit the giant garter snake.

The proposed project would positively affect the biological connectivity between and within two of the Basin's three major geographical areas and TNBC's preserve lands. The GGS/Drainage Canal that SAFCA proposes to construct would provide connectivity between the population of snakes and the TNBC preserves around Fisherman's Lake with the population of snakes and TNBC preserves in the northwest portion of the Natomas Basin near the North Drainage Canal. The SAFCA would provide guaranteed water in the canal between April and October, which would create aquatic connectivity. In an effort to increase the habitat quality of the corridor, SAFCA will create benches along the canal, which would be shallowly inundated in the summer months to provide a prey base support emergent marsh vegetation which would provide cover for the giant garter snake. The SAFCA proposes to manage this canal in perpetuity for the giant garter snake, and proposes to encumber the canal with an easement in which the conservation values prevail over drainage values. The SAFCA's plan to construct this canal would benefit connectivity and strengthen the success of the NBHCP.

In December 2008, FEMA will issue a new flood map for the Natomas Basin. This would place all of Natomas into the AE zone, which would require that builders place the bottom floor of new construction up to 20 feet above ground level to keep it out of the floodplain. This would effectively stop new construction in Natomas. While not directly growth-facilitating, the proposed project would serve planned and reasonably foreseeable growth by providing flood protection to the Natomas Basin which is currently an impediment to future growth (planned or otherwise) in the Natomas Basin. It is likely that some of the growth (commercial, municipal, and residential) in the Natomas Basin will not require section 7 consultation with the Service for compliance with the Act, and will not obtain take coverage pursuant to section 10 of the Act. Currently, the NBHCP and the East Contra Costa HCP are the only two permitted regional HCPs in the Sacramento area, although Placer, Yolo, South Sacramento, Yuba, and Sutter are all developing regional HCPs. Until these regional HCPs are finalized, there is no mechanism to provide "take" coverage for projects with no Federal nexus besides these projects pursuing their own individual HCPs. Some "take" of listed species is likely to occur for which no

minimization, avoidance, and compensation/mitigation measures for federally-listed species are implemented.

SAFCA, the Corps, the city of Sacramento, Sacramento County, and Sutter County should understand that future development within the Natomas Basin could negatively affect the NBHCP and MAPHCP and potentially jeopardize the giant garter snake in the Natomas Basin. Any additional "take" of listed species outside what has been analyzed in this biological opinion or the NBHCP and MAPHCP cannot occur without appropriate permits or consultations with the Service and CDFG.

The cumulative effects of reasonable foreseeable projects in the Natomas Basin may pose a significant threat to the eventual recovery of the giant garter snake. The following proposed projects could significantly affect the sustainability of giant garter snakes in the Natomas Basin when considered cumulatively with the proposed Natomas Levee Improvement Project:

- The proposed Greenbriar residential development is located on an approximately 577-acre site south of Elkhorn Boulevard and west of State Highway 99. Development on this site could result in the loss of giant garter snake habitat adjacent to Lone Tree Canal, depending on the configuration of houses and infrastructure.
- Natomas Joint Vision, as currently proposed by the City of Sacramento and Sacramento County, is to develop approximately 6,000 acres in the area of the County outside of the City's permitted area under the NBHCP.
- Sacramento International Airport's Master Plan would enlarge the airport on land currently owned by the airport and would occur through 2020. Much of the land slated for airport expansion is currently in agricultural production.

Other projects which are reasonably foreseeable and should be considered cumulative with the proposed project, but for which the Service has little to no information about the extent of their effects to giant garter snakes, include:

- Camino Norte
- Downtown Natomas Airport Light Rail
- Pacific Gas & Electric Line 406/407 Pipeline
- Sacramento Municipal Utility District Powerline – Elkhorn Substation
- Sutter Pointe Specific Plan

Conclusion

After reviewing the current status of the giant garter snake and valley elderberry longhorn beetle, the environmental baseline for the species, the effects of the proposed project, and the cumulative effects on this species, it is the Service's biological opinion that the proposed Natomas Landside Improvements Project, as described herein, is not likely to jeopardize the continued existence of

the giant garter snake or valley elderberry longhorn beetle. The project will not result in a net destruction or adverse modification of valley elderberry longhorn critical habitat.

The Corps and SAFCA have proposed to improve flood protection for the Natomas Basin above what currently exists. Two HCPs currently exist within the Natomas Basin and are based on future development occurring within the permit area of the MAPHCP and NBHCP. The baselines and assumptions for which these HCPs were developed were based on no additional development occurring within the basin outside of these permit areas and no change in landuse practices. Sacramento County and the City of Sacramento are already proposing additional development outside of the existing permit areas. Additionally, the Natomas Basin has experienced a large amount of rice fallowing both in land held by private farmers and leases terminated on Sacramento County Airport property. While the Service has concluded that SAFCA's project would not jeopardize the giant garter snake or valley elderberry longhorn beetle, it does facilitate growth within the Natomas Basin, which would require additional analysis to determine if this growth could jeopardize any of the 22 species covered by the MAPHCP and NBHCP. If growth outside of the permit areas were to occur within the Natomas Basin, these future projects must have a higher conservation outcome than currently exists in the HCPs and must be closely coordinated with the Service.

INCIDENTAL TAKE STATEMENT FOR PHASE 2 CONSTRUCTION

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering. Harm is defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by impairing behavioral patterns including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act, provided that such taking is in compliance with this Incidental Take Statement.

The measures described below are nondiscretionary for listed species in Phase 2 of this opinion and must be implemented by the Corps in order for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity that is covered by this incidental take statement. If the Federal agency (1) fails to adhere to the terms and conditions of the incidental take statement, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

Amount or Extent of Take

Giant Garter Snake

The Service anticipates that incidental take of the snake will be difficult to detect or quantify for the following reasons: giant garter snakes are cryptically colored, secretive, and known to be sensitive to human activities. Snakes may avoid detection by retreating to burrows, soil crevices, vegetation, or other cover. Individual snakes are difficult to detect unless they are observed, undisturbed, at a distance. Most close-range observations represent chance encounters that are difficult to predict. It is not possible to make an accurate estimate of the number of snakes that will be harassed, harmed or killed during Phase 2 construction activities (staging areas, work on canal banks, soil borrow areas, and vehicle traffic to and from borrow areas). In instances when take is difficult to detect, the Service may estimate take in numbers of species per acre of habitat lost or affected as a result of the action. Therefore, the Service anticipates that all giant garter snakes inhabiting 187 acres of aquatic and 818.9 acres of upland habitat may be harassed, harmed, or 2 giant garter snakes killed by loss and destruction of habitat, as a result of the project.

Valley Elderberry Longhorn Beetle

The Service expects that incidental take of the valley elderberry longhorn beetle will be difficult to detect or quantify. The cryptic nature of these species and their relatively small body size make the finding of an injured or dead specimen unlikely. The species occurs in habitats that make them difficult to detect. Due to the difficulty in quantifying the number of beetles that will be taken as a result of the proposed action, the Service is quantifying take incidental to the project as the number of elderberry stems one inch or greater in diameter at ground level (beetle habitat) that will become unsuitable for beetles due to direct or indirect effects as a result of Phase 2 construction. Therefore, the Service estimates that all beetles inhibiting 23 elderberry plants containing stems 1 inch or greater at ground level (118 stems between 1-3 inches, 39 stems between 3 and 5 inches and 35 stems $\geq$5 inches; see Table 3 in the text) will become unsuitable as a result of the proposed action.

Effect of the Take

The Service has determined that this level of anticipated take is not likely to result in jeopardy to the giant garter snake, or valley elderberry longhorn beetle, and will not result in the destruction or adverse modification of designated critical habitat because in the case of the giant garter snake critical habitat has not been designated and it is outside of the critical habitat for valley elderberry longhorn beetle.

Reasonable and Prudent Measures

The following reasonable and prudent measures are necessary and appropriate to minimize the effect of the proposed project on the giant garter snake and valley elderberry longhorn beetle.

1. The Corps and SAFCA shall implement the project as proposed in the biological assessment and this biological opinion.

2. Effects of harassment of individual giant garter snakes within the proposed project, and of the loss or degradation of the species' habitat shall be minimized.

3. Effects of harassment of individual valley elderberry longhorn beetle, and of the loss and degradation of the species' habitat shall be minimized.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Corps must ensure compliance with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are nondiscretionary.

1. The following terms and conditions implement reasonable and prudent measure one (1):

   a. The Corps and SAFCA shall minimize the potential for incidental take of the giant garter snake and valley elderberry longhorn beetle resulting from the project related activities by implementation of the project description as described in the biological assessment and the project description of this biological opinion.

   b. If requested, before, during, or upon completion of ground-breaking and construction activities, the project proponents shall allow access by Service and/or California Department of Fish and Game personnel to the project site to inspect project effects to the snake and valley elderberry longhorn beetle.

   c. A Service approved Worker Environmental Awareness Training Program for construction personnel shall be conducted by a Service-approved biologist for all construction workers prior to the commencement of construction activities. The program shall provide workers with information on their responsibilities with regard to the giant garter snake and valley elderberry longhorn beetle, an overview of the life-history of the species, information on take prohibitions, and protections afforded the species under the Act. Written documentation of the training must be submitted to the Sacramento Fish and Wildlife Office within 30 days of the completion of training. As needed, training shall be conducted in Spanish for Spanish language speakers and other languages as needed or necessary.

   d. The applicants shall include a copy of this biological opinion within its solicitations for design and construction of the proposed project making the primary contractor responsible for implementing all requirements and obligations included within the biological opinion, and to educate and inform all other contractors involved in the project as to the requirements of the biological opinion.

2. The following terms and conditions implement reasonable and prudent measure two (2):

   a. The project proponents shall minimize the potential for harm or harassment of the snake resulting from project-related activities by implementation of the conservation measures as described in the Corps' Biological Assessment and appearing in the project description (pages 3-44) of this biological opinion.

   b. At least 30 calendar days prior to initiating construction activities, the project proponents shall submit the names and curriculum vitae of the biological monitor(s) for the proposed project. Monitors shall have the ability to differentiate giant garter snakes from other snakes and the authority to stop construction activities if a snake is encountered during construction until appropriate corrective measures have been completed or until the snake is determined to be unharmed.

   c. For Phase 2 work which would occur outside of the giant garter snake active window (power pole relocations and private irrigation canal relocation) exclusion fencing would be placed around upland areas that giant garter snakes could use to overwinter. The exclusionary fencing would be monitored everyday prior to and during construction to ensure that openings do not develop that would allow the entry of a giant garter snake into the construction area.

   d. Construction activity shall be conducted between May 1 and October 1. This is the active period for the snake and direct mortality is lessened, because snakes are expected to actively move and avoid danger. If it appears that construction activity may go beyond October 1, the project proponents shall contact the Service as soon as possible, but not later than July 15 of the year in question, to determine if additional measures are necessary to minimize take.

   e. The project proponents shall implement Best Management Practices (BMPs) to prevent sediment from entering areas containing snake habitat, including, but not limited to, silt fencing, temporary berms, no cleaning of equipment in or near snake habitat, installation of vegetative strips, and temporary sediment disposal.

   f. Runoff from dust control and oil and other chemicals used in other construction activities shall be retained in the construction site and prevented from flowing into areas containing snake habitat. The runoff shall be retained in the construction areas by creating small earthen berms, installing silt fences or hay-bale dikes, or implementing other measures on the construction site to prevent runoff from entering the habitat of the snake.

   g. Project-related vehicles shall observe a 20-mile-per-hour speed limit within construction areas, except on County roads and State and Federal highways. This

is particularly important during periods when the snake may be sunning or moving on roadways.

h. To avoid attracting snake predators, all trash items, such as wrappers, cans, bottles, and food scraps, must be disposed of in closed containers and removed at least once a day from the entire project site.

i. Within 24-hours prior to the commencement of construction activities, the site shall be inspected by a Service-approved biologist. The biologist will provide the Service with a written report that adequately documents the monitoring efforts within 24-hours of commencement of construction activities. Snakes encountered during construction activities shall be allowed to move away from the area on their own volition. The biologist shall notify the Service immediately if any listed species are found on-site, and will submit a report, including date(s), location(s), habitat description, and any corrective measures taken to protect the species found. The biologist shall be required to report any take to the Service immediately by telephone at (916) 414-6600 and by electronic mail or written letter addressed to the Deputy Assistant Field Supervisor, within one (1) working day of the incident. The project area shall be re-inspected by the monitoring biologist whenever a lapse in construction activity of two weeks or greater has occurred.

j. Erosion control structures will be installed concurrently with construction. Erosion control structures will be constructed so runoff will be directed away from sensitive habitats. Tightly woven fiber netting (mesh size less than 0.25 inch) or similar material shall be used for erosion control or other purposes at the project site to ensure giant garter snakes and other reptiles or amphibians are not trapped by the erosion control material. This limitation will be communicated to the contractor through use of Special Provisions included in the bid solicitation package. Coconut coir matting is an acceptable erosion control material. No plastic mono-filament matting shall be used for erosion control. The edge of the material shall be buried in the ground to prevent giant garter snakes and other reptiles and amphibians from crawling underneath the material. Erosion control measures shall direct water flow into existing drainages or disperse water across vegetated areas in order to avoid concentrating water.

k. Movement of heavy equipment to and from the project site shall be restricted to established roadways to minimize habitat disturbance. Stockpiling of construction materials, including portable equipment, vehicles, and supplies, shall be restricted to the designated construction staging area and exclusive of aquatic habitat avoidance areas. Aquatic snake habitat adjacent to the project area shall be flagged and avoided by all construction personnel.

l. To the extent feasible, the project proponents shall confine clearing of vegetation and scraping, or digging, of soil to the minimal area necessary to facilitate construction activities.

m. High visibility fencing shall be placed to prevent encroachment of construction personnel and equipment into areas containing snake habitat. The fencing shall be inspected before the start of each work day and maintained by the project proponents until completion of the project. The fencing may be removed only when the construction of the project is completed.

n. After completion of construction activities, any temporary fill and construction debris shall be removed. As described in the biological assessment and the project description of this biological opinion, the project proponents will restore all snake habitat subject to temporary ground disturbances, including storage and staging areas and temporary roads. These areas shall be re-contoured, if appropriate, and re-vegetated with appropriate locally-collected native plant species to promote restoration of the area to pre-project conditions. All temporary fill and construction debris shall be removed. An area subject to "temporary" disturbance includes any area that is disturbed during the project, but that, after project completion, will not be subject to further disturbance and has the potential to be re-vegetated. Appropriate methods and plant species used to re-vegetate such areas will be determined on a site-specific basis in consultation with the Service and the CDFG. Restoration work may include replanting emergent vegetation. Refer to the Service's *Guidelines for the Restoration and/or Replacement of Giant Garter Snake Habitat.* A written report shall be submitted to the Service within ten (10) working days of the completion of construction at the project site.

o. The Corps and SAFCA shall ensure compliance with the reporting requirements.

p. Prior to construction on May 1, 2009, the Corps and SAFCA will have the following documents completed and approved by the Service:

- drainage easement language for the GGS/Drainage Canal;
- Mitigation and Monitoring Plan and Long-Term Management Plan;
- encumbrances on a portion of the District Assessment Fee; and
- contract with NCMWC to provide reliable water for the GGS/Drainage Canal and managed marsh.

3. The following terms and conditions implement reasonable and prudent measure three (3):

a. The procedures outlined in the Service's *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* dated July 9, 1999, shall be followed for all actions

related to the proposed project.

b. Elderberry shrubs will be fenced with high visibility construction fencing. In areas where the typical 20-foot buffer from the dripline of the elderberry shrub is encroached on, the fencing will be placed as far from the elderberry shrub's dripline as construction activities will allow.

c. A biological monitor will be present on site when work will encroach on the 20-foot elderberry buffer. The monitor will have the authority to stop construction within 20 feet of the shrub if unauthorized take of the beetle occurs. The monitor shall contact the Service immediately to determine what corrective measures need to be taken.

d. Compensation plantings shall occur within the same year as the transplantation of the elderberry shrubs. The selection of the final compensation site for elderberry shrubs shall be coordinated with the Service. A Service reviewed plan for the longterm maintenance and monitoring of the elderberry compensation site shall be completed prior to transplantation.

Reporting Requirements

A post-construction compliance report prepared by the monitoring biologists must be submitted to the Chief of the Endangered Species Division (Central Valley) at the Sacramento Fish and Wildlife Office within thirty (30) calendar days of the completion of construction activity or within thirty (30) calendar days of any break in construction activity lasting more than thirty (30) calendar days. This report shall detail: (i) dates that groundbreaking at the project started and the project was completed; (ii) pertinent information concerning the success of the project in meeting compensation and other conservation measures; (iii) an explanation of failure to meet such measures, if any; (iv) known project effects on the giant garter snake, if any; (v) occurrences of incidental take of any these species; and (vi) other pertinent information.

The Corps must require SAFCA to report to the Service immediately any information about take or suspected take of federally-listed species not authorized in this biological opinion. The SAFCA must notify the Service within 24 hours of receiving such information. Notification must include the date, time, and location of the incident or of the finding of a dead or injured animal. In the case of a dead animal, the individual animal should be preserved, as appropriate, and held in a secure location until instructions are received from the Service regarding the disposition of the specimen or the Service takes custody of the specimen. The Service contact persons is, Chief of the Endangered Species Division (Central Valley) at (916) 414-6600, and the Resident Agent-in-charge of the Service's Law Enforcement Division at (916) 414-6660.

Any contractor or employee who during routine operations and maintenance activities inadvertently kills or injures a listed wildlife species must immediately report the incident to their

representative. This representative must contact the CDFG immediately in the case of a dead or injured listed species. The CDFG contact for immediate assistance is State Dispatch at (916) 445-0045.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities that can be implemented to further the purposes of the Act, such as preservation of endangered species habitat, implementation of recovery actions, or development of information and data bases.

1. The Corps and SAFCA should assist in the implementation of the draft, and when published, the final Recovery Plan for the giant garter snake.

2. The Corps and SAFCA should provide funding to researchers studying topics identified by the Service in the draft, and when published, the final Recovery Plan for the giant garter snake.

3. The Corps should use environmental restoration authorities to acquire and restore garter snake habitat from willing sellers.

To be kept informed of actions minimizing or avoiding adverse effects or benefiting listed and proposed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION - CLOSING STATEMENT

This concludes formal consultation with the Corps on the Natomas Levee Improvement Project. As provided in 50 CFR 402.16, re-initiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the proposed action may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in this opinion; or (4) a new species or critical habitat is designated that may be affected by the proposed action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation.

If you have any questions regarding this biological opinion on the Natomas Landside Improvements Project, please contact Jennifer Hobbs at (916) 414-6541 or Jana Milliken, Sacramento Valley Branch Chief.

Sincerely,

Ken Sanchez
Acting Field Supervisor

cc:
Elizabeth Holland, Corps, Sacramento, CA
Todd Gardner, CDFG, Sacramento, CA
Peter Buck, SAFCA, Sacramento, CA
Kelly Fitzgerald, EDAW, Sacramento, CA

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PERSONAL COMMUNICATIONS

Hansen, Eric. 2006. Consulting Environmental Biologist. Provided information on population trends, threats, and recommendations for future actions. May 8, 2006, and August 22, 2006.

Kelly, David. 2006. U.S. Fish and Wildlife Service, Sacramento, California

Roberts, John. 2006. The Natomas Basin Conservancy, Executive Director. Provided information on population trends, threats, and recommendations for future actions. May 8, 2006, and August 22, 2006.

Wylie, Glenn. 2006. USGS-BRD, Western Ecological Research Center, Dixon Field Station. Provided information on population trends, threats, and recommendations for future actions to benefit the giant garter snake. May 9, 2006.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

In Reply Refer To:
81420-2008-F-0195-R001

MAY 6 2009

Mr. Francis C. Piccola
Chief, Planning Division
U.S. Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, California 95814

Subject: Section 7 Programmatic Formal Consultation on the Natomas Levee Improvement Program, Landside Improvements Project, Sacramento and Sutter Counties, California

Dear Mr. Piccola:

This is in response to your March 31, 2009, request to amend the formal consultation with the U.S. Fish and Wildlife Service (Service) on the Natomas Levee Improvement Program, Landside Improvements Project (proposed project) in Sacramento and Sutter Counties, California, dated October 9, 2008 (File 81420-2008-F-0195-5). Your request was received on April 1, 2009. Your request was received in our office on June 11, 2008. This document represents the Service's concurrence to amend the programmatic biological opinion on the effects of the action to two federally-listed threatened species: the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) and the giant garter snake (*Thamnophis gigas*), in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act).

The Sacramento Area Flood Control Agency (SAFCA) recently made changes to the conservation strategy of their project. The Service, the U.S. Army Corps of Engineers (Corps), and SAFCA believed the change in the conservation strategy was substantial and re-initiation of consultation was necessary. Given the programmatic nature of this consultation, the Service is amending the project description and effects analysis within this biological opinion. Paragraphs that contain changes from the October 9, 2008, document have been bolded. This programmatic biological opinion supersedes the October 9, 2008, programmatic biological opinion.

TAKE PRIDE IN AMERICA

This biological opinion is based on information provided in the Corps' letter requesting consultation and their biological assessment. A complete administrative record is on file at the Sacramento Fish and Wildlife Office.

CONSULTATION HISTORY

September 25, 2006. SAFCA had a meeting with the Service to briefly describe the conceptual Natomas Levee Improvement Project.

May 10, 2007. SAFCA made a presentation of their Natomas Levee Improvement Program Conceptual Plan to the Natomas Joint Vision, which included staff from the Service, California Department of Fish and Game (CDFG), the City of Sacramento, the Sacramento International Airport (Airport), and the Corps. This presentation included additional details and conceptual project designs.

October 29, 2007. The Service and the CDFG sent a joint comment letter to SAFCA on the Natomas Levee Improvement Project's Draft Environmental Impact Report.

January 11, 2008. SAFCA, the Corps, the Service, and CDFG began holding coordination meetings on the Natomas Levee Improvement Project to discuss project description and schedule.

January 24, 2008. SAFCA, the Corps, the Service, and CDFG held a coordination meeting, which included John Roberts from the Natomas Basin Conservancy (TNBC) to discuss project effects.

March 28, 2008. The Service met with SAFCA and Congresswoman Doris Matsui to discuss the project and schedule of the project.

June 17, 2008. SAFCA and the Corps held a meeting with CDFG and the Service to discuss work proposed for construction in 2009.

June 25, 2008. The Corps, EDAW, CDFG, and Service held a meeting to go over the effects of the project on specific cover-types.

July 2, 2008. The Service met again with Congresswoman Doris Matsui to discuss the schedule of the biological opinion.

July 9, 2008. The Service met with SAFCA, EDAW, CDFG, and the Corps to discuss endowments and easements for the conservation measures. The Service advised SAFCA that any thing other than a conservation easement for protection of compensation areas would take a great deal of time to work through.

July 10, 2008. The Corps, EDAW, SAFCA, CDFG, and Service held a meeting to discuss effects and schedule of the project.

July 15, 2008. The Service and Corps met with SAFCA to resolve schedule differences for the biological opinion. The Service committed to completing the biological opinion by September 24, 2008.

July 17, 2008. The Service provided a request via e-mail for 39 additional acres of managed marsh creation as part of the compensation strategy. This request was sent to EDAW, SAFCA, Corps, and CDFG.

July 21, 2008. The Service, Corps, EDAW, SAFCA, and CDFG met to discuss project effects and compensation strategy.

September 9, 2008. SAFCA provided an updated compensation strategy based on landuse changes at borrow sites on Sacramento County Airport lands.

September 11, 2008. The Service provided EDAW with comments on the draft language for a drainage easement on the GGS/Drainage Canal.

September 17, 2008. SAFCA, EDAW, and the Service had a meeting in which SAFCA proposed an idea to develop a compensation bank within the Natomas Basin.

September 19, 2008. The Service responded to the proposal submitted by SAFCA for a compensation bank and suggested that in order to provide a biological opinion to the Corps and SAFCA by September 24, 2008, SAFCA not include compensation banking as part of their project description. The Service also suggested that placing a conservation easement on ½ of the area borrowed at Brookfield would help compensate for effects due to the project.

September 21, 2008. SAFCA's consultant provided an e-mail, which agreed to the Service's September 19, 2008, e-mail.

September 24, 2008. The Service sent the Corps and SAFCA a draft biological opinion for the Landside Improvement Project.

September 29, 2008. SAFCA's consultant EDAW provided comments to the Service on the draft biological opinion.

October 9, 2008. The Service sent the final biological opinion to the Corps and SAFCA.

February 5, 2009. The Service, CDFG, SAFCA, EDAW, Sacramento County, John Roberts from the TNBC, and Reclamation District (RD) 1000 met to discuss the GGS/Drainage Canal easement and each agencies roles and responsibilities.

February 11, 2009. The Service provided SAFCA's attorney Fran Layton with our comments on the GGS/Drainage Canal easement language.

February 12, 2009. SAFCA's attorney spoke to Lynn Cox, Department of Interior Solicitor, and indicated that as had been previously discussed the TNBC would not be 3rd party beneficiary on the GGS/Drainage Canal easement where the canal crosses airport property because Sacramento County Airport System (SCAS) wanted them removed. Additionally, SCAS also wanted language inserted into the easement, which would give them the ability to modify the GGS/Drainage Canal, should the Federal Aviation Authority request it but that they would consult with the Service and CDFG prior to working within the GGS/Drainage Canal and provide compensation for effects.

February 24, 2009. The Service, CDFG, SAFCA, EDAW, Corps, and Sacramento County met to discuss the language of the easement along the GGS/Drainage Canal. Agreement was reached at this meeting. Because SAFCA would not place the GGS/Drainage Canal under a conservation easement they would provide additional compensation near Fisherman's Lake, which would have a conservation easement placed on it.

March 4, 2009. The Service, CDFG, and EDAW met to discuss effects acreages for the entire project. EDAW indicated at the meeting that SAFCA may not create aquatic benches on any portion of the GGS/Drainage Canal. The Service indicated that if that was the case than the programmatic biological opinion would have to be amended.

March 31, 2009. The Corps re-initiates consultation on the programmatic biological opinion.

BIOLOGICAL OPINION

Description of Action Area

The proposed project area is located in the Natomas Basin in northern Sacramento and southern Sutter Counties, generally bounded by leveed reaches of the Natomas Cross Canal (NCC) on the north, the Sacramento River on the west, the American River on the south, and the Pleasant Grove Creek Canal (PGCC) and Natomas East Main Drainage Canal (NEMDC)/Steelhead Creek on the east. This project, which is part of the larger Natomas Levee Improvement Program (NLIP) being undertaken by SAFCA, consists of three construction phases, generally occurring between 2008 and 2011. Construction of Phase 2 includes the 5.3-mile NCC south levee, the Sacramento River east levee from the NCC south levee to 2,000 feet south of the North Drainage Canal (Reaches 1-4B), the Elkhorn Main Irrigation Canal (Elkhorn Canal) between the North Drainage Canal and the Elkhorn Reservoir settling basin, the site of RD 1000 Pumping Plant No. 2, and adjacent land. Construction of Phase 3 includes the Sacramento River east levee south of the limits of the Phase 2 improvements to just south of Interstate 5 (I-5) (Reaches 5A–9B), the PGCC west levee, the NEMDC west levee between Elkhorn Boulevard and Northgate

Boulevard, the area between Elkhorn Reservoir and the West Drainage Canal where a new canal designed to provide drainage and associated giant garter snake habitat (referred to in this document as the "GGS/Drainage Canal") would be constructed, the portion of the West Drainage Canal north of I-5, the Elkhorn Canal downstream of Elkhorn Reservoir, and RD 1000 Pumping Plant No. 2. Construction Phase 4, which is still being designed, includes the Sacramento River east levee south of the limits of the Phase 3 improvements to the junction with the American River north levee (Reaches 10–20), the NEMDC west levee between Sankey Road and Elkhorn Boulevard, the Riverside Main Irrigation Canal (Riverside Canal), and the West Drainage Canal south of I-5 to Fisherman's Lake. Phase 1 of the project occurred during the summers of 2007 and 2008 and consisted of placing slurry wall along 9,700 linear feet of the Natomas Cross Canal (Service file number 1-1-07-F-0207).

Because the Corps and SAFCA only have a detailed project description for Phase 2 of the entire Natomas Levee Improvement Project, this biological opinion analyzes the landscape effects of the project for all Phases (2, 3, and 4) but will only analyze and provide incidental take coverage for Phase 2. Each subsequent phase will initiate section 7 consultation with the Service under the umbrella of this programmatic biological opinion.

Overview of NLIP Landside Improvements Project

SAFCA is designing the NLIP in coordination with the Federal and state flood control project sponsors, the Corps, and the State of California Central Valley Flood Protection Board (formerly The Reclamation Board), to address the deficiencies in the Natomas levee system with a focus on achieving a 100-year level of flood protection by 2011. This will require improving the following landside conditions along the NCC south levee, the Sacramento River east levee, and the PGCC and NEMDC west levees:

- Inadequate freeboard—The NCC south levee and portions of the Sacramento River east levee are not high enough to provide at least 3 feet of freeboard above the 100-year water surface elevation. Additional reaches do not provide 3 feet of freeboard above the 200-year design water surface elevation.

- Underseepage and through-seepage vulnerability—Most of the levee reaches do not meet recently adopted Federal criteria for safely containing underseepage and through-seepage when the water surface in the adjacent channel reaches the 100-year elevation or, in some cases, the 200-year elevation.

The NLIP Landside Improvements project encompasses addressing freeboard deficiencies through levee raises; addressing seepage potential using a combination of seepage berms, cutoff walls, and relief wells; and acquiring additional right-of-way to construct the improvements and to prevent encroachment into the flood control system. In addition, the project has been designed to include an enlarged levee embankment (adjacent setback levee) along the land side of the existing Sacramento River east levee to minimize the need for substantial removal of vegetation and structural encroachments on the water side of this levee in compliance with Corps guidance.

These improvements would include recontouring the levee slopes where necessary to provide a 3:1 horizontal-to-vertical (3H:1V) waterside slope and a 3H:1V (preferred) or 2H:1V (maximum) landside slope.

The specific goal of the NLIP Landside Improvements Project is to provide at least 100-year flood protection as quickly as possible while laying the groundwork to achieve at least urban-standard (200-year) flood protection over time.

Additional project objectives that influenced SAFCA's project design were to:

(1) use flood control projects in the vicinity of the Sacramento County Airport to facilitate better management of Airport lands to reduce hazards to aviation safety, and

(2) use flood control projects to enhance habitat quality and values by increasing the extent of the lands in the Natomas Basin being managed to provide habitat for the giant garter snake, the Swainson's hawk, and other special-status species.

Recognizing the importance of securing maximum Federal support for the flood control project, SAFCA has explored implementation approaches that also advance the achievement of Federal aviation and wildlife protection objectives where complementary opportunities exist. Accordingly, the proposed project includes the following elements:

- The project would include construction of the GGS/Drainage Canal to provide giant garter snake habitat and some drainage infrastructure west of the Airport. Construction of these facilities would allow for dewatering of the ditch running along the western portion of the Airport runway system, which the airport recognizes as a flight safety hazard, by offsetting the effects on drainage and irrigation needs and giant garter snake habitat.

- The project would combine SAFCA's need for levee embankment and berm material with the SCAS's need to modify the condition and management of Airport bufferlands so as to reduce wildlife hazards affecting Airport operations in a manner that enhances the connectivity of areas managed specifically for their habitat value.

Existing Project Facilities and Potential Borrow Sites

Construction activities for all project phases would take place within the Natomas Basin, except for potential development of a borrow site on RD 1001 land northeast of the basin. The following subsections describe the existing flood control facilities, their general setting, and adjacent irrigation infrastructure and the potential borrow sources for the project as provided by the Corps in their Environmental Impact Statement for the proposed project.

Flood Control and Irrigation Facilities

Natomas Cross Canal South Levee

The NCC is a 5.3-mile-long channel that carries water from several tributary watersheds in western Placer County and eastern Sutter County to the Sacramento River. The NCC begins at the PGCC and East Side Canal and extends southwest to its confluence with the Sacramento River near the Sankey Road/Garden Highway intersection. During periods of flooding, the Sutter Bypass, Sacramento River, and NCC all contribute to raised water elevations that can affect the NCC levees. For engineering purposes, the south levee is divided into seven reaches. Much of the south levee contains an existing stability berm with an internal drainage system. Levee slopes are approximately 3H:1V on the water side and 2H:1V on the land side.

There is an approximately 80- to 100-foot maintenance access area on the landside of the levee through most of the NCC's length. Farms and rural residences are located on both sides of the NCC, with rice the primary crop under cultivation. The Lucich North and Frazer Habitat Preserves, maintained by the TNBC, lie south of the NCC south levee from the eastern end of Reach 2 through the western end of Reach 6. A drainage canal, referred to as the Vestal Drain, runs parallel to the NCC south levee through much of Reach 2, approximately 100 feet from the landside levee toe. There is a private irrigation pump and irrigation canal at the landside levee toe in Reach 1. Natomas Central Mutual Water Company's (NMWC) Bennett Pumping Plant and RD 1000's Pumping Plant No. 4 are located in Reach 2, and the NMWC Northern Pumping Plant is located in Reach 3. The NMWC North Main Canal runs parallel to the levee through Reaches 4 and 5, approximately 100 feet from the landside levee toe.

Sacramento River East Levee

An 18-mile-long section of the east levee of the Sacramento River protects the west side of the Natomas Basin between the NCC and the American River. For planning purposes, the levee is divided into 20 reaches. Garden Highway is located on top of the levee crown within all 20 reaches. A drained, 10-foot-wide stability berm is present on the landside slope of the levee between the NCC and Powerline Road (Reaches 1–11). Cutoff walls to address through-levee seepage remediation were previously constructed through the levee in Reaches 12–20. The land uses along the levee vary from north to south. Along the landside, Reaches 1–13 are bordered mainly by private agricultural lands containing a few rural residences, Airport bufferlands, and two farmed the TNBC parcels. Teal Bend Golf Club is west of the Airport, adjacent to the levee along Reach 6. The parcels bordering Reaches 14–18 contain more residences, several rural estates, and three TNBC parcels. The landside of Reaches 19 and 20 are bordered by residential subdivisions, a business park, the City of Sacramento's Natomas Oaks Park, undeveloped Costa Park site, and Shorebird Park.

Several irrigation canals, pipelines, wells, and pump stations exist along the Sacramento River east levee. The Elkhorn Canal and the Riverside Canal are key agricultural irrigation canals in the NMWC system. The Elkhorn Canal runs parallel to the Sacramento River east levee from the

North Drainage Canal in Reach 4B through Reach 8 and into the start of Reach 9 (1,250 feet south of Elkhorn Boulevard); this canal is supplied by the Prichard and Elkhorn Pumping Plants on the Sacramento River. The Riverside Canal extends from just north of Reach 13 to the middle of Reach 19 and is supplied by the Riverside Pumping Plant, on the Sacramento River just north of Radio Road. Several lateral canals connect to the Elkhorn and Riverside Canals. The existing Elkhorn and Riverside Canals are highline canals that use gravity flow to deliver water for irrigation by maintaining water levels above the surrounding ground levels. These canals have earthen embankments with side slopes that are nearly vertical, requiring regular maintenance. Approximately 1 mile of the existing Elkhorn Canal is concrete lined and the entire Riverside Canal is concrete lined.

In addition to the NMWC irrigation systems, there are several landowner-operated systems along the levee. These facilities are located primarily in Reaches 1–4A and 9–12, in areas not currently served by the NMWC systems. The areas are serviced by either well pumps on the landside or river pumps, which discharge into buried pipelines, small irrigation ditches, or directly onto fields. The distribution systems run along the landside toe of the levee to supply fields that slope away from the levee. There are approximately nine small pumping plants that provide water from the river and approximately 10 groundwater well pumps.

Several drainage pumping plants are operated by RD 1000 along the Sacramento River east levee. These facilities pump drain water from the main drainage canal system into the river. They include Pumping Plant No. 2, located in Reach 4B; Pumping Plant No. 5, located in Reach 10; Pumping Plant No. 3, located in Reach 13; and Pumping Plant No. 1, located in Reach 20A. Pumping Plant No. 2 was temporarily removed as part of an emergency levee repair in 2006 and would be replaced as an element of the proposed project in the 2009–2010 construction phases. In addition to these RD 1000 pumping stations, the City of Sacramento operates the Willow Creek drainage pumping station, which is located in Reach 19B.

Pleasant Grove Creek Canal West Levee

The PGCC west levee extends southerly from the east end of the NCC south levee to the north end of the NEMDC/Steelhead Creek levee near the Sankey Road crossing. The PGCC west levee protects the Natomas Basin from flood flows from Pleasant Grove Creek and other creeks in western Placer County, as well as from water that backs up in the NCC during high river stages in the Sacramento River. Levee slopes are generally 2H:1V on both the water side and land side of the levee. Natomas Road is located on top of the levee crown. No berms support this levee. A private canal extends parallel to the PGCC west levee for about 1,500 feet at the landside levee toe. Farms and scattered rural residences are located on the landside of the PGCC west levee, and a manufacturing facility and a railroad siding are located within several hundred feet of the levee, just south of Sankey Road.

Natomas East Main Drainage Canal

The 13.3-mile NEMDC/Steelhead Creek west levee extends southerly from the south end of the PGCC west levee near the Sankey Road crossing to Northgate Boulevard. The NEMDC west levee protects the Natomas Basin from flood flows from Arcade and Dry Creeks, as well as from water during high river stages in the American River. Natomas and East Levee Roads are located on top of the levee crown. Private canals extend parallel to portions of the NEMDC west levee landside levee toe. Farms and scattered rural residences are located on the land side of the northern portion of the NEMDC west levee (between Sankey Road and Elkhorn Boulevard), while the southern portion (generally south of Del Paso Road to Northgate Boulevard) is bordered by urban and commercial/industrial development.

SAFCA's NEMDC stormwater pumping station, a facility that is connected to the NEMDC/Steelhead Creek west levee and the Dry Creek north levee, is situated between Del Paso Road and Elkhorn Boulevard. Other pumping stations occur along the NEMDC west levee, including NMWC Pumping Plant Nos. 6 and 8, which pump water out of the Natomas Basin for in-basin drainage and flood control. The RD 1000 operates Pumping Plant Nos. 6 and 8 and City of Sacramento operates Pump Station No. 102 on the NEMDC west levee.

Borrow Sites

Borrow sites are areas from which earthen materials would be removed for use in construction. Where borrow sites would be used over more than one construction season, the work would progress in cells that would be incrementally developed as habitat or returned to agricultural use as the borrow activities are completed. Several properties have been identified as likely sources of soil borrow, mainly for use in the improvements to the Sacramento River east levee. SAFCA has identified the following preferred borrow sources for the construction of the flood control and irrigation infrastructure improvements for construction Phases 2, 3, and 4, and a redundant source that may be pursued if negotiations regarding the preferred sources are unsuccessful or additional quantities are found to be needed during construction:

- Brookfield property (Phases 2, and 3 preferred): Private property west of the PGCC at Fifield Road, which was in rice cultivation in 2008. Material from this property could be used along the NCC south levee and the upper reaches of the Sacramento River east levee in construction Phase 2 and on the PGCC west levee in construction Phases 3. While the overall property may be used as borrow during multiple years, no area of the property would be used for consecutive years. After the removal of borrow material, the land would be returned to rice cultivation in the same season or if too late to plant, then in the following season.

- Airport bufferlands north of the Airport complex (Phases 2 and 3 preferred, Phase 4 potential): Sacramento County property north of Elverta Road and west of Powerline Road. These lands could provide soil for use along the middle reaches of the Sacramento River east levee in construction Phases 2 and 3. They could also provide material for

construction in the lower reaches of the levee in construction Phase 4, if needed. While the overall property may be used as borrow during multiple years, no area of the property would be used for consecutive years. After the removal of borrow material, the borrow areas, which are currently either fallow agricultural lands or ruderal grassland, would be returned to fallow agricultural fields.

- Fisherman's Lake area (Phase 4 preferred): Privately owned parcels between TNBC-managed habitat areas. Several parcels, which are currently planted in rice, orchards, or field crops, may be suitable sources of borrow material for use in the lower reaches of the Sacramento River east levee and are strategically situated for creation of habitat that would link existing TNBC parcels.

- Krumenacher property (Phase 3 preferred): Private parcel at the intersection of East Levee Road and Elkhorn Boulevard. This parcel is a component of the Natomas Panhandle, identified in the Natomas Basin Habitat Conservation Plan (NBHCP) and development of this parcel is already covered by a July 25, 2007, biological opinion (1-1-06-F-0294). This land, which is primarily grassland, could provide a borrow source for the levee widening improvements to the NEMDC.

- Twin Rivers Unified School District (Phase 3 preferred): Material stockpiled on property owned by Twin Rivers Unified School District, immediately south of Krumenacher. This parcel is a component of the Natomas Panhandle, identified in the NBHCP, and development of this parcel is already covered by a July 25, 2007, biological opinion (1-1-06-F-0294). This material could provide a borrow source for the levee widening improvements to the NEMDC.

- Horangic/Private Property Northwest of Garden Highway and Reservoir Road (Phase 3 preferred): Private parcel located in Reach 6A along the Sacramento River east levee. The portion of this site that would not be in the levee footprint could provide borrow material for seepage berms in Reaches 5A–5B. The site would be shallow-graded for borrow material and returned to field crops.

- Binford deYoung/Private Property Southwest of Garden Highway and Elverta Road (Phase 3 preferred): Private parcel located in Reach 5B along the Sacramento River east levee. The portion of this site that would not be in the levee footprint could provide borrow material for seepage berms in Reaches 5A–5B. The site would be shallow-graded for borrow material and returned to field crops.

- Bianchi/Private Property Northwest of Garden Highway and Reservoir Road (Phase 3 potential): Private parcel located in Reach 7 along the Sacramento River east levee. This property could borrow material for levee construction south of the Teal Bend Golf Club. The site would be shallow graded for borrow material and returned to field crops.

- Novak property (Phase 3 preferred, Phase 4 potential): A SAFCA-owned, 94-acre property located south of Del Paso Road and east of Powerline Road in Reach 12A along the Sacramento River east levee. The site could be used for levee construction south of the Teal Bend Golf Course. The site would be shallow graded for borrow material and returned to grassland or field crops.

- **Additional borrow sites may be needed in the event that the currently identified sites are not able to supply all of the required fill material. In order to ensure that adequate fill material is available for the project, the Elkhorn Borrow Area has been identified as an area where additional borrow sites may be created. Borrow in this area would be reclaimed in the same manner as the other borrow sites already identified, as would conservation measures.**

Overview of the Project Elements

The elements of the proposed project are categorized into five broad, overlapping categories:
- levee raising and seepage remediation,
- improvements to major irrigation and drainage infrastructure,
- acquisition of right-of-way within the footprint of the proposed features, at borrow sites, and to prevent encroachment and provide for maintenance access along the land side of the flood control facilities,
- habitat development and management for giant garter snakes and Swainson's hawks, and
- additional actions to meet Federal Emergency Management Agency requirements: encroachment management and bridge crossing modifications.

Levee Raising and Seepage Remediation

General Methods - The following subsections provide an overview of the approaches to addressing freeboard deficiencies and seepage potential that would be used in various combinations on the NCC south levee and Sacramento River east levee, and the PGCC and NEMDC west levees.

Raising, Widening and Flattening Levees (Phases 2, 3 ,4)

The entire NCC south levee, much of the Sacramento River east levee and a portion of the PGCC west levee at Sankey Road lack the required 3 feet of freeboard above the 100-year water surface profile. To meet overall NLIP goals, SAFCA would increase the levee freeboard sufficiently in freeboard-deficient areas to meet the desired minimum of 3 feet of freeboard above the 200-year water surface profile. The levee height increases would be accomplished through raises of the existing NCC south levee or through construction of the raised adjacent setback levee adjacent to the existing Sacramento River east levee:

- Raise of existing levee (NCC south levee). For a minor raise of the levee crown elevation (typically 6 inches or less), the raise may be limited to the levee crown area, provided that

there is enough existing crown width to accommodate the raise without narrowing the crown to a width that is less than the minimum requirement. For most of the NLIP levee raises, however, a greater crown raise is required and/or the levee slopes must be flattened. The required crown elevation would be met through a full levee raise. Full levee raises consist of an embankment raise from the landside or waterside toe (or both) upward to the increased crown elevation. This requires partially excavating the levee slope to provide a working platform for equipment, typically 10 feet wide, and rebuilding the levee to the appropriate elevation by benching the new embankment material into the existing embankment material.

- Adjacent setback levee (Sacramento River east levee). The proposed adjacent setback levee adjoining the Sacramento River east levee would be constructed with a crown elevation 3 feet above the 200-year water surface profile. In the upper reaches, where the existing levee has freeboard deficiencies of as much as 3 feet, the crown of the adjacent setback levee would be higher than the existing levee and Garden Highway roadway. In the lower reaches, where the existing levee has sufficient freeboard, the adjacent setback levee would be the same height as the existing levee.

The only levee segment that lacks adequate levee height that would be maintained at its current elevation is the PGCC west levee at Sankey Road because the flows through this levee segment into the interior of the Natomas Basin during a Federal Emergency Management Agency (FEMA) 100-year or "200-year" design event are not damaging and are subject to management as part of the basin's interior drainage system. Along the NEMDC west levee between Northgate Boulevard and Elkhorn Boulevard, the levee currently meets FEMA 100-year levee height requirements and also meets the "200-year" plus 3 feet of levee height design for the top of the levee profile.

The final levee configuration must meet the Corps criteria of a 20-foot-wide minimum crown, a 3H:1V waterside slope, and a 3H:1V (preferred) or 2H:1V (maximum) landside slope. Because the levees in most of the project reaches currently have landside slopes of 2H:1V, the proposed project includes flattening these slopes to at least a 3H:1V profile, and preferably 5H:1V. The PGCC west levee would be expanded on the land side to provide a levee width to encompass, at a minimum, a theoretical 3H:1V waterside slope, a crown width of at least 20 feet, and a landside slope of at least 3H:1V. The intent of the landside expansion is to preserve the existing Natomas Road and East Levee Road, which are County/City-maintained roads located on top of the existing PGCC and NEMDC west levees. Levee widening and slope flattening would also occur along the NEMDC west levee between Elkhorn Boulevard and the NEMDC stormwater pumping station.

Seepage Remediation

Underseepage problems can occur where levees are constructed on low-permeability foundation soil (silt and clay) underlain by a layer of higher permeability (sand and gravel). Excessive underseepage makes the levee susceptible to failure during periods of high river stage. Under these conditions, seepage travels horizontally under the levee and then is forced vertically

upward through the low-permeability foundation layer, often referred to as a "blanket." Failure of the blanket can occur either by uplift, a condition in which the blanket does not have enough weight to resist the confined pressure acting on the bottom of the blanket, or by piping (internal erosion) caused by water flowing under high vertical gradients through the erodible blanket and carrying fine soil particles out of the foundation materials. Through-seepage is seepage through a levee embankment that can occur during periods of high river stage. Depending on the duration of high water and the permeability of embankment soil, seepage may exit the landside face of the levee. Seepage can also pass directly through pervious layers in the levee if such layers are present. Under these conditions, the stability of the landside levee slope may be reduced.

During Phases 2–4, along the Sacramento River east levee, cutoff walls would be constructed through the adjacent levee in some reaches, and 100-foot-wide earthen seepage berms would be constructed in others for seepage remediation. Although portions of this reach of the Natomas perimeter levee system are considered susceptible to seismically induced ground shaking, such a condition would likely not cause deformation of the soil-bentonite (SB) walls in the adjacent levee because of its malleability and location farther away from the river channel, where levee failure is more likely to occur in association with seismically induced collapse of the river bank. Additionally, because an SB seepage cutoff wall is constructed lower in the levee section, it is not likely to be significantly affected by failure of the levee itself if the levee were to collapse. Relief wells cause the least amount of construction disturbance but require routine maintenance of the wells themselves and the drainage and pumping facilities necessary to support them. Seepage berms are feasible where there is sufficient room for construction.

Phase 2 includes the construction of a seepage cutoff wall through the levee crown of the NCC within Reaches 3–7. In Phase 3, a SB or soil-cement-bentonite cutoff wall will be constructed along the NEMDC west levee between Elkhorn Boulevard and Northgate Boulevard. The SB cutoff walls will also be constructed within the PGCC west levee where required to provide seepage remediation. In Phase 4, a cutoff wall will be constructed in the American River north levee between Gateway Oaks Drive and Northgate Boulevard (Reaches 1-4) to reduce seepage potential where required.

Major Irrigation and Drainage Infrastructure Modifications

There are two major canal systems in the Natomas Basin: an irrigation system owned and operated by NMWC and a drainage system owned and operated by RD 1000. The NMWC pumps water into the basin to provide irrigation water to its shareholders for agricultural use within the basin. During winter (October–April), drainage is primarily rainfall runoff; during summer (May–September), drainage water from agricultural fields is typically recirculated for irrigation. Because the basin is surrounded by levees, all excess drainage within the basin must be pumped out. In general, irrigation water is pumped into the basin from the Sacramento River and NCC and returned to the perimeter rivers and canals via RD 1000's drainage system. In the southern part of the Natomas Basin, the City of Sacramento also operates several drainage pump stations that serve residential areas.

As a result of the planned levee improvements in the Natomas Basin, the irrigation canals currently at the toe of the Sacramento River east levee (the Elkhorn Canal and the Riverside Canal) would be replaced by new irrigation canals set back from the existing levee farther to the east. Where constraints exist, certain portions of the canals would be piped. The existing and proposed irrigation canals are highline canals, which means that the bottom of the canal is roughly equal to the surrounding ground elevation. Irrigation canals would be constructed high enough to raise water levels above the levels of the adjacent fields to allow for gravity flow into the fields.

A new drainage canal would be constructed to provide aquatic connectivity of giant garter snake habitat between the North Drainage Canal and West Drainage Canal. The proposed GGS/Drainage Canal would be constructed with the top of bank roughly at existing ground level to facilitate drainage. Material excavated to construct the GGS/Drainage Canal would generally be used to construct the embankments of the adjacent highline irrigation canals. Some import and export of soil materials for levee construction would be required to accommodate the phasing of the activities. The following subsections provide an overview of these irrigation and drainage infrastructure modifications.

Relocation of the Elkhorn and Riverside Canals

General Construction Plan for Relocated Canals - The Elkhorn and Riverside Canals would be constructed with sufficient height to raise water levels above the levels of adjacent fields. Design water levels would be based on existing levels at service points along the alignments and the tops of embankments would provide for 1 foot of freeboard. To provide for stable banks, side slopes of 3H:1V would be used. The invert of canals would be lined with concrete to control vegetation and to allow for maintenance with minimal disturbance of aquatic habitat along the water's edge.

To avoid interruptions in service along the existing irrigation canals, the relocated canals would be constructed and operational before construction of planned levee improvements that would conflict with the existing irrigation canals. Thus, in any particular reach, the new canal would be constructed before the levee improvements in that same reach. Approximately half of the new Elkhorn Canal (North Drainage Canal to Elkhorn Reservoir) is planned for construction in Phase 2. The GGS/Drainage Canal from the North Drainage Canal to Elkhorn Reservoir also would be constructed in Phase 2, because this section would run parallel to and within the same right-of-way as the proposed Elkhorn Canal in this area. Concurrent construction of these new irrigation and drainage facilities would facilitate the use of excavated material from the GGS/Drainage Canal excavation for use as embankment material along the Elkhorn Canal. The remainder of the Elkhorn Canal and GGS/Drainage Canal would be constructed in Phase 3, and the new Riverside Canal would be constructed during the Phase 4.

Elkhorn Canal - Approximately 22,300 feet of the Elkhorn Canal would be relocated to accommodate the levee construction. This facility is a main irrigation canal that services NMWC Central and Elkhorn systems from the Prichard and Elkhorn Pumping Plants on the Sacramento River. Approximately 1 mile of the existing Elkhorn Canal is concrete lined, including segments

between Elverta Road and the Elkhorn Pumping Plant and also just north and south of Elkhorn Road; the remainder is earth lined.

The proposed alignment of the new Elkhorn Canal is based primarily on the extent of the planned levee improvements. The canal was sited as close as possible to the projected toe of the new levee (with allowance made for a 5H:1V landside levee slope). After this initial alignment was determined, a number of site-specific factors were considered and used to refine the alignment. The resulting alignment minimizes conflicts with known cultural resources sites and existing trees and is roughly parallel to the projected levee toe.

North of Elkhorn Reservoir, the maximum bottom width of the new canal would be 12 feet. The canal embankments would be approximately 7 feet tall with 15-foot-wide patrol roads along the top of the embankments with a two percent grade sloped down towards the canal. The vegetated side slopes would be 3H:1V to provide for stable banks. Overall, the width of the canal would be approximately 140 feet, with additional width required for a buffer and maintenance area for the canal construction north of Elkhorn Reservoir.

To minimize project impacts on the existing Teal Bend Golf Club, the alignment of the Elkhorn Canal through the golf course would be piped (approximately 3,200 feet). Two 36-inch pipes would be aligned parallel to the levee toe land side of the flood control facility corridor. This alignment would avoid existing golf course infrastructure to the extent possible.

South of Teal Bend, the Elkhorn Canal would return to an open channel parallel to the toe of the new levee. The majority of this reach of earthen canal has a design bottom width of 5 feet, with a minimum of 1 foot of levee height and 3H:1V side slopes. A 15–foot-wide patrol road would be located on the top of the field side of the canal; the other embankment would be 8 feet wide on the crown. The only portion of the new canal that would have a concrete-lined invert would be the 4,100-foot section where the existing canal is lined. The remaining 2,900 feet of new canal would be earthen-lined. To avoid impacts on existing residences, a second section (approximately 950 feet through the Mortensen and Breese properties) of the Elkhorn Canal may be piped using a single 36-inch pipe. The materials to construct the Elkhorn Canal would come primarily from the construction of the GGS/Drainage canal north of I-5. However, a small amount of import from the Airport north borrow sites is expected to be used to support construction of a portion of Phase 2 improvements.

Riverside Canal - Approximately 18,600 feet of the Riverside Canal would be relocated to accommodate the levee construction. This facility is a main irrigation canal that services NMWC Riverside system. The supply for this canal is the Riverside Pumping Plant. The canal flows south along the landside toe of the levee to approximately Bryte Bend Road. The canal south of Bryte Bend Road has not been used in recent years. The canal north of the Riverside Pumping Plant is supplied by relifted water at RD 1000's Pumping Plant No. 3. From Pumping Plant No. 3, the canal flows north approximately 950 feet and turns away from the levee. The entire existing Riverside Canal is concrete lined, although much of the concrete lining is broken and in

poor condition. **To control vegetation and to allow for canal maintenance with minimal disturbance of aquatic habitat along the water's edge, the invert of the new canal may be concrete lined.**

Like the Elkhorn Canal alignment, the alignment of the Riverside Canal would be based primarily on the extent of the planned levee improvements. The canal would be sited as close as possible to the projected toe of the new levee (allowing for a 5H:1V landside levee slope). After this initial alignment is determined, a number of other factors would be considered and used to refine the alignment. One-half to three-quarters of a mile south of San Juan Road southward to I-80, there are a number of residences along the landside toe of the levee. To avoid bisecting these private properties, it is likely that the Riverside Canal alignment would follow the eastern property line of these parcels. The final alignment would also aim to minimize conflicts with existing trees and other site-specific constraints that are identified during design. Based on these site-specific factors and the variation of the proposed seepage remediation methods in different reaches, the alignment would be only roughly parallel to the projected levee toe. The proposed bottom width of the relocated Riverside Canal would be determined during final design to meet existing capacity needs.

Construction of the New GGS/Drainage Canal - The GGS/Drainage Canal would maintain existing aquatic connectivity and compensate for the permanent loss of giant garter snake habitat due to the filling of the Airport West Ditch. In addition to providing giant garter snake habitat, the GGS/Drainage Canal would intercept flows from non-Airport property sources. Irrigation and drainage water currently flowing into the Airport West Ditch from non-Airport property would be incorporated into the GGS/Drainage Canal.

The GGS/Drainage Canal would generally extend parallel to the Sacramento River east levee, extending from the North Drainage Canal at the RD 1000 Pumping Plant No. 2 in the north to the West Drainage Canal in the south, approximately 1,000 feet south of Elkhorn Boulevard. South of I-5, the existing RD 1000 West Drainage Canal may be modified to provide improved snake habitat value in the reach between I-5 and Fisherman's Lake. This reach of the GGS/Drainage Canal has yet to be designed but could include improvements that benefit the giant garter snake, including improved bank slopes and enhanced aquatic habitat and vegetative cover. The length of the entire GGS/Drainage Canal, including the reconstruction, would be approximately 43,800 linear feet. The GGS/Drainage Canal would have a series of check structures along its length to maintain consistent water levels in the low-flow channel of the canal during the snake's active season (April–October). Supplemental water would be provided from NMWC irrigation system. The low-flow channel would have a top width of approximately 50 feet and an average depth of approximately 6 feet. Vegetation would be managed within the canal excavation and on the banks by mowing.

The portion of the GGS/Drainage Canal that would be constructed in Phase 2 is north of Elkhorn Reservoir would be parallel and approximately 30 feet west of the edge of the Elkhorn Canal. Thus, the alignment was based on the same factors as discussed above for the Elkhorn Canal.

North of Reservoir Road the canal would be set back a minimum of 200 feet from the projected levee toe to minimize concerns of excessive seepage exit gradients in the bottom of the canal. The canal in this location would have a 10-foot bottom width and vegetated 3H:1V side slopes. The canal would be approximately five feet deep with two percent grade sloped down towards the canal from the edge of the Elkhorn Canal embankment and the adjacent ground for a distance of 12 feet to allow for a patrol road. The depth would be sufficient to provide a minimum water depth of 4.5 feet with allowance for 1 foot of water level variance and a minimum of 1 foot of freeboard. The footprint of the GGS/Drainage Canal is approximately 50 feet wide. A 30-foot right-of-way would separate the proposed GGS/Drainage Canal from the proposed relocated Elkhorn Canal. South of Elkhorn Reservoir, the new canal would be constructed with roughly the same proportions as the segment north of Elkhorn Reservoir.

The GGS/Drainage Canal north of Teal Bend Golf Club would be managed as a linear high-quality giant garter snake habitat, with stormwater drainage a secondary function during major storm events, which typically occur in the snake's inactive season. South of Teal Bend Golf Club, the canal would also serve as giant garter snake habitat area, but the volume of stormwater drainage would increase in a southerly direction as the canal collects additional runoff as a result of the natural slope of the basin. Winter storm–related runoff exceeding the capacity of the West Drainage Canal south of I-5 would be pumped into the Sacramento River using RD 1000's Pumping Plant No. 3, consistent with existing stormwater management practice.

The shoreline and lower bank of the GGS/Drainage Canal (including the improved West Drainage Canal) would be planted or managed to promote tule/cattail (*Typha latifolia*) vegetation as suitable cover and foraging habitat for giant garter snake. However, management of the canal would also require removal of noxious aquatic weeds that obstruct the flow of water. A secure water supply would ensure that water of a suitable quality is present and flowing at low velocity in the canal during the active season of the giant garter snake, and that the water surface would be managed within a range of approximately 1 foot to provide consistent cover from predators along the tule fringe of canal banks. Input of supplemental canal water would begin at a diversion point on the North Drainage Canal at the north end of the new GGS/Drainage Canal. Other points of inflow may occur at downstream locations.

Reconfiguration of Airport West Ditch

To take advantage of common construction practices and to maximize the use of common facilities, the rearrangement of irrigation and drainage facilities required to provide for rerouting of flows that contribute to the Airport West Ditch would be undertaken in conjunction with these proposed NLIP improvements in construction Phase 3. This work would include modifications and extension of existing irrigation infrastructure and modification of some local drainage conveyance facilities.

Removal of Culvert and Reconstruction at Pumping Plant No. 2

The project would include the removal of a deep culvert beneath the levee section at the RD 1000 Pumping Plant No. 2 location and the replacement of a relocated RD 1000 Pumping Plant No. 2, which was removed from the western end of the North Drainage Canal in response to underseepage observed during extended winter storms in January 2006.

Modifications to Pumping Plants (Phases 3 and 4)

The NCMWC pumping facilities that provide water to the Elkhorn and Central Main Canals (Prichard and Elkhorn Pumping Plants) would need to be modified to accommodate the new height of the Sacramento River east levee during Phase 3. The discharge piping would be raised above the "200-year" flood level to maintain the design level of flood risk reduction and would be extended to the relocated irrigation canals. Some replacement of pumping equipment and earthen intake channel reconstruction would be required to improve the system.

Land Acquisition

Several of the measures described above would increase the footprint of the flood control system: levees would be widened on the land side as a result of raising, constructing an adjacent setback levee, and flattening the waterside and/or landside slopes. In addition, a 50- to 100-foot-wide access and maintenance corridor would be established at the landside toes of the levees. The proposed improvements also include woodland corridors and groves to replace trees that are removed from within the levee footprint and maintenance access areas, and canal construction east of the flood control features. SAFCA also would acquire adjacent land for relocation of infrastructure from the flood control corridor and planned improvements outside the flood control corridor (e.g., the GGS/Drainage Canal), with appropriate easements provided to utility owners upon completion of the work. To meet its project footprint needs, SAFCA would acquire private lands in fee and would acquire an easement interest where the project features would be on Airport land (owned by Sacramento County). Where the project footprint would overlie land owned and managed by TNBC, SAFCA may either purchase the land in fee or obtain easements.

Additional Actions to Meet FEMA Requirements

Encroachment Management (Phases 3 and 4)

Corps levee guidance requires the removal of vegetation greater than 2 inches in diameter on the levee slopes and within 15 feet of the waterside and landside levee toes. The Corps levee guidance also requires an assessment of encroachments on the levee slopes, including utilities, fences, structures, retaining walls, driveways, and other features that penetrate the levee prism. Substantial encroachments are present on the Sacramento River east levee. One of the objectives of constructing an adjacent setback levee along the Sacramento River east levee is to facilitate acceptable management of existing vegetation and structural encroachments along the water side

of this levee. By moving the hypothetical waterside slope of the levee (the "levee template") landward, the adjacent levee would significantly reduce most of the conflicts between these encroachments and applicable Corps levee operation and maintenance requirements. Should any of these existing encroachments be determined to reduce the integrity of the levee, increase flood risk unacceptably, or impede visibility or access to the waterside levee slope, the encroachments would need to be removed. Removal of some waterside slope encroachments may be required by the end of 2011 to ensure that the levee system meets Federal criteria for the 100-year level of protection. Along the land side of the proposed adjacent setback levee, encroachment removal would typically be accomplished as part of the landside levee improvements. This activity would include the relocation of utility poles that are on the existing landside slope of the levee.

Bridge Crossings (Phase 4)

Under applicable Federal requirements, the plane of the northbound and southbound bridge crossings of SR 99/70 over the NCC must be 4 feet above the 100-year water surface elevation in the NCC. The 100-year water surface elevation is 44.4 NAVD 88. The soffit (underside) elevation of the northbound crossing is 44.9 NAVD 88, and the soffit elevation of the southbound crossing is 42.9 NAVD 88. Accordingly, during construction of Phase 4 the following options must be considered for implementation in conjunction with the California Department of Transportation:

(1) Raise both bridge crossings as necessary to meet minimum FEMA clearance requirements.
(2) Provide for installation of a closure structure across the southbound crossing in the event of a 100-year or greater flood.
(3) Replace the bridge rail structures on the east and west sides of the bridge crossings and modify the levees connecting to these structures to provide at least 4 feet of levee height above the 100-year water surface elevation. Under any of these options, at least the northbound crossing could remain open for use during a 100-year flood event.

Investigations to Aid Project Planning and Design

Geo-technical Investigations

Additional exploration of geotechnical conditions is anticipated to be required in Phases 2–4 along the NCC south levee, Sacramento River east levee, PGCC west levee, NEMDC/Steelhead Creek west levee, and American River north levee to facilitate refinement of design for flood facility improvements. Exploration of subsurface conditions would primarily be conducted by drilling borings. Borings along the levees would generally be drilled to depths of 60-120 feet below the ground surface using either a rubber-tire truck-mounted drill rig or an all-terrain drill rig equipped with an 8-inch-diameter hollow-stem auger and a 4-inch-diameter rotary wash drill bit. Hollow-stem augers would generally be used to drill through the levee fill and would be left in place to act as temporary casing and protection against hydraulic fracturing of the levee.

Rotary wash drilling methods would be used below the augers. Borings located at and landward of the levee toe would be drilled using rotary wash drilling methods.

Exploration of potential borrow sites will also be required to assess suitability of the material. Such exploration could include boring methods similar to those described above, but to shallower depths (10–12 feet below grade). Test pit excavation would be conducted using a tire-mounted backhoe to depths of 10–12 feet below grade. The test pits would likely be 1–3 feet wide along dirt roadways and 3–6 feet wide in agricultural fields by about 10 feet long. Samples would be obtained by hand with shovels from the excavated materials. When the bottom depth has been reached, the test pits would be loosely backfilled with the spoils with minor compaction effort. In the dirt roadways, the backfilled materials would be compacted with more effort to maintain drivability and safety.

Cultural Resources Investigations

Archeological surveys within potential flood control facility improvement footprints and potential borrow sites are required to facilitate project planning in Phases 2–4 and satisfy requirements under Section 106 of the National Historic Preservation Act. The surveys would include up to three stages of work. All excavation work in Stages 1 and 2 would be conducted with hand tools, such as shovels and trowels. Stage 1 entails digging shovel test pits 15 inches in diameter and up to 3 feet deep to evaluate the characteristics of subsurface material; these test pits would be backfilled immediately. Depending on archeological evidence found within the shovel test pits, Stage 2 work may be initiated to allow for a more thorough site investigation. This Phase would include excavation of 1-meter-square and 5-foot-deep test units. These test units may need to remain open for several days until examination can be completed. Any sites requiring deeper excavation to further investigate subsurface features identified in the first two stages would be included in Stage 3. This stage would require the use of machinery, such as a backhoe.

Conservation Strategy Overview

The project conservation strategy would contribute toward the establishment of a habitat reserve in the increasingly urbanized landscape of the Natomas Basin. The refuge is projected to occupy approximately 15,000 acres once the NBHCP objectives and other proposed conservation programs are completed. Through habitat creation, restoration, and preservation, SAFCA will increase the amount of protected habitat available for NBHCP-covered species above the project amount from the HCPs. Further, SAFCA's proposed plan will consolidate large areas of habitat, assisting in the expansion of TNBC reserve blocks in the northwestern and southwestern regions of the Basin. Finally, establishment of woodland corridors will greatly improve the connectivity between core habitat reserves that are distributed throughout the Basin, and substantially increase acreage and patch size of these critical habitats.

Overall, the proposed project is an opportunity to employ a landscape-scale vision, helping to advance the goals and objectives of the NBHCP and assist the Federal Aviation Administration

(FAA), Corps, and the local Reclamation Districts in achieving their goals. SAFCA's Natomas Landside Improvements Project presents a unique, one-time opportunity to reconfigure habitat and connective corridors in the Basin at a landscape scale.

Rather than a piecemeal approach to habitat protection, SAFCA's proposed project secures and expands the amount of habitat protected in the Basin, establishes the components that tie the preserves and disparate mitigation sites together in perpetuity under public ownership, and increases the quality and viability of this emerging urban reserve. Refer to the March 13, 2009, Draft (and subsequent revisions) *Programmatic Long-Term Management Plan* document (prepared by EDAW for SAFCA) for a more complete summary of the conceptual strategy for creating/enhancing/preserving, protecting, and managing habitats in the Natomas Basin in perpetuity. The following subsections provide an overview of the primary goals and landscape-level benefits of this habitat conservation strategy.

Increase Amount of Protected Habitat

While the project will result in loss and reconfiguration of landside habitats adjacent to the widened levees in the Natomas Basin, the proposed project has been specifically designed to minimize impacts to these landside habitats, and to avoid impacts to riparian habitats along the Sacramento River and NCC. The construction of an adjacent setback levee and installation of seepage cutoff walls enable SAFCA to retain the mature riparian tree corridor and numerous Swainson's hawk nests that are located along the waterside of the Natomas Basin levees. The project's conservation strategy includes the preservation, enhancement, and creation of almost 1,500 acres of compensatory habitats in the Natomas Basin, including:

- **100 acres of created, managed marsh,**
- **850 acres of created, managed grasslands,**
- **60 acres of canals and 80 acres of associated uplands,**
- **140 acres of preserved and created landside valley oak woodlands,**
- **175 acres of preserved rice fields, and**
- **150 acres of agricultural field crops.**

The project will result in the creation of a larger contiguous area protected and managed for the giant garter snake, valley elderberry longhorn beetle, Swainson's hawk, and other NBHCP-covered species than currently exists.

Expansion and Consolidation of Protected Habitat in the Natomas Basin

The project will consolidate large areas of habitat, assisting in the expansion and infill of TNBC reserve blocks in the northwestern and southwestern regions of the Basin. SAFCA will acquire several properties to provide compensatory habitat, either in the form of preserved rice and agricultural crop fields or created managed marsh, managed grasslands, or landside woodlands. Many of these properties are contiguous with existing TNBC reserves or other completed or planned mitigation habitats. Protecting habitat adjacent to existing TNBC reserves and other

mitigation sites creates a larger contiguous area managed for giant garter snake and Swainson's hawk than currently exists. This increases the habitat value, sustainability, and functions that these individual properties would otherwise provide in isolation, contributing to giant garter snake and Swainson's hawk recovery in the Basin.

Strengthen Connectivity between the TNBC Reserves

The proposed enhancements of existing Basin landscapes are important to the successful implementation of the NBHCP, along with the acquisition and permanent protection of mitigation land. **The connective woodland corridors that SAFCA proposes to establish and/or improve are enhancements that will aid in NBHCP implementation, providing TNBC with an opportunity to improve its overall performance towards the goals of the NBHCP in regards to woodlands. The establishment of a landside woodland corridor would provide more nesting and perching habitat for Swainson's hawks in the basin than currently exists, and bring potential nesting and perching sites in closer proximity to areas that are managed as foraging habitat for this species in the basin.**

Mitigation, Management, and Monitoring Plan

Mitigation and monitoring plan (MMP) and a programmatic long-term management plan (LTMP) for the compensatory habitat components are being prepared to guide SAFCA and its partners as they manage the compensatory land components in perpetuity. The MMPs would address the habitat creation and preservation components of the NLIP Landside Improvements project. The MMPs and LTMP would establish specific success criteria for the habitat components, specify remedial measures to be undertaken if success criteria are not met (e.g., adaptive management, physical adjustments, additional monitoring), and describe short- and long-term management and maintenance of the habitat lands. The MMPs and LTMP would also describe the strategies for the long-term protection of these habitats and funding for the management as provided through appropriate mechanisms, which would be determined by SAFCA, the regulatory agencies, and other entities cooperating in the implementation of the project.

The goal of the MMPs and LTMP is to ensure that the conservation values of the preserved, restored, and created habitats are maintained in good condition in perpetuity. The MMPs and LTMP would discuss specific management strategies designed to maintain the conservation values for each of the habitat mitigation components and identify performance criteria used to determine the success of the mitigation habitats. The biological goals include: (1) the preservation of the abundance and diversity of native species, and particularly special-status species, in the mitigation habitats; (2) the protection of the habitat features from the effects of indiscriminate land uses that may adversely impact mitigation habitats; and (3) the restoration of any adverse condition within the mitigation habitat areas that may affect or potentially affect these areas.

Implementing Mechanisms for Long-Term Protection and Management

The MMPs and LTMP would describe the framework for the protection and management of the mitigation habitat components of the NLIP Landside Improvements project. The actual implementation of this framework would be enacted through easements, stakeholder-specific management agreements or memoranda of understandings, and contractual agreements. These contractual agreements would focus on the management obligations specific to each management entity, and describe the demonstrated financial and legal assurances necessary to implement the MMPs and LTMP to protect and manage the habitat mitigation components in perpetuity. These contractual agreements would be subject to review and approval by the Service, Corps, and CDFG, and enforced by SAFCA, in perpetuity, and by Corps through permit issuance.

Management Entities for Project Features

Agencies and organizations anticipated to have management responsibility for proposed project features are SAFCA, RD 1000, NMWC, and TNBC.

Sacramento Area Flood Control Agency
SAFCA would be responsible for the design and construction of all project components, including compensatory habitat. Once the project features are completed, most of the land or land management responsibility would be conferred by SAFCA to the other management entities. Memoranda of understanding, land ownership transfers, or management endowments and contracts would be used by SAFCA to transfer land management responsibility to the appropriate public agency or nonprofit land management organization.

Reclamation District 1000
The mission and purpose of RD 1000 is to operate and maintain the flood protection levees surrounding the Natomas Basin and to operate and maintain the internal drainage system to evacuate agricultural and urban stormwater and incidental runoff. The RD 1000 would be responsible for the management of the proposed levee improvements, reconstructed Pumping Plant No. 2, and drainage features. Typical maintenance activities include mowing grassland along levee slopes, berms, and rights-of-way, removing sediment and noxious aquatic weeds from the canals, and managing bank vegetation.

Natomas Central Mutual Water Company
The NMWC is a nonprofit mutual water company with the primary focus of keeping the water conveyance functioning to serve the company shareholders. The NMWC would be responsible for maintaining and managing the relocated Elkhorn and Riverside Canals. The relocated canals would be maintained and operated in the same manner as the existing canals. Typical maintenance activities include operating and repairing water control structures and barrier gates, periodically removing sediment and noxious aquatic weeds from the canals, repairing canal roads, managing bank vegetation, and mowing grassland along canal and road rights-of-way. However, the relocated Elkhorn and Riverside Canals would have improved levees, better water

control structures, and wider roads and rights-of-way than the existing canals. These improvements are expected to ease annual canal management efforts, allowing for a proportionately greater focus on maintenance and operations and less need for system repair and dredging.

The Natomas Basin Conservancy
The TNBC acquires and manages land for the purpose of meeting the objectives of the NBHCP. The TNBC owns approximately 30 mitigation properties totaling more than 4,500 acres. Private land acquired by SAFCA and converted to managed marsh, preserved in rice, or used for woodland establishment would be conveyed to the TNBC after creation of these habitats. SAFCA may also contract with the TNBC for management elements of some habitat features (e.g., the GGS/Drainage Canal).

Management Agreements

The MMPs will describe the framework for the design and management of the mitigation habitat components of the proposed project. The actual implementation of this framework will be enacted through Management Agreements. These contractual agreements will focus on the management obligations specific to each entity, and describe the demonstrated financial and legal assurances necessary to implement the MMPs and protect and manage the habitat mitigation components in perpetuity. These contractual agreements will be subject to review and approval by the Service, Corps, and CDFG, and enforced by SAFCA, in perpetuity, and by Corps through permit issuance.

Funding Mechanism
Funding for implementation of the MMP and LTMP, including construction, monitoring, and long-term management of the compensatory habitat components, has been incorporated into the overall budget for implementation of the NLIP Landside Improvements project. Funding for the management and administration of the various habitat components will be negotiated through agreements with RD 1000 (GGS/Drainage Canal management, managed grasslands), TNBC (rice fields, field crops, landside woodlands, and GGS/Drainage Canal administration), and NCMWC (water).

SAFCA anticipates funding for the agreements with RD 1000 and NCMWC will be provided on an annual basis from the special assessments collected as part of the Consolidated Capital Assessment District (CCAD). In order to ensure timely payment for the services rendered under these agreements, SAFCA will maintain reserve accounts with balances sufficient to support annual funding for two years for each agreement. Upon termination of the CCAD in 2037, these payments will be covered by assessments collected as part of SAFCA's existing Operation and Maintenance Assessment District. Funding for the agreement with TNBC will be provided through a non-wasting endowment funded by CCAD assessments.

Project Phasing

The proposed project is comprised of three phases of construction, spanning approximately 3 years. Phase 2 of the NLIP Landside Improvements project, for which SAFCA is currently requesting a permit, is described and analyzed in detail in this permit application, while Phases 3 and 4, for which subsequent requests for permits will be submitted, are described and analyzed at a more general, program level of detail in this document.

Phase 2 Work

Table 1 summarizes the major elements of Phase 2 of the Landside Improvements project (proposed project) and the general timeframes in which the elements are expected to be implemented. Note that although seepage berms are depicted as the primary means of providing underseepage remediation along the Sacramento River east levee, the use of cutoff walls continues to be evaluated, and cutoff walls will likely be implemented instead of berms in several locations. Each of the main project elements are described in more detail below.

Levee Raising and Seepage Remediation

Natomas Cross Canal South Levee

The proposed project would include raising the entire NCC south levee (Station 0+00 to Station 287+50, Reaches 1 to 7) and would continue the construction of a seepage cutoff wall from the eastern terminus of the NCC South Levee Phase 1 Improvements (NCC Phase 1 Improvements) initiated in 2007 (Station 0+00 to Station 61+00, beginning of Reach 1 to approximately middle of Reach 2) to the eastern end of the NCC south levee (approximately Station 56+00 to Station 287+50, approximately the middle of Reach 2 to end of Reach 7). NCC Reaches correspond roughly to the following Stations: Reach 1 (Station 0 to Station 3); Reach 2 (Station 4 to Station 103), Reach 3 (Station 103 to Station 123), Reach 4 (Station 123 to Station 170), Reach 5 (Station 171 to Station 195), Reach 6 (Station 195 to Station 277), and Reach 7 (Station 278 to Station 287). Phase 2 would include the construction of the NCC south levee component, which is anticipated to occur over one construction seasons, beginning in May 2009 and ending in October 2009. The primary construction activities are described below.

Preparation for construction of the cutoff wall would begin with using scrapers (or other suitable equipment, depending on the slope) to clear and grub/strip the surface to a depth of 2 inches to remove low-growing vegetation, loose stone, and surface soils. The aggregate base from the operating road also would be removed and stockpiled for later reuse. Waste material would be hauled to an off-site location.

Construction of the cutoff wall would include degrading the existing levee to a depth equal to one-half its total height (approximately 9 feet). A 70-foot-deep cutoff wall would be constructed for a total length of 23,150 linear feet (2 million square feet), with the method of installation at the contractor's discretion. Given anticipated schedule constraints, a

Table 1 Summary of the Major Elements of Phase 2 of the Proposed Project	
Project Element	**Proposed Activity and Timing**
Levee raising and seepage remediation: NCC south levee	Raise and realign the NCC south levee to provide additional freeboard and more stable waterside and landside slopes and to reduce the need for removal of waterside vegetation. (May–October 2009) Construct a seepage cutoff wall through the levee crown in Reaches 3–7. (May–October 2009)
Levee raising and seepage remediation: Sacramento River east levee (adjacent setback levee)	Construct a raised adjacent setback levee from the NCC to just south of the North Drainage Canal (Reaches 1–4B) with a 100-foot seepage berm in Reach 4A and a 300-foot seepage berm in Reach 4B. (May–October 2009) Relocate utility poles. (November-December 2008)
Improvements to major irrigation and drainage infrastructure	Construct a new canal designed to provide drainage and associated giant garter snake habitat (the GGS/Drainage Canal) between the North Drainage Canal and Elkhorn Reservoir. (May–October 2009) Relocate the Elkhorn Canal (highline irrigation canal) between the North Drainage Canal and Elkhorn Reservoir in anticipation of the filling of the existing Elkhorn Canal at the toe of the Sacramento River east levee. (May–October 2009) Remove a deep culvert at the location of Pumping Plant No. 2. (May–October 2009)
Habitat enhancement, creation and management	Establish vegetative habitat features in the new GGS/Drainage Canal. (Fall 2009) Recontour and create habitat on lands used as borrow sources. (Fall 2009) Establish grassland on the adjacent setback levee slopes and seepage berms. (Fall 2009) Install woodland plantings to offset the loss of portions of tree groves in the landside levee footprint. (Fall 2008–Fall 2009)
Right-of-way acquisition	Acquire right-of-way through fee title or easement interest within the footprint of the project features, at the borrow sites and along the flood control system. (Before construction)
Notes: Elkhorn Canal = Elkhorn Main Irrigation Canal; GGS = Giant Garter Snake; NCC = Natomas Cross Canal	

three-heading, double-shift work schedule is anticipated. Material degraded to support cutoff wall construction would be compacted at the landside toe of the levee to support the levee raising operation described below. Unsuitable material generated from cutoff wall construction would be disposed of off-site.

Raising of the Natomas Cross Canal South Levee

Levee raising would occur throughout the entire length of the NCC to provide three feet of freeboard over the design water surface profile (this requires raising the levee approximately three feet). Throughout most of the NCC, this would be accomplished by setting the levee back towards the landside, such that there is a theoretical 3H:1V waterside slope extending from the existing waterside toe to the new waterside top. Following degrading of the levee for cutoff wall construction, the new levee crown would be constructed such that the actual waterside slope extends to meet the point of degrade on the waterside slope. This actual slope would be 3H:1V or flatter. The new levee crown would have a width of twenty feet and the new landside slope would be 3H:1V. Where an existing stability berm is present, it would be stripped and incorporated into the new levee prism. Any portion of the berm outside of the limits of new fill would be trimmed back to conform to the new landside 3H:1V slope. Where the berm is fully incorporated, it would be stripped and trimmed as necessary to accommodate placement of new fill material around it. Existing drain pipes exiting the berm would be extended to daylight landward of the new levee landside toe.

Throughout Reaches 6 and 7, Sutter County infrastructure (Howsley Road and related features) and private residences are close to the NCC south levee. To avoid the infrastructure and residences, between Station 215+00 and 245+00 (central portion of Reach 6, from just west of State Route (SR) 70/99 to just east of SR 70/99), the levee would be raised waterward, encroaching on the NCC channel approximately 30 feet. Between Stations 245+00 and 279+50 (remaining portion of Reach 6), the levee would be raised on the landside, similar to Stations 54+00 through 215+00 (approximately the middle of Reach 2 to initial portion of Reach 6). Smooth transition distances of up to 200–500 feet would link the waterward and landward raises.

Vegetation would be removed from the waterside slope in all locations above the elevation corresponding with the projection of the landside levee toe on the waterside slope. Between Station 0+00 and 54+00 (Reach 1 through first half of Reach 2), where there is significant vegetation on the waterside slope above this elevation, the levee would be set back an additional fifteen feet to provide a "root-free" zone on the levee slope, and the vegetation would remain.

Removal of Structures

Relocation of Howsley Road, the Morrison Canal, a roadway drainage pump station, and three residences and outbuildings would be required by landward levee raises in Reaches 6 and 7. If hydraulic modeling indicates that unacceptable hydraulic impacts would not result from waterside levee raising in Reaches 6 and 7, only two structures in Reach 7 (a residence and a semimobile trailer) would require relocation as a result of the proposed levee improvements.

Utility Modifications and Miscellaneous Work

Pipelines penetrate the NCC south levee at four locations: Odysseus Farms (Bolen Ranch); NMWC waterside Bennett Pumping Plant; NMWC Northern Pumping Plant; and RD 1000's landside Pumping Plant No. 4. None of these penetrations comply with current Corps regulations; therefore, the pipelines would be raised to have their inverts above the 200-year water surface elevation and would be equipped with waterside shutoff valves. If pipes are corroded, they may have to be replaced down the waterside slope of the levee.

As part of raising the pump station discharge pipelines that cross the NCC south levee, canals south of the levee would need to be relocated farther from the levee toe in the following locations: the RD 1000 Vestal Drain and NMWC Bennett Canal between Station 55+50 and Station 61+50 (middle of Reach 2) and the NMWC North Main Canal between Station 120+00 and Station 123+50 (end of Reach 3 to beginning of Reach 4) and between Station 216+00 and 218+00 (Reach 6, just west of SR 70/99). The ditch segments would be moved about 100 feet farther away from the levee toe. Some of this work may be accomplished by NMWC as part of its American Basin Fish Screen Project, but the timing of this NMWC project is uncertain. If the work is not accomplished by NMWC, SAFCA would relocate the canals at the time that the pipelines are raised.

Between Station 0+00 and Station 19+00 (beginning of Reach 1 through first eighth of Reach 2) of the NCC south levee, SAFCA intends to obtain a landside levee maintenance access area to match the 80- to 100-foot wide maintenance access area already established for the levee. This area is currently in active rice fields. Once the maintenance access area is established, this area would be filled to be above the agricultural field grade to prevent encroachment by farming operations into the maintenance access area and to provide an operating road at the levee toe. Between Station 99+00 and Station 124+00 (end of Reach 2 through Reach 3), a low-lying area between the levee's landside toe and an operating road for the Lucich North Habitat Preserve would be filled to raise the grade of the operating road at the landside toe.

In 1996, as part of SAFCA's NCC and PGCC Levee Project, 200 feet of floodwall was installed to raise the NCC levee around the State Route (SR) 99/70 bridges over the NCC. The top of wall for this floodwall is at elevation 44.80 feet (National Geodetic Vertical Datum 29). To conform to current levee criteria, the floodwall would need to be raised to elevation 49.3 feet.

Construction Staging Areas and Postconstruction Site Condition

Construction staging would take place in areas adjacent to the NCC south levee, within the maintenance access areas between Stations 0+00 and 56+00, 61+00 and 96+50, 99+00 and 216+00, and 251+00 and 281+00. Cutoff wall construction would require temporary establishment of three on-site slurry batch plants that would occupy about 1–2 acres each. Each batch plant site would likely contain tanks for water storage, a pug mill mixer, bulk bag supplies of bentonite, bentonite and cement storage silos, cyclone mixers, pumps, and generators. The sites would also include slurry tanks to store the blended slurries temporarily until they are

pumped to the work sites. Slurry constituents would be mixed with water at the batch plant and the mixture would be pumped from the tanks through pipes to the cutoff wall construction work sites.

After construction, the levee slopes and any previously vegetated areas disturbed during construction, including staging areas, would be seeded with a grass mix.

Sacramento River East Levee Reaches 1–4B

Phase 2 of construction would begin in 2009 for the Sacramento River east levee, which includes an adjacent levee extending from the northern end of Reach 1 at the NCC south levee through Reach 4B (approximately Station 0+00 to Station 226+00). Also included in Phase 2 is: installation of cutoff wall in Reach 2 of the adjacent levee; construction of a 100-foot seepage berm in Reach 4A and 300-foot berm in Reach 4B; planting of woodlands in a corridor and fallow fields extending from the lower end of Reach 1 through portions of Reach 4A; and reconstruction of the intersections of Sankey Road and Riego Road with Garden Highway.

An adjacent setback levee is proposed in lieu of in-place modification of the existing Sacramento River east levee, which has substantial structural and vegetation encroachments along its water side. The adjacent-levee raise would involve the construction of a new embankment adjacent to the existing levee. A minimum 5-foot-wide shoulder would extend from the landside edge of the crown of the existing levee to the water side of the new adjacent setback levee embankment. A 3H:1V slope would extend up to the crown of the adjacent setback levee. The crown would be at least 20 feet wide and would be topped with an aggregate base access road for inspection and maintenance. The adjacent setback levee would have a 5H:1V landside slope, except for approximately 5,000 feet in Reaches 2 and 3, which would be 3H:V1. It would be constructed of compacted random fill material from borrow sources and from the excavation of the existing landside stability berm.

It is assumed that a main construction staging area for this phase would be located on approximately 5 acres near Riego Road. The area would be fenced and would be used for the contractor's and engineer's construction trailers, parking for personnel, machine maintenance tools and parts, possibly water trucks, and the storage of fuels and other materials to be used for construction. The project right-of-way along the construction area also would be used for staging of construction materials and equipment. Personnel, equipment, and imported materials would reach the project site via SR 99/70, Sankey Road, Riego Road, and Elverta Road. The primary corridors where construction activity would take place are the adjacent levee alignment and existing dirt roads used for access to the work areas; soil borrow areas; and paved roads, including Powerline, Sankey, and Riego Roads.

Improvements to Reaches 1–4B are anticipated to occur over one construction season, beginning in May 2009 and ending in October 2009. The primary construction activities are described below.

Site Preparation (Tree Removal, Clearing, Grubbing, and Stripping) - Site preparation would entail removing trees and other large vegetation from the construction area and stripping the top 6 inches of material from the landside slope of the existing levee, the footprint of the adjacent setback levee, the seepage berm areas, and the 50-foot-wide permanent maintenance access corridor. Large roots and deleterious material would then be grubbed from the working area. To the extent feasible, trees that must be removed from within the footprint of the adjacent setback levee or berms would be relocated outside of the footprint to new woodland planting areas, where a substantial number of new trees would also be planted. Excess earth materials (organic soils, roots, and grass from borrow areas and the adjacent levee foundation and excavated material that does not meet levee embankment criteria) would be used in the reclamation of borrow areas or hauled off-site to landfills. Cleared vegetation (i.e., trees, brush) would be hauled off-site to landfills.

Relocation of Irrigation Ditch - Odysseus Farms, located at the junction of the NCC south levee and Sacramento River east levee, maintains a private irrigation ditch that is situated within the proposed footprint of the adjacent setback levee. This private irrigation ditch is situated along the top of an existing berm in Reach 1 within the proposed footprint of the adjacent setback levee. Before filling of the existing ditch, a new ditch would be constructed in Reach 1 to serve irrigation needs for agricultural uses of the land along this reach. The new ditch would be constructed from Station 0+00 to Station 25+00 and would be elevated, similar to the existing canal, to allow for gravity flow southward from the NCC. The relocated ditch would cross under Sankey Road through a culvert and meet the existing canal lateral at Station 25+00. The existing ditch would be drained and any unsuitable material from the ditch bottom would be excavated and hauled off-site. To maintain irrigation system continuity, this relocation work would need to be implemented prior to May 1, 2009, as facilities begin operations prior to May and are continually in operation through the end of summer, thus presenting limited opportunities for relocation during the levee construction work window.

Removal of Landside Structures and Other Facilities - Residences and other farm structures that are within the proposed footprint of the adjacent setback levee embankment, berms, and maintenance areas at Station 35+00 in Reach 1 (house, barn, and shed) would have to be removed or relocated farther from the flood control facilities before the start of levee construction. Irrigation facility collection/distribution boxes, wells, and standpipes within the footprint of the flood control features would be demolished and replaced as needed. Debris from structure demolition, power poles, utility lines, piping, and other materials requiring disposal would be hauled off-site to a suitable landfill. As feasible, demolished concrete could be sent to a concrete recycling facility. Wells and septic systems would be abandoned in accordance with the applicable state and county requirements. Some utility poles would be relocated after October 1, 2008, after permit issuance; the removal of other landside structures and facilities would not occur until May of 2009.

Excavation of Stability Berm and Inspection Trench

The existing stability berm along the levee would be excavated and the soil and drain rock would be stockpiled for use in the construction of the adjacent setback levee. The geotextile fabric from

the drain layer would be discarded. A 3-foot-deep inspection trench would also be excavated along the foundation of the adjacent levee raise area after stripping has occurred. The purpose of this trench is to expose or intercept any undesirable underground features such as old drain tile, water or sewer lines, other debris, animal burrows, buried logs, or pockets of unsuitable material (e.g., sand lenses). After inspection, the trench would be backfilled and compacted as part of the embankment construction.

Construction of Adjacent Levee Raise and Cutoff Walls
Borrow material would be excavated from several locations in the project area and would be delivered to the levee construction sites by scrapers or haul trucks where it would be spread by motor graders and compacted by sheepsfoot rollers to build the adjacent levee up to a height equal to about two-thirds of the height of the existing levee. This would create a working platform for cutoff wall installation using an excavator with a long-stick boom capable of digging a trench to a maximum depth of approximately 80 feet. Bentonite slurry would be pumped into the trench during excavation to prevent caving. The soil excavated from the trench would be mixed with bentonite and backfilled into the trench to create the cutoff wall.

Reconstruction of Garden Highway at Intersections - The Garden Highway intersections at Sankey and Riego Roads would require reconstruction to accommodate the raised adjacent setback levee. It is anticipated that Garden Highway would be extended up and onto the widened adjacent levee at these locations to meet with the secondary roads. Approach embankments at the intersections would be enlarged and the entire intersections would be repaved. Intersecting roads would be raised at a slope of 15H:1V, extending the approach embankment approximately 350 feet outward from the levee. The side slopes of the raised embankments would be at a 3H:1V slope.

Installation of Surface Drainage Outlets across Garden Highway - Between the adjacent setback levee and the Garden Highway pavement, new storm drain facilities would be constructed to convey surface water beneath Garden Highway and toward the Sacramento River. A drainage swale collection system would convey runoff water to drop inlets located approximately 1,000 feet apart along an approximately 22,800-foot-long section of the improved levee, and new 12-inch diameter pipe laterals would convey the water beneath Garden Highway to the waterside slope berm. Excavation of a trench across Garden Highway and down the waterside levee slope would be required; those segments of Garden Highway where excavation occurs would have to be reconstructed. Single-lane traffic controls and through-traffic detours would be required during construction Phase 2. Drainage outlets would be located on the waterside levee berm, above the two-year ordinary high water mark. The construction of the drainage outlets entail the excavation of a 100 square foot area, of which the lower eighteen to twenty-four inches would be filled with a gravel/cobble mix, and the upper six to twelve inches would be an open depression. Water exiting the drainage outlets would settle in the depression, and then flow overland to the Sacramento River.

Site Restoration and Demobilization - Following construction, the levee slopes, seepage berms, maintenance access right-of-way, and any previously vegetated areas disturbed during

construction would be seeded with a grass mix. Any construction debris would be hauled to an appropriate waste facility. Equipment and materials would be removed from the site, and staging areas and any temporary access roads would be restored to preproject conditions. Demobilization would likely occur in various locations as construction proceeds along the project alignment.

Major Irrigation and Drainage Infrastructure Modifications

Elkhorn Canal - The Phase 2 construction plan would include the new Elkhorn Canal from the North Drainage Canal to Elkhorn Reservoir, between Reach 4B and Reach 6B. On the north end, the new canal would be connected with the existing Prichard Pumping Plant outfall and an outlet to the North Drainage Canal would be constructed. An outfall to provide for connection to RD 1000 Pumping Plant No. 2, during its construction in Phase 3, would be incorporated into the Phase 2 canal construction to minimize the need for future canal disturbance. The discharge pipes from the Prichard Pumping Plant would be extended to the relocated canal. The outlet to the North Drainage Canal would be combined with the GGS/Drainage Canal outfall with a gated control structure in the irrigation canal and a piped outlet to the North Drainage Canal.

At the southern end, the relocated Elkhorn Canal would connect into an earthen-lined sediment basin. The sedimentation basin would consist of a number of watered, earthen-bottomed chambers separated by weirs, which may be concrete or rock covered. The basins would have 3H:1V embankments that are 15-foot-wide at the top to provide maintenance equipment access. The total area of basins including the embankments is approximately 9.6 acres, with nearly 3.3 acres of water surface. The proposed sediment basin would be connected to Elkhorn Reservoir with a temporary pipe and outfall structure. During construction Phase 3 (see below), Elkhorn Reservoir would be dewatered and piping from the Elkhorn Pumping Plant would be extended to the new sediment basin, at which time the Elkhorn Reservoir sediment basin would be abandoned and filled.

The GGS/Drainage Canal would be constructed parallel to and within the same right-of way as the Elkhorn Canal. These features would be constructed concurrently to facilitate the use of excavated material from the GGS/Drainage Canal for use as embankment material along the Elkhorn Canal.

The primary construction stages for Elkhorn Canal are described in the subsections below.

Clearing and Grubbing/Stripping

Preparation for canal construction would entail using bulldozers/scrapers to clear and grub/strip the surface to a depth of 4–6 inches and remove low-growing vegetation and loose surface soils. Suitable materials removed during this stage could be stockpiled. Unsuitable material would be wasted and hauled off-site. The right-of-way for the canal that would need to be cleared (including the GGS/Drainage Canal right-of-way) is approximately 225 feet wide. Bulldozers/scrapers and front-end loaders would be used to excavate and move material. Water

trucks would be used to control dust and dump trucks would be used to haul unsuitable materials away.

This phase of construction would commence immediately after mobilization and would most likely occur in multiple sections of the Elkhorn Canal and GGS/Drainage Canal alignments simultaneously.

Pump Discharge Pipe Extension

Because the Elkhorn Canal would be relocated farther from NMWC pumping plants than the existing canal, additional pipe would need to be installed to maintain the connections between the pumping plants and the irrigation canals. In particular, discharge pipes would need to be extended at Prichard Pumping Plant and Elkhorn Pumping Plant. Pipes would be transported to the site on flatbed trucks. Excavators and backhoes would be used to dig the pipe trenches and lay the sections of welded steel pipe and backfill the trench. The trench would be deep enough to provide for a minimum of 12 inches of cover. A small compactor would be used to compact the soil over the pipe. The construction of pipelines at the existing Prichard Pumping Plant would occur during Phase 2 of construction, and at the Elkhorn Pumping Plant pipeline construction would occur during Phase 3 of construction.

Prichard Pumping Plant Connection

A new concrete transition structure would be constructed at the north end of the existing Elkhorn Canal to connect the existing Prichard outfall box culvert to the new Elkhorn Canal. Three reinforced concrete discharge pipes, two 36-inch and one 30-inch, approximately 600 feet in length, would be constructed in parallel from the new transition structure to the proposed distribution box located approximately 250 feet south of the western end of the North Drainage Canal. These pipes would connect the Prichard Pumping Plant outfall to the distribution box. From the distribution box, two 54-inch reinforced concrete discharge pipes, approximately 30 feet long, would connect the box to the new Elkhorn Canal.

The concrete distribution box footprint would be approximately 25 foot by 30 foot. A 60-inch discharge pipe stub and 48-inch intake pipe stub would be constructed on the north side of the distribution box. These stubs will provide for future connections of the distribution box to the North Drainage Canal and Pumping Plant No. 2.

Water Control Facility Construction

New facilities that would be constructed include distribution boxes, gate valves, cast-in-place concrete headwalls and control structures, culverts, and a proposed earthen-lined sediment basin adjacent to Elkhorn Reservoir. Backhoes and excavators would be used to excavate material for the new facilities. Precast distribution boxes, pipes, and other appurtenances would be transported to the site on flatbed trucks. Other concrete facilities would be poured in place and concrete would be transported to the site in ready-mix and boom concrete pumper trucks. Small compactors would be used to compact fill material around the facilities.

Embankment and Access Road Construction

The existing Elkhorn Canal is a highline canal, and construction of its replacement would require little or no excavation but a large amount of borrow material. The bottom of the new Elkhorn Canal channel would be approximately at existing ground level. During construction, borrow material would be required to build up the embankments of the new canal, which would be approximately 4 feet above the channel bottom with 3H:1V side slopes. Bulldozers and graders would be used to move and shape the embankment material, sheepsfoot and smooth drum rollers would be used to compact the embankment material, and water trucks would be used on-site for dust control and moisture conditioning.

Irrigation Interconnections

This phase includes work required to interconnect the relocated Elkhorn Canal with the existing irrigation canals within the Natomas Basin. Excavators and backhoes would be used to trench any connectors and motor graders would be used to shape the embankments. A water truck would be used to control dust and provide moisture conditioning during the excavation and construction of the interconnection facilities. Canal interconnections would be performed before the abandonment of the existing Elkhorn Canal.

Central Main Flume Connection

A second concrete distribution box would be constructed to connect the Elkhorn Canal to the Central Main Flume. The box will be located at the intersection of the Elkhorn Canal with the Central Main Flume with a footprint that is approximately 19 feet by 49 feet and will be tied into the existing concrete flume. Three 48-inch slide gates would be constructed on both the north and south ends of the box to connect the box to the Elkhorn Canal both north and south of the flume. A 6 foot by 6 foot reinforced concrete box culvert on the east end of the distribution box would connect to an outfall structure and the end of the flume.

Erosion Control

Erosion control measures would be installed before the start of construction and would be maintained throughout the construction period to prevent sedimentation of adjacent waterways. A hydroseeding truck would be used at the end of construction to seed any disturbed area. Water trucks would be used throughout the construction period to control dust in any disturbed areas.

Irrigation Canal Abandonment

As the newly constructed canal is completed and operable, the existing Elkhorn Canal would be abandoned. Irrigation flows would be rerouted to the new canal and the existing canal would be dewatered and abandoned. The filling of the abandoned Elkhorn Canal in Reach 4B would take place as part of Phase 2 of levee construction and in Reaches 5A to 6B would take place as part of the Phases 3 and 4 of levee construction. Portions of farm canals and other irrigation canals would be abandoned because of the relocation of the Elkhorn Canal. Such segments that are outside the footprint of the proposed levee improvements would be filled after the relocation of the Elkhorn Canal is completed. Dump trucks would be used to haul fill material to those canals, rollers would be used to compact the fill, and water trucks would be used for dust control.

Demobilization/Cleanup

This phase includes dismantling any temporary facilities, hauling away any leftover construction materials, and cleaning up the site. All disturbed areas would be reseeded and graded to drain. A front-end loader and dump trucks would be used to move materials. This phase of construction would also entail general cleanup and hauling away unused and waste materials. All construction equipment would be removed.

Scheduling for Phase 2 Construction of the Elkhorn Canal

The segment of the Elkhorn Canal from the Prichard Pumping Plant to the Elkhorn sedimentation basin would be constructed between May and October 2009. The segment of the Elkhorn Canal from the Central Main Flume to the Elkhorn sedimentation basin would be constructed between May and October 2009.

Phase 2 Construction on New GGS/Drainage Canal - The Phase 2 construction plan would include the construction of the GGS/Drainage Canal from the North Drainage Canal to the slough east of Elkhorn Reservoir, between Reach 4B and Reach 6B. The GGS/Drainage Canal and Elkhorn Canal would be parallel and separated by a 20-foot right-of-way access. The GGS/Drainage Canal would tie into the North Drainage Canal east of the proposed location of replacement RD 1000 Pumping Plant No. 2. Crossing of the Elkhorn Canal and tie-in to the North Drainage Canal are anticipated to be made via open, arching culverts (e.g., "Con-Arch" culverts) that allow the GGS/Drainage Canal to pass under the Elkhorn Canal and the access road on the south side of the North Drainage Canal without being confined to pipes.

Because portions of the GGS/Drainage Canal and the Elkhorn Canal would be constructed parallel within the same right-of way, they would be constructed concurrently during Phase 2 construction. This approach would facilitate the use of material from the GGS/Drainage Canal excavation for use as embankment material along the Elkhorn Canal. Construction of the GGS/Drainage Canal would include the same construction phases as described above for the Elkhorn Canal, with a few exceptions. The top of bank for the GGS/Drainage Canal would be approximately at existing ground level. During construction, a trench at least 6 feet deep and an average width of 55 feet would need to be excavated for the construction of the GGS/Drainage Canal. Reclamation would include planting tules on the sloped banks. Backhoes would be used to prepare the planting areas and a water truck would be used to control dust.

Removal of Culvert at Pumping Plant No. 2 Site - SAFCA would undertake a second phase of the levee repairs and facility removal adjacent to the RD 1000 Pumping Plant No. 2 site at the west end of the North Drainage Canal as part of the proposed project. This phase of work would include: (1) excavating and removing approximately 400 feet of the existing levee section adjacent to the Pumping Plant No. 2 site to expose a deep culvert and possible voids under the levee, (2) removing the deep culvert, (3) reconstructing the levee adjacent to the pumping plant sump with levee embankment fill, and (4) demolishing, removing, and relocating the pumping plant remnants within the project footprint. The last activity, reconstruction of the pumping plant, would be conducted in the 2009 construction phase and is described in the next subsection.

The project-related work would be confined to an area of approximately 2.3 acres. A stockpile and staging area of approximately 4.5 acres would be established near the work area.

Excavation limits would be extended to reconstruct the levee section adjacent to the sump and to reach areas where anomalies were identified during a geophysical investigation of the site. An area on the water side of the sheet pile wall would be excavated to lower the ground surface so as to reduce the loading on the sheet pile and excavation shoring system as the excavation takes place on the land side of the sheet piles. Excavated material would be stored on the site along the dewatered section of the North Drainage Canal, east of the abandoned sump, and in an adjacent agricultural field along the canal.

During excavation, the remnants of the pumping plant would be demolished and removed. This work includes relocation of a 36-inch irrigation supply pipe that is within the excavation limits. A temporary plastic fabric-lined ditch at the outfall of this pipe would also be relocated to provide for sufficient staging and stockpile areas. A short irrigation system 'outage' would be required to allow for relocation of the pipe and ditch.

Heavy equipment required for construction includes semi flatbed and/or box trucks to deliver equipment and materials; a crane to drive sheet pilings for additional shoring needs; dump trucks to haul debris, stockpile excavated levee material, and import select soil materials for levee reconstruction; two hydraulic excavators; two dozers for stripping and stockpiling material, a grader, water truck, and front-end loader for maintenance of haul roads and stockpiles; and a roller compactor for levee construction.

Habitat Enhancement, Development, and Management

Habitat enhancements and developments planned for Phase 2 of project construction include: the northern segments of the relocated Elkhorn Canal and the newly constructed GGS/Drainage Canal between the North Drainage Canal and Elkhorn Reservoir; the preservation and establishment of landside woodlands along the Sacramento River east levee; the creation of managed grasslands on the newly constructed levee slopes, seepage berms, access rights-of-ways, and canal embankments; and the preservation of rice land. Please refer to the Phase 2 MMP for a more complete summary of the conceptual strategy for creating/enhancing/preserving, protecting, and managing habitats in the Natomas Basin in perpetuity.

The proposed project would offset temporary and permanent effects to habitat of listed species through the creation, enhancement, and preservation of habitat in the basin. The construction of the Elkhorn Canal and GGS/Drainage Canal, including their management elements, are described above in more detail. Design and management elements for the managed grasslands, landside woodlands, and rice fields are summarized below.

Managed Grasslands

Levee Slopes and Seepage Berms - Levee improvements would result in landside slopes that are less steep than the existing slopes, and several reaches of the Sacramento River east levee would

have adjoining 80- to 300-foot-wide earthen seepage berms with a nearly flat slope (50H:1V or less). Parallel to the landside toe of enlarged levees and seepage berms would be maintenance access roads and seepage relief wells in some locations. Additional setback buffer lands would flank some of these features, and property acquisition for the proposed project may leave SAFCA with remnant portions of acquired parcels that are nonessential to flood control uses. With the exception of the crown of the levee, these areas would be managed as grassland. Most grassland would be mowed or grazed throughout the growing season, with an emphasis on mowing procedures and stubble height to optimize these areas for Swainson's hawk foraging habitat. However, the primary purpose and management priority of levees and seepage berms would continue to be flood risk reduction, for which RD 1000 has principal management and maintenance responsibility, and they would be maintained in accordance with Corps and Central Valley Flood Protection Board operations and maintenance requirements.

Canal Embankments - The side slopes of the new GGS/Drainage Canal and relocated Elkhorn and Riverside Canals would be flatter than typical canal slopes in the Natomas Basin and consistent (3H:1V), resulting in greatly reduced erosion and sedimentation. Vegetation on the banks could easily be mowed to a specified stubble height using cutter blades instead of the existing, high-disturbance practice of flail mowing or scraping vegetation from the banks and canal with a drag bucket. These improved canal maintenance practices would substantially reduce disturbance and incidental mortality of giant garter snakes that use bank and shoreline vegetation as cover and feeding habitat.

Landside Woodlands

Woodlands consisting of native riparian species would be planted east of the maintenance corridor along the Sacramento River east levee improvements. In Phase 2, tree and shrub species, including elderberry shrubs (*Sambucus mexicana*), would be planted on approximately 30 acres of existing cropland or fallow or currently unused sites. Groves would generally be at least 50-100 feet wide and several hundred feet long. Wide woodland corridors would promote successful nesting by a variety of native birds deeper within the grove canopy, where nest parasitism by crows, cowbirds, and starlings is less of a factor in breeding success. At maturity, stand structure would vary from closed canopy woodland to grassland savanna vegetation types.

Planting sites would require suitable soil conditions, water supply during a 3- to 5-year establishment phase, reduced risk of wildfire, and minimal depth to seasonally high groundwater or other natural water sources to sustain trees once irrigation ceases. A mixture of native riparian species would be planted, but predominant species would be Valley oak (*Quercus kelloggii*), the primary tree species that would be affected by the proposed improvements to the Sacramento River east levee, and cottonwood (*Populus fremontii*), which is a preferred nest tree for Swainson's hawks in the basin and is faster growing than Valley oak. Establishment of woody vegetation would likely require more than one technique, including seeding in winter, flood irrigation, drip or agricultural-scale spray heads, cuttings, and acorn planting.

Where trees would be removed from existing groves to make way for the proposed flood control system features, they would be transplanted in new locations, including newly planted groves, to

the extent feasible. The woodland planting areas would provide locations for transplanting any elderberry shrubs that would need to be moved from the proposed footprint of flood risk reduction improvements.

Rice Fields

Brookfield - The Brookfield property is a 353-acre private property that is located between Howsley Road and Fifield Road, west of the PGCC west levee. As of the summer of 2008, the property is currently in rice cultivation.

Up to 160 acres of the site may be utilized for borrow operations in Phase 2. After the completion of borrow excavation, the 160 acres would be returned to rice and at least ½ of the 353-acre site would be preserved in perpetuity. The removal of borrow material would entail excavating the site to a depth of up to approximately 6 feet, with an approximate net yield of 3.6 million cubic yards of soil from the site. One foot of topsoil would be removed and stockpiled for reuse during reclamation of the site. This borrow material would be used for levee improvements along the NCC south levee (construction Phase 2), PGCC west levee (construction Phase 3), and possibly the NEMDC west levee (construction Phase 4); however, no area of the property would be used in consecutive years. Following the removal of borrow material for the levee construction, the site would be graded and returned to rice cultivation.

Currently, the site is irrigated from on-site wells. To provide irrigation to the site following the excavation of borrow material, the irrigation canal along the south side of the site would be deepened and reconfigured from the Brookfield site westward to the culvert under SR 99/70. Additionally, a field irrigation ditch would be constructed within the Brookfield site to provide irrigation water from the adjacent highline canal to the fields. Grading of the site would be performed at a slope that would allow the water to flow back to the drainage canals running along the west and south side of the property. The water from the eastern fields would be drained into a canal along the west side of the pasture land and into the southern drainage canal. The drainage channel along the west and south side of the property would be modified to allow the site to drain following borrow excavation.

Modifications include widening all canals to an 8-foot bottom width with 3H:1V side slopes. Specific canal improvements could include modification of approximately 4,480 feet of the RD 1000 canal that borders the south end of the site, modification of 3,670 feet of the private north-south drainage ditch along the west edge of the property, creation of a 900-foot long drainage ditch along the west edge of the pasture lands, and modification of a 6,350 foot long section of the drainage canal along SR 99/70 from the RD 1000 canal south. Improvements of the drainage canal along SR 99/70 may require land acquisition of up to 25 acres to account for the additional width of the channel and flatter side slopes.

Reclamation of Other Borrow Sites

Borrow sites would provide material for Phase 2 flood control and irrigation infrastructure modifications. Following excavation of the borrow material, these sites would be reclaimed for postconstruction uses.

Airport North Borrow Sites - The Airport's north bufferlands have been historically farmed as rice fields and field crops. However, based on FAA requirements to reduce hazardous wildlife attractants near runways, the Airport has opted to not renew rice leases on its bufferlands. Thus, these lands are currently either fallow agricultural fields or ruderal grassland. After borrow activities, these sites would be returned to their current condition.

Cut depths for all the borrow sites would be approximately 4–6 feet. Following the excavation of the borrow sites, disturbed areas would be finish graded to standard irrigation slopes so that the sites would drain and not have any standing water in less than 10-year storm events. Excavated soils not used for borrow material, such as the organic surface layer or soils considered unsuitable for levee construction, would be stockpiled and respread on-site following excavation. Any unsuitable borrow material would be stockpiled on-site and graded back into the restoration of the site. Revegetation activities would include erosion control on excavated slopes (i.e., hydroseeding) and application of fertilizer.

Overview of Construction Phases 3 and 4

Table 2 summarizes the major elements of Phases 3 and 4 of the proposed project and the anticipated general timeframes in which the elements are expected to be implemented. Note that although seepage berms are depicted as the primary means of providing underseepage remediation along the Sacramento River east levee, the use of cutoff walls continues to be evaluated, and cutoff walls will likely be implemented instead of berms in several locations.

Levee Raising and Seepage Remediation

Sacramento River East Levee Reaches 5A–20A

Improvements to the Sacramento River east levee would continue in construction Phases 3 and 4, and would extend from Reach 5A (below Station 226+00) through Reach 20A (Station 925+50). It is anticipated that construction of improvements to the Sacramento River east levee would encompass Reaches 5A-9B in construction Phase 3 and Reaches 10-20A in construction Phase 4. The construction season is assumed to be mid-April – November for both construction phases. The following descriptions of design and construction of the improvements to the Sacramento River east levee proposed for construction Phases 3 and 4 are described in less detail than construction Phase 2 (improvements to the NCC south levee and Sacramento River east levee Reaches 1–4B) because they are not as far along in the project design process.

Table 2
Summary of the Major Elements of Phase 3 and 4

Project Element	Proposed Activity and Timing
Levee raising and seepage remediation: Sacramento River east levee (adjacent setback levee)	Construct an adjacent setback levee along Stations 55+00 to 68+00 in Reach 2 and from just south of the North Drainage Canal to the American River north levee (Reaches 5A–20B), raised where needed to provide adequate freeboard, with seepage berms, relief wells, and cutoff walls for seepage remediation as required (specific seepage remediation measures are still under study). (May 1, 2009–November 1, 2010)
Levee widening and flattening and seepage remediation: PGCC west levee	Widen the levee between Howsley Road and Sankey Road to allow for seepage remediation and flatten the levee on the water side to meet Corps criteria. Construct cutoff walls or seepage berms where required. (April–November 2009)
Levee widening and flattening and seepage remediation: NEMDC west levee	Widen levee and flatten slope between Elkhorn Blvd and NEMDC stormwater pumping station. (April–November 2009) Construct a seepage cutoff wall from NEMDC stormwater pumping station to Northgate Blvd where required. (April–November 2009)
Improvements to major irrigation and drainage infrastructure	Construct the new GGS/Drainage Canal between Elkhorn Reservoir and the West Drainage Canal, and improve the West Drainage Canal to provide enhanced giant garter snake habitat. (May 1–November 1, 2009) Implement Airport West Ditch improvements in connection with construction of the GGS/Drainage Canal to allow the Airport to decommission the agricultural irrigation function of this facility and eliminate the hazards currently associated with it. The Airport stormwater detention function provided by this ditch would continue. The ditch would therefore be recontoured as a gently sloping swale to facilitate periodic maintenance such as mowing. (May 1–November 1, 2009) Relocate the Riverside Canal and the Elkhorn Canal downstream of Elkhorn Reservoir (specific alignments to be determined) and fill the existing canals. (May 1–November 1, 2009, and May 1-November 1, 2010) Construct RD 1000 Pumping Plant No. 2. (April 1, 2009–September 1, 2010)
Habitat enhancement, creation and management	Establish habitat enhancements in the new GGS/Drainage Canal and improved West Drainage Canal. (Fall 2009) Recontour and create marsh and managed grassland on lands used as borrow sources. (Fall or spring after borrow excavation in 2009 and 2010) Establish grassland on the adjacent setback levee slopes and seepage berms. (Fall after construction in 2009 and 2010) Install woodland plantings to offset the loss of portions of tree groves in the landside levee footprint (locations to be determined). (Fall 2009 and 2010)
Additional actions to meet FEMA requirements: encroachment management on the Sacramento River east levee, and bridge crossing modifications at the NCC	Remove encroachments from a portion of the water side and land side of the Sacramento River east levee as needed to ensure that the levee can be certified as meeting the minimum requirements of the NFIP and Corps design criteria (specific criteria still under discussion). (Timing to be determined) Modify the SR 99/70 crossing of the NCC as needed to meet FEMA requirements. (Timing to be determined)
Right-of-way acquisition	Acquire right-of-way through fee title or easement interest within the footprint of the project features, at the borrow sites and along the flood control system. (Before construction)

Notes: Airport = Sacramento International Airport; Elkhorn Canal = Elkhorn Main Irrigation Canal; FEMA = Federal Emergency Mgmnt Agency; GGS = Giant Garter Snake; NCC = Natomas Cross Canal; NFIP = National Flood Insurance Program; PGCC = Pleasant Grove Creek Canal; RD = Reclamation District; Riverside Canal = Riverside Main Irrigation Canal; SR = State Rou Corps = U.S. Army Corps of Engineers

Required Freeboard Increases and Proposed Underseepage Remediation - Levee crown raises are required to provide adequate freeboard above the 100-year design water surface elevation in Reaches 5A–10 and above the 200-year design water surface elevation in Reaches 11A and 11B. Downstream of Reach 11B (Powerline Road), there is adequate freeboard above the 200-year design water surface elevation, and levee crown raises are not required. Substantial structural encroachments and large amounts of woody vegetation are present on the waterside slope of the existing levee, and the adjacent setback levee is proposed to extend through Reaches 5A–19A to avoid the need for extensive removal of the existing vegetation and encroachments on the waterside slope to meet Corps criteria. The existing levee in Reaches 19B–20B already has a wide crown, and extensive residential development is located along the landside levee toe; therefore, construction of the adjacent setback levee is not proposed for these reaches. The adjacent setback levee would extend outward at least 11 feet from the landside edge of the existing levee crown and would have a 3H:1V landside slope.

Underseepage remediation is required in many of the reaches from 5A through 20A. Reach 20B has sufficient freeboard for the 200-year water surface elevation and a cutoff wall (constructed by Corps in 2000) that meets current design criteria. Because this wall was constructed to an adequate depth, this reach does not need additional seepage remediation. Based on the results of geotechnical investigations, engineering and cost considerations, and land use constraints, cutoff walls are proposed for Reaches 5A–20A.

Removal of Landside Structures and Vegetation - Removal of some residences, other structures, and woodland vegetation, including mature trees, would be required to create ample space for the adjacent setback levee, berms, and maintenance access corridor. It is anticipated that residences would be removed at Station 62+00 in Reach 2, Station 245+00 in Reach 5A, Station 368+00 in Reach 8, Station 436+50 in Reach 9A, Station 468+00 in Reach 10, and at several locations along Reaches 15 through 18.

Miscellaneous Construction Elements and Postconstruction Site Condition - Modifications of roadway intersections with Garden Highway, utility relocations, removal of pumps and wells, and relocation of private canals would be similar to these activities as described for the improvements to Sacramento River east levee Reaches 1–4B. As described for Reaches 1–4B, after construction, the levee slopes, seepage berms, maintenance access right-of-way, and any previously vegetated areas disturbed during construction would be seeded with a grass mix.

Pleasant Grove Creek Canal West Levee

The PGCC west levee is vulnerable to seepage and has stability concerns. The proposed project includes improvements to 17,400 feet of the PGCC west levee, beginning at the east end of the NCC improvements at Howsley Road and extending southerly to Sankey Road. Construction is anticipated to proceed in Phases 3 and 4 on this component of the NLIP. Details of the proposed improvements will be developed based on additional geotechnical studies and cost analysis. The improvements are expected to consist of the following:

- widening of the levee to provide a minimum top width of 20 feet to accommodate safe lane widths for Natomas Road;
- flattening the water side of the levee to a 3H:1V slope;
- reconstructing the landside levee slope with new, select material to create a 3H:1V slope (the existing slope ranges from 2:1 to 2.5:1);
- from its intersection with Howsley Road and continuing one quarter mile south, raising the widened levee one to two-tenths of a foot to provide 3 feet of levee height on the 100-year design water surface profile; and
- constructing a SB cutoff wall through three separate reaches, totaling approximately 5,000 lineal feet, to coincide with areas where streams historically flowed east to west through the current PGCC alignment.

Irrigation and drainage canals at the landside toe of the existing levee would need to be relocated to the west to accommodate the berm construction. Several structures associated with the industrial facility near the southern end of the PGCC would need to be relocated.

The postproject site condition (grass-covered levee slopes and berms) and long-term maintenance practices would be as described above for the NCC south levee and Sacramento River east levee.

Natomas East Main Drainage Canal West Levee

The NEMDC west levee is vulnerable to seepage and has stability concerns. The proposed project includes improvements to the NEMDC west levee, beginning from Sankey Road south to Northgate Boulevard. Construction is anticipated to proceed in Phases 3 and 4 on this component of the NLIP. Details of the proposed improvements will be developed based on additional geotechnical studies and cost analysis. The improvements are expected to consist of the following:

- From the NEMDC pump station (between Elkhorn Boulevard and Del Paso Road) south to Northgate Boulevard, approximately 25,000 linear feet of cutoff wall is to be constructed to a depth of up to 80 feet from the levee crown. The existing maintenance easement on this stretch of the NEMDC will not accommodate levee reshaping or levee degrading beyond what is necessary to provide a minimum working platform for cutoff wall installation. Additionally, structures in close proximity of the landside levee toe make additional maintenance easement acquisition impractical. Where asphalt-concrete surfacing is present at the levee crown, it would be removed and disposed of off site. Following completion of the cutoff wall, the levee crown would be reconstructed and the operating road surface restored.

- North of the NEMDC pump station, to Elkhorn Boulevard, levee widening and slope flattening will occur similar to what is described for the PGCC west levee. These project components include:
  - widening of the levee to provide a minimum top width at least 20 feet to accommodate safe lane widths for Natomas and East Levee Roads;
  - flattening the water side of the levee to a 3H:1V slope; and
  - reconstructing the landside levee slope with new, select material to create a 3H:1V slope.

The postproject site condition and long-term maintenance practices would be as described above for the NCC south levee and Sacramento River east levee.

Major Irrigation and Drainage Infrastructure Modifications

Elkhorn and Riverside Canals

Construction Phases 3 and 4 would include the relocation of the remainder of the Elkhorn Canal (south of Elkhorn Reservoir) and the relocation of the Riverside Canal and would include the same construction phases as described for Phase 2. Timing of the new canal construction would be critical to avoid interruptions in irrigation service. The remainder of the relocated Elkhorn Canal, from Elkhorn Reservoir south, and the relocated Riverside Canal would be constructed before existing canals are filled in as part of the levee improvements in Reaches 6B–9A scheduled for construction Phase 3 and 12–20B scheduled for construction in Phase 4.

In addition to the general canal construction activities described for construction Phase 2, Elkhorn Reservoir would be dewatered and piping from the Elkhorn Pumping Plant would be extended to the new settling basin, at which time Elkhorn Reservoir would be abandoned and filled. The pipelines from the Elkhorn and Riverside Pumping Plants to the relocated irrigation canals would be constructed.

Phase 3 Construction of the New GGS/Drainage Canal

Phase 3 construction phase would include the construction of the GGS/Drainage Canal from north of Teal Bend Golf Course to the West Drainage Canal and improvements to the West Drainage Canal to enhance habitat value for giant garter snake. Because the GGS/Drainage Canal would be approximately 3.5–5.5 feet lower in elevation than the Elkhorn Canal, it would cross underneath the Elkhorn Canal, approximately 350 feet north of Elkhorn Reservoir, likely through a structure similar to that described above for the northern crossing. Reclamation would include planting tules on the sloped banks. In the portion of the canal below I-5, tules would be planted above the canal bench. Backhoes would be used to prepare the planting areas and a water truck would be used to control dust. A 2,850-foot-long section of the existing West Drainage Canal would include a 15-foot-wide managed tule bench, which would typically be inundated with water and drain into the main channel.

Removal of Airport West Ditch

As part of a safety survey conducted by the FAA for the Airport, the FAA expressed concern that the Airport West Ditch provides habitat for wildlife that potentially create a hazard to aircraft. The FAA recommended relocation of the ditch to alleviate the hazard. Additionally, a longstanding problem has existed with leakage from a 24-inch pipeline, resulting in marshy conditions along its route, approximately 11,000 feet between the intake structure and delivery point at the Airport pumps. During the past year the Airport began receiving all of its domestic (drinking) water supply from the City of Sacramento via a pipeline and storage tank project. Two of the on-Airport water wells previously used to provide domestic water were connected to the Airport's landscape irrigation piping system, and the water supply to the "leaky underground

pipe" was deactivated. All of the Airport's landscape irrigation needs are now provided on-site, and there is no need for the leaky pipe to remain in place. Irrigation water provided by NMWC still flows south through the Airport West Ditch, however, whereupon it is pumped to privately owned farms west of the Airport. The proposed project would include the construction of canal improvements to allow for decommissioning of the agricultural irrigation function of the ditch.

During storms, the Airport West Ditch receives stormwater runoff from a portion of the impervious surfaces on the west side of the Airport. Depending on the water volume, some of the stormwater is retained in the ditch until it can drain off-site to the Sacramento River. Therefore, the stormwater detention function of the Airport West Ditch must continue. In addition to the habitat-related safety issues, the ditch presents a physical obstruction hazard to planes that may leave the runway during adverse takeoff or landing situations. Therefore, the final stage of this project component would consist of regrading the Airport West Ditch to a gently sloping swale that can be easily maintained through mowing or other means. The more gradual gradient would also pose a lower threat to aircraft that may unexpectedly exit the runway.

To take advantage of common construction practices and to maximize the use of common facilities, the rearrangement of irrigation and drainage facilities required to provide for rerouting of flows that contribute to the Airport West Ditch would be accomplished along with the proposed NLIP improvements. The proposed GGS/ Drainage Canal would intercept many of the Airport West Ditch's off-site irrigation and drainage sources and reroute flows outside of the Airport Operations Area. The intent is to reroute year-round flows through the GGS/Drainage Canal. Additional irrigation infrastructure improvements required to reroute these flows would be implemented along with the GGS/Drainage Canal construction. Equipment that would be utilized in this reconfiguration includes excavators, loaders, compactors, dump trucks, water trucks, hydroseeding trucks, and generators.

Pumping Plant No. 2 Reconstruction and Relocation

Pumping Plant No. 2 would be reconstructed and relocated as part of the proposed project at the western end of the North Drainage Canal, approximately 900 feet east of the centerline of the levee in the vicinity of the intersection with the P6 Drain. Long discharge pipes would extend over the levee to the Sacramento River. The work is expected to take place in construction Phase 3. Two 42-inch steel discharge pipes, approximately 850 feet long, would connect the two 300-horsepower pumps from the pump station to a new concrete outfall structure in the Sacramento River. The new outfall structure would be constructed close to the location of the original Pumping Plant No. 2 outfall structure. Equipment required for construction of Pumping Plant No. 2 include an excavator, dozer, loader, crane, boom truck, pile driver, concrete pump, generator, and water truck.

Habitat Enhancement, Development, and Management

Habitat enhancements and developments planned for Phases 3 and 4 of project construction include: the southern segments of the relocated Elkhorn Canal and the newly constructed GGS/Drainage Canal between the Elkhorn Reservoir and the West Drainage Canal and the relocated Riverside Canal; additional establishment of landside woodlands along the Sacramento

River east levee; continued creation of managed grasslands on the newly constructed levee slopes, seepage berms, access rights-of-ways, and canal embankments; the creation of managed marsh in the southern areas of the basin; and preservation of additional rice and agricultural upland cropland. Similar to Phase 2, temporary and permanent effects to habitats of listed species that result from the implementation of Phases 3 and 4 would be offset through the creation, enhancement, and preservation of habitat in the basin.

Programmatic Biological Opinion Implementing Procedure

Because the Corps and SAFCA only have a detailed project description for Phase 2 of the entire Natomas Levee Improvement Project, this biological opinion analyzes the landscape effects of the project for all Phases (2, 3, and 4) but will only analyze and provide incidental take coverage for Phase 2. For each subsequent phase, the Corps will initiate section 7 consultation with the Service under the umbrella of this programmatic biological opinion. The following process will be used when implementing projects under this programmatic biological opinion:

1. The Corps will submit a letter requesting that the proposed phase be tiered to this programmatic biological opinion and provide the Service the following:
    a. Project maps, which includes reaches under construction, cover types within the construction/maintenance boundary.
    b. Project schedule.
    c. An inventory of any elderberry stems >1 inch diameter that are within 100 feet of project actions and the number of shrubs and stems that would be transplanted and when and where they would be transplanted.
    d. A description of how compensation measures from the preceding phase are being implemented and the schedule for completion of those measures.

2. The Service will review new information that may reveal effects not considered previously and review the information provided to determine whether the activities described under future Phases were programmatically analyzed in this document.

3. The Corps and SAFCA should involve the Service on Phase 3 and Phase 4 early in the process to allow the Service an opportunity to comment on project descriptions and expedite the completion of biological opinions for those phases.

Please refer to the October 9, 2008, biological opinion for the giant garter snake and valley elderberry longhorn beetle Status of the Species and Baseline.

Effects of the Proposed Action

Giant garter snake

Direct Effects

Overall Project

Land use changes due to SAFCA's project include the permanent loss of up to 395.75 acres of row and field crop including fallow fields (some of which was previously active rice), 65.52 acres of orchard, and 113.75 acres of rice. The project includes an increase of 46.42 acres of woodland, 521.79 acres of grassland, 93.71 acres of managed marsh, and 31.38 acres of canals.

Depending on how the grasslands are managed, the conversion of row crop and fallow agricultural fields to grassland could be beneficial to giant garter snakes. Agricultural areas typically have high levels of disturbance due to crop maintenance and harvesting activities. Mortality of snakes by farm equipment would be highly likely. Fallow agricultural fields may lack adequate cover for snakes and increase the risk of predation. Some of the grassland would be created on the slopes of the new levees and berms. While these grasslands would be subject to greater human disturbance than non-levee grasslands, due to maintenance requirements from the Corps, they would still suffer less disturbance than an active agricultural field. Flood control structures need to allow easy visual inspection from the top of the levee during the spring and fall. While RDs have varying ways of complying with this requirement, SAFCA is proposing to have RD 1000 mow levee slopes to a height which would allow for visual inspection but also be high enough to reduce the chance of coming into contact with a snake. The Corps also requires that the levee slopes receive rodent control measures to keep ground burrowing mammals from burrowing into the sides of the levee. This could include grouting ground squirrel holes closed, which would remove potential hibernacula for giant garter snakes in the winter months to using a rodenticide which would lessen the number of ground squirrels in the area.

Giant garter snakes are not typically found in orchards because of the high amount of overstory cover, therefore there would be a benefit to giant garter snake due to the loss of 65.52 acres of orchard habitat. However, SAFCA proposes to create an additional 46.42 acres of woodland to compensate for effects to Swainson's hawk nesting trees. It is unlikely that giant garter snakes will use dense woodland areas. Therefore, this represents a net loss of 19.10 acres of habitat that is unlikely to be used by giant garter snakes.

Because of the project, 65.50 acres of rice would be permanently converted to an upland habitat type. SAFCA has proposed to compensate for the loss of rice by creating 65.50 acres of managed marsh on 48 acres of existing rice fields and 18 acres of annual grassland/fallow crops/row and field crop near Fisherman's Lake. Overall, there would be a loss of 113.50 acres of rice from the Natomas Basin. Additionally, there will be a temporary loss of rice within the Natomas Basin due to borrow excavation from the Brookfield site. The Brookfield site would be used over two seasons with no one area being

out of production for more than one season. About 160 acres would be out of production and unavailable to giant garter snake during Phase 2 and a separate 190 acres would be out of production and unavailable to giant garter snake the next year during Phase 3. The loss of rice reduces the amount and availability of habitat, including summer water, for the snake. Due to the large amount of rice that has been fallowed in the Natomas Basin (37 percent loss of active rice between 2004 and 2007), any additional loss of rice, even for 1 season, has a direct effect on giant garter snakes. Flooded rice fields act as seasonal marshes and produce high numbers of prey species such as tadpoles, frogs and mosquitofish. Effects associated with reduced available summer water in the form of rice field habitat also include displacement of individual giant garter snakes from familiar habitat areas and result in giant garter snakes foraging over a wider area. Giant garter snakes may move to other areas of suitable habitat, but will encounter increased mortality from vehicles, exposure to temperature extremes, predation, and human disturbance while migrating to new areas. Migrating snakes or snakes using a larger foraging area may displace resident snakes or compete for food and shelter resources with resident snakes, resulting in reduced survivorship and fecundity of both resident and immigrant snakes.

Adverse effects from the reduction of rice fields may be greatest for gravid females, juveniles, and neonate snakes. Gravid females spend significant time basking in mid to late summer while incubating young, and thus may have reduced survivorship or fecundity if displaced from familiar retreats and basking sites (giant garter snakes are live bearers and contribute significant resources to brooding offspring). Abundant food resources are essential for females to both recover body mass after giving birth and to survive the overwintering period when the snakes do not forage and to the survival of juveniles and neonates. Giant garter snakes typically double their weight in the first year, with rapid growth likely necessary to reach a size class no longer susceptible to predation by non-native predatory fish and bullfrogs. The reduced availability of rice fields will result in less small prey for young snakes, which would inhibit growth, result in delayed sexual maturation and decreased births and recruitment of individuals into the population. This could potentially skew the age structure of the population to older giant garter snakes. Juveniles and neonates also rely on developing sufficient body mass prior to overwintering in order to survive long periods without foraging. Temporary or permanent loss of rice fields will not only remove habitat, but will also have adverse effects on reproduction, recruitment, and survival of the snake that will continue to affect giant garter snake populations well beyond the project time frame.

To offset the effects of the permanent loss of 113.50 acres of rice and the temporary effects to 350 acres of rice in the basin, SAFCA proposes to create 65.5 acres of managed marsh and permanently protect 175 acres of rice. Managed marsh has the capability to provide higher quality habitat for giant garter snakes because the habitat is available for the snake year round, will be subject to less human disturbance from farming activities, protected in perpetuity with a Conservation Easement, and will hold water for longer periods of time than a rice field typically does. Providing protection in perpetuity in the form of a Conservation Easement on 175 acres of rice fields would also benefit the snake because the

rice farming at this site would be managed by the TNBC and would assure more "snake-friendly" rice habitat than a typical rice field.

SAFCA proposes to affect 29.42 acres of irrigation and drainage canals that are vitally important for giant garter snakes both for foraging and movement within the basin. The loss of a canal within the basin even for a single season could have a large detrimental effect to giant garter snakes and their ability to access areas within the Natomas Basin for foraging and cover. The Elkhorn and Riverside Canals would be relocated away from the toe of the existing levee and moved between 400 to 800 feet away from their current location. To minimize any temporal loss of canal habitat for the giant garter snake, SAFCA has proposed to construct the replacement canal a year prior to filling the existing irrigation canals. This serves two purposes; to prevent an interruption in irrigation service and to allow vegetation to develop along the canal banks, which will provide cover for the giant garter snakes. About 54.94 acres of upland habitat is currently available to giant garter snakes along the Elkhorn and Riverside Canals. This area includes annual grassland/ruderal areas and excludes active row and field crops within 200 feet of the canals. While giant garter snakes can and do utilize upland habitat farther than 200 feet from aquatic habitat SAFCA will only be temporarily affecting habitat outside of this area through borrow excavation. Borrow activities near the irrigation canal relocations would be conducted primarily on active alfalfa fields. A small amount of orchard and fallowed agricultural lands would also be excavated for borrow. Giant garter snakes do not typically use alfalfa as upland habitat due to the high amount of disturbance through mowing and harvesting, though they may travel through them to reach aquatic habitat. Borrowing activities on the active and fallowed agricultural fields would temporarily affect the snakes by causing them to potentially have to travel longer distances to reach aquatic habitat; however this would only occur for one season and landuse on the borrow sites would return to current conditions. About 49.36 acres of upland habitat would be created adjacent to the relocated Elkhorn and Riverside Canals. Uplands along the Elkhorn and Riverside Canals would be vegetated with native perennial grasses.

Two sections of the Elkhorn Canal would be piped to avoid infrastructure. About 3,200 feet of canal would be piped near Teal Bend Golf Club and another 1,000 feet would be piped south of the golf club to avoid existing residences. Piping the irrigation canals for such long lengths would adversely affect connectivity. Given the lack of light, vegetation, and prey species that would be found within the pipes, giant garter snakes would most likely avoid using the pipes to reach up- or downstream aquatic habitat. Snakes, which may be using the newly constructed canals, may then have to travel over land to reach other aquatic habitat and will encounter increased mortality from vehicles, exposure to temperature extremes, predation, and human disturbance while migrating to new areas. To compensate for reducing connectivity by piping a large segment of the Elkhorn Canal, SAFCA is constructing the GGS/Drainage Canal, which will have a reliable source of water and run parallel to the Elkhorn Canal, though about 4,500 feet to the east.

SAFCA will be filling 19.27 acres of drainage ditches and marsh habitat. The majority of the acreage is due to the filling of the Airport West Drain. To compensate for the loss of habitat SAFCA has proposed to build the GGS/Drainage Canal and to compensate with 19.27 acres of managed marsh with a conservation easement near Fisherman's Lake. There are about 8.94 acres of upland habitat that is associated with the ditches and marsh. Because the aquatic features are going to be filled, this area will no longer serve the same function of adjacent upland habitat for the giant garter snake. SAFCA will be creating and preserving a small amount of upland habitat adjacent to the GGS/Drainage Canal and also creating 8.94 acres of managed marsh with a conservation easement near Fisherman's Lake. The GGS/Drainage Canal will be sloped to minimize maintenance and will have the side slopes planted with perennial grasses along the upper slope and rushes and sedges along the water's edge. The segment of the GGS/Drainage Canal, which would be built parallel to the Airport West Ditch, would be constructed in the same season as the Airport West Ditch will be filled. Unfortunately, this will not allow time for vegetation to become established on the banks and any snakes using the newly constructed GGS/Drainage canal would be subject to higher predation due to the lack of cover. SAFCA has proposed to create better aquatic canal habitat for giant garter snakes by assuring that the new GGS/Drainage Canal would have a minimum water depth of 4.5 feet between April and October, which is the active season for the giant garter snake.

SAFCA proposes to purchase long-term water contracts from NCMWC to provide water for both the managed marsh and GGS/Drainage Canal. While the Service expects the GGS/Drainage Canal to provide benefits to giant garter snakes in the Natomas Basin by offsetting the effects of their project, there is some concern regarding the long term protection of the canal because the project description does not provide a Conservation Easement on this feature. SAFCA has negotiated with the SCAS on an easement for the GGS/Drainage Canal where it crosses their property. The SCAS reserves the right to make changes to the canal should the Federal Aviation Administration require them to do so for purposes of aircraft safety. These changes to the canal could result in take of the giant garter snake. Should the SCAS make changes to the canal, they would still have to undergo consultation with the Service to analyze the effects of their project on federally listed species. Upon consulting with the Service and CDFG, the easement includes language that SCAS will compensate for any damages resulting from their actions to federally or state listed species through restoration or replacement of habitat. However, even with these provisions the easement does not provide the protection that is typically placed on compensation lands. SAFCA will be providing additional compensation lands at a 1:1 ratio of upland and aquatic habitat affected due to the filling of the Airport West Ditch in addition to creating the GGS/Drainage Canal. Therefore, SAFCA will create 28.21 acres of managed marsh near Fisherman's Lake with a conservation easement to compensate for 19.27 acres of aquatic habitat the majority of which is along the Airport West Ditch and 8.94 acres of upland habitat, which is suitable for giant garter snake and is associated with the aquatic features being affected.

Phase 2 Construction

Phase 2 construction includes work along the NCC and reaches 1-4B along the Sacramento River east levee. The Corps and SAFCA have proposed to complete the majority of the work during the active season of the giant garter snake (May 1 to October 1). Construction during this time would occur in 61.1 acres of developed land, 139.6 acres of annual grassland, 645.5 acres of row and field crop and fallow agriculture, 1.5 acres of orchard, 185 acres of rice (25 would be a permanent effect, 160 acres would be a temporary effect), 2 acres of canals and ditches, 22 acres of open water and other non-canal wetlands, and 10.3 acres of woodland. At the end of the construction season the proposed land cover types will be 53.5 acres of developed land, 30 acres of created woodland, 15.85 acres of preserved woodland, 168 acres of levee slope grassland, 123 acres of grassland on seepage berms and canal embankments, 19 acres of irrigation canal, 13.5 acres of GGS/Drainage Canal, and 175 acres of preserved rice. The newly created cover-types with the project would protected from future development through either a flood control easement, conservation easement, or drainage easement.

Phase 2 construction would primarily occur between May 1 and October 1. The only components of Phase 2 work which would occur outside of the giant garter snake's active season would be relocation of power poles, relocation of private irrigation pipelines, canals, and wells, and the removal, transplantation, and/or planting of trees and elderberry shrubs that are located in the Phase 2 footprint. To reduce the likelihood of disturbing or killing a giant garter snake that may be overwintering in uplands that would be affected this winter, SAFCA has proposed to erect exclusionary fencing around the areas where they would be working prior to October 1. This fence would be monitored daily prior to and during construction to insure that there are no breaches that a snake could get through. This should remove the chance that project construction would kill giant garter snakes when they are working in the winter months.

The remainder of the project would be constructed during the active period (May 1 – October 1) for the snake, resulting in a decreased risk of direct mortality of snakes. However, given the number of acres of aquatic and upland giant garter snake habitat affected within Phase 2, it is highly likely effects to snakes would include removal of cover and basking sites, filling or crushing of burrows or crevices, obstructing snake movement, and decreasing the prey base, and may result in the direct disturbance, displacement, injury, and/or mortality of snakes. Snakes may disperse across or may bask on existing roads, and thus may be killed or injured by construction equipment or other vehicles accessing the project site.

Compensation for the loss of rice in Phase 2 would occur during Phase 4 with the creation of 65.50 acres of managed marsh along the western boundary of Fisherman's Lake. The creation of managed marsh at this location would connect to existing TNBC Preserve lands which currently are in managed marsh which would enlarge a core area for giant garter snakes in the Natomas Basin. While the Service recognizes the benefit of enlarging managed marsh within the Fisherman's Lake area, there would be a temporal loss of aquatic habitat for giant garter snake between when rice is converted to upland in Phase 2 and when marsh is created in Phase 4. If for some reason the Corps and SAFCA either do not complete all the project phases or do not

provide the 65.50 acres of managed marsh in 2011, then they would have to reinitiate consultation with the Service as outlined on page 79 of this biological opinion.

Within the construction of Phase 2, SAFCA has proposed to create canal habitat in advance of canal that would be filled in Phase 3. This helps to offset effects due to the filling of canal which would be a loss of aquatic habitat for snakes, by allowing the new canals to become established in advance and also allow vegetation to begin to grow along the banks, which would provide cover from predation for the giant garter snake.

Valley Elderberry Longhorn Beetle

Effects to the valley elderberry longhorn beetle may occur with the transplantation of elderberry shrubs outside of the footprint of the levee enlargement. Loss of an elderberry shrub or even a stem can result in direct mortality of valley elderberry longhorn beetles or affect valley elderberry longhorn breeding and feeding because adult beetles rely solely on elderberry flowers for food and must lay their eggs on elderberry stems to successfully reproduce.

All three phases of the project have potential to affect about 40 elderberry shrubs through transplantation. This action will adversely affect the valley elderberry longhorn beetle. Any beetle larvae occupying these plants are likely to be killed when the plants are removed. An additional number of elderberry shrubs would remain where they currently are however, construction work would occur within 100 feet but no closer than 20 feet from the dripline of an elderberry shrub.

Temporal loss of habitat will occur. Although mitigation for impacts on the beetle involve creation or restoration of habitat, it generally takes five or more years for elderberry plants to become large enough to support beetles, and it generally takes 25 years or longer for riparian habitats to reach their full value (USFWS 1994). Temporal loss of habitat will temporarily reduce the amount of habitat available to beetles and may cause fragmentation of habitat and isolation of subpopulations. In cases where the proposed project will reduce the canopy closure of riparian forests, an edge effect is created that could result in reduced habitat quality for the beetles. Beetles disperse poorly and the systematic removal of elderberry shrubs from a relatively connected river corridor has adverse effects well outside of the project's footprint.

Proposed avoidance and minimization measures should minimize adverse effects resulting from elderberry stem trimming or elderberry transplantation.

Effects of Phase 2 Construction to Valley Elderberry Longhorn Beetle

Table 3 lists the elderberry shrub stem counts and sizes which would be transplanted as part of the Phase 2 construction. Effects to the valley elderberry longhorn beetle due to transplantation of these shrubs are described above. Elderberry shrubs would be transplanted and elderberry seedlings and associated natives would be planted at one of the following properties: Rio Ramaza, Cummings, or Lasuevic.

Table 3. Elderberry Stem Sizes and Compensation

Location	Stems (maximum diameter at ground level)	Exit Hole on Shrub (Yes or No)	Elderberry Seedling Ratio	Associated Native Plant Ratio	Number of Stems Observed	Required Elderberry Plantings	Required Associated Native Plant Plantings
Riparian	stems ≥1" & ≤3"	No	2:1	1:1	33	66	66
		Yes	4:1	2:1	57	228	456
Riparian	stems > 3" & <5"	No	3:1	1:1	16	48	48
		Yes	6:1	2:1	13	78	156
Riparian	stems > 5"	No	4:1	1:1	16	64	64
		Yes	8:1	2:1	16	128	256
Non-riparian	stems ≥1" & ≤3"	No	1:1	1:1	23	23	23
		Yes	2:1	2:1	5	10	20
Non-riparian	stems > 3" & <5"	No	2:1	1:1	8	16	16
		Yes	4:1	2:1	2	8	16
Non-riparian	stems > 5"	No	3:1	1:1	2	6	6
		Yes	6:1	2:1	1	6	12
Total replacement plantings						681	1,139
Total Elderberry shrubs to be transplanted						23	
1,820 /10 = 182 valley elderberry longhorn beetle credits or 7.52 acres							

Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local, or private actions affecting listed species that are reasonably certain to occur in the area considered in this biological opinion. Future Federal actions not related to this proposed action are not considered in determining the cumulative effects, but are subject to separate consultation requirements pursuant to section 7 of the Act.

The effectiveness of the NBHCP's OCS relies on the City of Sacramento and Sutter County limiting development to a combined total of 15, 517 acres within their respective permit areas. The proposed project site is located outside the permitted development area, and SAFCA is not a permittee under the NBHCP; however, the plan assumes no significant new development in the basin outside of the City of Sacramento and Sutter County permit areas. The NBHCP outlines a carefully constructed OCS that balances reasonable development in the Basin with conservation of snake habitat in order to maintain a viable population of giant garter snakes in the basin and avoid jeopardy to this threatened species. The NBHCP and MAPHCP allow for urban development of certain areas (totaling up to 17,500 acres) in the Basin in return for the preservation of, and in some cases, restoration and management of 8,725 acres, in an interconnected preserve system, which when added to the baseline of agricultural and undeveloped lands in the basin, will

conserve the Natomas Basin snake population. While the proposed project does not increase the number of developed acres beyond the 17,500 contemplated under the NBHCP and MAPHCP, it does change (in some cases, permanently) habitat types from one type to another. Loss of habitat, which the 22 covered species of the NBHCPs may use, include 395.75 acres of row and field crop, 65.52 acres of orchard, and 113.75 acres of rice. Increases in the following habitat types would occur with the project: 46.42 acres of woodland, 521.79 acres of grassland, 93.71 acres of managed marsh, and 31.38 acres of canal. While there would be a change in habitat types within the basin, the NBHCP covered species would still be able to use the habitats that SAFCA's project would be creating and development would be precluded from these areas through conservation easements, flood control easements, and drainage easements.

While SAFCA is not a signatory to the NBHCP, the plan sets forth a regional conservation strategy that covers the entire basin. The NBHCP's efficacy in maintaining a viable population of giant garter snake in the Basin depends, in significant part, on the retention of a sufficient amount of undeveloped acreage throughout the Basin, to support giant garter snake.[1] The NBHCP operates under the assumption that agricultural land in the Basin would continuously rotate between crop types, and therefore all land provides habitat for all 22 of the NBHCP covered species, including the giant garter snake.

SAFCA's proposed project will directly affect existing land that has been preserved as mitigation for either the NBHCP or MAPHCP. During Phase 2 of the project, 1.63 acres of fallow row and grain crop would be affected at the Atkinson Preserve and 4.09 acres of alfalfa and 5.72 acres of wheat would be affected at the Huffman West Preserve. During Phase 4 of the project, 1.98 acres of alfalfa, 0.05 acre of developed, 0.83 acre of ruderal, and 0.48 acre of valley oak woodland would be affected at the Alleghany 50 Preserve and 0.044 acre of valley oak woodland and 0.00034 acre of riparian scrub would be affected at the Cummings Preserve. These areas would be replaced with levee slope covered in grassland. As provided for in the NBHCP (IV.C.2.c.(1)) SAFCA shall "pay for the value of replacing every acre of reserve land impacted." To accomplish this SAFCA has proposed to acquire existing TNBC land not currently dedicated to mitigation to offset acre-per-acre losses. This existing TNBC land would consist of rice, not the upland habitat types affected. SAFCA will fund the perpetual maintenance, monitoring, and enhancement of these preserves for the benefit of the covered species. Because this land is currently and will be maintained in rice, this will benefit the giant garter snake.

Creating connectivity between the preserve lands is a primary goal of the NBHCP. The NBHCP references the irrigation and drainage canals as a means of connecting preserve lands. SAFCA will be replacing any canals, which they affect during construction on the levees with the exception of the areas which would be piped to avoid the golf course or

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1 In NWF v. Norton, 2005 U.S. Dist LEXIS 33768, Judge Levi upheld the NBHCP and its strategy to protect the GGS in the Natomas Basin. However, in footnote 13 of the opinion, he cautioned that,"the Service and those seeking an ITP in the future will face an uphill battle if they attempt to argue that additional development in the basin beyond the 17,500 acres will not result in jeopardy" to the snake.

residences. Relocated irrigation canals will still be accessible via lateral canals, which run to the surrounding row and field crops, however, it is likely that summer water availability in those areas is not consistent. SAFCA will be building the GGS/Drainage Canal, which will connect the North Drainage Canal to the West Drainage Canal, which eventually empties into Fisherman's Lake. Water will be maintained in the canal during the giant garter snakes' active season (April to October). Unfortunately, the north/south aquatic connection will travel about 8 miles through a landscape of primarily row and field crop and annual grassland with no rice agriculture. While there has not been a study of giant garter snake use of canals with varying surrounding landuses, previous studies have found increased detection of giant garter snakes in canals which are immediately adjacent to rice or managed marsh versus canals which are surrounded by upland habitat (Wylie *et al.* 2002b, 2004b). While the possibility exists for a random snake to travel up or down the GGS/Drainage Canal between the northern preserves and the Fisherman's Lake preserves, without "way stations" of rice or managed marsh spread out along the aquatic corridor to provide cover and prey items, it is highly unlikely that this corridor would provide genetic exchange between the two preserve areas.

In December 2008, FEMA will issue a new flood map for the Natomas Basin. This would place all of Natomas into the AE zone, which would require that builders place the bottom floor of new construction up to 20 feet above ground level to keep it out of the floodplain. This would effectively stop new construction in Natomas. While not directly growth-facilitating, the proposed project would serve planned and reasonably foreseeable growth by providing flood protection to the Natomas Basin which is currently an impediment to future growth (planned or otherwise) in the Natomas Basin. It is likely that some of the growth (commercial, municipal, and residential) in the Natomas Basin will not require section 7 consultation with the Service for compliance with the Act, and will not obtain take coverage pursuant to section 10 of the Act. Currently, the NBHCP and the East Contra Costa HCP are the only two permitted regional HCPs in the Sacramento area, although Placer, Yolo, South Sacramento, Yuba, and Sutter are all developing regional HCPs. Until these regional HCPs are finalized, there is no mechanism to provide "take" coverage for projects with no Federal nexus besides these projects pursuing their own individual HCPs. Some "take" of listed species is likely to occur for which no minimization, avoidance, and compensation/mitigation measures for federally-listed species are implemented.

SAFCA, the Corps, the city of Sacramento, Sacramento County, and Sutter County should understand that future development within the Natomas Basin could negatively affect the NBHCP and MAPHCP and potentially jeopardize the giant garter snake in the Natomas Basin. Any additional "take" of listed species outside what has been analyzed in this biological opinion or the NBHCP and MAPHCP cannot occur without appropriate permits or consultations with the Service and CDFG.

The cumulative effects of reasonable foreseeable projects in the Natomas Basin may pose a significant threat to the eventual recovery of the giant garter snake. The following proposed

projects could significantly affect the sustainability of giant garter snakes in the Natomas Basin when considered cumulatively with the proposed Natomas Levee Improvement Project:

- The proposed Greenbriar residential development is located on an approximately 577-acre site south of Elkhorn Boulevard and west of State Highway 99. Development on this site could result in the loss of giant garter snake habitat adjacent to Lone Tree Canal, depending on the configuration of houses and infrastructure.
- Natomas Joint Vision, as currently proposed by the City of Sacramento and Sacramento County, is to develop approximately 6,000 acres in the area of the County outside of the City's permitted area under the NBHCP.
- Sacramento International Airport's Master Plan would enlarge the airport on land currently owned by the airport and would occur through 2020. Much of the land slated for airport expansion is currently in agricultural production.

Other projects which are reasonably foreseeable and should be considered cumulative with the proposed project, but for which the Service has little to no information about the extent of their effects to giant garter snakes, include:

- Camino Norte
- Downtown Natomas Airport Light Rail
- Pacific Gas & Electric Line 406/407 Pipeline
- Sacramento Municipal Utility District Powerline – Elkhorn Substation
- Sutter Pointe Specific Plan

Conclusion

After reviewing the current status of the giant garter snake and valley elderberry longhorn beetle, the environmental baseline for the species, the effects of the proposed project, and the cumulative effects on this species, it is the Service's biological opinion that the proposed Natomas Landside Improvements Project, as described herein, is not likely to jeopardize the continued existence of the giant garter snake or valley elderberry longhorn beetle. The project is outside of critical habitat for the valley elderberry longhorn beetle and critical habitat has not been designated for the giant garter snake, therefore there is no affect to critical habitat as a result of this project.

The Corps and SAFCA have proposed to improve flood protection for the Natomas Basin above what currently exists. Two HCPs currently exist within the Natomas Basin and are based on future development occurring within the permit area of the MAPHCP and NBHCP. The baselines and assumptions for which these HCPs were developed were based on no additional development occurring within the basin outside of these permit areas and no change in landuse practices. Sacramento County and the City of Sacramento are already proposing additional development outside of the existing permit areas. Additionally, the Natomas Basin has experienced a large amount of rice fallowing both in land held by private farmers and leases terminated on Sacramento County Airport property. While the Service has concluded that

SAFCA's project would not jeopardize the giant garter snake or valley elderberry longhorn beetle, it does facilitate growth within the Natomas Basin, which would require additional analysis to determine if this growth could jeopardize any of the 22 species covered by the MAPHCP and NBHCP. If growth outside of the permit areas were to occur within the Natomas Basin, these future projects must have a higher conservation outcome than currently exists in the HCPs and must be closely coordinated with the Service.

INCIDENTAL TAKE STATEMENT FOR PHASE 2 CONSTRUCTION

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering. Harm is defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by impairing behavioral patterns including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act, provided that such taking is in compliance with this Incidental Take Statement.

The measures described below are nondiscretionary for listed species in Phase 2 of this opinion and must be implemented by the Corps in order for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity that is covered by this incidental take statement. If the Federal agency (1) fails to adhere to the terms and conditions of the incidental take statement, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

Amount or Extent of Take

Giant Garter Snake

The Service anticipates that incidental take of the snake will be difficult to detect or quantify for the following reasons: giant garter snakes are cryptically colored, secretive, and known to be sensitive to human activities. Snakes may avoid detection by retreating to burrows, soil crevices, vegetation, or other cover. Individual snakes are difficult to detect unless they are observed, undisturbed, at a distance. Most close-range observations represent chance encounters that are difficult to predict. It is not possible to make an accurate estimate of the number of snakes that will be harassed, harmed or killed during Phase 2 construction activities (staging areas, work on canal banks, soil borrow areas, and vehicle traffic to and from borrow areas). In instances when take is difficult to detect, the Service may estimate take in numbers of species per acre of habitat

lost or affected as a result of the action. Therefore, the Service anticipates that all giant garter snakes inhabiting 187 acres of aquatic and 818.9 acres of upland habitat may be harassed, harmed, or 2 giant garter snakes killed by loss and destruction of habitat, as a result of the project.

Valley Elderberry Longhorn Beetle

The Service expects that incidental take of the valley elderberry longhorn beetle will be difficult to detect or quantify. The cryptic nature of these species and their relatively small body size make the finding of an injured or dead specimen unlikely. The species occurs in habitats that make them difficult to detect. Due to the difficulty in quantifying the number of beetles that will be taken as a result of the proposed action, the Service is quantifying take incidental to the project as the number of elderberry stems one inch or greater in diameter at ground level (beetle habitat) that will become unsuitable for beetles due to direct or indirect effects as a result of Phase 2 construction. Therefore, the Service estimates take incidental to the project as death, injury, harassment, and harm of all beetles inhabiting the 23 elderberry plants containing stems 1 inch or greater at ground level (118 stems between 1-3 inches, 39 stems between 3 and 5 inches and 35 stems $\geq$5 inches; see Table 3 in the text).

Effect of the Take

The Service has determined that this level of anticipated take is not likely to result in jeopardy to the giant garter snake, or valley elderberry longhorn beetle, and will not result in the destruction or adverse modification of designated critical habitat because in the case of the giant garter snake critical habitat has not been designated and it is outside of the critical habitat for valley elderberry longhorn beetle.

Reasonable and Prudent Measures

The following reasonable and prudent measures are necessary and appropriate to minimize the effect of the proposed project on the giant garter snake and valley elderberry longhorn beetle.

1. The Corps and SAFCA shall implement the project as proposed in the biological assessment and this biological opinion.

2. Effects of harassment of individual giant garter snakes within the proposed project, and of the loss or degradation of the species' habitat shall be minimized.

3. Effects of harassment of individual valley elderberry longhorn beetle, and of the loss and degradation of the species' habitat shall be minimized.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Corps must ensure compliance with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are nondiscretionary.

1. The following terms and conditions implement reasonable and prudent measure one (1):

    a. The Corps and SAFCA shall minimize the potential for incidental take of the giant garter snake and valley elderberry longhorn beetle resulting from the project related activities by implementation of the project description as described in the biological assessment and the project description of this biological opinion.

    b. If requested, before, during, or upon completion of ground-breaking and construction activities, the project proponents shall allow access by Service and/or California Department of Fish and Game personnel to the project site to inspect project effects to the snake and valley elderberry longhorn beetle.

    c. A Service approved Worker Environmental Awareness Training Program for construction personnel shall be conducted by a Service-approved biologist for all construction workers prior to the commencement of construction activities. The program shall provide workers with information on their responsibilities with regard to the giant garter snake and valley elderberry longhorn beetle, an overview of the life-history of the species, information on take prohibitions, and protections afforded the species under the Act. Written documentation of the training must be submitted to the Sacramento Fish and Wildlife Office within 30 days of the completion of training. As needed, training shall be conducted in Spanish for Spanish language speakers and other languages as needed or necessary.

    d. The applicants shall include a copy of this biological opinion within its solicitations for design and construction of the proposed project making the primary contractor responsible for implementing all requirements and obligations included within the biological opinion, and to educate and inform all other contractors involved in the project as to the requirements of the biological opinion.

2. The following terms and conditions implement reasonable and prudent measure two (2):

    a. The project proponents shall minimize the potential for harm or harassment of the snake resulting from project-related activities by implementation of the conservation measures as described in the Corps' Biological Assessment and appearing in the project description (pages 3-44) of this biological opinion.

    b. At least 30 calendar days prior to initiating construction activities, the project proponents shall submit the names and curriculum vitae of the biological

monitor(s) for the proposed project. Monitors shall have the ability to differentiate giant garter snakes from other snakes and the authority to stop construction activities if a snake is encountered during construction until appropriate corrective measures have been completed or until the snake is determined to be unharmed.

c. For Phase 2 work which would occur outside of the giant garter snake active window (power pole relocations and private irrigation canal relocation) exclusion fencing would be placed around upland areas that giant garter snakes could use to overwinter. The exclusionary fencing would be monitored everyday prior to and during construction to ensure that openings do not develop that would allow the entry of a giant garter snake into the construction area.

d. Construction activity shall be conducted between May 1 and October 1. This is the active period for the snake and direct mortality is lessened, because snakes are expected to actively move and avoid danger. If it appears that construction activity may go beyond October 1, the project proponents shall contact the Service as soon as possible, but not later than July 15 of the year in question, to determine if additional measures are necessary to minimize take.

e. The project proponents shall implement Best Management Practices to prevent sediment from entering areas containing snake habitat, including, but not limited to, silt fencing, temporary berms, no cleaning of equipment in or near snake habitat, installation of vegetative strips, and temporary sediment disposal.

f. Runoff from dust control and oil and other chemicals used in other construction activities shall be retained in the construction site and prevented from flowing into areas containing snake habitat. The runoff shall be retained in the construction areas by creating small earthen berms, installing silt fences or hay-bale dikes, or implementing other measures on the construction site to prevent runoff from entering the habitat of the snake.

g. Project-related vehicles shall observe a 20-mile-per-hour speed limit within construction areas, except on County roads and State and Federal highways. This is particularly important during periods when the snake may be sunning or moving on roadways.

h. To avoid attracting snake predators, all trash items, such as wrappers, cans, bottles, and food scraps, must be disposed of in closed containers and removed at least once a day from the entire project site.

i. Within 24-hours prior to the commencement of construction activities, the site shall be inspected by a Service-approved biologist. The biologist will provide the Service with a written report that adequately documents the monitoring efforts

within 24-hours of commencement of construction activities. Snakes encountered during construction activities shall be allowed to move away from the area on their own volition. The biologist shall notify the Service immediately if any listed species are found on-site, and will submit a report, including date(s), location(s), habitat description, and any corrective measures taken to protect the species found. The biologist shall be required to report any take to the Service immediately by telephone at (916) 414-6600 and by electronic mail or written letter addressed to the Deputy Assistant Field Supervisor, within one (1) working day of the incident. The project area shall be re-inspected by the monitoring biologist whenever a lapse in construction activity of two weeks or greater has occurred.

j. Erosion control structures will be installed concurrently with construction. Erosion control structures will be constructed so runoff will be directed away from sensitive habitats. Tightly woven fiber netting (mesh size less than 0.25 inch) or similar material shall be used for erosion control or other purposes at the project site to ensure giant garter snakes and other reptiles or amphibians are not trapped by the erosion control material. This limitation will be communicated to the contractor through use of Special Provisions included in the bid solicitation package. Coconut coir matting is an acceptable erosion control material. No plastic mono-filament matting shall be used for erosion control. The edge of the material shall be buried in the ground to prevent giant garter snakes and other reptiles and amphibians from crawling underneath the material. Erosion control measures shall direct water flow into existing drainages or disperse water across vegetated areas in order to avoid concentrating water.

k. Movement of heavy equipment to and from the project site shall be restricted to established roadways to minimize habitat disturbance. Stockpiling of construction materials, including portable equipment, vehicles, and supplies, shall be restricted to the designated construction staging area and exclusive of aquatic habitat avoidance areas. Aquatic snake habitat adjacent to the project area shall be flagged and avoided by all construction personnel.

l. To the extent feasible, the project proponents shall confine clearing of vegetation and scraping, or digging, of soil to the minimal area necessary to facilitate construction activities.

m. High visibility fencing shall be placed to prevent encroachment of construction personnel and equipment into areas containing snake habitat. The fencing shall be inspected before the start of each work day and maintained by the project proponents until completion of the project. The fencing may be removed only when the construction of the project is completed.

n. After completion of construction activities, any temporary fill and construction debris shall be removed. As described in the biological assessment and the project description of this biological opinion, the project proponents will restore all snake habitat subject to temporary ground disturbances, including storage and staging areas and temporary roads. These areas shall be re-contoured, if appropriate, and re-vegetated with appropriate locally-collected native plant species to promote restoration of the area to pre-project conditions. All temporary fill and construction debris shall be removed. An area subject to "temporary" disturbance includes any area that is disturbed during the project, but that, after project completion, will not be subject to further disturbance and has the potential to be re-vegetated. Appropriate methods and plant species used to re-vegetate such areas will be determined on a site-specific basis in consultation with the Service and the CDFG. Restoration work may include replanting emergent vegetation. Refer to the Service's *Guidelines for the Restoration and/or Replacement of Giant Garter Snake Habitat.* A written report shall be submitted to the Service within ten (10) working days of the completion of construction at the project site.

o. The Corps and SAFCA shall ensure compliance with the reporting requirements.

p. Prior to construction on May 1, 2009, the Corps and SAFCA will have the following documents completed and approved by the Service:

- drainage easement language for the GGS/Drainage Canal;
- Mitigation and Monitoring Plan and Long-Term Management Plan;
- encumbrances on a portion of the District Assessment Fee; and
- contract with NCMWC to provide reliable water for the GGS/Drainage Canal and managed marsh.

3. The following terms and conditions implement reasonable and prudent measure three (3):

a. The procedures outlined in the Service's *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* dated July 9, 1999, shall be followed for all actions related to the proposed project.

b. Elderberry shrubs will be fenced with high visibility construction fencing. In areas where the typical 20-foot buffer from the dripline of the elderberry shrub is encroached on, the fencing will be placed as far from the elderberry shrub's dripline as construction activities will allow.

c. A biological monitor will be present on site when work will encroach on the 20-foot elderberry buffer. The monitor will have the authority to stop

construction within 20 feet of the shrub if unauthorized take of the beetle occurs. The monitor shall contact the Service immediately to determine what corrective measures need to be taken.

d. Compensation plantings shall occur within the same year as the transplantation of the elderberry shrubs. The selection of the final compensation site for elderberry shrubs shall be coordinated with the Service. A Service reviewed plan for the longterm maintenance and monitoring of the elderberry compensation site shall be completed prior to transplantation.

Reporting Requirements

A post-construction compliance report prepared by the monitoring biologists must be submitted to the Chief of the Endangered Species Division (Central Valley) at the Sacramento Fish and Wildlife Office within thirty (30) calendar days of the completion of construction activity or within thirty (30) calendar days of any break in construction activity lasting more than thirty (30) calendar days. This report shall detail: (i) dates that groundbreaking at the project started and the project was completed; (ii) pertinent information concerning the success of the project in meeting compensation and other conservation measures; (iii) an explanation of failure to meet such measures, if any; (iv) known project effects on the giant garter snake, if any; (v) occurrences of incidental take of any these species; and (vi) other pertinent information.

The Corps must require SAFCA to report to the Service immediately any information about take or suspected take of federally-listed species not authorized in this biological opinion. SAFCA must notify the Service within 24 hours of receiving such information. Notification must include the date, time, and location of the incident or of the finding of a dead or injured animal. In the case of a dead animal, the individual animal should be preserved, as appropriate, and held in a secure location until instructions are received from the Service regarding the disposition of the specimen or the Service takes custody of the specimen. The Service contact persons are, Chief of the Endangered Species Division (Central Valley) at (916) 414-6600, and the Resident Agent-in-charge of the Service's Law Enforcement Division at (916) 414-6660.

Any contractor or employee who during routine operations and maintenance activities inadvertently kills or injures a listed wildlife species must immediately report the incident to their representative. This representative must contact the CDFG immediately in the case of a dead or injured listed species. The CDFG contact for immediate assistance is State Dispatch at (916) 445-0045.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities that can be implemented to further the purposes of the Act, such as preservation of endangered species habitat, implementation of recovery actions, or development of information and data bases.

1. The Corps and SAFCA should assist in the implementation of the draft, and when published, the final Recovery Plan for the giant garter snake.

2. The Corps and SAFCA should provide funding to researchers studying topics identified by the Service in the draft, and when published, the final Recovery Plan for the giant garter snake.

3. The Corps should use environmental restoration authorities to acquire and restore garter snake habitat from willing sellers.

To be kept informed of actions minimizing or avoiding adverse effects or benefiting listed and proposed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION - CLOSING STATEMENT

This concludes formal consultation with the Corps on the Natomas Levee Improvement Project. As provided in 50 CFR 402.16, re-initiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the proposed action may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in this opinion; or (4) a new species or critical habitat is designated that may be affected by the proposed action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation.

If you have any questions regarding this biological opinion on the Natomas Landside Improvements Project, please contact Jennifer Hobbs at (916) 414-6541 or Jana Milliken, Chief, Sacramento Valley Branch at (916) 414-6645.

Sincerely,

for Susan K. Moore
Field Supervisor

cc:
Elizabeth Holland, Corps, Sacramento, CA
Todd Gardner, CDFG, Sacramento, CA
Peter Buck, SAFCA, Sacramento, CA
Kelly Holland, EDAW, Sacramento, CA

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

In Reply Refer To:
81420-2008-F-0195-R002

OCT 2 2009

Mr. Francis C. Piccola
Chief, Planning Division
U.S. Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, California 95814

Subject: Re-initiation of Formal Consultation for the Natomas Levee Improvement Program, Landside Improvements Project, Phase 2 Biological Opinion, Sacramento and Sutter Counties, California

Dear Mr. Piccola:

This is in response to your August 13, 2009, request to amend the project description of the biological opinion written by the U.S. Fish and Wildlife Service (Service) on the Natomas Levee Improvement Program, Landside Improvements Project Phase 2 (proposed project) in Sacramento and Sutter Counties, California, dated October 9, 2008 (File 81420-2008-F-0195-5) and amended on May 6, 2009. The Corps has requested changes to the project description including adding work at Pumping Plant 34, removal of a section of the Central Main Flume, Elkhorn Pump Plant Pipeline, and a change in the timing of construction of other activities. These changes have resulted in a change to the previous effects analysis. This document represents the Service's concurrence to amend the Phase 2 biological opinion on the effects of the action to two federally-listed threatened species: the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) and the giant garter snake (*Thamnophis gigas*), in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act).

This amendment is based on: (1) your August 13, 2009, e-mail requesting re-initiation under section 7 of the Service's May 6, 2009, amended biological opinion (biological opinion); (2) the memo prepared by EDAW dated August 12, 2009; (3) the August 12 and 13, 2009, e-mails from the U.S. Army Corps of Engineers (Corps) including information regarding the valley elderberry longhorn beetle; and (4) other information available to the Service.

The following changes are made to the May 6, 2009, amended biological opinion:

1. On page 29, change first sentence of last paragraph from:

Improvements to Reaches 1–4B are anticipated to occur over one construction season, beginning in May 2009 and ending in October 2009.

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To:

Improvements to Reaches 1–4B are anticipated to occur over one construction season. Reach 1 will be completed by October 2009 and Reaches 2-4B will extend through November 15, 2009. After October 1, 2009, construction will consist of compacting of newly constructed levee embankment, hydroseeding, and demobilization.

2. On page 32, insert following paragraph after second paragraph under Major Irrigation and Drainage Infrastructure Modifications:

Construction of the sedimentation basin would occur between August 15 and November 15, 2009. Aquatic features in this area are heavily shaded by dense riparian woodlands. Areas which could support overwintering giant garter snakes would be disturbed prior to October 1 and fenced with exclusionary fencing.

3. Insert the following paragraphs on page 33 prior to Prichard Pumping Plant Connection:

Pumping Plant Number 4 Outfall Raising

The RD 1000's Pumping Plant Number 4 site is located along the NCC south levee and pumps water from the Natomas basin into the NCC. In order to modify Pump Plant Number 4's outfall to the 200-year flood elevation the area surrounding the outfall must be dewatered by constructing a rock cofferdam. The rock cofferdam would be composed of angular washed rock and placed so that it binds with the underlying rock already in the channel and creates a stable configuration. The cofferdam would prevent water from entering the work site while allowing water to flow around the work zone. After the rock has been placed with an excavator, the contractor would place a thin layer of 3/4- to 1-1/2-inch washed crushed rock over the streamside surface of the cofferdam. The contractor would then place a rubberized liner that would form the water barrier of the dam and minimize the potential for water leakage. After construction, the contractor would pump water out of the enclosed work area using a pump and intake and discharge hoses. The intake hose would be fitted with a screen with a ¼-inch mesh opening.

After the area surrounding the outfall is dewatered, the outfall would be excavated in order to build the concrete outfall structure. During construction of the new outfall structure, additional pumping would likely be required to maintain the lowered water elevation within the cofferdam. After construction of the outfall structure, the contractor would use some of the rock from the cofferdam to fill in the area around the Pumping Plant Number 4 discharge outfall structure. After the initial placement of rock is complete, water would be pumped into the cofferdam area to equalize the water pressure on the rubberized liner. The liner would then be removed. The contractor would then carefully remove the remaining rock that is located above the elevation of the new plant outfall apron. The rock would be stacked on the bank for later removal to a different location on the project outside of the stream zone. About 0.07 acre of giant garter snake aquatic habitat would be changed permanently from natural bank to hardened bank from this construction. This work would occur after May 1, 2010.

4. Insert the following paragraph on page 34 under Central Main Flume Connection:

The Central Main Flume is constructed in an earthen berm slightly above the existing grade. The flume is narrow and concrete lined. A portion of the flume is located under the footprint of proposed improvements to the Sacramento River east levee. An additional 625-foot-long segment of Central Main Flume between the western edge of the new canal alignments and the eastern edge of the levee improvements footprint will need to be removed as part of the project. Removal of the flume would involve an excavator or other piece of heavy equipment working from one side of the flume to break up the concrete and remove the rubble. This section of the Central Main Flume has little open water and is shaded by oak woodland along its entire length. However, there are some small ditches that run parallel along the Central Main Flume that would be filled in as a result of the project. This would result in the loss of 0.12 acre of aquatic giant garter snake habitat and 0.06 acre of upland giant garter snake habitat. SAFCA proposes to create 0.18 acre of managed marsh near Fisherman's Lake during Phase 4A.

5. Insert the following paragraph on page 34 after the Central Main Flume Connection section:

Elkhorn Pumping Plant

As part of the construction of the sediment basin, SAFCA would have to relocate the outfall for the Elkhorn Pumping Plant to the new sediment basin. A temporary 36-inch pipe will be fit to the existing 42-inch metal pipe within the outfall structure and will extend across the Elkhorn Reservoir into the new sediment basin. Water from the Elkhorn Pumping Plant will outfall into the sediment basin rather than the existing Elkhorn Reservoir when the sediment basin construction is completed. Installation of the new pipes would require temporary dewatering of a portion of the existing Elkhorn Reservoir using sandbag cofferdams. The water in the pipeline alignment will be pumped onto upland and allowed to infiltrate. The discharge area for the pumped water will have silt fence around it. Once the pipeline alignment is dewatered, the ground will be excavated with spoils contained within the cofferdam limits. The pipes will be installed and the trench will be backfilled. However, in order to protect the pipes an extra 2-foot of cover will be placed over the pipes, above existing ground level, resulting in a change in the aquatic area of the Elkhorn Reservoir. These construction activities would result in a permanent loss of 0.10 acre and temporary loss of 0.18 acre of aquatic habitat for giant garter snake and temporary loss of 0.16 acre of upland habitat for giant garter snake. SAFCA proposes to create 0.10 acre of managed marsh near Fisherman's Lake during Phase 4 of the project.

6. On page 35, change the second paragraph from:

The segment of the Elkhorn Canal from the Prichard Pumping Plant to the Elkhorn sedimentation basin would be constructed between May and October 2009. The segment of the Elkhorn Canal from the Central Main Flume to the Elkhorn sedimentation basin would be constructed between May and October 2009.

To:

The segment of the Elkhorn Canal from the Prichard Pumping Plant to the Elkhorn sedimentation basin would be constructed between August 1 and November 15, 2009. The segment of the Elkhorn Canal from the Central Main Flume to the Elkhorn sedimentation basin would be constructed between September 15 and December 15, 2009. All areas would be disturbed prior to October 1 and giant garter snake exclusion fencing will be placed prior to October 1, 2009, in areas that are potential overwintering sites for giant garter snakes.

7. On page 50, change the Phase 2 Giant Garter Snake Effects section from:

Phase 2 construction includes work along the NCC and reaches 1-4B along the Sacramento River east levee. The Corps and SAFCA have proposed to complete the majority of the work during the active season of the giant garter snake (May 1 to October 1). Construction during this time would occur in 61.1 acres of developed land, 139.6 acres of annual grassland, 645.5 acres of row and field crop and fallow agriculture, 1.5 acres of orchard, 185 acres of rice (25 would be a permanent effect, 160 acres would be a temporary effect), 2 acres of canals and ditches, 22 acres of open water and other non-canal wetlands, and 10.3 acres of woodland. At the end of the construction season the proposed land cover types will be 53.5 acres of developed land, 30 acres of created woodland, 15.85 acres of preserved woodland, 168 acres of levee slope grassland, 123 acres of grassland on seepage berms and canal embankments, 19 acres of irrigation canal, 13.5 acres of GGS/Drainage Canal, and 175 acres of preserved rice. The newly created cover-types with the project would be protected from future development through either a flood control easement, conservation easement, or drainage easement.

Phase 2 construction would primarily occur between May 1 and October 1. The only components of Phase 2 work which would occur outside of the giant garter snake's active season would be relocation of power poles, relocation of private irrigation pipelines, canals, and wells, and the removal, transplantation, and/or planting of trees and elderberry shrubs that are located in the Phase 2 footprint. To reduce the likelihood of disturbing or killing a giant garter snake that may be overwintering in uplands that would be affected this winter, SAFCA has proposed to erect exclusionary fencing around the areas where they would be working prior to October 1. This fence would be monitored daily prior to and during construction to insure that there are no breaches that a snake could get through. This should remove the chance that project construction would kill giant garter snakes when they are working in the winter months.

The remainder of the project would be constructed during the active period (May 1 – October 1) for the snake, resulting in a decreased risk of direct mortality of snakes. However, given the number of acres of aquatic and upland giant garter snake habitat affected within Phase 2, it is highly likely effects to snakes would include removal of cover and basking sites, filling or crushing of burrows or crevices, obstructing snake movement, and decreasing the prey base, and may result in the direct disturbance, displacement, injury, and/or mortality of snakes. Snakes may disperse across or may bask on existing roads, and thus may be killed or injured by construction equipment or other vehicles accessing the project site.

To:

Phase 2 construction includes work along the NCC and reaches 1-4B along the Sacramento River east levee. Construction would occur in 61.1 acres of developed land, 139.8 acres of annual grassland, 645.5 acres of row and field crop and fallow agriculture, 1.5 acres of orchard, 185 acres of rice (25 would be permanently affected, 160 acres would be temporarily affected), 2.35 acres of canals and ditches, 22 acres of open water and other non-canal wetlands, and 10.3 acres of woodland. At the end of the construction season the proposed land cover types will be 53.5 acres of developed land, 30 acres of created woodland, 15.85 acres of preserved woodland, 168 acres of levee slope grassland, 123 acres of grassland on seepage berms and canal embankments, 19 acres of irrigation canal, 13.5 acres of GGS/Drainage Canal, and 175 acres of preserved rice. The newly created cover-types with the project would be protected from future development through either a flood control easement, conservation easement, or drainage easement.

SAFCA has proposed to conduct some of the Phase 2 construction outside of the giant garter snake active season (between May 1 and October 1). These include relocation of power poles, relocation of private irrigation pipelines, canals, and wells, the removal, transplantation, and/or planting of trees and elderberry shrubs that are located in the Phase 2 footprint, construction of pipes from the Elkhorn Pumping Plant to the Elkhorn Reservoir, Sacramento River east levee Reaches 2-4B, upper Elkhorn Canal and Upper GGS/Drainage Canal construction, and a new sedimentation basin. To reduce the likelihood of disturbing or killing a giant garter snake that may be overwintering in uplands that would be affected during the inactive season (October through April), SAFCA has proposed to erect exclusionary fencing prior to October 1 around areas where snakes would be likely to overwinter. This fence would be monitored daily prior to and during construction to insure that there are no breaches that a snake could get through. This should lessen the chance that project construction would kill overwintering giant garter snakes. Many of the canals have been without water this year, which would make the areas that SAFCA proposes to construct in the winter less attractive to the giant garter snake due to their use of aquatic features for feeding and movement. Additionally, for the construction of pipes from the Elkhorn Pumping Plant to the Elkhorn Reservoir, Sacramento River east levee Reaches 2-4B, upper Elkhorn Canal and Upper GGS/Drainage Canal construction, and new sedimentation basin construction at these sites would begin prior to October 1, 2009 which is when the snakes begin to search for sites suitable for overwintering. Disturbance of these areas prior to snakes finding them for overwintering would likely cause them to seek other areas.

The remainder of the project would be constructed during the active period (May 1 – October 1) for the snake, which can result in a decreased risk of direct mortality of snakes because snakes are more active during these months. However, given the number of acres of aquatic and upland giant garter snake habitat affected within Phase 2, it is highly likely effects to snakes would include removal of cover and basking sites, filling or crushing of burrows or crevices, obstructing snake movement, and temporary loss of aquatic habitat which decreases the prey base, and may result in the direct disturbance, displacement, injury, and/or mortality of snakes. Snakes may disperse across or may bask on existing roads, and thus may be killed or injured by construction equipment or other vehicles accessing the project site.

8. On page 56, change the Phase 2 Incidental Take Statement from:

Giant Garter Snake

The Service anticipates that incidental take of the snake will be difficult to detect or quantify for the following reasons: giant garter snakes are cryptically colored, secretive, and known to be sensitive to human activities. Snakes may avoid detection by retreating to burrows, soil crevices, vegetation, or other cover. Individual snakes are difficult to detect unless they are observed, undisturbed, at a distance. Most close-range observations represent chance encounters that are difficult to predict. It is not possible to make an accurate estimate of the number of snakes that will be harassed, harmed or killed during Phase 2 construction activities (staging areas, work on canal banks, soil borrow areas, and vehicle traffic to and from borrow areas). In instances when take is difficult to detect, the Service may estimate take in numbers of species per acre of habitat lost or affected as a result of the action. Therefore, the Service anticipates that all giant garter snakes inhabiting 187 acres of aquatic and 818.9 acres of upland habitat may be harassed, harmed, or 2 giant garter snakes killed by loss and destruction of habitat, as a result of the project.

To:

Giant Garter Snake

The Service anticipates that incidental take of the snake will be difficult to detect or quantify for the following reasons: giant garter snakes are cryptically colored, secretive, and known to be sensitive to human activities. Snakes may avoid detection by retreating to burrows, soil crevices, vegetation, or other cover. Individual snakes are difficult to detect unless they are observed, undisturbed, at a distance. Most close-range observations represent chance encounters that are difficult to predict. It is not possible to make an accurate estimate of the number of snakes that will be harassed, harmed or killed during Phase 2 construction activities (staging areas, work on canal banks, soil borrow areas, and vehicle traffic to and from borrow areas). In instances when take is difficult to detect, the Service may estimate take in numbers of species per acre of habitat lost or affected as a result of the action. Therefore, the Service anticipates that all giant garter snakes inhabiting 187.35 acres of aquatic and 818.9 acres of upland habitat may be harassed, harmed, or 3 giant garter snakes killed by loss and destruction of habitat, as a result of the project. The number of snakes killed has been increased because some of the construction schedule has been changed to occur in the winter months when snakes are less mobile and more likely to be killed due to construction activities.

The Service has reviewed the changes in the project description and analyzed the effects to the giant garter snake due to these changes. The Service's biological opinion is that the proposed Natomas Landside Improvements Project changes are not likely to jeopardize the continued existence of the giant garter snake.

This concludes formal consultation with the Corps on the amended Natomas Levee Improvement Program, Landside Improvements Project Phase 2. As provided in 50 CFR §402.16, re-initiation of formal consultation is required where discretionary Federal agency involvement or control

over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation.

If you have any questions regarding this biological opinion on the Natomas Landside Improvements Project Phase 2, please contact Jennifer Hobbs at (916) 414-6541 or Jana Milliken, Chief, Sacramento Valley Branch at (916) 414-6645.

Sincerely,

Peter A. Cross

Susan K. Moore
Field Supervisor

cc:
Elizabeth Holland, Corps, Sacramento, CA
Patrick Moeszinger, CDFG, Rancho Cordova, CA
Peter Buck, SAFCA, Sacramento, CA
Mike Eng, EDAW, Sacramento, CA

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

In Reply Refer To:
81420-2009-F-0890-1

SEP 28 2009

Mr. Francis C. Piccola
Chief, Planning Division
U.S. Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, California 95814

Subject: Phase 3 Section 7 Appendage to the Programmatic Biological Opinion for the Natomas Levee Improvement Program, Landside Improvements Project, Sacramento and Sutter Counties, California

Dear Mr. Piccola:

This is in response to your April 2, 2009, request for formal consultation with the U.S. Fish and Wildlife Service (Service) on the Natomas Levee Improvement Program (NLIP), Landside Improvements Project Phase 3 (proposed project) in Sacramento and Sutter Counties, California. Your request was received on April 6, 2009. A programmatic biological opinion was completed on October 9, 2008 (File 81420-2008-F-0195-5) and amended on April 6, 2009 (File 81420-2008-F-0195-R001). The programmatic biological opinion analyzed the entire proposed project on the landscape level and because details of the project were only available for Phase 2, provided an incidental take statement for only that phase of the project. This biological opinion will examine the details of the Phase 3 portion of the project and the effects of the action to two federally-listed threatened species: the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)(beetle) and the giant garter snake (*Thamnophis gigas*)(snake) in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act). Critical habitat has been designated for the beetle; however, the proposed project is not located within nor will it affect critical habitat for the beetle or any other federally-listed species. Critical habitat has not been designated for the giant garter snake.

This biological opinion is based on information provided in the U.S. Army Corps of Engineers' (Corps) letter requesting consultation and their biological assessment. A complete administrative record is on file at the Sacramento Fish and Wildlife Office.

TAKE PRIDE IN AMERICA

CONSULTATION HISTORY FOR PHASE 3

December 23, 2008. EDAW, the consultant to the Sacramento Area Flood Control Agency (SAFCA), provided the Service with an administrative draft Phase 3 biological assessment.

January 8, 2009. EDAW held a meeting with SAFCA, the Corps, California Department of Fish and Game (CDFG), and the Service to discuss the Phase 3 project and schedule.

February 25, 2009. The Service provided SAFCA comments on the Phase 3 administrative draft biological assessment.

April 6, 2009. The Service received the April 2, 2009, biological assessment from the Corps. The Service also met with SAFCA, CDFG, EDAW, and the Corps to discuss incidental take coverage of activities described in the long-term management plan for the upper GGS/Drainage Canal and Brookfield rice. It was agreed that this biological opinion would include the project description and analyze effects for the long-term maintenance of the GGS/Drainage Canal and Brookfield rice.

July 10, 2009. The Service, SAFCA, EDAW, Corps, and CDFG met to discuss a change in project description. SAFCA proposed working outside of the giant garter snake window for portions of the Phase 3 work. The Service requested an updated project description to include updated conservation measures. SAFCA agreed to provide a memo to the Corps for transmittal to the Service the first week of August.

BIOLOGICAL OPINION

Description of Action Area

The proposed project area is located in the Natomas Basin in northern Sacramento and southern Sutter Counties, generally bounded by leveed reaches of the Natomas Cross Canal (NCC) on the north, the Sacramento River on the west, the American River on the south, and the Pleasant Grove Creek Canal (PGCC) and Natomas East Main Drainage Canal (NEMDC)/Steelhead Creek on the east. This project, which is part of the larger NLIP being undertaken by SAFCA, consists of three construction phases, generally occurring between 2008 and 2011. Construction of Phase 3 includes: the Sacramento River east levee south of the limits of the Phase 2 improvements to just south of Interstate 5 (I-5) (Reaches 5A–9B) and vegetation clearing along reaches 10-12A; the PGCC west levee; the NEMDC west levee between Elkhorn Boulevard and Northgate Boulevard; the area between Elkhorn Reservoir and the West Drainage Canal where a new canal designed to provide drainage and associated giant garter snake habitat (referred to in this document as the "GGS/Drainage Canal") would be constructed; the Elkhorn Canal downstream of Elkhorn Reservoir; the Airport West Ditch; and Reclamation District (RD) 1000 Pumping Plant No. 2.

As greater flood protection will be provided for the entire Natomas Basin, the action area includes the entire Natomas Basin.

Description of Proposed Action

Overview of NLIP Landside Improvements Project

The SAFCA is designing the NLIP in coordination with the Federal and state flood control project sponsors, the Corps, and the State of California Central Valley Flood Protection Board (formerly The Reclamation Board), to address the deficiencies in the Natomas levee system with a focus on achieving a 100-year level of flood protection by 2011. This will require improving the following landside conditions along the NCC south levee, the Sacramento River east levee, and the PGCC and NEMDC west levees:

- Inadequate freeboard—The NCC south levee and portions of the Sacramento River east levee are not high enough to provide at least 3 feet of freeboard above the 100-year water surface elevation. Additional reaches do not provide 3 feet of freeboard above the 200-year design water surface elevation.
- Underseepage and through-seepage vulnerability—Most of the levee reaches do not meet recently adopted Federal criteria for safely containing underseepage and through-seepage when the water surface in the adjacent channel reaches the 100-year elevation or, in some cases, the 200-year elevation.

The NLIP Landside Improvements project encompasses addressing freeboard deficiencies through levee raises; addressing seepage potential using a combination of seepage berms, cutoff walls, and relief wells; and acquiring additional right-of-way to construct the improvements and to prevent encroachment into the flood control system. In addition, the project has been designed to include an enlarged levee embankment (adjacent setback levee) along the land side of the existing Sacramento River east levee to minimize the need for substantial removal of vegetation and structural encroachments on the water side of this levee in compliance with Corps guidance. These improvements would include recontouring the levee slopes where necessary to provide a 3:1 horizontal-to-vertical (3H:1V) waterside slope and a 3H:1V (preferred) or 2H:1V (maximum) landside slope.

The specific goal of the NLIP Landside Improvements Project is to provide at least 100-year flood protection as quickly as possible while laying the groundwork to achieve at least urban-standard (200-year) flood protection over time.

Additional project objectives that influenced SAFCA's project design were to:

(1) use flood control projects in the vicinity of the Sacramento County Airport to facilitate better management of Airport lands to reduce hazards to aviation safety, and

(2) use flood control projects to enhance habitat quality and values by increasing the extent and connectivity of the lands in the Natomas Basin being managed to provide habitat for the giant garter snake, the Swainson's hawk, and other special-status species.

Recognizing the importance of securing maximum Federal support for the flood control project, SAFCA has explored implementation approaches that also advance the achievement of Federal aviation and wildlife protection objectives where complementary opportunities exist. Accordingly, the proposed project includes the following elements:

- The project would include construction of the GGS/Drainage Canal to provide giant garter snake habitat and some drainage infrastructure west of the Airport. Construction of these facilities would allow for dewatering of the ditch running along the western portion of the Airport runway system, which the airport recognizes as a flight safety hazard, by offsetting the effects on drainage and irrigation needs and giant garter snake habitat.

- The project would combine SAFCA's need for levee embankment and berm material with the Sacramento County Airport System's (SCAS) need to modify the condition and management of Airport bufferlands so as to reduce wildlife hazards affecting Airport operations in a manner that enhances the connectivity of areas managed specifically for their habitat value.

Levee Raising and Seepage Remediation

Sacramento River East Levee Reaches 5A-12

Phase 3 construction on the Sacramento River east levee would include improvements from the northern end of Reach 5A through Reach 9B, a distance of approximately 4.5 miles. In addition, vegetation removal would occur along the levee in Reaches 10 through 12A to prepare this segment of the levee improvements footprint for Phase 4 construction. Phase 3 project work along the Sacramento River east levee includes:

- construction of an adjacent levee in Reaches 5A-9B;
- installation of conventional soil bentonite (SB) cutoff walls and/or deep soil mix cutoff walls where necessary along the proposed adjacent levee;
- construction of a 100-foot-wide seepage berm in Reaches 5A through 6A;
- installation of relief wells, spaced at 60- to 100-foot intervals, approximately 20 feet beyond the toe of the 100-foot seepage berm locations;
- removal of trees and 63 elderberry shrubs (*Sambucus sp.*) from Reaches 10 through 12A to prepare for construction of a 500-foot-wide berm and the Riverside Canal realignment that would be conducted in Phase 4;
- planting of 130-foot-wide woodland groves in areas between Reaches 7 through 8 and between Reaches 8 through 9B; and
- reconstruction of the intersections of Elverta Road, Elkhorn Boulevard, North Bayou Road, and private and semi-public access ramps with Garden Highway.

The primary construction staging area would be located on two approximately 1-acre sites, one near Elkhorn Boulevard and one near Elverta Boulevard. The area would be fenced and used for the contractor's and engineer's construction trailers, parking for personnel, machine maintenance tools and parts, possibly water trucks, and the storage fuels and other materials to be used for construction. The project right-of-way along the construction area also would be used for staging of construction materials and equipment.

Unless otherwise noted in the following project description levee improvements for this phase are anticipated to be constructed between May and November of 2009 and 2010. Demobilization, and site restoration (e.g., hydroseeding, gravelling) would extend through November. Where construction activities would occur outside of the specified work window for listed species, SAFCA has and will continue to coordinate with the Corps, the Service, and CDFG to implement conservation measures proposed within this project description.

Site Preparation (Tree Removal, Clearing, Grubbing, and Stripping)

Site preparation would entail removing trees and other large vegetation from the Phase 3 construction area and stripping the top 6 to 12 inches of material from the landside slope of the existing levee and the footprint of the adjacent setback levee and seepage berm (as applicable). Trees within the utility and operations and maintenance corridors would be avoided where possible. Where trees cannot be retained, the permanent maintenance access corridor will be cleared but not stripped. Large roots, tree stumps and deleterious material would then be grubbed from the working area.

To the extent feasible, trees that must be removed from within the Phase 3 footprint would be removed during the winter (between November 15, 2009 and February 15, 2010) prior to the construction season to avoid disturbing the nesting behavior of special-status birds in the spring. Trees suitable for relocation would be transplanted outside of the footprint into new woodland planting areas, where a substantial number of new trees would also be planted. Large trees which cannot be transplanted would be felled about 3 feet above ground level and stumps would temporarily be left in place until construction of the levee begins in May 2010. Logs would be cut into rounds with handheld equipment and removed from site with light vehicles. Cleared vegetation (i.e., trees, brush) would be hauled off-site to landfills or bio-recycling facilities.

Vegetation, primarily trees and elderberry shrubs, would be removed within the partial conceptual footprint of the Phase 4 footprint of the Sacramento River east levee (Reaches 10-12A), as needed, during the annual dormant season (November 1 to February 15). Removal of vegetation from the future Phase 4 footprint will allow this to occur during the elderberry dormant season and when migratory birds are not nesting, lessening the effects to these speices. This footprint consists of the adjacent setback levee, a seepage berm that may be up to 500-feet-wide, depending on site conditions, a 50-foot-wide operations and maintenance corridor, and 20-foot-wide utility corridor, resulting in a total flood control footprint that is approximately 670 feet wide. In addition, vegetation would also be removed in the partial conceptual footprint of the relocated Riverside Canal, which is directly adjacent to the landside edge of the flood control

footprint. This operation will require removal of some trees and relocation/removal of elderberry shrubs, which occur mostly adjacent to existing roads. Large trees would be felled and disposed of as described above. Small trees, where feasible, and elderberry shrubs currently existing on the Cummings Preserve would be relocated to 0.5-acre area onsite. Other elderberry shrubs and small trees would be relocated to the woodland corridor. A minimal amount of ground disturbance in specific areas would occur.

Relocation and Removal of Landside Structures, Irrigation Ditches and Other Facilities

Residences and other farm structures that are within the proposed footprint of the flood control facilities and the GGS/Drainage Canal would have to be removed or relocated farther from the flood control facilities before the start of levee construction in those areas. Demolition would begin in the fall of 2009 and would require up to 60 days to complete. The majority of the work would be completed by February 15, 2010.

Private irrigation wells that are located within the proposed levee improvements footprint of the Sacramento River East Levee would need to be removed and reconstructed. Reconstruction of the private irrigation wells would start in the fall of 2009, and would require 60 days to complete. The majority of the work would be completed by December 15, 2009, when weather conditions are likely to limit earthwork construction activities. Remaining earthwork construction activities would need to resume when conditions dry in the spring to allow operation when irrigation season begins in April. After construction of the wells, installation of the pumping equipment, well testing, and heavy equipment access could extend up to 6 months, but would involve limited ground disturbance. Existing facilities within the levee construction footprint would be capped once the new wells were operational, however demolition and removal of the capped wells would occur concurrently with the levee construction which is to begin May 2010.

Utility poles that currently exist on the landside slope of the levee and at the landside levee toe would need to be relocated and/or rerouted to accommodate the widened levee footprint. In order to sustain power supply to customers, about 60 power poles need to be relocated within the Phase 3 project area prior to the initiation of levee construction which is expected to begin May 1, 2010. The footprint of each power pole is about 1.76 square feet (cumulatively 0.002 acre) and each pole would be placed in the ground 7 feet deep. Existing power poles will be pulled out from the ground as straight as possible by truck-mounted equipment. Installation of new poles would require drilling equipment with a drill (no larger than 24 inches in diameter) mounted on a truck. Power pole relocation would require 12 weeks to complete and would begin October 2009. To the extent feasible, mainline utility poles would be relocated beyond the landside levee toe or berms, and a secondary line of distribution poles would be relocated to the drainage swale area between the existing levee and the adjacent levee. Some poles may need to be relocated to the water side of the existing levee. Tree pruning would likely be required in some locations to accommodate the poles and wires. The relocations would be conducted in coordination with the utility companies and the construction operations.

Debris from structure demolition, power poles, utility lines, piping, and other materials requiring disposal would be hauled off-site to a suitable landfill. Wells and septic systems would be abandoned in accordance with the applicable state and county requirements.

Excavation of Stability Berm and Inspection Trench

The existing stability berm along the levee would be excavated and the material would be used in the construction of the seepage berms. The geotextile fabric from the drain layer would be discarded to a suitable landfill. Prior to the construction of the adjacent levee, a 6-foot-deep inspection trench would be excavated. After inspection, the trench would be backfilled and compacted as part of the embankment construction with material from the borrow sites. The material from the inspection trench would be stockpiled and used either in the adjacent setback levee or the seepage berm.

Construction of Adjacent Levee, Cutoff Walls, and Seepage Berms

Borrow material from the borrow source would be delivered to the levee construction sites by scrapers or haul trucks where it would be spread by motor graders and compacted by sheepsfoot rollers to build the adjacent levee. In those areas where a cutoff wall is required, the adjacent levee would be built up to a height equal to about one-third of the proposed levee. This would create a working platform for cutoff wall installation using an excavator with a long-stick boom capable of digging a trench to a maximum depth of approximately 85 feet. Bentonite slurry would be pumped into the trench during excavation to prevent caving. The soil excavated from the trench would be mixed with bentonite and backfilled into the trench to create the cutoff wall. The working platform would also be used for cutoff wall installation using a machine capable of injecting and mixing the bentonite slurry with the soil simultaneously to a maximum depth of approximately 115 feet. Between Reaches 5B through 6A, borrow material would be spread and compacted for construction of the seepage berms.

Installation of Relief Wells and Monitoring Wells

Relief wells may be installed adjacent to the seepage berms. Relief wells would be spaced at 100-foot intervals approximately 20 feet beyond the toe of the berm. Monitoring wells (piezometers) would be constructed at varying intervals along all reaches.

Reconstruction of Garden Highway at Intersections

The Garden Highway intersections at Elverta Road, Elkhorn Boulevard, and North Bayou Road would require reconstruction to accommodate the raised adjacent setback levee. It is anticipated that Garden Highway would be extended up and onto the widened adjacent levee at these locations to meet with the secondary roads. Approach embankments at the intersections would be enlarged and the entire intersections would be repaved. The intersecting roads would be raised at a slope of 15H:1V, extending the approach embankment approximately 500 feet outward from the levee. The side slopes of the raised embankments would be at a 3H:1V or

2H:1V slope depending on embankment soil type. Traffic control measures and detours would be required during this phase of construction. Private access ramps and access ramps at secondary roadways would also be raised.

Installation of Surface Drainage Outlets Across Garden Highway

The portion of levee between the adjacent setback levee and the Garden Highway pavement would include new storm drainage collection facilities to convey surface water beneath Garden Highway and toward the Sacramento River. A grassed surface collection system (drainage swale) would convey runoff water to drop inlets, and new pipe laterals would convey the water beneath Garden Highway to new outfalls in the berm along the east bank of the Sacramento River. In most locations, the outfalls would be placed above the ordinary high water mark (OHWM) on the 'bench' adjacent to the levee. The location of the cross culverts would be selected to minimize impacts on existing residential properties and riparian vegetation, including trees. The drainage pipes vary from 12 to 18 inches in diameter. The discharge would vary with the magnitude of precipitation events and is anticipated to exceed 1 cubic foot per second (cfs) during substantial rain events. These discharge pipes would require minor landscape improvements to prevent erosion and ensure that applicable water quality standards are met. Rock slope protection (rip rap) would be installed on the surface of the 'bench' to prevent erosion below the outfalls. Excavation of a trench to install the culvert piping across Garden Highway would be required, and those segments where excavation occurs would have to be reconstructed. Single-lane traffic controls and through-traffic detours would be required during this phase of construction.

Site Restoration and Demobilization

Upon completion of construction activities, the levee slopes and the tops of the seepage berms would be hydroseeded. An aggregate base road would be constructed on the crown of the new levee. Any construction debris would be hauled to an appropriate waste facility. Equipment and materials would be removed from the site, and staging areas and any temporary access roads would be restored to pre-project conditions. Demobilization would likely occur in various locations as construction proceeds along the project alignment.

Pleasant Grove Creek Canal West Levee

General Plan for Phase 3 Construction

The PGCC west levee would be expanded to the landside to provide a levee width to encompass, at a minimum, a theoretical 3H:1V waterside slope, a crown width of at least 20 feet, and a landside slope of at least 3H:1V. Beginning just south of its intersection with Howsley Road and continuing one quarter mile south, the widened levee would be raised one to two-tenths of a foot to provide 3 feet of levee height on the 100-year design water surface profile. South of the levee raising section, the new levee width would be increased to provide a base on surface profile. South of the levee raising section, the new levee width would be increased to provide a base on

which to construct seepage remediation improvements. A SB cutoff wall would extend through the entire PCGG west levee, totaling approximately 17,400 lineal feet, to coincide with areas where streams historically flowed east to west through the current PGCC alignment. The cutoff wall beginning at Howsley Road could potentially overlap for 100 - 500 feet with the NCC cutoff wall constructed as part of the Phase 2 project.

Some rock slope protection would be required on the land side of the levee at Howsley Road, where the 100-year stormwater could pass through this lower section of the levee. Five existing culverts that pass beneath the PGCC west levee and extend to the east side of the canal would be replaced with pipe materials and pipe closure devices meeting Corps standards for levee penetrations. Rock slope protection on the waterside would also be required for erosion control purposes. Primary construction activities are described below.

Cutoff Wall Construction

To provide a stable working surface for cutoff wall construction, and to mitigate potential levee through-seepage, the widened levee would first be constructed up to an elevation at least one third of its ultimate height. The working surface would be constructed by hauling earthen material to the levee from the borrow site using elevating scrapers or trucks. The cutoff wall would then be constructed through the widened levee, to a depth of approximately 60 feet from the existing levee crown. The conventional, long reach excavator method would be used to construct approximately 5,000 lineal feet of cutoff wall. A 3,000-foot-long cutoff wall would be constructed at the downstream end of the PGCC, and two separate 1,000-foot-long reaches would be constructed opposite of where Pleasant Grove Creek enters the PGCC from the east and where Curry Creek enters the PGCC from the east.

Levee slope flattening, and widening along the landside of the PGCC west levee is anticipated to require 475,000 cubic yards of import material (including material as described above to construct a cutoff wall working platform). This material is anticipated to be hauled from the Brookfield borrow site using elevating scrapers for the majority of the PGCC west levee.

Placement of Rock Slope Protection Control on the Waterside and Landside Levee Slopes

Current erosion and wind and wave analyses indicate that select areas of the PGCC west levee may require the placement of rock slope protection on the waterside levee slope to provide additional erosion control. Where creeks flow into the PGCC from the east, the waterside slope opposite the creek entrance would be armored with rock slope protection. Some rock slope protection would also be required on the landside of the levee at Howsley Road, where levee overtopping from wave action could affect this section of the levee.

Work on the waterside of the PGCC west levee may require reshaping the waterside levee slope to be flatter then its current 2:1 slope to conform to current Corps criteria. This may be accomplished by trimming back the waterside slope, which would require relocation of Natomas

Road, or by placing additional fill material on the waterside of the levee slope. This is an issue currently under evaluation by SAFCA's design team.

Utility Modifications

Numerous private irrigation facilities along the PGCC west levee would be disrupted by the proposed levee improvements and would be replaced as part of the Phase 3 improvements. These private structures, consisting of nine landside water wells and one private river pump, service the adjacent agricultural fields. The water wells would be relocated outside of the flood control footprint (by drilling replacement wells and abandoning the existing wells). The river pump discharge pipes through the levee would be raised and anti-siphon valves added. In addition to the wells and river pump, there is approximately 4,300 feet of local irrigation canals and approximately 1,600 feet of buried irrigation piping that would be relocated. The private irrigation facilities would be replaced with in-kind structures compatible with the new levee footprint to prevent disruption of service in the fields.

Natomas East Main Drainage Canal West Levee

General Plan for Phase 3 Construction

Improvements identified for the NEMDC west levee include cutoff wall installation, levee widening, and slope flattening. From the NEMDC stormwater pumping station south to Northgate Boulevard, cutoff walls are to be constructed to a depth of up to 80 feet from the levee crown. The existing maintenance area on this stretch of the NEMDC west levee would not accommodate levee reshaping or levee degrading beyond what is necessary to provide a minimum working platform for cutoff wall installation. Additionally, structures in close proximity of the landside levee toe make additional maintenance area acquisition impractical. Therefore, this wall is anticipated to be a cement-bentonite wall constructed by the conventional, long reach excavator method, or a soil-cement-bentonite wall constructed by the Deep Soil Mixing or Trench Remixing Deep method. North of the NEMDC stormwater pumping station to Elkhorn Boulevard, landside levee widening and maintenance area acquisition would occur similar to what is described for the PGCC levee above.

Cutoff Wall Construction

To provide a working platform for construction of the cutoff wall, at a minimum, the surface of the gravel operating road would be removed and stockpiled for later reuse. East Levee Road and Ueda Bikeway asphalt pavement would also be removed for construction of the cutoff wall. Depending on the equipment used to construct the wall, the levee may be degraded between 2 or 3 feet to provide additional working width. Approximately 7,000 linear feet of cutoff wall would be constructed to a depth of 80 feet, approximately 8,000 lineal feet of cutoff wall would be constructed to a depth of 60 feet, and approximately 10,000 linear feet would be constructed to a depth of 45 feet. Following completion of the cutoff wall, the levee crown would be

reconstructed and the operating road surface restored to gravel roadway or asphalt pavement depending on the existing road surface.

Levee Flattening and Widening

Landside levee widening and slope flattening work at the NEMDC west levee is scheduled to occur between Elkhorn Boulevard and the NEMDC stormwater pumping station. Approximately 225,000 cubic yards of imported earthen material would be required. A potential borrow source at the intersection of East Levee Road and Elkhorn Boulevard (Krumenacher property or Twin River Unified School District property) has been identified as the likely source of borrow material for this segment of the project. Where levee improvements are located within 1 mile of the borrow site, elevating scrapers would likely be used to haul the material to the levee. Hydraulic excavators and off-road dump trucks may also be used to load and haul the material from the borrow site.

Major Irrigation and Drainage Infrastructure Modifications

Phase 3 Construction on Elkhorn Canal

During Phase 3, approximately 10,350 feet of the Elkhorn Canal would be relocated and reconstructed several hundred feet east of the landside toe of the Sacramento River east levee (Reaches 6B-9B, south of Elkhorn Reservoir). Approximately 4,100 feet of the existing Elkhorn Canal south of the Elkhorn Reservoir sedimentation basin is concrete-lined, and the remainder is earthen-lined, except for the section that would be piped. The bottom of the canal, which would be approximately 5 feet wide, would be high enough to raise irrigation water levels above the levels of adjacent fields so that these fields could be fed by gravity flow. To control vegetation and to allow for canal maintenance with minimal disturbance of aquatic habitat along the water's edge, approximately 4,700 lineal feet of the invert of the canal may be concrete-lined; this corresponds to segments where the existing canal is lined. The canal would be confined by approximately 4-foot-high earthen embankments designed to provide one foot of levee height above irrigation water operating levels. To provide for stable banks, the side slopes of the canal would be 3H:1V. A 15-foot-wide patrol road would be located on top of the field side embankment; the other embankment would be approximately 8 feet wide.

To avoid existing infrastructure to the extent possible, approximately 3,200 feet of the canal would be piped through the Teal Bend Golf Club. Two 36-inch pipes would be aligned parallel to the levee toe landside of the flood control facility corridor. Approximately 950 additional feet of the canal may be piped through the Mortensen and Breese properties to avoid impacts on existing residences; a single 36-inch pipe is expected to be used in this section.

The Phase 3 portion of the relocated Elkhorn canal and the GGS/Drainage Canal would be constructed concurrently. Timing of the new canal construction would be critical to avoid interruption in irrigation service. Temporary connections may need to be constructed to avoid agricultural service interruptions to adjacent properties. The major construction stages are described below.

Clearing and Grubbing/Stripping

Prior to construction, the canal right-of way surface would be cleared and stripped to a depth of 4 to 6 inches, with removal of low-growing vegetation and loose surface soils. Suitable materials removed during this stage could be stockpiled. Unsuitable material would be hauled off-site. Prior to any excavation, utility poles in the path of the canal construction would need to be relocated. Natural gas pipelines, wells, and other gas facilities would be avoided or reconfigured in the design of the Elkhorn Canal and GGS/Drainage Canal.

Embankment and Access Road Construction

Up to 246,000 cubic yards of material required to construct the embankments of the Elkhorn Canal would come primarily from the construction of the GGS/Drainage Canal excavation and would be required for construction of Phase 3 of the Elkhorn Canal between Elkhorn reservoir and I-5. Borrow material from the GGS/Drainage Canal excavation would be utilized to build up the embankments of the replacement Elkhorn Canal, which would have a top elevation approximately 4 feet above the channel bottom and 3H:1V side slopes.

Concrete-lined sections of the canal would utilize boom trucks and concrete pumps to apply the concrete to the bottom of the channel. Piped sections would be constructed by excavating open trenches, laying the pipe, and backfilling to provide adequate cover material.

Water Control Facility Construction

Approximately 25 field services (water turnout points), roadway crossings, and diversion boxes are located along the entire length of canal. The turnouts, roadway crossings, and diversion boxes would need to be replaced as part of the proposed project. New facilities that would be constructed include distribution boxes, gate valves, cast-in-place concrete headwalls and control structures, and culverts. Backhoes and excavators would be used to excavate material for the new facilities. Precast distribution boxes, pipes, and other appurtenances would be transported to the site on trucks. Other concrete facilities would be cast in place and concrete would be transported to the site in redimix trucks. Small compactors would be used to compact fill material around the facilities. Portions of farm canals and other irrigation canals would be abandoned because of the relocation of the Elkhorn Canal. Segments that are outside the footprint of the proposed levee improvements would be filled after the relocation of the Elkhorn Canal is completed.

Erosion Control and Demobilization/Cleanup

Erosion control measures would be installed prior to the start of construction and maintained throughout the duration of the construction to minimize sedimentation of adjacent waterways. A hydroseeding truck would be used at the end of the construction to seed any disturbed areas. Water trucks would be used throughout the construction to control dust in any disturbed areas. Following construction, all disturbed areas would be vegetated and the construction site would be

generally cleaned up including hauling off of unused and waste materials. All construction equipment would be taken off-site.

Phase 3 Construction on New GGS/Drainage Canal

The Phase 3 portion of the GGS/Drainage Canal would begin at the Elkhorn Reservoir and connect to the West Drainage Canal. The GGS/Drainage Canal would have a series of check structures along its length to maintain consistent water levels in the low-flow channel of the channel during the giant garter snake's active season (May through October). Water would be provided from Natomas Central Mutual Water Company's (NCMWC) irrigation system. The GGS/Drainage Canal would cross Jacobs Slough through a control structure with two flashboard risers on the GGS/Drainage Canal and two box culverts on the slough. The level of water in various parts of the slough would be controlled by raising or lowering the flashboards. The normal operating level of the slough would be its existing normal water surface elevation. No borrow materials are anticipated to be needed to construct the GGS/Drainage Canal. As the Phase 3 portion of the relocated Elkhorn Canal and the GGS/Drainage Canal would be constructed concurrently, material excavated during the construction of the GGS/Drainage Canal would be used for construction of the Elkhorn Canal. Timing of the new canal construction would be critical to avoid interruptions in irrigation service. Temporary connections may need to be constructed to avoid agricultural service interruptions to adjacent properties. The following section outlines the construction timing for the GGS/Drainage Canal and the Elkhorn Canal. The GGS/Drainage Canal would not have any concrete lining. The top of bank for the GGS/Drainage Canal would be approximately at existing ground level. During construction, a trench at least 6 feet deep with an average width of 55 feet would be excavated to construct the canal. The canal would have a 10-foot bottom width and vegetated 3H:1V side slopes. The depth would be sufficient to provide a minimum water depth of 4.5 feet with allowance for 1 foot of water level variance and a minimum of 1 foot of levee height.

A 2,200-foot-long section of the GGS/Drainage Canal between the sedimentation basin and Walnut Road would include a 15-foot-wide managed upland bench. The 5,900-foot-long section between the southeastern corner of Teal Bend Golf Club and the West Drainage Canal would have a 35-foot-wide managed upland bench. This bench, which would be periodically irrigated with canal water and drain into the main channel, would be planted with perennial native grasses, similar to the surrounding uplands. Restoration would include planting tules on the sloped banks. Backhoes would be used to prepare the planting areas and a water truck would be used to control dust.

A sediment collector ditch is proposed to be created at grade and parallel to the maintenance right-of-way on the east site of the lower GGS/Drainage Canal, between the segment of the new canal that extends from about the southeastern corner of the Teal Bend Golf Club to the West Drainage Canal. Tailwater and stormwater drainage from agricultural fields adjacent to the lower GGS/Drainage Canal will be collected in this 3-foot-deep, 8- to 11-foot-wide ditch where most of the sediment volume will settle. Existing overland flow and collector drains will be consolidated into six outfalls entering the canal. These local field drains will be directed into the

sediment control ditch at small check structures. Water released from the sediment control ditches to the lower GGS/Drainage Canal will be managed using water control structures at six locations along the length of the ditch, where water will enter the canal through 15- to 20-foot-wide shallow, grassy swales. During the growing season and the giant garter snake's active season, water will only be in the ditch and grassy swales when adjacent fields are being irrigated.

Construction Schedule for the Lower Elkhorn Canal and GGS/Drainage Canal

In order to maintain NCMWC's irrigation service while the levee improvements are being constructed (between May 1 and October 1, 2010), SAFCA's goal is to construct the open channel portion of the Elkhorn Canal south of the Teal Bend Golf Club prior to the onset of the irrigation season, which begins approximately April 15, 2010. The GGS/Drainage Canal would be constructed concurrently to facilitate the use of material from the GGS/Drainage Canal excavation for use as embankment material along the Elkhorn Canal. Not all of the construction for these two canals would occur during the giant garter snake's inactive season. During the winter of 2009/2010, SAFCA proposes to limit construction on the Elkhorn Canal to the area immediately south of Teal Bend Golf Club south of its terminus and construction on the GGS/Drainage Canal would extend from 200 feet south of Jacobs Slough along Schoolhouse Road to 200 feet north of the West Drainage Canal. This work would also include the demolition of structures at the Ferreira and Pacific Terrace properties, which are located within the GGS/Drainage Canal alignment.

Construction is expected to begin in November 2009 and would require three months to complete. The construction of the piped portion of the Elkhorn Canal through the Teal Bend Golf club and the connection points of the GGS/Drainage Canal at Jacobs Slough and the West Drainage Canal, as well as much of the vegetation establishment and fine grading, would be delayed until after May 1, 2010.

Potential aquatic habitat for giant garter snakes within this area includes the existing Elkhorn Canal, Jacobs Slough, Schoolhouse Road ditch, some lateral canals extending off of Elkhorn Canal, Schoolhouse Road ditch, and the West Drainage Canal. The majority of the Elkhorn Canal proposed for construction prior to May 1, 2010, is more than 200 feet away from aquatic habitat for giant garter snakes. Two small portions of the open channel construction would occur within 200 feet of aquatic habitat: 1) where the Elkhorn Canal begins immediately south of Teal Bend Golf Club; and 2) the piped segment in the middle of the Sacramento River east levee Reach 8. Another portion of the open channel construction would cross a drainage ditch that extends along West Elkhorn Boulevard.

The northern and southern terminous points for the GGS/Drainage Canal construction would be at least 200 feet away from aquatic habitat (Jacobs Slough on the north and West Drainage Canal on the south). At the southern end of the GGS/Drainage Canal a mobile pump would be placed on a trailer with its intake pipe in the southern end of the GGS/Drainage Canal and the outfall in the West Drainage Canal. The operation of the mobile pump will be timed sporadically to allow silt in the GGS/Drainage Canal to settle between pumping events. To prevent erosion in the

West Drainage Canal, about 400 square feet of 18-inch-thick rip-rap would be placed in the canal to line the pump outfall.

Most of the GGS/Drainage Canal constructed during the winter of 2009/2010 would occur parallel to the Schoolhouse Road ditch. Schoolhouse Road is immediately east of the ditch and the GGS/Drainage Canal would be constructed east of Schoolhouse Road and would occur on actively farmed lands (primarily alfalfa and some row crop).

The haul route will be along West Elkhorn Boulevard. Some surface improvements to support the haul road function would be necessary and will be accomplished within the existing road surface. A drainage ditch is located along the road. If an off-road haul route is required, bridges would be used to cross aquatic habitat and the areas would be disturbed and fences prior to October 1, 2009.

Modifications to Pumping Plants

Reconstruction of Pumping Plant Number 2

As part of Phase 3 improvements, Pump Plant 2 would be reconstructed at a site located farther away from the levee than the location of the old site. The outfall of Pump Plant 2 would be reconstructed at the same location of the bank of the Sacramento River. Water would be conveyed from the pump to the outfall by three 36-inch pipes. The outfall pipes would be reinforced with concrete structural components and flap gates would be provided for each of the discharge pipes to prevent water backflow. The piping and outfall would be designed to discharge water at a maximum velocity of 12 feet per second. Pumping capacity of the reconstructed Pump Plant 2 facilities would approximately match historical capacity, which is based on the capacity to pump drainage water from the Natomas Basin during a 100-year base flood event. However, to maintain the equivalent capacity, some additional pumping horsepower would be needed to overcome the losses in pumping rate associated with longer discharge pipes and higher discharge head due to raising the pipes above the "200-year" design water surface elevation.

A sheetpile cofferdam would be used to dewater a small area (less than 0.05 acre) on the bank of the Sacramento River where the outfall for Pump Plant 2 would be reconstructed. The sheetpiles for construction of the cofferdam would be installed using a pneumatic hammer sequentially from the upstream to the downstream limits of the construction area and the resulting structure would connect to the bank and effectively isolate the construction area. After construction of the sheetpiles the area behind the cofferdam would be dewatered using a pump with a screened inlet. A concrete erosion control platform would be constructed immediately beneath the outfall pipes and riprap would be placed in a localized area on the waterside of the sheetpile and the disturbed levee area to prevent future erosion and scour. After dewatering and construction is complete, the sheetpile would be cut down to a level that is flush with the concrete erosion control platform and riprap. A fish rescue plan would be developed and implemented to ensure that fish are not harmed or stranded during dewatering or other construction activities.

Prichard and Elkhorn Pumping Plants Modifications

In general, water is pumped into the Basin using NCMWC facilities and drainage within the Basin is pumped to the river via RD 1000's drainage system and pumping plants. Under the Phase 3 Project, the discharge pipes are required to cross the levee above the new "200-year" design flood elevation. To accommodate this, the existing gate structure for the NCMWC Prichard and Elkhorn irrigation pumping plants would need to be removed and the existing pumps would be replaced to allow similar performance after the levee improvements and pipe-raising/replacement. Any work done to the pumps would occur once the pumps are pulled from the platforms using cranes from the riverbank or from barges. At both pumping plants, new impellers, pump bowls, and shafts would be required. For both pumping plants, the existing pumping plant superstructures include a pump platform and bridge out into the river channel. The pipes are hung under the pumping plant platform over the water such that replacement would require working over the water. The pump platform superstructures would require rehabilitation to accommodate the new pipes and to provide stability during construction. For Prichard Pumping Plant, this would include using a diver to add concrete sleeves to the pilings to provide additional support for structure improvements and new equipment. At the Elkhorn Pumping Plant, pile improvements would also be required in addition to repair of the existing retaining wall. For the removal and re-installation of the pumps, some localized minor maintenance dredging under the pump house may be required to clear sediment buildup, if any around the pump bows. Dredging would be performed by divers with dredging hoses over a period of less than 2 weeks at each Pumping Plant (as necessary). For removal of the manifold structure and gate structures, the use of a backhoe, pneumatic hammer, a front-end loader, and haul truck would likely be required during construction. Electrical equipment for the pumps would be replaced and the new equipment would be placed on a pad that would be constructed on the waterside bench above the "200-year" water surface elevation (and above the OHWM). The products of demolition from changes to the pumping plants and infrastructure would be wasted and removed from the site or salvaged and returned to NCMWC.

At Prichard Pumping Plant, there are two 36-inch pipes and one 30-inch pipe that connect from the pump house at the end of the platform to a concrete vault located at the top of the riverbank on the waterside of Garden Highway. From the concrete vault to the gate vault located at the waterside shoulder of the levee, there is one 72-inch pipe. From the gate vault through the levee to the Elkhorn Canal the pipe is 72-inch with a 60-inch grouted liner, which transitions into a 6-foot by 6-foot box culvert landside of the levee. Replacement pipes would include two 36-inch pipes and one 30-inch pipe continuous from the pumps through the levee to the canal outfall. Excavation at the Prichard site would be required to remove and replace these existing pipes and install new pipes. The excavation area from the concrete vault to the waterside top of existing levee is estimated to be 0.3 acre. Some minor excavation on waterside of vault would be required above the OHWM to expose the pipes, which are partially buried. Modifications at Elkhorn Pumping Plant would be similar to those at Prichard Pumping Plant. One 24-inch pipe and one 30-inch pipe connect the pumps in the river to the concrete gate house. One 42-inch pipe connects the gate house to the existing sedimentation basin. Replacement pipes would include one 24-inch and one 36-inch from the pumps through the levee to the canal outfall.

Excavation at the Elkhorn site would be required to remove and replace the existing pipes. The excavation area from the platform to the waterside top of existing levee is estimated to be 0.2 acre. Some excavation on the waterside of gate house would be required above the OHWM to expose the pipes, which are partially buried.

Modifications to Irrigation Infrastructure

Private Irrigation Modifications

The proposed levee improvements in Phase 3 would also impact private irrigation facilities including agricultural wells, private river pumps, and canals along Reaches 9B-12 of the Sacramento River east levee and along the PGCC west levee. These facilities would generally be relocated landward to move them outside of the flood control footprint and reconstructed in-kind. Discharge piping from river pumps in these reaches would be raised and extended. Some pipe raising in the lower reaches of the Sacramento River would be deferred until the new adjacent levee is constructed to allow for pipe raising.

Airport West Ditch Reconfiguration

The Airport West Ditch would be reconfigured and redesigned in coordination with construction of the GGS/Drainage Canal. The NLIP's new GGS/Drainage Canal would intercept the year-round irrigation and drainage sources from adjacent private farms, which currently flow into the Airport West Ditch and the Airport Operations Area. Additional irrigation infrastructure required to reroute these flows would be implemented along with the new GGS/Drainage Canal construction.

The existing Airport West Ditch is up to seven feet deep. This depth and the irrigation and drainage water that flows through the ditch results in standing water conditions that attract wildlife that creates a potential hazard to aircraft. Filling and leveling the ditch would involve placing a two feet deep layer of aggregate in the bottom of the existing ditch, than covering that layer with earthen fill to just below the invert of the existing runway storm drain pipes that outfall into the ditch.

The ditch cross section would be re-graded to form a shallow drainage swale with flattened side slopes to accommodate mowing operations required for vegetation control. The swale would be approximately five feet deep with 5H:1V side slopes. In general practice, a minimum side slope to accommodate machinery access for mowing operations is 3H:1V. The swale is outside the Runway Safety Area in accordance with FAA Advisory Circular 150/5300-13. Sacramento County Airport System (SCAS) would be responsible for maintenance of the proposed swale.

Geotechnical Investigations along Portions of Phase 4 Project Footprint

SAFCA needs to conduct an exploration of geotechnical conditions in the Natomas Basin as a component of the NLIP Landside Improvements project. Geotechnical borings are necessary to complete the preliminary design process for the upcoming Phase 4 project, and identify the

footprint of the levee repairs so that the environmental team members can then determine the effects of the proposed action.

Geotechnical field investigations would include a series of soil test borings and characterization of conditions underlying the levee system. The subsurface conditions at the site will be explored by drilling borings to depths between 80 and 120 feet below existing grade . Borings will be drilled using a truck-mounted drill rig equipped with either a 4- or 8-inch diameter solid or hollow stem auger. The borings will be drilled on the crest of the existing levee, the landside toe of the levee, and/or at locations approximately 100 to 200 feet away from the landside toe. The landside toe borings will be drilled on the maintenance road at the base of the levees where possible but would be drilled in open fields where no roads exist. One rubber-tire truck-mounted drill rig with a support truck would be onsite during the geotechnical explorations. The toe boring sites are generally accessible for truck mounted drilling equipment via the maintenance road.

Geotechnical investigations are proposed within the Phase 4 project area at numerous sites including: Sacramento River east levee reaches 15-20 (31 borings), the American River north levee (17 borings), and the northern segment of the NEMDC west levee between Sankey Road and Elkhorn Boulevard (57 borings). Geotechnical investigations would begin in the fall of 2009 and would require 90 days to complete. Some of the borings are within 100 feet of elderberry shrubs; however none of the borings will occur closer than 20 feet from the dripline of an elderberry shrub. Borings that are within an area that giant garter snakes (5 borings along the Sacramento River east levee) could be overwintering will be postponed until May 1, 2010.

Habitat Enhancement, Development, and Management

Several project components involve the replacement and/or creation of habitat for listed species, including the construction of the southern 10,350-foot segment of the relocated Elkhorn Canal downstream of Elkhorn Reservoir, the construction of the southern 13,200-foot segment of the GGS/Drainage Canal between Elkhorn Reservoir and the West Drainage Canal, and the creation of managed grasslands on the newly constructed levee slopes, seepage berms access rights-of-ways, and canal embankments. The project also incorporates other habitat enhancements and developments planned for Phase 3 of project construction including the preservation and establishment of landside woodlands and waterside riparian forest and scrub along the Sacramento River east levee and the preservation of agricultural upland cropland. The construction of the Elkhorn Canal and GGS/Drainage Canal are described above in more detail. Please refer to the *Mitigation and Monitoring Plan, Natomas Levee Improvement Program, Landside Improvements Project (Phase 2)* document for a more complete summary of the strategy for creating/enhancing/preserving, protecting, and managing habitats in the Natomas Basin in perpetuity. A Phase 3 project Mitigation and Management Plan for these habitat components is currently being developed; a Programmatic Long-term Management Plan is also being developed and would include site-specific management plans for each of the habitat components. Design elements for the canals, managed grasslands, landside woodlands, waterside riparian forest and scrub, and agricultural croplands are summarized below.

Canals

GGS/Drainage Canal

The GGS/Drainage Canal north of Teal Bend Golf Club (golf club) would be managed by RD 1000 primarily as giant garter snake habitat, with stormwater drainage a secondary function during major storm events, which typically occur in the snake's inactive season. South of Teal Bend Golf Club, the canal would also serve as a giant garter snake habitat area, but the volume of stormwater drainage would increase in a southerly direction as the canal collects additional runoff as a result of the natural slope of the basin. Winter storm-related runoff exceeding the capacity of the West Drainage Canal south of I-5 would be pumped into the Sacramento River using RD 1000's Pumping Plant Number 3, consistent with existing stormwater management practice.

The shoreline and lower bank of the GGS/Drainage Canal would be planted or managed to promote tule vegetation as suitable cover and foraging habitat for giant garter snake. However, management of the canal would also require removal of noxious aquatic weeds that obstruct the flow of water. A secure water supply would ensure that water of a suitable quality is present and flowing at low velocity in the canal during the active season of the giant garter snake, and that the water surface would be managed within a range of approximately 1 foot to provide consistent cover from predators along the tule fringe of canal banks. Input of supplemental canal water would begin at a diversion point on the North Drainage Canal at the north end of the new GGS/Drainage Canal. Other points of inflow may occur at downstream locations.

Elkhorn Canal

The Elkhorn Canal will be relocated to enable management of existing NCMWC water supply infrastructure affected by levee widening. This canal is the primary source of surface irrigation water for rice and other irrigated crops throughout the basin, including the Natomas Basin Conservancy (TNBC) reserves that are managed for rice and marsh. Secondary functions include water filtration, sediment storage, and wildlife habitat.

The relocated Elkhorn Canal would continue to be managed for irrigation function, and would be maintained and operated in the same manner as the existing NCMWC canals. The bank slopes of the relocated canal would be 3H:1V, in contrast to the over-steepened, eroding banks on the existing canal. This would reduce the frequency and level of bank disturbance, require less need for system repair and dredging, and provide more continuous and higher quality shoreline cover for giant garter snake and other semiaquatic species. There will be two sections of the Elkhorn Canal that will be piped, one to avoid the golf club and one to avoid a residence.

Managed Grasslands

Levee Slopes and Seepage Berms

Most grasslands would be mowed or grazed throughout the growing season, with an emphasis on mowing procedures and stubble height (generally 6-12 inches) to optimize these areas for Swainson's hawk foraging habitat. This management regime is in accordance with the Corps and state guidelines for levee inspection. The primary purpose and management priority of levees and seepage berms would continue to be flood risk reduction, for which RD 1000 has principal management and maintenance responsibility, and they would be maintained in accordance with the Corps and Central Valley Flood Protection Board operations and maintenance requirements.

Canal Embankments

The side slopes of the new GGS/Drainage Canal and relocated Elkhorn Canal would be flatter than typical canal slopes in the Natomas Basin and consistent (3H:1V), resulting in greatly reduced erosion and sedimentation. Vegetation on the banks could easily be mowed to a specified stubble height using cutter blades instead of the existing, high-disturbance practice of flail mowing or scraping vegetation from the banks and canal with a drag bucket. These improved canal maintenance practices would reduce disturbance and mortality of giant garter snakes that use bank and shoreline vegetation as cover and feeding habitat.

Landside Woodlands

In Phase 3, woodlands consisting of native riparian species would be planted east of the maintenance corridor along the Sacramento River east levee improvements. Tree and shrub species, including elderberry shrubs, would be planted on approximately 18.5 acres of existing cropland, fallow, or currently unused sites in a woodland corridor along Reaches 7-9B of the Sacramento River east levee. An additional 2.5 acres of existing woodlands would be preserved along the proposed woodland corridor. At least another 15 acres of woodlands would be established on a site as yet to be determined. Groves would generally be at least 50-100 feet wide and several hundred feet long. At maturity, stand structure would vary from closed canopy woodland to grassland savanna vegetation type.

Planting sites would require suitable soil conditions, water supply during a 3- to 5-year establishment phase, reduced risk of wildfire, and minimal depth to seasonally high groundwater or other natural water sources to sustain trees once irrigation ceases. A mixture of native riparian species would be planted, but predominant species would be Valley oak (*Quercus lobata*), the primary tree species that would be affected by the proposed improvements to the Sacramento River east levee, and cottonwood (*Populus fremontii*), which is a preferred nest tree for Swainson's hawks in the basin and is faster growing than valley oak. Establishment of woody vegetation would likely require more than one technique, including seeding in winter, flood irrigation, drip or agricultural-scale spray heads, cuttings, and acorn planting.

Where trees would be removed from existing groves to make way for the proposed flood control system features, they would be transplanted in new locations, including newly planted groves, to the extent feasible. The woodland planting areas would provide locations for transplanting any elderberry shrubs that would need to be moved from the proposed footprint of flood risk reduction improvements.

Waterside Riparian Forest and Scrub (Shaded Riverine Aquatic)

Sacramento River waterside riparian forest and scrub will be restored using native species, including an assemblage of grasses, sedges, shrubs, and trees. Effects on riparian forest habitat are due to modifications of the pumping plant. At maturity, the riparian vegetation community would provide shaded riverine aquatic habitat (SRA) functions. SRA habitat is defined as the nearshore aquatic habitat occurring at the interface between a river and adjacent woody riparian habitat. The principal attributes of this cover type are: (1) an adjacent bank composed of natural, eroding substrates supporting riparian vegetation that either overhang or protrude into the water; and (2) water that contains variable amounts of woody debris, such as leaves, logs, branches, and roots and has variable depths, velocities, and currents. Riparian habitat provides structure (through SRA habitat) and food for fish species, including special-status fish species addressed in this document. Shade decreases water temperatures, while low overhanging branches can provide sources of food by attracting terrestrial insects. As riparian areas mature, the vegetation sloughs off into the rivers, creating structurally complex habitat consisting of large woody debris (LWD) that furnishes refugia from predators, creates higher water velocities, and provides habitat for aquatic invertebrates.

Agricultural Croplands

Up to 60 acres of upland field cropland would be preserved in perpetuity at one of the following (or combination of) the following borrow sites:

Private Property in Reach 7 of the Sacramento River East Levee/Bianchi Parcel
This 86-acre property is located along the Sacramento River east levee in Reach 7, southeast of Garden Highway and the Teal Bend Golf Club. The property is currently farmed as field crops. The portion of the site that is outside the levee improvement and canal construction footprints could be excavated to an average depth of 4 feet to provide borrow material for Phase 3 improvements to the Sacramento River east levee south of the Teal Bend Golf Club. The borrow site would be returned to field crops following excavation.

South Sutter, LLC/Thornton
This 97-acre parcel, located east of Garden Highway and north of Elkhorn Boulevard in Reach 8 of the Sacramento River east levee, is owned by South Sutter, LLC. The property is currently farmed as field crops. Preliminary estimates indicated that the property could be excavated to an average depth of 5 feet to generate up to 484,000 cubic

yards of potential borrow material for the Phase 3 Project segment of the Sacramento River east levee. This property would be returned to field crops following excavation.

These two borrow sites, as well as other potential sites located in the Elkhorn Borrow Area that would be returned to field crops following excavation, would be either partially or entirely preserved as agricultural cropland in perpetuity.

Reclamation of Other Borrow Sites

Borrow sites would provide material for Phase 3 flood control and irrigation infrastructure modifications. Following excavation of the borrow material, these sites would be reclaimed for post-construction uses.

Airport North Borrow Sites

The Airport's north bufferlands historically have been mostly farmed as rice fields and field crops. However, based on FAA requirements to reduce hazardous wildlife attractants near runways, the Airport has opted to not renew rice leases on its bufferlands. Thus, these lands are currently either fallow agriculture fields or ruderal grassland. After borrow activities, these sites would be reclaimed as grasslands.

Excavated soils not used for borrow material, such as the organic surface layer or soils considered unsuitable for levee construction, would be stockpiled and respread on-site following excavation. Any unsuitable borrow material would be stockpiled on-site and graded back into the restoration of the site. Revegetation activities would include erosion control on excavated slopes (i.e., hydroseeding), application of fertilizer, and seeding.

Brookfield

The Brookfield property is a 348-acre private property that is located between Howsley Road and Fifield Road, west of the PGCC west levee. As of summer of 2008, the property was in rice cultivation. As a component of the Phase 2 project a conservation easement will be recorded over a portion of this site (up to 175 acres) to preserve rice lands in perpetuity.

The removal of borrow material would entail excavating up to 190 acres of the site to a depth of up to approximately 6 feet, with an approximate net yield of approximately 3.6 million cubic yards of soil from the site. One foot of topsoil would be removed and stockpiled for reuse during reclamation of the site. This borrow material would be used for levee improvements along the PGCC west levee in Phase 3. Other portions of the site may be used as a borrow source for levee improvements along the NCC south levee (Phase 2) and possibly the NEMDC west levee (Phase 4); however, no area of the property would be used for more than one year. Following the removal of borrow material for the levee construction, the site would be graded and returned to rice cultivation.

Currently, the site is irrigated from on-site wells. To provide irrigation to the site following the excavation of borrow material, existing irrigation and drainage canals on the site would be modified to improve surface water delivery and facilitate site draining. Additional field irrigation ditches may be constructed within the Brookfield site to provide irrigation water from the adjacent highline canal to the fields. Grading of the site would be performed at a slope that would allow the water to flow back to the drainage canals running along the west and south side of the property.

Krumenacher Trust Property

The Krumenacher Trust property consists of an approximately 118-acre parcel located at the southwest corner of West Elkhorn Boulevard and the NEMDC. The owners have approached SAFCA to see if suitable arrangements could be developed to grade the site and generate borrow material for use along the NEMDC west levee. This parcel is a component of the Natomas Panhandle, identified in the Natomas Basin Habitat Conservation Plan (NBHCP), and development of this parcel is already covered by a biological opinion issued by the Service on July 25, 2007 (Service file number 1-1-06-F-0294) and amendment on December 18, 2007 (Service file number 81420-2008-F-0471).

Novak

The 94-acre Novak property is located in the vicinity of Fisherman's Lake, northeast of Garden Highway and Powerline Road. SAFCA has purchased this property in fee for the project. The property is currently farmed as field crops and orchard. This orchard would be removed as part of the project. The southern part of the property would be used for the levee footprint. The remaining acres could be excavated to an average depth of 4 feet to provide borrow material for Phase 3 and Phase 4 improvements to the Sacramento River east levee. Following borrow grading, the site would be topsoiled (12 inches thick) and reclaimed to an upland for a suitable commercial crop or a native perennial grassland.

Private Property in Reach 5B of the Sacramento River East Levee/Binford DeYoung Parcel

This property consists of 48 acres southeast of Garden Highway and Elverta Road on three parcels. The property is currently farmed as field crops. Approximately 34 acres of the site that is outside the levee improvement and canal construction footprints could be excavated to an average depth of 2 feet to provide borrow material for Phase 3 improvements along the Sacramento River east levee. The borrow site would be returned to field crops following excavation.

Private Property in Reach 6A of the Sacramento River East Levee/Horangic Parcel

This property consists of 71 acres northeast of Garden Highway and the Teal Bend Golf Club. The property is currently farmed as field crops. Approximately 20 acres of the site that is outside the levee improvement and canal construction footprints could be excavated to an average depth of 2

feet to provide borrow material for Phase 3 improvements to the Sacramento River east levee. The borrow site would be returned to field crops following excavation.

Twin Rivers Unified School District High School Site

The Twin Rivers Unified School District (formerly Grant Joint Union High School District site) is presently constructing a high school campus on several parcels of land south of Elkhorn Boulevard and west of the NEMDC west levee. During site grading operations, somewhere between 150,000 and 200,000 cubic yards of material were excavated to allow the school site to be graded compatibly with improvements proposed for neighboring properties. This excess soil may be available to SAFCA if suitable arrangements can be made for its removal from the site. The material would most likely be used by SAFCA for the NEMDC west levee improvements. This parcel is a component of the Natomas Panhandle, identified in the NBHCP, and development of this parcel is already covered by a July 25, 2007, biological opinion (Service file number 1-1-06-F-0294).

Longterm Maintenance of GGS/Drainage Canal, Brookfield Rice, and Landside Woodlands

GGS/Drainage Canal

RD 1000 will conduct routine maintenance activities, including water-level management, debris and sediment removal, canal bank repair, aquatic weed management, and terrestrial vegetation management, in order to maintain the desired functions and conditions of the upper and lower GGS/Drainage Canal. RD 1000 will prepare an annual operation and maintenance letter report to be submitted to the Corps and Service for review by the end of each maintenance year. The letter report will provide a summary of canal maintenance activities completed during the year, as well as routine maintenance activities and special projects planned for the upcoming year. RD 1000 will follow the incidental take avoidance and minimization measures within this biological opinion.

Water Level Management and Water Supply

Water for the GGS/Drainage Canal will be provided from the NCMWC irrigation system, or from groundwater wells located on SAFCA property. Water depth in the canal is designed to be 4.5 feet ± 0.5 feet, which will minimize growth of submerged aquatic weeds and limit tules to the shallow margins to maintain flow capacity. The upper GGS/Drainage Canal will be divided into five segments by a series of water control structures along its length to manage the water level in the canal. The lower GGS/Drainage Canal will have water control structures about every 2,000 feet to manage the water level in the canal. Water flow will be maintained at an estimated 5 cubic feet per second to avoid eutrophication and anaerobic conditions in the canal. Water will be supplied to the upper and lower GGS/Drainage Canal during the giant garter snake active season (May 1st to October 1st).

Debris and Sediment Removal

Debris and sediment removal is the act of removing accumulated earthen matter (soil, mineral particles, and/or organic debris) that accumulates in the GGS/Drainage Canal. Suspended matter in the water may gradually drop out of suspension as the water moves through the GGS/Drainage Canal, thereby creating a layer of organic and fine mineral sediment on the bed of the canal, decreasing canal capacity and promoting invasion by aquatic weeds. Debris and sediment removal will be warranted when RD 1000 can no longer maintain the design conditions of a particular segment of the GGS/Drainage Canal.

Debris and sediment removal activities will mostly be conducted under dewatered conditions; however, due to groundwater seepage and stormwater drainage demands, dewatering may not always be possible in some canal segments. A segment of the canal would be dewatered and sediment and debris removal would occur within two weeks of dewatering. Debris and sediment removal would occur in no more than 20 percent of the in the upper GGS/Drainage Canal each year and up to 50 percent of the lower GGS/Drainage Canal each year with a recurrence of 4 to 6 years. The addition of the sediment collector ditch on the lower GGS/Drainage Canal should lessen the need to conduct sediment removal in the lower GGS/Drainage Canal because most of the sediment will drop out in the sediment collector ditch and will be removed periodically during the giant garter snake's active season. No more than one segment of the canal will be dewatered at any given time. Coffer dams may be used to dewater only a short length of the canal within a segment, thereby leaving water in most of the segment. The water control structures will be used to hold water in the other segments of the canal while debris and sediment removal activities are taking place. If debris and sediment removal is carried out under watered conditions, careful operation of equipment will be employed to reasonably avoid damage to the canal banks.

Debris and sediment will be removed with the use of specialized equipment designed to avoid or minimize canal bank disturbance. The equipment will operate from the maintenance road and use a specialized hydraulic arm and bucket to scoop debris and sediment from the bed of the canal. Movement of the equipment will be limited to the maintenance road to avoid canal bank disturbance. Debris and sediment removed will be placed on the road away from the canal bank. Spoils placed on the road will be allowed to dry for 6 to 12 months and then be graded to become part of the road. Alternatively, spoils may be placed on adjacent agricultural properties with permission from adjacent property owners or land managers. The spoils will be removed from the canal and placed directly on the adjacent property. The spoils will be allowed to dry and will be distributed and incorporated into the adjacent property by the adjacent property owner or land manager. Where it is not feasible to place spoils on the operation and maintenance road or on adjacent agricultural properties, the spoils will be hauled to a predetermined disposal site.

However, because the upper GGS/Drainage Canal is designed to minimize maintenance requirements (e.g., 3H:1V slopes, vegetated banks, greater width and flow capacity), debris and sediment removal will likely occur less frequently. The scheduling of debris and sediment

removal activities will be determined by RD 1000 staff, and will be included in the annual operation and maintenance letter report.

The preferred timing of debris and sediment removal is during the giant garter snake inactive season (October 1st to May 1st). Dewatering the canal allows the equipment operator to see the canal bottom and submerged banks, and avoid damaging the banks while removing the debris and sediment. If necessary, debris and sediment removal may occur during the giant garter snake active season (May 1st to October 1st), preferably under dewatered conditions.

While removing debris and sediment under dewatered conditions is preferred, dewatering the canal may not always be possible in some segments due to groundwater seepage and stormwater drainage demands during the giant garter snake inactive season. Debris and sediment removal may also be conducted under watered conditions during the giant garter snake inactive season.

Canal Bank Repair

Repairing canal banks may be required to reestablish the canal's original design cross section, carrying capacity, and structural integrity in the event of canal bank deterioration. Deterioration becomes evident in the form of sloughing and slumping of the canal banks, limiting the canal's carrying capacity and decreasing the structural integrity of the banks. The scheduling of bank repair activities will be determined by RD 1000 staff, and will be included in the annual operation and maintenance letter report.

Bank repair activities will mostly be conducted under dewatered conditions; however, due to groundwater seepage, dewatering may not always be possible. Water control structures and coffer dams will be used to dewater segments or preferably small portions of a segment. No more than one segment of the canal will be dewatered at any given time. Bank repair activites will occur during the giant garter snake active season. Dewatered sections will have bank repair activities conducted within two weeks of dewatering a segment. Due to groundwater seepage, irrigation delivery schedules, and stormwater drainage, complete dewatering may not always be possible, therefore, this activity may be conducted under watered conditions, generally in October. A preconstruction survey for giant garter snakes will need to be conducted by a qualified biologist prior to construction activities under both watered and dewatered conditions.

Bank repairs conducted under dewatered conditions will require soil to be imported to the site, unless a local source of soil is available. Site preparation in advance of soil placement will include the grubbing of vegetation from the damaged bank and compaction of the existing canal bank surface. For bank repairs that are greater than 10 feet in length, the existing canal bank may be cut back to allow the new soil to be keyed-in. Soil will be delivered to the project site by truck or other large equipment, using the operation and maintenance road. The placement and distribution of the soil will be done either by hand or mechanically, using a backhoe, hydraulic arm excavator, or small bulldozer depending on the size of the area to be repaired. The repaired canal bank will be compacted by hand-operated compactors (also referred to as "wackers"), by wheel rolling with heavy equipment or sheepsfoot roller, or tamping with the excavator/backhoe

bucket or vibratory compaction equipment. Disturbed areas will be reseeded with native perennial grass seed at the completion of the bank repair.

If bank repairs must be conducted under watered conditions, rip rap (6- to 12-inch diameter rock) will be placed on the lower portion of the canal slope with an excavator or backhoe and "tamped" into the slope toe using the bucket of the excavator or backhoe.

No plastic, monofilament, jute, or similar erosion control matting that could entangle snakes shall be placed by RD 1000 or its contractors in or within 200 feet of the upper GGS/Drainage Canal. Possible substitutions include coconut coir matting, straw, tackified hydro seeding compounds, or other material approved by the Service and CDFG.

The GGS/Drainage Canal is designed to reduce the potential for bank erosion and the resulting need for bank repair activities. Bank repair activities will be conducted on an as-needed basis. Based on RD 1000's experience with managing other canals in the Natomas Basin, bank repair activities for the upper GGS/Drainage Canal are anticipated to be infrequent (i.e., one project every 10 years) and small scale (10 to 100 linear feet). However, soil conditions, river levels and groundwater levels could affect the frequency of erosion repairs and will need to be evaluated over time.

Vegetation Management and Invasive Weed Control Activities

Vegetation management and invasive weed control is the use of physical/mechanical, ecological, and/or chemical techniques to support establishment of native and/or desirable aquatic, wetland, and upland vegetation, and reduction or suppression of nonnative and/or undesirable aquatic, wetland, and upland vegetation (i.e., noxious weeds) within and adjacent to the upper GGS/Drainage Canal.

The techniques described below will be used by RD 1000 and its contractors to manage vegetation in the upper GGS/Drainage Canal area. These vegetation management techniques may be used separately or in combination by RD 1000. Likewise, because RD 1000 currently utilizes many different types of vegetation control on other drainage canals in RD 1000's service area, the list of vegetation management techniques described below is not intended to be exclusive. If RD 1000 intends to implement vegetation management techniques in the upper GGS/Drainage Canal area that are not identified below, RD 1000 will discuss these with SAFCA and the Service and CDFG to determine if an amendment to the site specific management plan is required. Additionally, any new vegetation management method may adversely affect the giant garter snake and may require a section 7 consultation or habitat conservation plan. RD 1000 will include a summary of vegetation management practices in the annual operation and maintenance letter report.

Aquatic Vegetation Management

Hand Pulling/Cutting - Manual removal of aquatic vegetation by may be accomplished by field personnel entering the GGS/Drainage Canal under watered conditions, pulling/cutting the plants,

and depositing the material on the operation and maintenance road. Vegetation removed in this manner is allowed to desiccate to be later hauled away and burned, composted off-site, or incorporated into the existing access road fill. This technique is typically employed when equipment access is restricted, because it is labor-intensive, expensive, and can present worker safety issues. Site-specific hand pulling/cutting may be employed throughout the year to maintain the functionality of the canal, especially at water control drop structures.

Excavator/Backhoe Vegetation Removal - A hydraulic long-arm excavator or backhoe will be used to remove aquatic vegetation accumulations causing GGS/Drainage Canal blockages. This equipment is used to harvest the aquatic vegetation by dislodging it and placing the plant remains on the operation and maintenance road. Vegetation removed in this manner is allowed to desiccate and is later hauled away and burned or composted off-site. This technique is employed under watered or dewatered conditions and may be employed throughout the year when aquatic vegetation growth is severe and restricts water flow in the GGS/Drainage Canal.
Water Level Manipulation - Water level manipulation involves dewatering segments of the GGS/Drainage Canal to expose submersed aquatic plants. These plants depend on water for physical support because they lack a protective epidermal cell wall (or hardened cuticle layer) making them susceptible to desiccation. The canal segment must remain dewatered until aquatic vegetation has completely desiccated, or has been removed from the canal channel.

Chemical Treatment - Use of both contact and systemic herbicides can be valuable for the suppression of aquatic weeds. Use of selective herbicides, in contrast to broad spectrum herbicides that may cause mortality of desirable bank vegetation, may be required. These herbicides will be evaluated for their potential affect on non-targeted vegetation and animals by a State-licensed Pest Control Advisor prior to application. Chemicals not approved for use in or near water will be avoided. If herbicides and/or pesticides are used in the GGS/Drainage Canal, they will be applied in accordance with label instructions under the direction of a State-licensed Pest Control Advisor and applied by State-licensed pesticide applicators or employees under their direct supervision. Chemical treatments would be applied in October, after the irrigation season and before the flood season. The water would be held for 10 days in each confined segment of the canal that is being treated.

Upland Vegetation Management
The uplands adjacent to the upper GGS/Drainage Canal will be managed as native perennial grasslands. The grasslands will be maintained primarily to provide cover for giant garter snakes, and secondarily as foraging habitat for Swainson's hawks.

Grazing - Small-hoofed animals, such as sheep or goats, can be used to manage upland and wetland vegetation adjacent to the upper GGS/Drainage Canal. Grazing has been successfully employed by TNBC in its operations. Grazing for noxious weed control should typically be conducted in spring after the dominant noxious weed species have flowered, but before they have set seed. Timing will vary depending on weather conditions, and should be based on observations made by RD 1000 staff. Grazing will not occur between May 1st and July 1st to allow native perennial grasses to set seed. Grazing to control vegetation height should be

conducted between July 1st and October 1st. The use of grazing animals shall be evaluated to ensure that hoofed animals are not causing bank erosion or damage to a viable perennial grassland cover. Large-hoofed livestock, such as cattle, will not be used.

Mowing - Mowing is utilized to control terrestrial vegetation on operation and maintenance roads and canal banks to the water line. Mowing is accomplished utilizing a wheeled tractor with boom mounted flail mower and/or a rear attached flail mower or a self-contained riding-type mower. All mowers are provided with height gages which are set to leave the remaining vegetation approximately 6- to 12-inches tall, except for access roads where vegetation will be cut to leave the access roads clean of cover. Vegetation along the canal banks will be mowed, when necessary, only to the high-water mark when the canal is watered. Mowing for noxious weed control should typically be conducted in spring after the dominant noxious weed species have flowered, but before they have set seed. Timing will vary depending on weather conditions, and should be based on observations made by RD 1000 staff. As feasible and based on fire hazard potential, mowing should not occur between May 1st and July 1st to allow native perennial grasses to set seed, unless noxious weed control is the highest priority. Mowing to control vegetation height should be conducted between July 1st and October 1st; however, burrowing owl nesting sites will be avoided during this time period.

Prescribed Burning - If conditions are conducive, (e.g., favorable wind conditions and sufficient fuel material), burning has been shown to be effective in the reduction of organic matter (i.e., thatch) on canal banks or adjacent uplands. Prescribed burning should be used infrequently, primarily when other vegetation management methods are inadequate. Prescribed burning must be conducted in coordination with the local fire district and in accordance with all laws and local ordinances. Prescribed burning to control vegetation in the upper GGS/Drainage Canal area shall be conducted only between November 1st and April 1st. Due to proximity to the Airport runways, prescribed burning will not be used along the lower GGS/Drainage Canal.

Chemical Treatment - Use of both contact and systemic herbicides can be valuable for the suppression of terrestrial weedy plants. These herbicides will be evaluated for their potential affect on non-targeted vegetation and animals, by a State-licensed Pest Control Advisor prior to application. Chemicals not approved for use in or near water will not be used. If herbicides and/or pesticides are used in the GGS/Drainage Canal, they will be applied in accordance with label instructions under the direction of a State-licensed Pest Control Advisor and applied by State-licensed pesticide applicators or employees under their direct supervision.

Giant Garter Snake Brookfield Rice

The Brookfield property will be preserved as productive rice fields, and will include portions of irrigated wetlands as defined by Corps Regulatory Branch under Sec. 404 of the Clean Water Act. Rice fields enhance the forage and refugia habitat available to giant garter snakes. Protecting rice fields in the northeast Natomas Basin, as will occur at the Brookfield property, and managing them in perpetuity as giant garter snake habitat, will enhance the viability and resilience of giant garter snake populations in the Natomas Basin. Irrigation ditches used for

water delivery and drainage for the rice fields provide giant garter snake habitat, as well as connectivity between the targeted properties, including Brookfield, and habitat on other properties with rice fields and managed wetlands both east and west of State Route 99.

SAFCA will also seek to improve surface-water irrigation to the Brookfield property in order to reduce the site's dependence on groundwater. Until surface water supplies are made available to the Brookfield property, the giant garter snake rice habitat will be irrigated from on-site wells. TNBC will either farm the property, or contract with a farm tenant to grow rice on the property. TNBC and/or the farm tenant will manage water delivery to the rice field throughout the rice growing- and winter-seasons to maintain a sustainable rice production operation and maximize habitat benefits to giant garter snake. Water levels will be maintained approximately 6 inches deep during the growing season.

Rice Production

TNBC will manage the Brookfield property for sustainable rice production, which will include occasional crop rotations. Crop rotations are necessary to address conditions, such as soil depletion, resistant weeds, and insect or pest control. Hired field workers will observe the NBHCP's giant garter snake take minimization practices to ensure they do not intentionally harm or kill snakes on the giant garter snake rice habitat properties. The rice tenant will be required to conduct irrigation ditch maintenance in a wildlife friendly manner (as described below). Because the Brookfield property will be managed by TNBC, it will be managed in compliance with practices approved as part of the NBHCP.

Rice is typically planted in May and harvested between late August and October, depending on the planting date, rice variety, seasonal growth progress, and rainfall events that may interrupt the harvesting process. The rice is harvested with combines, collected in a storage tank on the combine, transferred to a grain cart, and transferred to a truck.

After rice harvest and drainage of rice fields, rice stubble or straw decomposition is managed with different practices to minimize disease and residue. Several approaches are used:

- The rice stubble is disced or chopped and subsequently flooded via irrigation.
- The rice stubble is disced prior to winter rains. No irrigation water is applied.
- The rice stubble is plowed to bury the residue, typically after one of the above practices have been applied.
- The rice stubble is cut, windrowed, baled, and removed from the field with little stubble remaining on the field.
- The rice stubble is burned in the fall or spring. The amount of burning allowed is limited. See the rice field burning section below for more detail.

Crop Rotation and Fallowing

Crop rotation and fallowing maintains the long-term viability of the agricultural land, and provides improved habitat diversity in the Natomas Basin. It is recommended that between 10

and 25 percent of the rice fields be followed and planted with a cover crop each year. However, it is critical that irrigation and drainage ditches adjacent to fallowed fields continue to convey water, and that adjacent rice fields are planted in rice. The use of fallowing and crop rotation provides multiple benefits, including: improved soil condition; reduced pesticide use; reduced fertilizer use; improved water quality; increased habitat diversity; and improved disease, pest, and weed control. The amount of rice fields fallowed in any given year can be influenced by water availability, plant disease, weed resistance, insect infestation, soil nutrient depletion, the prevailing market price of rice, and the practicality of planting non-rice crops under local field conditions. Crop rotations include such crops as wheat, rye, oats, barley, clover, vetch, safflower, and similar cover crops.

Irrigation Ditch Maintenance

TNBC will conduct irrigation ditch maintenance on the Brookfield property according to practices recommended in the NBHCP. The following practices are adapted from TNBC's:

- When ditch cleaning is necessary, vegetation will be maintained on both ditch banks to the greatest extent practicable, by excavating only from the channel bottom, lifting the spoils straight up, and placing them away from the ditch banks; or if it is not possible to maintain vegetation on both ditch banks during channel excavation, vegetation must always be maintained on one bank.
- Movement of heavy equipment will be confined to existing roadways to the greatest extent practicable to minimize habitat disturbance.
- Excavation activities will be conducted between May 1st and October 1st; if excavation is needed outside of this window, the Service and CDFG must be consulted for permission to proceed.
- Before ditches are excavated, the ditch will be de-watered for a minimum of two weeks before cleaning begins.
- Maintenance activities along ditches, such as mowing and discing, will maintain buffer strips of standing vegetation along the ditch.
- Mowing herbaceous vegetation growing along ditch banks from the top of bank down to the waterline will be avoided to the greatest extent practicable except when management of noxious weeds is called for.
- If mowing is used to control terrestrial vegetation beyond the top of the channel banks, the height of the vegetation after mowing will be at least 6 inches.
- Use of aquatic herbicides to control invasive aquatic vegetation will be minimized to the greatest extent practicable, and use shall be consistent with manufacturer's recommendations and all applicable laws and regulations.
- Prescribed burning used to control vegetation along ditch banks will be conducted using methods that avoid harm to giant garter snakes.
- Driving over snakes that are observed on roads will be avoided at all times.

Noxious Weed Control Activities

The vegetation management techniques described below may be used separately or in combination. If TNBC intends to implement vegetation management techniques on the Brookfield property that are not identified below, TNBC will discuss these with the Service and CDFG to determine if an amendment to the site specific management plan is required. Additionally, any new vegetation management method may adversely affect the giant garter snake and may require a section 7 consultation or habitat conservation plan. The techniques set forth below will guide activities by TNBC in managing noxious weeds on the Brookfield property.

Water Level Manipulation - Water level manipulation involves the dewatering of rice fields and irrigation ditches and exposure of submersed aquatic plants. These plants depend on water for physical support since such plants lack a protective epidermal cell wall (or hardened cuticle layer) making them susceptible to desiccation. The rice field or irrigation ditch must remain dewatered until aquatic vegetation has completely desiccated, or has been removed.

Grazing - Use of sheep or goats, can be used to manage upland and wetland vegetation adjacent to the rice fields. Grazing for noxious weed control should be conducted typically in the spring before the weeds have set seed. Timing will vary depending on weather conditions and weed types, and should be based on observations made by TNBC.

Mowing - Mowing and chopping are utilized to control terrestrial vegetation on maintenance roads and upland areas adjacent to rice fields. All mowing and chopping equipment will be provided with height gages which can be set to allow remaining vegetation to be approximately 6 to 12 inches tall, except for access roads where vegetation can be cut to leave the access roads clean of cover. Vegetation along the water-side of irrigation ditches should only be mowed when treating a noxious weed infestation. Mowing for noxious weed control should be conducted typically in the spring before the dominant noxious weed species have set seed; however, certain weeds will require treatment later in the year. Timing will vary depending on weather conditions and weed types, and should be based on observations made by TNBC. The use of mechanical vegetation control methods should be avoided during cool weather (typically in February, March, October, and November) if there is risk that giant garter snakes are not in hibernation.

Prescribed Burning - If conditions are conducive (e.g., favorable wind conditions and sufficient fuel material), burning has been shown to be effective in the reduction of organic matter (i.e., thatch) in grassland areas. Prescribed burning should be used infrequently, primarily when other vegetation management methods are inadequate. Prescribed burning must be conducted in accordance with all laws and local ordinances. Prescribed burning by TNBC or its farm tenants to control noxious weeds, thatch, disease, or undesirable insects on the Brookfield property shall be conducted only between November 1st and April 1st, except when rice is out of rotation.

Rice Straw Burning - Burning of rice straw has been in decline since the passage in the early 1990s of the Rice Straw Burning Reduction Act. Today, rice growers may only burn a maximum

of 25 percent of their fields and only when significant levels of disease are present. Because of its proximity to urban areas, it is difficult to get a burn permit in the Natomas Basin. Appropriate burn timing facilitates nutrient release into rice growing area substrate. Any such rice straw burning activities shall be subject to all laws regarding burning activities.

Hand Pulling/Cutting - Manual removal of aquatic and terrestrial vegetation by pulling and/or cutting (with a string trimmer or other cutting tool) is accomplished by field personnel entering the croplands, pulling/cutting the plants, and depositing the material on the side of fields. Typically, vegetation removed in this manner is allowed to desiccate and is later hauled away and burned or composted off-site. This technique is only employed when equipment access is restricted because it is labor-intensive, expensive, and can present worker safety issues. Hand pulling/cutting may be employed throughout the year to maintain the ecological or agricultural functionality of the crop.

Chemical - Use of both contact and systemic herbicides can be valuable for the suppression of aquatic and terrestrial weedy plants both within and adjacent to the rice fields. A State-licensed Pest Control Advisor will evaluate these herbicides for their potential affect on non-targeted vegetation and animals prior to application. During the initial application of rice field aquatic herbicides, herbicide-laden irrigation water within the rice fields will be held in compliance with State and Federal pesticide use regulation. At the end of this period, irrigation water may again be released. Chemicals not approved for use in or near water will not be used. If herbicides and/or pesticides are used on the Brookfield property, they will be applied in accordance with label instructions under the direction of a State-licensed Pest Control Advisor and applied by State-licensed pesticide applicators or employees under their direct supervision.

Landside Woodlands

About 140 acres of landside woodlands will be created and/or preserved throughout all the Phases of the proposed project. The design of landside woodland habitats will include valley oak savanna with grassland, elderberry shrub clusters, mixed riparian forest, native grassland, riparian scrub, as well as a mosaic of closed canopy oak, sycamore, and cottonwood woodland. Long-term management and maintenance of the woodlands will be the responsibility of TNBC. The woodland mitigation will be managed to support growth, survival, and natural regeneration of planted, transplanted, and existing native trees, shrubs, and perennial grasses. Maintenance requirements will be minimal and will focus on the following activities: noxious weed management, nonnative woody vegetation management, plant disease and insect infestation management, thatch management, and fire hazard prevention. Additionally, trespass and associated illegal activities, such as dumping, vandalism, camping, poaching, and drug-related activities, will require regular patrolling and reporting to law enforcement agencies. Management of the landside woodlands will be consistent with the Service's July 9, 1999, *Conservation Guidelines for the Valley Elderberry Longhorn Beetle*, which are designed to avoid any adverse effects to the beetle.

Conservation Measures

Valley Elderberry Longhorn Beetle

The following measures shall be implemented to avoid, minimize, and compensate potential adverse effects on valley elderberry longhorn beetle:

- Worker awareness trainings for construction personnel shall be conducted by a qualified biologist approved by the Service before the commencement of construction activities and as needed when new personnel begin work on the project. The program shall inform all construction personnel about the life history and status of the beetle, the need to avoid damaging the elderberry plants, measures to avoid and minimize impacts on this species and its habitat, the conditions of relevant regulatory permits, and the possible penalties for not complying with these requirements. Written documentation of the training shall be submitted to the Service within 30 days of the completion of training.
- All elderberry shrubs that are located adjacent to construction areas, but can be avoided, shall be protected through establishment of a fenced avoidance area. The high visibility fencing shall be placed at least 20 feet from the dripline of the shrubs, unless otherwise approved by the Service. This fencing shall prevent the encroachment of construction personnel and vehicles and protect the shrubs.
- No insecticides, herbicides, or other chemicals that might harm the beetle or its host plant shall be used within 100 feet of the elderberry shrubs.
- Dirt roadways and disturbed areas within 100 feet of elderberry shrubs shall be watered at least twice a day to minimize dust emissions.
- The 14 elderberry shrubs that are currently on TNBC Cummings Preserve lands would be relocated within the preserve, east of their existing location and outside of the project footprint. SAFCA proposes to compensate for the loss of 0.5 acre of preserve land that would be converted to elderberry savannah by providing TNBC with 0.5 acre of upland habitat within SAFCA's compensation land surrounding Fisherman's Lake. Because these 14 elderberry shrubs are compensation for effects from the NBHCP, SAFCA will provide 14 additional elderberry seedlings and 14 additional associated natives within their woodland corridor.
- All other elderberry shrubs that require removal shall be transplanted to the woodland corridors and woodland restoration/creation areas. If none of the areas of suitable habitat to be created as part of the proposed project would be available before the impact would occur, alternative transplantation locations (e.g., TNBC preserves, Airport lands) shall be identified to the Service for approval.
    - If feasible, based on the Service authorization, elderberry shrubs shall be transplanted when the plants are dormant (November through the first 2 weeks of February) to increase the success of transplanting. If it is not feasible to transplant elderberry shrubs during their dormant season, compensation would be increased by 2.5 times. Transplantation would not

occur during the beetle's flight season (March 15–June 15). A qualified biologist shall be available to monitor transplanting activity.

- Elderberry shrubs to be transplanted shall be cut back 3 to 6 feet from the ground or to 50% of their height (whichever is taller) by removal of branches and stems. The trunk and all stems measuring 1 inch in diameter or greater at ground level that are removed shall be replanted. All leaves on the shrubs shall be removed.
- Shrubs shall be removed with a truck-mounted hydraulic tree spade, backhoe, front end loader, or other suitable equipment. When a shrub is being excavated, as much of the root ball as possible shall be removed and replanted immediately at the mitigation site. Care shall be taken to ensure that the soil is not dislodged from the root ball. Typically, the transplant hole is first excavated by the tree spade and deep-watered. Then the shrubs are transplanted with the same tree spade and immediately transported to the planting hole.
- The planting area shall be at least 1,800 square feet (0.04 acre) for every transplanted elderberry shrub. In this 1,800-square-foot area, associated tree and shrub species for each elderberry shrub shall also be planted. The root ball shall be planted so that the top is level with the existing ground and the soil shall be compacted so that settlement is minimized.
- A watering basin measuring at least 3 feet in diameter with a continuous berm (approximately 8 inches wide at the base and 6 inches high) shall be constructed around each transplanted elderberry shrub. Upon completion of planting, soil shall be saturated with water. No fertilizers or other supplements or paint shall be used on the shrubs. The frequency of watering shall be determined based on soil conditions present at the mitigation site. Either a drip irrigation system or watering truck shall be used to provide water to the site.

- Each elderberry stem measuring 1 inch or greater in diameter at ground level that is adversely affected (i.e., transplanted) shall be replaced with elderberry seedlings and seedlings of associated species, in accordance with the Service's *Conservation Guidelines for the Valley Elderberry Longhorn Beetle*, July 9, 1999. Elderberry seedlings or cuttings shall be replaced at ratios ranging from 1:1 to 8:1 (new plantings to affected stems), depending on the diameter of the affected elderberry stems and the presence of beetle exit holes. Native plants shall be planted, in association with the replacement elderberry shrub seedlings or cuttings, at 1:1 (for shrubs without evidence of beetle exit holes) or 2:1 (for shrubs with evidence of beetle exit holes) ratios. Stock of seedlings and/or cuttings shall be obtained from local sources. Table 1 lists the number of elderberry stems that would be affected and the proposed compensation plantings.
- A restoration, monitoring, and management plan shall be prepared and implemented. This plan shall specify how the woodland/elderberry habitat creation areas would be managed to ensure that the appropriate habitat conditions are provided. The plan shall, at a minimum, describe requirements for transplantation of shrubs that require removal;

specify the number of replacement elderberry shrubs and associated native plants to be established and associated success criteria; specify remedial measures to be undertaken if mitigation success criteria are not met; and describe short- and long-term maintenance and management. Long-term protection of the planting area for elderberry and associated species, and funding for its management, shall be provided through appropriate mechanisms to be determined by SAFCA, the Service, and other entities cooperating in implementation of the proposed project. The plan shall be reviewed and approved by the Service prior to implementation.

Table 1. Elderberry Stem Sizes and Compensation

Location	Stems (maximum diameter at ground level)	Exit Hole on Shrub (Yes or No)	Elderberry Seedling Ratio	Associated Native Plant Ratio	Number of Stems Observed	Required Elderberry Plantings	Required Associated Native Plant Plantings
Riparian	stems ≥1" & ≤3"	No	2:1	1:1	8	16	16
		Yes	4:1	2:1	14	56	112
Riparian	stems > 3" & <5"	No	3:1	1:1	3	9	9
		Yes	6:1	2:1	3	18	36
Riparian	stems > 5"	No	4:1	1:1	4	16	16
		Yes	8:1	2:1	4	32	64
Non-riparian	stems ≥1" & ≤3"	No	1:1	1:1	204	204	204
		Yes	2:1	2:1	37	74	148
Non-riparian	stems > 3" & <5"	No	2:1	1:1	43	86	86
		Yes	4:1	2:1	9	36	72
Non-riparian	stems > 5"	No	3:1	1:1	31	93	93
		Yes	6:1	2:1	15	90	180
Elderberry replacements for Cummings Preserve						14	14
Total replacement plantings						744	970
Total Elderberry shrubs to be transplanted						77	
1,714 /10 = 171.4 valley elderberry longhorn beetle credits or 7.08 acres							

Giant Garter Snake

The following measures shall be implemented to avoid, minimize, and compensate potential adverse effects on giant garter snake:

- Worker awareness trainings for construction personnel shall be conducted by a qualified biologist approved by the Service and CDFG before commencement of construction activities and as needed when new personnel begin work on the project. The program shall inform all construction personnel about the life history and status of the snake, the need to avoid damaging suitable habitat and causing snake mortality, measures to avoid

and minimize impacts on this species and its habitats, the conditions of relevant regulatory permits, and the possible penalties for not complying with these requirements.

- Written documentation of the training shall be submitted to the Service and CDFG within 30 days of the completion of training.
- Construction and other ground-disturbing activities within 200 feet of suitable aquatic habitat for the giant garter snake shall not commence before May 1, with initial ground disturbance expected to correspond with the snake's active season (as feasible in combination with minimizing disturbance of nesting Swainson's hawks). Initial ground disturbance shall be completed by October 1.
- Some components of the proposed project may occur prior to the beginning of the defined giant garter snake active season. Activities, such as utility relocations, removal of residential or agricultural structures, and removal, transplantation, and planting of trees and elderberry shrubs, would be conducted before May 1. The removal of trees and elderberry shrubs corresponds to the avoidance and minimization measures for valley elderberry longhorn beetle (e.g., the Service guidelines specify that elderberry shrubs shall be transplanted between November 1 and February 15) and Swainson's hawk (e.g., CDFG guidelines specify that trees should be removed outside of the raptor nesting season, which is generally between March 1 and July 31).
- Some components of the proposed project may occur beyond the end of the defined giant garter snake active season and up to November 31 of all construction years. For example, demobilization and site restoration (e.g., hydroseeding, gravelling) activities may extend through November of all years. However, these activities would not generally be within 200 feet of potential aquatic habitat. SAFCA does not anticipate any construction activities to occur within potential giant garter snake habitat outside of this species' active season. Should limited construction need to occur in snake habitat outside of the active season, however, SAFCA would coordinate with the Corps, Service, and CDFG. Further, SAFCA recognizes that it may be necessary to implement additional avoidance and minimization measures for project activities that occur beyond October 1.
- Any aquatic habitat for the snake that is dewatered shall remain dry for at least 15 consecutive days after April 15 and before excavating or filling of the dewatered habitat. If complete dewatering is not possible, potential snake prey (e.g., fish and tadpoles) shall be removed so that snakes and other wildlife are not attracted to the construction area.
- Within 24 hours before the commencement of ground-disturbing activities, areas within 200 feet of suitable aquatic habitat for giant garter snakes shall be surveyed for giant garter snakes by a qualified biologist. The biologist shall provide the Service with written documentation of the monitoring efforts within 48 hours after the survey is completed. The action area shall be re-inspected by a qualified biologist whenever a lapse in construction activity of 2 weeks or greater has occurred. A qualified biologist shall be present on-site during initial ground disturbance activities. The biologist shall be available throughout the construction period and shall conduct weekly monitoring visits to ensure avoidance and minimization measures are being properly implemented.
- Before the commencement of construction activities, high-visibility fencing shall be erected to protect suitable giant garter snake habitat that is located adjacent to

construction areas, but can be avoided, from encroachment of personnel and equipment. The fencing shall be inspected before the start of each work day and maintained by SAFCA and construction personnel until completion of the project. The fencing shall be removed only when the construction within a given area is completed. This fencing shall conform to the specifications detailed in the measure below.

- Tightly woven fiber netting (mesh size less than 0.25 inch) or similar material shall be used for erosion control and other purposes at the project site to ensure that giant garter snakes are not trapped or become entangled by the erosion control material. Coconut coir matting is an acceptable erosion control material. No plastic mono-filament matting shall be used for erosion control. The edge of the material shall be buried in the ground to prevent giant garter snakes from crawling underneath the material. Erosion control structures shall be constructed so runoff shall be directed away from sensitive habitats, directing water flow into existing drainages or disperse water across vegetated areas to avoid concentrating water.
- The number of access routes, the number and size of staging areas, and the total area of the proposed project activity shall be limited to the minimum necessary. Routes and boundaries shall be clearly demarcated. Movement of heavy equipment to and from the project site shall be restricted to established roadways and designated staging areas to minimize habitat disturbance. Project-related vehicles shall observe a 20-mile-per-hour speed limit within construction areas, except on county roads and on state and Federal highways.
- All snakes encountered shall not be harassed, harmed, or killed and shall be allowed to leave the construction area on their own volition. If any snake is observed retreating into an underground burrow within the project limits, no construction shall be allowed within a 50-foot radius of the burrow. A 50-foot radius nondisturbance buffer zone shall be established until a qualified biologist can make a determination that the snake is or is not a giant garter snake. If a qualified biologist determines that a giant garter snake has retreated into an underground burrow within the project limits, and the area of the burrow cannot be avoided by the project, then under the approval, supervision and direction of the Service and a qualified biologist, the burrow shall be excavated to allow personnel with appropriate authority to capture and handle the giant garter snake to relocate the giant garter snake outside of the action area. The biologist shall notify the Service immediately if any listed species are found on-site, and shall submit a report, including date(s), location(s), habitat description, and any corrective measures taken to protect the species found.
- During construction operations, stockpiling of construction materials, portable equipment, vehicles, and supplies shall be restricted to the designated construction staging areas. All heavy equipment, vehicles, and supplies shall be stored at the designated staging area at the end of each work period.
- To eliminate an attraction to predators of the giant garter snake, all food-related trash items, such as wrappers, cans, bottles, and food scraps, shall be disposed of in closed containers.

- After construction activities are complete, any temporary fill or construction debris shall be removed and temporarily disturbed areas restored to their preproject conditions. An area subject to "temporary" disturbance includes any area that is disturbed during the project, but that, after project completion, shall not be subject to further disturbance and has the potential to be revegetated. All giant garter snake habitats subject to temporary ground disturbances, including storage and staging areas and temporary roads, shall be restored. These areas shall be recontoured, if appropriate, and revegetated with appropriate native plant species to promote restoration of the area to preproject conditions. Appropriate methods and plant species used to revegetate such areas shall be determined on a site-specific basis in consultation with the Service and CDFG and in accordance with the Service's *Guidelines for the Restoration and/or Replacement of Giant Garter Snake Habitat.*
- SAFCA shall maintain and monitor temporarily disturbed areas of giant garter snake habitat for 1 year following the completion of construction and restoration activities. Monitoring reports documenting restoration of these areas shall be submitted to the Service upon the completion of the restoration implementation and 1 year after the restoration implementation. Monitoring reports shall include photo-documentation and shall describe when restoration was completed, what materials were used, specified plantings, and justifications of any substitutions to the Service-recommended guidelines.
- As summarized above under the "Habitat Enhancement, Development, and Management)" section, unavoidable adverse effects to giant garter snake habitat shall be compensated through the creation and preservation of suitable aquatic and upland habitat for this species.

Jeopardy Determination

In accordance with policy and regulation, the jeopardy analysis in this biological opinion relies on four components: (1) the *Status of the Species*, which evaluates the giant garter snake's and valley elderberry beetle's range-wide condition, the factors responsible for that condition, and their survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the condition of the giant garter snake and valley elderberry longhorn beetle in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the valley elderberry beetle and giant garter snake; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed federal action and the effects of any interrelated or interdependent activities on the giant garter snake and valley elderberry beetle; and (4) the *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the giant garter snake and valley elderberry beetle.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the giant garter snake's and valley elderberry beetle's current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the giant garter snake and valley elderberry beetle.

The jeopardy analysis in this biological opinion places an emphasis on consideration of the range-wide survival and recovery needs of the giant garter snake and valley elderberry beetle and the role of the action area in the survival and recovery of the giant garter snake and valley elderberry beetle as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Status of the Species
The status of the species for the giant garter snake and valley elderberry longhorn beetle are incorporated by reference from the programmatic biological opinion (pages 45-50 and 54-60).

Environmental Baseline
The environmental baseline for the giant garter snake and valley elderberry longhorn beetle are incorporated by reference from the programmatic biological opinion (page 50-54 and 61-62).

Effects of the Proposed Action

Giant garter snake

Direct Effects due to Phase 3 Construction

Phase 3 construction includes work along reaches 5A-9B along the Sacramento River east levee, PGCC west levee, NEMDC west levee, Elkhorn Canal, GGS/Canal, RD 1000 Pump Plant 2, and Airport West Ditch. Construction during this time would occur in 22.60 acres of developed land; 64.12 acres of annual grassland; 117.84 acres of row and field crop and fallow agriculture; 9.99 acres of orchard; 45.23 acres of rice; 14.66 acres of canals, ditches, and marsh; 12.74 acres of seasonal wetlands or riverine wetlands; and 35.34 acres of woodland (including 1.89 acres of Sacramento River riparian). At the end of construction for Phase 3 the proposed land cover types will be 6.09 acres of developed land; 33.61 acres of created woodland; 2.51 acres of preserved woodland; 266.32 acres grassland (primarily levee slope grassland and a small amount of grassland associated with the canals); and 16.67 acres of irrigation canals and ditches. The newly created cover-types from the project would be protected from future development through either a flood control easement, conservation easement, or drainage easement.

Components of Phase 3 work which would occur outside of the giant garter snake's active season include relocation of power poles; relocation of private irrigation pipelines, canals, and wells; the removal, transplantation, and/or planting of trees and elderberry shrubs that are located in the Phase 3 and 4 footprint; and construction of the lower GGS/Drainage Canal and the Elkhorn Canal. Giant garter snakes have been observed to overwinter as far as 250 meters from aquatic habitat. Given that giant garter snakes are generally inactive during the winter months SAFCA's working during the inactive season would kill giant garter snakes that may be overwintering within the construction footprint. To reduce disturbing and/or killing giant garter snakes that may be overwintering in uplands that would be affected this winter and construction would not begin prior to October 1, SAFCA has proposed to place exclusionary fencing erected prior to

October 1 in areas that may have overwintering giant garter snakes. The fencing would exclude giant garter snakes from entering the area where SAFCA would be constructing during the winter. This fence would be monitored daily prior to and during construction to insure that there are no breaches that a snake could get through. Areas that are unlikely to have overwintering giant garter snakes include areas which have active construction or agricultural activities occurring on them. The construction of the lower GGS/Drainage would begin after October 1, however the construction footprint is within active agriculture (alfalfa and row crop) which has been disturbed by typical agricultural practices and it is unlikely that giant garter snakes would use it for overwintering habitat. Effects likely due to this work being constructed during the inactive season includes crushing of snakes within their burrows and crushing snakes which are out of the burrow to bask or move short distances but are slower moving due to the temperature.

The remainder of the project would be constructed during the active period (May 1 – October 1) for the snake, resulting in a decreased risk of direct mortality of snakes and would be completed in one construction season, minimizing the length of the effects to snakes. Effects to snakes are highly likely given the number of acres affected within Phase 3. Effects would include removal of cover and basking sites and filling or crushing of burrows or crevices due to excavation activities. Snake movements would be obstructed due to construction activities blocking access to aquatic or upland habitat. The large amount of construction equipment and number of workers within the Phase 3 action area would increase the likelihood of running over basking or dispersing snakes. Filling in of aquatic habitat such as rice, marsh and ditches would decrease the prey base for giant garter snakes. All of these effects are likely to result in the direct disturbance, displacement, injury, and/or mortality of snakes. Some of these effects would be minimized through SAFCA's conservation measures. Much of the work would occur during the snake's active season which would reduce snake mortality because the snakes would be able to leave habitat that is undergoing construction. Dewatering habitat prior to working within in it by at least 2 weeks prior to disturbance would facilitate snakes leaving the construction areas. Speed limits along construction roads as well as worker awareness training should minimize vehicles running over basking or dispersing snakes. SAFCA has proposed to construct new canals and ditches prior to filling the existing ditches. This should allow both an area for the snakes to disperse to as well as help provide prey for snakes.

Compensation for the 45.23 acres of rice permanently converted to managed levee grassland in Phase 3 would occur by creating 45.23 acres of managed marsh during Phase 4 along the western boundary of Fisherman's Lake. The creation of managed marsh at this location would connect to existing TNBC Preserve lands which are currently managed marsh and would enlarge a core area for giant garter snakes in the Natomas Basin. While the Service recognizes the benefit of enlarging managed marsh within the Fisherman's Lake area, there would be a temporal loss of aquatic habitat for giant garter snakes between when rice is converted to upland in Phase 3 and when marsh is created in Phase 4.

SAFCA will be filling 9.25 acres of drainage ditches and marsh habitat. The majority of the acreage is due to the filling of the Airport West Drain. To compensate for the loss of habitat, SAFCA has proposed to build the GGS/Drainage Canal (while it will have some long-term

protections through a drainage easement, it will not be protected with a conservation easement) and to compensate with 9.25 acres of managed marsh with a conservation easement near Fisherman's Lake. There are about 5.93 acres of upland habitat that is associated with the ditches and marsh. Because the aquatic features are going to be filled, this area will no longer serve the same function of adjacent upland habitat for the giant garter snake. SAFCA will be creating and preserving a small amount of upland habitat adjacent to the GGS/Drainage Canal and also creating 5.93 acres of managed marsh with a conservation easement near Fisherman's Lake. The GGS/Drainage Canal will be sloped to minimize maintenance and will have the side slopes planted with perennial grasses along the upper slope and rushes and sedges along the water's edge. The new GGS/Drainage Canal would have a minimum water depth of 4.5 feet between April and October, which is the active season for the giant garter snake. Because snakes tend to overwinter near the water line of their aquatic habitat it is likely that snakes may overwinter along the GGS/Drainage Canal. Water level management of the GGS/Drainage Canal should prevent fluctuating water levels in the winter months which will avoid flooding upland habitat that giant garter snakes may use for overwintering.

SAFCA will be providing additional compensation lands at a 1:1 ratio of upland and aquatic habitat affected due to the filling of the Airport West Ditch in addition to creating the GGS/Drainage Canal. The GGS/Drainage Canal will only be protected with a drainage easement, not a conservation easement. Because the primary purpose of the easement will not be for conservation of the giant garter snake SAFCA has proposed to compensate 1:1 near Fisherman's Lake by creating managed marsh and placing a conservation easement over the property. Therefore, managed marsh created as compensation for Phase 3 will be built in Phase 4 and include 15.18 acres of compensation for canal and adjacent upland habitat effects. Phase 4 marsh creation at Fisherman's Lake will also include 25.35 acres of managed marsh due to habitat loss in Phase 2 and 45.23 acres of rice converted to grassland in Phase 3. SAFCA has committed to creating 100 acres of managed marsh at Fisherman's Lake during Phase 4.

Direct Effects due to Maintenance of GGS/Drainage Canal and Brookfield Rice

On-going maintenance activities will likely result in injury to and death of giant garter snakes. Sediment removal, vegetation removal, and canal bank repair of the GGS/Drainage Canal in the active season would involve the use of heavy machinery on the maintenance road. Giant garter snakes basking on the road could be run over by the large equipment. Snakes would also be harassed and would leave the construction area due to the human and construction activity. Snakes leaving the area would be subject to higher mortality due to predation. Maintenance activities may also fragment and isolate available habitat, prevent dispersal of giant garter snakes among habitat units, and reduce the availability of cover and giant garter snake prey.

Conservation measures proposed by SAFCA would minimize effects to giant garter snakes. Limiting the time of work, keeping heavy equipment on the maintenance road, using specialized equipment to protect the banks during sediment removal, dewatering the area prior to work beginning, the design of the canal, limiting the amount of rock placed for erosion protection, and worker awareness training would all minimize the likelihood of take of the giant garter snake

during canal maintenance. Work proposed between October 1 and May 1 would avoid disturbing the bank of the canal and vegetation along the edge of the canal, which should limit effects to overwintering snakes. Heavy equipment on the maintenance road would likely affect snakes which may be overwintering in nearby upland burrows or snakes which may take advantage of warm winter weather and may be out of a burrow foraging. However speed limits and worker awareness training would lessen the chances of snakes being run over by construction equipment. The above conservation measures should reduce these effects.

Grazing by small-hoofed animals has a low likelihood of injuring giant garter snakes and other species. Livestock move slowly through an area, providing time for giant garter snakes and other species to escape trampling. The small-hoofed animals cause minimal or no damage to giant garter snake burrows. Because mowing coincides with the giant garter snake active season, individuals present in upland habitat are likely to retreat to the water at the first sign of noise, vibration, and human activity, thereby reducing the chance of injury. Giant garter snakes could be injured or killed during prescribed burning activities if they are above ground, and in some cases, if their burrows become too hot. Burning of grasses and other ruderal vegetation typically proceeds quickly enough that harm to giant garter snakes in burrows or riprap is minimized.

The act of growing and harvesting rice could negatively affect giant garter snakes. Agricultural practices such as tilling, grading, harvesting, or mowing may kill or injure giant garter snakes. Giant garter snakes have been observed to overwinter near canals within or adjacent to rice fields making them especially vulnerable to earth moving activities required to shape flood irrigated fields, form rice checks (small berms that affect water flow) and install irrigation boxes (structures which regulate flow quantity). Growing of wild rice crops may result in more adverse effects than growing the more common long and short grain rice. Long and short grain rice are harvested after irrigation has ceased and fields have dried. Because radio-marked giant garter snakes have been observed moving from rice fields into the nearby canals as water recedes prior to harvest (Wylie 1998b), giant garter snakes are presumed to be absent when mechanical harvesters are driven into the fields. In contrast, wild rice is harvested while the field is inundated with water. The effects of mechanical harvesting upon giant garter snakes in fields with water and prey are present are unknown but, the harvesting is suspected to disrupt hunting, basking, or other behaviors.

Valley Elderberry Longhorn Beetle

Direct Effects due to Phase 3 Construction

Table 1 in the conservation measures above lists the elderberry shrub stem counts and sizes which would be transplanted as part of the Phase 3 construction. Elderberry shrubs would be transplanted and elderberry seedlings and associated natives would be planted within the portions of the woodland corridor that will be constructed in Phase 3. Valley elderberry longhorn beetle may be adversely affected with the transplantation of elderberry shrubs. Any beetle larvae occupying these plants are likely to be killed when the plants are transplanted. Loss of an elderberry shrub or even a stem can result in direct mortality of valley elderberry longhorn

beetles or affect valley elderberry longhorn breeding and feeding because adult beetles rely solely on elderberry flowers for food and must lay their eggs on elderberry stems to successfully reproduce.

Temporal loss of habitat will occur. Although mitigation for impacts on the beetle involve creation or restoration of habitat, it generally takes five or more years for elderberry plants to become large enough to support beetles, and it generally takes 25 years or longer for riparian habitats to reach their full value. Temporal loss of habitat will temporarily reduce the amount of habitat available to beetles and may cause fragmentation of habitat and isolation of subpopulations. Beetles disperse poorly and the systematic removal of elderberry shrubs from a relatively connected river corridor has adverse effects well outside of the project's footprint.

Cumulative Effects

The cumulative effects for the giant garter snake and valley elderberry longhorn beetle have not changed and are incorporated by reference from the amended programmatic biological opinion (pages 68-70).

Conclusion

After reviewing the current status of the giant garter snake and valley elderberry longhorn beetle, the environmental baseline for the species, the effects of the proposed project, and the cumulative effects on this species, it is the Service's biological opinion that the proposed Natomas Landside Improvements Project Phase 3, as described herein, is not likely to jeopardize the continued existence of the giant garter snake or valley elderberry longhorn beetle.

The Corps and SAFCA have proposed to improve flood protection for the Natomas Basin above what currently exists. Two HCPs currently exist within the Natomas Basin and are based on future development occurring within the permit area of the Metro Air Park Habitat Conservation Plan (MAPHCP) and NBHCP. The baselines and assumptions for which these HCPs were developed were based on no urban development occurring within the basin outside of these permit areas and landuse practices remaining essentially the same. Sacramento County and the City of Sacramento have been in discussions about additional development outside of the existing permit areas. As discussed in the Environmental Baseline, the Natomas Basin has experienced a large amount of rice fallowing both in land held by private farmers and leases terminated on Sacramento County Airport property. While the Service has concluded that SAFCA's project would not jeopardize the giant garter snake or valley elderberry longhorn beetle, it could enable future growth to occur that otherwise would not be allowable but for these actions, which would require additional analysis to determine if this growth could jeopardize any of the 22 species covered by the MAPHCP and NBHCP. However, although future growth in the Natomas Basin outside of the permit area is under discussion, the Service does not consider it to be reasonably foreseeable at this time, as no specific proposals are proposed or under review. If growth outside of the permit areas were to occur within the Natomas Basin, these future projects

must have a higher conservation outcome than currently exists in the HCPs and must be closely coordinated with the Service.

INCIDENTAL TAKE STATEMENT FOR PHASE 3 CONSTRUCTION

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering. Harm is defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by impairing behavioral patterns including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act, provided that such taking is in compliance with this Incidental Take Statement.

The measures described below are nondiscretionary for listed species in Phase 3 of this opinion and must be implemented by the Corps in order for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity that is covered by this incidental take statement. If the Federal agency (1) fails to adhere to the terms and conditions of the incidental take statement, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

Amount or Extent of Take

Giant Garter Snake

The Service anticipates that incidental take of the snake will be difficult to detect or quantify for the following reasons: giant garter snakes are cryptically colored, secretive, and known to be sensitive to human activities. Snakes may avoid detection by retreating to burrows, soil crevices, vegetation, or other cover. Individual snakes are difficult to detect unless they are observed, undisturbed, at a distance. Most close-range observations represent chance encounters that are difficult to predict. It is not possible to make an accurate estimate of the number of snakes that will be harassed, harmed or killed during Phase 3 construction activities (staging areas, work on canal banks, soil borrow areas, and vehicle traffic to and from borrow areas) or long-term maintenance of the GGS/Drainage Canal and Brookfield rice. In instances when take is difficult to detect, the Service may estimate take in numbers of species per acre of habitat lost or affected as a result of the action. Therefore, the Service anticipates that all giant garter snakes inhabiting 59.99 acres of aquatic and 73.81 acres of upland habitat may be harassed, harmed, or 3 giant garter snakes killed by loss and destruction of habitat due to construction of Phase 3. The Service also anticipates that all giant garter snakes inhabiting the 2.2-mile-long upper

GGS/Drainage Canal may be harmed, harassed, or 1 giant garter snake killed due to RD 1000 annual maintenance of the canal and adjacent uplands per year.

Valley Elderberry Longhorn Beetle

The Service expects that incidental take of the valley elderberry longhorn beetle will be difficult to detect or quantify. The cryptic nature of these species and their relatively small body size make the finding of an injured or dead specimen unlikely. The species occurs in habitats that make them difficult to detect. Due to the difficulty in quantifying the number of beetles that will be taken as a result of the proposed action, the Service is quantifying take incidental to the project as the number of elderberry stems one inch or greater in diameter at ground level (beetle habitat) that will become unsuitable for beetles due to direct or indirect effects as a result of Phase 3 construction. Therefore, the Service estimates that all beetles inhibiting 63 elderberry plants containing stems 1 inch or greater at ground level (165 stems between 1-3 inches, 50 stems between 3 and 5 inches and 50 stems $\geq$5 inches; see Table 1 in the text) will become unsuitable as a result of the proposed action.

Effect of the Take

The Service has determined that this level of anticipated take is not likely to result in jeopardy to the giant garter snake, or valley elderberry longhorn beetle, and will not result in the destruction or adverse modification of designated critical habitat because in the case of the giant garter snake critical habitat has not been designated and it is outside of the critical habitat for valley elderberry longhorn beetle.

Reasonable and Prudent Measures

The following Reasonable and Prudent Measures are necessary and appropriate to minimize the effect of the proposed project on the giant garter snake and valley elderberry longhorn beetle.

1. The Corps and SAFCA shall implement the project as proposed in the biological assessment and described in this biological opinion.

2. Effects of harassment of individual giant garter snakes within the proposed project, and of the loss or degradation of the species' habitat shall be minimized.

3. Effects of harassment of individual valley elderberry longhorn beetle, and of the loss and degradation of the species' habitat shall be minimized.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Corps must ensure compliance with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are nondiscretionary.

1. The following Terms and Conditions implement Reasonable and Prudent Measure one (1):

    a. The Corps and SAFCA shall minimize the potential for incidental take of the giant garter snake and valley elderberry longhorn beetle resulting from the project related activities by implementation of the project description as described in the biological assessment and the project description (pages 2 - 37) of this biological opinion.

    b. If requested, before, during, or upon completion of ground-breaking and construction activities, the project proponents shall allow access by Service and/or California Department of Fish and Game personnel to the project site to inspect the project for effects to giant garter snakes and valley elderberry longhorn beetles and to determine if the proposed conservation measures are being implemented.

    c. A Service-approved Worker Environmental Awareness Training Program for construction personnel shall be conducted by a Service-approved biologist for all construction workers prior to the commencement of construction activities. As needed, training shall be conducted in Spanish for Spanish language speakers and other languages as needed or necessary.

    d. The applicants shall include a copy of this biological opinion within its solicitations for design and construction of the proposed project making the primary contractor responsible for implementing all requirements and obligations included within the biological opinion, and to educate and inform all other contractors involved in the project as to the requirements of the biological opinion.

2. The following Terms and Conditions implement Reasonable and Prudent Measure two (2):

    a. At least 30 calendar days prior to initiating construction activities, the project proponents shall submit the names and curriculum vitae of the biological monitor(s) for the proposed project. Monitors shall have the ability to differentiate giant garter snakes from other snakes and the authority to stop construction activities if a snake is encountered during construction until appropriate corrective measures have been completed or until the snake is determined to be unharmed.

    b. For Phase 3 work that would occur outside of the giant garter snake active window, (power pole relocations, removal or relocation of residential or agricultural structures, construction of lower GGS/Drainage Canal and portions of Elkhorn Canal, and removal of trees and elderberry shrubs) exclusion fencing shall be placed around upland areas that giant garter snakes could use to overwinter. The exclusionary fencing shall be monitored everyday prior to and

during construction to ensure that openings do not develop that would allow the entry of a giant garter snake into the construction area.

c. If it appears that any other construction activity may go beyond October 1, the project proponents shall contact the Service as soon as possible, but not later than July 15 of the year in question, to determine if additional measures are necessary to minimize take. Areas that have not had ground breaking occur prior to September 15 shall not work past October 1.

d. The project proponents shall implement Best Management Practices to prevent sediment from entering areas containing snake habitat, including, but not limited to, silt fencing, temporary berms, no cleaning of equipment in or near snake habitat, installation of vegetative strips, and temporary sediment disposal.

e. Runoff from dust control and oil and other chemicals used in other construction activities shall be retained in the construction site and prevented from flowing into areas containing snake habitat. The runoff shall be retained in the construction areas by creating small earthen berms, installing silt fences or hay-bale dikes, or implementing other measures on the construction site to prevent runoff from entering the habitat of the snake.

f. The biologist shall notify the Service immediately if any listed species are found on-site, and will submit a report, including date(s), location(s), habitat description, and any corrective measures taken to protect the species found. The biologist shall be required to report any take to the Service immediately by telephone at (916) 414-6600 and by electronic mail or written letter addressed to the Division Chief, Endangered Species Program, within one (1) working day of the incident. The project area shall be re-inspected by the monitoring biologist whenever a lapse in construction activity of two weeks or greater has occurred.

g. To the extent feasible, the project proponents shall confine clearing of vegetation and scraping, or digging, of soil to the minimal area necessary to facilitate construction activities.

h. After completion of construction activities, any temporary fill and construction debris shall be removed. A written report regarding restoration of temporarily disturbed sites shall be submitted to the Service within ten (10) working days of the completion of construction at the project site.

i. The Corps and SAFCA shall ensure compliance with the reporting requirements.

j. Prior to commencement of construction on May 1, 2010, the Corps and SAFCA shall have the Phase 3 Mitigation and Monitoring Plan and Site Specific Management Plan completed and approved by the Service.

k. RD 1000 will include the number of giant garter snakes which are taken due to maintenance of the GGS/Drainage Canal in their annual report. Take should be recorded as actual number of snakes harmed, harassed, or killed, and the acreage of habitat affected. Once the incidental take coverage provided for within this biological opinion has been reached, RD 1000 may not conduct any further maintenance activities along the GGS/Drainage Canal for the remainder of the year without consulting with the Service.

l. If spoil from the GGS/Drainage Canal is to be placed on adjacent property during the inactive season (October 1 to May 1), the land should be either active row or orchard (they should have been farmed the previous year). Spoil should not be placed on agricultural fields which have been fallowed for one year or longer, or ruderal/grassland habitat as this may be habitat for overwintering snakes.

m. TNBC shall manage the Brookfield rice in concert with all of the preserves they manage for the NBHCP. Therefore, no more than 10 percent of TNBC managed rice shall be out of production in any given year.

3. The following Terms and Conditions implement Reasonable and Prudent Measure three (3):

a. The procedures outlined in the Service's *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* dated July 9, 1999, shall be followed for all actions related to the proposed project.

b. A biological monitor will be present on site when work will encroach on the 20-foot elderberry buffer. The monitor will have the authority to stop construction within 20 feet of the shrub if unauthorized take of the beetle occurs. The monitor shall contact the Service immediately to determine what corrective measures need to be taken.

c. Compensation plantings shall occur within the same year as the transplantation of the elderberry shrubs.

Reporting Requirements

A post-construction compliance report prepared by the monitoring biologists must be submitted to the Deputy Assistant Field Supervisor at the Sacramento Fish and Wildlife Office within thirty (30) calendar days of the completion of construction activity or within thirty (30) calendar days of any break in construction activity lasting more than thirty (30) calendar days. This report shall detail: (i) dates that groundbreaking at the project started and the project was completed; (ii) pertinent information concerning the success of the project in meeting compensation and other conservation measures; (iii) an explanation of failure to meet such measures, if any; (iv) known

project effects on the giant garter snake and valley elderberry longhorn beetle, if any; (v) occurrences of incidental take of any these species; and (vi) other pertinent information.

The Corps must require SAFCA to report to the Service immediately any information about take or suspected take of federally-listed species not authorized in this biological opinion. SAFCA must notify the Service within 24 hours of receiving such information. Notification must include the date, time, and location of the incident or of the finding of a dead or injured animal. In the case of a dead animal, the individual animal should be preserved, as appropriate, and held in a secure location until instructions are received from the Service regarding the disposition of the specimen or the Service takes custody of the specimen. The Service contact persons are, Division Chief, Endangered Species Program at (916) 414-6600, and the Resident Agent-in-charge of the Service's Law Enforcement Division at (916) 414-6660.

Any contractor or employee who during routine operations and maintenance activities inadvertently kills or injures a listed wildlife species must immediately report the incident to their representative. This representative must contact the CDFG immediately in the case of a dead or injured listed species. The CDFG contact for immediate assistance is State Dispatch at (916) 445-0045.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities that can be implemented to further the purposes of the Act, such as preservation of endangered species habitat, implementation of recovery actions, or development of information and data bases.

1. The Corps and SAFCA should assist in the implementation of the draft, and when published, the final Recovery Plan for the giant garter snake.

2. The Corps and SAFCA should provide funding to researchers studying topics identified by the Service in the draft, and when published, the final Recovery Plan for the giant garter snake.

3. The Corps should use environmental restoration authorities to acquire and restore garter snake habitat.

To be kept informed of actions minimizing or avoiding adverse effects or benefiting listed and proposed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION - CLOSING STATEMENT

This concludes formal consultation with the Corps on the Natomas Levee Improvement Project, Phase 3. As provided in 50 CFR 402.16, re-initiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the proposed action may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in this opinion; or (4) a new species or critical habitat is designated that may be affected by the proposed action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation.

If you have any questions regarding this biological opinion on the Natomas Landside Improvements Project Phase 3, please contact Jennifer Hobbs at (916) 414-6541 or Jana Affonso, Chief, Sacramento Valley Branch at (916) 414-6645.

Sincerely,

for Susan K. Moore
Field Supervisor

cc:
Elizabeth Holland, Corps, Sacramento, CA
Patrick Moeszinger, CDFG, Rancho Cordova, CA
Peter Buck, SAFCA, Sacramento, CA
Linda Leeman, EDAW, Sacramento, CA

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
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Sacramento, California 95825-1846

In Reply Refer To:
81420-2010-F-0446-1

MAY 20 2010

Ms. Alicia Kirchner
Chief, Planning Division
U.S. Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, California 95814

Subject: Phase 4a Section 7 Appendage to the Programmatic Biological Opinion for the Natomas Levee Improvement Program, Landside Improvements Project, Sacramento and Sutter Counties, California

Dear Ms. Kirchner:

This is in response to your February 3, 2010, request for formal consultation with the U.S. Fish and Wildlife Service (Service) on the Natomas Levee Improvement Program (NLIP), Landside Improvements Project Phase 4a (proposed project) in Sacramento and Sutter Counties, California. Your request was received on February 4, 2010. A programmatic biological opinion (BO) was completed on October 9, 2008 (File 81420-2008-F-0195-5), amended on April 6, 2009 (File 81420-2008-F-0195-R001), and amended again on October 2, 2009 (81420-2008-F-0195-R002). The programmatic BO analyzed the entire proposed project on the landscape level and because details of the project were only available for Phase 2, provided an incidental take statement for only that phase of the project. A BO for the Phase 3 portion of the project was completed on September 28, 2009, (File 81420-2009-F-0890) and amended on October 2, 2009 (File 81420-2009-F-0890-R001). This BO will examine the details of the Phase 4a portion of the project and the effects of the action to the federally-listed threatened giant garter snake (*Thamnophis gigas*) (GGS) in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act). Critical habitat has not been designated for the GGS; therefore, none will be affected.

This BO is based on information provided in the U.S. Army Corps of Engineers' (Corps) letter requesting consultation and their biological assessment. A complete administrative record is on file at the Sacramento Fish and Wildlife Office.

TAKE PRIDE IN AMERICA

CONSULTATION HISTORY FOR PHASE 4a

December 16, 2009. AECOM, the consultant to the Sacramento Area Flood Control Agency (SAFCA), provided the Service with an administrative draft Phase 4a biological assessment.

January 4, 2010. The Service e-mailed comments to AECOM on the draft Phase 4a biological assessment.

February 3, 2010. The Corps initiated section 7 consultation on Phase 4a.

BIOLOGICAL OPINION

Description of Action Area

The NLIP Landside Improvements Project consists of three phases of construction. Phase 2, which was discussed in more detail in the Programmatic and Phase 2 BA (SAFCA 2008a), will be implemented along the 5.3-milelong Natomas Cross Canal (NCC) south levee, the Sacramento River east levee from the NCC south levee to 2,000 feet south of the North Drainage Canal, the Elkhorn Main Irrigation Canal (Elkhorn Canal) between the North Drainage Canal and the Elkhorn Reservoir settling basin, the site of Reclamation District (RD) 1000 Pumping Plant No. 2, and adjacent land. Phase 3, which was discussed in more detail in the Phase 3 BA (SAFCA 2009a), will include the Sacramento River east levee south of the limits of the Phase 2 improvements to just south of Interstate 5 (I-5), the Pleasant Grove Creek Canal (PGCC) west levee, the Natomas East Main Drainage Canal (NEMDC) west levee between Elkhorn Boulevard and Northgate Boulevard, the area between Elkhorn Reservoir and the West Drainage Canal where a new GGS/Drainage Canal will be constructed, the Elkhorn Canal downstream of Elkhorn Reservoir, and RD 1000 Pumping Plant No. 2.

Phase 4a, which is the proposed project, will consist of:

- improvements to the Sacramento River east levee south of the limits of the Phase 3 improvements to approximately 2.5 miles north of Interstate 80,
- the relocation of the Riverside Main Irrigation Canal (Riverside Canal),
- creation of habitat in the vicinity of Fisherman's Lake, and
- improvements and modifications to a number of pumping plants along the Sacramento River east levee and NCC south levee.

Subsequent phases of the project may include improvements to the Sacramento River east levee south of the limits of the Phase 4a limits, the American River north levee, and the NEMDC west levee between Sankey Road and Elkhorn Boulevard and improvements to the West Drainage Canal from I-5 to Fisherman's Lake.

As greater flood protection will be provided for the entire Natomas Basin, the action area includes the entire Natomas Basin.

Description of Proposed Action

Overview of NLIP Landside Improvements Project

SAFCA is designing the NLIP in coordination with the Federal and state flood control project sponsors, the Corps, and the State of California Central Valley Flood Protection Board (CVFPB), to address the deficiencies in the Natomas levee system with a focus on achieving a 100-year level of flood protection by 2011. This will require improving the following landside conditions along the NCC south levee, the Sacramento River east levee, and the PGCC and NEMDC west levees:

- Inadequate freeboard—The NCC south levee and portions of the Sacramento River east levee are not high enough to provide at least 3 feet of freeboard above the 100-year water surface elevation. Additional reaches do not provide 3 feet of freeboard above the 200-year design water surface elevation.
- Underseepage and through-seepage vulnerability—Most of the levee reaches do not meet recently adopted Federal criteria for safely containing underseepage and through-seepage when the water surface in the adjacent channel reaches the 100-year elevation or, in some cases, the 200-year elevation.

The NLIP Landside Improvements project encompasses addressing freeboard deficiencies through levee raises; addressing seepage potential using a combination of seepage berms, cutoff walls, and relief wells; and acquiring additional right-of-way to construct the improvements and to prevent encroachment into the flood control system. In addition, the project has been designed to include an enlarged levee embankment (adjacent setback levee) along the land side of the existing Sacramento River east levee to minimize the need for substantial removal of vegetation and structural encroachments on the water side of this levee in compliance with Corps guidance. These improvements will include recontouring the levee slopes where necessary to provide a 3:1 horizontal-to-vertical (3H:1V) waterside slope and a 3H:1V (preferred) or 2H:1V (maximum) landside slope.

The specific goal of the NLIP Landside Improvements Project is to provide at least 100-year flood protection as quickly as possible while laying the groundwork to achieve at least urban-standard (200-year) flood protection over time.

Additional project objectives that influenced SAFCA's project design were to:

(1) use flood control projects in the vicinity of the Sacramento County Airport (Airport) to facilitate better management of Airport lands to reduce hazards to aviation safety, and

(2) use flood control projects to enhance habitat quality and values by increasing the extent and connectivity of the lands in the Natomas Basin being managed to provide habitat for the giant garter snake, the state-listed threatened Swainson's hawk (*Buteo swainsoni*), and other special-status species.

Recognizing the importance of securing maximum Federal support for the flood control project, SAFCA has explored implementation approaches that also advance the achievement of Federal aviation and wildlife protection objectives where complementary opportunities exist. Accordingly, the proposed project includes the following elements:

- The project will include construction of the GGS/Drainage Canal to provide giant garter snake habitat and some drainage infrastructure west of the Airport. Construction of these facilities will allow for dewatering of the ditch running along the western portion of the Airport runway system, which the airport recognizes as a flight safety hazard, by offsetting the effects on drainage and irrigation needs and giant garter snake habitat.

- The project will combine SAFCA's need for levee embankment and berm material with the Sacramento County Airport System's need to modify the condition and management of Airport bufferlands to reduce wildlife hazards affecting Airport operations in a manner that enhances the connectivity of areas managed specifically for their habitat value.

Levee Raising and Seepage Remediation

Sacramento River East Levee Reach 4B

Additional geotechnical analysis has determined that a cutoff wall is required in Reach 4B of the Sacramento River east levee. The 3-foot-wide soil-bentonite (SB) cutoff wall will be installed in the adjacent levee during the 2010 construction season. All construction will occur on the landside of the levee. Construction of the Reach 4B cutoff wall will involve degrading the new adjacent levee approximately 10 feet to create a working platform. The cutoff wall will be constructed from this working platform using a long-stick excavator, which will construct a continuous cutoff wall to depths ranging from approximately 20 to 75 feet. Once the cutoff wall is fully constructed and allowed to settle for at least 4 weeks, the adjacent levee embankment will be reconstructed and aggregate base/hydroseed will be placed on the surface.

Sacramento River East Levee Reaches 10–15

General Plan for Phase 4a Construction
Phase 4a construction on the Sacramento River east levee will include improvements from the northern end of Reach 10 through Reach 15, a distance of approximately 5.9 miles. Phase 4a Project work along the Sacramento River east levee includes:

- constructing an adjacent levee in Reaches 10-15;
- installing either SB or soil-cement-bentonite (SCB) through the existing levee or along the landside toe of the existing levee in Reaches 12A through 14;
- constructing 100- to 300-foot-wide seepage berms in Reaches 10 through a portion of 12A, part of Reach 14, and Reach 15 (Exhibit 6);
- installing relief wells, spaced at 60- to 100-foot intervals, approximately 20 feet beyond the toe of the seepage berm locations in Reaches 10, part of 11A, part of 14, and 15;

- establishing a 20- to 50-foot-wide operations and maintenance access corridor and a 20-foot-wide utility corridor adjacent to the toe of the adjacent levee or seepage berm;
- planting 50- to 200-foot-wide woodland groves in areas between Reaches 12A through 14;
- constructing new surface drainage inlets and outfalls along the Sacramento River east levee;
- reconstructing the Garden Highway intersections at Power Line Road, Radio Road, San Juan Road, and most private parcel ramps and RD 1000 facility access ramps; and
- acquiring parcel 225-0090-00, including vegetation clearing onsite.

The primary construction staging area will be located on approximately 1 acre near Power Line Road and the Garden Highway. At least three additional staging areas of about 1 acre each will be required along and at each end of the Riverside Canal alignment. These areas will be fenced and used for the contractor's and engineer's construction trailers, parking for personnel, machine maintenance tools and parts, possibly water trucks, and the storage of fuels and other materials to be used for construction. The project right-of-way along the construction area also will be used for staging of construction materials and equipment.

For this phase, the levee improvements are anticipated to be constructed between April 15 and November 1 of 2010 and 2011, with mobilization beginning April 15 and initial ground disturbance beginning May1. Some construction could extend as late as December 31. In areas within 200 feet of giant garter snake habitat, these areas will be continuously disturbed starting no later than the last two weeks of September. Some related activities, such as utility relocations; removal or relocations of residential or agricultural structures; and removal, transplantation, and planting of trees; will be conducted before April 15, though these will occur farther than 200 feet from suitable aquatic giant garter snake habitat. Demobilization and site restoration (e.g., hydroseeding, gravelling) will extend through January and these will occur within areas that have been continuously disturbed prior to the giant garter snake inactive period. Should additional construction activities occur outside of the specified work window for listed species, SAFCA will coordinate with the Corps, the Service, and DFG to implement additional avoidance and minimization measures as necessary and, if appropriate, will request that the Corps reinitiate section 7 consultation with the Service.

Site Preparation (Tree Removal, Clearing, Grubbing, and Stripping)

Site preparation will entail clearing structures and woody vegetation from the Phase 4a construction area (Reaches 12b through 15 and part of Reach 16 for the Riverside Canal) and stripping the top 12 inches of material from the landside slope of the existing levee and the footprint of the adjacent setback levee and seepage berm (as applicable). All vegetation in the operations and maintenance corridor within 15 feet of the levee toe or seepage berm will be cleared. However, outside of this 15-foot zone, trees within the utility and operations and maintenance corridors will be avoided where feasible. Where trees cannot be retained, the permanent maintenance access corridor will be cleared but not stripped. Large roots, tree stumps, root balls, deleterious material, and below ground infrastructure will then be grubbed from the working area. To the extent feasible, trees that must be removed from within the

footprint will be removed during the winter prior to the construction season to avoid disturbing the nesting behavior of special-status birds in spring. Excess earth materials (organic soils, roots, and grass from borrow areas and the adjacent levee foundation and excavated material that does not meet levee embankment criteria) will be respread on the surface of the new levee slopes and seepage berms, be used in the reclamation of borrow areas, or hauled off-site to landfills. Debris generated during the clearing and grubbing operations will be hauled off-site to landfills, concrete recycling plants or cogeneration facilities.

This footprint consists of the adjacent setback levee, a seepage berm, an operation and maintenance corridor, and a utility corridor, resulting in a total flood control footprint that ranges from approximately 127 to 465 feet wide. In addition, vegetation will also be removed in the footprint of the relocated Riverside Canal, which is directly adjacent to the landside edge of the flood control footprint. This operation will require removal of some trees and relocation/removal of elderberry shrubs, which occur mostly adjacent to existing roads. During winter, large trees will be felled approximately 3 feet above ground level, with stumps temporarily left in place. Logs will be cut into rounds for removal by contractors with handheld equipment and removed in light vehicles. Small trees and elderberry shrubs, where feasible, will be relocated to woodland preservation corridors or nodes that are part of the Phase 4a Project. A minimal amount of ground disturbance in specific areas will occur. During the giant garter snake active season (after May 1 and before October 1), the stumps will be removed and the footprint cleared and grubbed completely to prepare for construction. Vegetation clearing for Reaches 10–15 of the Sacramento River east was addressed in the Phase 3 BO.

Relocation and Removal of Landside Structures, Irrigation Ditches and Other Facilities

Approximately 12 residences and other farm structures that are within the footprint of the levee improvements will have to be removed or relocated farther from the flood control facilities before the start of levee construction in those areas. Irrigation facility conveyance features, distribution boxes, wells, and standpipes within the project footprint will be demolished and replaced as needed. Power poles that currently exist on the landside slope of the levee and at the landside levee toe will need to be relocated and/or rerouted to accommodate the widened levee footprint. To the extent feasible, mainline utility poles will be relocated beyond the landside levee toe or berms, and a secondary line of distribution poles will be relocated to the drainage swale area between the existing levee and the adjacent levee. Should placing poles on top of the seepage berms be required, either raised foundations or steel-reinforced concrete piers will be constructed to prevent the poles from affecting the seepage berms. Some poles may need to be relocated to the waterside of the existing levee. The relocations will be conducted in coordination with the utility companies and the construction operations. Tree pruning will likely be required in some locations to accommodate the poles and wires. Debris from structure demolition, power poles, utility lines, piping, and other materials requiring disposal will be hauled off-site to a suitable landfill. Wells and septic systems will be abandoned in accordance with the applicable State and county requirements.

Excavation of Stability Berm and Inspection Trench

The existing stability berm along the levee from Reaches 10 to 11B will be excavated and the fill material will be used in the construction of the seepage berms. The geotextile fabric from the berm's drain layer will be discarded to a suitable landfill. The rock from the stability berm's drainage layer will be either incorporated into the seepage berm, incorporated into other project features, or hauled off-site to landfills. The geotextile fabric from the berm's drainage layer will be hauled off-site to landfills.

Construction of Adjacent Levee, Cutoff Walls, and Seepage Berms

Borrow material from the borrow source will be delivered to the levee construction sites by scrapers or haul trucks where it will be spread by motor graders and compacted by sheepsfoot rollers to build the adjacent levee and seepage berms. In Reaches 10–12B, the levee will be raised to provide up to 2.3 feet of levee height above the 200-year design flood elevation. In Reaches 13–15, where the existing levee already meets height requirements, the top of the new levee will be no higher than the elevation of the existing levee crown. The landside slope of the adjacent levee will be 3H:1V (horizontal feet:vertical feet). In those areas where a cutoff wall is required, the adjacent levee will be built up a height approximately 5 feet above existing grade at the toe of the levee to create a working platform for cutoff wall installation. Three-foot wide cutoff walls made of either SB or SCB will be installed either through the existing levee or along the landside toe of the existing levee, with the top of the cutoff walls being at least 5 feet above existing ground surface and extending to a maximum depth of 110 feet below ground surface in some areas. Between Reaches 10 through the beginning of 12A and a portion of 14 through 15, borrow material will be spread and compacted for construction of the 100- to 300- foot-wide seepage berms.

Installation of Relief Wells and Monitoring Wells

Relief wells will be constructed at selected locations where the seepage berms cannot be wide enough or cutoff walls deep enough to meet the required seepage remediation design parameters. Relief wells will also be constructed along some of the entrance channels to the landside pump stations. Relief wells will be spaced at 50- to 100-foot intervals approximately 20 feet beyond the toe of the berm and will extend to depths of between 60 to 80 feet below the ground surface. Relief well surface discharge near the seepage berm toe will flow into new collection ditches or existing roadside ditches that will convey the water to Pumping Plant No. 5 or other parts of the interior drainage system.

Reconstruction of Garden Highway at Intersections

Where the cutoff wall will be constructed through the crown of the adjacent levee, reconstruction work on Garden Highway will be required to restore the landside lane of the roadway. Garden Highway intersections at Powerline Road, Radio Road, San Juan Road, multiple private parcel ramps, and RD 1000 facility access ramps will require reconstruction to accommodate the adjacent levee. It is anticipated that Garden Highway will be extended up and onto the widened

adjacent levee at these locations to meet with the secondary roads. Approach embankments at the intersections will be enlarged and the entire intersections will be repaved. Intersecting roadway embankments will be raised at and will be designed to meet Sacramento County roadway design criteria, typically extending the approach embankment approximately 600 feet outward from the adjacent levee. Traffic control measures and detours will be required during this phase of construction.

Installation of Surface Drainage Outlets Across Garden Highway

Upstream of Reach 15 of the Sacramento River east levee, the portion of levee between the new adjacent setback levee and the Garden Highway pavement will include new storm drainage collection facilities to convey surface water beneath Garden Highway and toward the Sacramento River. These drainage facilities will be necessary only in areas where the adjacent levee is higher than Garden Highway or during the transition back to the nonraised adjacent levee. A surface collection system (grassed drainage swale) will convey runoff water to drop inlets, and new pipe laterals will convey the water beneath Garden Highway to new waterside outfalls, spaced approximately 1,500 feet apart, in the berm along the east bank of the Sacramento River (Exhibit 7a). In most locations, the outfalls will be placed above the ordinary high water mark on the 'bench' adjacent to the levee. The location of the cross culverts will be selected to minimize impacts on existing residential properties and riparian vegetation, including trees. The drainage pipes vary from 12 to 30 inches diameter. The discharge will vary with the magnitude of precipitation events and is anticipated to exceed 1 cubic foot per second (cfs) during substantial rain events. These discharge pipes will require minor landscape improvements to prevent erosion and ensure that applicable water quality standards are met. Rock slope protection will be installed on the surface of the 'bench' to prevent erosion below the outfalls. Excavation of a trench to install the culvert piping across Garden Highway will be required, and those segments where excavation occurs will have to be reconstructed. Single-lane traffic controls and through-traffic detours will be required during this phase of construction. No waterside outlets will be required in Reach 13, 14, and 15 because the new adjacent levee will not be raised above the existing levee or because the transition from the raised levee to the existing levee height will end at a point where runoff from Garden Highway in this reach could continue to drain to both the landside and waterside of the levee as it does now.

Upon completion of construction activities, the levee slopes and the tops of the seepage berms will be hydroseeded. An aggregate base patrol road will be constructed on the crown of the new levee and on the landside edge of the seepage berm. Any construction debris will be hauled to an appropriate waste facility. Equipment and materials will be removed from the site, and staging areas and any temporary access roads will be restored to pre-project conditions. Demobilization will likely occur in various locations as construction proceeds along the project alignment.

Natomas Cross Canal South Levee

At the Natomas Central Mutual Water Company's (NCMWC) pumping plants along the NCC south levee, discharge pipelines penetrate the NCC south levee at an elevation lower than the 200-year design flood elevation and must be raised or removed to comply with current levee

design criteria. One 36-inch-diameter pipe and one 42-inch-diameter pipe are located at the Bennett Pumping Plant; three 30-inch-diameter and two 42-inch-diameter pipelines are located at the Northern Pumping Plant.

The demolition of the Northern and Bennett Pumping Plants and the removal of the intake pipes are part of the American Basin Fish Screen and Habitat Improvement Project (ABFS), which will include a replacement pumping facility on the Sacramento River, near the Garden Highway and Sankey Road intersection. Timing and extent of construction at these sites under the NLIP is dependent upon the following two scenarios:

1. If construction of the ABFS is completed first, the demolition of the plants will be completed and the pipes beneath the levee can be removed as needed to install the cutoff wall.

2. If the ABFS is not completed first, the cutoff wall will be installed along the NCC south levee and the pipes will be raised and the pumps and motors will be modified so that these plants can continue to operate. Then, once the ABFS project is constructed and operational, the pipes and pumps will be removed.

General Plan for Phase 4a Construction

The Bennett Pumping Plant gap is located between Stations 56+00 and 61+00 of the NCC, and the Northern Main Pumping Plant gap is located between Stations 188+50 and 122+10 of the NCC. Once the issues with the discharge pipes are resolved, cutoff walls will be installed up to 80 feet deep at the pumping plant locations to close gaps that will remain along the cutoff wall following construction of the Phase 1B and Phase 2 Projects. The levee will also be raised at these locations to an elevation equal to at least 3 feet above the 200-year design flood elevation, and the levee side slopes will be flattened to meet current design criteria.

Cutoff Wall Construction

At the pumping plant locations, including overlaps, a total length of 1,050 lineal feet (73,500 square feet) of cutoff wall will be constructed. Cutoff wall installation at the pumping plant locations will include the mobilization of a long reach excavator, levee degrading equipment, and slurry production equipment. The levee will be degraded to one-half the levee height, as measured from the landside toe, and existing pumping plant pipes will be removed. At the Bennett Pumping Plant, where a 42-inch-diameter pipe is located deeper in the levee (approximately 20 feet beneath the existing crown), the levee will be further degraded to the base of the pipe and the pipe removed. The levee will then be reconstructed to one-half the levee height to support cutoff wall construction. A cutoff wall will be constructed along the existing levee centerline, overlapping the previously constructed cutoff walls adjacent to the pumping plants by a minimum of 50 feet. After allowing the cutoff wall approximately 3 weeks to consolidate, the levee reconstruction will begin, as discussed below.

Levee Raising

Levee raising will be carried out in a manner similar to the work completed on the NCC as part of the Phase 2 Project. To obtain 3 feet of levee height above the 200-year design water surface, these levee sections will be raised approximately 3 feet. At the Bennett Pump Plant, where additional levee degrading is required to remove a deeper pipeline, the levee will be constructed to a 3H:1V waterside slope, aligning with the portions of levee constructed adjacent to this reach as part of the Phase 2 Project. Given the landward setback of the Phase 2 Project construction, this slope configuration will provide a 3H:1V theoretical slope from the toe to top of the waterside slope. At the Northern Pump Plant, where it is not necessary to degrade the levee beyond one half the levee height, the crown will be reconstructed from the point of degrade up at a slope of 3H:1V. Landside slopes at both locations will be constructed at 3H:1V. The Brookfield borrow site will be the most likely source for import material.

Major Irrigation and Drainage Infrastructure Modifications

Riverside Canal Realignment

The 18,600-foot Riverside Canal is a main irrigation canal that services the NCMWC's riverside system. The canal flows south along the landside toe of the levee from RD 1000 Pumping Plant No. 3 at the beginning of Reach 13 to Bryte Bend Road at the end of Reach 17, beyond which the canal is abandoned. The canal is lined with concrete for most of its length, although the concrete is broken in many areas allowing vegetation to grow along the bank. During Phase 4a, the Riverside Canal will be relocated and reconstructed several hundred feet east of the landside toe of the Sacramento River east levee (Reaches 13–15) to accommodate the levee improvements as well as extended up to Reach 11B. The total length of relocated canal to be constructed in Phase 4a is 14,940 feet.

Timing of the new Riverside Canal construction will be critical to avoid interruptions in irrigation service. Temporary connections may need to be constructed to avoid agricultural service interruptions to adjacent properties. The construction of the Riverside Canal will occur in advance of the abandonment and filling of the existing Riverside Canal by the levee improvements. Extension of the Riverside Pumping Plant pipes to provide water to the new canal and turnout connections to users will be constructed outside of the irrigation season so as to avoid service interruptions.

Canal Alignment

The proposed alignment of the replacement Riverside Canal is based primarily on the extent of the planned levee improvements. Much of the replacement canal will be sited as close as possible to the toe of the new levee and seepage berm footprint. One-half to three-quarters of a mile south of San Juan Road southward to Interstate 80 (I-80), there are a number of residences along the landside toe of the levee. To avoid removing a significant number of the residential and agricultural structures on these private properties, the new Riverside Canal alignment will follow the eastern property line of these parcels, veering farther east in Reach 16. The final

alignment will also strive to avoid existing trees and other site-specific constraints that are identified during final design. Based on these site-specific factors and the variation of the proposed seepage remediation methods in different reaches, the alignment will be only roughly parallel to the projected levee toe.

The bottom of the canal, which will be approximately 8 to 10 feet wide, will be high enough to raise irrigation water levels above the levels of adjacent fields so that these fields could be fed by gravity flow. The canal will be confined by approximately 5.5-foot-high earthen embankments designed to provide 1 foot of levee height above irrigation water operating levels. To provide for stable banks, the side slopes of the canal will be 3H:1V or flatter. Between Reach 11B and mid-Reach 14 the invert and side slopes of the canal will be earthen. Between mid-Reach 14 and Reach 17 the invert and side slopes of the canal will be lined with concrete for control of vegetation and to allow for canal maintenance with minimal disturbance of aquatic habitat along the water's edge. If lined, the interior side slopes of the canal could be steepened up to a configuration of 2H:1V, possibly resulting in a slightly narrower footprint. The tops of the embankments will be approximately 12 feet wide, with a patrol road with an aggregate based rock surface located on top of the each of the embankments. The total canal right-of-way will be roughly 155 feet wide, including a landside operation and maintenance corridor.

Canal and Pipeline Construction

Clearing and Grubbing/Stripping

Prior to construction, the canal right-of-way surface will be cleared and stripped to a depth of 4 to 6 inches, with removal of low-growing vegetation and loose surface soils. Additional overexcavation up to 3 feet deep may be required if materials not suitable for embankment foundations are encountered. Earthen materials removed during this stage will be stockpiled for reuse in embankments, topsoil respread, or adjacent berm construction. Non-earthen materials that are not suitable for reuse in embankments will be wasted and hauled off-site. Prior to any excavation, power poles in the path of the canal construction will be relocated. Natural gas pipelines, gas wells, and other gas facilities will be avoided or reconfigured in design of the new Riverside Canal.

Embankment and Pipeline Construction

Up to 400,000 cubic yards of material required to construct the embankments of the new Riverside Canal will come primarily from the borrow sites around Fisherman's Lake. Concrete-lined sections of the canal will utilize boom trucks and concrete pumps to apply the concrete to the bottom and sides of the channel.

Pipe sections will be constructed by excavating open trenches, laying the pipe, and backfilling to provide adequate cover material. Pipeline construction will likely occur in conjunction with construction of the open channel portion of the new Riverside Canal. This will facilitate operational changes and avoid potential service interruptions by temporarily creating a redundant system, because construction will occur while the existing Riverside Canal is still operational.

However, because levee improvements south of Reach 15 (approximately the north end of the pipeline) will be constructed as part of the Phase 4b Project, it is possible that pipeline construction will be delayed and included in the contract for Phase 4b Project levee improvements. In that case, a temporary connection will be constructed from the relocated and extended Riverside Canal to the existing Riverside Canal to provide interim irrigation service to the parcels that will eventually be served by the pipeline. If the Phase 4b Project is not built, the interim pipeline connection will remain to serve irrigated agricultural fields south of Reach 15. For the quantitative analysis of impacts associated with the relocated canal, it was assumed that the area within the canal footprint will include the anticipated water surface area for the canal and two 12-foot-wide roads (one on each embankment). It was assumed the remainder of the land in the project footprint will be converted to managed grassland. However, these calculations did not account for the geometry of canal slopes and therefore underestimate the total amount of bank land cover associated with the canal.

Water Control Facility Construction

Approximately 40 field services (water turnout points), roadway crossings, and diversion boxes are located along the canal. The turnouts, roadway crossings, and diversion boxes will need to be replaced as part of the proposed project. New facilities that will be constructed include distribution boxes, gate valves, cast-in-place concrete headwalls and control structures, and culverts. Backhoes and excavators will be used to excavate material for the new facilities. Precast distribution boxes, pipes, and other appurtenances will be transported to the site on trucks. Other concrete facilities will be cast in place and concrete will be transported to the site in ready-mix trucks. Small compactors will be used to compact fill material around the facilities. Portions of farm canals and other irrigation canals will be abandoned because of the relocation of the Riverside Canal. Canal segments that are outside the footprint of the proposed levee improvements will be filled after the relocation of the Riverside Canal is completed.

Erosion Control and Demobilization/Cleanup

Erosion control measures will be installed prior to the start of construction and maintained throughout the duration of the construction to minimize sedimentation of adjacent waterways. A hydroseeding truck will be used at the end of the construction to seed any disturbed area. Water trucks will be used throughout the construction to control dust in any disturbed areas. Following construction, all disturbed areas will be vegetated and the construction site will be generally cleaned up including hauling off unused and waste materials. All construction equipment will be taken off-site.

Modification to Pumping Plants

Riverside Pumping Plant Modifications

The NCMWC Riverside Pumping Plant's pump discharge pipes, which currently penetrate the Sacramento River east levee (Reach 14) below the 200-year design flood elevation, will be raised to cross the levee above this elevation. The existing pumps will require modification or

replacement to achieve pre-project performance after the levee improvements and pipe raising. The building superstructure that supports the pumps at the Riverside Pumping Plant will require retrofitting or other rehabilitation to accommodate the replacement pipes. The pump house, manifold structures, gate boxes, and outfall will be removed or modified for replacement of discharge pipes. Some excavation of sediments within the Sacramento River channel may be required for installation of the new pumps. In-water construction will include use of dredge pumps to remove sediment so that new pumps could be installed, but no dewatering involving use of a cofferdam will take place. Use of a backhoe, pneumatic hammers, and a front-end loader and haul truck will likely be required to remove the pump discharge manifold structure, the pump house, and the gate structures. The material will be removed from the site or salvaged and returned to NCMWC. For modifications to the pumps, the pumps will be removed from the platform and replaced with new pumps. Temporary pipes will be installed under Garden Highway at the Riverside Pumping Plant concurrent with cutoff wall construction. In the following construction year, permanent pipes will be installed after the levee has settled.

The existing design capacity of the Riverside Canal is 45 cfs. The capacity of the modified Riverside Pumping Plant will not increase as part of the pump consolidation efforts. This is because of a reduction in the Riverside Canal's service area. Irrigation-water service to the areas north and south of I-80 and San Juan Road was decreased as a direct result of urban development in these areas. Irrigation water will also be provided from the Riverside Canal system to the Novak site which will be managed for Swainson's hawk foraging habitat. Similar to the Northern and Bennett Pumping Plant locations described above under the NCC south levee improvements work, the retrofitting of the Riverside Pumping Plant and the removal and screening of the intake pipes are part of the ABFS, which will include a replacement pumping facility on the Sacramento River, near the intersection of Garden Highway and Sankey Road.

Timing and the extent of construction at this site under the NLIP is dependent upon the following two scenarios:

1. If construction of the ABFS is completed first, the demolition of the plant will be completed and the pipes across the levee will be removed as needed to implement seepage remediation measures.

2. If the ABFS is not completed first, the seepage remediation measures will be implemented along the Sacramento River east levee, and the pipes will be raised and the pumps and motors will be modified as necessary so that this plant can continue to operate. Then, as part of the ABFS project, the pipes and pumps will be removed and replacement (screened) facilities constructed.

Modifications or Relocations of Pumping Plant Nos. 3 and 5

The existing discharge pipes at RD 1000's Pumping Plant Nos. 3 and 5 will be raised to cross the levee above the new "200-year" design flood elevation. Both pumping plants will require new discharge pipes and some additional modifications to accommodate the new criteria and levee improvements. The existing pumps will require modification or replacement to allow similar

performance after the levee improvements and pipe raising. To mitigate for levee underseepage potential, relief wells and channel modifications to the pumping plant intake channels will be required. As design evaluations continue and the design is refined, additional modifications could be required to maintain the plant's current operations, such as adding relief wells and lining the intake channel with either filter gravel or rock-covered geotextile fabric. In addition, relocating the pump stations may be necessary to accommodate the adjacent levee footprint. Temporary pipes will be installed under Garden Highway at Pumping Plant Nos. 3 and 5 concurrent with cutoff wall construction. In the following construction year, permanent pipes will be installed after the levee has settled.

Pumping Plant No. 5

Pumping Plant No. 5 is located in Reach 10 of the Sacramento River east levee. An excavated intake channel is located adjacent to the levee and connected to the West Drainage Canal on the east end, and three pumps and an equipment building are located immediately adjacent to the landside levee toe. Each pump connects to a buried discharge pipe that runs across the existing levee to an outfall structure on the Sacramento River. Three air/siphon release valves, one for each pipe, are located close to Garden Highway on the waterside of the levee.

Modifications will include replacing the discharge pipes that extend from this pumping plant across the levee to tie into the existing discharge pipes within the waterside bench. These modifications will take place above the Sacramento River's normal water surface elevations; therefore, no dewatering will occur. The air/siphon release valves will be replaced and shutoff valves will be added. The valves will be constructed in a concrete vault in the waterside shoulder of the levee. The pumps will also be replaced and/or upgraded to account for the higher head associated with the raised discharge pipes.

To facilitate raising of the pump discharge pipes, Garden Highway will require a local raise in grade over the pipes. The road raise will transition back down to existing grade upstream and downstream of the local raise. This work will require partial regrading of the waterside slope for the 1,200-foot length of the raised Garden Highway in Reach 10. The levee will transition upstream and downstream of this site from an adjacent levee to a raise of the existing levee in place. The levee at this site will require degrade and reconstruction with engineered fill.

This pump station will need to be relocated as a seepage and stability mitigation measure. The pump station will be moved approximately 300 feet away from the levee along the existing intake canal. The intake channel between the existing and new pump station sites will be filled. The reconstructed Pumping Plant No. 5 will consist of a cast-in-place concrete sump, with a trash rack and operating deck. An enclosure building will be provided to house the electrical, control, and monitoring equipment. The pumps, electrical equipment, maintenance platform, and pump deck will be elevated above the Natomas Basin's interior 100-year flood elevation. Access roads will be reconstructed to allow access to the relocated pump station. Related infrastructure, such as access roads and utilities that serve Pumping Plant No. 5 and are located within the levee footprint, will be relocated outside the footprint.

Pumping Plant No. 3

Pumping Plant No. 3 is located along Reach 13 of the Sacramento River east levee. Four pumps, a water vault, a control-room building, and associated infrastructure for the pumping plant are located immediately adjacent to the landside levee toe. Three of the pumps are connected to a concrete pressure vault and discharge into a single deep culvert under the levee with an outfall into the Sacramento River. The other pump is directly connected to a discharge pipe to the river and crosses through the levee high in the levee section, under Garden Highway. A spare discharge pipe also crosses through the levee high in the levee section. These two pipes are discharged into a concrete outfall structure built into the bank of the river.

The scope of the modifications required at Pumping Plant No. 3 will be similar to those described for Pumping Plant No. 5, in that the pipe across the levee will need to be raised and replaced. The extended pipe will tie into existing discharge pipes within the waterside bench. The modifications to Pumping Plant No. 3 will also include relocating and replacing the water vault. The new water vault and outlet pipe will likely be located on the waterside bench to tie into the existing outlet pipes at that location. These modifications will take place above the Sacramento River's normal water surface elevations; therefore, no dewatering will occur.

To comply with current levee construction standards, removal of the deep culvert at this site will be required. Removal of the culvert will require a deep excavation and dewatering, which will be accomplished by installation of a sheetpile cofferdam in the Sacramento River. Dewatering will be accomplished through the use of sheetpiling and pumping. In addition to pumping from behind the cofferdam, temporary holes with pumps will be installed around the perimeter of the area to be dewatered to lower the groundwater. Groundwater pumping will be discharged into the drainage canal upstream of Pumping Plant No. 3 or other surface canals in the area, such as the Riverside Irrigation Canal. Discharge into the Sacramento River will also be considered, provided water can be routed through silt settling basins to provide suitable water quality. The three Pumping Plant No. 3 pumps which discharge through this deep culvert will be reconfigured to pump into individual discharge pipes. These pipes will cross through high in the levee section, similar to the other pumps. A new concrete outfall will be constructed in the bank of the river, similar to the existing concrete outfall for other pumps. The new outfall will likely replace the existing with a larger outfall for all five pipes to minimize the footprint. This construction will take place behind the cofferdam that will be installed to remove the existing deep culvert. The concrete outfall will be constructed with the cofferdam, and the dam will be cut off flush with the outfall invert when complete. Rock will be placed around the outfall and down the slope to stabilize the area around the outfall. New pumps could require the excavation of a deeper sump, which may require some excavation of and modification to the Pumping Plant No. 3 drainage canal. Similar seepage and mitigation measures will be performed in the intake channel to 300–400 feet upstream of the pump entrance. Modifications will include a combination of installing relief wells, flattening the slopes of the channel banks, and lining the channel with a gravel or geotextile filter layer covered with rock. Related infrastructure, such as access roads and utilities that serve the pumping plant and are located within the levee footprint, will be relocated outside the footprint.

South Lauppe Pump Replacement

The Corps and the CVFPB have approved a bank protection project, under Corps' larger Sacramento River Bank Protection Project, to repair five erosion sites in the Sacramento River watershed, including a 1-acre, site at River Mile 77.2 on the left bank of the Sacramento River in Sutter County. The bank protection project will install rock slope protection at this site, which will require reconstruction of the existing South Lauppe vertical river pump. The Phase 4a Project addresses the impacts of reconstruction of the pump. This facility is operated by a private landowner and serves approximately 200 acres of farmland, including the Natomas Basin Conservancy's (TNBC) Huffman West Preserve. The pumping plant irrigates the above farmland in conjunction with an existing groundwater well. Operational conditions will essentially remain unchanged.

The existing platform and vertical pump will be replaced by a new pile supported platform and slant pump. A steel operating deck will be constructed on the bench near top of bank, approximately 20 feet landside of the existing platform. Pairs of steel H-piles to support the slant pump will be driven every 20 feet from the new platform to 75 feet beyond the existing platform, a distance of approximately 120 feet. Pump supports and operating deck columns above the waterline could also be supported with concrete foundations.

Reconstruction of the new South Lauppe River Pump will occur following completion of the bank protection project. However, the existing pump, motor, electrical, and steel platform (including vertical supports) and discharge pipes will be removed to facilitate the bank protection project. The removal will require a system outage until the replacement facility can be constructed, which will be accomplished through reliance upon alternative delivery facilities, such as the groundwater well, and changes in cropping. The existing concrete abutments for platform posts will be left in place to support the new pump. Removal of the pump will not require dewatering, and the only activities below the ordinary high water mark will be cutting off steel supports and lifting the pump out of the river using a crane from the top of bank.

After installation of the rock, as part of the proposed project, steel H-piles will be driven using a crane and impact hammer. Because some of the supports are located within the rock protection area, coordination with the Corps will be required to provide space for the new H-piles. During the rock placement, the Corps could leave voids in the rock for the H-piles, or during the H-pile installation, the existing rock could be pulled back for the pile installation and replaced following installation. Rock placed below the water surface could be moved and replaced using equipment from the top of bank and divers to avoid dewatering. Concrete foundations could be used to support the pump support columns above the waterline.

Once the supports are installed, the new steel platform will be constructed and connected to the new piles. The new slant pump will be installed and connected to the H-piles. New controls and electric service will be provided. The construction also includes a new discharge pipe to connect to the existing discharge pipe. Some limited excavation may be required for placement of footings (less than 50 square feet) above the waterline, but below the ordinary high water mark and on the bench. This construction activity will take place from the top of bank and the only

work below the ordinary high water mark will be welding of steel supports and lifting the new pump into place. Estimated permanent fill will be less than 50 square feet for each site.

An alternative to modifying the existing South Lauppe River Pump will be to relocate the facility to the north such that it will be outside of the planned rock slope protection area. The facility will be relocated in kind with a steel platform and vertical pump. Some in water pile driving will be required for this option as well. The overall footprint for the platform and pump will be much smaller, approximately half the length of the slant pump footprint, thus requiring much less in water work. This alternative will also require a 300-foot, 16-inch-diameter pipeline to connect the new river pump to the existing irrigation system landside of the existing pump.

Other Private Pump Replacements

Nine additional private river pumps will require pipe raising and motor and pump upgrades in order to be compatible with the proposed levee improvements and to meet current levee standards. For all pumps, discharge pipes will be raised above the 200-year design flood elevation to comply with current levee standards. The locations of the private river pumps are as follows NCC south levee:

- Odysseus private river pump is located near the confluence with the Sacramento River;

Sacramento River east levee:

- Cummings private river pump is located in Reach 1,
- North Lauppe pump is located in Reach 2,
- Siddiqui and Hewitt private river pumps are located in Reach 11A,
- three Airport river pumps are located in Reach 11B, and
- SAFCA pump for the Novak property is located in Reach 12A.

Odysseus, Cummings, and North Lauppe modified pipe configurations will require upgrades to the pump motors and pump bowls. The capacity of the facilities will be unchanged, but the higher pumping levels will require more power input to maintain existing capacity. These modifications will be constructed in winter 2010 and 2011, during the non-irrigation season, and will be completed by April 1, 2011 to minimize irrigation service disruptions. The pumping facility rehabilitation will require removal and replacement of existing pumps using a crane from the bench area above the top of the NCC and Sacramento River bank. A barge could also be employed for removal and replacement of pumps. Motor upgrades will most likely require an upgrade of electrical equipment, as well as overhead electrical service. New conduits from the power pole to the platform will be constructed by open trenching. New power poles and guy wires could also be required. Steel members on the pumping plant superstructure may be replaced or upgraded on existing foundations. Where foundations are inadequate, additional and/or replacement supports will be constructed. Minor vegetation trimming and/or clearing may be required.

At the Odysseus Pump, cast-in-place concrete drilled piers or slab foundations will be constructed. New steel H-piles will be driven to support the pump and platform upgrades at the Cummings Pump in the Sacramento River east levee Reach 1. To remove and reinstall the pumps, some localized minor maintenance dredging under the pump house may be required to clear sediment buildup, if any, around the pump bowls. Dredging will be performed by divers with dredging hoses. The sites will generally be accessed off of the adjacent NCC levee patrol road and Garden Highway, along existing access roads. No dewatering will be required. Work within the NCC and Sacramento River will be limited to removal and replacement of pumps by crane and any required repairs to steel pump platform superstructure. No fill placement or bank hardening is anticipated. Upon completion, disturbed overbank areas will be restored with native seed mix.

At the Siddiqui pump, Hewitt pump, the three Airport river pumps, and SAFCA pump for the Novak property, existing discharge pipes will be extended landward through the new levee footprint to adjacent agricultural fields and will be reconnected to irrigation distribution systems (pipes and/or ditches to match existing) that will be relocated to make room for the expanded levee footprint.

For waterside pipe replacement, vegetation will be avoided to the extent feasible, but generally an approximately 15-foot-wide corridor will be required for excavation, removal, and replacement of pipes. The modified pipe configuration will require upgrades to the pump motors and pump bowls. The capacity of the facilities will be unchanged, but the higher pumping levels will require more power input to maintain existing pumping capacity. The pumping facility rehabilitation will require removal and replacement of existing pumps using a crane from the bench area above the top of the Sacramento River bank. A barge could also be employed for removal and replacement of pumps. Motor upgrades will most likely require upgrade of electrical equipment, as well as overhead electrical service. New conduits from power poles to platforms will be constructed by open trenching. New power poles and guy wires might also be required. Steel members on the pumping plant superstructure may require replacement or upgrade. Where foundations are inadequate, additional and/or replacement supports will need to be constructed. Improvements to the foundations could include cast-in-place concrete drilled piers or slab foundations and/or driving new or replacement steel H-piles. Some minor tree trimming and clearing of undergrowth will be required to provide access for the work. Because relocation of the platforms is not anticipated, tree removal will be minimal (less than 1 acre).

Pipe replacement will occur within the normal levee construction window between April 15 and October 30, and will require temporary piping around the construction area. Pump replacement will likely occur during winter to minimize irrigation service disruptions. Replacement of the pumps will be completed no later than April. To remove and reinstall the pumps, some localized minor maintenance dredging under the pump house might be required to clear sediment buildup, if any, around the pump bowls. Dredging will be performed by divers with dredging hoses. Construction equipment will generally reach sites from Garden Highway. No dewatering will be required. In-water work will be limited to removal and replacement of pumps by crane and any required repairs to steel pump platform superstructure. No fill placement or bank hardening is anticipated. Upon completion, disturbed overbank areas will be restored with native seed mix.

Development of New and Replacement Groundwater Wells

Approximately 13 existing water wells on the landside of the Sacramento River east levee will be disrupted by the proposed levee improvements and will require abandonment and replacement outside of the levee footprint. The existing wells will be destroyed in accordance with regulatory guidelines following construction of the replacement wells. The wells that will be abandoned and replaced include:

- Five existing agricultural wells in Reaches 1–4 that will be replaced by new wells outside the levee footprint;
- An agricultural well in Reach 6A that will be replaced by a new well either in Reach 6A or in Reach 5B that will serve as a back-up water supply for the new GGS/Drainage Canal that was addressed as part of the Phase 3 Project;
- An agricultural well in Reach 8 that will be abandoned and replaced with a new well outside the levee footprint;
- Five existing agricultural wells in Reaches 9–12 that will be abandoned and replaced outside the proposed levee footprint; and
- A well on the TNBC's Cummings tract, which serves as a redundant water supply for that preserve, will likely need to be abandoned and replaced.

In addition to replacement wells, approximately five new wells will be constructed to provide a water supply for habitat mitigation features:

- In Reach 6A, a groundwater well will be constructed to provide a back-up supply for the GGS/Drainage Canal during critically dry years, when surface water deliveries might be reduced;
- In Reach 7 or Reach 8, a new well is planned to provide irrigation water for woodland mitigation plantings that were addressed as part of the Phase 3 Project; and
- In the Fisherman's Lake area, a new well is proposed within Reaches 12–14 for maintenance of woodland plantings. Within Reaches 13–14, two new wells are planned to serve as supplemental water supplies for new marsh habitat that will be created in that area.

Precise locations for replacement and new water wells will be determined during the design process.

Well Construction

Depths of the proposed new and replacement wells on the landside of the Sacramento River east levee will typically range from 200 to 500 feet. Final depth will be determined after exploratory drilling to evaluate yield of water-bearing strata. Agricultural wells will generally be 16 inches in diameter; habitat mitigation wells may be smaller diameter, approximately 12 inches.

Well construction will begin with drilling of one exploratory hole (test boring) at each potential well site to identify the water-bearing strata. These data are used to evaluate preliminary design and to select well construction materials. Drilling of the exploratory holes will generally use mud rotary drilling methods which will utilize drilling muds (bentonite). For each test boring, a drill rig will be used to drill a 6- to 8-inch diameter test hole up to 500 feet in depth. Following completion of the test boring, the hole will be backfilled with the boring cuttings and bentonite.

For construction of each well, an outer casing and seal will initially be constructed to stabilize the hole and prevent contamination of lower soil layers during drilling process. An outer casing hole, generally 36-inch or less will initially be drilled to approximately 50 to 60 feet deep, lined with a steel casing, and the annular space outside of casing will be filled with grout. After the grout has set, the well hole will be drilled up to 500 feet deep. The well casing will be steel pipe with wire-wrapped well screen or perforated casing set at water bearing layers. After installation, the annular space around the casing and screens will be packed with gravel, and the upper approximately 50 feet will be sealed with grout. For the larger wells, the well casing will be 16-inch diameter or less and the bore holes will be sized for a 4- to
6-inch thick gravel pack in the annular space.

The final phase of construction will be well development, test pumping, and disinfection. Development will consist of swabbing or scouring the well with drilling equipment and pumping to consolidate gravel pack and remove fines and drilling fluid. Test pumping will be performed to establish the well yield and drawdown for final pump selection. Finally, the well will be disinfected with chlorine treatment, and a temporary cap will be installed. Well water from test pumping will be discharged into existing irrigation facilities, which the well serves, discharged into drainage ditches, or discharged directly onto adjacent agricultural fields.

Pumps will be installed in each well. For the mitigation wells, submersible pumps will normally be used. For the agricultural wells, a 6- by 6-foot concrete pad will be constructed at ground level to provide for mounting a vertical turbine well pump. A service pole with meter and control panel will need to be installed near each well to provide overhead electrical service.

Demolition of the existing wells will be performed in accordance with Sutter or Sacramento County regulations. Well equipment will be removed and salvaged or hauled away. The well pump bases and casing will be cut below surrounding grade. Abandonment will generally require grouting the well.

The well construction will require a total of approximately 3 weeks. Required construction equipment will include a well drill rig, pump, generator, grouting machine, crane, flatbed truck, light plant, and water truck. Site preparation and cleanup will require earthmoving equipment such as a front-end loader or small dozer to construct the working pad and pond for cuttings.

Reclamation of Borrow Sites

The Fisherman's Lake Borrow Area, the Novak borrow site, and the South Sutter borrow site are anticipated to be the primary sources of soil borrow for Phase 4a Project construction. However,

additional borrow sites already described in the biological assessments for the Phase 2 and 3 Projects may be utilized if the Phase 4a borrow sites are not able to supply all of the required fill material. Borrow material will be excavated from primarily agricultural lands that either are currently fallow or produce row or field crops. These sites may also contain scattered rural housing, drainage and irrigation features, and woodlands. The excavation limits on the borrow sites will provide a minimum buffer of 50 feet from the edge of the borrow site boundary. In areas with adjacent drainage features, however, the borrow sites grading may extend into the canal bank with a new patrol road constructed along the top of bank. Additionally, where features are blended into adjacent mitigation sites, the work will extend to the boundary to maximize site restoration area. From the property line boundary setback, the slope from existing grade down to the bottom of the excavation will be no steeper than 3H:1V. After excavation, disturbed areas will be finish graded in compliance with criteria for drainage of reclaimed land uses. Excavated soils not used for borrow material, such as the organic surface layer or soils considered unsuitable for levee construction, will be stockpiled and respread on-site after excavation. For areas planned to be returned to agricultural use, approximately 1 foot of topsoil will be removed and stockpiled for reuse during reclamation of the site. Sites will be reclaimed for use and either returned to agriculture or used for habitat mitigation ("Habitat Enhancement, Development, and Management" section below). Revegetation activities will include erosion control on excavated slopes (i.e., hydroseeding), application of fertilizer, and seeding.

Fisherman's Lake Borrow Area and Novak Borrow Site

The 469-acre Fisherman's Lake Borrow Area consists of multiple parcels beginning at Powerline Road and extending south to and beyond Radio Road. These parcels, including the 94-acre Novak borrow site, total approximately 563 acres.

Existing land uses include orchard, field crops, and rice cultivation. Some lands in the area include managed marsh and agricultural upland (field crop) areas owned by TNBC; these conservation areas will not be used for borrow operations. Approximately 367 acres of the Fisherman's Lake Borrow Area and approximately 66 acres of the Novak borrow site will be available for excavation of borrow material and used for several project purposes: levee improvements, relocation and extension of the Riverside Canal, woodland mitigation, other habitat creation, and borrow. The areas excavated for borrow material will be reclaimed as agricultural land, or converted to managed habitat including, grassland, agricultural land, or managed marsh depending on their location and existing land use. Plans for managed habitat elements are currently under design (detailed plans will be included in the Phase 4a Mitigation Monitoring Plan [MMP]). However, it is anticipated that portions of the AKT, Johnson, Natomas Urban Development, and Sharma parcels within the Fisherman's Lake borrow area will be converted into managed marsh complex with the remainder of these parcels to be reclaimed as grassland and agricultural land and managed as Swainson's hawk foraging habitat. Field crops on the Natomas Boot parcel will be reclaimed to this use following the temporary borrow operations. New irrigation pipes and drainage pipes will be installed to service these sites.

South Sutter, LLC Borrow Site

The South Sutter, LLC borrow site was previously identified and analyzed in the Phase 3 BA as an area that could serve as an additional source of borrow material to complete the levee improvements in Sacramento River east levee Reaches 4B–9B. The South Sutter, LLC borrow site is close enough to Sacramento River east levee Reaches 10–12 to contribute to the large quantity of borrow material that will be needed to construct the adjacent levee and seepage berms that comprise the Phase 4a Project improvements in these reaches. Approximately 62 acres of the approximately 80-acre site will be available for excavation of borrow material. This borrow site is currently used as croplands (alfalfa) and will be reclaimed to this use following the temporary borrow operations. The site will be preserved and managed as Swainson's hawk foraging habitat.

Prichard Lake Preserve

During the month of February 2010, Airport staff observed SAFCA's contractor using a road which runs adjacent to the Prichard Lake Preserve to access and egress a portion of the Airport's borrow site. This road had not been identified as an access road in the construction plans and specifications. Airport staff reported the incident to SAFCA and the contractor and requested the contractor discontinue using the road due to the proximity of the preserve which was created to provide habitat for giant garter snakes. The contractor's use of the dirt road resulted in damage, which SAFCA proposes to repair.

The access road will be repaired with a motor grader which will smooth out the road surface by re-contouring the existing rutted surface. A water truck will be present to provide dust control as needed. Access will be by existing roads and no excess materials will be generated. No in-water work will be required. Total duration will be less than one day. This activity will occur between May 1 and September 31, 2010.

Airport Land Exchange

SAFCA and the Airport will carry out a land exchange that will support expansion of Airport bufferlands along the eastern edge of the proposed new Elkhorn Irrigation Canal and provide SAFCA additional habitat mitigation land along the upper portion of the Sacramento River east levee outside of the 10,000 foot Airport Critical Zone. The exchange will involve SAFCA's acquisition of three Airport properties totaling approximately 54 acres on each side of SAFCA's Lausevic property in Reach 4a of the Sacramento River east levee. These properties will be developed by SAFCA as woodland planting areas. In exchange, the Airport will acquire the remainder of the Horangic and Binford-DeYoung properties (formerly analyzed as borrow sites in the Phase 3 BA) within the Airport's 10,000 foot Critical Zone that will not be developed as part of the Phase 2 and 3 Projects. This remainder, totaling approximately 45 acres, will be managed by the Airport in accordance with the Federal Aviation Administration Advisory Circular 150/5200-33B, *Hazardous Wildlife Attractants on or Near Airports.*

Habitat Enhancement, Development, and Management

Fisherman's Lake Habitat Complex and Other Habitat Creation/Preservation Sites

The area west and south of Fisherman's Lake (Reaches 12A–14 of the Sacramento River east levee) represents a unique opportunity to establish a large and interconnected block of diversified habitat on the west side of the Natomas Basin that will create multiple benefits for Natomas Basin Habitat Conservation Plan (NBHCP)-covered species. This complex will be developed beginning in the Phase 4a Project, with other improvements to continue in the Phase 4b Project. The proposed habitat developments will benefit the Fisherman's Lake habitat complex by:

- more than doubling TNBC's preserve holdings west of Fisherman's Lake by creating 122 acres of managed marsh complex, preserving approximately 127 acres of managed agricultural uplands, and establishing up to 40 acres of oak woodland groves;
- connecting two existing TNBC marsh preserves to establish a continuous block of 200 acres of managed marsh complex adjacent to the Fisherman's Lake slough;
- adding a new habitat component to the Fisherman's Lake Area—large oak woodland groves on the landside of the Sacramento River east levee—that will complement waterside woodland patches and provide native bird species greater opportunities to nest, find refuge from predators, and forage in nearby grassland and upland agriculture; and
- improving water quality for Fisherman's Lake habitat by increasing water circulation in and out of the area through reconfiguration and reoperation of irrigation and drainage canals.

Some of the habitat created as part of the Phase 4a Project will compensate for habitat impacts resulting from previous project phases. Additionally, some of the proposed Phase 4a Project habitat creation could occur at the same time as construction (and, thus, environmental impacts) of the Phase 3 Project.

In January 2006, RD 1000 discovered seepage at the interior foot of the levee at Pumping Plant 2, three sinkholes, and boils in the canal adjacent to the Pumping Plant. The Service was contacted and we agreed emergency work should be completed and once the emergency was over it will be necessary to determine if any follow-up under the Act will be necessary. Corps Regulatory determined that consultation with the Service was not necessary in order for them to issue an after-the-fact 404 permit for the action. The Corps did require as a Special Condition lfo the permit that RD 1000 mitigate for the loss of 0.6 acre of giant garter snake habitat. The permit required RD 1000 to compensate for effects to giant garter snakes with 5.4 acres of giant garter snake habitat. SAFCA has agreed to provide RD 1000 with 5.4 acres of giant garter snake habitat at the Fisherman's Lake Complex. Therefore, 5.4 acres of the Fisherman's Lake Complex will be used solely for the emergency work done by RD 1000 at Pumping Plant 2.

Giant Garter Snake Habitat /Managed Marsh Complex Creation
After the completion of borrow activities, soil borrow sites in the vicinity of Fisherman's Lake will be finish graded and planted with native marsh vegetation by SAFCA to create approximately 122 acres of managed marsh complex (including approximately 35% upland and

65% wetland habitats) that will benefit the giant garter snake. This habitat, consisting of open-water channels, tule benches, freshwater marshes, and upland plant communities, will provide giant garter snakes with basking areas, vegetative cover from predators, and foraging habitat. The marsh will be situated near and be functionally connected to TNBC's created marshes located on the Natomas Farms and Cummings Preserves. These two marshes, while adjacent to Fisherman's Lake, are separated from each other by private property. SAFCA will construct new marshes adjacent to these TNBC marshes which will be hydrologically connected, thereby providing for greater contiguous management areas and enhancing the value of the adjacent preserves to sustain the giant garter snake population. After establishment of the Phase 4a Project marsh, SAFCA will grant TNBC a conservation easement and enter into a stakeholder-specific management agreement (within the existing master agreement for habitat management between the two agencies) with TNBC, ensuring the permanent protection and management of these sites as habitat and open space.

Managed Marsh Creation - Marsh habitat will be created on cultivated rice fields and other fallow and cultivated croplands that will be acquired by SAFCA. During construction of the Phase 4a Project, these parcels will be temporarily used as a source of soil borrow material for levee and berm construction, with excavation removing up to 5 feet of soil from each of the borrow sites. These sites will then be converted to managed marsh complex. The marsh will consist of a mosaic of aquatic and upland habitats, and an upland buffer between the restoration sites and adjacent roads. This created marsh will maximize habitat edge transitions to provide for shorter distances between burrow, basking, and foraging areas.

Design of the giant garter snake marsh will follow the templates established by TNBC on recent projects and experience with the design, construction, and management of the Airport System's Willey mitigation site in the northeast part of the basin and its existing marsh mitigation project at Prichard Lake. These design templates feature a combination of uplands and shallow water bodies, sinuosity of swales, and water control structures to manage target water levels at different times of the year. The marsh will have perimeter fences to control and protect grazing animals, such as goats. Grazing by goats is a management technique successfully used by TNBC to reduce invasions of weedy thatch and exotic plants while retaining sufficient cover for giant garter snake and other semiaquatic species that rely on grassy uplands adjoining the wetland ponds. An essential component of the managed marsh complex will be procuring a firm, reliable water supply and good water quality throughout the giant garter snake's active season of April–October.

General Construction Plan for the Managed Marsh Complex - The managed marsh site will be constructed at excavated borrow sites within the Fisherman's Lake Borrow Area. The excavation limits for the borrow sites will be a minimum of 50 feet from the edge of the site boundary. From this setback, the slope from existing grade down to the bottom of the excavation will be no steeper than 3H:1V. After excavation, disturbed areas will be finish graded to allow creation of the marsh complex. Finish grading and installation of operational facilities and habitat features will take place in fall of 2010 and 2011. Planting will occur in the fall/winter of 2010/2011 and 2011/2012.

Excavated soils not used for borrow material, such as the 1-foot-deep organic surface layer or soils considered unsuitable for levee construction, will be stockpiled and respread on-site after excavation. Soil graded back into the site will result in a finish grade elevation somewhat higher than the final design grades. The borrow-site excavation operations will use water for dust control and to maintain proper moisture content in the borrow material. Any excess groundwater generated during temporary dewatering activities will be discharged into adjacent irrigation and drainage canals after application of appropriate water quality best management practices. Revegetation activities will include erosion control on excavated slopes (e.g., straw mulch, hydroseeding), application of fertilizer as needed, and seeding of an initial cover crop on the finish grade of the bottom of the borrow site. Marsh plantings will then be installed and the borrow site flooded. It is anticipated that no unsuitable soil material will be hauled off-site. Debris encountered during excavation will be hauled off-site.

Other construction components are as follows:

- **Maintenance and access roads.** All-weather roads up to 15 feet wide will be constructed away from the open water channels and between the upland areas in 25-foot-wide maintenance access areas.
- **Water supply and control facilities.** An essential component of the managed marsh complex will be procurement of a firm, reliable water supply and good water quality throughout the giant garter snake's active season (i.e., April–October). A well to provide a backup source of water will be installed in a location where it could supply water to the network of channels if it is needed to replace or supplement the surfacewater supply (see "Development of New and Replacement Groundwater Wells" subsection under the "Major Irrigation and Drainage Infrastructure Modifications" section above). Water control facilities, such as riser boards, will be installed at key points in the channels to allow maintenance of desired water levels.
- **Habitat features for giant garter snake.** At points along the channels, clusters of rocks will be installed above the water line to provide basking areas for the snakes. Tule benches will be planted between upland areas and the channels to provide cover for the snakes.

Canal Habitat Enhancement

Portions of the new (replacement) Riverside irrigation and drainage canal, will be enhanced to provide improved habitat for giant garter snake. Bank conditions will be modified (i.e., flattened slopes) resulting in improved conditions for movement of giant garter snake between existing and proposed rice and marsh habitats, and Fisherman's Lake between Reaches 11B and mid-14. In addition, ancillary or lateral canals in the vicinity of Fisherman's Lake will also likely receive improvements.

The Riverside Canal, which is discussed above in more detail under the "Major Irrigation and Drainage Infrastructure Modifications" section, will be relocated to enable management of existing NCMWC water supply infrastructure affected by levee widening. The relocated

Riverside Canal will continue to be managed to provide irrigation supplies and will be maintained and operated in the same manner as the existing NCMWC canals.

Agricultural Croplands

To compensate for the permanent loss of foraging habitat within the foraging range of potentially affected Swainson's hawk nest locations, SAFCA will create or preserve approximately 150 to 200 acres of high-quality foraging habitat in perpetuity. This habitat will be created or preserved in part by acquiring sites near Fisherman's Lake used for borrow material and reclaiming those sites to a mixture of cropland and grassland managed specifically to maximize foraging opportunities for Swainson's hawk. Agricultural cropland could also be created or preserved at the Novak and South Sutter, LLC borrow sites to the extent that these areas are used as sources of borrow material for the Phase 4a Project. Crop types and crop rotations will be managed to optimize the seasonal variation of prey availability for Swainson's hawks and other raptors. This upland agriculture will connect areas managed by TNBC to create a larger, more continuous block of high-quality Swainson's hawk foraging habitat. This block of foraging habitat will be adjacent to a 100- to 200-foot-wide zone, with blocks ranging from several hundred to several thousand feet in length, in which SAFCA will create landside woodland habitat (see "Landside Woodlands" section below).

Managed Grasslands on Levee Slopes, Seepage Berms, and Rights-of-Way

The proposed levee improvements will result in landside slopes that are less steep than the existing slopes, and several reaches of the Sacramento River east levee will have adjoining 100- to 300-foot-wide earthen seepage berms with a nearly flat slope (50H:1V or less). Parallel to the landside toe of enlarged levees and seepage berms will be maintenance setbacks, gravel access roads, utility corridors, as well as relief wells in some locations. Additional setback bufferland (sometimes composed of woodland corridors, canal corridors, or field crops) will flank some of these features, and property acquisition for the proposed project may leave SAFCA with remnant portions of acquired parcels that are nonessential to flood control uses. With the exception of the crown of the levee and the seepage berm access road, these areas will be managed as native perennial grassland. Most grassland will be mowed or grazed throughout the growing season, with an emphasis on mowing procedures and stubble height that optimize these areas for Swainson's hawk foraging habitat. This management regime will be in accordance with the Corps and State guidelines for levee inspection. However, the primary purpose and management priority of levees and seepage berms will continue to be flood protection, for which RD 1000 has principal management and maintenance responsibility.

An MMP will be developed for the Phase 4a Project's compensatory habitat components, and will include a monitoring program with performance criteria that will be developed to determine the progress of the managed grasslands toward achieving its goals. The MMP will include methods to create the grasslands, including native-grass mixes that will be seeded along new levee slopes and seepage berms, staging areas, and adjacent maintenance and utility rights-of-way. An initial baseline assessment of managed grassland sites will be conducted after the initial

seeding program, and then a monitoring program with performance criteria will be developed to determine the progress of the grassland habitats and to assess the need for adaptive management.

Landside Woodlands

In the Phase 4a Project, woodlands consisting of native riparian and valley oak woodland species, including elderberry shrubs, will be planted. Landside woodlands will be planted within a 100- to 200-foot-wide corridor adjacent to the relocated Riverside Canal in Reaches 12A–14 of the Sacramento River east levee. The riverside forest that borders the Sacramento River in the vicinity of Fisherman's Lake is patchy and contains considerable gaps. Establishing landside woodland corridors in these reaches will compensate for gaps in the riverside forest community and increase the interface of landside woodlands connected to the riverside riparian forest. SAFCA will also plant woodland groves in Reach 4A of the Sacramento River east levee on the properties shown in Exhibit 2, north and south of the Phase 2 woodland planting area. Combined, the Reach 4A woodland planting areas will create a nearly 40-acre block of nesting habitat south of Riego Road adjacent to both existing woodland habitat on the waterside of the levee and foraging habitat on surrounding farmland.

Groves will generally be at least 50 feet wide and several hundred feet long, depending on location constraints. Portions of the created woodlands will be at least 100 feet wide to promote successful nesting by a variety of native birds deeper within the grove canopy. At maturity, stand structure will vary from closed-canopy woodland to valley oak savanna vegetation types, with a native perennial grassland understory.

Planting sites will require suitable soil conditions, irrigation water during a 3- to 5-year establishment phase, reduced risk of wildfire, and minimal depth to seasonally high groundwater or other natural water sources to sustain trees once irrigation ceases. To provide irrigation water, groundwater wells will likely need to be drilled in the vicinity of the plantings (see "Development of New and Replacement Groundwater Wells" subsection under the "Major Irrigation and Drainage Infrastructure Modifications" section above).

A mixture of native riparian and woodland species will be planted, but the predominant species will be valley oak, the primary tree species that will be affected by the proposed improvements to the Sacramento River east levee; and cottonwood, which is a preferred nest tree for Swainson's hawks in the Basin and is faster growing than valley oak. Establishing woody vegetation will likely require more than one technique, including planting nursery stock, live cuttings, and acorn planting in winter, sustained by flood irrigation, drip, or agricultural-scale spray heads. The woodland planting areas will also accommodate trees and elderberry shrubs that will be removed from existing groves to make way for the proposed flood control system features and transplanted. Taking into account predictable and unavoidable mortality within the first 5 years of establishment, the intent is to have an average stem density of approximately 162 trees and shrubs per acre within 5–10 years of growth. Wherever possible, groves will be bordered by restricted-access public lands and rights-of-way to reduce the risk of vandalism and other inappropriate uses that may threaten wildlife values or risk wildfires from human sources.

The MMP with performance criteria will be developed to determine the progress of the woodland habitats. The criteria for measuring performance will be used to determine if the conservation component is trending toward sustainability (reduced human intervention) and to assess the need for adaptive management (e.g., changes in design or maintenance revisions).

Conservation Measures

Valley Elderberry Longhorn Beetle

The following measures shall be implemented to avoid, minimize, and compensate potential adverse effects on valley elderberry longhorn beetle:

- Worker awareness trainings for construction personnel shall be conducted by a qualified biologist approved by the Service before the commencement of construction activities and as needed when new personnel begin work on the project. The program shall inform all construction personnel about the life history and status of the beetle, the need to avoid damaging the elderberry plants, measures to avoid and minimize impacts on this species and its habitat, the conditions of relevant regulatory permits, and the possible penalties for not complying with these requirements. Written documentation of the training shall be submitted to the Service within 30 days of the completion of training.
- All elderberry shrubs that are located adjacent to construction areas, but can be avoided, shall be protected through establishment of a fenced avoidance area. The high visibility fencing shall be placed at least 20 feet from the dripline of the shrubs, unless otherwise approved by the Service. This fencing shall prevent the encroachment of construction personnel and vehicles and protect the shrubs.
- No insecticides, herbicides, or other chemicals that might harm the beetle or its host plant shall be used within 100 feet of the elderberry shrubs.
- Dirt roadways and disturbed areas within 100 feet of elderberry shrubs shall be watered at least twice a day to minimize dust emissions.

Giant Garter Snake

The following measures shall be implemented to avoid, minimize, and compensate potential adverse effects on giant garter snake:

- Worker awareness trainings for construction personnel shall be conducted by a qualified biologist approved by the Service and California Department of Fish and Game (CDFG) before commencement of construction activities and as needed when new personnel begin work on the project. The program shall inform all construction personnel about the life history and status of the snake, the need to avoid damaging suitable habitat and causing snake mortality, measures to avoid and minimize impacts on this species and its habitats, the conditions of relevant regulatory permits, and the possible penalties for not complying with these requirements.
- Written documentation of the training shall be submitted to the Service and CDFG within 30 days of the completion of training.

- Construction and other ground-disturbing activities within 200 feet of suitable aquatic habitat for the giant garter snake shall not commence before May 1, with initial ground disturbance expected to correspond with the snake's active season (as feasible in combination with minimizing disturbance of nesting Swainson's hawks). Initial ground disturbance shall be completed by October 1.
- Some components of the proposed project may occur prior to the beginning of the defined giant garter snake active season. Activities, such as utility relocations, and removal of residential or agricultural structures, will be conducted before May 1, typically farther than 200 feet from suitable aquatic habitat for giant garter snakes or in habitat unsuitable for estivation.
- Some components of the proposed project may occur beyond the end of the defined giant garter snake active season and up to November 30 of all construction years. For example, demobilization and site restoration (e.g., hydroseeding, gravelling) activities may extend through November of all years. However, these activities will not generally be within 200 feet of potential aquatic habitat. SAFCA does not anticipate any construction activities to occur within potential giant garter snake habitat outside of this species' active season. Should limited construction need to occur in snake habitat outside of the active season, however, SAFCA will coordinate with the Corps, Service, and CDFG. Further, SAFCA recognizes that it may be necessary to implement additional avoidance and minimization measures for project activities that occur beyond October 1 such as dewatering of aquatic habitat, continuous disturbance in construction areas for the last two weeks in September and through completion of construction, installation of exclusionary fencing prior to October 1, or other measures to minimize the potential for giant garter snakes in construction areas.
- Any aquatic habitat for the snake that is dewatered shall remain dry for at least 15 consecutive days after April 15 and before excavating or filling of the dewatered habitat. If complete dewatering is not possible, potential snake prey (e.g., fish and tadpoles) shall be removed so that snakes and other wildlife are not attracted to the construction area.
- Within 24 hours before the commencement of ground-disturbing activities, areas within 200 feet of suitable aquatic habitat for giant garter snakes shall be surveyed for giant garter snakes by a qualified biologist. The biologist shall provide the Service with written documentation of the monitoring efforts within 48 hours after the survey is completed. The action area shall be re-inspected by a qualified biologist whenever a lapse in construction activity of 2 weeks or greater has occurred. A qualified biologist shall be present on-site during initial ground disturbance activities. The biologist shall be available throughout the construction period and shall conduct weekly monitoring visits to ensure avoidance and minimization measures are being properly implemented.
- Before the commencement of construction activities, high-visibility fencing shall be erected to protect suitable giant garter snake habitat that is located adjacent to construction areas, but can be avoided, from encroachment of personnel and equipment. The fencing shall be inspected before the start of each work day and maintained by SAFCA and construction personnel until completion of the project. The fencing shall be removed only when the construction within a given area is completed. This fencing shall conform to the specifications detailed in the measure below.

- Tightly woven fiber netting (mesh size less than 0.25 inch) or similar material shall be used for erosion control and other purposes at the project site to ensure that giant garter snakes are not trapped or become entangled by the erosion control material. Coconut coir matting is an acceptable erosion control material. No plastic mono-filament matting shall be used for erosion control. The edge of the material shall be buried in the ground to prevent giant garter snakes from crawling underneath the material. Erosion control structures shall be constructed so runoff shall be directed away from sensitive habitats, directing water flow into existing drainages or disperse water across vegetated areas to avoid concentrating water.
- The number of access routes, the number and size of staging areas, and the total area of the proposed project activity shall be limited to the minimum necessary. Routes and boundaries shall be clearly demarcated. Movement of heavy equipment to and from the project site shall be restricted to established roadways and designated staging areas to minimize habitat disturbance. Project-related vehicles shall observe a 20-mile-per-hour speed limit within construction areas, except on county roads and on state and Federal highways.
- All snakes encountered shall not be harassed, harmed, or killed and shall be allowed to leave the construction area on their own volition. If any snake is observed retreating into an underground burrow within the project limits, no construction shall be allowed within a 50-foot radius of the burrow. A 50-foot radius nondisturbance buffer zone shall be established until a qualified biologist can make a determination that the snake is or is not a giant garter snake. If a qualified biologist determines that a giant garter snake has retreated into an underground burrow within the project limits, and the area of the burrow cannot be avoided by the project, then under the approval, supervision and direction of the Service and a qualified biologist, the burrow shall be excavated to allow personnel with appropriate authority to capture and handle the giant garter snake to relocate the giant garter snake outside of the action area. The biologist shall notify the Service immediately if any listed species are found on-site, and shall submit a report, including date(s), location(s), habitat description, and any corrective measures taken to protect the species found.
- During construction operations, stockpiling of construction materials, portable equipment, vehicles, and supplies shall be restricted to the designated construction staging areas. All heavy equipment, vehicles, and supplies shall be stored at the designated staging area at the end of each work period.
- To eliminate an attraction to predators of the giant garter snake, all food-related trash items, such as wrappers, cans, bottles, and food scraps, shall be disposed of in closed containers.
- After construction activities are complete, any temporary fill or construction debris shall be removed and temporarily disturbed areas restored to their preproject conditions. An area subject to "temporary" disturbance includes any area that is disturbed during the project, but that, after project completion, shall not be subject to further disturbance and has the potential to be revegetated. All giant garter snake habitats subject to temporary ground disturbances, including storage and staging areas and temporary roads, shall be restored. These areas shall be recontoured, if appropriate, and revegetated with appropriate native plant species to promote restoration of the area to preproject

conditions. Appropriate methods and plant species used to revegetate such areas shall be determined on a site-specific basis in consultation with the Service and CDFG and in accordance with the Service's *Guidelines for the Restoration and/or Replacement of Giant Garter Snake Habitat.*

- SAFCA shall maintain and monitor temporarily disturbed areas of giant garter snake habitat for 1 year following the completion of construction and restoration activities. Monitoring reports documenting restoration of these areas shall be submitted to the Service upon the completion of the restoration implementation and 1 year after the restoration implementation. Monitoring reports shall include photo-documentation and shall describe when restoration was completed, what materials were used, specified plantings, and justifications of any substitutions to the Service-recommended guidelines.
- Unavoidable adverse effects to giant garter snake habitat shall be compensated through the creation and preservation of suitable aquatic and upland habitat for this species.

Jeopardy Determination

In accordance with policy and regulation, the jeopardy analysis in this BO relies on four components: (1) the *Status of the Species*, which evaluates the giant garter snake's and valley elderberry beetle's range-wide condition, the factors responsible for that condition, and their survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the condition of the giant garter snake in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the valley elderberry beetle and giant garter snake; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed federal action and the effects of any interrelated or interdependent activities on the giant garter snake and valley elderberry beetle; and (4) the *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the giant garter snake and valley elderberry beetle.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the giant garter snake's and valley elderberry beetle's current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the giant garter snake and valley elderberry beetle. The jeopardy analysis in this BO places an emphasis on consideration of the range-wide survival and recovery needs of the giant garter snake and valley elderberry beetle and the role of the action area in the survival and recovery of the giant garter snake and valley elderberry beetle as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Status of the Species

The status of the species for the giant garter snake is incorporated by reference from the programmatic BO (pages 45-50 and 54-60).

Environmental Baseline
The environmental baseline for the giant garter snake is incorporated by reference from the programmatic BO (page 50-54 and 61-62).

Effects of the Proposed Action

Giant garter snake

Direct Effects due to Phase 4a Construction

Phase 4a construction includes work along reaches 10-15 along the Sacramento River east levee, woodland corridor creation along reaches 10-14, construction at various pumping plants (Bennett, Northern, Number 3, Number 5, Riverside, and 10 private), relocation of the Riverside Canal, creation of Fisherman's Lake managed marsh complex, and land exchanges and acquisitions. Construction during this phase will occur in 30.64 acres of developed land; 54.39 acres of annual grassland; 304.75 acres of row crop, field crop, and fallow agriculture; 28.92 acres of orchard; 1.84 acres of rice; 4.97 acres of canals, ditches, and marsh; 1.62 acres of seasonal wetlands or riverine wetlands; and 36.27 acres of woodland (including 2.49 acres of Sacramento River riparian). At the end of construction for Phase 4a the proposed land cover types will be 30.68 acres of developed land; 70.68 acres of created woodland; 7.14 acres of preserved woodland; 287.73 acres grassland (primarily levee slope grassland and a small amount of grassland associated with the canals); 10.20 acres of irrigation canals and ditches; and 57.00 acres of fallow land. The newly created cover-types from the project will be protected from future development through either a flood control easement, conservation easement, or drainage easement.

Components of Phase 4a work which will occur outside of the giant garter snake's active season include utility relocation and removal of residential or agricultural structures. These will be conducted before April 15. Giant garter snakes have been observed to overwinter as far as 250 meters from aquatic habitat (Wylie *et.al* 1997). Given that giant garter snakes are generally inactive during the winter months, SAFCA's working during the inactive season will kill giant garter snakes that may be overwintering within the construction footprint. To reduce disturbing and/or killing giant garter snakes that may be overwintering in uplands that will be affected by working out of season, SAFCA has proposed to place exclusionary fencing which will be erected prior to October 1 in areas in which giant garter snakes may overwinter. The fencing will exclude giant garter snakes from entering the area where SAFCA will be constructing during the winter. This fence will be monitored daily prior to and during construction to insure that there are no breaches that a snake could get through. Areas that are unlikely to have overwintering giant garter snakes include areas which have active construction or agricultural activities occurring on them. Effects likely due to construction during the inactive season includes crushing of snakes within their burrows and crushing snakes which are out of the burrow to bask or move short distances but are slower moving due to the temperature.

The remainder of the project will be constructed during the active period (May 1 – October 1) for the snake, resulting in a decreased risk of direct mortality of snakes and will be completed in one

construction season, minimizing the length of the effects to snakes. Effects to snakes are highly likely given the number of acres affected within Phase 4a. Effects will include removal of cover and basking sites and filling or crushing of burrows or crevices due to excavation activities. Snake movements will be obstructed due to construction activities blocking access to aquatic or upland habitat. The large amount of construction equipment and number of workers within the Phase 4a action area will increase the likelihood of running over basking or dispersing snakes. Filling in of aquatic habitat such as rice, marsh and ditches will decrease the prey base for giant garter snakes. All of these effects are likely to result in the direct disturbance, displacement, injury, and/or mortality of snakes. Some of these effects will be minimized through SAFCA's conservation measures. Much of the work will occur during the snake's active season which will reduce snake mortality because the snakes will be able to leave or avoid habitat that is undergoing construction. Dewatering habitat prior to working within in it by at least 2 weeks prior to disturbance will facilitate snakes leaving the construction areas. Speed limits along construction roads as well as worker awareness training should minimize vehicles running over basking or dispersing snakes. SAFCA has proposed to construct new canals and ditches prior to filling the existing ditches. This should allow both an area for the snakes to disperse to as well as help provide prey for snakes.

SAFCA will be removing 1.84 acres of rice when constructing along the NCC south levee pumping plants. Additionally 4.97 acres of drainage ditches and marsh habitat will be converted to grassland habitat primarily because of the Sacramento River East Levee improvements. To compensate for the loss of habitat, SAFCA has proposed to compensate with 6.81 acres of managed marsh with a conservation easement near Fisherman's Lake. There are about 5.93 acres of upland habitat that is associated with the ditches and marsh. Because the aquatic features are going to be filled, this area will no longer serve the same function of adjacent upland habitat for the giant garter snake.

Part of the Phase 4a project involves relocating the Riverside Main Irrigation Canal. The current Riverside Canal is 18,600 linear feet with 2.72 acres of giant garter snake aquatic habitat and 17.98 acres of giant garter snake upland habitat. SAFCA will fill this canal as a result of the levee improvement construction. A new canal will be constructed several hundred feet east of the existing canal. Because the lower 6,000 linear feet of has been abandoned due to lack of agricultural need below Reach 17, SAFCA will not be relocating the lower 6,000 linear feet of the Riverside Canal. The Riverside Canal will be extended 2,869 linear feet northwest of where it currently begins (up to Reach 11B) in order to provide water for the Novak property which will be protected in perpetuity as Swainson's hawk foraging habitat and will require a source of irrigation water. This segment of the canal (Reaches 11B – 13) will be earthen lined and will have vegetation planted along the banks. The first 5,541 linear feet of replacement Riverside Canal (Reaches 13 – mid-14) will also be earthen lined and have vegetation planted along the banks. Aquatic giant garter snake habitat created with the construction of these portions of the Riverside Canal will be 5.74 acres. Upland giant garter snake created along the newly constructed Riverside Canal will be 9.53 acres. The remaining 6,530 linear feet of Riverside Canal (Reaches mid-14 – 16) will be concrete lined. Aquatic giant garter snake habitat within the concrete lined section will be 4.46 acres and upland giant garter snake habitat created along

the concrete lined section will be 7.40 acres. In Phase 4b, SAFCA will construct an additional 4,110 linear feet of concrete lined canal (Reach 17).

While the existing Riverside Canal is concrete lined, years of maintenance and disturbance have caused the concrete to break apart and leaving areas for vegetation to become established as well as crevices and burrows which could be used by giant garter snakes for overwintering. SAFCA will double the amount of aquatic habitat with similar quality (earthen lined segment) as currently exists within the Riverside Canal. Additionally they will replace the aquatic migratory corridor along its entire length. While aquatic connectivity will be replaced the quality of the section of canal which is lined with concrete will be reduced from what is being affected. Concrete lining will limit vegetation establishment and persistence along the canal, and this will subject giant garter snakes using the canal to greater predation because there will not be cover for the snakes to evade predators in. SAFCA is offsetting the degradation of this section of the Riverside Canal by providing twice as much aquatic habitat in between Reaches 11B and mid-14 as exists in the current Riverside Canal. Therefore, the amount of aquatic habitat available to the snake will not have decreased; however, the quality of the habitat within Reaches mid-14 and 17 will be degraded due to the concrete lining of the new canal and the lack of vegetation along the sides of the canal.

SAFCA will be creating 122 acres of managed marsh adjacent to Fisherman's Lake. Creation of marsh within this area will provide long term benefits to the Natomas Basin by permanently protecting and increasing marsh habitat adjacent to Fisherman's Lake, one of the core giant garter snake areas within the Natomas Basin. Creation of managed marsh in these locations will connect two existing TNBC preserves (Cummings and Natomas Farms) hydrologically and with similar cover-types creating a block of 204 acres of managed marsh immediately adjacent to Fisherman's Lake.

There will be short term temporary effects at the sites due to borrow activities and habitat creation. Of the 122 acres proposed for conversion to managed marsh about 74.66 acres are either fallow crops, row and field crops, or ruderal/annual grassland and the remaining 47.34 acres are currently farmed in rice. There will be a loss of aquatic giant garter snake habitat in the form of rice during borrow activities and the construction of the managed marsh. The 122 acres of managed marsh compensates for effects that occurred as part of Phase 2, Phase 3, and Phase 4a. Long term the amount of giant garter snake habitat adjacent to Fisherman's Lake will be increased and connect to existing giant garter snake preserves which will offset the effects of the project on the giant garter snake.

Cumulative Effects

The cumulative effects for the giant garter snake have not changed and are incorporated by reference from the amended programmatic BO (pages 68-70).

Conclusion

After reviewing the current status of the giant garter snake, the environmental baseline for the species, the effects of the proposed project, and the cumulative effects on this species, it is the Service's BO that the proposed Natomas Landside Improvements Project Phase 4a, as described herein, is not likely to jeopardize the continued existence of the giant garter snake.

The Corps and SAFCA have proposed to improve flood protection for the Natomas Basin above what currently exists. Two Habitat Conservation Plans (HCP) currently exist within the Natomas Basin and are based on future development occurring within the permit area of the Metro Air Park Habitat Conservation Plan (MAPHCP) and the NBHCP. The baselines and assumptions for which these HCPs were developed were based on no urban development occurring within the basin outside of these permit areas and landuse practices (primarily agriculture) remaining essentially the same. Sacramento County and the City of Sacramento have been in discussions with the Service about additional development outside of the existing permit areas. As discussed in the Environmental Baseline, the Natomas Basin has experienced a large amount of rice fallowing both in land held by private farmers and leases terminated on Sacramento County Airport property. While the Service has concluded that SAFCA's project will not jeopardize the giant garter snake, it could enable future growth to occur that otherwise will not be allowable but for these actions, which will require additional analysis to determine if this growth could jeopardize any of the 22 species covered by the MAPHCP and NBHCP. However, although future growth in the Natomas Basin outside of the permit area is under discussion, the Service does not consider it to be reasonably foreseeable at this time, as no specific proposals are proposed or under review. If growth outside of the permit areas were to occur within the Natomas Basin, these future projects must have a higher conservation outcome than currently exists in the HCPs and must be closely coordinated with the Service.

INCIDENTAL TAKE STATEMENT FOR PHASE 4A CONSTRUCTION

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering. Harm is defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by impairing behavioral patterns including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act, provided that such taking is in compliance with this Incidental Take Statement.

The measures described below are nondiscretionary for listed species in Phase 4a of this opinion and must be implemented by the Corps in order for the exemption in section 7(o)(2) to apply.

The Corps has a continuing duty to regulate the activity that is covered by this incidental take statement. If the Federal agency (1) fails to adhere to the terms and conditions of the incidental take statement, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

Amount or Extent of Take

Giant Garter Snake

The Service anticipates that incidental take of the snake will be difficult to detect or quantify for the following reasons: giant garter snakes are cryptically colored, secretive, and known to be sensitive to human activities. Snakes may avoid detection by retreating to burrows, soil crevices, vegetation, or other cover. Individual snakes are difficult to detect unless they are observed, undisturbed, at a distance. Most close-range observations represent chance encounters that are difficult to predict. It is not possible to make an accurate estimate of the number of snakes that will be harassed, harmed or killed during Phase 4a construction activities (staging areas, work on canal banks, soil borrow areas, and vehicle traffic to and from borrow areas) or long-term maintenance of the GGS/Drainage Canal and Brookfield rice. In instances when take is difficult to detect, the Service may estimate take in numbers of individual snakes per acre of habitat lost or affected as a result of the action. Therefore, the Service anticipates that all giant garter snakes inhabiting 56.87 acres of aquatic and 23.91 acres of upland habitat may be harassed, harmed, or 3 giant garter snakes killed by loss and destruction of habitat due to construction of Phase 4a.

Effect of the Take

The Service has determined that this level of anticipated take is not likely to result in jeopardy to the giant garter snake.

Reasonable and Prudent Measures

The following Reasonable and Prudent Measures are necessary and appropriate to minimize the effect of the proposed project on the giant garter snake.

1. All conservation measures as described in the biological assessment, and as re-stated here in the Project Description section of this BO, must be fully implemented and adhered to.

2. Effects of harassment of individual giant garter snakes within the proposed project, and of the loss or degradation of the species' habitat shall be minimized.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Corps must ensure compliance with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are nondiscretionary.

1. The following Terms and Conditions implement Reasonable and Prudent Measure one (1):

    a. The Corps and SAFCA shall minimize the potential for incidental take of the giant garter snake resulting from the project related activities by implementation of the project description as described in the biological assessment and the project description (pages 2 - 37) of this BO.

    The Corps and SAFCA shall include full implementation and adherence to conservation measures as a condition of any permit issued or contract awarded for the project.

    b. If requested, before, during, or upon completion of ground-breaking and construction activities, the project proponents shall allow access by Service and/or California Department of Fish and Game personnel to the project site to inspect the project for effects to giant garter snakes and to determine if the proposed conservation measures are being implemented.

    c. A Service-approved Worker Environmental Awareness Training Program for construction personnel shall be conducted by a Service-approved biologist for all construction workers prior to the commencement of construction activities. As needed, training shall be conducted in Spanish for Spanish language speakers and other languages as needed or necessary.

    d. The Corps and SAFCA shall require that all personnel associated with this project are made aware of the conservation measures and the responsibility to implement them fully. This could be accomplished by including a copy of this BO within its solicitations for design and construction of the proposed project and making the primary contractor responsible for implementing all requirements and obligations included within the BO, as well as and educating and informing all other contractors involved in the project as to the requirements of the BO.

2. The following Terms and Conditions implement Reasonable and Prudent Measure two (2):

    a. At least 30 calendar days prior to initiating construction activities, the project proponents shall submit the names and curriculum vitae of the biological monitor(s) for the proposed project. Monitors shall have the ability to differentiate giant garter snakes from other snakes and the authority to stop construction activities if a snake is encountered during construction until appropriate corrective measures have been completed or until the snake is determined to be unharmed.

b. For Phase 4a work that will occur outside of the giant garter snake active window, (power pole relocations, removal or relocation of residential or agricultural structures, construction of lower GGS/Drainage Canal and portions of Elkhorn Canal, and removal of trees and elderberry shrubs) exclusion fencing shall be placed around upland areas that giant garter snakes could use to overwinter prior to October 1. The exclusionary fencing shall be monitored everyday prior to and during construction to ensure that openings do not develop that would allow the entry of a giant garter snake into the construction area.

c. If it appears that any other construction activity may go beyond October 1, the project proponents shall contact the Service as soon as possible, but not later than July 15 of the year in question, to determine if additional measures are necessary to minimize take. Areas that have not had ground breaking occur prior to September 15 shall not work past October 1.

d. The project proponents shall implement Best Management Practices to prevent sediment from entering areas containing snake habitat, including, but not limited to, silt fencing, temporary berms, no cleaning of equipment in or near snake habitat, installation of vegetative strips, and temporary sediment disposal.

e. Runoff from dust control and oil and other chemicals used in other construction activities shall be retained in the construction site and prevented from flowing into areas containing snake habitat. The runoff shall be retained in the construction areas by creating small earthen berms, installing silt fences or hay-bale dikes, or implementing other measures on the construction site to prevent runoff from entering the habitat of the snake.

f. The biologist shall notify the Service immediately if any listed species are found on-site, and will submit a report, including date(s), location(s), habitat description, and any corrective measures taken to protect the species found. The biologist shall be required to report any take to the Service immediately by telephone at (916) 414-6600 and by electronic mail or written letter addressed to the Division Chief, Endangered Species Program, within one (1) working day of the incident. The project area shall be re-inspected by the monitoring biologist whenever a lapse in construction activity of two weeks or greater has occurred.

g. To the extent feasible, the project proponents shall confine clearing of vegetation and scraping, or digging, of soil to the minimal area necessary to facilitate construction activities.

h. After completion of construction activities, any temporary fill and construction debris shall be removed. A written report regarding restoration of temporarily disturbed sites shall be submitted to the Service within ten (10) working days of the completion of construction at the project site.

i. The Corps and SAFCA shall ensure compliance with the reporting requirements.

j. Prior to commencement of construction on May 1, 2010, the Corps and SAFCA shall have the Phase 4a Mitigation and Monitoring Plan and Site Specific Management Plan completed and approved by the Service.

k. RD 1000 will include the number of giant garter snakes which are taken due to maintenance of the GGS/Drainage Canal in their annual report. Take should be recorded as actual number of snakes harmed, harassed, or killed, and the acreage of habitat affected. Once the incidental take coverage provided for within this BO has been reached, RD 1000 may not conduct any further maintenance activities along the GGS/Drainage Canal for the remainder of the year without consulting with the Service.

l. If spoil from the GGS/Drainage Canal is to be placed on adjacent property during the inactive season (October 1 to May 1), the land should be either active row or orchard (they should have been farmed the previous year). Spoil should not be placed on agricultural fields which have been fallowed for one year or longer, or ruderal/grassland habitat as this may be habitat for overwintering snakes.

m. TNBC shall manage the Brookfield rice in concert with all of the preserves they manage for the NBHCP. Therefore, no more than 10 percent of TNBC managed rice shall be out of production in any given year including Brookfield.

Reporting Requirements

A post-construction compliance report prepared by the monitoring biologists must be submitted to the Deputy Assistant Field Supervisor at the Sacramento Fish and Wildlife Office within thirty (30) calendar days of the completion of construction activity or within thirty (30) calendar days of any break in construction activity lasting more than thirty (30) calendar days. This report shall detail: (i) dates that groundbreaking at the project started and the project was completed; (ii) pertinent information concerning the success of the project in meeting compensation and other conservation measures; (iii) an explanation of failure to meet such measures, if any; (iv) known project effects on the giant garter snake, if any; (v) occurrences of incidental take of any these species; and (vi) other pertinent information.

The Corps must require SAFCA to report to the Service immediately any information about take or suspected take of federally-listed species not authorized in this BO. SAFCA must notify the Service within 24 hours of receiving such information. Notification must include the date, time, and location of the incident or of the finding of a dead or injured animal. In the case of a dead animal, the individual animal should be preserved, as appropriate, and held in a secure location until instructions are received from the Service regarding the disposition of the specimen or the Service takes custody of the specimen. The Service contact persons are, Division Chief,

Endangered Species Program at (916) 414-6600, and the Resident Agent-in-charge of the Service's Law Enforcement Division at (916) 414-6660.

Any contractor or employee who during routine operations and maintenance activities inadvertently kills or injures a listed wildlife species must immediately report the incident to their representative. This representative must contact the CDFG immediately in the case of a dead or

injured listed species. The CDFG contact for immediate assistance is State Dispatch at (916) 445-0045.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities that can be implemented to further the purposes of the Act, such as preservation of endangered species habitat, implementation of recovery actions, or development of information and data bases.

1. The Corps and SAFCA should assist in the implementation of the draft, and when published, the final Recovery Plan for the giant garter snake.

2. The Corps and SAFCA should provide funding to researchers studying topics identified by the Service in the draft, and when published, the final Recovery Plan for the giant garter snake.

3. The Corps should use environmental restoration authorities to acquire and restore garter snake habitat.

To be kept informed of actions minimizing or avoiding adverse effects or benefiting listed and proposed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION - CLOSING STATEMENT

This concludes formal consultation with the Corps on the Natomas Levee Improvement Project, Phase 4a. As provided in 50 CFR 402.16, re-initiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the proposed action may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in this opinion; or (4) a new species or critical habitat is designated that may be affected by the proposed action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation.

If you have any questions regarding this BO on the Natomas Landside Improvements Project Phase 4a, please contact Jennifer Hobbs at (916) 414-6541 or Jana Affonso, Chief, Sacramento Valley Branch at (916) 414-6645.

Sincerely,

for Susan K. Moore
Field Supervisor

cc:
Elizabeth Holland, Corps, Sacramento, CA
Patrick Moeszinger, CDFG, Rancho Cordova, CA
Peter Buck, SAFCA, Sacramento, CA
Kelly Holland, AECOM, Sacramento, CA

Literature Cited

Wylie, G.D., M. Cassaza, and J.K. Daugherty. 1997. 1996 Progress report for the giant garter snake study. Preliminary report, U.S. Geological Survey, Biological Resources Division.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

In Reply Refer To:
81420-2010-F-0949-1

OCT 12 2010

Ms. Alicia Kirchner
Chief, Planning Division
U.S. Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, California 95814

Subject: Phase 4b Section 7 Appendage to the Programmatic Biological Opinion for the Natomas Levee Improvement Program, Landside Improvements Project, Sacramento and Sutter Counties, California

Dear Ms. Kirchner:

This is in response to your June 30, 2010, request for formal consultation with the U.S. Fish and Wildlife Service (Service) on the Natomas Levee Improvement Program (NLIP), Landside Improvements Project Phase 4b (proposed project) in Sacramento and Sutter Counties, California. Your request was received on June 30, 2010. A programmatic biological opinion (BO) was completed on October 9, 2008 (File 81420-2008-F-0195-5), amended on May 6, 2009 (File 81420-2008-F-0195-R001), October 2, 2009 (81420-2008-F-0195-R002), February 2, 2010 (81420-2008-F-0195-R003), and August 17, 2010 (81420-2008-F-0195-R004). The programmatic BO analyzed the entire proposed project on the landscape level and because details of the project were only available for Phase 2, provided an incidental take statement for only that phase of the project. A BO for the Phase 3 portion of the project was completed on September 28, 2009, (File 81420-2009-F-0890) and amended on October 2, 2009 (File 81420-2009-F-0890-R001), and August 17, 2010 (81420-2009-F-0890-R002). A BO for the Phase 4a portion of the project was completed on May 20, 2010 (81420-2010-F-0446). The Service has reviewed the information submitted by your office requesting formal consultation on the effects of the Phase 4b project on the federally-listed endangered vernal pool tadpole shrimp (*Lepidurus packardi*) the federally-listed threatened vernal pool fairy shrimp (*Branchinecta lynchi*) (collectively, vernal pool crustaceans), valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), and giant garter snake (*Thamnophis gigas*) (GGS) in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act). Critical habitat has been designated for the beetle and vernal pool crustaceans; however, the proposed project is not located within nor will it affect critical habitat for these species or any other federally-listed species. Critical habitat has not been designated for the GGS; therefore, none will be affected.

TAKE PRIDE® IN AMERICA

The programmatic BO (File 81420-2008-F-0195-5) did not include effects to vernal pools or the species that could inhabit them. However, given the level of impacts to vernal pool species in this phase, the Service has determined that the project can be appended to the Service's February 28, 1996, *Programmatic Formal Endangered Species Act Consultation on Issuance of 404 Permits for Projects with Relatively Small Effects on Listed Vernal Pool Crustaceans within the Jurisdiction of the Sacramento Field Office, California (1-1-96-F-001)*(Vernal Pool Programmatic Opinion).

This BO is based on information provided in the U.S. Army Corps of Engineers' (Corps) letter requesting consultation and their biological assessment. A complete administrative record is on file at the Sacramento Fish and Wildlife Office.

CONSULTATION HISTORY FOR PHASE 4b

February 2010. AECOM, the consultant to the Sacramento Area Flood Control Agency (SAFCA), provided the Service with an administrative draft Phase 4b biological assessment.

June 23, 2010. The Service, the Corps, and AECOM met to discuss the draft Phase 4b biological assessment.

June 30, 2010. The Corps initiated section 7 consultation on Phase 4b.

BIOLOGICAL OPINION

Description of Action Area

The NLIP Landside Improvements Project consists of the following phases of construction.

Phase 2, which was discussed in more detail in the Programmatic and Phase 2 BO includes work along:

- 5.3-milelong Natomas Cross Canal (NCC) south levee,
- the Sacramento River east levee from the NCC south levee to 2,000 feet south of the North Drainage Canal,
- the Elkhorn Main Irrigation Canal (Elkhorn Canal) between the North Drainage Canal and the Elkhorn Reservoir settling basin,
- the site of Reclamation District (RD) 1000 Pumping Plant No. 2, and
- adjacent land.

Phase 3, which was discussed in more detail in the Phase 3 BO, includes work along:

- the Sacramento River east levee south of the limits of the Phase 2 improvements to just south of Interstate 5 (I-5),
- the Pleasant Grove Creek Canal (PGCC) west levee,
- the Natomas East Main Drainage Canal (NEMDC) west levee between Elkhorn Boulevard and Northgate Boulevard,

- the area between Elkhorn Reservoir and the West Drainage Canal where a new GGS/Drainage Canal will be constructed,
- the Elkhorn Canal downstream of Elkhorn Reservoir, and
- RD 1000 Pumping Plant No. 2.

Phase 4a, which was discussed in more detail in the Phase 4a BO includes work along:

- improvements to the Sacramento River east levee south of the limits of the Phase 3 improvements to approximately 2.5 miles north of Interstate 80,
- the relocation of the Riverside Main Irrigation Canal (Riverside Canal),
- creation of habitat in the vicinity of Fisherman's Lake, and
- improvements and modifications to a number of pumping plants along the Sacramento River east levee and NCC south levee.

Phase 4b, will include work along:

- the Sacramento River east levee south of the limits of the Phase 4a Project along Reach A:16–20 of the Sacramento River east levee,
- the American River north levee (Reach I:1–4),
- the PGCC (Reach E),
- the NEMDC west levee (Reaches F–H),
- improvements to the West Drainage Canal from I-5 to Fisherman's Lake,
- relocation of the Riego Road Canal along the NEMDC west levee, and
- relocation of the Vestal Drain and Morrison Canal along the NCC.

As greater flood protection will be provided for the entire Natomas Basin, the action area includes the entire Natomas Basin.

Description of Proposed Action

Overview of NLIP Landside Improvements Project

SAFCA is designing the NLIP in coordination with the Federal and state flood control project sponsors, the Corps, and the State of California Central Valley Flood Protection Board (CVFPB), to address the deficiencies in the Natomas levee system with a focus on achieving a 100-year level of flood protection by 2011. This will require improving the following landside conditions along the NCC south levee, the Sacramento River east levee, and the PGCC and NEMDC west levees:

- Inadequate freeboard—The NCC south levee and portions of the Sacramento River east levee are not high enough to provide at least 3 feet of freeboard above the 100-year water surface elevation. Additional reaches do not provide 3 feet of freeboard above the 200-year design water surface elevation.
- Underseepage and through-seepage vulnerability—Most of the levee reaches do not meet recently adopted Federal criteria for safely containing underseepage and through-seepage

when the water surface in the adjacent channel reaches the 100-year elevation or, in some cases, the 200-year elevation.

The NLIP Landside Improvements project encompasses addressing freeboard deficiencies through levee raises; addressing seepage potential using a combination of seepage berms, cutoff walls, and relief wells; and acquiring additional right-of-way to construct the improvements and to prevent encroachment into the flood control system. In addition, the project has been designed to include an enlarged levee embankment (adjacent setback levee) along the landside of the existing Sacramento River east levee to minimize the need for substantial removal of vegetation and structural encroachments on the water side of this levee in compliance with Corps guidance. These improvements will include recontouring the levee slopes where necessary to provide a 3:1 horizontal-to-vertical (3H:1V) waterside slope and a 3H:1V (preferred) or 2H:1V (maximum) landside slope.

The specific goal of the NLIP Landside Improvements Project is to provide at least 100-year flood protection as quickly as possible while laying the groundwork to achieve at least urban-standard (200-year) flood protection over time.

Additional project objectives that influenced SAFCA's project design were to:

(1) use flood control projects in the vicinity of the Sacramento County Airport (Airport) to facilitate better management of Airport lands to reduce hazards to aviation safety, and

(2) use flood control projects to enhance habitat quality and values by increasing the extent and connectivity of the lands in the Natomas Basin being managed to provide habitat for the giant garter snake, the state-listed threatened Swainson's hawk (*Buteo swainsoni*), and other special-status species.

Recognizing the importance of securing maximum Federal support for the flood control project, SAFCA has explored implementation approaches that also advance the achievement of Federal aviation and wildlife protection objectives where complementary opportunities exist. Accordingly, the proposed project includes the following elements:

- The project will include construction of the GGS/Drainage Canal to provide giant garter snake habitat and some drainage infrastructure west of the Airport. Construction of these facilities will allow for dewatering of the ditch running along the western portion of the Airport runway system, which the airport recognizes as a flight safety hazard, by offsetting the effects on drainage and irrigation needs and GGS habitat.

- The project will combine SAFCA's need for levee embankment and berm material with the Sacramento County Airport System's need to modify the condition and management of Airport bufferlands to reduce wildlife hazards affecting Airport operations in a manner that enhances the connectivity of areas managed specifically for their habitat value.

Levee Modifications and Seepage Remediation

Sacramento River East Levee Reach A: 16–20

Phase 4b construction on the Sacramento River east levee will include improvements along Reach A: 16–20, a distance of approximately 3.4 miles. Phase 4b Project work along the Sacramento River east levee includes:

- construct an adjacent levee in Reach A:16–20;
- install either soil-bentonite (SB), cement-bentonite (CB), or SCB cutoff wall through the existing levee or along the landside toe of the existing levee in Reach A:19B–20;
- construct 100- to 300-foot-wide seepage berms in Reach A:16 through a portion of Reach A:19B;
- install relief wells, spaced at 60- to 100-foot intervals, approximately 20 feet beyond the toe of the seepage berm locations in Reach A:16–19B and along some of the entrance channels t the landside pump stations;
- establish a 50-foot-wide operations and maintenance access corridor and a 20-foot-wide utility corridor adjacent to the toe of the adjacent levee or seepage berm in Reach A:16–19A;
- establish a 10-foot-wide operations and maintenance access corridor and a 20-foot-wide utility corridor adjacent to the toe of the adjacent levee or seepage berm in Reach A:19B–20;
- remove trees and elderberry shrubs during the dormant season as needed from the levee improvement footprint (Reach A:16–20), which extends to 120–460 feet from the existing levee centerline.
- fill the portions of the Riverside Canal still used for irrigation (Reach A:16–18A) and the abandoned portion of the Riverside Canal (Reach A:18A–19B); the relocated Riverside Canal was addressed in the Phase 4a Project BA (SAFCA 2010);
- plant up to 10 acres of woodland groves in Reach A:16 on the Marsten and Wang parcel;
- reconstruct the Garden Highway intersections at Orchard Lane and 20 additional private parcel ramps; and
- clear vegetation clearing within the modified levee prism and easement.

The main construction staging areas will be located on parcels located in Reach A: 16–18 of the Sacramento River east levee. These areas will be fenced and used for the contractor's and engineer's construction trailers, parking for personnel, machine maintenance tools and parts, possibly water trucks, and the storage of fuels and other materials to be used for construction. The project right-of-way along the construction area also will be used for staging of construction materials and equipment. This analysis does not include staging areas since they have not been specified at this time. Consultation will need to be reinitiated at a later date to include an effects analysis of these areas if needed.

Site Preparation (Tree Removal, Clearing, Grubbing, and Stripping)

Site preparation will entail clearing structures and woody vegetation from the action area (Reach A:16–20) and stripping the top 12 inches of material from the landside slope of the existing levee and the footprint of the adjacent setback levee and seepage berm (as applicable). All vegetation in the operations and maintenance corridor within 15 feet of the levee toe or seepage berm will

be cleared. However, outside of this 15-foot zone, trees within the utility and operations and maintenance corridors will be avoided where feasible. Where trees cannot be retained, the permanent maintenance access corridor will be cleared but not stripped. Large roots, tree stumps, root balls, deleterious material, and below-ground infrastructure will then be grubbed from the working area. To the extent feasible, trees that must be removed from within the footprint will be removed during winter prior to the construction season to avoid disturbing the nesting behavior of special-status birds in spring. Trees suitable for relocation will be transplanted outside of the footprint to new woodland planting areas, where a substantial number of new trees will also be planted. Excess earth materials (organic soils, roots, and grass from borrow areas and the adjacent levee foundation, and excavated material that does not meet levee embankment criteria) will be re-spread on the surface of the new levee slopes and seepage berms, be used in the reclamation of borrow areas, or hauled off-site to landfills. Debris generated during the clearing and grubbing operations will be hauled off-site to landfills, concrete recycling plants, or cogeneration facilities.

Vegetation, particularly trees and elderberry shrubs, will be removed within the Phase 4b footprint of the Sacramento River east levee (Reach A: 16–20), as needed, during the vegetation dormant season. This footprint consists of the adjacent setback levee, a seepage berm, an operation and maintenance corridor, and a utility corridor, resulting in a total project footprint that ranges from approximately 120 to 460 feet wide. This operation will require removal of some trees and relocation/removal of elderberry shrubs, which occur mostly adjacent to existing roads. During winter, large trees will be felled approximately 3 feet above ground level, with stumps temporarily left in place. Logs will be cut into rounds for removal by contractors with handheld equipment and removed in light vehicles. Small trees and elderberry shrubs, where feasible, will be relocated to woodland conservation corridors that are part of the Phase 4b Project with conservation easements placed on them. A minimal amount of ground disturbance in specific areas will occur. During the GGS active season (after May 1 and before October 1), the stumps will be removed and the footprint cleared and grubbed completely to prepare for construction.

Relocation and Removal of Landside Structures, Irrigation Ditches and Other Facilities

Approximately 21 residences along the Sacramento River east levee and other farm structures that are within the footprint of the levee improvements will have to be removed or relocated farther from the flood damage reduction facilities before the start of levee construction in those areas. About 15 residences identified for removal are in Reach A: 16–18B and approximately 6 residences in Reach A:19A–20. Irrigation facility conveyance features, distribution boxes, wells, and standpipes within the project footprint of will be demolished and replaced as needed.

Power poles that currently exist on the landside slope of the levee and at the landside levee toe will need to be relocated and/or rerouted to accommodate the widened levee footprint. To the extent feasible, mainline utility poles will be relocated beyond the landside levee toe or berms. Should placing poles on top of the seepage berms be required, either raised foundations or steel-reinforced concrete piers will be constructed to prevent the poles from affecting the seepage berms. Some poles may need to be relocated to the water side of the existing levee. Tree

pruning will likely be required in some locations to accommodate the poles and wires. The relocations will be conducted in coordination with the utility companies and the construction operations. The Corps will review where power pole relocations will occur and reinitiate section 7 consultation with the Service if use of these sites may affect federally listed species.

Debris from structure demolition, power poles, utility lines, piping, and other materials requiring disposal will be hauled off-site to a suitable landfill. Wells and septic systems will be abandoned in accordance with the applicable state and county requirements.

Construction of Adjacent Levee, Cutoff Walls, and Seepage Berms

Borrow material from the borrow source will be delivered to the levee construction sites by scrapers or haul trucks where it will be spread by motor graders and compacted by sheepsfoot rollers to build the adjacent levee and seepage berms. The existing levee already meets height requirements, and the top of the new levee will be no higher than the elevation of the existing levee crown. The landside slope of the adjacent levee will be 3H:1V (horizontal feet:vertical feet) in Reach A:16–19A and vary in Reach A:19B–20 between 3H:1V to 2H:1V. In those areas where a cutoff wall is required, the adjacent levee will be built up a height approximately 5 feet above existing grade at the toe of the levee to create a working platform for cutoff wall installation. Three-foot-wide cutoff walls made of SB, CB, or SCB will be installed either through the existing levee or along the landside toe of the existing levee, with the top of the cutoff walls being at least 5 feet above existing ground surface and extending to a maximum depth of 110 feet below ground surface in some areas. Between Reach A: 16–20 borrow material will be spread and compacted for construction of the 120- to 300-foot-wide seepage berms.

Installation of Relief Wells and Monitoring Wells

Relief wells will be constructed at selected locations where the seepage berms cannot be wide enough or cutoff walls deep enough to meet the required seepage remediation design parameters. Relief wells will be constructed along some of the entrance channels to the landside pump stations. Relief wells will be spaced at 60- to 100-foot intervals approximately 20 feet beyond the toe of the berm and will extend to depths of between 60 to 80 feet below the ground surface. Relief well surface discharge near the seepage berm toe will flow into new collection ditches or existing roadside ditches that will convey the water to RD 1000 Pumping Plant Nos. 1A and 1B, or other parts of the interior drainage system.

Reconstruction of Garden.Highway at Intersections

Where the cutoff wall will be constructed through the crown of the adjacent levee, reconstruction work on Garden Highway will be required to restore the landside lane of the roadway. Garden Highway intersections at Orchard Lane and 20 private parcel ramps, RD 1000 facility access ramps at RD 1000 Pumping Plants Nos. 1A and 1B, and City Sump 160 will require reconstruction to accommodate the adjacent levee. It is anticipated that Garden Highway will be extended up and onto the widened adjacent levee at these locations to meet with the secondary roads. Approach embankments at the intersections will be enlarged and entire intersections will

be repaved. Intersecting roadway embankments will be designed to meet Sacramento County roadway design criteria, typically extending the approach embankment approximately 600 feet outward from the adjacent levee. Traffic control measures and detours will be required during this phase of construction.

Lands Disturbed

Improvements to Reaches 16-20 of the Sacramento River East Levee will disturb and convert 30.32 acres of developed areas such as homes, roads, and other infrastructure, 33.23 acres of annual grassland, 5.56 acres of row and field crop, 4.16 acres of orchard, 1.37 acres of canals or ditches, and 25.62 acres of woodlands to 28.8 acres of developed area and 71.46 acres of managed grassland on the new levee and seepage berm. Five elderberry shrubs with 44 stems greater than one inch in diameter will be transplanted due to levee and seepage rehabilitation.

American River North Levee Reach I: 1-4

Construction of the proposed action along the American River north levee will include improvements from the Gateway Oaks Drive to Northgate Boulevard, a distance of approximately 2.3 miles. Phase 4b Project work along the American River north levee includes:

- a new levee slope (3H:1V) will be constructed adjoining the existing American River north levee from Station 0+00 to 115+71;
- installation of a SB, CB, or SCB cutoff wall through the existing levee or along the landside toe of the existing levee from Station 0+00 to 115+71;
- establishment of a 20-foot-wide operations and maintenance access corridor and a 10-foot-wide utility corridor adjacent to the levee toe;
- removal and/or transplantation of trees and elderberry shrubs during the dormant season as needed from the levee improvement footprint, which extends 106 feet landward from the existing levee centerline;
- removal of landside woodlands within 15 feet of the new levee slope to comply with Corps levee vegetation standards;
- reconstruction of the Garden Highway intersections at Natomas Park Drive, Truxel Road, Arden Garden Connector, Northgate Boulevard, and four additional private parcel ramps; and
- vegetation clearing within the modified levee prism and easement.

Site Preparation (Tree Removal, Clearing, Grubbing, and Stripping)

Site preparation for the American River North Levee Reach I is the same as described above under the Sacramento River east levee reaches 16-20. The footprint consists of the adjacent setback levee, a seepage berm, an operation and maintenance corridor, and a utility corridor, resulting in a total flood control footprint is approximately 106 feet wide from the existing levee centerline. This operation will require removal of some trees and relocation/removal of elderberry shrubs.

Reconstruction of Garden Highway Intersections

Garden Highway intersections at Natomas Park Drive, Truxel Road, Arden Garden Connector, Northgate Boulevard, and four additional private parcel ramps will require reconstruction to accommodate the installation of the cutoff wall and levee slope flattening. The ramps will be reconstructed to current general ramp and intersection geometry. Where alternate access to the private parcels is available, the private ramps will be removed and not replaced. The design will meet City of Sacramento roadway design criteria. Traffic control measures and detours will be required during this phase of construction.

Lands Disturbed

Improvements to Reaches 1-4 of the American River North Levee will disturb and convert 19.59 acres of developed areas such as homes, roads, and other infrastructure, 0.03 acre of annual grassland, and 6.91 acres of woodlands to 12.69 acres of developed area and 13.84 acres of managed grassland on the new levee and seepage berm. Five elderberry shrubs with 37 stems greater than one inch in diameter will be transplanted due to levee and seepage rehabilitation.

Pleasant Grove Creek Canal West Levee, Reach E

Phase 4b Project construction on the PGCC west levee will include improvements along the entire length of the PGCC, a distance of approximately 3.3 miles. Phase 4b Project work along the PGCC west levee includes:

- raising the west levee by 1–1.5 feet above the existing levee height to provide 3 feet of levee height above the 0.005 AEP water surface profile;
- flattening levee slopes to 3H:1V;
- establishing a 50-foot-wide operations and maintenance access corridor and a 20-foot-wide utility corridor adjacent to the levee toe;
- removing trees and elderberry shrubs during the dormant season as needed from the levee improvement footprint, which extends 313 feet landward from the existing levee centerline; and
- clearing vegetation within the modified levee prism and easement.

Site Preparation

Site preparation is as described above under Sacramento River east levee except trees are generally not present along the landside or waterside toe of the existing toe of the PGCC west levee. If trees are present in the action area of the PGCC, trees will be relocated or avoided as appropriate and described above under the "Sacramento River East Levee – Site Preparation" section.

Levee Raising

Levee raising will be carried out in a manner similar to the work completed on the NCC as part of the Phase 2 Project. To obtain three feet of levee height above the 0.005AEP water surface,

these levee sections will be raised approximately 1–1.5 feet above the existing levee height. The levee will be constructed to a 3H:1V waterside slope and a 5H:1V theoretical landside slope due to the landward setback of the Phase 3 Project construction. The Triangle Properties Borrow Area will be the most likely source for import material.

Lands Disturbed

Improvements to the PGCC will disturb 1.37 acres of developed areas such as homes, roads, and other infrastructure, 3.35 acres of annual grassland, 16.02 acres of rice, and 0.017 acre of landside woodlands. This area will be converted to 20.91 acres of developed area.

Natomas East Main Drainage Canal West Levee, Reaches F-H

Phase 4b Project construction on the NEMDC west levee will include improvements along the entire length of the NEMDC, a distance of approximately 6.8 miles. Phase 4b Project work along the NEMDC west levee includes:

- raising the NEMDC South west levee by 1–1.5 feet above the existing levee height to provide 3 feet of levee height above the 0.005 AEP water surface profile along a 500-foot-long section of the NEMDC west levee south of Elkhorn Boulevard from Station 313+00 to 318+50;
- raising the NEMDC North west levee by 1–2 feet above the existing levee height to provide 3 feet of levee height above the 0.005 AEP water surface profile from Elkhorn Boulevard to a point approximately 1 mile upstream of Elverta Road;
- flattening levee slopes to 3H:1V along the NEMDC North;
- installing either SB, CB, or SCB cutoff wall through the existing levee or along the landside toe of the existing levee along the NEMDC North;
- establishing a 20-foot-wide operations and maintenance access corridor and a 15-foot-wide utility corridor adjacent to the levee toe;
- removing trees and elderberry shrubs during the dormant season as needed from the levee improvement footprint, which extends 313 feet landward from the existing levee centerline; and
- removing riparian woodlands and landside woodlands within 15 feet of the levee toe along NEMDC west levee from Sankey Road south to the intersection with the Arden-Garden Connector.

Levee Raising

Levee raising will be carried out in a manner similar to the work completed on the NCC as part of the Phase 2 Project. To obtain three feet of levee height above the 0.005 AEP water surface, levee sections will be raised approximately 1–2 feet above the existing levee height. The levee will be constructed to a 3H:1V waterside and landside slope. The Triangle Properties Borrow Area and the Krumenacher site will be the most likely source for import material.

Lands Disturbed

Improvements to the NEMDC will disturb 26.72 acres of developed areas such as homes, roads, and other infrastructure, 66.38 acres of annual grassland, 30.79 acres of fallow crops, 0.02 acre of canals or ditches, 0.03 acre of marsh, 22.48 acres of rice, 0.01 acre of seasonal wetlands, 2.09 acres of landside woodlands, and 0.74 acre of waterside woodlands. This area will be converted to 28.8 acres of developed area and 120.46 acres of managed grassland on the new levee and seepage berm.

Major Irrigation and Drainage Infrastructure Modifications

West Drainage Canal

Currently, the West Drainage Canal is characterized by mostly barren, steep banks with little or no cover or foraging habitat for GGS. This condition extends over several miles of the lower canal system. Improvements to the West Drainage Canal will be designed to enhance GGS corridor habitat compared to the existing habitat conditions found on the West Drainage Canal south of I-5 and to increase the functional values of the managed wetlands complex on the west side of Fisherman's Lake. The canal abuts the north and east sides of TNBC's Rosa Preserve for approximately 1.5 miles at the east end of the lower canal.

Improvements to the West Drainage Canal include realignment of an approximately 1 mile portion of the West Drainage Canal near Reach 11A of the Sacramento River east levee and modifications to the existing canal. The proposed realignment of the West Drainage Canal is designed to lessen the canal's potential as a wildlife attraction hazard for Airport operations by relocating the western portion of the canal farther away from the airport operations area. The realigned West Drainage Canal has been designed to improve the continuity of the canal corridor for movement of GGS between Fisherman's Lake managed wetlands and other managed wetlands and rice fields in the northern part of the Natomas Basin by creating a shoreline band of GGS habitat.

Canal Alignment

Habitat features will be designed into the realigned portion of the canal (in the vicinity of Reach 11A of the Sacramento River east levee) and added to the north bank of the existing canal between the realigned portion of the canal and Powerline Road and to the south bank between Powerline Road and the Fisherman's Lake slough. The new alignment will abandon and reroute approximately 4,700 feet of the West Drainage Canal. The modified West Drainage Canal, which will require a right-of-way of up to 150 feet for approximately 1.2 miles, will have a bottom width of up to 30 feet, stable 3H:1V bank slopes on one or both sides, and a narrow, variable width bench on one side of the canal. A 20-foot-wide maintenance and inspection road will flank each side of the canal and will be slightly elevated above adjacent land to improve an all-weather road condition. Culverts will cross under the patrol road to allow continued drainage into the canal from adjacent fields. The realignment will include re-routing of a small section of the West Drainage Canal (starting at the M10 Drain south of I-5, which leads to RD 1000's

Pumping Plant No. 5) to a north-south orientation to improve the management of adjacent agricultural parcels, and to move the canal farther from the Airport Operations Area in the vicinity of the west runway. Regrading of agricultural parcels between new and old canal alignment may be required for drainage. The normal managed water depth for this reach of the West Drainage Canal will be 6–7 feet in winter and 7–8 feet in summer under both existing and proposed conditions.

Opportunities to improve the existing West Drainage Canal are constrained by the existence of a row of power line poles located on the south side of the West Drainage Canal west of Powerline Road and on the north side of the canal east of Powerline Road. Because the poles are close to the top of the canal bank, canal improvements will not be feasible on both sides of the canal unless the power line poles were relocated farther away. Therefore, improvements will be focused on the north bank of the canal west of Powerline Road (east of the realigned portion) and the south bank of the canal east of Powerline Road. No improvements will be made to the south bank west of Powerline Road, and only a 20-foot-wide right-of-way for a maintenance road will be added to the north bank east of Powerline Road.

On the north side of the West Drainage Canal west of Powerline Road and the south side of the canal east of Powerline Road, the steep bank will be laid back to a stable 3H:1V slope to prevent ongoing bank slumping and reduce the need for future bank repairs and sediment removal. In these locations, the easement will be expanded between 25 and 35 feet to accommodate flattening of the banks, widening the maintenance road, and adding a 15- to 20-foot-wide setback between the road and adjacent crop fields to place and dry canal sediment and floating debris. Suitable excavated material from laying back the canal bank will be used to elevate an all-weather road above the existing field grade. Besides flattening to a 3H:1V slope, bank improvements will include creating a 2- to10-foot-wide submerged bench with tule growth to prevent aquatic weeds such as water primrose from attaching to the bank and then expanding across the canal water surface. Bank width will vary depending upon site constraints.

Clearing and Grubbing/Stripping

Prior to construction of the realigned West Drainage Canal, the canal right-of-way surface will be cleared and stripped to a depth of 4 to 6 inches, with removal of low-growing vegetation and loose surface soils. Additional over-excavation up to 3 feet deep may be required if materials not suitable for embankment foundations are encountered. Earthen materials removed during this stage will be stockpiled for reuse in embankments, topsoil re-spread, or adjacent berm construction. Non-earthen materials that are not suitable for reuse in embankments will be wasted and hauled off-site. Natural gas pipelines, gas wells, and other gas facilities will be avoided or reconfigured in design of the new West Drainage Canal.

Erosion Control and Demobilization/Cleanup

Erosion control measures will be installed prior to the start of construction and maintained throughout the duration of the construction to minimize sedimentation of adjacent waterways. A hydroseeding truck will be used at the end of the construction to seed any disturbed area. Water

trucks will be used throughout construction to control dust in any disturbed areas. Following construction, all disturbed areas will be vegetated and the construction site will be generally cleaned up including hauling off unused and waste materials. All construction equipment will be taken off-site.

Lands Disturbed

Modification to the West Drainage Canal will disturb 0.06 acre of annual grassland, 25.36 of row and field crops, 3.10 acres of fallow crops, 12.96 acres of canals or ditches, and 2.06 acres of rice. This area will be converted to 28.06 acres of developed area and 15.48 acres of canals.

Riego Road Canal

A portion of an irrigation canal owned by Natomas Central Mutual Water Company (NCMWC) will be disrupted by the proposed improvements to the NEMDC west levee (Reaches F–G). The affected portion includes approximately 4,000 feet of irrigation canal, approximately 250 feet of buried irrigation piping and culverts, and several irrigation control turn-out structures. These facilities will be relocated outside of the levee footprint as part of the Phase 4b Project. To prevent disruption of irrigation service, the NCMWC irrigation system will be replaced with in-kind facilities compatible with the new levee footprint. The new canal will be a highline canal with 3H:1V side slopes and a maintenance road on each of the embankments. A right-of-way of up to 100 feet beyond the new levee footprint will be required for the new facility.

Lands Disturbed

Modification to Riego Road Canal will disturb 0.70 acre of canals or ditches and 6.43 acres of rice. This area will be converted to 0.70 acre of managed grassland and 6.43 acres of canals.

Private Irrigation Ditches and Groundwater Wells

Sacramento River East Levee Reach A: 16-20

Several private irrigation water wells are located in the vicinity of Bryte Bend Road and Garden Highway. The wells at the southeast end of the Riverside Canal (Reach 18) adjacent to Bryte Bend Road will be disrupted by the proposed levee improvements and will be relocated as part of the proposed action. This well discharges directly to the existing Riverside Canal for irrigation service to the adjacent fields for agricultural use. The water well will be relocated outside of the flood control footprint (by drilling replacement wells and abandoning the existing well) and sited at least 100 feet off of the adjacent levee or seepage berm toe. To prevent disruption of service in the fields, the private irrigation well will be replaced with in-kind facilities compatible with the new levee footprint.

Depths of the proposed new and replacement wells on the landside of the Sacramento River east levee will typically range from 200 to 500 feet. Final depth will be determined after exploratory

drilling to evaluate yield of water-bearing strata. Agricultural wells will generally be 16 inches in diameter.

Well construction will begin with drilling of one exploratory hole (test boring) at each potential well site to identify the water-bearing strata. These data are used to evaluate preliminary design and to select well construction materials. Drilling of the exploratory holes will generally use mud rotary drilling methods which will utilize drilling muds (bentonite). For each test boring, a drill rig will be used to drill a 6- to 8-inch diameter test hole up to 500 feet in depth. Following completion of the test boring, the hole will be backfilled with the boring cuttings and bentonite.

For construction of each well, an outer casing and seal will initially be constructed to stabilize the hole and prevent contamination of lower soil layers during drilling process. An outer casing hole, generally 36-inch or less in diameter, will initially be drilled to approximately 50 to 60 feet deep, lined with a steel casing, and the annular space outside of casing will be filled with grout. After the grout has set, the well hole will be drilled up to 500 feet deep. The well casing will be steel pipe with wire-wrapped well screen or perforated casing set at water bearing layers. After installation, the annular space around the casing and screens will be packed with gravel, and the upper approximately 50 feet will be sealed with grout. For the larger wells, the well casing will be 16-inch diameter or less and the bore holes will be sized for a 4- to 6-inch thick gravel pack in the annular space.

The final phase of construction will be well development, test pumping, and disinfection. Development will consist of swabbing or scouring the well with drilling equipment and pumping to consolidate gravel pack and remove fines and drilling fluid. Test pumping will be performed to establish the well yield and drawdown for final pump selection. Finally, the well will be disinfected with chlorine treatment, and a temporary cap will be installed. Well water from test pumping will be discharged into existing irrigation facilities which the well serves, discharged into drainage ditches, or discharged directly onto adjacent agricultural fields.

Pumps will be installed in each well. For the mitigation wells, submersible pumps will normally be used. For the agricultural wells, a 6- by 6-foot concrete pad will be constructed at ground level to provide for mounting a vertical turbine well pump. A service pole with meter and control panel will need to be installed near each well to provide overhead electrical service.

Demolition of the existing wells will be performed in accordance with Sutter or Sacramento County regulations. Well equipment will be removed and salvaged or hauled away. The well pump bases and casing will be cut below surrounding grade. Abandonment will generally require grouting the well.

Natomas East Main Drainage Canal

Numerous private irrigation facilities along the NEMDC will be disrupted by the proposed levee improvements and will therefore be relocated as part of the proposed action. These private facilities include nine landside water wells that provide irrigation for cultivation of adjacent fields. The water wells will be relocated outside of the Phase 4b Project footprint (by drilling

replacement wells and abandoning existing wells) and sited at least 100 feet off of the future levee toe. In addition to the wells, approximately 1,500 feet of local field irrigation ditches and approximately 2,500 feet of buried irrigation piping will be relocated. To prevent disruption of service in the fields, the private irrigation systems will be replaced with in-kind facilities compatible with the new levee footprint.

Pleasant Grove Creek Canal

Numerous private irrigation facilities along the PGCC west levee will be disrupted by the proposed levee improvements and will be replaced as part of the proposed action. These private structures, consisting of eight landside water wells and one private river pump, service the adjacent fields for agricultural use. The water wells will be relocated outside of the Phase 4b Project footprint (by drilling replacement wells and abandoning the existing wells). The river pump discharge pipes through the levee will be raised and a new positive control valves and an air release/siphon breaker valve will be added. In addition to the wells and river pump, approximately 1,900 feet of local irrigation canals and approximately 2,200 feet of buried irrigation piping will be relocated. To prevent disruption of service in the fields, the private irrigation facilities will be replaced with in-kind structures compatible with the new levee footprint. Some RD 1000 drainage facilities will be relocated prior to PGCC construction, including approximately 5,900 feet of drainage canal and 750 feet of pipe.

Lands Disturbed

Modification to private irrigation relocations will disturb 0.26 acre of developed areas such as homes, roads, and other infrastructure, 2.85 acres of annual grassland, 0.02 acre of canals or ditches, and 13.11 acres of rice. This area will be converted to 16.24 acre of canals.

Natomas Cross Canal South Levee Ditches

Along the NCC south levee, between Stations 19+00 to 97+00, the Vestal Drain ditch runs parallel to the landside toe of the levee. The geotechnical analyses of the ditch in its present location results in unacceptable seepage gradients at the base of the canal. From Stations 199+00 to 244+00, the Morrison Irrigation Canal has similar gradient problems. Both canals will be removed and replaced as part of the proposed action. Replacement canals will be constructed 400 feet from the existing landside toe of slope. The new canal size will be designed with 3H:1V side slopes. It is anticipated that there will be a balance of fill material available to fill the old canal with the material excavated from the new canal. About 125,000 cubic yards will be excavated for the new canals and used to backfill the old canals.

Modification to the Morrison Canal and Vestal Drain will disturb 0.95 acre of developed areas such as homes, roads, and other infrastructure, 2.58 acres of annual grassland, 7.16 acres of fallow crops, 0.15 acre of canals or ditches, and 26.17 acres of rice. These areas will be converted to 37.01 acres of canals.

Modifications to Pumping Plants

Modification of RD 1000's Pumping Plant Nos. 1B, 6, and 8

The existing discharge pipes at RD 1000's Pumping Plant Nos. 1B, 6, and 8, which are within the limits of work for the proposed action, will be raised to cross the levee above the new 0.005 AEP water surface design. All pumping plants will require new discharge pipes and some additional modifications to accommodate the new criteria and levee improvements. The existing pumps will require modification or replacement to allow similar performance after the levee improvements and pipe raising. To mitigate for levee underseepage potential, relief wells and channel modifications to the pumping plant intake channels will be required. As design evaluations continue and the design is refined, additional modifications could be required to maintain the plant's current operations, such as adding relief wells and lining the intake channel with either filter gravel or rock-covered geotextile fabric. In addition, relocating the pump stations may be necessary to accommodate the adjacent levee footprint.

Pumping Plant No. 1B - Pumping Plant No. 1B, located along Garden Highway approximately 1 mile west of Interstate 5 (I-5) and immediately adjacent to the landside levee toe in Reach 19B, consists of six pumps, a control-room building, and associated infrastructure for the pumping plant. Each pump for Pumping Plant No. 1B connects to a buried 48-inch discharge pipe that runs across the existing levee to an outfall structure on the east bank of the Sacramento River. Six air/siphon release valves, one for each pipe, are located close to the crown of the levee in a vault on the waterside of the levee. A metering vault is located on the landside of the levee. The pumping-plant modifications will include raising and replacing the discharge pipes that extend from Pumping Plant No. 1B across the levee within the confines of the planned levee construction to tie into the existing discharge pipes on the waterside. The air/siphon release valves will be replaced and shutoff valves will be added. The valves will be constructed in a new concrete vault in the waterside shoulder of the levee. The metering vault along with the plant access ramp may also be replaced or relocated. The pumps and motors will also be replaced and/or upgraded to account for the higher head associated with the raised discharge pipes.

To facilitate raising of the pump discharge pipes, Garden Highway will require a local raise of several feet in grade over the pipes. The road raise will transition back down to existing grade upstream and downstream of the local raise. This work will require partial regrading of the waterside slope for the length of the raised Garden Highway. The levee will transition upstream and downstream of this site from an adjacent levee to a raise of the existing levee in place. The levee at this site will require degrade and reconstruction with engineered fill.

Modification to Pumping Plant No. 1B will disturb 0.02 acre of waterside woodlands. This area will be converted to 0.02 acre of developed area.

Pumping Plant No. 6 - Pumping Plant No. 6 is located along the NEMDC, approximately three-quarters of a mile north of Elkhorn Boulevard. An excavated intake channel connects to the pumping plant. Four pumps, a control-room building, and associated infrastructure for the pumping plant are located immediately adjacent to the landside levee toe. Each pump for

Pumping Plant No. 6 connects to a buried discharge pipe that crosses the existing levee and connects to an outfall structure on the NEMDC. These pipes consist of one 42-inch pipe, two 36-inch pipes, and one 30-inch pipe. Four air/siphon release valves, one for each pipe, are located close to the NEMDC on the waterside of the levee.

The pumping-plant modifications will include raising and replacing the discharge pipes that extend from Pumping Plant No. 6 across the levee to tie into the existing discharge pipes within the waterside of the levee. The air/siphon release valves will be replaced and shutoff valves will be added. The valves will be constructed in a concrete vault in the waterside shoulder of the levee.

An upgrade to and/or replacement of the pumps, motors, and the electrical service including a new electrical building for Pumping Plant No. 6 will be required to provide the increased horsepower needed to pump over the levee. Use of new pumps could require the excavation of a deeper sump, which may require some associated modifications to the landside intake channel. To facilitate raising of the pump discharge pipes, East Levee Road will require a local raise in grade over the pipes. The road raise will transition back down to existing grade upstream and downstream of the local raise. This work will require partial regrading of the waterside slope for the length of the raised East Levee Road. The levee will transition upstream and downstream of this site from an adjacent levee to a raise of the existing levee in place. The levee at this site will require degrade and reconstruction with engineered fill. Traffic control measures and detours will be required during pipe removal and replacement under East Levee Road.

The pipe raise will require a new outfall to comply with the Corps siphon recovery limits criteria, which limit the distance from the top of the apex of the pipe to the top of the outlet pipe. Construction of a new outfall structure will require dewatering a portion of the NEMDC.

Modification to Pumping Plant No. 6 will disturb 0.86 acre of annual grassland, 0.06 acre of canals or ditches, and 0.04 acre of marsh. This area will be converted to 0.90 acre of developed area and 0.06 acre of canal.

Pumping Plant No. 8 - Pumping Plant No. 8 is located along the NEMDC, approximately two-thirds of a mile north of I-80. An excavated intake channel is located on the west side of Northgate Boulevard, and nine pumps and an equipment building are located immediately adjacent to the pump station on the west side of Northgate Boulevard. Each pump for Pumping Plant No. 8 connects to a buried discharge pipe that runs across the existing levee to an outfall structure on the NEMDC. There are a total of nine pipes, including five 54-inch pipes, three 36-inch pipes, and one 60-inch pipe. Nine air/siphon release valves, one for each pipe, are located close to the NEMDC on the waterside of the levee.

The pumping-plant modifications will include raising and replacing the discharge pipes that extend from Pumping Plant No. 8 across the levee to tie into the existing discharge pipes within the waterside bench. The air/siphon release valves will be replaced and shutoff valves will be added. The valves will be constructed in a concrete vault in the waterside shoulder of the levee.

The pumps will also be replaced and/or upgraded to account for the higher head associated with the raised discharge pipes.

An upgrade to and/or replacement of the pumps, motors, and the electrical service including a new electrical building for Pumping Plant No. 8 will be required to provide the increased horsepower needed to pump over the levee. Use of new pumps could require the excavation of a deeper sump, which may require some associated modifications to the landside intake channel. To facilitate raising of the pump discharge pipes, the existing bike trail will require a local raise in grade over the pipes. The trail raise will transition back down to existing grade upstream and downstream of the local raise. This work will require partial regrading of the waterside slope for the length of the raised bike trail. The levee at this site will require degrade and reconstruction with engineered fill. A detour or closure of the bike trail will be required for up to 30 days. Likewise, the pipes will need to be replaced under Northgate Boulevard.

The pipe raise will require a new outfall to comply with the Corps siphon recovery limits criteria, which limit the distance from the top of the apex of the pipe to the top of the outlet pipe. Construction of a new outfall structure will require dewatering a portion of the NEMDC.

Modification to Pumping Plant No. 8 will disturb 0.29 acre of annual grassland, 0.45 acre of canals or ditches, and 0.39 acre of marsh. This area will be converted to 0.68 acre of developed area and 0.45 ace of canal.

City of Sacramento Sump Pumps

The City of Sacramento owns and operates several storm drainage sump pumps to pump residential and urban stormwater out of the Basin. Under the new levee performance criteria, the discharge pipes are required to cross the levee above the new 0.005 AEP design water surface. Therefore, the discharge pipes will be raised and additional modifications will be made to bring all of the pumping plants into compliance with the new criteria. As design evaluations continue and the design is refined, additional modifications could be required to maintain the City Sump 102's current operations. In addition, relocating the pump stations away from the levee may be necessary to accommodate the adjacent levee footprint. The Corps will review any pump station relocations and reinitiate section 7 consultation with the Service if the relocations may affect federally listed species.

City Sump 160 (Sacramento River East Levee Reach A:19B) - City Sump 160 is located along Reach 19B of the Sacramento River east levee. A 90-inch storm drain carries stormwater drainage from adjacent properties to the pump station. A chain link fence with slats and barbed wire is located approximately 30 feet from the landside toe of the levee and, combined with a concrete block wall, surrounds the pump station. Five pumps, an equipment building, an above-ground diesel fuel storage tank, and electrical transformers are located behind the fence. Each pump for City Sump 160 connects to a buried steel discharge pipe that runs across the existing levee to an outfall structure on the Sacramento River. There are a total of five pipes, including two 54-inch pipes, two 42-inch pipes, and one 12-inch pipe. Five air/siphon release valves, one

for each pipe, are located on the landside of the levee near the top. A concrete pipe support wall is located approximately 100 feet from the outfall on the waterside of the levee.

The pumping-plant modifications will include raising the discharge pipes that extend from City Sump 160 across the levee to tie into the existing discharge pipes on the waterside. The air/siphon release valves will be replaced and shutoff valves will be added. The valves will be constructed in a concrete vault in the waterside shoulder of the levee. If necessary, the concrete pipe support wall will be removed and replaced. An upgrade to the pumps and diesel engines for City Sump 160 will likely be required to provide the increased horsepower needed to pump drainage water through the raised pipes.

To facilitate raising of the pump discharge pipes, Garden Highway will require a local raise in grade over the pipes. The road raise will transition back down to existing grade upstream and downstream of the local raise. This work will require partial regrading of the waterside slope for the raised Garden Highway. The levee will transition upstream and downstream of this site from an adjacent levee to a raise of the existing levee in place. The levee at this site will require degrade and reconstruction with engineered fill.
The pipe raise will require a new outfall to comply with the Corps siphon recovery limits criteria, which limit the distance from the top of the apex of the pipe to the top of the outlet pipe. Construction of a new raised outfall structure will require dewatering a portion of the Sacramento River.

Modification to City Sump 160 will disturb 0.03 acre of seasonal wetland and 0.28 acre of waterside woodlands. This area will be converted to 0.31 acre of developed area.

City Sump 58 (American River North Levee) - City Sump 58 is located along the American River North Levee approximately 0.4 mile east of Truxel Road. A 30-inch storm drain carries stormwater drainage from adjacent properties to the pump station. A chain link fence with slats and barbed wire is located at the landside toe of the levee and surrounds the pump station. Three pumps, an equipment building, trash rack hoist, and electrical transformer are located immediately adjacent to the landside levee toe. Each pump for City Sump 58 connects to a buried discharge pipe that runs across the existing levee to an outfall structure on the NEMDC. There are three pipes, including two 20-inch pipes and one 12-inch pipe. Three air/siphon release valves, one for each pipe, are located close to Garden Highway on the landside of the levee. A concrete cutoff structure located within the pipe trench surrounding the pipes is located on the waterside of the levee.

The pumping-plant modifications will include replacing the discharge pipes that extend from City Sump 58 across the levee to tie into the existing discharge pipes on the waterside. The cutoff structure will be removed. The air/siphon release valves will be replaced and shutoff valves will be added. The valves will be constructed in a concrete vault in the waterside shoulder of the levee. An upgrade to the pumps, motors, and the electrical service for City Sump 58 will be required to provide the increased horsepower needed to pump through the raised pipes.

To facilitate raising of the pump discharge pipes, Garden Highway will require a local raise in grade over the pipes. The road raise will transition back down to existing grade upstream and downstream of the local raise. This work will require partial regrading of the waterside slope for the length of the raised Garden Highway. The levee at this site will require degrade and reconstruction with engineered fill.

The pipe raise will require a new outfall to comply with the Corps siphon recovery limits criteria, which limit the distance from the top of the apex of the pipe to the top of the outlet pipe. Construction of a new raised outfall structure will require dewatering a portion of the low-flow channel of the NEMDC within the American River floodway.

In addition, this pump station may need to be relocated as a seepage and stability mitigation measure because of the proximity of the pumps to the toe of the levee. Any landward shift in the levee toe will impact City Sump 58. The reconstructed City Sump 58 will consist of a cast-in-place concrete sump, with a trash rack and operating deck. An enclosure building will be provided to house the electrical, control, and monitoring equipment. The existing storm drain will need to be modified. Related infrastructure, such as access roads and utilities that serve City Sump 58 and are located within the levee footprint, will be relocated outside the footprint.

Modification to City Sump 58 will disturb 0.08 acre of waterside woodlands. This area will be converted to 0.08 acre of developed area.

City Sump 102 (Natomas East Main Drainage Canal at Gardenland Park) - City Sump 102 is located along the NEMDC west levee adjacent to Gardenland Park north of Bowman Avenue. A 60-inch storm drain carries stormwater drainage from adjacent properties to the pump station. A chain link fence with slats and barbed wire is located at the landside toe of the levee and surrounds the pump station. Four pumps, trash rack hoist, electrical transformer, and an equipment building are located immediately adjacent to the landside levee toe. Each pump for City Sump 102 connects to a buried discharge pipe that runs across the existing levee to an outfall structure on the NEMDC. There are four pipes, including three 36-inch pipes and one 12-inch pipe. Four air/siphon release valves, one for each pipe, are located on the waterside of the levee near the top of the levee.

The pumping-plant modifications will include replacing the discharge pipes that extend from City Sump 102 across the levee to tie into the existing discharge pipes within the waterside bench. The air/siphon release valves will be replaced and shutoff valves will be added. The valves will be constructed in a concrete vault in the waterside shoulder of the levee. An upgrade to the pumps, motors, and the electrical service for City Sump 102 will be required to provide the increased horsepower needed to pump through the raised pipes.

To facilitate raising of the pump discharge pipes, the bike trail will require a local raise in grade over the pipes. The trail raise will transition back down to existing grade upstream and downstream of the local raise. This work will require partial regrading of the waterside slope for the length of the raised bike trail. The levee will transition upstream and downstream of this site

from an adjacent levee to a raise of the existing levee in place. The levee at this site will require degrade and reconstruction with engineered fill.

The pipe raise will require a new outfall to comply with the Corps siphon recovery limits criteria, which limit the distance from the top of the apex of the pipe to the top of the outlet pipe. Construction of a new raised outfall structure will require dewatering a portion of the NEMDC.

In addition, this pump station may need to be relocated as a seepage and stability mitigation measure because of the proximity of the pumps to the toe of the levee. Any landward shift in the levee toe could also require relocation of City Sump 102. The reconstructed City Sump 102 will consist of a cast-in-place concrete sump, with a trash rack and operating deck. An enclosure building will be provided to house the electrical, control, and monitoring equipment. The existing storm drain will need to be modified. Related infrastructure, such as access roads and utilities that serve City Sump 102 and are located within the levee footprint, will be relocated outside the footprint.

Modification to City Sump 102 will disturb 0.09 acre of annual grassland and 0.11 acre of canals or ditches. This area will be converted to 0.09 acre of disturbed area and 0.11 acre of canal.

Bank Protection and Other Waterside Improvements

Erosion repair and rock slope protection are required at locations where erosion around the outfall structures penetrating the PGCC and NEMDC levees has been observed. Additional remediation to protect against damage caused by beavers and burrowing animals is needed along the PGCC west levee and the NCC south levee, from State Route (SR) 99 to Howsley Road. Finally, a portion of the low-flow channel of the NEMDC will reconstructed.

Bank Protection

Along the PGCC and NEMDC, six erosion sites have been identified for levee slope erosion repair, placement of rip rap, and/or channel realignment. All of the locations are at the confluences of tributary streams where the channel of PGCC or NEMDC has migrated to the west and threatens or has damaged the right levee. These include four sites along the PGCC west bank (at Curry Creek, Pleasant Grove Creek, Howsley Road Bridge, and Pierce-Roberts Drain) and two sites along the NEMDC west bank (at Dry Creek and Arcade Creek). As described below, bank protection will be constructed along the PGCC (Reach E) and NEMDC South (Reach H) to address the waterside erosion sites.

The bank protection areas on the west bank of the PGCC at Curry Creek, Pleasant Grove Creek, and Pierce-Roberts Drain range from 300–400 feet in length. At Curry Creek and Pleasant Grove Creek, riprap will be placed on the west levee waterside slopes opposite the confluences with Curry and Pleasant Grove Creeks, extending from the waterside toe to the top of slope for about 50 feet upstream and 100 feet downstream of the confluences. The rock will likely be covered with soil and grass. Riprap armoring will also occur opposite the outlet of the Pierce-Roberts Drain. Rock or other protection will be placed along the Howsley Road Bridge embankment and

along the landside of the PGCC west levee near the Howsley Road gap to prevent erosion from undermining the gap or affecting the landslide slope. Investigations are ongoing to determine if riprap should be placed around the left (west) abutment of the Howsley Road Bridge.

The linear extent of the proposed protection on the west bank of the NEMDC at the confluence with Dry Creek is approximately 2,500 feet. Proposed protection will include rock fill to bring the waterside bench up to existing grade, a rock blanket to stabilize the existing 2:1 bank slope below the bench, and a blanket of rock on the waterside toe to help minimize scour (launchable toe). The linear extent of the proposed protection on the west bank of the NEMDC at the confluence with Arcade Creek is approximately 400 feet. Proposed protection will include a variable width bench, a rock riprap blanket on the slope, and a launchable toe.

Erosion repair at six sites along the PGCC and NEMDC will disturb 2.52 acres of developed areas such as homes, roads, and other infrastructure, 3.35 acres of annual grassland, 1.09 acres of canal or ditch, and 6.12 acres of marsh. These areas will be converted to 13.08 acres of developed area.

Beaver Exclusion Wall

The PGCC west levee and the NCC south levee between SR 99 and Howsley Road also experience a significant problem with beavers and other burrowing animals. To provide low-maintenance mitigation for this concern, a beaver exclusion wall will be constructed in these areas. The wall will be constructed of reinforced concrete or steel or vinyl sheet piling, and will be located at the waterside levee toe at a distance of about 50 feet from the levee centerline. The top of the wall will be located above the ordinary high water mark, and the bottom of the wall will reach as deep as 20 feet. The wall will be completely submerged in the levee.

Modification to the PGCC west levee and NCC south levee to create a beaver wall will disturb 0.57 acre of developed areas such as homes, roads, and other infrastructure, 17.28 acres of annual grassland, 2.05 acres of marsh, and 0.37 acre of stream. This area will be converted to 20.27 acres of developed area.

Low-Flow Channel Restoration

The NEMDC low-flow channel beneath and downstream of I-80 has been disturbed by the City of Sacramento Pump Station 157 outfall structure. The outfall has caused the low-flow channel to meander towards the west (right) bank of the channel, which could eventually weaken the existing NEMDC west levee. To fix this problem, the low-flow channel will be reconstructed at the middle of the channel. This reconstruction will be accomplished by creating a diversion for the existing stream flow, filling the existing low-flow channel, and excavating a new low-flow channel. The total length of the channel realignment will be about 1,000 feet. A rock berm will be placed between the low-flow channel and Sump 157 to minimize the impact of the pump station discharge on the west levee.

Natomas Cross Canal Bridge Remediation at State Route 99

The undersides of the SR 99 bridges over the NCC will be affected by high river stages in a flood event. The southern abutment for both bridges is supported by the NCC south levee. The Phase 4b Project includes the construction of a moveable barrier system or a stop log gap at the south end of the SR 99 bridges to be used at high river stages to prevent overflow from reaching the landside of the NCC south levee. The bridge deck connections to the supporting piers and abutments will be modified as needed to resist uplift pressure during high water stages and additional seepage remediation, consisting of seepage cutoff walls where the bridges cross the NCC south levee (Reach D:6), will be installed.

Providing closure at SR 99 will entail constructing a removable barrier that will be stored off-site and installed across the roadway on the south side of the bridge when the NCC stage reached a pre-established elevation. To support the removable barrier, a permanent structure constructed at and adjacent to the highway will be constructed. The permanent support system will tie into levee raising work completed as part of the Phase 2 Project.

Underseepage mitigation at the bridges will be provided by a SCB cutoff wall constructed by the Deep-Mix Method (DMM) through the highway road section, The cutoff wall will be constructed through the centerline of the levee through the SR 99 roadway section to a depth of up to 95 feet.

Modification to the SR 99 bridges will disturb 0.76 acre of developed areas such as homes, roads, and other infrastructure, 0.92 acre of annual grassland, and 0.69 acre of canals or ditches. This area will be converted to 2.37 acres of developed area.

Reclamation of Borrow Sites

The South Fisherman's Lake, Triangle Properties Borrow Area, and the West Lakeside School Site are areas that have been identified as sources of soil borrow for construction of the Phase 4b Project. However, additional borrow sites already described in the biological assessments for the Phase 3 and 4a Projects, including the Fisherman's Lake Borrow Area, Krumancher Borrow Site, and the Twin Rivers Unified School District Stockpile Site, may be utilized if the borrow sites are not able to supply all of the required fill material. Borrow material will be excavated from primarily agricultural lands that either are currently fallow or produce row or field crops. These sites may also contain scattered rural housing, drainage and irrigation features, and woodlands. The excavation limits on the borrow sites will provide a minimum buffer of 50 feet from the edge of the borrow site boundary. However in areas with adjacent drainage features the borrow sites grading may extend into the canal bank with a new patrol road constructed along the top of bank. From the property line boundary setback, the slope from existing grade down to the bottom of the excavation will be no steeper than 3H:1V. After excavation, disturbed areas will be finish graded in compliance with criteria for drainage of reclaimed land uses. Excavated soils not used for borrow material, such as the organic surface layer or soils considered unsuitable for levee construction, will be stockpiled and re-spread on-site after excavation. For areas planned to be returned to agricultural use, approximately 1 foot of topsoil will be removed and stockpiled for reuse during reclamation of the site. Sites will be reclaimed for use and either returned to

agriculture or used for detention basin creation in the Triangle Properties Borrow Area. Revegetation activities will include erosion control on excavated slopes (i.e., hydroseeding), application of fertilizer, and seeding.

Fisherman's Lake Borrow Area, Krumenacher Borrow Site, and the Twin Rivers Stockpile Site

The 469-acre Fisherman's Lake Borrow Area consists of multiple parcels beginning at Powerline Road and extending south to and beyond Radio Road. Impacts associated with use of the Fisherman's Lake Borrow Area were addressed in the Phase 4a Project BA.

The 118-acre Krumenacher Borrow Site and the Twin Rivers Stockpile Site are located south of Elkhorn Boulevard, adjacent to the NEMDC South west levee. Impacts associated with use of these areas as a borrow source and stockpiling area were addressed in the Phase 3 Project BA.

Triangle Properties Borrow Area

The 1,808-acre Triangle Properties Borrow Area consists of multiple parcels along the east levee of the PGCC extending west toward the Union Pacific Railroad line. Existing land uses include developed, pasture, orchard, field crops, and rice cultivation. Some undeveloped lands in the Triangle Properties Borrow Area contain vernal pool habitat; these areas will not be used for borrow operations. Approximately 143 acres of the Triangle Properties Borrow Area will be available for excavation of borrow material. This area is currently in rice cultivation. Borrow activities would not remove the area from production for longer than once season. The areas excavated for borrow material will be reclaimed as rice. The Corps will place a conservation easement on half of the total area used for borrow.

South Fisherman's Lake Borrow Area

The 269-acre South Fisherman's Lake Borrow Area is located north and south of San Juan Road and east of the Sacramento River east levee. Existing land use is agricultural production of field crops. A small portion of the site is comprised of unimproved roads and irrigation ditches. Approximately 267 acres of the South Fisherman's Lake Borrow Area will be available for excavation of borrow material. The areas excavated for borrow material will be reclaimed as agricultural land.

West Lakeside School Site

The 43-acre West Lakeside School Site is located north of Del Paso Road and east of the West Drainage Canal/ Fisherman's Lake. Existing land use is agricultural production of field crops. A small portion of the site is comprised of unimproved roads and irrigation ditches. Approximately 42 acres of the West Lakeside School Site will be available for excavation of borrow material. The areas excavated for borrow material will be reclaimed as agricultural land.

Habitat Enhancement, Development, and Management

Several Phase 4b Project components involve the replacement and/or creation of habitat for listed species, including: landside woodland, the construction of the relocated West Drainage Canal, the creation of managed marsh at the Brookfield Property (or another ServiceUSFWS-approved location), the creation of managed grasslands on the newly constructed levee slopes, seepage berms, access rights-of-ways, canal embankments, and the preservation and establishment of landside woodlands along the Sacramento River east levee in Reach A:16, east of the NEMDC, and along Lower Dry Creek. The construction of the West Drainage Canal is described above in more detail. Refer to the *Mitigation and Monitoring Plans for Phases 2 and 3, Natomas Levee Improvement Program, Landside Improvements Project* document for a more complete summary of the strategy for creating, enhancing, preserving, protecting, and managing habitats in the Natomas Basin in perpetuity. A draft Mitigation and Management Plan (MMP) for Phase 4a is in review by the Corps, Service, and California Department of Fish and Game (CDFG). A Programmatic Long-Term Management Plan (LTMP) for all phases of the Project has been developed and approved by the Corps, Service, and CDFG. As the compensatory habitat components are developed, site-specific management plans and associated easements and management agreements are being created and incorporated into the LTMP.

Canal Habitat Enhancement

The West Drainage Canal will be enhanced to provide improved habitat for GGS. Bank slopes will be flattened reducing bank erosion and associated water quality problems. Besides flattening to a 3H:1V slope, bank improvements will include creating a 2- to 10-foot-wide submerged bench with tule growth to prevent aquatic weeds such as water primrose from attaching to the bank and then expanding across the canal water surface. Bank width will vary depending upon site constraints. Tule benches will provide cover for GGS as well as a source of prey.

The western portion of the West Drainage Canal, which is discussed above in more detail under the "Major Irrigation and Drainage Infrastructure Modifications" section, will be relocated farther away from the Airport operations area in an effort to lessen the canal's potential as a wildlife attraction hazard for Airport operations. The realigned section of the canal will have a bottom width of up to 30 feet, stable 3H:1V bank slopes on one or both sides, and a narrow, variable width bench on one side of the canal. A 20-foot-wide maintenance and inspection road will flank each side of the canal and will be slightly elevated above adjacent land to improve an all-weather road condition.

The West Drainage Canal will continue to be managed for drainage function, as culverts will cross under the patrol road to allow continued drainage into the canal from adjacent fields. The West Drainage Canal will be maintained and operated in the same manner as the Lower GGS/Drainage Canal as described in the Site Specific Management Plan (SSMP).

Giant Garter Snake Habitat/Managed Marsh Complex

To compensate for adverse project effects on GGS habitat, 94.36 acres of managed marsh will be created within the Brookfield borrow site that is currently in rice production, and the adjacent Chappell Ditch and Drain will be improved. The site, which is located in the eastern portion of the Natomas Basin, south of Howsley Road and east of SR 99, will provide managed marsh in an area that is dominated by rice cultivation. As a component of the Phase 2 Project, approximately 160 acres of the 200-acre site was excavated to about 5 feet below existing grade to supply borrow material for NCC south levee improvements and about 80 acres had a conservation easement placed on it and will be left in rice in perpetuity. The Corps will also create managed marsh on this acreage.

In Phase 4b, the Brookfield Borrow Site will be finish graded and planted with native marsh vegetation by the project proponent to create approximately 174.63 acres of managed marsh complex (including approximately 30–40 percent upland and 60–70 percent wetland habitats) that will benefit the GGS. This habitat, consisting of open-water channels, freshwater marshes, and upland plant communities, will provide GGS with basking areas, vegetative cover from predators, and foraging habitat. After establishment of the managed marsh complex, the Corps and SAFCA will grant a conservation easement to and enter into a stakeholder-specific management agreement with TNBC, ensuring the permanent protection and management of these sites as habitat and open space.

Managed Marsh Creation

About 94.36 acres of managed marsh habitat will be created on cultivated rice fields at the Brookfield property (or another Service-approved borrow location). The marsh will consist of a mosaic of aquatic and upland habitats, and an upland buffer between the restoration sites and adjacent roads. This created marsh will maximize habitat edge transitions to provide for shorter distances between burrow, basking, and foraging areas.

Design of the GGS marsh will follow the templates established by TNBC on recent projects and experience with the design, construction, and management of the Airport System's Willey mitigation site in the northeast part of the basin and its existing marsh mitigation project at Prichard Lake. These design templates feature a combination of uplands and shallow water bodies, sinuosity of swales, and water control structures to manage target water levels at different times of the year. The marsh will have perimeter fences to control and protect grazing animals, such as goats. Grazing by goats is a management technique successfully used to reduce invasions of weedy thatch and exotic plants while retaining sufficient cover for GGS and other semi-aquatic species that rely on grassy uplands adjoining the wetland ponds. A firm, reliable water supply consisting of good water quality throughout the GGS's active season of April–October will be procured for the site.

The Brookfield property is adjacent to NCMWC's Chappell Ditch and RD 1000's CH1 Drain. Drainage improvements are proposed as part of the borrow site marsh design, which will improve drainage and irrigation to the Brookfield site. Currently, the Brookfield site's water

supply comes from on-site wells, some of which are located within the footprint of the PGCC levee improvements. To provide irrigation to the site following the marsh creation and to eliminate the need to replace all of the on-site wells, the Chappell Ditch and CH1 Drain will be widened and extended to provide surface water to the Brookfield marsh and adjacent rice fields to the south and east. The side slopes will be graded at a 3:1 slope which will require less maintenance of the canal and more aquatic GGS habitat. This improvement will be designed to provide irrigation to approximately 940 acres formerly supplied by groundwater irrigation wells.

General Construction Plan for the Managed Marsh Complex

The excavation limits for the borrow sites will be a minimum of 50 feet from the edge of the site boundary. From this setback, the slope from existing grade down to the bottom of the excavation will be no steeper than 3H:1V. After excavation, disturbed areas will be finish graded to allow creation of the marsh complex. Finish grading and installation of operational facilities and habitat features will take place from August through October.

Excavated soils that were not used for borrow material in Phase 2, such as the 1-foot-deep organic surface layer or soils considered unsuitable for levee construction, were stockpiled and will be re-spread on-site after excavation. Soil graded back into the site will result in a finish grade elevation somewhat higher than the final design grades. The borrow-site excavation operations will use water for dust control and to maintain proper moisture content in the borrow material. Any excess groundwater generated during temporary dewatering activities will be discharged into adjacent irrigation and drainage canals after application of appropriate water quality best management practices (BMPs). Revegetation activities will include erosion control on excavated slopes (e.g., straw mulch, hydroseeding), application of fertilizer as needed, and seeding of an initial cover crop on the finish grade of the bottom of the borrow site. Marsh plantings will then be installed and the borrow site flooded. It is anticipated that no unsuitable soil material will be hauled off-site. Debris encountered during excavation will be hauled off-site.

The Chappell Ditch and CH1 Drain will be upgraded for approximately 5,000 feet from SR 99 east and extended east to the PGCC and south along the PGCC for approximately 6,500 feet, making the total length of improvements approximately 11,500 feet. The Chappell Ditch will have 3H:1V side slopes, a bottom width of 18 feet, a depth of 6 feet, and two 15-foot-wide access roads, one on each embankment. The Chappell Drain, which provides drainage for agricultural fields to the north, will have 3H:1V side slopes, a bottom width of 12 feet, and variable depth. The construction footprint varies in width from 90 to 165 feet, plus a 20-foot temporary construction easement on each side.

Other construction components are as follows:

- **Maintenance and access roads.** All-weather roads up to 15 feet wide will be constructed away from the open-water channels and between the upland areas in 25-foot-wide maintenance access areas.

- **Water supply and control facilities.** An essential component of the managed marsh complex will be procurement of a firm, reliable water supply and good water quality throughout the GGS's active season (i.e., April–October). A well to provide a backup source of water will be installed in a location where it could supply water to the network of channels if it is needed to replace or supplement the surface-water supply. Water control facilities, such as riser boards, will be installed at key points in the channels to allow maintenance of desired water levels.

- **Habitat features for giant garter snake.** At points along the channels, clusters of rocks will be installed above the water line to provide basking areas for the snakes. Tule benches will be planted between upland areas and the channels to provide cover for the snakes.

Managed Grassland on Levee Slopes, Seepage Berms, and Rights-of-Way

The proposed levee improvements will result in landside slopes that are less steep than the existing slopes, and several reaches of the Sacramento River east levee will have adjoining 100- to 300-foot-wide earthen seepage berms with a nearly flat slope (50H:1V or less). Parallel to the landside toe of enlarged levees and seepage berms will be maintenance setbacks, gravel access roads, utility corridors, as well as relief wells in some locations. Additional setback bufferland (sometimes composed of woodland corridors, canal corridors, or field crops) will flank some of these features, and property acquisition for the proposed action may leave the project proponent with remnant portions of acquired parcels that are nonessential to flood control uses. With the exception of the crown of the levee and the seepage berm access road, these areas will be managed as native perennial grassland. Most grassland will be mowed or grazed throughout the growing season, with an emphasis on mowing procedures and stubble height that optimize these areas for Swainson's hawk foraging habitat as described in the . This management regime will be in accordance with Corps and state guidelines for levee inspection. Longterm management of the grassland in Phase 4b will be included in the managed grassland SSMP and the Corps will review reinitiate section 7 consultation with the Service if management may affect federally listed species. However, the primary purpose and management priority of levees and seepage berms will continue to be flood damage reduction, for which RD 1000 has principal management and maintenance responsibility.

The forthcoming Phase 4b MMP will include methods to create the grasslands, including native-grass mixes that will be seeded along new levee slopes and seepage berms, staging areas, and adjacent maintenance and utility rights-of-way. An initial baseline assessment of managed grassland sites will be conducted after the initial seeding program, and then a monitoring program with performance criteria will be developed to determine the progress of the grassland habitats and to assess the need for adaptive management.

Landside Woodlands

Under the proposed action, woodlands consisting of native riparian and valley oak woodland species, including elderberry shrubs will be planted within a 10-acre area along Reach A:16 of the Sacramento River east levee and up to 60 acres along Lower Dry Creek C. Lower Dry Creek,

a 420-acre open space area located north of Main Avenue and east of the NEMDC, consists of Hansen Park, owned by the City of Sacramento, and the Coyle Property, which is owned by SAFCA. SAFCA has a conservation easement on Hansen Park (the western portion of the Lower Dry Creek area), and a conservation easement could also be placed on the Coyle property to the east. Existing woodland corridors along Dry Creek channels will be preserved, and additional woodland will be created by filling in gaps and widening these existing riparian corridors. Opportunities to create new woodland corridors may be available on historic stream channels that the creek has migrated away from over time. Created woodland will be designed to avoid vernal pools, seasonal wetlands, and relatively permanent water.

Groves will generally be at least 50 feet wide and several hundred feet long, depending on location constraints. Portions of the created woodlands will be at least 100 feet wide to promote successful nesting by a variety of native birds deeper within the grove canopy. At maturity, stand structure will vary from closed-canopy woodland to valley oak savanna vegetation types, with a native perennial grassland understory.

Planting sites will require suitable soil conditions, irrigation water during a 3- to 5-year establishment phase, reduced risk of wildfire, and minimal depth to seasonally high groundwater or other natural water sources to sustain trees once irrigation ceases. To provide irrigation water, groundwater wells will likely need to be drilled in the vicinity of the plantings.
A mixture of native riparian and woodland species will be planted, but the predominant species will be valley oak, the primary tree species that will be affected by the proposed improvements to the Sacramento River east levee; and cottonwood, which is a preferred nest tree for Swainson's hawks in the Basin and is faster growing than valley oak. Establishing woody vegetation will likely require more than one technique, including planting nursery stock, live cuttings, and acorn planting in winter, sustained by flood irrigation, drip, or agricultural-scale spray heads. The woodland planting areas will also accommodate trees and elderberry shrubs that will be removed from existing groves to make way for the proposed flood damage reduction system features and transplanted. Taking into account predictable and unavoidable mortality within the first 8 years of establishment, the intent is to have an average planted tree survival rate of 65 percent, transplanted tree survival rate of 60 percent, and a relative canopy cover of 35 percent. Wherever possible, groves will be bordered by restricted-access public lands and rights-of-way to reduce the risk of vandalism and other inappropriate uses that may threaten wildlife values or risk wildfires from human sources.

The forthcoming Phase 4b MMP will identify performance criteria that will be used to determine the progress of the woodland habitats. The criteria for measuring performance will be used to determine if the conservation component is trending toward sustainability (reduced human intervention) and to assess the need for adaptive management (e.g., changes in design or maintenance revisions).

Creation of the woodland corridor in Reach 16 and woodland groves near lower Dry Creek will disturb 50 acres of annual grassland and 10 acres of row and field crop. This areas will be converted to 60 acres of woodland.

Conservation Measures

Vernal Pool Crustaceans

The following measures shall be implemented to avoid, minimize, and compensate potential adverse effects on vernal pool crustaceans including the vernal pool fairy shrimp and the vernal pool tadpole shrimp:

- Worker awareness trainings for construction personnel shall be conducted by a qualified biologist approved by the Service before the commencement of construction activities and as needed when new personnel begin work on the project. The program shall inform all construction personnel about the life history and status of vernal pool crustaceans, measures to avoid and minimize impacts on this species and its habitat, the conditions of relevant regulatory permits, and the possible penalties for not complying with these requirements. Written documentation of the training shall be submitted to the Service within 30 days of the completion of training.
- All vernal pool crustacean habitat that is located adjacent to construction areas, but can be avoided, shall be protected through establishment of a fenced avoidance area. The 250-foot buffers shall be clearly identified by staking or flagging and high-visibility fencing shall be placed around sensitive habitat. This fencing shall prevent the encroachment of construction personnel and vehicles and protect vernal pool crustacean habitat. Suitable habitat for federally listed vernal pool crustaceans will be avoided at the Triangle Properties Borrow Area and the Lower Dry Creek woodland planting area.
- No insecticides, herbicides, or other chemicals that might harm vernal pool crustacean shall be used within 250 feet of the suitable habitat.
- Dirt roadways and disturbed areas within 250 feet of suitable habitat for vernal pool crustaceans shall be watered at least twice a day to minimize dust emissions.
- If loss of potential habitat occurs it will be compensated for at a Service-approved mitigation bank, at a preservation ratio of 2:1 and a creation ratio of 1:1.

Valley Elderberry Longhorn Beetle

The following measures shall be implemented to avoid, minimize, and compensate potential adverse effects on valley elderberry longhorn beetle:

- Prior to the commencement of construction of the proposed project, surveys shall be conducted for elderberry shrubs throughout the action area. The Corps shall re-initiate formal consultation with the Service if additional elderberry shrubs are found.
- Worker awareness trainings for construction personnel shall be conducted by a qualified biologist approved by the Service before the commencement of construction activities and as needed when new personnel begin work on the project. The program shall inform all construction personnel about the life history and status of the beetle, the need to avoid damaging the elderberry plants, measures to avoid and minimize impacts on this species and its habitat, the conditions of relevant regulatory permits, and the possible penalties for

not complying with these requirements. Written documentation of the training shall be submitted to the Service within 30 days of the completion of training.

- All elderberry shrubs that are located adjacent to construction areas, but can be avoided, shall be protected through establishment of a fenced avoidance area. The high visibility fencing shall be placed at least 20 feet from the dripline of the shrubs, unless otherwise approved by the Service. This fencing shall prevent the encroachment of construction personnel and vehicles and protect the shrubs.
- No insecticides, herbicides, or other chemicals that might harm the beetle or its host plant shall be used within 100 feet of the elderberry shrubs.
- Dirt roadways and disturbed areas within 100 feet of elderberry shrubs shall be watered at least twice a day to minimize dust emissions.
- Elderberry shrubs that require removal shall be transplanted to the woodland corridors and woodland restoration/creation areas. If areas of suitable habitat to be created as part of the proposed action will not be available before the impact will occur, alternative transplantation locations (e.g., TNBC preserves, NLIP woodland corridors) shall be identified and provided to the Service for their approval.
    - If feasible, based on Service authorization, elderberry shrubs shall be transplanted when the plants are dormant (November through the first 2 weeks of February) to increase the success of transplanting. If it is not feasible to transplant elderberry shrubs during their dormant season, compensation will be increased by 2.5 times. Transplantation will not occur during the beetle's flight season (March 15–June 15). A qualified biologist shall be available to monitor transplanting activity.
    - Elderberry shrubs to be transplanted shall be cut back 3 to 6 feet from the ground or to 50% of their height (whichever is taller) by removal of branches and stems. The trunk and all stems measuring 1 inch in diameter or greater at ground level that are removed shall be replanted. All leaves on the shrubs shall be removed.
    - Shrubs shall be removed with a truck-mounted hydraulic tree spade, backhoe, front-end loader, or other suitable equipment. When a shrub is being excavated, as much of the root ball as possible shall be removed and replanted immediately at the mitigation site. Care shall be taken to ensure that the soil is not dislodged from the root ball. Typically, the transplant hole is first excavated by the tree spade and deep-watered. Then the shrubs are transplanted with the same tree spade and immediately transported to the planting hole.
    - The planting area shall be at least 1,800 square feet (0.04 acre) for every transplanted elderberry shrub. In this 1,800-square-foot area, associated tree and shrub species for each elderberry shrub shall also be planted. The root ball shall be planted so that the top is level with the existing ground and the soil shall be compacted so that settlement is minimized.
    - A watering basin measuring at least 3 feet in diameter with a continuous berm (approximately 8 inches wide at the base and 6 inches high) shall be constructed around each transplanted elderberry shrub. Upon completion of planting, soil shall be saturated with water. No fertilizers or other

supplements or paint shall be used on the shrubs. The frequency of watering shall be determined based on soil conditions present at the mitigation site. Either a drip irrigation system or watering truck shall be used to provide water to the site.

- Each elderberry stem measuring 1 inch or greater in diameter at ground level that is adversely affected (i.e., transplanted) shall be replaced with elderberry seedlings and seedlings of associated species, in accordance with the Service's Conservation Guidelines (USFWS 1999). Elderberry seedlings or cuttings shall be replaced at ratios ranging from 1:1 to 8:1 (new plantings to affected stems), depending on the diameter of the affected elderberry stems and the presence of beetle exit holes. Native plants shall be planted, in association with the replacement elderberry shrub seedlings or cuttings, at 1:1 (for shrubs without evidence of beetle exit holes) or 2:1 (for shrubs with evidence of beetle exit holes) ratios. Stock of seedlings and/or cuttings shall be obtained from local sources. Table 1 lists the number of elderberry stems that will be affected and the proposed compensation plantings.
- An MMP and LTMP shall be prepared and implemented. These plans shall specify how the woodland/elderberry habitat creation areas will be managed to ensure that the appropriate habitat conditions are provided. The plans shall, at a minimum, describe requirements for transplantation of shrubs that require removal; specify the number of replacement elderberry shrubs and associated native plants to be established and associated success criteria; specify remedial measures to be undertaken if mitigation success criteria are not met; and describe short- and long-term maintenance and management. Long-term protection of the planting area for elderberry and associated species, and funding for its management, shall be provided through appropriate mechanisms to be determined by the Corps, Service, and other entities cooperating in implementation of the proposed action. The plan shall be reviewed and approved by the Service prior to implementation.

Table 1. Elderberry Stem Sizes and Compensation

Location	Stems (maximum diameter at ground level)	Exit Hole on Shrub (Yes or No)	Elderberry Seedling Ratio	Associated Native Plant Ratio	Number of Stems Observed	Required Elderberry Plantings	Required Associated Native Plant Plantings
Non-riparian	stems ≥1" & ≤3"	No	1:1	1:1	33	33	33
		Yes	2:1	2:1	25	50	100
Non-riparian	stems > 3" & <5"	No	2:1	1:1	4	8	8
		Yes	4:1	2:1	9	36	72
Non-riparian	stems > 5"	No	3:1	1:1	2	6	6
		Yes	6:1	2:1	8	48	96
Total replacement plantings						181	315
Total Elderberry shrubs to be transplanted						10	
496 /10 = 49.6 valley elderberry longhorn beetle credits or 2.05 acres							

Giant Garter Snake

The following measures shall be implemented to avoid, minimize, and compensate potential adverse effects on GGS:

- Worker awareness trainings for construction personnel shall be conducted by a qualified biologist approved by the Service and CDFG before commencement of construction activities and as needed when new personnel begin work on the project. The program shall inform all construction personnel about the life history and status of the snake, the need to avoid damaging suitable habitat and causing snake mortality, measures to avoid and minimize impacts on this species and its habitats, the conditions of relevant regulatory permits, and the possible penalties for not complying with these requirements. Written documentation of the training shall be submitted to the Service and CDFG within 30 days of the completion of training.
- Construction activities and ground-disturbing activities other than those discussed in the following bullet within 200 feet of suitable aquatic habitat for the GGS shall not commence before May 1, with initial ground disturbance expected to correspond with the snake's active season (as feasible in combination with minimizing disturbance of nesting Swainson's hawks). Construction shall be completed by October 1.
- Some components of the proposed project may occur prior to the beginning of the defined GGS active season. Activities, such as utility relocations, and removal of residential or agricultural structures, will be conducted before May 1, typically farther than 200 feet from suitable aquatic habitat for GGSs or in habitat unsuitable for estivation.
- Some components of the proposed action may occur beyond the end of the defined GGS active season of all construction years. Major levee construction (site grading, compacting, etc.) begun in the summer months must halt no later than October 1 of each construction year. Some other activities such as demobilization and site restoration (e.g., hydroseeding, gravelling), may extend past October 1. The project proponent also acknowledges that unanticipated construction delays could occur and result in the need to extend construction work into the GGS inactive season. Should construction need to occur in snake habitat outside of the active season the Corps will notify the Service and CDFG by August 15 to reinitiate consultation. Further, the project proponent recognizes that it may be necessary to implement additional avoidance and minimization measures for project activities that occur beyond October 1.
- Any aquatic habitat for the snake that is dewatered shall remain dry for at least 15 consecutive days after April 15 and before excavating or filling of the dewatered habitat. If complete dewatering is not possible, potential snake prey (e.g., fish and tadpoles) shall be removed so that snakes and other wildlife are not attracted to the construction area.
- Within 24 hours before the commencement of ground-disturbing activities, areas within 200 feet of suitable aquatic habitat for GGS shall be surveyed for GGS by a qualified biologist. The biologist shall provide the Service with written documentation of the monitoring efforts within 48 hours after the survey is completed. The action area shall be re-inspected by a qualified biologist whenever a lapse in construction activity of 2 weeks or greater has occurred. A qualified biologist shall be present on-site during initial

ground disturbance activities. The biologist shall be available throughout the construction period and shall conduct weekly monitoring visits to ensure avoidance and minimization measures are being properly implemented.

- Before the commencement of construction activities, high-visibility fencing shall be erected to protect suitable GGS habitat that is located adjacent to construction areas, but can be avoided, from encroachment of personnel and equipment. The fencing shall be inspected before the start of each work day and maintained by SAFCA and construction personnel until completion of the project. The fencing shall be removed only when the construction within a given area is completed. This fencing shall conform to the specifications detailed in the measure below.
- Tightly woven fiber netting (mesh size less than 0.25 inch) or similar material shall be used for erosion control and other purposes at the project site to ensure that GGS are not trapped or become entangled by the erosion control material. Coconut coir matting is an acceptable erosion control material. No plastic mono-filament matting shall be used for erosion control. The edge of the material shall be buried in the ground to prevent GGS from crawling underneath the material. Erosion control structures shall be constructed so runoff shall be directed away from sensitive habitats, directing water flow into existing drainages or disperse water across vegetated areas to avoid concentrating water.
- The number of access routes, the number and size of staging areas, and the total area of the proposed project activity shall be limited to the minimum necessary. Routes and boundaries shall be clearly demarcated. Movement of heavy equipment to and from the project site shall be restricted to established roadways and designated staging areas to minimize habitat disturbance. Project-related vehicles shall observe a 20-mile-per-hour speed limit within construction areas, except on county roads and on state and Federal highways.
- All snakes encountered shall not be harassed, harmed, or killed and shall be allowed to leave the construction area on their own volition. If any snake is observed retreating into an underground burrow within the project limits, no construction shall be allowed within a 50-foot radius of the burrow. A 50-foot radius nondisturbance buffer zone shall be established until a qualified biologist can make a determination that the snake is or is not a GGS. If a qualified biologist determines that a GGS has retreated into an underground burrow within the project limits, and the area of the burrow cannot be avoided by the project, then under the approval, supervision and direction of the Service and a qualified biologist, the burrow shall be excavated to allow personnel with appropriate authority to capture and handle the GGS to relocate the GGS outside of the action area. The biologist shall notify the Service immediately if any listed species are found on-site, and shall submit a report, including date(s), location(s), habitat description, and any corrective measures taken to protect the species found.
- During construction operations, stockpiling of construction materials, portable equipment, vehicles, and supplies shall be restricted to the designated construction staging areas. All heavy equipment, vehicles, and supplies shall be stored at the designated staging area at the end of each work period.
- To eliminate an attraction to predators of the GGS, all food-related trash items, such as wrappers, cans, bottles, and food scraps, shall be disposed of in closed containers.

- After construction activities are complete, any temporary fill or construction debris shall be removed and temporarily disturbed areas restored to their preproject conditions. An area subject to "temporary" disturbance includes any area that is disturbed during the project, but that, after project completion, shall not be subject to further disturbance and has the potential to be revegetated. All GGS habitats subject to temporary ground disturbances, including storage and staging areas and temporary roads, shall be restored. These areas shall be recontoured, if appropriate, and revegetated with appropriate native plant species to promote restoration of the area to preproject conditions. Appropriate methods and plant species used to revegetate such areas shall be determined on a site-specific basis in consultation with the Service and CDFG and in accordance with the Service's *Guidelines for the Restoration and/or Replacement of Giant Garter Snake Habitat.*
- The Corps shall maintain and monitor temporarily disturbed areas of GGS habitat for 1 year following the completion of construction and restoration activities. Monitoring reports documenting restoration of these areas shall be submitted to the Service upon the completion of the restoration implementation and 1 year after the restoration implementation. Monitoring reports shall include photo-documentation and shall describe when restoration was completed, what materials were used, specified plantings, and justifications of any substitutions to the Service-recommended guidelines.
- Unavoidable adverse effects to GGS habitat shall be compensated through the creation and preservation of suitable aquatic and upland habitat for this species.

Evaluation under Programmatic Consultation for Vernal Pool Crustaceans

This letter is an agreement by the Service to append the proposed project to the Vernal Pool Programmatic Opinion, and represents the Service's biological opinion on the effects of the proposed action. By appending the project to the vernal pool programmatic the Corps acknowledges and accepts all of the conservation measures outlined within the vernal pool programmatic, including, but not limited to, the measures to minimize adverse impacts. The Corps will also follow all reasonable and prudent measures, and all terms and conditions as directed by the programmatic.

The proposed project will result in direct effects to 0.3 acre of habitat for vernal pool crustaceans. The agreed upon conservation responsibilities of the applicant are as follows:

1. Prior to the start of construction, the project applicant will purchase vernal pool preservation credits sufficient to preserve 0.6 acre (0.3 acre at a 2:1 ratio = 0.6 acre) at a Service-approved vernal pool crustacean conservation bank(s) with a service area covering the project. Proof of purchase of these credits shall be provided to the Service and the Corps before groundbreaking occurs for the proposed project.

2. Prior to the start of construction, the project applicant will purchase vernal pool creation credits sufficient to restore/create 0.3 acre (0.3 acre at a 1:1 ratio = 0.3 acre) at a Service-approved vernal pool crustacean conservation bank(s) with a service area covering the

project. Proof of purchase of these credits shall be provided to the Service and the Corps before groundbreaking occurs for the proposed project.

Jeopardy Determination

In accordance with policy and regulation, the jeopardy analysis in this BO relies on four components: (1) the *Status of the Species*, which evaluates the valley elderberry longhorn beetle's vernal pool crustaceans', and GGS's range-wide condition, the factors responsible for that condition, and their survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the condition of the valley elderberry longhorn beetle, vernal pool crustaceans, and GGS in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the valley elderberry longhorn beetle, vernal pool crusaceans, and GGS; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed federal action and the effects of any interrelated or interdependent activities on the valley elderberry longhorn beetle, vernal pool crustaceans, and GGS; and (4) the *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the valley elderberry longhorn beetle, vernal pool crustaceans, and GGS.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the valley elderberry longhorn beetle's, vernal pool crustaceans', and GGS's current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the valley elderberry longhorn beetle, vernal pool crustaceans and GGS.

The jeopardy analysis in this BO places an emphasis on consideration of the range-wide survival and recovery needs of the valley elderberry longhorn beetle, vernal pool crustaceans, and GGS and the role of the action area in the survival and recovery of the valley elderberry longhorn beetle, vernal pool crustaceans and GGS as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Status of the Species

The status of the species for the valley elderberry longhorn beetle and GGS is incorporated by reference from the programmatic BO (pages 45-50 and 54-60).

Environmental Baseline

The environmental baseline for the valley elderberry longhorn beetle and GGS is incorporated by reference from the programmatic BO (page 50-54 and 61-62).

Effects of the Proposed Action

Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp

The proposed project will directly affect listed crustaceans inhabiting a total of 0.3 acre of vernal pool crustacean habitat. Direct effects of this project are due to the filling of seasonal wetlands for the construction of the proposed levee improvements. During construction, vernal pool crustaceans and cysts will be crushed, buried, or otherwise destroyed.
In addition to the adverse effects above, the proposed project will contribute to a local and range-wide trend of habitat loss and degradation, the principal reasons that the vernal pool fairy shrimp and vernal pool tadpole shrimp population numbers have declined. The proposed project will contribute to the fragmentation and reduction of the acreage of the remaining listed vernal pool crustacean habitat located in Sacramento and Sutter Counties and throughout the range of these two listed vernal pool crustaceans.

The applicant has proposed to offset the effects on the listed vernal pool crustaceans inhabiting the 0.3 acre of suitable habitat that will be directly affected by the proposed project by purchasing preservation and creation credits at a Service-approved conservation bank(s). Contributing to the long-term preservation and management of the vernal pool habitat is critical for the species' survival and recovery.

Valley Elderberry Longhorn Beetle

The proposed project will result in the transplantation, outside of the action area, of the 10 elderberry shrubs within the action area with stems greater than 1.0 inch in diameter. The 10 shrubs affected shrubs have 58 stems between 1 and 3 inches, 13 stems between 3 and 5 inches and 10 stems greater than 5 inches at ground level.

Loss of an elderberry shrub or even a stem can affect valley elderberry longhorn beetle breeding and feeding because adult valley elderberry longhorn beetles rely solely on elderberry foliage and flowers for food and must lay their eggs on elderberry stems to successfully reproduce.

Transplantation of elderberry shrubs that are or could be used by beetle larvae is expected to adversely affect the beetle. Valley elderberry longhorn beetle larvae may be killed or the valley elderberry longhorn beetles' life cycle interrupted during or after the transplanting process. For example:

1. Transplanted elderberry shrubs may experience stress or become unhealthy due to changes in soil, hydrology, microclimate, or associated vegetation. This may reduce their quality as habitat for the valley elderberry longhorn beetle, or impair their production of habitat-quality stems in the future.

2. Elderberry shrubs may die as a result of transplantation.

3. Branches containing larvae may be cut, broken, or crushed as a result of the transplantation process.

Temporal loss of habitat may occur. Although conservation measures for effects on the valley elderberry longhorn beetle will involve creation or restoration of habitat, it generally takes five or more years for elderberry plants to become large enough to support beetles, and it may take 25 years or longer for riparian habitats to reach their full value. Temporal loss of habitat may cause fragmentation of habitat and isolation of subpopulations.

Habitat creation and transplantation of the shrubs will minimize the effect of permanent and temporary habitat loss on the valley elderberry longhorn beetle. Success of a restoration sites has been linked to presence of transplanted elderberry shrubs that have served to colonize a newly created riparian habitat. Transplants also provide an older larger shrubs within the plantings of young small elderberry seedlings that are planted as compensation. Elderberry shrubs will be transplanted and seedlings planted within the 10-acre woodland corridor that the Corps is constructing within the project area. This corridor will be managed in perpetuity for riparian habitat including valley elderberry longhorn beetle habitat, through the site specific management plan.

Giant garter snake

Phase 4b construction includes levee rehabilitation along Sacramento River east levee reaches 16-20, slope flattening and seepage remediation along American River north levee reaches 1-4, levee raising and seepage remediation along the PGCC west levee and NEMDC west levee, improvements to irrigation and drainage infrastructure, bank protection along PGCC and NEMDC, culvert remediation along the PGCC and detention basins, NCC bridge remediation at SR 99, creation of managed marsh at Brookfield borrow site, woodland corridor creation along reach 16 and along Lower Dry Creek, and land acquisitions. Construction during this phase will occur in 83.06 acres of developed land; 181.27 acres of annual grassland; 81.97 acres of row crop, field crop, and fallow agriculture; 4.16 acres of orchard; 86.16 acres of rice; 26.25 acres of canals, ditches, and marsh; 0.41 acre of seasonal wetlands or riverine wetlands; and 35.91 acres of landside and waterside woodland. At the end of construction for Phase 4b the proposed land cover types will be 157.06 acres of developed land; 60 acres of created woodland; 206.46 acres grassland (levee slope grassland); and 75.78 acres of canals and ditches. The newly created cover-types from the project will be protected from future development through either a flood control easement, conservation easement, or drainage easement.

Components of Phase 4b work that will occur outside of the GGS's active season include utility relocation, removal of residential or agricultural structures, and transplantation and planting of trees and elderberry shrubs. These will be conducted before April 15. GGS have been observed to overwinter as far as 250 meters from aquatic habitat (Wylie *et.al* 1997). Given that GGS are generally inactive during the winter months, SAFCA's working during the inactive season will kill GGS that may be overwintering within the construction footprint. To reduce disturbing and/or killing GGS that may be overwintering in uplands that will be affected by working out of season, SAFCA has proposed to place exclusionary fencing, which will be erected prior to

October 1 in areas in which GGS may overwinter and SAFCA is proposing to remove/plant trees or elderberries. The fencing will exclude GGS from entering the area where SAFCA will be constructing during the winter. This fence will be monitored daily prior to and during construction to insure that there are no breaches that a snake could get through. Excluding snakes from these areas will affect the GGS by limiting its ability to utilize suitable upland habitat for winter hibernation and by changing its dispersal behavior. Increased construction activity in areas where GGS are known to occur could expose snakes to increased risks of injury and mortality from predation, exposure, vehicular traffic, and construction equipment. It may be forced to disperse through and/or around the construction sites in response to habitat changes and seasonal indicators at a time when snakes are slower moving due to temperatures. Areas that are unlikely to have overwintering GGS include areas which have active construction or agricultural activities occurring on them.

The remainder of the project will be constructed during the active period (May 1 – October 1) for the snake, resulting in a decreased risk of direct mortality of snakes and construction within any given area will be completed in one construction season, minimizing the length of the effects to snakes. Effects to snakes are highly likely given the number of acres affected within Phase 4b and given that work will occur and given that numerous rice fields border the eastern portion of the Natomas basin. Effects will include removal of cover and basking sites and filling or crushing of burrows or crevices due to excavation activities. Snake movements will be obstructed due to construction activities blocking access to aquatic or upland habitat. The large amount of construction equipment and number of workers within the Phase 4b action area will increase the likelihood of running over basking or dispersing snakes. Filling in of aquatic habitat such as rice, marsh and ditches will decrease the prey base for GGS. All of these effects are likely to result in the direct disturbance, displacement, injury, and/or mortality of snakes. Some of these effects will be minimized through the Corps' conservation measures. Much of the work will occur during the snake's active season, which will reduce snake mortality because the snakes will be able to leave or avoid habitat that is undergoing construction. Dewatering habitat prior to working within in it by at least 2 weeks prior to disturbance will facilitate snakes leaving the construction areas. Speed limits along construction roads as well as worker awareness training should minimize vehicles running over basking or dispersing snakes. The Corps will to construct the realigned portion of the West Drainage Canal prior to filling the current alignment and will enlarge the canal and provide increased vegetated habitat for the GGS within the West Drainage Canal. Having RD 1000 maintain the canal in a similar manner to the Lower GGS/Drainage Canal will also provide long-term benefits to snakes in the area, as channel maintenance will be done less frequently and with built in conservation measures that will reduce harm or harassment of GGS. The bench that is included in the design should allow both an area for the snakes to take cover in as well as help provide prey for snakes. Other irrigation improvements such as Riego Road Canal, Vestal Drain, and Morrison Canal all provide more canal habitat then will be affected once construction is completed.

To acquire material for levee work in the northeastern portion of the project area, the Corps will borrow from 143 acres of rice fields in the Triangle Area, outside of the Natomas Basin. Borrow activities will preclude the area from being planted in rice and therefore, reduce the amount of habitat available for GGS. To minimize effects to GGS the Corps will only borrow from any one

area for no more than one growing season and the field will be placed back into production and available to GGS the following season. Additionally, the Corps has proposed to place a conservation easement on half of the total area of rice fields used for borrow. This will provide long term protection to this area and preclude this area from being developed in the future.

The Corps will be removing 86.16 acres of rice when constructing along the NEMDC levee, the PGCC levee, and irrigation canal construction. Additionally 8.63 acres of marsh habitat will be removed primarily during construction of the beaver wall, and erosion repair along the PGCC and NEMDC. To compensate for the loss of habitat, the Corps has proposed to compensate with 94.36 acres of managed marsh with a conservation easement on the Brookfield Borrow Site, which is in rice cultivation.

The Corps will be creating 94.36 acres of managed marsh in the northeastern portion of the Natomas Basin. Creation of marsh within this area will provide long term benefits to the Natomas Basin by permanently protecting and increasing marsh habitat within the Natomas Basin. In addition the canal improvements that the Corps will make at the Chappell Ditch and CH1 Drain will provide improved connectivity of the managed marsh to other locations within the Natomas Basin than currently exists. There will be a loss of aquatic GGS habitat in the form of rice during borrow activities and the construction of the managed marsh. Long term the amount of GGS habitat within the Natomas Basin will be increased and connectivity within the northeastern portion of the basin will be improved, which will offset the effects of the project on the GGS.

Cumulative Effects

The cumulative effects for the GGS have not changed and are incorporated by reference from the amended programmatic BO (pages 68-70).

Conclusion

After reviewing the current status of the vernal pool fairy shrimp, vernal pool tadpole shrimp, valley elderberry longhorn beetle, and GGS, the environmental baseline for the species, the effects of the proposed project, and the cumulative effects on this species, it is the Service's BO that the proposed Natomas Landside Improvements Project Phase 4b, as described herein, is not likely to jeopardize the continued existence of the these species. Although critical habitat has been designated for the vernal pool crustaceans and valley elderberry longhorn beetle, the proposed action will not affect critical habitat.

The Corps and SAFCA have proposed to improve flood protection for the Natomas Basin above what currently exists. Two Habitat Conservation Plans (HCP) currently exist within the Natomas Basin and are based on future development occurring within the permit area of the Metro Air Park Habitat Conservation Plan (MAPHCP) and the NBHCP. The baselines and assumptions for which these HCPs were developed were based on no urban development occurring within the basin outside of these permit areas and landuse practices (primarily agriculture) remaining essentially the same. Sacramento County and the City of Sacramento have been in discussions

with the Service about additional development outside of the existing permit areas. As discussed in the Environmental Baseline, the Natomas Basin has experienced a large amount of rice fallowing both in land held by private farmers and leases terminated on Sacramento County Airport property. While the Service has concluded that the Corps and SAFCA's project will not jeopardize the GGS, it could enable future growth to occur that otherwise will not be allowable but for these actions, which will require additional analysis to determine if this growth could jeopardize any of the 22 species covered by the MAPHCP and NBHCP. However, although future growth in the Natomas Basin outside of the permit area is under discussion, the Service does not consider it to be reasonably foreseeable at this time, as no specific proposals are proposed or under review. If growth outside of the permit areas were to occur within the Natomas Basin, these future projects must have a higher conservation outcome than currently exists in the HCPs and must be closely coordinated with the Service.

INCIDENTAL TAKE STATEMENT FOR PHASE 4B CONSTRUCTION

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering. Harm is defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by impairing behavioral patterns including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act, provided that such taking is in compliance with this Incidental Take Statement.

The measures described below are nondiscretionary for listed species in Phase 4b of this opinion and must be implemented by the Corps in order for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity that is covered by this incidental take statement. If the Federal agency (1) fails to adhere to the terms and conditions of the incidental take statement, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

Amount or Extent of Take

Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp

The Service anticipates incidental take of the listed vernal pool crustaceans will be difficult to detect for the following reasons: (1) these species have small body size, therefore finding a dead or injured specimen is unlikely; (2) these species occur in habitats that makes detection difficult; and (3) losses may be masked by seasonal and annual fluctuations in numbers, chance events, changes in water regime, or additional environmental disturbance. Due to the difficulties in

quantifying the number of individuals that will be taken as a result of the proposed action, the Service is quantifying take incidental to this project as the number of acres of suitable habitat for the vernal pool crustaceans that will become unsuitable for this species as a result of the action. The Service estimates that all vernal pool fairy shrimp and vernal pool tadpole shrimp inhabiting 0.3 acre of vernal pool habitat will be harassed, harmed, injured, or killed, as a result of the levee expansion. The incidental take associated with the proposed action on vernal pool fairy shrimp and vernal pool tadpole shrimp is hereby exempted from prohibitions of take under section 9 of the Act.

Valley Elderberry Longhorn Beetle

The Service expects that incidental take of the valley elderberry longhorn beetle will be difficult to detect or quantify. The cryptic nature of these species and their relatively small body size make the finding of an injured or dead specimen unlikely. The species occurs in habitats that make them difficult to detect. Due to the difficulty in quantifying the number of beetles that will be taken as a result of the proposed action, the Service is quantifying take incidental to the project as the number of elderberry stems one inch or greater in diameter at ground level (beetle habitat) that will become unsuitable for beetles due to direct or indirect effects as a result of Phase 3 construction. Therefore, the Service estimates that all beetles inhibiting 10 elderberry plants containing stems 1 inch or greater at ground level (58 stems between 1-3 inches, 13 stems between 3 and 5 inches and 10 stems $\geq$5 inches; see Table 1 in the text) will become unsuitable as a result of the proposed action.

Giant Garter Snake

The Service anticipates that incidental take of the snake will be difficult to detect or quantify for the following reasons: GGS are cryptically colored, secretive, and known to be sensitive to human activities. Snakes may avoid detection by retreating to burrows, soil crevices, vegetation, or other cover. Individual snakes are difficult to detect unless they are observed, undisturbed, at a distance. Most close-range observations represent chance encounters that are difficult to predict. It is not possible to make an accurate estimate of the number of snakes that will be harassed, harmed or killed during Phase 4b construction activities (staging areas, work on canal banks, soil borrow areas, and vehicle traffic to and from borrow areas). In instances when take is difficult to detect, the Service may estimate take in numbers of individual snakes per acre of habitat lost or affected as a result of the action. Therefore, the Service anticipates that all GGS inhabiting 112.41 acres of aquatic and 263.24 acres of upland habitat may be harassed, harmed, or 3 GGS killed by loss and destruction of habitat due to construction of Phase 4b.

Effect of the Take

The Service has determined that this level of anticipated take is not likely to result in jeopardy to the valley elderberry longhorn beetle or GGS and that the proposed project, as described, fits within the parameters of the level of take anticipated in the vernal pool crustacean programmatic opinion and is not likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the vernal pool crustaceans in the wild.

Reasonable and Prudent Measures

The following Reasonable and Prudent Measures are necessary and appropriate to minimize the effect of the proposed project on the GGS.

1. All conservation measures as described in the biological assessment, and as re-stated here in the Project Description section of this BO, must be fully implemented and adhered to.

2. Effects of harassment of individual GGS within the proposed project, and of the loss or degradation of the species' habitat shall be minimized.

3. Effects of harassment of individual valley elderberry longhorn beetle, and of the loss and degradation of the species' habitat shall be minimized.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Corps must ensure compliance with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are nondiscretionary.

1. The following Terms and Conditions implement Reasonable and Prudent Measure one (1):

    a. The Corps and SAFCA shall minimize the potential for incidental take of vernal pool crustaceans, valley elderberry longhorn beetles, and GGS resulting from the project related activities by implementation of the project description as described in the biological assessment and the project description (pages 2 - 37) of this BO.

    The Corps and SAFCA shall include full implementation and adherence to conservation measures as a condition of any permit issued or contract awarded for the project.

    b. If requested, before, during, or upon completion of ground-breaking and construction activities, the project proponents shall allow access by Service and/or California Department of Fish and Game personnel to the project site to inspect the project for effects to GGS and to determine if the proposed conservation measures are being implemented.

    c. A Service-approved Worker Environmental Awareness Training Program for construction personnel shall be conducted by a Service-approved biologist for all construction workers prior to the commencement of construction activities. As needed, training shall be conducted in Spanish for Spanish language speakers and other languages as needed or necessary.

d. The Corps and SAFCA shall require that all personnel associated with this project are made aware of the conservation measures and the responsibility to implement them fully. This could be accomplished by including a copy of this BO within its solicitations for design and construction of the proposed project and making the primary contractor responsible for implementing all requirements and obligations included within the BO, as well as and educating and informing all other contractors involved in the project as to the requirements of the BO.

e. The Corps shall provide quarterly construction activity updates which include what areas have been under construction, what construction activities have been occurring, estimates on completion dates, and what activities are planned for the next quarter.

2. The following Terms and Conditions implement Reasonable and Prudent Measure two (2):

a. At least 30 calendar days prior to initiating construction activities, the project proponents shall submit the names and curriculum vitae of the biological monitor(s) for the proposed project. Monitors shall have the ability to differentiate GGS from other snakes and the authority to stop construction activities if a snake is encountered during construction until appropriate corrective measures have been completed or until the snake is determined to be unharmed.

b. For Phase 4b work that will occur outside of the GGS active window, (power pole relocations, removal or relocation of residential or agricultural structures, construction of lower GGS/Drainage Canal and portions of Elkhorn Canal, and removal of trees and elderberry shrubs) exclusion fencing shall be placed around upland areas that GGS could use to overwinter prior to October 1. The exclusionary fencing shall be monitored everyday prior to and during construction to ensure that openings do not develop that will allow the entry of a GGS into the construction area.

c. If it appears that any other construction activity may go beyond October 1, the project proponents shall contact the Service as soon as possible, but not later than July 15 of the year in question, to determine if additional measures are necessary to minimize take. Areas that have not had ground breaking occur prior to September 15 shall not work past October 1.

d. The project proponents shall implement Best Management Practices to prevent sediment from entering areas containing snake habitat, including, but not limited to, silt fencing, temporary berms, no cleaning of equipment in or near snake habitat, installation of vegetative strips, and temporary sediment disposal.

e. Runoff from dust control and oil and other chemicals used in other construction activities shall be retained in the construction site and prevented from flowing into

areas containing snake habitat. The runoff shall be retained in the construction areas by creating small earthen berms, installing silt fences or hay-bale dikes, or implementing other measures on the construction site to prevent runoff from entering the habitat of the snake.

f. The biologist shall notify the Service immediately if any listed species are found on-site, and will submit a report, including date(s), location(s), habitat description, and any corrective measures taken to protect the species found. The biologist shall be required to report any take to the Service immediately by telephone at (916) 414-6600 and by electronic mail or written letter addressed to the Division Chief, Endangered Species Program, within one (1) working day of the incident. The project area shall be re-inspected by the monitoring biologist whenever a lapse in construction activity of two weeks or greater has occurred.

g. To the extent feasible, the project proponents shall confine clearing of vegetation and scraping, or digging, of soil to the minimal area necessary to facilitate construction activities.

h. After completion of construction activities, any temporary fill and construction debris shall be removed. A written report regarding restoration of temporarily disturbed sites shall be submitted to the Service within ten (10) working days of the completion of construction at the project site.

i. The Corps and SAFCA shall ensure compliance with the reporting requirements.

3. The following Terms and Conditions implement Reasonable and Prudent Measure three (3):

a. A biological monitor will be present on site when work will encroach on the 20-foot elderberry buffer. The monitor will have the authority to stop construction within 20 feet of the shrub if unauthorized take of the beetle occurs. The monitor shall contact the Service immediately to determine what corrective measures need to be taken.

b. Compensation plantings shall occur within the same year as the transplantation of the elderberry shrubs.

Reporting Requirements

A post-construction compliance report prepared by the monitoring biologists must be submitted to the Deputy Assistant Field Supervisor at the Sacramento Fish and Wildlife Office within thirty (30) calendar days of the completion of construction activity or within thirty (30) calendar days of any break in construction activity lasting more than thirty (30) calendar days. This report shall detail: (i) dates that groundbreaking at the project started and the project was completed; (ii) pertinent information concerning the success of the project in meeting compensation and other

conservation measures; (iii) an explanation of failure to meet such measures, if any; (iv) known project effects on the GGS, if any; (v) occurrences of incidental take of any these species; and (vi) other pertinent information.

The Corps must require SAFCA to report to the Service immediately any information about take or suspected take of federally-listed species not authorized in this BO. SAFCA must notify the Service within 24 hours of receiving such information. Notification must include the date, time, and location of the incident or of the finding of a dead or injured animal. In the case of a dead animal, the individual animal should be preserved, as appropriate, and held in a secure location until instructions are received from the Service regarding the disposition of the specimen or the Service takes custody of the specimen. The Service contact persons are, Division Chief, Endangered Species Program at (916) 414-6600, and the Resident Agent-in-charge of the Service's Law Enforcement Division at (916) 414-6660.

Any contractor or employee who during routine operations and maintenance activities inadvertently kills or injures a listed wildlife species must immediately report the incident to their representative. This representative must contact the CDFG immediately in the case of a dead or injured listed species. The CDFG contact for immediate assistance is State Dispatch at (916) 445-0045.

CONSERVATION RECOMMENDATIONS

Conservation recommendations are suggestions of the Service regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of new information. These measures may serve to further minimize or avoid the adverse effects of a proposed action on listed, proposed, or candidate species, or on designated critical habitat. They may also serve as suggestions on how action agencies can assist species conservation in furtherance of their responsibilities under section 7(a)(1) of the Act, or recommend studies improving an understanding of a species' biology or ecology. Wherever possible, conservation recommendations should be tied to tasks identified in recovery plans. The Service is providing you with the following conservation recommendations:

1. The Corps and SAFCA should assist in the implementation of the draft, and when published, the final Recovery Plan for the GGS.

2. The Corps and SAFCA should provide funding to researchers studying topics identified by the Service in the draft, and when published, the final Recovery Plan for the GGS.

3. The Corps should use environmental restoration authorities to acquire and restore garter snake habitat.

To be kept informed of actions minimizing or avoiding adverse effects or benefiting listed and proposed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION - CLOSING STATEMENT

This concludes formal consultation with the Corps on the Natomas Levee Improvement Project, Phase 4b. As provided in 50 CFR 402.16, re-initiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the proposed action may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in this opinion; or (4) a new species or critical habitat is designated that may be affected by the proposed action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation.

If you have any questions regarding this BO on the Natomas Landside Improvements Project Phase 4b, please contact Jennifer Hobbs at (916) 414-6541 or Micelle Tovar, Acting Chief, Sacramento Valley Branch at (916) 414-6645.

Sincerely,

Susan K. Moore
Field Supervisor

cc:
Elizabeth Holland, Corps, Sacramento, CA
Patrick Moeszinger, CDFG, Rancho Cordova, CA
Peter Buck, SAFCA, Sacramento, CA
Kelly Holland, AECOM, Sacramento, CA

Literature Cited

Wylie, G.D., M. Cassaza, and J.K. Daugherty. 1997. 1996 Progress report for the giant garter snake study. Preliminary report, U.S. Geological Survey, Biological Resources Division.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

November 17, 2009

Regulatory Division SPK-2009-00238

Lizette Crosbie
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, California 95814

Dear Ms. Crosbie:

We are responding to your request for a preliminary jurisdictional determination (JD), in accordance with our Regulatory Guidance Letter (RGL) 08-02, for the Robla Creek site. The approximately 711.01-acre site is located near Dry Creek, east of the Natomas Basin, in Sections 5, 6, 7 and 9 of Township 9 & 10 North, Range 5 East, Latitude 38.66722° North, Longitude -121.46115° West, Sacramento County, California.

Based on available information, we concur with the estimate of potential waters of the United States, as depicted on EDAW's November 5, 2009 drawings *Robla Creek Wetland Delineation – Map 1 & 2* (copies enclosed). The approximately 144.21-acres of wetlands and other water bodies present within the survey area (as depicted on the map and summarized on the table provided on both *Map 1* and *2*) may be jurisdictional waters of the United States. These waters may be regulated under Section 404 of the Clean Water Act.

A copy of our RGL 08-02 Preliminary Jurisdictional Determination Form for this site is enclosed. Please sign and return a copy of the completed form to this office. Once we receive a copy of the form with your signature we can accept and process a Pre-Construction Notification or permit application for your proposed project.

You should not start any work in any potentially jurisdictional waters of the United States unless you have Department of the Army permit authorization, or if you intend to request an approved JD for this site. In certain circumstances, as described in RGL 08-02, an approved JD may later be necessary.

This preliminary determination has been conducted to identify the potential limits of wetlands and other water bodies which may be subject to Corps of Engineers' jurisdiction for the particular site identified in this request. This determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

We appreciate your feedback. At your earliest convenience, please tell us how we are doing by completing the customer survey on our website under *Customer Service Survey.*

Please refer to identification number SPK-2009-00238 in any correspondence concerning this project. If you have any questions, please contact Mary Pakenham-Walsh at U.S. Army Corps of Engineers Regulatory Division, California Delta Branch, 1325 J Street, Room 1480, Sacramento, CA 95814-2922, email *Mary.R.Pakenham-Walsh@usace.army.mil*, or telephone 916-557-7718. For more information regarding our program, please visit our website at *www.spk.usace.army.mil/regulatory.html.*

Sincerely,

ORIGINAL SIGNED

Kathleen A. Dadey, Ph.D.
Chief, California Delta Branch
Sacramento District

Enclosures

Copy Furnished without enclosures

Mr. Robert Solecki, California Regional Water Quality Control Board, Central Valley Region, 11020 Sun Center Drive #200, Rancho Cordova, California 95670-6114
Mr. Paul Jones, U.S. Environmental Protection Agency, 75 Hawthorne St. (WTR-8), San Francisco, California 94105
Ms. Jana Affonso, U.S. Fish and Wildlife Service, Endangered Species Division, 2800 Cottage Way, Suite W2605, Sacramento, California 95825-3901
California Department of Fish and Game, 1701 Nimbus Road, Suite A, Rancho Cordova, California 95670
Ms. Sarah Bennett, EDAW, Inc., 2022 J Street, Sacramento, California 95811

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

July 24, 2008

Regulatory Division (SPK-2007-00211)

Sarah Bennett
EDAW, Inc.
2022 J Street
Sacramento, California 95811

Dear Ms. Bennett:

We are responding to your request, on behalf of the Sacramento Area Flood Control Agency, for an approved jurisdictional determination for a portion of the Natomas Levee Improvement Program Landside Improvements Project (NLIP) site. This approximately 5,283-acre site is located in the Natomas Basin in Northern Sacramento and Southern Sutter Counties, California.

Based on available information, we concur with the estimate of waters of the United States, as depicted on your June 4, 2008, revised Maps 1-19. Approximately 212.3 acres of waters of the United States, including wetlands, are present within the survey area. These waters are regulated under Section 404 of the Clean Water Act, since they are tributary and adjacent to navigable waters of the United States, in particular the Sacramento River.

The 7.04 acres of features identified as Field Ditches on the above drawings appear to have been constructed wholly in and drain only uplands. As such, we do not consider these to be waters of the United States. This disclaimer of jurisdiction is only for Section 404 of the Federal Clean Water Act. Other Federal, State, and local laws may apply to activities in these features. In particular, authorization from the California State Water Resources Control Board and/or the U.S. Fish and Wildlife Service may be necessary.

This verification is valid for five years from the date of this letter, unless new information warrants revision of the determination before the expiration date. This letter contains an approved jurisdictional determination for your subject site. If you object to this determination, you may request an administrative appeal under Corps regulations at 33 CFR Part 331.

A Notification of Appeal Process (NAP) fact sheet and Request for Appeal (RFA) form is enclosed. If you request to appeal this determination you must submit a completed RFA form to the South Pacific Division Office at the following address: Administrative Appeal Review Officer, Army Corps of Engineers, South Pacific Division, CESPD-PDS-O, 1455 Market Street, San Francisco, California 94103-1399, Telephone: 415-503-6574, FAX: 415-503-6646.

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR Part 331.5, and that it has been

received by the Division Office within 60 days of the NAP. Should you decide to submit an RFA form, it must be received at the above address by 60 days from the date of this letter. It is not necessary to submit an RFA form to the Division Office if you do not object to the determination in this letter.

You should provide a copy of this letter and notice to all other affected parties, including any individual who has an identifiable and substantial legal interest in the property.

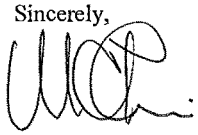
This determination has been conducted to identify the limits of Corps of Engineers' Clean Water Act jurisdiction for the particular site identified in this request. This determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

The extent of waters on other portions of the approximately 9,661-acre project site was separately verified under our identification numbers 200300776, 200600332, and 200600795. Based on available information, there are a total of approximately 610 acres of waters of the United States, in the overall NLIP area. This total does not include the Sacramento River itself which is outside of this project site.

We appreciate your feedback. At your earliest convenience, please complete our customer survey at *http://www.spk.usace.army.mil/customer_survey.html*. Your passcode is "conigliaro".

Please refer to identification number SPK-2007-00211 in any correspondence concerning this project. If you have any questions, please contact Mike Finan at our California North Branch , 1325 J Street, Room 1480, Sacramento California 95814-2922, email *michael.c.finan@usace.army.mil*, or telephone (916) 557-5324. You may also use our website: *www.spk.usace.army.mil/regulatory.html*.

Sincerely,



Mike Finan
Project Manager, Wetland Specialist

Enclosure(s)

Copy furnished without enclosure(s):

John Bassett, Sacramento Area Flood Control Agency, 1007 7th Street, 7th Floor, Sacramento, California 95814
William Marshall, Central Valley Regional Water Quality Control Board, 11020 Sun Center Drive, #200, Rancho Cordova, California 95670-6114
Ken Sanchez, U.S. Fish and Wildlife Service, Endangered Species Division, 2800 Cottage Way, W-2605, Sacramento, California 95825

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

RECEIVED MAY 2 3 2008

DEPARTMENT OF THE ARMY PERMIT

Permittee: Grant Joint Union High School District

Permit Number: SPK-2005-01087

Issuing Office: U.S. Army Engineer District, Sacramento
Corps of Engineers
1325 "J" Street
Sacramento, California 95814-2922

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below. A notice of appeal options is enclosed.

Project Description:

To place fill material into 1.8734 acres of waters of the United States, including 0.9 acre of stock pond, 0.22 acre of vernal pools, 0.72 acre of seasonal wetland swales and 0.03 acre of jurisdictional drainage ditch for the construction of a joint middle/high school, and associated infrastructure.

All work is to be completed in accordance with the attached plan(s).

Project Location:

South of Elkhorn Boulevard and north of Del Paso Road in Section 36, Township 10 North, Range 4 East, in Sacramento County, California, USGS Topographic Quadrangle Rio Linda; Latitude 38.6770° North, Longitude 121.4903° West.

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on **May 23, 2013**. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal

and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

1. To mitigate for the loss of 1.8734 acres of waters of the United States, including 0.9 acre of stock pond, 0.22 acre of vernal pools, 0.72 acre of seasonal wetland swales and 0.03 acre of jurisdictional drainage ditch, you shall purchase 3.9 acre vernal pool creation and 0.2 seasonal wetland creation credits at a Corps approved wetland mitigation bank. Evidence of this purchase shall be provided to this office prior to proceeding with any activity otherwise authorized by this permit. A list of approved mitigation banks has been included for your reference.

2. This Corps permit does not authorize you to take an endangered species, in particular the vernal pool fairy shrimp (*Branchinecta lynchi*), vernal pool tadpole shrimp (*Lepidurus packardi*), or designated critical habitat. In order to legally take a listed species, you must have separate authorization under the Endangered Species Act (e.g., an Endangered Species Act Section 10 permit, or a Biological Opinion under Endangered Species Act Section 7, with "incidental take" provisions with which you must comply). The enclosed Fish and Wildlife Service Biological Opinion, (Number 1-1-0+-F-0294), dated July 25, 2007, and (Number 1-1-07-F-0140, dated April 5, 2007, and the December 18, 2007 revision, contains mandatory terms and conditions to implement and reasonable and prudent measures that are associated with "incidental take" that is also specified in the Biological Opinion. Your authorization under this Corps permit is conditional upon your compliance with all of the mandatory terms and conditions associated with incidental take of the attached Biological Opinion, which terms and conditions are incorporated by reference in this permit. Failure to comply with the terms and conditions associated with the incidental take statement in the Biological Opinion, where a take of the listed species occurs, would constitute an unauthorized take, and it would also constitute non-compliance with your Corps permit. The Fish and Wildlife Service is the appropriate authority to determine compliance with the terms and conditions of its Biological Opinion, and with the Endangered Species Act. You must comply with all conditions of this Biological Opinion.

3. To document pre and post-project construction conditions, you shall submit pre-construction photos of the project site prior to project implementation and post-construction photos of the project site within 30 days after completion of authorized activities.

4. You must allow representatives from the Corps of Engineers to inspect the authorized activity and any mitigation, preservation, or avoidance areas at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

5. You shall employ construction best management practices (BMPs) onsite to prevent degradation to on-site and off-site waters of the U.S. You shall submit photodocumentation of your BMPs to our office within 30 days of commencement of construction. Photos may be submitted electronically to regulatory-info@usace.army.mil.

6. You shall stabilize and protect against erosion any unstable fills in or adjacent to wetlands and other waters of the U.S. by using appropriate erosion controls such as the use of matting, seeding, or other effective methods. The erosion controls shall remain in place until all exposed areas are permanently stabilized.

7. You shall clearly identify the project limits in the field by using survey markers and/or construction fencing, prior to beginning any construction activities to ensure waters of the United States outside of the project footprint are not impacted. Identification of these areas shall be maintained until construction is complete. No heavy equipment or work is permitted in waters of the United States beyond those authorized through this permit.

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

( ) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).

(X) Section 404 of the Clean Water Act (33 U.S.C. 1344).

( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal projects.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data. The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant.

Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (see 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General Condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

Permittee

May 23, 2008
Date

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

Kathleen A. Dadey, PhD, Chief,
Sacramento Office
(For the District Engineer)

May 23, 2008
Date

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

Transferee

Date

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

June 29, 2005

Regulatory Branch (200300776)

Greg Rowe
Sacramento County Airport System
6900 Airport Boulevard
Sacramento, California 95837-1109

Dear Mr. Rowe:

We are responding to your consultant's request for an approved jurisdictional determination for the Sacramento Airport Land Management area. This approximately 2,838-acre site is located on or near the Sacramento River, in Sections 19, 30 & 31, Township 10 North, Range 4 East, and Sections 24, 25 & 36, Township 10 North, Range 3 East, M.D.B.&M., approximate Latitude 38° 41′ 19.7″ & Longitude 121° 35′ 56.7″, Sacramento County, California.

Based on available information and with the exception of the jurisdictional determinations on the map, we concur with the estimate of waters of the United States, as depicted on the **May 5, 2005, SMF LMP Wetland Delineation Maps 1-4** drawings prepared by **EDAW, Inc.** Approximately 27.86 acres of waters of the United States, including wetlands, are present within the survey area. These waters are regulated under Section 404 of the Clean Water Act since they are tributary, or adjacent to a tributary, to the Sacramento River.

You have determined that hydrology for wetlands FM4 and FM5 are solely supported by a "leaky-pipe" and based on Regulatory Branch Memorandum (RBM) 2004-03 the wetlands are not jurisdictional. Although RBM 2004-03 only addressed "leaky-ditch" wetlands, for this case we believe RBM 2004-03 and RBM 2003-04 ("Irrigated" Wetlands) are applicable to this situation. Based on the available information, including topography, we believe there is uncertainty regarding the source of hydrology for these wetlands. In accordance with the above RBMs, we will assume that these wetlands are supported, at least partially, by natural hydrology, unless clearly demonstrated otherwise. Therefore, at this time, we consider these wetlands jurisdictional. If practical, we recommend you consider closing the valve to this pipe and monitoring the hydrology to clearly demonstrate the source of hydrology. Detailed topography and the exact location of the pipe relative to wetlands may also be helpful in determining the source of hydrology.

The wetlands identified as Swales 4, 5 and 9, acreages 0.04, 0.04 and 0.01 respectively, on the above drawings are intrastate isolated waters with no apparent interstate or foreign commerce connection. As such, these waters are not currently regulated by the Corps of Engineers. This disclaimer of jurisdiction is only for Section 404 of the Federal Clean Water Act. Other Federal, State, and local laws may apply to your activities. In particular, you may need authorization from the California State Water Resources Control Board and/or the U.S. Fish and Wildlife Service.

This verification is valid for five years from the date of this letter, unless new information warrants revision of the determination before the expiration date. A *Notification of Administrative Appeal Options and Process and Request for Appeal* form is enclosed. If you wish to appeal this approved jurisdictional determination, please follow the procedures on the form. You should provide a copy of this letter and notice to all other affected parties, including any individual who has an identifiable and substantial legal interest in the property.

This determination has been conducted to identify the limits of Corps of Engineers' Clean Water Act jurisdiction for the particular site identified in this request. This determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

Please refer to identification number 200300776 in any correspondence concerning this project. If you have any questions, please contact Justin Cutler at our Sacramento Office, 1325 J Street, Room 1480, Sacramento, California 95814-2922, email *Justin.Cutler@usace.army.mil*, or telephone 916-557-5258. You may also use our website: *www.spk.usace.army.mil/regulatory.html*.

Sincerely,

Thomas J. Cavanaugh
Acting Chief, Central California/Nevada Section

Enclosure(s)

Copies furnished without enclosure(s):

Anne King, EDAW, Incorporated, 2002 J Street, Sacramento, California 95814
Camille Garibaldi, Federal Aviation Administration, 831 Mitten Road, Suite 210, Burlingame, California 94010
George Day, Storm Water and Water Quality Certification Unit, Central Valley Regional Water Quality Control Board, 11020 Sun Center Drive #200, Rancho Cordova, California 95670-6114
Oscar Balaguer, Chief, Water Quality Certification Unit, California State Water Resources Control Board, 1001 I Street, Sacramento, California 95814
U.S. Fish and Wildlife Service, Wetlands Branch, 2800 Cottage Way, Suite W2605, Sacramento, California 95825-3901
U.S. Fish and Wildlife Service, Endangered Species Division, 2800 Cottage Way, Suite W2605, Sacramento, California 95825-3901
Richard Radmacher, Assistant Planner, Planning and Community Development Department, County of Sacramento, 827 7th Street, Room 230, Sacramento, California 95814-2406

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

March 21, 2006

Regulatory Branch (200300776)

RECEIVED
MAR 24 2006
AIRPORT FACILITIES

Tim Hawkins
Associate Environmental Analyst
Department of Environmental Review and Assessment
827 7th Street, Suite 220
Sacramento, California 95814

Dear Mr. Hawkins:

We are responding to your request for an approved jurisdictional determination for the Sacramento International Airport Parcel South of I-5 site. This approximately 300-acre site is located on or near Section 19, 24, 25, 30, 31, 36, Township 10 North, Range 3, 4 East, MDB&M, Latitude 38° 41′ 19.7″, Longitude 121° 35′ 56.7″, Sacramento County, California.

Based on available information, we concur with the estimate of waters of the United States, as depicted on the map included in your February 8, 2006 submittal to Kathleen Dadey of our office. Approximately 3.72 acres of waters of the United States, including wetlands, are present within the survey area. These waters are regulated under Section 404 of the Clean Water Act since they are tributary to the Sacramento River, or adjacent to a tributary of the River.

The water identified as an agricultural ditch in the February 8, 2006 report (shown as a yellow line in the north central portion of the aforementioned map) is an intrastate isolated water with no apparent interstate or foreign commerce connection. As such, this water is not currently regulated by the Corps of Engineers. This disclaimer of jurisdiction is only for Section 404 of the Federal Clean Water Act. Other Federal, State, and local laws may apply to your activities. In particular, you may need authorization from the California State Water Resources Control Board and/or the U.S. Fish and Wildlife Service.

This verification is valid for five years from the date of this letter, unless new information warrants revision of the determination before the expiration date. This letter contains an approved jurisdictional determination for the airport's potential expansion (parking lot). If you object to this verification, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and Request for Appeal (RFA) form. If you request to appeal this verification, you must submit a completed RFA form to the South Pacific Division Office at the following address:

Doug Pomeroy, Administrative Appeal Review Officer
Army Corps of Engineers, South Pacific Division
CESPD-PDS-O
333 Market Street, Room 923
San Francisco, California 94105-2195
Telephone: 415-977-8035
FAX: 415-977-8129

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR Part 331.5, and that it has been received by the Division Office within 60 days of the NAP. Should you decide to submit an RFA form, it must be received at the above address by May 20, 2006. It is not necessary to submit an RFA form to the Division Office if you do not object to the verification in this letter.

You should provide a copy of this letter and notice to all other affected parties, including any individual who has an identifiable and substantial legal interest in the property.

This determination has been conducted to identify the limits of Corps of Engineers' Clean Water Act jurisdiction for the particular site identified in this request. This determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

Please refer to identification number 200300776 in any correspondence concerning this project. If you have any questions, please contact Ms. Kathleen Dadey at our Sacramento Office, 1325 J Street, Room 1480, Sacramento, California 95814-2922, email *kathleen.a.dadey@usace.army.mil*, or telephone 916-557-7253. You may also use our website: *www.spk.usace.army.mil/regulatory.html*.

Sincerely,

ORIGINAL SIGNED
Thomas J. Cavanaugh
Acting Chief
Central California/Nevada Section

Enclosure(s)

Copy furnished without enclosure

Greg Rowe, Sacramento County Airport System, 6900 Airport Boulevard, Sacramento, California 95837-1109

Camille Garibaldi, Federal Aviation Administration, 831 Mitten Road, Suite 210, Burlingame, California 94010

William Marshall, Storm Water and Water Quality Certification Unit, Central Valley Regional Water Quality Control Board, 11020 Sun Center Drive #200, Rancho Cordova, California 95670-6114

Oscar Balaguer, Chief, Water Quality Certification Unit, California State Water Resources Control Board, 1001 I Street, Sacramento, California 95814

U.S. Fish and Wildlife Service, Wetlands Branch, 2800 Cottage Way, Suite W2605, Sacramento, California 95825-3901

U.S. Fish and Wildlife Service, Endangered Species Division, 2800 Cottage Way, Suite W2605, Sacramento, California 95825-3901

Richard Radmacher, Assistant Planner, Planning and Community Development Department, County of Sacramento, 827 7th Street, Room 230, Sacramento, California 95814-2406

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

September 29, 2006

RECEIVED
OCT 02 2006
By

Regulatory Branch (200600332)

Greg Rowe
Sacramento County Airport System
6900 Airport Boulevard
Sacramento, California 95837

Dear Mr. Rowe:

We are responding to your consultant's request for an approved jurisdictional determination for the Sacramento Intl Airport North site. This approximately 900-acre site is located adjacent to the Sacramento River, north of the Sacramento International Airport, in Township 10N, Range 3E, MDB&M, Latitude 38.722, Longitude 121.594, Sacramento County, California.

Based on available information, we concur with the estimate of waters of the United States, as depicted on Exhibit 3, Elverta North Wetland Delineation, dated August 23, 2006 prepared by EDAW, Inc.. Approximately 94.57 acres of waters of the United States, including wetlands, are present within the survey area. These waters are regulated under Section 404 of the Clean Water Act since they are adjacent and/or tributary to the Sacramento River or are adjacent to one of a number of ditches which are tributary to the Sacramento River. The Sacramento River is a navigable water of the United States.

This verification is valid for five years from the date of this letter, unless new information warrants revision of the determination before the expiration date. This letter contains an approved jurisdictional determination for your subject site. If you object to this determination, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and Request for Appeal (RFA) form. If you request to appeal this determination you must submit a completed RFA form to the South Pacific Division Office at the following address: Doug Pomeroy, Administrative Appeal Review Officer, Army Corps of Engineers, South Pacific Division, CESPD-PDS-O, 333 Market Street, Room 923, San Francisco, California 94105-2195, Telephone: 415-977-8035 FAX: 415-977-8129.

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR Part 331.5, and that it has been received by the Division Office within 60 days of the NAP. Should you decide to submit an RFA form, it must be received at the above address by November 28, 2006. It

is not necessary to submit an RFA form to the Division Office if you do not object to the determination in this letter.

You should provide a copy of this letter and notice to all other affected parties, including any individual who has an identifiable and substantial legal interest in the property.

This determination has been conducted to identify the limits of Corps of Engineers' Clean Water Act jurisdiction for the particular site identified in this request. This determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

Please refer to identification number 200600332 in any correspondence concerning this project. If you have any questions, please contact at our Sacramento Valley Office, 1325 J Street, Room 1480, Sacramento, California 95814-2922, email kathleen.a.dadey@usace.army.mil, or telephone 916-557-7253. You may find additional information on our website: *www.spk.usace.army.mil/regulatory.html.*

Sincerely,

ORIGINAL SIGNED
Kevin J. Roukey
Chief, Central California/Nevada
Section

Enclosure(s)

Copy furnished without enclosure(s):

Matt Wacker, EDAW, Inc. 2022 J Street, Sacramento, California 95814

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

November 7, 2006

Regulatory Branch (200600795)

RECEIVED
NOV 09 2006
By

John Bassett
Sacramento Area Flood Control Agency
1007 7th Street 7th Floor
Sacramento, California 95814

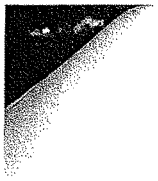
Dear Mr.:

We are responding to your consultant's request for an approved jurisdictional determination for the Natomas Cross Canal site. This approximately 340.0-acre site is located on or near Sacramento River in Section , Township 11 North, Range 4 East, MDB&M, Latitude 038° 48′ 25.4″, Longitude 121° 33′ 59.4″, Sutter County, California.

Based on available information, we concur with the estimate of waters of the United States, as depicted on the **October 18, 2006, Natomas Cross Canal** drawing prepared by **EDAW**. Approximately **271.22** acres of waters of the United States, including wetlands, are present within the survey area. These waters are regulated under Section 404 of the Clean Water Act since they are **a broad continuum of wetland features adjacent to the Natomas Cross Canal, which is a tributary to the Sacramento River.**

This verification is valid for five years from the date of this letter, unless new information warrants revision of the determination before the expiration date. This letter contains an approved jurisdictional determination for your subject site. If you object to this determination, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and Request for Appeal (RFA) form. If you request to appeal this determination you must submit a completed RFA form to the South Pacific Division Office at the following address: Doug Pomeroy, Administrative Appeal Review Officer, Army Corps of Engineers, South Pacific Division, CESPD-PDS-O, 333 Market Street, Room 923, San Francisco, California 94105-2195, Telephone: 415-977-8035 FAX: 415-977-8129.

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR Part 331.5, and that it has been received by the Division Office within 60 days of the NAP. Should you decide to submit an RFA form, it must be received at the above address by January 7, 2007. It is not necessary to submit an RFA form to the Division Office if you do not object to the determination in this letter.



You should provide a copy of this letter and notice to all other affected parties, including any individual who has an identifiable and substantial legal interest in the property.

This determination has been conducted to identify the limits of Corps of Engineers' Clean Water Act jurisdiction for the particular site identified in this request. This determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

Please refer to identification number 200600795 in any correspondence concerning this project. If you have any questions, please contact Tom Cavanaugh at our Sacramento Valley Office, 1325 J Street, Room 1480, Sacramento, California 95814-2922, email *Brian.E.Vierria@usace.army.mil*, or telephone 916-557-7728. You may also use our website: *www.spk.usace.army.mil/regulatory.html*.

Sincerely,

ORIGINAL SIGNED

Thomas J. Cavanaugh
Chief, Sacramento Valley Office

Enclosure(s)

Copy furnished without enclosure(s):

Ann King, Edaw, 2022 J Street, Sacramento, California 95814

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

April 15, 2010

Regulatory Division SPK-2008-01039

John Bassett
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, California 95814

Dear Mr. Bassett:

We are responding to your consultant's January 13, 2010, request, on your behalf, for a preliminary jurisdictional determination (JD), in accordance with our Regulatory Guidance Letter (RGL) 08-02, for the Natomas Levee Improvement Program *Phase 3 Landside Improvements Project, Supplement to the Phase 3 Landside Improvement Project* and *Phase 4 Landside Improvements Project*. These sites total approximately 2695.4-acres and are located in the Natomas Basin in various Sections in Townships 9, 10 and 11 North and Ranges 4 and 5 East in Sacramento County, California.

Based on available information, we concur with the estimate of potential waters of the United States, as depicted on the September 2008, March 29, 2009 (revised June 15, 2009) and August 12, 2009, respectively, drawings prepared by EDAW. The approximately 290.58 acres of wetlands and 111.92 acres of other water bodies present within the surveyed areas may be jurisdictional waters of the United States. These waters may be regulated under Section 404 of the Clean Water Act.

A copy of our RGL 08-02 Preliminary Jurisdictional Determination Form for this site is enclosed. Please sign and return a copy of the completed form to this office. Once we receive a copy of the form with your signature we can accept and process a Pre-Construction Notification or permit application for your proposed project.

You should not start any work in potentially jurisdictional waters of the United States unless you have Department of the Army permit authorization. You may request an approved JD for these sites at any time prior to starting work within waters. In certain circumstances, as described in RGL 08-02, an approved JD may later be necessary.

A copy of our Notice of Appeal Options form is also enclosed. You should provide a copy of this letter and notice to all other affected parties, including any individual who has an identifiable and substantial legal interest in the property.

This preliminary determination has been conducted to identify the potential limits of wetlands and other water bodies which may be subject to Corps of Engineers' jurisdiction for the particular site identified in this request. A Notification of Appeal Process and Request for Appeal (RFA) form is enclosed to notify you of your options with this determination. This determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

We appreciate your feedback. At your earliest convenience, please tell us how we are doing by completing the customer survey on our website under *Customer Service Survey*.

Please refer to identification number SPK-2008-01039 in any correspondence concerning this preliminary jurisdictional determination. If you have any questions concerning this preliminary jurisdictional determination, please contact Michael Finan at Sacramento District Regulatory Division, email *Michael.C.Finan@usace.army.mil*, or telephone 916 557-5324. Otherwise, you may contact me directly. For more information regarding our program, please visit our website at *www.spk.usace.army.mil/regulatory.html*.

Sincerely,

ORIGINAL SIGNED

Kathleen A. Dadey, Ph.D.
Chief, California Delta Branch

Enclosures

Copy Furnished without enclosures

William Marshall, Central Valley Regional Water Quality Control Board, 11020 Sun Center Drive, #200, Rancho Cordova, California 95670-6114
Jason Brush, U.S. Environmental Protection Agency, Region IX, Wetlands Regulatory Office,(WTR-8), 75 Hawthorne Street, San Francisco, California 94105
Ken Sanchez, U.S. Fish and Wildlife Service, Endangered Species Division, 2800 Cottage Way, W-2605, Sacramento, California 95825
Sarah Bennett, EDAW Inc. 2022 J Street, Sacramento, California 95811

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

JAN 8 2009

In response refer to:
2009/01731

Mr. Francis C. Piccola
Chief, Planning Division
U.S. Army Corps of Engineers
1325 J Street
Sacramento, California 95814

Dear Mr. Piccola:

This is in response to your April 2, 2009, letter requesting the initiation of formal section 7 consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to the Endangered Species Act (ESA) for the proposed Natomas Levee Improvement project, Phases 3 and 4a. Specifically, the U.S. Army Corps of Engineers (Corps) has determined that the implementation of project related activities may have an adverse affect to federally listed endangered Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*), threatened Central Valley spring-run Chinook salmon (*O. tshawytscha*), threatened Central Valley steelhead (*O. mykiss*), the threatened Southern Distinct Population Segment (DPS) of North American green sturgeon (*Acipenser medirostris*), or their respective designated critical habitat. In addition, the Corps has requested consultation on the impacts of the proposed project to the Essential Fish Habitat (EFH) for Pacific salmon pursuant to provisions of the Magnuson-Stevens Fishery Conservation and Management Act (MSA). This letter also serves as consultation under the authority of and in accordance with the provisions of the Fish and Wildlife Coordination Act (FWCA) of 1934, as amended.

On April 2, 2009, NMFS received a biological assessment from the Corps consultant, EDAW/AECOM, as well as several supporting memorandums on September 14, 30, and October 1, 2009, respectively. The memorandums addressed the revegetation plan and the Corps Engineering Technical Letter 1110-2-271 (ETL). The Corps, in cooperation with Sacramento Area Flood Control Agency (SAFCA), modified their design plans to meet the Corps ETL. The Corps and SAFCA plan to replace the loss of vegetation on-site at a 1:1 ratio where feasible. Where on-site replacement of vegetation is not feasible, vegetation would be planted at a 3:1 ratio off-site. If it is determined that the area is not large enough to accommodate all of the replacement vegetation necessary for the loss of Shaded Riverine Aquatic (SRA) habitat, SAFCA shall purchase SRA credits at a NMFS approved conservation bank.

Action

The Corps and SACFCA plan to improve the Natomas levee system located in northern Sacramento and southern Sutter Counties. The project area is bordered by the Natomas Cross Canal on the north, the Sacramento River on the west, the American River on the south, and the Pleasant Grove Creek Canal and Natomas East Main Drainage/Steelhead Creek on the east. The general plan for Phase 3 and 4a includes raising the levee from the levee crown with some removal of vegetation on the waterside of the levee slope from the toe to the crown of the levee, constructing a slurry wall, re-contouring the levee slopes from the landside, and improving the drainage structures on the landside of the levee for wildlife habitat. The activities will result in the loss of 1.986 acres of SRA habitat above the Ordinary High Water Mark (OHWM) and 0.244 acres below the OHWM. Other activities include the installation of a coffer dam with a vibratory hammer in order to rebuild the intake pumps. In-water construction activities for Phases 3 and 4a will occur between July 1 and October 1. The Corps and SAFCA expect the activities behind the coffer dam, as well as its removal, to be completed before October 1. Disturbed areas on the waterside will be restored using biotechnical remediation techniques. Removal of Instream Woody Material (IWM) will be avoided where possible. If the removal of IWM is necessary, the IWM will be replaced. Although some levee grading and minor tree removal will occur below the OHWM, revegetation with native species will be designed to compensate for the temporal loss of riparian vegetation on the water side of the slope. Permanent impacts to riparian vegetation will be replaced at a 1:1 ratio, on-site where feasible. Where on-site replacement is not feasible, vegetation will be planted at a 3:1 ratio off-site. If it is determined that the area is not large enough to accommodate all of the replacement vegetation necessary for the loss of SRA habitat, SAFCA shall purchase SRA credits at a NMFS approved conservation bank. During all phases of construction, Best Management Practices (BMP) and conservations measures for erosion control and water quality will be implemented.

ESA Consultation

Based on our review of the information provided in your April 2, 2009, biological assessment and letter requesting the initiation of ESA section 7 consultation, and the September 14, 30, and October 1, 2009 memorandums, NMFS finds that the proposed activities do not require formal section 7 consultation. We have determined that the proposed project is not likely to adversely affect federally listed Central Valley steelhead, endangered Sacramento River winter-run Chinook salmon, threatened Central Valley spring-run Chinook salmon, threatened Southern DPS of North American green sturgeon, or their respective designated critical habitats. This determination is based largely on the fact that in-water construction will be minimal and will occur during a time of the year when sensitive life history stages (rearing or smolting juveniles) of listed fish will not be present in the action area; the project proposal includes using biotechnical remediation designs and techniques for work conducted on the waterside of the levee in order to minimize the loss of riparian vegetation and replace any lost vegetation with native riparian species; the action includes a fish relocation plan for fish that may become trapped behind the coffer dam, as well as a slurry spill contingency plan to minimize the risk of bentonite slurry entering the aquatic environment; the utilization of a vibratory hammer for the placement of the coffer dam to minimize any potential acoustic effects to listed species; and the implementation of BMPs for water quality and erosion control. Based on the incorporation of

these conservation measures into the project description, NMFS has concluded that potential adverse effects of the proposed project to listed species have been minimized to the point of being discountable or insignificant.

This concludes ESA section 7 consultation for the proposed project. This concurrence does not provide incidental take authorization pursuant to section 7(b) (4) and section 7(o) (2) of the ESA. Reinitiation of consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (2) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered; or (3) a new species is listed or critical habitat designated that may be affected by the action.

EFH

With regards to EFH consultation, the action area has been identified as EFH for all races of Central Valley Chinook salmon (*O. tshawytscha*), including the fall-/late-fall-run in Amendment 14 of the Pacific Salmon Fishery Management Plan pursuant to the MSA. Federal action agencies are mandated by the MSA [section 305(b)(2)] to consult with NMFS on all actions that may adversely affect EFH, and NMFS must provide EFH conservation recommendations to those agencies [section 305(b)(4)(A)]. Because the proposed project would implement conservation measures which are expected to avoid adverse impacts to Chinook salmon habitat, additional EFH Conservation Recommendations are not being provided at this time, however, if there is substantial revision to the action, the lead Federal agency will need to re-initiate EFH consultation.

FWCA

The purpose of the FWCA is to ensure that wildlife conservation receives equal consideration and is coordinated with other aspects of water resources development [16 U.S.C. 661]. The FWCA establishes a consultation requirement for Federal departments and agencies that undertake any action that proposes to modify any stream or other body of water for any purpose, including navigation and drainage [16 U.S.C 662(a)]. Consistent with this consultation requirement, NMFS provides recommendations and comments to Federal action agencies for the purpose of conserving fish and wildlife resources. The FWCA provides the opportunity to offer recommendations for the conservation of species and habitats beyond those currently managed under the ESA and MSA. Because the proposed project is designed to avoid and minimize environmental impacts to aquatic habitat within the action area, NMFS has no additional FWCA comments to provide.

Please contact Madelyn Martinez at (916) 930-3605, or via e-mail at Madelyn.Martinez@noaa.gov if you have any questions regarding this letter.

Sincerely,

for Rodney R. McInnis
Regional Administrator

cc: Copy to file – ARN 151422SWR2004SA00179
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APPENDIX D3
CLEAN WATER ACT SECTION 404(b)(1) EVALUATION

I. Project Description, Project Purpose, and Need

The U.S. Army Corps of Engineers (USACE), Sacramento District and the Sacramento Area Flood Control Agency (SAFCA), the local sponsor, propose to construct the Natomas Levee Improvement Program (NLIP), Phase 4b Landside Improvements Project (Phase 4b Project or the project), which consists of levee improvements to the remaining portions of the Natomas Basin's perimeter levee system in the City of Sacramento and in Sutter and Sacramento Counties, California. The overall purpose of the multi-phase NLIP is to bring the entire 42-mile Natomas Basin perimeter levee system into compliance with applicable Federal and state standards for levees protecting urban areas through a program of proposed levee improvements to address levee height deficiencies, levee seepage potential, and streambank erosion conditions along the Natomas Basin perimeter levee system. The Landside Improvements Project, which is a component of the NLIP, consists of four phases (1, 2, 3, and 4a and 4b). For a complete summary of the NLIP phasing, see Chapter 2, "Alternatives," in the Environment Impact Statement/Environmental Impact Report (EIS/EIR). Also, see Section 4.18, "Summary of Environmental Impacts and Mitigation Measures from Previous Natomas Levee Improvement Program Landside Improvements Project Phases 1–4a," in the EIS/EIR for a summary of impacts and mitigation measures associated with the Phase 1–4a Projects.

The Phase 4b Project builds upon a program of improvements analyzed in previous environmental documents for achieving flood risk damage reduction for the 53,000-acre Natomas Basin. The project is the final phase of the Landside Improvements Project and the subject of the EIS/EIR. The proposed improvements consist of levee improvements, associated landscape and irrigation/drainage infrastructure modifications, and habitat creation and management.

A description of all of the alternatives to the Phase 4b Project can be found in Chapter 2, "Alternatives," of the EIS/EIR. The EIS/EIR includes a screening of all of the alternatives considered for analysis, including criteria and rationale for those alternatives carried forward and those alternatives not carried forward in EIS/EIR (see Sections 2.1.5, "Alternatives Considered, But Eliminated from Further Consideration," and 2.1.6, "Alternatives Carried Forward for Evaluation in this EIS/EIR"). This 404(b)(1) analysis focuses on the alternatives carried forward for analysis in the EIS/EIR: the No-Action Alternative, the Adjacent Levee Alternative (Proposed Action), and the Fix-in-Place Alternative.

- **No-Action Alternative**—The expected future without-project conditions.
- **Adjacent Levee Alternative (Proposed Action)**—An adjacent levee would be constructed along the Sacramento River east levee Reach A:16–20; and, where required for this levee, cutoff walls, seepage berms, and relief wells would be installed for seepage remediation. A cutoff wall would be installed in the American River north levee east of Gateway Oaks Drive to Northgate Boulevard, and the landside slope would be flattened. The Natomas East Main Drain Canal (NEMDC) west levee would be raised in place or widened from just south of Elkhorn Boulevard to Sankey Road, and the landside slope would be flattened and seepage remediation would be constructed as necessary. Waterside erosion protection would be constructed in locations along the Pleasant Grove Creek Canal (PGCC) and NEMDC (south of Elkhorn Boulevard). Culverts located beneath the PGCC would be upgraded or removed, and replacement flood storage would be provided as needed. At the State Route (SR) 99 crossing of the Natomas Cross Canal (NCC), seepage remediation would be installed and a moveable barrier system would be constructed to prevent overflow from reaching the landside of the NCC south levee. The western portion of the West Drainage Canal would be realigned to the south, and the remaining portion of the existing canal would be improved to reduce bank erosion and sloughing, decrease aquatic weed infiltration,

improve Reclamation District 1000 (RD 1000) maintenance access, and enhance giant garter snake habitat connectivity. Irrigation canals and ditches would be relocated either to make room for expanded levee sections or to reduce underseepage potential. Discharge pipes for RD 1000 pumping plants and City of Sacramento sump pumps would be raised to cross the levee above design flood water surface elevation. Parcels in the South Fisherman's Lake and Triangle Properties Borrow Areas and at the West Lakeside School Site would be excavated and reclaimed as agricultural land. Woodland groves would be established to compensate for impacts along the Sacramento River east levee Reach A:16–20, American River north levee Reach I:1-4, and NEMDC.

- **Fix-in-Place Alternative**—The Sacramento River east levee would be improved in place in Reach A:16–20 and seepage remediation would be implemented. The Fix-in-Place Alternative would be the same as described for the Adjacent Levee Alternative (Proposed Action) except that the crown of the Sacramento River east levee would not be widened. This type of levee improvement would narrow the overall landside footprint by 15 feet but would require a greater extent of levee degrade to construct cutoff walls and a greater extent of encroachment removal along the Sacramento River east levee compared to the Adjacent Levee Alternative (Proposed Action).

The above three alternatives are described in detail in Chapter 2, "Alternatives," of the EIS/EIR. The Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative were developed for consideration with a focus on improvements to the Sacramento River east levee Reach A:16–20. Phase 4b Project improvements to the American River north levee Reach I:1-4, NEMDC west levee, PGCC west levee, NCC south levee, West Drainage Canal, and modifications to the landscape and irrigation/drainage system would be similar under the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative.

As noted above, the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative would use differing methods to achieve flood damage reduction objectives for the Sacramento River east levee Reach A:16–20. Therefore, the differences between the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative, including effects on habitats, are the result of these differences in design of the Sacramento River east levee.

a. Location

The 53,000-acre Natomas Basin in northern Sacramento and southern Sutter Counties, California, including a portion of the city of Sacramento (**Plate 1-1** in the EIS/EIR), is bounded by a levee system. Originally constructed in the early part of the 20th century, this levee system is bordered by the NCC to the north, the Sacramento River to the west, the American River to the south, and the PGCC and NEMDC/Steelhead Creek to the east.

b. General Description

The American River Watershed Common Features/Natomas Post-authorization Change Report (Common Features/Natomas PACR) includes all four project phases (1, 2, 3, and 4a and 4b) of the NLIP Landside Improvements Project. These project phases are summarized in Chapter 1, "Purpose and Need," of the EIS/EIR. This information will become part of the overall request for congressional review and approval of the Common Features/Natomas PACR.

USACE's overall purpose of the project is to develop and select an alternative that would reduce the risk of flood damage in the Natomas Basin. Some residual risk will always remain, however, in any flood damage reduction system. Ultimately, Congress must authorize the Common Features/Natomas PACR, which includes the Phase 4b Project. If not authorized by Congress, USACE must make decisions on whether or not to grant permission to SAFCA to alter the Natomas Basin levee system (Federal project levees) under Section 408 of the Rivers and Harbors Act (RHA), and issue permits

under Sections 404 of Clean Water Act (CWA) and 10 of RHA, for SAFCA to implement the Phase 4b Project without Federal participation.

The Natomas Basin floodplain is occupied by over 83,000 residents and $8.2 billion in damageable property. Although improvements to the Natomas Basin perimeter levee system, completed as part of the Sacramento Urban Levee Reconstruction Project and the North Area Local Project, have significantly reduced flood risk for the area, the Natomas Basin remains vulnerable to flooding in a less than 100-year (0.01 annual exceedance probability [AEP]) flood event. Uncontrolled flooding in the Natomas Basin floodplain in a flood exceeding a 100-year (0.01 AEP) event could result in $7.4 billion in damage (this excludes Sacramento International Airport [Airport] facilities) (SAFCA 2007). Flooding could also release toxic and hazardous materials, contaminate groundwater, and damage the metropolitan power and transportation grids. The disruption in transportation that could result from a major flood could affect the Airport and interstate and state highways. In addition, displacement of residents, businesses, agriculture, and recreational areas could occur. Resulting damage could hinder community growth, stability, and cohesion.

The NLIP was initially outlined in the *Natomas Levee Evaluation Study Final Report Prepared for SAFCA in Support of the Natomas Basin Components of the American River Common Features* (SAFCA 2006). This evaluation was based on the engineering studies and reports that were included as appendices to the above-referenced report, which are available for review at SAFCA's office at 1007 7th Street, 7th Floor, Sacramento, California. These studies and reports indicate that segments of the Natomas perimeter levee system reflect the following problems for both the Federal Emergency Management Agency (FEMA) 100-year (0.01 AEP) and the 200-year (0.005 AEP) design water surface elevations:

- inadequate levee height,
- through-levee seepage and foundation underseepage with excessive hydraulic gradients,
- embankment instability, and
- susceptibility to riverbank erosion and scour.

Although not highlighted in the levee evaluation report, portions of the perimeter levee system, particularly along the east levee of the Sacramento River, are also subject to vegetative and structural encroachments into the levee prism.

In January 2008, FEMA remapped the Natomas Basin as an AE zone, and the flood zone designation took effect in December 2008. FEMA defines AE zones as areas with a 0.01 AEP of flooding. The designation requires mandatory flood insurance purchases by homeowners and requires that the bottom floor of all new buildings be constructed at or above base flood elevation—as little as 3 feet above ground level in some of the Natomas Basin but up to 20 feet above ground level in much of the Basin. This designation and the associated constraints effectively stopped all projects that were not issued building permits before the new maps took effect.

Additional concerns include levee height deficiency, seepage, riverbank erosion, levee encroachments, aviation safety, habitat conservation, agricultural irrigation, and drainage infrastructure.

c. Authority and Purpose

The Common Features/Natomas PACR is being prepared by USACE to consider the level of Federal participation in flood risk management for the Natomas Basin.

USACE plans to implement the project; however, in the event the Common Features/Natomas PACR is not approved by Congress, the EIS/EIR will support SAFCA's implementation of the Phase 4b Project, should SAFCA choose to proceed without additional Federal participation.

The need for flood risk management is discussed in more detail in Chapter 1, "Introduction and Statement of Purpose and Need," of the EIS/EIR.

d. General Description and Quantity of Dredged or Fill Material

(1) General Characteristics of Material

No-Action Alternative. Without project improvements to the Natomas Basin perimeter levee system, the risk of levee failure would still remain high because to achieve the full benefits of flood damage reduction in the Natomas Basin, all phases of NLIP must be implemented. A levee failure in the Natomas Basin could result in flooding that could adversely or beneficially affect waters of the United States that occupy approximately 930 acres, or 1.7%, of the Basin (The Natomas Basin Conservancy [TNBC] 2007). Because the exact level of impact would be dependent on the flooding duration, depth, rate, timing, and location, acreages are not displayed below in **Table 1** because estimating such acreages would be too speculative for meaningful consideration.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. Construction of the levee improvements, borrow activities, and improvements and relocations of irrigation and drainage infrastructure would require the permanent placement of fill material in jurisdictional waters of the United States. A delineation of jurisdictional waters of the majority of the Phase 4b Project area was completed by AECOM and verified by USACE in 2007 through 2009 (USACE Reference IDs #20081039, #200700211, #200600795, #200900238).

Table 1 displays the potential direct and indirect impacts of the Project Alternatives to jurisdictional Waters of the United States and wetlands.

Three primary borrow sources have been identified for the project: West Lakeside School Site, the South Fisherman's Lake Borrow Area, and the Triangle Properties Borrow Area. The project could also use borrow material from sources analyzed as part of the Phase 4a Project—the Twin River Unified School District Stockpile Site, the Krumenacher Borrow Site, and the Fisherman's Lake Borrow Area. Under both the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative, use of new project borrow sites would require the permanent fill of waters of the United States including drainage ditches, irrigation canals, and irrigated wetlands. Because design has not yet been completed, the final total acreage of fill is not known at this time. Impacts associated with haul road construction across various drainage canals would be temporary, and these resources would be restored to pre-project conditions after project completion.

A wetland delineation has not been completed for the Triangle Properties Borrow Area; however, it is expected that the rice fields in the Triangle Properties Borrow Area could contain irrigated wetlands. For the purposes of this analysis, the impacts described above are considered permanent. Vernal pools are present within the Triangle Properties Borrow Area on approximately 85 acres; areas with vernal pool complex would not be used for borrow source material and this habitat would remain undisturbed. The total acreage for temporary impacts noted in **Table 1** is the potential acreage of temporary impacts if all borrow sites are completely disturbed within their excavation footprints, which is up to 290 acres (worst-case) within the larger borrow area.

Construction of the adjacent levee along the Sacramento River east levee Reach A:16–20 under both the Adjacent Levee Alternative (Proposed Action) and the Fix-in-Place Alternative would result in potential impacts to waters of the United States, including wetlands (fill of irrigation and drainage ditches). Impacts to waters of the United States, including wetlands, would also occur from:

Table 1
Estimated Potential Direct and Indirect Impacts of the Phase 4b Project on Jurisdictional Waters of the United States

Project Feature	Functional Value[1]	Adjacent Levee Alternative (Proposed Action)		Fix-in-Place Alternative	
		Temporary Impact (acres)	Permanent Impact (acres)	Temporary Impact (acres)	Permanent Impact (acres)
Construction of Sacramento River east levee, American River north levee, NEMDC west levee[2], and PGCC west levee[2] Improvements					
Irrigation and drainage ditches (fill)[2]	Low	-	1.40	-	1.40
Wetlands (fill)[2]	Low	-	0.3	-	0.3
Construction of Erosion Repair					
Irrigation and drainage ditches (fill)[2]	Low	-	-	-	-
PGCC waterside erosion control rip rap (fill)	High	-	14.50	-	14.50
NEMDC waterside erosion control rip rap (fill)	High	-	5.49	-	5.49
Erosion repair (dewatering of PGCC)	High	14.50	-	14.50	-
Erosion repair (dewatering of NEMDC)	High	5.49	-	5.49	-
Construction of Relocated West Drainage Canal					
Irrigation and drainage ditches (fill)	Low	-	0.19	-	0.19
Irrigation ditches (dewatering of existing West Drainage Canal)[3]	Low	12.96	-	12.96	-
Construction of Relocated Riego Road Canal Vestal Drain, Morrison Canal, Chappell Ditch, and Private Irrigation					
Irrigation and drainage ditches (fill)	Low	-	0.02	-	0.02
Dewater of existing Riego Road canal	Low	-	0.68	-	0.68
Construction of Flood Protection at SR 99					
Dewater and fill of NCC	Low	0.69	0.69	0.69	0.69
Fill of seasonal wetland	Low	-	0.43	-	0.43
Fill of irrigated wetland[4]	Low		<27		<27
Replacement of RD 1000's Pumping Plant Nos. 6 and 8 and City Sump Pumps 102 and 160					
Intake channel modification (dewater)	High	-	0.50	-	0.50
Sacramento River waterside outfall construction (fill)[5]	High	-	0.03	-	0.03
NEMDC waterside outfall construction (fill)	High	-	0.76	-	0.76
Borrow Site and Haul Road Construction					
South Fisherman's Lake drainage ditches and canals (fill/dewater)	Low	-	1.38	-	1.38
West Lakeside School Site Borrow Area	Low	0.26	-	0.26	-
Irrigated wetlands in Triangle Properties Borrow Area (fill)[6]	Low	<290	<147	<290	<147
Total (approximate)		**324**	**199**	**324**	**199**

Notes: NCC = Natomas Cross Canal; NEMDC = Natomas East Main Drainage Canal; PGCC = Pleasant Grove Creek Canal; RD = Reclamation District; SR = State Route

[1] Functional value definitions: High = Natural structure and function of biotic community maintained, with minimal changes evident. Moderate = Moderate changes in structure and function of biotic community—i.e., moderate level of disturbance. Low = Severe changes in structure and/or function of biotic community evident—i.e., high level of disturbance. See Section 3.3.7 in Chapter 3, "Affected Environment," of the EIS/EIR for additional information.

[2] A portion of the project area along the PGCC west levee overlaps within the footprint previously analyzed in the Phase 3 EIS and EIR. Only impacts unique to the Phase 4b Project are reported in this table.

[3] The entire West Drainage Canal would be dewatered for improvements; however, only a 3.99-acre/4,700-foot-long section would be relocated.

[4] Chappell Ditch and Drain improvements would occur in areas that are currently in rice production; irrigated wetlands are generally a small component of actively farmed rice fields.

[5] Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act authorizations are required for work on the waterside of the levee.

[6] Approximately 290 acres of rice is present on the Triangle Properties Borrow Area; irrigated wetlands are generally a small component of actively farmed rice fields. Permanent impact assumes the worst-case scenario that 147 acres of shallow detention basins could not be returned to rice production.

Source: Data provided by Wood Rodgers in 2009 and Mead & Hunt in 2009; data compiled by AECOM in 2010

- raising and widening the west levee of NEMDC North;
- bank protection in the PGCC and NEMDC (including relocation of the low-flow channel in NEMDC South);
- relocating irrigation ditches along the NCC south levee and the west levees of PGCC and NEMDC North; and
- removing culverts under the PGCC.

Fill associated with levee modifications would occur in irrigated wetlands along the PGCC and NEMDC. Fill of seasonal wetlands and vernal pools would occur along NEMDC North as a result of levee raising and widening. Relocation and extension of the West Drainage Canal, Riego Road Canal, Vestal Drain, and Morrison Canal would result in permanent fill of drainage and irrigation ditches, and irrigated wetlands in rice fields.

Under the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative, the discharge pipes associated with RD 1000's Pumping Plant Nos. 1A and 1B along the Sacramento River east levee, Pumping Plant No. 6 along the NEMDC North, Pumping Plant No. 8 along the NEMDC South, City Sump 160 along the Sacramento River east levee, City Sump 102 along the NEMDC South, and City Sump 58 along the American River north levee would be replaced. Additionally, dewatering and new outfall construction would be required for all pumping plants except RD 1000 Pumping Plant Nos. 1A and 1B. Most of the outfalls would be placed above the OHWM and would not be expected to qualify as fill of waters of the United States under Section 404 of the CWA. Outfall installation, however, would result in temporary impacts due to dewatering within waters of the United States. The installation of these outfalls would result in the removal of some minor amounts of riparian vegetation.

Replacement of the discharge pipes would consist of raising the pumping plants' discharge pipes, extending the pipes to tie into existing discharge pipes within the waterside bench, and replacing or modifying pumps and motors. Seepage remediation in these locations may be required, including relocating the landside stations away from the levee to accommodate the raised discharge pipes. Modifications to the landside intake channel of RD 1000 Pumping Plant Nos. 6 and 8 may also be required. The waterside levee slope of RD 1000 Pumping Plant No. 8 would require partial regrading to accommodate the raised pump discharge pipes.

Lower Dry Creek, located east of the NEMDC, has been identified as a planting area to compensate for the Phase 4b Project's removal of landside and potentially waterside trees. Seasonal wetlands, vernal pools, freshwater marsh, and intermittent drainages are present within the planting area. Woodland mitigation plantings would not result in fill to waters of the United States; however, temporary impacts may occur from hauling woodland plantings and associated materials to planting sites.

(2) Source of Material

For levee improvements along the Sacramento River east levee Reach A:16–20 and the American River north levee Reach I:1–4, the proposed South Fisherman's Lake Borrow Area (**Plate 2-7a** in the EIS/EIR) and the West Lakeside School Site (**Plate 2-17** in the EIS/EIR) are anticipated to be the primary source of soil borrow material. A portion of the Fisherman's Lake Borrow Area (identified on **Plate 2-6** in the EIS/EIR), which was fully analyzed in the Phase 4a EIS/EIR, could provide additional borrow material for these improvements. The proposed Triangle Properties Borrow Area (**Plate 2-13** in the EIS/EIR) would be the primary source of borrow material for levee improvements along the PGCC (Reach E) and NEMDC North (Reaches F–G). The Krumenacher borrow site and Twin Rivers Unified School District stockpile site (**Plate 2-14** in the EIS/EIR), which were fully analyzed in previous environmental documents, would be the source of borrow material for improvements to NEMDC South

and back-up sources for NEMDC North (Reaches F–G). The South Fisherman's Lake Borrow Area, the West Lakeside School Site, and the Triangle Properties Borrow Area are fully analyzed in the EIS/EIR.

e. Description of the Proposed Discharge Site(s)

No-Action Alternative. There is no construction proposed as part of the No-Action Alternative, therefore there would be no discharge of fill materials.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. The locations of the discharge sites are in various locations around the perimeter and adjacent lands within the Natomas Basin where levee improvements are proposed. Primarily, the project activities would occur near the Sacramento River east levee, NCC south levee, NEMDC west levee, the American River north levee, and the PGCC west levee in the Natomas Basin. These are described in more detail in Chapter 2, "Alternatives," Chapter 3, "Affected Environment," and Chapter 4, "Environmental Consequences and Mitigation Measures," of the EIS/EIR.

(2) Size (acres)

No-Action Alternative. There is no construction proposed as part of the No-Action Alternative, therefore there would be no discharge of fill materials.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. Acres of impact are described above in Section D 1. Acres of impacts due to discharge of fill material for the Adjacent Levee Alternative (Proposed Action) and the Fix-in-Place Alternative would be similar.

(3) Type of Site (confined, unconfined, open water)

The fill areas for the project would take place in confined, unconfined areas, and open water.

(4) Type(s) of Habitat

No-Action Alternative, Adjacent Levee Alternative (Proposed Action), and Fix-in-Place Alternative. Based on the methodology for previously verified wetland delineations, irrigation/drainage canals and ditches in the Phase 4b Project area are anticipated to be considered waters of the United States and subject to regulation under CWA Section 404, though not all of the Phase 4b Project area has been verified by USACE. Other permanently and/or seasonally wet habitats, such as freshwater marsh, seasonal wetland, and vernal pool, could qualify as jurisdictional waters of the United States subject to Section 404 regulation if they are adjacent or abutting other jurisdictional waters of the United States. In the Phase 4b Project area, vernal pools are known to occur along the NEMDC, the Triangle Properties Borrow Area, and along Lower Dry Creek.

Previous delineation reports verified by USACE that cover portions of the Phase 4b Project footprint include a wetland delineation completed in 2008 that covers the PGCC and the NEMDC South (USACE Reference ID #20081039), a 2007 delineation that covers areas on the landside of the Sacramento River east levee Reaches 1–20 (C:1–4B, B:5A–15, and A:16–20) (USACE Reference ID #200700211), a delineation completed in 2006 for the NCC within the NLIP footprint (USACE Reference ID #200600795), and a delineation for the proposed woodland planting area at Lower Dry Creek east of the NEMDC (USACE Reference ID #200900238). These delineations identified the following features that fall within the Phase 4b Project area as jurisdictional: irrigation/drainage ditches and canals along the landside toe of the levee, irrigated wetlands in rice fields, freshwater marsh habitat, seasonal wetlands, and vernal pools. A delineation of jurisdictional waters of the United States covering the South Fisherman's Lake Borrow Area, the landside of the American River north levee, and the NEMDC North was submitted to USACE in September 2009 for review and verification and a preliminary jurisdictional determination is expected by summer 2010; a separate delineation for the West Lakeside

School Site has also been submitted to USACE and is currently under review. A delineation has not yet been completed for the West Drainage Canal east of Powerline Road, nor for the Triangle Properties Borrow Area (these will be completed by USACE). Jurisdictional features within these areas are expected to include primarily irrigation/ drainage ditches and irrigated wetlands in rice fields; seasonal wetlands and vernal pools are known to occur in the Triangle Properties Borrow Area.

In addition, the installation of an outfall at City of Sacramento Sump Pump No. 160 in Reach A:19B along the Sacramento River east levee would be within USACE jurisdictional areas. Discharge pipes and outfalls conveying filtered stormwater drainage from the east levee to the east bank of the Sacramento River under the Adjacent Levee Alternative (Proposed Action) might extend to areas within the jurisdiction of CWA Section 404 and/or RHA Section 10.

The functional quality of an aquatic resource is considered by USACE as part of the CWA Section 404 regulatory process. Habitat quality may be generally categorized as low, moderate, or high, defined herein as follows:

- **Low**: High levels of disturbance (e.g., vegetation disking for fire clearance purposes, dominance of monotypic stands of nonnative vegetation, presence of human-made structures).
- **Moderate**: Moderate levels of disturbance (e.g., natural plant communities intact with some evidence of nonnative vegetation, low-intensity developments such as trails, selective vegetation management for flood damage reduction purposes).
- **High**: Natural structure and function of biotic community exists, with minimal changes in structure or function evident—i.e., zero to low levels of human disturbance (e.g., natural plant communities intact, no artificial structures present, sensitive plant and/or wildlife species utilization).

(5) Timing and Duration of Discharge

No-Action Alternative. As described above, there would be no construction proposed and therefore no discharge of fill materials under the No-Action Alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. The timing of the discharge for both the Adjacent Levee Alternative (Proposed Action) and the Fix-in-Place Alternative would be similar. Discharge of fill material (borrow materials or new structures) would occur during grading, placement of fill prior to and during levee construction, construction of replacement and/or new irrigation and drainage infrastructure (e.g., canals, ditches, pump plants), throughout the calendar year, but mainly during the work period between May 1 and September 30 of each year.

f. Description of Disposal Method (hydraulic, drag line)

All of the fill work would be done with dozers, dump trucks, motor graders, and rollers.

II. Factual Determinations (Section 230.11)

a. Physical Substrate Determinations (consider items in Section 230.11(a# and 230.20 Substrate)

(1) Substrate Elevation and Slope

No-Action Alternative, Adjacent Levee Alternative (Proposed Action), and Fix-in-Place Alternative. The substrate elevation is roughly at sea level and the Natomas Basin is generally flat in slope. The topography of the Natomas Basin is flat, with dominant landscape features formed by the perimeter levees. The Phase 4b Project occurs in primarily agricultural and urban areas with little or no natural slopes. The substrate elevation and slope is the same for all alternatives. None of the proposed

modifications associated with the project would change the substrate characteristics of the landscape, because non-native substrates from outside the basin would not be introduced, nor would construction alter the underlying drainage or soil characteristics under the proposed features except to improve protection from levee under- and through-seepage.

(2) Sediment Type

No-Action Alternative, Adjacent Levee Alternative (Proposed Action), and Fix-in-Place Alternative. The soils in the project area are sediments adjacent to the Sacramento and American Rivers. These sediments are composed of Recent (Holocene) alluvial floodplain deposits (see Section 3.9.2.1 of the EIS/EIR). In general, these deposits consist primarily of unconsolidated sand and silt. Holocene alluvial deposits overlay an older alluvial fan system composed of Pleistocene-age sediments. Construction activities that would occur within alluvial floodplain or basin deposits would be located within Holocene sediments.

Riverbank and Modesto Formations. Piper et al. (1939) were the first to publish detailed geologic maps in the southern Sacramento and northern San Joaquin Valley areas, and they designated the older alluvial Pleistocene deposits as the Victor Formation. However, Davis and Hall (1959) proposed a subdivision of the Victor Formation into the Turlock Lake (oldest), Riverbank (middle), and Modesto (youngest) Formations. Marchand and Allwardt (1981) proposed that the Victor Formation be replaced by the Turlock Lake, Riverbank, and Modesto Formations as formal nomenclature for Quaternary deposits in the Sacramento and San Joaquin Valleys. Most researchers have followed this recommendation.

In the Sacramento Valley, the Modesto Formation consists of alluvial terraces, some alluvial fans, and some abandoned channel ridges of the Sacramento River. The Modesto Formation can be divided into upper and lower members. The upper member consists primarily of unconsolidated, unweathered, coarse sand and sandy silt. The age of this member has been placed at approximately 12,000–26,000 years Before Present (B.P.) (Atwater cited in Helley and Harwood 1985). The lower member of the Modesto Formation consists of consolidated, slightly weathered, well-sorted silt and fine sand, silty sand, and sandy silt. Age estimates for the lower member range from 29,000 to 42,000 years B.P. (Marchand and Allwardt 1981, cited in Helley and Harwood 1985).

Sediments in the Riverbank Formation consist of weathered reddish gravel, sand, and silt that form alluvial terraces and fans. In the Sacramento Valley, this formation tends toward soil-profile developments that are more easily distinguishable from the Modesto Formation (Helley and Harwood 1985). The Riverbank Formation is Pleistocene in age (Wagner et al. 1987), but it is considerably older than the Modesto Formation; estimates place the age of the Riverbank between 130,000 and 450,000 years B.P. (Helley and Harwood 1985). The Riverbank Formation forms alluvial fans and terraces of the Sacramento River. The Riverbank's fans and terraces are higher in elevation and generally have a more striking topography than those formed by the Modesto Formation.

(3) Dredged/Fill Material Movement

No-Action Alternative. Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for this alternative to affect dredged/fill material movement. There would be no impact under this alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. The fill material needed for the levee construction, replacement of new irrigation and drainage infrastructure, and other construction, would be moved from the borrow sites and placed in the construction areas. Once there, the material would typically be graded and compacted according to the feature that is being constructed, and is not expected to move after construction is completed.

(4) Physical Effects on Benthos (burial, changes in sediment type, etc.)

No-Action Alternative. Under the No-Action Alternative, no construction activities would occur; therefore, no potential exists for this alternative to physically affect benthos. There would be no impact under this alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. The fill material needed for the levee construction, replacement of new irrigation and drainage infrastructure, and other construction, would be moved from the borrow sites and placed in the construction areas, often permanently affecting irrigation and drainage canals and ditches, and in some cases small seasonal wetlands. Adverse affects on benthos due to discharge of fill materials would be temporary in nature, until the filled features can be replaced or restored. Therefore, there would be no adverse effect on benthos.

(5) Other Effects

No-Action Alternative. No other effects would occur as a result of the No-Action Alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. The effects to the physical substrate of the drainages and fill areas would be permanent. Habitat quality would improve in most of the borrow areas because of the conversion from low to moderate quality natural habitats to higher quality managed habitat.

(6) Actions Taken to Minimize Impacts (Subpart H)

No-Action Alternative. Under the No-Action Alternative, no actions are proposed to minimize impacts.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. A number of measures would be taken to minimize impacts to the various environmental resources (e.g., agricultural land, sensitive aquatic habitats including USACE jurisdictional features, wildlife habitat, and cultural resources) that would be affected by the Phase 4b Project. These are described in detail in Chapter 4, "Environmental Consequences and Mitigation Measures," of the EIS/EIR.

b. Water Circulation, Fluctuation, and Salinity Determinations

(1) Water (refer to section 230.11(b), 230.22 Water, and 230.25 Salinity Gradients; test specified in subpart G may be required). Consider effects on:

(a) Salinity.

No-Action Alternative. No fill would occur as part of the No-Action Alternative and therefore there would be no impact on salinity.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. The fill areas are not in or near saline water. The fill areas get water from rain events and do not connect with any saline waters. This water is fresh water and therefore, filling these areas would not adversely affect salinity.

(b) Water Chemistry (pH, etc.)

No-Action Alternative. No fill would occur as part of the No-Action Alternative and therefore there would be no impact on water chemistry.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. Planned construction activities for both alternatives would coincide with part of the rainy season. These activities

have the potential to temporarily impair water chemistry if disturbed and eroded soil, petroleum products, or construction-related wastes (e.g., cement and solvents) are discharged into receiving waters or onto the ground where they can be carried into receiving waters. Soil and associated contaminants that enter receiving waters through stormwater runoff and erosion can increase turbidity, stimulate algae growth, increase sedimentation of aquatic habitat, and introduce compounds that are toxic to aquatic organisms. Accidental spills of construction-related substances such as oils and fuels can contaminate both surface water and groundwater. The extent of potential impacts on water quality would depend on the following factors: tendency for erosion of soil types encountered, types of construction practices, extent of the disturbed area, duration of construction activities, timing of particular construction activities relative to the rainy season, proximity to receiving water bodies, and sensitivity of those water bodies to construction-related contaminants.

Slurry that would be used for construction of new cutoff walls in the Sacramento River east levee, American River north levee, and the west levee of NEMDC North has a fluid consistency when being placed. Improper handling or storage could result in releases to nearby surface water, thereby degrading water quality.

Replacement of discharge pipes at the RD 1000 pumping plants and City of Sacramento sump pumps listed above would involve excavation and grading on the waterside of the Sacramento River east levee, American River north levee, and NEMDC west levee. These activities could result in discharge of sediment and construction-related substances such as oils and fuels into these waterways.

Excavated areas that fill with surface or groundwater during project construction (such as areas along the NEMDC west levee, the American River north levee, and the Sacramento River east levee) would require dewatering. Surface or groundwater extracted from dewatering operations typically contains high levels of suspended sediment and often high levels of petroleum products and other construction-related contaminants. This extracted water could be directly released to local receiving waters, thereby degrading water quality.

The potential for release of soil or construction-related materials into the NEMDC, the PGCC, the NCC, the West Drainage Canal, local drainages, and ultimately the American or Sacramento Rivers could adversely affect river water quality.

(c) Clarity

No-Action Alternative. There would be no construction and no discharge of fill material as part of the No-Action Alternative and therefore there would be no adverse effect on water clarity.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. In areas of permanent fill where no jurisdictional waters remain after the fill, there would be a permanent loss of clarity. These areas are described above in **Table 1**. However, for areas that are not permanently filled, there would be only a temporary effect on clarity, as turbidity would be temporarily affected during construction. With the implementation of the mitigation measures in Section 4.7, "Water Quality," of the EIS/EIR and compliance with all applicable local, state, and Federal regulations, this would not be considered an adverse effect.

(d) Color

No-Action Alternative. There would be no construction and no discharge of fill material as part of the No-Action Alternative; therefore, there would be no effect on color.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. In areas of permanent fill where no jurisdictional waters remain after the discharge of fill material, there would be a permanent loss of color. These areas are described above in **Table 1**. However, for areas that are not

permanently filled, there would be only a temporary effect on color, as turbidity would temporarily affect color during construction. With the implementation of the mitigation measures in Section 4.7, "Water Quality," of the EIS/EIR and compliance with all applicable local, state, and Federal regulations, this would not be considered an adverse effect.

(e) Odor

No-Action Alternative, Adjacent Levee Alternative (Proposed Action), and Fix-in-Place Alternative. The proposed alternatives are not expected to affect odor because fill materials are from local sources and would not introduce foreign or noxious odors into jurisdictional features. There would be no effect.

(f) Taste

No-Action Alternative, Adjacent Levee Alternative (Proposed Action), and Fix-in-Place Alternative. The proposed alternatives are not expected to affect taste because fill materials are from local sources and would not introduce foreign or noxious odors into jurisdictional features. There would be no effect.

(g) Dissolved Gas Level

No-Action Alternative. There would be no construction and no discharge of fill material would occur due to the No-Action Alternative; therefore, no effects to dissolved gas levels would occur as a result of the No-Action Alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. The Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative would both cause temporary effects to dissolved gas levels during temporary dewatering of some irrigation and drainage ditches and canals, and during the construction of the replacement ditches and canals. The effects are not expected to be significant and they would be temporary in nature. A noticeable change with regard to dissolved gas levels would not occur, and in most cases conditions would be improved due to the improved nature of the replacement canals.

(h) Nutrients

No-Action Alternative. There would be no construction and no discharge of fill material would occur due to the No-Action Alternative; therefore, no effects to nutrients would occur as a result of the No-Action Alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. In areas of permanent fill where no jurisdictional waters remain after the discharge of fill material, there would be a permanent loss of nutrients. These areas are described above in **Table 1**. However, for areas that are not permanently filled, there would be only a temporary effect on nutrients, as dewatering would temporarily affect nutrients suspension and inflow of drainage and irrigation water during construction. With the implementation of the mitigation measures in Section 4.7, "Water Quality," of the EIS/EIR and compliance with all applicable local, state, and Federal regulations, this would not be considered an adverse effect.

(i) Eutrophication

No-Action Alternative. There would be no construction and no discharge of fill material would occur due to the No-Action Alternative; therefore, no effects to eutrophication would occur as a result of the No-Action Alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. Eutrophication would not occur in the ditches and canals affected by the project because replacement canals and ditches would be constructed concurrently or ahead of discharge of fill m and conditions (i.e., anaerobic standing water) that would lead to eutrophication would not occur. None of the proposed alternatives' components would permanently adversely affect eutrophication.

(j) Others as Appropriate

No-Action Alternative, Adjacent Levee Alternative (Proposed Action), and Fix-in-Place Alternative. As described in Sections 4.5, "Hydrology and Hydraulics," and 4.6, "Water Quality," with the implementation of mitigation measures described, the project is not expected to adversely affect other water characteristics.

(2) Current Patterns and Circulation (consider items in Section 230.11[b], and 230.23),

Current Flow and Water Circulation

(a) Current Patterns and Flow

No-Action Alternative. There would be no construction and no discharge of fill material would occur due to the No-Action Alternative; therefore, no effects to current patterns and flow would occur as a result of the No-Action Alternative.

Adjacent Levee Alternative (Proposed Action). Interior drainage patterns would be altered due to the levee construction (east approach). Minor drainages would be installed on the waterside of the Sacramento River east levee to route storm drainage between the existing Garden Highway and the adjacent levee. In addition, existing irrigation and drainage canals and ditches would be replaced where filled. After construction, the irrigation and drainage functions would be restored. There would be no substantial drainages eliminated and no substantial changes in the amount of flow. These changes would not be considered adverse effects.

Fix-in-Place Alternative. Effects on drainage patterns due to the Fix-in-Place Alternative would be similar to those caused by the Adjacent Levee Alternative (Proposed Action) except that there would not be a substantial alteration to the drainage of the existing Sacramento River east levee. Other changes to drainage patterns within the Natomas Basin in the project area would be similar and would not be considered an adverse effect.

(b) Velocity

No-Action Alternative. There would be no levee construction associated with the No-Action Alternative and, thus, velocities would not be affected.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. Improvements and replacements of irrigation and drainage canals and ditches as part of the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative would cause some temporary effects to drainage velocities in the interior of the Basin, but these would be restored once construction is complete. This effect would not be considered adverse. There would be no effect to velocities in the waterways adjacent to the Natomas Basin and, thus, no adverse effect.

(c) Stratification

No-Action Alternative. There would be no construction and no discharge of fill material would occur due to the No-Action Alternative; therefore, no effects to stratification would occur as a result of the No-Action Alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. The alternatives are not expected to significantly affect stratification in the interior of the Natomas Basin or adjacent waterways because discharge of fill materials is expected to occur in the Natomas Basin when aquatic areas are dewatered. Therefore, no effect on stratification would occur during construction. Fill materials are not likely to cause additional erosion or sedimentation in the water column; therefore, stratification after construction is not likely to occur. There would be no adverse effect.

(d) Hydrologic Regime

No-Action Alternative. There would be no construction and no discharge of fill material would occur due to the No-Action Alternative; therefore, no effects to the existing hydrologic regime would occur as a result of the No-Action Alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. As described above, some irrigation and drainage canals and ditches would need to be replaced under the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative, but would be restored as part of the project. Therefore, the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative are not expected to significantly affect the hydrologic regime in the interior of the Natomas Basin or adjacent waterways.

(3) Normal Water level Fluctuations (tides, river stage) (consider items in Sections230.11[b] and 230.24)

No-Action Alternative. There would be no construction and no discharge of fill material would occur due to the No-Action Alternative; therefore, no effects to normal water level fluctuations would occur as a result of the No-Action Alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. The Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative are not expected to affect normal water level fluctuations in the waterways adjacent to the Natomas Basin. As presented above in **Table 1**, fill material would be placed within the channel slopes of adjacent waterways for discharge of storm water, intake of irrigation water, and erosion control, but these features do not significantly the flow of the waterways and are not expected to adversely affect normal water level fluctuations.

(4) Salinity Gradients (consider items in section 230.11[b] and 230.25)

No-Action Alternative. There would be no construction and no discharge of fill material would occur due to the No-Action Alternative; therefore, no effects to salinity gradients would occur as a result of the No-Action Alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. The Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative would involve replacement of and improvements to the existing irrigation and drainage infrastructure in the Natomas Basin, all of which convey freshwater. These alternatives are not expected to adversely affect salinity gradients in the interior of the Natomas Basin or adjacent waterways.

(5) Actions That Will Be Taken to Minimize Impacts (refer to Subpart H)

No-Action Alternative. The No-Action Alternative does not include any actions to minimize impacts.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. Potential adverse effects to water circulation, fluctuation, and salinity would not result due to the Adjacent Levee Alternative (Proposed Action) and the Fix-in-Place Alternative and, thus, no specific actions will be taken to minimize impacts.

e. Suspended Particulate/ Turbidity Determinations

(1) Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site (consider items in section 230.11[c] and 230.21)

No-Action Alternative. There would be no construction and no discharge of fill material would occur due to the No-Action Alternative; therefore, no effects to suspended particulates and turbidity would occur as a result of the No-Action Alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. Existing conditions include irrigation and drainage canals and ditches, which have steep side slopes with inconsistent vegetative cover. As part of the alternatives, this infrastructure would be replaced with facilities that would be improved to have wider slopes and more consistent vegetative cover (i.e., native-grass-seeded slopes), resulting in less erosion and lower maintenance requirements. Maintenance activities often cause temporary and short-term impacts including increased suspended particulates and turbidity within those canals and ditches.

There would be no changes in suspended particulates and turbidity in the fill areas that are not in areas of permanent water. The drainages that would be disturbed during construction would likely experience temporary increases in suspended particulate and turbidity. Once the roadway and new access road are completed and the new culverts installed, there would likely be an increase in suspended particulates and turbidity during the first few rain events. However, there would not significant long-term changes in suspended particulates and turbidity.

(2) Effects (degree and duration) on Chemical and Physical Properties of the water Column (consider environmental values in Section 230.21, as appropriate)

(a) Light Penetration

No-Action Alternative. There would be no construction and no discharge of fill material would occur due to the No-Action Alternative; therefore, no effects to light penetration would occur as a result of the No-Action Alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. There would be no permanent effects to light penetration due to the Adjacent Levee Alternative (Proposed Action) and the Fix-in-Place Alternative. The project would not change the remaining jurisdictional waters in a way that would increase or decrease light penetration. The existing drainages that would not be directly affected (i.e., filled) or replaced would be restored to existing conditions after construction is completed.

(b) Dissolved Oxygen

No-Action Alternative. There would be no construction and no discharge of fill material would occur due to the No-Action Alternative; therefore, no effects to dissolved oxygen would occur as a result of the No-Action Alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. Temporary effects to dissolved oxygen in jurisdictional features in the Phase 4b Project vicinity may occur during construction of the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative due to situations where aquatic features such as canals and ditches would be partially dewatered to facilitate levee construction, canal or ditch improvement, or replacement. Once construction is complete, these canals and ditches would be improved, restored, or replaced. There would be no adverse effects to dissolved oxygen due to the Adjacent Levee Alternative (Proposed Action) or Fix-in-Place Alternative.

(c) Toxic Metals and Organics

No-Action Alternative. There would be no construction and no discharge of fill material would occur due to the No-Action Alternative; therefore, no effects to toxic metals and organics would occur as a result of the No-Action Alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. There would be no contaminants introduced to the drainage areas or any other jurisdictional waters with the project area. Due to the inertness of the fill materials, there would be no exchange of constituents between the fill and aquatic systems.

(d) Pathogens

No-Action Alternative. There would be no construction and no discharge of fill material would occur due to the No-Action Alternative; therefore, no effects to pathogens would occur as a result of the No-Action Alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. As described in the EIS/EIR, the proposed project would incorporate water quality features that would reduce the potential for pathogens to be introduced as a result of an increase in impervious surfaces (i.e., less heavy machinery traffic due to maintenance equipment traffic) and stormwater runoff. The Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative would comply with all applicable local, state, and Federal laws regarding water quality. Therefore, there would be no adverse effects due to these alternatives.

(e) Aesthetics

No-Action Alternative. Under the No-Action Alternative (No Project Construction), as described in Section 4.14, "Visual Resources," of the EIS/EIR, to comply with USACE guidance regarding levee encroachments, trees and vegetation would be removed from the landside and waterside of Sacramento River east levee Reach A:16–20, the landside of American River north levee Reach I:1–4, a portion of NEMDC South to the Arden-Garden Connector, and the landside and waterside of NEMDC South between Arden-Garden Connector and the NEMDC Stormwater Pumping Station. Up to 6 acres of waterside vegetation could also be removed from the American River north levee in the event that a variance from USACE levee vegetation guidance is not granted, resulting in a total of (estimated) approximately 25.89 acres of waterside vegetation that would be removed under this alternative. The quality of the views of the waterside of the levees would be degraded for recreational users of the rivers, residents along the waterside of the Sacramento River east levee, Garden Highway users, and others in the Natomas Basin that may be near a site where any large trees are removed. That is because the crowns of many trees, such as large cottonwood and oak trees, and Heritage oaks on the waterside or landside of the levees, are clearly visible from most parts of the Natomas Basin. Under this alternative, no minimization measures are proposed to mitigate for these effects.

Adjacent Levee Alternative (Proposed Action). As described in Section 4.14, "Visual Resources," of the EIS/EIR, effects to visual resources include those which would occur during construction (construction equipment and general disturbance) and include the movement of heavy machinery near residences and other recreational viewers in the Sacramento River. The effects from these activities would be temporary and short-term and would not be considered adverse. In addition, as described in **Table 4.7-2** in Section 4.7, "Biological Resources," the removal of (estimated) approximately 7.32 acres mature waterside vegetation combined with affects due to high viewer sensitivity of recreational users of the Sacramento River and residents on the waterside of the levee would be considered an adverse effect. Project effects would be offset by implementation of mitigation measures in the EIS/EIR, specifically Mitigation Measure 4.14-a, "Implement Mitigation Measures 4.7-a, "Minimize Effects on Woodland Habitat; Implement all Woodland Habitat Improvements and

Management Agreements; Compensate for Loss of Habitat; and Comply with Section 7 of the Federal Endangered Species Act, Section 1602 of the California Fish and Game Code, and Section 2081 of the California Endangered Species Act Permit Conditions," and 4.13-b, "Compensate City of Sacramento Department of Parks and Recreation for Loss of Parkland and Park Amenities."

Fix-in-Place Alternative. As described in Section 4.14, "Visual Resources," of the EIS/EIR, temporary and short-term effects to visual resources as a result of the movement of heavy machinery near residences would be similar to the Adjacent Levee Alternative (Proposed Action). However, as described in **Table 4.7-2** in Section 4.7, "Biological Resources," the Fix-in-Place Alternative would result in the removal of (estimated) approximately 26.52 acres of waterside vegetation, which is a greater effect than the Adjacent Levee Alternative (Proposed Action). Similarly, the removal of waterside vegetation combined with the same high viewer sensitivity of recreational users of the Sacramento River and residents on the waterside of the levee would be considered an adverse effect. Similar to the Adjacent Levee Alternative (Proposed Action), effects would be offset by implementation of mitigation measures in the EIS/EIR, specifically Mitigation Measure 4.14-a, discussed above.

(f) Others as Appropriate

No-Action Alternative, Adjacent Levee Alternative (Proposed Action), and Fix-in-Place Alternative. There would be no construction and no discharge of fill material would occur due to the No-Action Alternative; therefore, no effects to chemical and physical properties of the water column would occur as a result of the No-Action Alternative. There would be no other adverse effects due to the project alternatives.

(3) Effects on Biota (consider environmental values in Section 230.21, as appropriate)

(a) Primary Production, Photosynthesis

No-Action Alternative. As described in Section 2(e) above, an (estimated) approximately 25.89 acres of riparian woodland/shaded riverine aquatic (SRA) habitat would be removed as part of the No-Action Alternative, which would affect primary production (i.e., photosynthesis). This would be considered an adverse effect.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. As described in Section 2(e) above, an (estimated) approximately 7.32 acres and 25.52 acres of riparian woodland/SRA habitat would be removed as part of the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative, respectively, which would affect primary production (i.e., photosynthesis).

(b) Suspension/Filter Feeders

No-Action Alternative. Suspension and/or filter feeders have been known to occur in the Sacramento River and the American River; however, the No-Action Alternative would not involve any construction that would adversely affect populations of suspension and/or filter feeders.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. The majority of the construction work and fill materials in the Sacramento and American Rivers would be limited to the area of the Sacramento River east levee waterside slope above the ordinary high water mark, and would not adversely affect populations of suspension and/or filter feeders. Primarily, effects to the irrigation and drainage canals and ditches in the interior of the Natomas Basin would occur due to the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. Significant populations of filter feeders are not known in the interior of the Natomas Basin; therefore, no adverse effect would occur.

(c) Sight Feeders

No-Action Alternative. Sight feeders have been known to occur in the Sacramento and the American Rivers, however the No-Action Alternative does not have any construction that would directly adversely affect populations of sight feeders. However, as described in Section 4.7, "Biological Resources," of the EIS/EIR, waterside woodlands on the Sacramento River provide SRA habitat function, which is important for sight feeders such as fish and other Sacramento River aquatic resources. Removal of an (estimated) approximately 25.89 acres of waterside riparian woodland habitat would adversely affect important SRA habitat, including moderation of water temperatures, recruitment of woody debris, and introduction of insects that provide food for aquatic species.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. Sight feeders such as listed fish species occur in the Sacramento and the American Rivers; however, the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative do not have any construction that would directly adversely affect listed fish populations. The majority of the construction work and fill materials in the Sacramento and American Rivers would be limited to the area of the Sacramento River east levee waterside slope above the ordinary high water mark, and would not adversely affect fish populations because in water work is minimal. Primarily, effects to the irrigation and drainage canals and ditches in the interior of the Natomas would occur due to the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. Listed fish populations are not known to occur in the interior of the Natomas Basin and so no adverse effect would occur.

As described in detail in Section 4.7, "Biological Resources," of the EIS/EIR, removal of an (estimated) approximately 7.32 acres and 25.52 acres for the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative, respectively, of waterside riparian woodland habitat would adversely affect important SRA habitat, including moderation of water temperatures, recruitment of woody debris, and introduction of insects that provide food for aquatic species. This would be considered an adverse effect to SRA habitat.

(4) Actions Taken to Minimize Impacts (Subpart H)

No-Action Alternative. No construction is proposed as part of the No-Action Alternative; therefore, no actions would be taken to minimize impacts under the No-Action Alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. Section 4.7, "Biological Resources," of the EIS/EIR contains Mitigation Measure 4.7-a, "Minimize Effects on Woodland Habitat; Implement Woodland Habitat Improvements and Management Agreements; Compensate for Loss of Habitat; and Comply with Section 7 of the Federal Endangered Species Act, Section 2081 of the California Endangered Species Act, and Section 1602 of the California Fish and Game Code," which requires the project proponent to consult with and seek approval from the resource agencies, determine the appropriate amount of habitat to be created, and create and maintain sufficient habitat as compensation for impacts due to the alternatives.

d. Contaminant Determinations (consider items in Section 230.11[d])

No-Action Alternative. There would be no construction and no discharge of fill material would occur due to the No-Action Alternative; therefore, no effects due to contaminants would occur as a result of the No-Action Alternative. There would be no other adverse effects.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. As described in detail in Section 4.6, "Water Quality," of the EIS/EIR, implementation of the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative would include extensive ground-disturbing activities during construction, many of them near local drainages and waterways that could become contaminated by soil or construction substances. These waterways include the Sacramento River, the

American River, the NEMDC, the PGCC, the NCC, and the West Drainage Canal. The Sacramento River is a receiving water for much of the drainage from the Natomas Basin (including agricultural drainage). The potential for release of soil or construction-related contaminants/materials into the NEMDC, the PGCC, the NCC, the West Drainage Canal, local drainages, and ultimately the American or Sacramento Rivers could adversely affect water quality.

e. Aquatic Ecosystem and Organism Determinations (use evaluation and testing Procedures in Subpart G, as appropriate)

(1) Effects on Plankton

No-Action Alternative. There would be no construction and no discharge of fill material would occur due to the No-Action Alternative; therefore, no effects to plankton would occur as a result of the No-Action Alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. Plankton have the potential to occur in the water bodies surrounding the Natomas Basin and within the slower moving drainages and areas of standing water (i.e., rice fields and other agricultural bodies of water). Minor temporary effects to plankton would occur due to temporary and short-term impacts to water quality, fill of aquatic habitat, and dewatering. However, mitigation and replacement for aquatic habitats and features (i.e., managed marsh creation and relocation) and improvement of drainage and irrigation features would allow populations of plankton to reestablish once constructed. Populations of plankton would not be permanently affected and thus no adverse effect would occur.

(2) Effects on Benthos

No-Action Alternative, Adjacent Levee Alternative (Proposed Action), and Fix-in-Place Alternative. Because the project alternatives are not located in the sea or lake bottom, no adverse effects on the benthic community are expected.

(3) Effects on Nekton

No-Action Alternative. There would be no impact to nekton due to the No-Action Alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. As described in Chapter 3, "Affected Environment," and Section 4.7, "Biological Resources," nekton, specifically fish and crustaceans, occur in the project area and in the waterways surrounding the Natomas Basin. As described in Section 3 (c) above, populations of listed fish species would not be directly affected by the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative, though significant amounts of SRA habitat would be removed from the surrounding waterways as part of the Alternatives. The removal of substantial SRA habitat from the waterways surrounding the Natomas Basin would be considered an adverse effect.

(4) Effects on aquatic Food Web (refer to Section 230.31)

No-Action Alternative. There would be no effect on the aquatic food web as part of the No-Action Alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. As described in Section 4.7, "Biological Resources," of the EIS/EIR, the proposed project would temporarily impact aquatic habitats during construction through temporary dewatering, fill and replacement of irrigation and drainage canals and ditches and rice fields. The overall replacement aquatic habitat, including canals, ditches, and managed marsh (to compensate for impacts to rice fields) would improve the aquatic habitat conditions within the Natomas Basin. There would be no adverse effect to the aquatic food web as a result of the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative.

(5) Effects on Special Aquatic Sites (discuss only those found in project area or disposal site)

(a) Sanctuaries and Refuges (refer to section 230.40)

No-Action Alternative. There would be no levee construction as a result of the No-Action Alternative; therefore, there would be no adverse effects to sanctuaries or refuges with the proposed project.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. As described in Section 4.7, Biological Resources," of the EIS/EIR, the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative would include habitat creation components that would expand, enhance, and improve the functionality, size and connectivity of the existing Natomas Basin Preserve lands, thus creating a beneficial impact to the existing Natomas Basin Habitat Conservation Plan.

(b) Wetlands (refer to section 230.41)

No-Action Alternative. There would be no construction and no discharge of fill material would occur due to the No-Action Alternative; therefore, no effects to wetlands would occur as a result of the No-Action Alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. As described in Chapter 3, "Affected Environment," and Section 4.7, "Biological Resources," of the EIS/EIR, wetlands in the project area primarily include irrigated wetlands found in rice fields in the Natomas Basin and seasonal wetlands. As described in **Table 1**, above, the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative would potentially result in the temporary impacts to irrigated wetlands found in the Triangle Properties borrow site. Because the borrow site would be impacted temporarily and would be restored to former productivity once construction is complete, potential adverse effects would be temporary in nature. Project effects would be permitted and if necessary, mitigated for through compliance with CWA Section 404, therefore no adverse effect would occur.

Permanent impacts to both irrigated and seasonal wetlands would occur as part of the levee, irrigation, and drainage infrastructure replacement; these totals are displayed in **Table 1**, above. As discussed in Section 4.7, "Biological Resources," the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative would include creating waters of the United States that are expected to be more extensive than those filled by either alternative, and implementing the Phase 4b Project's restoration plan, including coordination with and issuance of the permits by the aforementioned resource/regulatory agencies, would ensure no-net-loss of sensitive aquatic habitats occurs and that new jurisdictional waters would be managed in a manner that minimizes maintenance disturbance and provides the essential functions of the habitats that would be lost. Therefore, both the Adjacent Levee Alternative (Proposed Action) and the Fix-in-Place Alternative, with implementation of this mitigation measure, would result an increase in the overall acreage and enhance the function of waters of the United States in the Natomas Basin. There would be no adverse effect to wetlands.

(c) Mud Flats (refer to Section 230.42)

No-Action Alternative, Adjacent Levee Alternative (Proposed Action), and Fix-in-Place Alternative. Mud flats do not occur in the Phase 4b Project area in the Natomas Basin. There would be no adverse project effects to mud flats.

(d) Vegetated Shallows (refer to Section 230.43)

No-Action Alternative, Adjacent Levee Alternative (Proposed Action), and Fix-in-Place Alternative. Vegetated Shallows do not occur in the Phase 4b Project area in the Natomas Basin. There would be no adverse project effects to vegetated shallows.

(e) Coral Reefs (refer to Section 230.44)

No-Action Alternative, Adjacent Levee Alternative (Proposed Action), and Fix-in-Place Alternative. Mud flats do not occur in the Project area in the Natomas Basin. There would be no adverse project effects to coral reefs.

(f) Riffle and Pool Complexes (refer to section 230.45)

No-Action Alternative, Adjacent Levee Alternative (Proposed Action), and Fix-in-Place Alternative. There are no riffle and pool complexes in the vicinity of the Phase 4b Project, therefore, there would be no adverse project effects to riffle and pool complexes.

(6) Threatened and Endangered Species (refer to Section 230.30)

No-Action Alternative. No levee or infrastructure improvements would occur and thus there would be no adverse effect to threatened and endangered species due to the No-Action Alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. As described in Section 4.7, "Biological Resources," habitat for threatened and endangered species would be adversely affected by levee construction, irrigation, and drainage improvements as part of both the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. As part of the habitat creation plan, both alternatives would include the enhancement of habitat under management of TNBC and expand, enhance, and improve the functionality of the Preserves for threatened and endangered species in the Basin. This would be considered a temporary adverse effect while the replacement habitats are being constructed, but a long-term beneficial effect once functions and values have been restored.

Direct impacts (i.e., "take" as defined by the Endangered Species Act and the California Endangered Species Act) would be minimized to the extent feasible by implementing the mitigation measures in the EIS/EIR and the conservation and minimization measures developed during consultation with the U.S. Fish and Wildlife Service (USFWS), the California Department of Fish and Game (DFG) and the National Marine Fisheries Service (NMFS). With the implementation of the mitigation, conservation, and minimization measures, no adverse effect would occur.

(7) Other Wildlife (refer to Section 230.32)

No-Action Alternative. No levee or infrastructure improvements would occur and, thus, there would be no adverse effect to other wildlife species due to the No-Action Alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. Similar to the effects described above for threatened and endangered species, effects to other wildlife species and habitat would be temporary. For habitats that would be affected, this would be considered a temporary adverse effect while the replacement habitats are being constructed, but a long-term beneficial impact once functions and values have been restored.

(8) Actions to Minimize Impacts (refer to Subpart H)

No-Action Alternative. No levee or infrastructure improvements would occur and, thus, there would be no actions to minimize effects due to the No-Action Alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. Mitigation measures to minimize effects are described in detail in Sections 4.6, "Water Quality," and 4.7, "Biological Resources," of the EIS/EIR. The habitat creation plan is described in detail in Chapter 2, "Alternatives," and Section 4.7, "Biological Resources," of the EIS/EIR. Other minimization and conservation measures would be developed with USFWS, DFG, and NMFS through the consultation and permitting process prior to project construction.

f. Proposed Disposal Site Determinations

(1) Mixing Zone Determination (consider factors in section 230.11[f][2])

No-Action Alternative. No levee or infrastructure improvements would occur and, thus, there would be no effects to the mixing zones in or adjacent to the project area due to the No-Action Alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. Mixing zones occur in the water column of the waterways adjacent to the Natomas Basin such as the Sacramento and American Rivers. The Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative do not involve placing fill materials within these zones. Additionally, as described in Section 4.6, "Water Quality," of the EIS/EIR, while both alternatives involve the continued discharge of drainage water from the interior of the Natomas Basin to the adjacent waterways, all applicable regulations regarding flow, duration, and water quality would be followed and no adverse affect would result to the mixing zone.

(2) Determination of Compliance with Applicable Water Quality Standards (present the standards and rationale for compliance or non-compliance with each standard)

No-Action Alternative. No levee or infrastructure improvements would occur and, thus, there would be no effects to compliance with applicable water quality standards due to the No-Action Alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. As described in Section 4.6, "Water Quality," of the EIS/EIR, while both alternatives involve the continued discharge of drainage water from the interior of the Natomas Basin to the adjacent waterways, all applicable regulations regarding flow, duration, and water quality would be followed and no adverse affect would occur due to non-compliance with water quality standards. All applicable water quality permits would be obtained and followed during project construction.

(3) Potential Effects on Human Use Characteristics

No-Action Alternative, Adjacent Levee Alternative (Proposed Action), and Fix-in-Place Alternative. The project alternatives would not have any significant adverse effects to municipal and private water supply, recreational and commercial fisheries, or water-related recreation. There would be no national and historic monuments, parks, seashores, wilderness areas, research sites or similar preserves affected by the proposed project.

g. Determination of Cumulative Effects an the Aquatic Ecosystem (consider requirements in Section 230.11[g])

No-Action Alternative. No levee or infrastructure improvements would occur and, thus, there would be no cumulative effects to the aquatic ecosystem.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. There would be no significant cumulative effects on the aquatic ecosystem due to this project. As described above and in Sections 4.6, "Water Quality," and 4.7, "Biological Resources," of the EIS/EIR, the effects to aquatic

ecosystems are primarily temporary in nature and are not considered adverse effects to the aquatic ecosystem.

Permanent cumulative effects to the aquatic ecosystem, as described in detail in Chapter 5, "Cumulative and Growth Inducing Impacts and Other Statutory Requirements," of the EIS/EIR, would be replaced and improved or enhanced resulting in no net loss of ecosystem function, thus creating a cumulatively beneficial impact to the overall aquatic ecosystem in the Natomas Basin.

h. Determination of Secondary Effects on the Aquatic Ecosystem (consider requirements in Section 230.11[h])

No-Action Alternative. No additional secondary effects on the aquatic ecosystem would result from the No-Action Alternative.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. As described in Sections 4.6, "Water Quality," and 4.7, "Biological Resources," in the EIS/EIR, secondary effects on the aquatic ecosystem as a result of the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative would consist of be beneficial in nature.

III. Findings of Compliance or Non-Compliance With the Restrictions on Discharge

a. Adaptation of the Section 404(b)(1) Guidelines to this Evaluation

No significant adaptations of the guidelines were made relative to this evaluation.

b. Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Site Which Would Have Less Impact on the Aquatic Ecosystem (briefly discuss alternatives considered and that are available and practical and state why the one selected would result in the least amount of significant impacts. Reference should be made to other appropriate sections on alternatives in EIS or Main Reports when the 404 Evaluation is contained in these documents.)

A complete description of the Alternatives carried forward for analysis is contained in Chapter 2, "Alternatives," of the EIS/EIR.

Based on this analysis contained in Chapter 2, "Alternatives," of the EIS/EIR and the analysis above, conducted in adherence with the Clean Water Act Section 404(b)(1) Guidelines, the No-Action Alternative would not meet the overall project purpose of providing an adequate level of flood protection; therefore, it does not meet the 404(b)(1) Guidelines definition of practicability and does not meet the project's purpose and need. In addition, associated flood risks render this alternative contrary to the public interest. The Adjacent Levee Alternative (Proposed Action) is considered to be practicable and have the least potential for adverse environmental effects. As described in the discussion under "Aesthetics" and "Sight Feeders" above, the Fix-in-Place Alternative is considered to be practicable, but would have substantially greater adverse effects on riparian woodland/SRA habitat than the Adjacent Levee Alternative (Proposed Action). In addition, the Fix-in-Place Alternative would require reconstruction of the existing Garden Highway increasing traffic effects, in accordance with currently applicable roadway standards.

Mitigation of SRA associated with both the Adjacent Levee Alternative (Proposed Action) and the Fix-in-Place Alternative may not be feasible due to the lack of availability of appropriate aquatic habitat mitigation areas, though the effect is substantially more adverse under the Fix-in-Place Alternative. In conclusion, considering the alternatives carried forward for analysis in the EIS/EIR and this document, there is no practicable alternative to the Adjacent Levee Alternative (Proposed Action)

that would have less adverse effect on the aquatic ecosystem without other adverse environmental or public interest consequences.

Under the Adjacent Levee Alternative (Proposed Action), impacts on the aquatic ecosystem have been avoided or minimized to the maximum extent possible. All appropriate and practicable measures to minimize potential harm to the aquatic ecosystem have been incorporated into the project design. Based on this analysis, it is concluded that the Adjacent Levee Alternative (Proposed Action) constitutes the least environmentally damaging practicable alternative.

c. Compliance with Applicable State Water Quality Standards and

d. Compliance with Applicable Toxic Effluent Standard or Prohibition Under Section 307 of the Clean Water Act

No-Action Alternative. There would be no levee construction associated with the No-Action Alternative; therefore, no compliance would be required.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. As described in Section 4.6, "Water Quality," of the EIS/EIR, the proposed project would adhere to all applicable state water quality standards and comply with applicable toxic effluent standards or prohibitions under Section 307 of the Clean Water Act. In addition, implementation of Mitigation Measure 4.6-a, "Implement Standard Best Management Practices, Prepare and Implement a Stormwater Pollution Prevention Plan, and Comply with National Pollutant Discharge Elimination System Permit Conditions," and Mitigation Measure 4.6-b, "Implement Best Management Practices and Comply with NPDES Permit Conditions for a Point-Source Discharge," would ensure compliance with state or Federal water quality standards.

e. Compliance with Endangered Species Act (ESA) of 1973

No-Action Alternative. There would be no levee construction as a result of the No-Action Alternative, so no compliance with ESA would be required.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. As described in Section 3.7, "Biological Resources," and Section 4.7, "Biological Resources," of the EIS/EIR, both the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative would have adverse effects (often through removal or fill) to habitat for Federally listed species and the potential for "take" of individuals. However, implementation of the NLIP programmatic conservation strategy in accordance with the Programmatic Biological Opinion (issued October 2009 by USFWS), and informal ESA Section 7 consultation through coordination with National Marine Fisheries Service, and implementation of Mitigation Measures 4.7-a through 4.7-l in the EIS/EIR, would ensure that adequate conservation, avoidance, and minimization measures are observed prior to, during, and after project construction to ensure compliance with the ESA.

f. Compliance with Specified Protection Measures for Marine Sanctuaries Designated by the Marine Protection, Research, and Sanctuaries Act of 1972

No-Action Alternative, Adjacent Levee Alternative (Proposed Action), and Fix-in-Place Alternative. There are no Designated Marine Sanctuaries in the vicinity of the Natomas Basin; therefore, there would be no adverse effect as a result of any of the alternatives.

g. Evaluation of Extent of Degradation of the Waters of the United States

(1) Significant Adverse Effects on Human Health and Welfare

No-Action Alternative. As described in Chapter 2, "Alternatives," of the EIS/EIR, the No-Action Alternative would not provide an adequate levee of flood protection for the Natomas Basin and would have a significant adverse effect on human health and welfare should a flood event occur.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative. The proposed project would not cause significant adverse effect on human health and welfare, including municipal and private water supplies, recreation and commercial fishing. As described above, construction activities would not adversely affect benthic communities and plankton. There would be no adverse effects to fish, shellfish, wildlife or special aquatic sites. As described in Sections 4.6, "Water Quality," and 4.7, "Biological Resources," of the EIS/EIR, temporary impacts to water quality and aquatic diversity would be minimal at fill sites, during construction. Additionally, irrigation and drainage canals and ditches, managed marsh, woodland, upland row and field crop, native grassland, SRA, woodlands, and other wildlife associated habitat would be restored after project construction according to resource agency approved Mitigation and Monitoring Plans and in coordination with the resource agencies and TNBC. The proposed project would not significantly affect recreation or economic values as its inherent purpose is to provide flood protection for the residents of the Natomas Basin. Temporary effects to traffic, esthetics would occur during construction.

h. Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem

No-Action Alternative. No levee construction would occur under the No-Action Alternative, and therefore no discharge would occur. No steps would be needed to minimize potential adverse impacts of the discharge on the aquatic ecosystem because no adverse effect would occur.

Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative As described in Section 4.7, "Biological Resources," of the EIS/EIR, both the Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative would have temporary adverse effects to the aquatic ecosystem during construction. These impacts would occur during the improvements and replacements of irrigation and drainage canals and ditches. Once improvements and replacements are complete, the adverse effects to these features would be restored and/or improved. There would be no permanent adverse effect. In addition, during construction, implementation of Mitigation Measures in Sections 4.6, "Water Quality," and 4.7, "Biological Resources," would ensure that all appropriate and practicable steps would be taken to minimize the potential adverse effects due to discharge on the aquatic ecosystem.

i. On the Basis of the Guidelines, the Proposed Disposal Site(s) for the discharge of fill material complies with the requirements of these guidelines.

Appropriate and practicable steps to minimize potential adverse effects of discharge and fill on the aquatic ecosystem include: placing fill material only where it is needed for the proposed project and confining it to the smallest practicable area. The areas disturbed by construction would be returned as close as possible to pre-project conditions.

On the basis of the guidelines, the proposed project is specified as complying with the inclusion of appropriate and practical conditions to minimize pollution or adverse effect on the aquatic ecosystem.

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D4 Tree Survey Results for the Natomas Cross Canal and the Lower Natomas East Main Drainage Canal

PSOMAS

Natomas Cross Canal South Levee Tree Survey
Sta. 0+00 to 50+00

Trees located on the 1/3 waterside slope line:

Species	Trunk Diameter (in)	Dripline (ft)	Northing(Y)	Easting(X)
Oak	18	14	2048474.0	6675711.7
Oak	12	14	2048472.8	6675709.7
Oak	12	18	2048789.3	6675916.7
Oak	12	16	2049555.8	6676767.0
Oak	12	16	2046756.5	6674687.9
Oak	10	14	2048662.0	6675831.0
Oak	6	8	2048458.4	6675701.4

Approximate canopy area = 4530 sqft

Trees located between the 1/3 and 1/2 waterside slope line:

Species	Trunk Diameter (in)	Dripline (ft)	Northing(Y)	Easting(X)
Oak	36	18	2047939.3	6675394.5
Oak	24	12	2048726.3	6675875.4
Oak	18	14	2047334.4	6675015.5
Oak	18	16	2047343.2	6675003.7
Oak	16	14	2047882.3	6675366.4
Oak	14	14	2047200.5	6674914.9
Oak	14	20	2047955.2	6675406.5
Oak	12	24	2047309.2	6674991.2
Oak	12	14	2047881.9	6675361.9
Oak	10	14	2048660.2	6675831.4
Oak	8	14	2046773.0	6674688.0
Oak	8	12	2048652.9	6675832.6
Oak	8	12	2048661.4	6675833.2
Oak	8	14	2048783.7	6675913.7
Oak	8	16	2048791.7	6675919.5
Cottonwood	14	18	2046764.3	6674679.9

Approximate canopy area = 9830 sqft

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Trees located upslope of the 1/2 waterside slope line:

Species	Trunk Diameter (in)	Dripline (ft)	Northing(Y)	Easting(X)
Oak	48	20	2048302.6	6675601.0
Oak	8	12	2046766.2	6674691.6
Oak	8	12	2046777.2	6674699.9

Approximate canopy area = 1250 sqft

NOTES:

The data shown above was collected during a field survey performed on 5/26/2010 at the request of AECOM.

The horizontal datum is NAD83 (1991.35 Epoch), being CCS83 Zone 2.

Coordinate values are grid, multiply by 1.00006027 to obtain ground values.

PSOMAS

NEMDC Levee Tree Survey
Sta. 16+50 to 57+50

Trees located on the Vegetation Impact Line:

Species	Trunk Diameter (in)	Dripline (ft)	Northing(Y)	Easting(X)
Oak	6	10	1983038.8	6713175.4

Approximate Canopy Area: 300± Sq. Ft.

Trees located slightly east of the Vegetation Impact Line:

Species	Trunk Diameter (in)	Dripline (ft)	Northing(Y)	Easting(X)
Oak	8	10	1983515.3	6713471.0

Approximate Canopy Area: 440± Sq. Ft.

Trees located west of the 1/3 waterside slope line:

Species	Trunk Diameter (in)	Dripline (ft)	Northing(Y)	Easting(X)
Oak	24	20	1986449.9	6713554.5
Oak	24	18	1986453.2	6713548.7

Approximate Canopy Area: 1190± Sq. Ft.

Trees located between the 1/3 waterside slope line and the Vegetation Impact Line:

Species	Trunk Diameter (in)	Dripline (ft)	Northing(Y)	Easting(X)
Oak	8	10	1983060.0	6713161.7
Oak	4	10	1983509.9	6713467.2
Oak	8	12	2046777.2	6674699.9
Deciduous	6	15	1983430.2	6713431.1
Deciduous	6	10	1983424.7	6713427.7
Deciduous	6	10	1983425.7	6713427.1
Deciduous	4	10	1983422.5	6713428.4
Deciduous	4	10	1983417.3	6713426.5
Deciduous	4	10	1983415.7	6713426.5
Deciduous	6	10	1983418.1	6713425.1
Deciduous	6	10	1983399.4	6713423.6

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Deciduous	8	10	1983421.6	6713433.0
Deciduous	4	10	1983419.4	6713433.6
Deciduous	4	10	1983408.3	6713429.0
Deciduous	8	10	1983394.2	6713420.7
Deciduous	4	10	1983390.8	6713421.2
Oak	30	50	1983394.0	6713405.0
Oak	36	13	1986718.3	6713517.1
Eucalyptus	36	25	1986795.2	6713514.5
Oak	30	27	1985860.4	6713679.0
Oak	38	28	1985908.6	6713672.9
Oak	24	22	1985999.8	6713654.9
Cottonwood	48	30	1986190.9	6713616.1
Willow	52	22	1986440.5	6713571.2
Deciduous	6	10	1986443.8	6713573.5
Deciduous	6	10	1986440.9	6713565.8
Oak	36	14	1985746.8	6713681.5
Oak	12	12	1985758.5	6713680.4
Oak	28	18	1985771.3	6713680.1
Oak	10	10	1985766.8	6713696.0

Approximate Canopy Area: 19,600± Sq. Ft.
Total Approximate Canopy Area: 21,530± Sq. Ft.

NOTES:

The data shown above was collected during a field survey performed on 5/28/2010 at the request of AECOM.

The horizontal datum is NAD83 (1991.35 Epoch), being CCS83 Zone 2.

Coordinate values are grid, multiply by 1.00006027 to obtain ground values.

Location	Tree Type	Tree Size (in)	Drip Diameter (ft)	Point	Northing	Easting	Note
On Veg. Impact Line	Oak	6	10	216603	1983038.8	6713175.4	
Between Impact & 1/3 Line	Oak	8	10	216604	1983060.0	6713161.7	
1.8' East of Impact Line	Oak	8	10	216605	1983515.3	6713471.0	
Between Impact & 1/3 Line	Oak	4	10	216606	1983509.9	6713467.2	
Outside of Area				216607	1983464.1	6713465.4	
Between Impact & 1/3 Line	Deciduous	6	15	216608	1983430.2	6713431.1	
Between Impact & 1/3 Line	Deciduous	6	10	216609	1983424.7	6713427.7	
Between Impact & 1/3 Line	Deciduous	6	10	216610	1983425.7	6713427.1	
Between Impact & 1/3 Line	Deciduous	4	10	216611	1983422.5	6713428.4	
Between Impact & 1/3 Line	Deciduous	4	10	216612	1983417.3	6713426.5	
Between Impact & 1/3 Line	Deciduous	4	10	216613	1983415.7	6713426.5	
Between Impact & 1/3 Line	Deciduous	6	10	216614	1983418.1	6713425.1	
Between Impact & 1/3 Line	Deciduous	6	10	216615	1983399.4	6713423.6	
Between Impact & 1/3 Line	Deciduous	8	10	216616	1983421.6	6713433.0	
Between Impact & 1/3 Line	Deciduous	4	10	216617	1983419.4	6713433.6	
Between Impact & 1/3 Line	Deciduous	4	10	216618	1983408.3	6713429.0	
Between Impact & 1/3 Line	Deciduous	8	10	216619	1983394.2	6713420.7	
Between Impact & 1/3 Line	Deciduous	4	10	216620	1983390.8	6713421.2	
Between Impact & 1/3 Line	Oak	30	50	216621	1983394.0	6713405.0	
Between Impact & 1/3 Line	Oak	36	13	74000	1986718.3	6713517.1	Multi-prong, 3" through 6"
Between Impact & 1/3 Line	Eucalyptus	36	25	74001	1986795.2	6713514.5	3-Prong, 10", 10", 8"
Between Impact & 1/3 Line	Oak	30	27	74004	1985860.4	6713679.0	4-Prong, 6", 8", 10", 12"
Between Impact & 1/3 Line	Oak	38	28	74005	1985908.6	6713672.9	3-Prong, 12", 14", 14"
Between Impact & 1/3 Line	Oak	24	22	74006	1985999.8	6713654.9	2-Prong, 14", 12"
Between Impact & 1/3 Line	Cottonwood	48	30	74007	1986190.9	6713616.1	
Between Impact & 1/3 Line	Willow	52	22	74008	1986440.5	6713571.2	3-Prong, 8", 12", 20"
Between Impact & 1/3 Line	Deciduous	6	10	74009	1986443.8	6713573.5	
Between Impact & 1/3 Line	Deciduous	6	10	74010	1986440.9	6713565.8	
Between Impact & 1/3 Line	Willow	12	22	74011	1986440.1	6713567.3	
Between Impact & 1/3 Line	Oak	24	20	74012	1986449.9	6713554.5	2-Prong, 14", 8"
West of 1/3 Line	Oak	24	18	74013	1986453.2	6713548.7	3-Prong, 10", 8", 6"
West of 1/3 Line	Oak	36	14	74016	1985746.8	6713681.5	2-Prong, 14", 14"
Between Impact & 1/3 Line	Oak	12	12	74017	1985758.5	6713680.4	
Between Impact & 1/3 Line	Oak	28	18	74018	1985771.3	6713680.1	2-Prong, 18", 12"
Between Impact & 1/3 Line	Oak	10	10	74019	1985766.8	6713696.0	

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

In Reply Refer To:
81420-2011-CPA-0003

OCT 13 2010

Ms. Alicia Kirchner
Chief, Planning Division
U.S. Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, California 95814

Dear Ms. Kirchner:

This letter constitutes the Fish and Wildlife Service's (Service) Fish and Wildlife Coordination Act (FWCA) report, as provided for in section 2(b) of the FWCA (Public Law 85-624; 16 U.S.C. 661-667e) on the Natomas Levee Improvement Project, Phase 4b, Sacramento, California.

Project History

The entire project known as the Natomas Levee Improvement Program, Landside Improvements Project is being phased by the U.S. Army Corps of Engineers (Corps) and the Sacramento Area Flood Control Agency (SAFCA).

In 2005 and early 2006, SAFCA conducted assessments of seepage potential along the east levee of the Sacramento River, the south levee of the Natomas Cross Canal (NCC), and the north levee of the American River in its Natomas Levee Evaluation Study. This study concluded that approximately 26 miles of these levees protecting the Natomas Basin are in need of improvements to correct underseepage potential. In addition, levee height and seepage remediation improvements at some locations on the Sacramento River east levee, the NCC south levee, the Pleasant Grove Creek Canal, and the Natomas East Main Drainage Canal (NEMDC)/Steelhead Creek west levee are needed to provide adequate freeboard and subsequent protection from a 200-year flood. In 2006, the Corps recommended that the levees surrounding the Natomas Basin be decertified based on new geotechnical information and new standards. SAFCA is proposing to focus on segments that do not currently meet the 100-year design criteria adopted by the Federal Emergency Management Agency. The project has been broken up into four phases. Phase 1 included slurry wall work along a portion of the NCC, began in 2007, and completed in 2008. Phase 2 work began in 2009 and includes: levee raising and seepage remediation along the remainder of the NCC and Sacramento River east levee (Reaches 1-4B); relocation of the upper Elkhorn Canal; construction of the upper drainage

canal; habitat enhancement, creation and management; and right-of-way acquisition. Phase 3 work began in 2010 and includes: levee raising and seepage remediation along the Sacramento River levee (Reaches 5A-9B); relocation of the lower Elkhorn Canal; construction of the lower drainage canal; woodland corridor creation; levee raising, slope flattening and widening, and seepage remediation along the Pleasant Grove Creek Canal west levee; seepage remediation and slope stability remediation along the NEMDC west levee; infrastructure relocation and realignment; right-of-way acquisition; reconfiguration of Airport West Ditch; and landside vegetation removal of the Sacramento River east levee Reaches 10-12A. Phase 4a will begin in 2011 and includes: levee raising and seepage remediation along the Sacramento River east levee (Reaches 10-15); levee raising and seepage remediation along the NCC at the Northern and Bennett pumping plant locations; relocation of the Riverside Canal; pump plant modifications (both landside and waterside) or replacements; creation of managed marsh along Fisherman's Lake; creation of woodland corridor between Reaches 12A and 14; and right-of-way acquisition.

Project Description

The remaining portion of work is Phase 4b. Phase 4b work includes: the Sacramento River east levee south of the limits of the Phase 4a Project along Reach A:16–20 of the Sacramento River east levee, the American River north levee (Reach I:1–4), the PGCC (Reach E), the NEMDC west levee (Reaches F–H), improvements to the West Drainage Canal from I-5 to Fisherman's Lake, relocation of the Riego Road Canal along the NEMDC west levee, and relocation of the Vestal Drain and Morrison Canal along the NCC. This FWCA report is only reviewing and commenting on Phase 4b of the overall project.

Three alternatives were evaluated for the Natomas Levee Improvement Project, Phase 4b: No Action Alternative; Adjacent Setback Levee; and Fix-In-Place. Descriptions of the alternatives can be found in the Corps' *Natomas Levee Improvement Program, Phase 4b Landside Improvements Project Draft Environmental Impact Statement* (EIS), July 2010. The Corps and SAFCA have selected Alternative 1 as their preferred alternative.

Service Involvement

The Service has been working with the Corps and SAFCA on the Natomas Levee Improvement Project, Phase 4b for the last 6 months. The Corps initiated section 7 consultation under the Endangered Species Act in June 2010 and a biological opinion was signed on October 12, 2010.

Recommendations/Conclusions

Because the Corps and SAFCA have selected a preferred alternative and formal section 7 consultation has been initiated on this alternative, we are focusing our recommendations on the Adjacent Setback Levee. For a complete description of this alternative, refer to the EIS. The Corps and SAFCA have incorporated many project avoidance, minimization, and compensation measures within their project description. Given this, the Service is not recommending any additional compensation. The Service feels that effects to important habitats such as riparian woodland habitat will be mitigated for by creating 10 acres of woodland along the Sacramento River East Levee woodland corridor and creating 50 acres of riparian forest within the Lower Dry Creek area. Effects to aquatic habitat will be mitigated through the creation of enlarged canals throughout the project site and managed marsh at the Brookfield Borrow Site.

Based on our review of documentation available, the Service has the following recommendations in regards to the proposed project:

1) Minimize the impact on migratory birds by conducting pre-construction nesting surveys and avoiding construction at those sites where nests are found until the young have fledged the nest.

2) Replace the loss of any shaded riverine aquatic habitat that is lost as part of the Phase 4b project as proposed. In order to provide the same future function of this habitat, plantings should occur on the waterside of the levee and in the vicinity of the area of impact.

3) Include the Service when developing the planting plan for all habitat types created as a result of the project. Woodland areas should include a shrub component to create a complex woodland habitat structure.

4) Minimize impacts to northwestern pond turtles by having a qualified biologist conduct focused surveys for pond turtle nests, juveniles, and adults prior to and during construction activities in suitable upland nesting and aquatic habitat (upland areas within 1,640 feet of canals, ditches, emergent wetlands, and other permanent/semi-permanent aquatic habitat).

5) Complete the appropriate consultation with NOAA Fisheries, as required under section 7 of the Endangered Species Act, for potential impacts to listed anadromous fish and marine species under NOAA Fisheries jurisdiction.

6) Obtain a 2081 permit from the California Department of Fish and Game on State listed species.

7) Create an operations, maintenance, and monitoring plan for any habitat created as a result of the proposed project. This plan should be coordinated with the Service and the entity responsible for long-term maintenance of the site.

If you have any questions regarding this report or other aspects of the FWCA, please contact Jennifer Hobbs at (916) 414-6541.

Sincerely,

for M. Kathleen Wood
Assistant Field Supervisor

cc:
Liz Holland, Corps, Sacramento, California
Peter Buck, SAFCA, Sacramento, California
Patrick Moeszinger, CDFG, Rancho Cordova, California
Kelly Holland, AECOM, Sacramento, California

APPENDIX E

Cultural Resources

PROGRAMMATIC AGREEMENT
AMONG THE U.S. ARMY CORPS OF ENGINEERS,
THE SACRAMENTO AREA FLOOD CONTROL AGENCY, AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER

REGARDING THE ISSUANCE OF PERMISSION UNDER THE AUTHORITY OF SECTION 408 OF THE RIVERS AND HARBORS ACT OF 1899 AND SECTION 404 OF THE CLEAN WATER ACT FOR THE NATOMAS LEVEE IMPROVEMENT PROGRAM, LANDSIDE IMPROVEMENTS PROJECT

WHEREAS, the U.S. Army Corps of Engineers, Sacramento District (Corps) proposes to review an application that seeks permission for alteration of flood control structures under the authority of Section 408 of the Rivers and Harbors Act and to issue one or more permits to discharge fill to the waters of the United States under the authority of Section 404 of the Clean Water Act to the Sacramento Area Flood Control Agency (SAFCA) for the Natomas Levee Improvement Program Landside Improvements Project (Project); and

WHEREAS, The Corps has determined that the issuance of these permissions and permits constitute an undertaking per 36 CFR 800.16(y), which require compliance with Section 106 of the National Historic Preservation Act (NHPA) of 1966 as amended (16 U.S.C. 470f); and

WHEREAS the Project includes improvements to an extensive levee system surrounding the Natomas Basin and landscape and irrigation/drainage infrastructure modifications that will be implemented in three construction phases, currently scheduled for 2008, 2009, and 2010; and

WHEREAS, the Corps has determined that this undertaking will have an adverse effect on at least one Historic Property that has been determined eligible for inclusion in the National Register of Historic Places (NRHP), CA-SAC-485/H; and

WHEREAS, because of the complex and phased nature of the improvements, the Corps has not yet determined the exact area of potential effects (APE), nor has SAFCA acquired all of the rights-of-entry, easements and ownership interests that would allow a complete inventory and determination of effects on Historic Properties; and

WHEREAS, the Natomas Basin is sensitive for buried archaeological resources that cannot be accurately located prior to construction; and such buried sites may also be Historic Properties, and therefore SAFCA and the Corps need to document a framework for managing post-review discoveries per 36 CFR Section 800.13, including evaluation of those resources, assessment of effects, and resolution of potential adverse effects; and

WHEREAS, at such time as any unevaluated cultural resource may be discovered, it may require archaeological data recovery and/or other historic preservation activities, in compliance with Section 106 of the National Historic Preservation Act, concurrent with *active* construction; and

WHEREAS, the urgency of flood control improvements require a management framework for Historic Properties that will be implemented after the execution of this agreement in an expedited manner that thus departs from the process normally used under 36 CFR Section 800 et seq., yet still fulfills the requirements of Section 106 of the NHPA; and

WHEREAS, SAFCA has been invited to participate as a signatory to this Programmatic Agreement (PA) by the Corps and the California State Historic Preservation Officer (SHPO; and

WHEREAS, the Corps has consulted The Ione Band of Miwok Indians, the Shingle Springs Band of Miwok Indians and the United Auburn Indian Community, and they have been invited to concur in this PA; and

WHEREAS, the Corps shall make the terms and conditions of this PA as part of the conditions of any permissions and permits issued by the Corps for this project; and

WHEREAS, SAFCA has agreed to undertake responsibility for compliance with the NHPA on its own behalf, and on behalf of the Central Valley Flood Protection Board; and

WHEREAS, the Corps has consulted with the SHPO and the Advisory Council on Historic Preservation in accordance with regulations implementing Section 106 of the NHPA;

WHEREAS, the Council has been consulted and declined to participate in this agreement;

NOW, THEREFORE, the Corps, the SHPO, and SAFCA agree that the Project shall be implemented in accordance with the following stipulations in order to take into account the effects of the undertaking on Historic Properties.

The Corps shall ensure that the following stipulations of this PA are carried out.

STIPULATIONS

I. DEFINITIONS

The terms used in this Programmatic Agreement shall be as defined in regulations implementing Section 106 of the NHPA, and as follows:

"APE (Area of Potential Effect)" means any location at which any Project development activity will be constructed; and locations of any Project-related construction staging areas, borrow areas, and materials stockpile areas; and the locations of any other Project development activities. The APE shall be defined so as to include the maximum spatial dimensions of all Project-related construction and operations rights-of-way, easements, areas which potentially may be affected by Project activities, and other properties to which SAFCA has access, whether on a temporary or permanent basis, or ownership for Project development.

"Concurring parties" means their concurrence indicates that they are in agreement with the terms of the PA.
"Consulting parties" means the Corps, the SHPO, and SAFCA who are signatories to this PA. Only signatories have the authority to amend or terminate this PA.

"Cultural resources" means any property or location that was created, modified, or used by people at least 50 years in the past. Cultural resources include but are not limited to Historic Properties and traditional cultural properties/places (i.e., NRHP listed or eligible properties as defined at 36 CFR Part 60).

"Historic Property" means a cultural resource that has been determined eligible for or is listed on the NRHP (i.e., NRHP listed or eligible properties as defined at 36 CFR Part 60), either by formal nomination

and listing or by concurrence between federal agencies and the SHPO.

"Historic preservation" means any activity conducted in accordance with the NHPA and its implementing regulations to, among other things, inventory, evaluate, manage, or treat cultural resources such as buildings, structures, sites, districts, and objects eligible for, or that may be determined eligible for, listing in the NRHP according to eligibility criteria at 36 CFR Part 60.

"Project development activities" means any physical action related to the Project that has the potential to damage or otherwise alter those characteristics of Historic Properties that would make them eligible for listing in the NRHP.

II. STANDARDS

(A.) Professional Qualifications. All technical work required for historic preservation activities implemented pursuant to this Programmatic Agreement shall be carried out by or under the direct supervision of a person or persons meeting at a minimum the *Secretary of Interior's Professional Qualifications Standards* for archaeology or history, as appropriate (48 FR 44739). "Technical work" here means all efforts to inventory, evaluate, and perform subsequent treatment such as data recovery excavation or recordation that is required under this Programmatic Agreement. This stipulation shall not be construed to limit peer review, guidance, or editing of documents by SAFCA or SAFCA's consultants.

(B.) Historic Preservation Standards. Historic preservation activities carried out pursuant to this Programmatic Agreement shall meet the *Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation* (48 FR 44716-44740) as well as standards and guidelines for historic preservation activities established by the SHPO. The Corps shall ensure that all reports prepared pursuant to this Programmatic Agreement will be provided to the consulting parties and shall ensure that all such reports meet published standards of the California Office of Historic Preservation, specifically, *Preservation Planning Bulletin* Number 4(a), "Archaeological Resources Management Reports (ARMR): Recommended Contents and Format" (December 1989).

III. PROJECT DESCRIPTION

(A) PROJECT Description. A description of the Project is found in the Final Environmental Impact Report (November 2007). A summary of the Project's description in the environmental impact report is provided as **Attachment A** and is made a part of this Programmatic Agreement.

(B) Existing Conditions. An archival search and archaeological survey have been completed for all areas of the APE as currently defined to which SAFCA currently has access, and which currently are not covered by paving, built environment features, or agricultural crops. A report of the results of archival research and archaeological survey, "Cultural Resources Inventory Reports, Part 1 – Natomas Levee Improvement Program Landside Improvements Project, Sacramento and Sutter Counties, California" (October 2007) is made **Attachment B** to this Programmatic Agreement.

A number of prehistoric sites are known to be present along the banks of the Sacramento River. However, archaeological survey of the area is of limited value because the alluvial depositional environment may obscure and bury sites, leaving no surface manifestation of those archaeological resources. For most of the length of the Project, levees have been built on the riverbanks. These levees are one focus of the Project's activity, and occupy a substantial portion of the Project's APE. Furthermore, it has not been established

whether certain known sites in proximity to the Project's development activities extend under the existing levees. The existing levees both obscure ground surfaces and prevent subsurface archaeological testing within their footprints. Because of these conditions, a full assessment of archaeological sites that may be present in the APE cannot be made in advance of construction. There is no definitive information, even for sites known to be in Project's proximity, of site boundaries relative to the APE, or of the significance or integrity of any portions of such sites that may be within the APE. For these reasons, even though archaeological deposits may extend into the APE, and even though some of these deposits may qualify as Historic Properties, it is impossible to develop meaningful site-specific Historic Properties Treatment Plans (HPTP) prior to all construction, or to carry out all necessary data recovery in advance of the Corps' approvals, permitting and construction.

For these reasons, unforeseen discoveries shall be treated pursuant to the provisions of 36 CFR 800.13 (Post-review discoveries).

(C) Project Phasing and Potential Changes to the APE: Because the improvements will occur in three phases (anticipated to be 2008, 2009, and 2010), it will be necessary to define the APE for each phase. The APE for each phase shall be submitted with the cultural resources inventory reports, and shall be consulted upon as part of that document, pursuant to **Stipulation IV**, below.

After the initial concurrence, changes to the APE may be necessary as SAFCA refines its phased Project plans. In particular, the ability of SAFCA to obtain access permissions of private landowners, determination of borrow sites and ongoing negotiations with resource agencies regarding species mitigation requirements may affect final Project's design, and may expand the current APE in some areas. Any changes to the APE shall be made in accordance with subsections D and E (below) of this Stipulation III. The SHPO, Corps, and SAFCA shall consult and reach concurrence in any changes to the APE. The final APE shall account for all Project development activities for the as-built Project. SAFCA shall notify the Corps of any change in the APE and the Corps shall determine the potential for Project development activities in a revised APE to affect cultural resources, through cultural resources inventory and testing as needed.

(1) If there is the potential that cultural resources exist in the revised APE, SAFCA shall submit to the Corps:
   (a) a map of the revised APE; and
   (b) a description of Project development activities to take place in the revised APE; and
   (c) a description of the inventory, nature, location, and known or potential significance of cultural resources in the revised APE; and
   (d) a description of any archaeologically sensitive areas in the revised APE that require monitoring by an archaeologist, and Native American monitor as appropriate; and
   (e) a plan for managing cultural resources in a manner that either avoids Project-related effects to cultural resources, or which mitigates any adverse effects, and which provides for the management of unforeseen cultural resources discoveries.

(2) If no cultural resources are identified within a revised APE, SAFCA shall document such a determination, provide documentation to the Corps and keep such documentation on file at its principal offices.

After the Corps and SAFCA agree to a revised APE and if such a change has the potential to have an effect on cultural resources, the Corps shall submit the documentation to the SHPO for their review. The SHPO

shall have 30 calendar days from the date of receipt of the notice of a revision to the APE to review and to provide in writing either concurrence with or objection to the definition of the revised APE, and any proposed historic preservation activities. Should the SHPO not respond in writing within 30 calendar days, the Corps and SAFCA shall proceed as though the SHPO has concurred in the revised APE, and the proposed historic preservation activities, if any

Should the SHPO object to the definition of the revised APE or proposed historic preservation activities, the Corps, SAFCA, and the SHPO shall consult for a period not to exceed 15 calendar days following the date of the receipt of the SHPO's written objection in an effort to come to agreement on the issues to which the SHPO has objected. Should the SHPO, the Corps, and SAFCA be unable to agree on the issues to which the SHPO has objected, the consulting parties to this Programmatic Agreement shall proceed in accordance with **Stipulation VIII (Resolving Objections)**, below.

(D) Scope of Identification Efforts in the APE: Inventories of Historic Properties within the established or revised APE shall be completed in accordance with **Stipulation IV (Inventory of Historic Properties)** of this Programmatic Agreement. Treatment of any adverse effects to Historic Properties within the established or revised APE shall be completed in accordance with **Stipulation V (Treatment of Effects)** of this Programmatic Agreement.

(E) Scope of the APE: For purposes of this Programmatic Agreement, a revised APE shall be defined to meet, at a minimum, the following criteria:

(1) The APE for any segment of the Natomas levees that are being improved as part of the Project and shall include the levee segment and a corridor extending not less than 75 feet from the land side toe of the levee segment. The APE also shall include:

- The extent of all Project construction and excavation activity required to construct flood control facilities and to modify irrigation and drainage infrastructure,
- The additional right-of-way/easements obtained by SAFCA as part of the Project's features,
- All areas used for excavation of borrow material and habitat creation, and
- All construction staging areas.

(2) The APE for Project activities shall include the direct footprint of the activity and a reasonable buffer determined by consultation between SAFCA and the Corps, according to the nature of the activity, SAFCA's ownership interest or easement, and the probability that ground-disturbing work may extend beyond the footprint of planned improvements and activities.

(3) The APE for any other type of Project development activities shall be defined by the Corps in consultation with the consulting parties.

IV. INVENTORY OF HISTORIC PROPERTIES

(A) Identification Efforts to Date and Further Work Required: An inventory of Historic Properties within the APE has been initiated consistent with the *Secretary of Interior's Standards and Guidelines for Archeology and Historic Preservation* (48 FR 44716–44740). The SAFCA shall submit a completed inventory and evaluation for each phase of Project work (2008, 2009, 2010) to the Corps. Such inventory shall be deemed complete by the Corps when the SHPO concurs in the NRHP eligibility recommendation for all cultural resources within the APE for that phase.

Areas of Archaeological Sensitivity: Areas of archaeological sensitivity will be monitored in accordance with HPTPs.

(C) Changes in the APE: If areas are added to the Project development activities subsequent to the SHPO concurrence on the map of the APE for a specific phase, SAFCA shall complete an inventory of Historic Properties within the expanded APE. Such inventory shall be undertaken and completed consistent with the *Secretary of Interior's Standards and Guidelines for Archeology and Historic Preservation* (48 FR 44716–44740). Such inventory shall be deemed completed by the Corps at such time as the SHPO concurs in the NRHP eligibility of all cultural resources within the established and revised APE for the Project, pursuant to this Stipulation IV.

V. TREATMENT OF EFFECTS

(A) Historic Property Treatment Plans: If Historic Properties are identified in cultural resources inventories that would be adversely affected by the Project, SAFCA shall prepare a Historic Properties Treatment Plan (HPTP) for review and written approval by the Corps and the SHPO for those specific properties. An HPTP applicable to every Historic Property that may sustain adverse effects by the Project shall be prepared, including for those Historic Properties found during construction. An HPTP may address individual or multiple Historic Properties. An HPTP shall stipulate those actions SAFCA shall take to resolve the adverse effects of the Project on Historic Properties. SAFCA shall ensure that all provisions of an HPTP are carried out in a timely manner. Any changes to an HPTP shall be reviewed and approved by the Corps. Copies of all reports pertaining to the treatment of Historic Properties shall be submitted to the consulting parties to this Programmatic Agreement. Reports and other data pertaining to the inventory of, and treatment of effects on, Historic Properties may be distributed to concurring parties to this Programmatic Agreement and to other members of the public consistent with **Stipulation VII (Confidentiality)** of this Programmatic Agreement. Individual HPTPs may be submitted simultaneously with the cultural resources inventory report for specific Project phases. If HPTPs are submitted simultaneously with an inventory report for a Project phase or with an addendum to such report for an expanded APE or Project description, the Corps and SHPO review period for such HPTP shall run concurrently with the review period for the inventory report.

Review Schedule: The SHPO and the Corps shall have 30 calendar days to review and comment upon in writing any HPTP submitted by SAFCA. The SHPO and the Corps shall indicate in their review that they find the HPTP either acceptable or not. In the event that comments are not made by the SHPO within 30 calendar days, the Corps shall assume the SHPO has accepted the HPTP as submitted. In the event the Corps and/or the SHPO provide written comment within the 30-day period, either SAFCA shall accept the comments and revise the HPTP accordingly, or SAFCA and the Corps may object to some or all comments. Comments from the Corps or the SHPO that are not acceptable to SAFCA shall be resolved by consultation among the Corps, the SHPO, and SAFCA for a period of not more than 15 calendar days. Should the Corps, the SHPO, and SAFCA be unable to resolve any dispute regarding the Corps or the SHPO comments, the consulting parties shall proceed in accordance with **Stipulation VIII (Resolving Objections)** of this Programmatic Agreement.

The Corps shall submit to the SHPO for review and comment any amendment, addendum, revision or other change to an HPTP. SAFCA shall proceed to make changes to an HPTP as per the procedure and schedule for the review and approval of an original HPTP. If a Historic Property is discovered within an expanded APE subsequent to an initial inventory effort for a phase, and the Corps and SAFCA agree that

the Project may adversely affect the property, SAFCA shall submit an addendum to the HPTP or a new HPTP. The review schedule for this submittal follows the provisions of Stipulation V.

(B) Commencement of Construction and Project Work: Project development activities may commence within the APE after a Historic Properties inventory has been completed (per **Stipulations III and IV**, above), and prior to treatment of adverse effects on Historic Properties within the APE provided that:

(1) A plan to respond to inadvertent archaeological discoveries is prepared by SAFCA and approved by the Corps prior to the commencement of Project activities anywhere in the APE for that phase of the Project; and

(2) Project development activities do not encroach within 30 meters (100 ft) of the known boundaries of any Historic Property as determined from archaeological site record forms, other documentation, or as otherwise defined in consultation with the SHPO; and

(3) An archaeological monitor is present during any Project activities that are anticipated to extend either vertically or horizontally into any areas designated to be archaeologically sensitive by SAFCA in consultation with the Corps.

(C) Final Report Documenting Implementation of the Historic Properties Treatment Plan(s): Within one year after the completion of all work performed as part of the Project SAFCA shall submit to the Corps and SHPO a final report documenting the results of all work prepared under the HPTPs. This report shall be submitted to the Corps and SHPO for review and comments, which SAFCA shall incorporate.

VI. NATIVE AMERICAN AND OTHER PUBLIC CONSULTATION AND PUBLIC NOTICE

Members of the interested public shall be invited to consult regarding this Programmatic Agreement. Within 30 calendar days of the signing date of this Programmatic Agreement, the Corps, the SHPO, and SAFCA shall consult to compile a list of members of the interested public who shall be provided notice of this Programmatic Agreement. The opinions of local Native Americans with cultural ties to the APE and the opinions of other members of the public shall be taken into account by the consulting parties for historic preservation actions taken in accordance with this Programmatic Agreement. Native Americans and other members of the public may be invited to concur in this Programmatic Agreement. Native American monitor(s) shall be invited to assist SAFCA in the treatment of any Native American human remains and items associated with Native American burials discovered during the Project in accordance with California Public Resources Code Section 5097.98 and California Health and Safety Code Section 7050.5(b) and 7050.5(c).

VII. CONFIDENTIALITY

Confidentiality regarding the nature and location of the archaeological sites and any other cultural resources discussed in this Programmatic Agreement shall be maintained on a "need-to know" basis limited to appropriate personnel and agents of SAFCA, the Corps, and the SHPO involved in planning, reviewing and implementing this Programmatic Agreement consistent with Section 304 of the NHPA.

VIII. RESOLVING OBJECTIONS

(A.) Should any party to this Programmatic Agreement object to any action proposed or carried out

pursuant to this Programmatic Agreement, the Corps shall consult with the objecting party(ies) for a period of time not to exceed *30 calendar days* to resolve the objection. If the Corps determines that the objection cannot be resolved, the Corps shall forward all documentation relevant to the dispute to the Council. Within 30 calendar days after receipt of all pertinent documentation, the Council shall either:

(1) Provide the Corps with recommendations, which the Corps shall take into account in reaching a final decision regarding the objection; or

(2) Notify the Corps that the Council will comment in accordance with the requirements of Section 106 of the NHPA, and proceed to comment. Any Council comment provided in response shall be taken into account by the Corps, pursuant to the requirements of Section 106 of the NHPA.

(3) Should the Council not exercise one of the above options within 30 days after receipt of all pertinent documentation, the Corps may assume the Council's concurrence in its proposed response to the objection.

(4) The Corps shall take into account any Council recommendation or comment provided in accordance with this stipulation with reference only to the subject of the objection; the Corps' responsibility to carry out all actions under this Programmatic Agreement that are not the subjects of the objection shall remain unchanged.

(B.) At any time during implementation of the measures stipulated in this Programmatic Agreement should an objection pertaining to the Programmatic Agreement be raised by a member of the public, the Corps or SAFCA shall notify the consulting parties to the Programmatic Agreement and take the objection into account, consulting with the objector and, should the objector so request, with any of the consulting parties to this Programmatic Agreement to address the objection.

IX. AMENDMENTS

Any consulting party to this Programmatic Agreement may propose that the Programmatic Agreement be amended, whereupon the Corps shall consult with the other consulting parties to this Programmatic Agreement to consider such amendment. Any amendment shall be executed by the consulting parties in the same manner as the original Programmatic Agreement.

If the Project has not been completed within five years of the date of the execution of this Programmatic Agreement, the consulting parties shall consult on a date not less than 90 days prior to the fifth anniversary of this Programmatic Agreement to either amend this Programmatic Agreement and acknowledge its continued applicability for the undertaking for a designated period of time, or terminate this Programmatic Agreement and proceed to again consult regarding the undertaking in accordance with regulations implementing Section 106 of the NHPA.

All attachments to this Programmatic Agreement, and other instruments prepared pursuant to this agreement such as, but not limited to, the Project's description, initial cultural resource inventory report and maps of the APE, HPTPs, and monitoring and discovery plans may be amended without requiring amendment of this Programmatic Agreement. Such amendments will be consulted on by the concurring parties and shall be final when agreement is reached by the parties.

X. FAILURE TO CARRY OUT THE TERMS OF THE AGREEMENT

Should the Corps fail to ensure that the terms of this Programmatic Agreement are carried out, the Corps shall notify the parties to this Programmatic Agreement and again consult with the SHPO and the Council in accordance with regulations implementing Section 106 of the NHPA. The Corps shall not take any action or make any irreversible decision that would affect an Historic Property, preclude historic preservation alternatives, or foreclose any opportunities for the Council to comment on the undertaking prior to completion of the process for considering and resolving effects on Historic Properties provided in this document.

XI. SCOPE OF THE PROGRAMMATIC AGREEMENT

Execution of this Programmatic Agreement by the Corps, the SHPO, and SAFCA, and implementation of its terms, evidence that Corps has afforded the Council an opportunity to comment on the undertaking for SAFCA Natomas Levee Improvement Program Landside Improvements Project, pursuant to 16 U.S.C. 470f, and that the Corps has taken into account the effects of the undertaking on Historic Properties. This Programmatic Agreement is limited in scope to the undertaking defined herein and is entered into solely for that purpose.

CONSULTING PARTIES:

U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT

By: _____ Date: 10 Apr 08

Title: COL Thomas Chapman, District Engineer, Sacramento District, U.S. Army Corps of Engineers

SACRAMENTO AREA FLOOD CONTROL AGENCY

By: _____ Date: 4/11/08

Title: Steln M. Buer, Executive Director, Sacramento Area Flood Control Agency

CALIFORNIA STATE HISTORIC PRESERVATION OFFICER

By: _____ Date: 5/1/08

Title: Milford Wayne Donaldson, F.A.I.A., California State Historic Preservation Officer

CONCUR:

CENTRAL VALLEY FLOOD PROTECTION BOARD

By: Jay S. Punia Date: 6/23/08
Title: Jay S. Punia, Executive Officer, Central Valley Flood Protection Board

By: JAY S. PUNIA Date: 6/23/08
Title: Executive Officer, CVFPB

Attachment A: Project Description Summary
Attachment B: "Cultural Resources Inventory Reports, Part 1 – Natomas Levee Improvement Program Landside Improvements Project, Sacramento and Sutter Counties, California" (report).

EDAW | AECOM

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 7, 2007

Debbie Pilas-Treadway
Native American Heritage Commission
915 Capitol Mall, Room 364
Sacramento, Ca 95814

RE: Natomas Levee Improvement Project

Dear Ms. Pilas-Treadway:

EDAW is conducting cultural resources studies for the above-referenced project located generally north of the City of Sacramento, in Sacramento and Sutter counties, and located on the Grays Bend, Taylor Monument, Verona, Rio Linda, Pleasant Grove, Sacramento East, and Sacramento West USGS quadrangle maps. Background research and field studies conducted for this project will identify cultural resources that may be impacted by proposed levee improvements throughout the American River basin. This letter is intended to initiate part of the consultation process that will eventually be required under Section 106 National Historic Preservation Act.

I am pleased to bring this activity to your attention, and would appreciate any information you can provide regarding prehistoric, historic, or ethnographic Native American land use. I am interested in any contemporary Native American values that may be present near or within the project area and would like to request a search of the NAHC Sacred Land files.

Please send via mail or facsimile (916-414-5850) a listing of local Native American representatives at your earliest convenience, so that I may contact appropriate individuals and account for their potential concerns in the planning process.

If you have any questions or comments feel free to contact me at my office. I can be reached by email at charlane.gross@edaw.com, or by phone at 916-414-5800. I look forward to hearing from you soon.

Sincerely,

Charlane Gross, M.A., R.P.A.
Senior Archaeologist

STATE OF CALIFORNIA Arnold Schwarzenegger, Governor

NATIVE AMERICAN HERITAGE COMMISSION
915 CAPITOL MALL, ROOM 364
SACRAMENTO, CA 95814
(916) 653-4082
Fax (916) 657-5390

June 19, 2007

Charlene Gross
EDAW Inc.
2011 J Street
Sacramento, CA 95814

Sent Via Fax: 916-414-5850
Of Pages: 3

RE: Natomas Levee Improvement project, Sacramento and Sutter Counties

Dear Ms. Gross:

The Native American Heritage Commission has reviewed the Sacred Lands File and found several burial/recorded sites in/near the project area. The location of sites is confidential.

I recommend that you contact the North Central Information Center, Ca State University, Sacramento, 6000 J Street, Adams Building, Suite 103, Sacramento, CA 916-278-6217 for sites in Sacramento County and Northeast Information Center, Ca State University, Chico, Building 25, Suite 204, Chico, CA 95929, 530-898-4413 for Sutter County, for further information of recorded sites located in/near the APE.

I have enclosed a list of Native Americans individuals/organizations contacts may have knowledge of additional cultural resources in the project area. The Commission makes no recommendation or preference of a single individual, or group over another. These lists should provide a starting place in locating areas of potential adverse impact within the proposed project area. I suggest you contact all of those indicated, if they cannot supply information, they might recommend other with specific knowledge. A minimum of two weeks must be allowed for responses after notification.

If you receive notification of change of addresses and phone numbers from any these individuals or groups, please notify me. With your assistance we are able to assure that our lists contain current information. If you have any questions or need additional information, please contact me at (916) 653-4038.

If you have any questions or need additional information, please contact me.

Sincerely,

Debbie Pilas-Treadway
Environmental Specialist III

Native American Contacts
Sacramento and Sutter Counties
June 19, 2007

√ = CALL
√ = CALL W/MESSAGE
√ = CALL SPOKE W/INDIVIDUAL (SEE CALL LOG RECORD)

√
Rose Enos
15310 Bancroft Road — Maidu
Auburn , CA 95603 — Washoe
(530) 878-2378

Shingle Springs Band of Miwok Indians
Nicholas Fonseca, Chairperson
P.O. Box 1340 — Miwok
Shingle , CA 95682 — Maidu
nfonseca@ssband.org
(530) 676-8010
(530) 676-8033 Fax

√
Enterprise Rancheria of Maidu Indians
Frank Watson, Vice Chairperson
1940 Feather River Blvd., Suite B — Maidu
Oroville , CA 95965
eranch@cncnet.com
(530) 532-9214
(530) 532-1768 FAX

Strawberry Valley Rancheria
Calvine Rose, Chairperson
PO Box 667 — Maidu
Marysville , CA 95901 — Miwok
No #

√
Enterprise Rancheria of Maidu Indians
Glenda Nelson, Chairperson
1940 Feather River Blvd., Suite B — Maidu
Oroville , CA 95965
eranch@cncnet.com
(530) 532-9214
(530) 532-1768 FAX

Strawberry Valley Rancheria
Robert Kerfoot
PO Box 667 — Maidu
Marysville , CA 95901 — Miwok
No #

√
Shingle Springs Band of Miwok Indians
Jeff Murray, Cultural Resources Manager
P.O. Box 1340 — Miwok
Shingle , CA 95682 — Maidu
jmurray@ssband.org
(530) 676-8010
(530) 676-8033 Fax

√
United Auburn Indian Community of the Auburn
Jessica Tavares, Chairperson
575 Menlo Drive, Suite 2 — Maidu
Rocklin , CA 95765 — Miwok
916 663-3720
916 663-3727 - Fax

This list is current only as of the date of this document.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources for the proposed Natomas Levee Improvement project, Sacramento and Sutter Counties.

Native American Contacts
Sacramento and Sutter Counties
June 19, 2007

United Auburn Indian Community of the Auburn
Tribal Preservation Committe
575 Menlo Drive, Suite 2 Maidu
Rocklin , CA 95765 Miwok
916 663-3720
916 663-3727 - Fax

This list is current only as of the date of this document.

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EDAW | AECOM

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

United Auburn Indian Community of the Auburn
Tribal Preservation Committee
575 Menlo Drive, Suite 2
Rocklin, CA 95765

Subject: Natomas Levee Improvement Project(s)

To Whom It May Concern:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

We would appreciate your help in identifying any concerns you or your community may have regarding any cultural resources in the study area. Please return the enclosed response form. Returning this form does not imply that you approve or disapprove of the study, nor does it limit your opportunity to comment at a later time. Efforts to address your concerns will be included in the planning process.

In order to incorporate your concerns and/or input in any forthcoming reports, we would appreciate receiving your comments by July 10th.

If you have questions, please contact me at (916) 414-5800.

Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW | AECOM

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

United Auburn Indian Community of the Auburn
Jessica Tavares, Chairperson
575 Menlo Drive, Suite 2
Rocklin, CA 95765

Subject: Natomas Levee Improvement Project(s)

Dear Ms. Tavares:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

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Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW | AECOM

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Strawberry Valley Rancheria
Robert Kerfoot
P.O. Box 667
Marysville, CA 95901

Subject: Natomas Levee Improvement Project(s)

Dear Mr. Kerfoot:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

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Senior Archaeologist

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EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Strawberry Valley Rancheria
Calvine Rose, Chairperson
P.O. Box 667
Marysville, CA 95901

Subject: Natomas Levee Improvement Project(s)

Dear Mr. Rose:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

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Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW | AECOM

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Single Springs Band of Miwok Indians
Nicholas Fonseca, Chairperson
P.O. Box 1340
Shingle Springs, CA 95682

Subject: Natomas Levee Improvement Project(s)

Dear Mr. Fonseca:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

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Senior Archaeologist

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EDAW | AECOM

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Shingle Springs Band of Miwok Indians
Jeff Murray, Cultural Resources Manager
P.O. Box 1340
Shingle Springs, CA 95682

Subject: Natomas Levee Improvement Project(s)

Dear Mr. Murray:

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If you have questions, please contact me at (916) 414-5800.

Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW | AECOM

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Enterprise Rancheria of Maidu Indians
Glenda Nelson, Chairperson
1940 Feather River Blvd., Suite B
Oroville, CA 95965

Subject: Natomas Levee Improvement Project(s)

Dear Ms. Nelson:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

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Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW | AECOM

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916 414.5850 www.edaw.com

June 21, 2007

Enterprise Rancheria of Maidu Indians
Frank Watson, Vice Chairperson
1940 Feather River Blvd., Suite B
Oroville, CA 95965

Subject: Natomas Levee Improvement Project(s)

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EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

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Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW | AECOM

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Rose Enos
15310 Bancroft Road
Auburn, CA 95603

Subject: Natomas Levee Improvement Project(s)

Dear Ms. Enos:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

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Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW

Project Name: 05110058.01
Project Number: SAFCA/N. NATOMAS LEVEE

Telephone Contact Report

CONFIDENTIAL

Call Participants:	LBH – ROSE ENOS	Title:	? – MAIDU/WASHOE CONTACT
Initiated By:	LBH	Organization:	(SEE ABOVE)
Phone Number:	530-878-2378	Location:	EDAW SAC
Subject:	SAFCA, NATOMAS C.C. LEVEE	Date/Time:	7-9-07 12:30

Discussion Item(s):

- CONCERN IS BURIAL SITE AVOIDANCE
- WOULD LIKE ANY INFORMATION CONCERNING ANY FURTHER WORK CONCERNING SUCH SITES

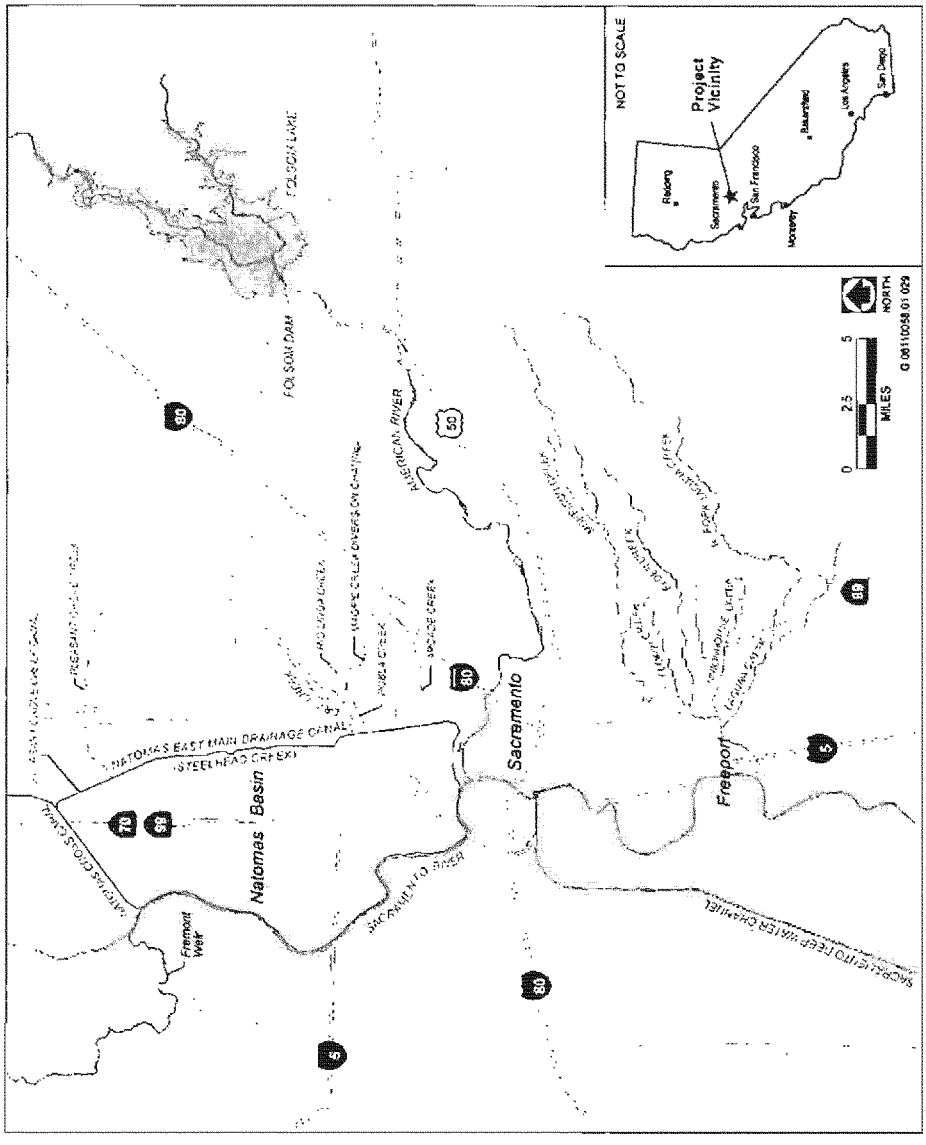
Action Item(s):

Distribution:

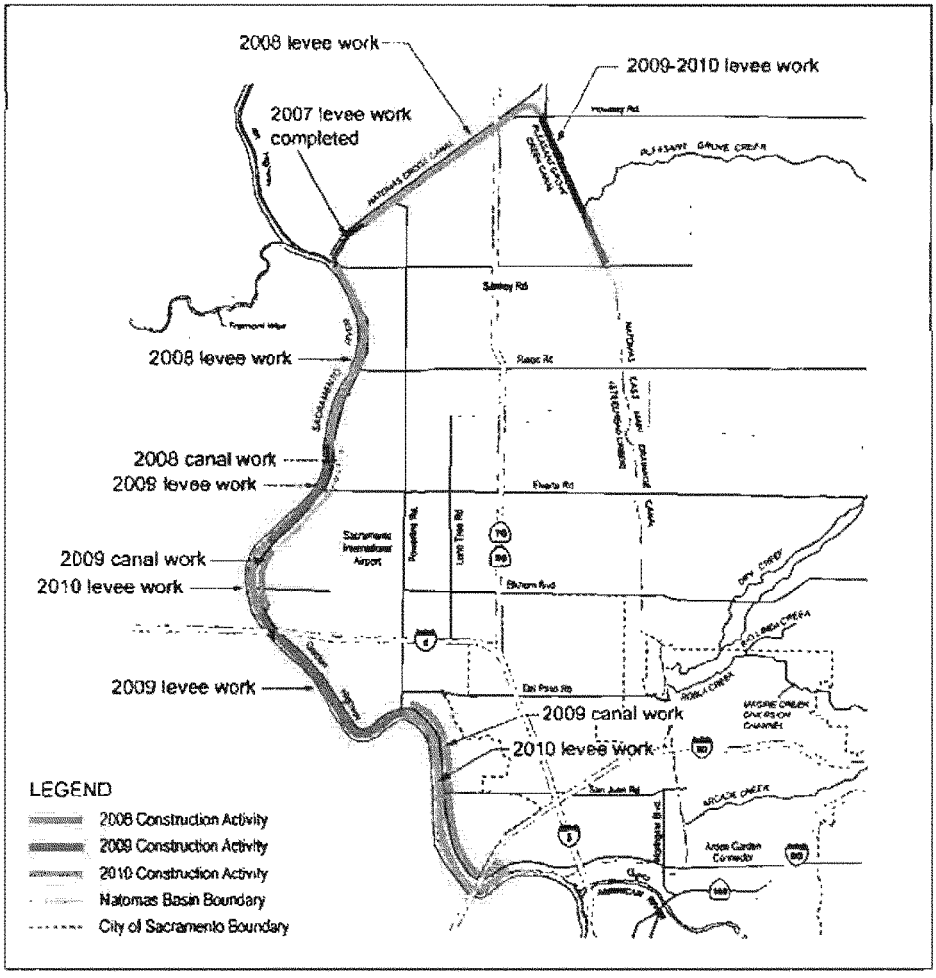
This phone note may contain confidential and proprietary information. It is intended for use by EDAW, Inc., its clients, vendors, and other associates.

ENCLOSURE 4

PROGRAMMATIC AGREEMENT
NATOMAS LEVEE IMPROVEMENT PROJECT



Enclosure 1: Project Location



Enclosure 2: Project Construction by Phase

ENCLOSURE 3

PROJECT SUMMARY

ENCLOSURE 3

DESCRIPTION OF THE SACRAMENTO AREA FLOOD CONTROL AGENCY'S NATOMAS LEVEE IMPROVEMENT PROGRAM LANDSIDE IMPROVEMENTS PROJECT

PURPOSE AND NEED

PROJECT OVERVIEW

The Natomas Levee Improvement Program (NLIP) Landside Improvements Project proposed by the Sacramento Area Flood Control Agency (SAFCA) is intended to provide urgently needed flood control system improvements to the Natomas Basin in southern Sutter and northern Sacramento Counties, California (Exhibit 1). The project would improve the levee system that protects the 53,000-acre Natomas Basin, including a portion of the city of Sacramento. The Natomas Basin is bounded by leveed reaches of the Natomas Cross Canal (NCC) on the north, the Sacramento River on the west, the American River on the south, and the Pleasant Grove Creek Canal (PGCC) and Natomas East Main Drainage Canal (NEMDC)/Steelhead Creek on the east (Exhibit 1).

SAFCA's intent is to provide the Natomas Basin with at least a 100-year level of flood protection by the end of 2010 and a "200-year" level of protection by the end of 2012. Achievement of these aims would significantly reduce the risk of an uncontrolled flood in the Natomas Basin that would result in a catastrophic loss of property (estimated at $7 billion) and a prolonged interruption of commercial activity, including the operation of Sacramento International Airport (Airport) and closure of Interstate 5 (I-5) and State Route (SR) 99/70. Flooding is particularly hazardous in a heavily urbanized basin like Natomas because of the depths that floodwaters can reach—more than 10 feet in some areas.

DEFICIENCIES OF THE NATOMAS LEVEE SYSTEM AND PROPOSED REMEDIES

Approximately 26 miles of the NCC south levee, the Sacramento River east levee, and the PGCC west levee require one or more forms of remediation to address the potential for failure in a 100-year or "200-year" flood event, as follows:

- Inadequate freeboard—The NCC south levee and portions of the Sacramento River east levee must be raised to provide at least 3 feet of freeboard above the 100-year water surface elevation, and several reaches of the Sacramento River east levee must be raised to provide 3 feet of freeboard above the "200-year" design water surface elevation.

- Underseepage and through-seepage vulnerability—Most of these same reaches do not meet recently adopted federal criteria for safely containing underseepage and through-seepage when the water surface in the adjacent channel reaches the 100-year elevation or, in some cases, the "200-year" elevation.

Underseepage problems can occur where levees are constructed on low-permeability foundation soil (silt and clay) underlain by a layer of higher permeability (sand and gravel). Excessive underseepage makes the levee susceptible to failure during periods of high river stage. Under these conditions, seepage travels horizontally under the levee and then is forced vertically upward through the low-permeability foundation layer, often referred to as a "blanket." Failure of the blanket can occur either by uplift, a condition in which the blanket does not have enough weight to resist the confined pressure acting on the bottom of the blanket, or by piping (internal erosion) caused by water flowing under high vertical gradients through the erodible blanket and carrying fine soil particles out of the foundation materials. Through-seepage is seepage through a levee embankment that can occur during

periods of high river stage. Depending on the duration of high water and the permeability of embankment soil, seepage may exit the landside face of the levee. Seepage can also pass directly through pervious layers in the levee if such layers are present. Under these conditions, the stability of the landside levee slope may be reduced.

The project encompasses addressing freeboard deficiencies through levee raises; addressing seepage potential using a combination of seepage berms, cutoff walls, and relief wells; and acquiring additional right-of-way to construct the improvements and to prevent encroachment into the flood control system. In addition, the project has been designed to include an enlarged levee embankment (adjacent setback levee) along the land side of the existing Sacramento River east levee to preclude the need for substantial removal of vegetation and structural encroachments on the water side of this levee in compliance with U.S. Army Corps of Engineers (Corps) guidance. These improvements would include recontouring the levee slopes where necessary.

The following subsections summarize the methods to address freeboard deficiencies and seepage potential, which will be used in various combinations on the NCC south levee, Sacramento River east levee, and the PGCC west levee.

Levee Raises

The freeboard increases would be accomplished through raises of the existing NCC south levee or through construction of the raised adjacent setback levee adjacent to the existing Sacramento River east levee:

- Raise of existing levee (NCC south levee). A full levee raise is required for the NCC south levee, consisting of an embankment raise from the landside or waterside toe (or both) upward to the increased levee crown elevation. This requires partially excavating the levee slope to provide a working platform for equipment, typically 10 feet wide, and rebuilding the levee to the appropriate elevation by benching the new embankment material into the existing embankment material.

- Adjacent setback levee (Sacramento River east levee). The levee raise of the Sacramento River east levee would be accomplished through the construction of an "adjacent setback levee" adjoining the Sacramento River east levee. The adjacent setback levee would be constructed with a crown elevation 3 feet above the "200-year" water surface profile. In the upper reaches, where the existing levee has freeboard deficiencies of as much as 3 feet, the crown of the adjacent setback levee would be higher than the existing levee and Garden Highway roadway. In the lower reaches, where the existing levee has sufficient freeboard, the adjacent setback levee would be the same height as the existing levee.

Seepage Berms

Seepage berms are wide embankments placed outward from the landside toe of the levee to lengthen the underseepage path, thereby lowering, to acceptable levels, the erosive potential of seepage passing through permeable layers under the levees. Seepage berms typically extend 100 to 400 feet from the levee. The berm thickness depends on the severity of the seepage pressure, but generally berms are 5 feet thick near the landside toe and taper to a thickness of 3 feet at the prescribed distance from the toe. A seepage collection ditch is often constructed at the landward toe of all seepage berms. Seepage berms are planned for construction along portions of the Sacramento River east levee and the PGCC west levee.

Cutoff Walls

Conventional slurry cutoff walls are typically constructed using an excavator with a long-stick boom capable of digging a trench to the maximum required depth. Bentonite slurry is pumped into the trench during trench excavation to prevent caving. The soil, cement, and bentonite are mixed to achieve the required cutoff wall strength and permeability, and the mixture is backfilled into the trench. Select fill is used to rebuild the levee. The NLIP includes construction of cutoff walls along portions of the NCC south levee and the Sacramento east levee. Cutoff wall construction may also be required in some areas along the PGCC west levee.

For the NCC south levee, preparation for construction of the cutoff wall would begin with using scrapers (or other suitable equipment, depending on the slope) to clear and grub/strip the surface to a depth of 2 inches to remove low-growing vegetation, loose stone, and surface soils. The aggregate base from the operating road also would be removed and stockpiled for later reuse. Waste material would be hauled to an off-site location.

Construction of the cutoff wall would include degrading the existing levee to a depth equal to one-half its total height (approximately 9 feet). A 70-foot-deep cutoff wall would be constructed for the total length of 23,150 lineal feet, with the method of installation at the contractor's discretion. Material degraded to support cutoff wall construction would be compacted at the landside toe of the levee to support raising portions of the NCC south levee. Unsuitable material generated from cutoff wall construction would be disposed of off-site. Equipment that would be used in phases of the cutoff wall construction includes excavators, scrapers, loaders, bulldozers, rollers, haul trucks, water trucks, hydroseeding trucks, pickup trucks, slurry pumps, and generators.

Work on the Sacramento River east levee includes construction of an adjacent levee with construction of a cutoff wall to occur in several reaches of the adjacent levee. Borrow material would be excavated from several locations in the project area and would be delivered to the levee construction sites by scrapers or haul trucks where it would be spread by motor graders and compacted by sheepsfoot rollers to build the adjacent levee up to a height equal to about two-thirds of the height of the existing levee. This would create a working platform for cutoff wall installation using an excavator with a long-stick boom capable of digging a trench to a maximum depth of approximately 80 feet. Bentonite slurry would be pumped into the trench during excavation to prevent caving. The soil excavated from the trench would be mixed with bentonite and backfilled into the trench to create the cutoff wall.

Relief Wells

Relief wells provide protection against levee underseepage by providing a path for underseepage to exit to the ground surface at the landside toe of the levee without creating sand boils or piping levee foundation materials. Relief wells are an option for addressing underseepage in reaches where continuous sand and gravel layers have been identified by the geotechnical analysis.

Relief wells are constructed near the levee landside toe to provide pressure relief beneath surficial fine-grained soils. The wells are constructed using soil boring equipment to bore a hole vertically through the fine-grained blanket layer and into the coarse-grained aquifer layer beneath. Pipe casings and filters are installed to allow the pressurized water to flow to the ground surface, thereby relieving the pressures beneath the clay blanket. Relief wells either may discharge onto open ground or may require conveyance to a stormwater drainage system or a pump station. Relief wells cause the least amount of construction disturbance but require routine maintenance of the wells themselves and the drainage and pumping facilities necessary to support them.

EXISTING PROJECT FACILITIES AND POTENTIAL BORROW SITES

All project construction activities would take place within the Natomas Basin, except for the development of a borrow site on Reclamation District (RD) 1001 land northeast of the basin (Exhibit 2). The following sections describe the existing flood control facilities, their general setting, and adjacent irrigation infrastructure and the potential borrow sources. These features, as well as the borrow locations, constitute the physical infrastructure and locations where the project may result in effects on historic properties.

Flood Control and Irrigation Facilities

Natomas Cross Canal South Levee

The NCC is a 5.3-mile-long channel that carries water from several tributary watersheds in western Placer County and eastern Sutter County to the Sacramento River. The NCC begins at the PGCC and East Side Canal and extends southwest to its confluence with the Sacramento River near the Sankey Road/Garden Highway

intersection. During periods of flooding, the Sutter Bypass, Sacramento River, and NCC all contribute to raised water elevations that can affect the NCC levees. For engineering purposes, the levee is divided into seven reaches. Much of the south levee contains an existing stability berm with an internal drainage system. An approximately 80- to 100-foot maintenance access area extends along the land side of the levee through most of the NCC's length.

Farms and rural residences are located on both sides of the NCC, with rice the primary crop under cultivation. The Lucich North and Frazer Habitat Preserves, maintained by The Natomas Basin Conservancy (TNBC), lie south of the NCC south levee from the eastern end of Reach 2 through the western end of Reach 6. A drainage canal, referred to as the Vestal Drain, runs parallel to the NCC south levee through much of Reach 2, approximately 100 feet from the landside levee toe. A private irrigation pump and irrigation canal are located at the landside levee toe in Reach 1. Natomas Central Mutual Water Company's (NMWC's) Bennett Pumping Plant and RD 1000's Pumping Plant No. 4 are located in Reach 2, and the NMWC Northern Pumping Plant is located in Reach 3. NMWC's North Main Canal runs parallel to the levee through Reaches 4 and 5, approximately 100 feet from the landside levee toe.

Sacramento River East Levee

An 18-mile-long section of the east levee of the Sacramento River protects the west side of the Natomas Basin between the NCC and the American River. For planning purposes, the levee is divided into 20 reaches. The Garden Highway is located on top of the levee crown within all 20 reaches. A drained, 10-foot-wide stability berm is present on the landside slope of the levee between the NCC and Powerline Road (Reaches 1–12). Cutoff walls were previously constructed through the levee in Reaches 12–20.

The land uses along the levee vary from north to south. Along the land side, Reaches 1–13 are bordered mainly by private agricultural lands containing a few rural residences, Airport bufferlands, and two farmed TNBC parcels. Teal Bend Golf Club is west of the Airport, adjacent to the levee along Reach 6. The parcels bordering Reaches 14–18 contain more residences, several rural estates, and three TNBC parcels. The land side of Reaches 19 and 20 is bordered by residential subdivisions, a business park, and City parklands.

Several irrigation canals, pipelines, wells, and pump stations exist along the Sacramento River east levee. The Elkhorn Canal and the Riverside Canal are key agricultural irrigation canals in the NMWC system. The Elkhorn Canal runs parallel to the Sacramento River east levee from the North Drainage Canal in Reach 4B through Reach 8 and into the start of Reach 9 (1,250 feet south of Elkhorn Boulevard). The Riverside Canal extends from just north of Reach 13 to the middle of Reach 19. Several lateral canals connect to the Elkhorn and Riverside Canals. These canals have earthen embankments with side slopes that are nearly vertical, requiring regular maintenance. Both canals are supplied by pumping plants on the Sacramento River.

In addition to the NMWC irrigation systems, there are several landowner-operated systems along the levee. These facilities are located primarily in Reaches 1–4A and 9–12, in areas not currently served by the NMWC systems. The areas are serviced by either well pumps on the land side or river pumps, which discharge into buried pipelines, small irrigation ditches, or directly onto fields. The distribution systems run along the landside toe of the levee to supply fields that slope away from the levee.

Several drainage pumping plants are operated by RD 1000 along the Sacramento River east levee. These facilities pump drain water from the main drainage canal system into the river. They include Pumping Plant No. 2, located in Reach 4B; Pumping Plant No. 5, located in Reach 10; Pumping Plant No. 3, located in Reach 13; and Pumping Plant No. 1, located in Reach 20A. Pumping Plant No. 2 was temporarily removed as part of an emergency levee repair in 2006 and would be replaced as an element of the project in 2009–2010. In addition to these RD 1000 pumping stations, the City of Sacramento operates the Willow Creek drainage pumping station which is located in Reach 19B.

Pleasant Grove Creek Canal West Levee

The PGCC west levee extends southerly from the east end of the NCC south levee to the north end of the NEMDC/Steelhead Creek levee near the Sankey Road crossing. The PGCC west levee protects the Natomas Basin from flood flows from Pleasant Grove Creek and other creeks in western Placer County, as well as from water that backs up in the NCC during high river stages in the Sacramento River. Natomas Road is located on top of the levee crown. No berms support this levee. A private canal extends parallel to the PGCC west levee for about 1,500 feet at the landside levee toe. Farms and scattered rural residences are located on the land side of the PGCC west levee, and a manufacturing facility and a railroad siding are located within several hundred feet of the levee, just south of Sankey Road.

Borrow Sites

Borrow sites are areas from which earthen materials would be removed for use in construction. The sites would be recontoured and developed as either managed marsh or grassland habitat following excavation for this use. Where borrow sites would be used over more than one construction season, the work would progress in cells that would be incrementally developed as habitat as the borrow activities are completed.

SAFCA has identified borrow sources for the project in 2008, 2009, and 2010 flood control and irrigation infrastructure improvements and redundant sources that may be pursued if negotiations regarding the preferred sources are unsuccessful or additional quantities are found to be needed during construction:

- Brookfield property (2008 preferred, 2009 preferred, 2010 preferred)
- Airport bufferlands north of the Airport complex (2008 preferred, 2009 preferred, 2010 potential)
- Fisherman's Lake area (2010 preferred) (no specific parcels identified for this borrow site)
- RD 1001 (2008 potential, 2009–2010 potential)

Except for the Fisherman's Lake area in the southern part of the Natomas Basin, these borrow areas are shown in Exhibit 3.

DESCRIPTION OF PROJECT ELEMENTS AND ACTIVITIES

The elements of the project are described in this section in four broad, overlapping categories:

- levee raising and seepage remediation,
- improvements to major irrigation and drainage infrastructure,
- habitat development and management, and
- additional actions to meet Federal Emergency Management Agency (FEMA) requirements: encroachment management and bridge crossing modifications.

Expanding the landside footprint of the Sacramento River east levee necessitates redesigning and relocating the irrigation and drainage infrastructure currently located along the landside toe of the levee. Relocation of other major and minor irrigation and drainage canals located near the NCC south levee and the PGCC west levee will be necessary with implementation of levee improvements. Modifications to the existing irrigation and drainage systems will include creation of a new canal designed to provide giant garter snake (GGS) habitat and improved stormwater drainage west of the Airport (GGS/Drainage Canal).

Site preparation would entail removing trees and other large vegetation from the construction area and stripping the top 6 inches of material from the landside slope of the existing levee, the footprint of the adjacent setback levee, the seepage berm areas, and the 50-foot-wide permanent maintenance access corridor. Large roots and

deleterious material would then be grubbed from the working area. To the extent feasible, trees that must be removed from within the footprint of the adjacent setback levee or berms would be relocated outside of the footprint to new woodland planting areas, where a substantial number of new trees would also be planted. Excess earth materials (organic soils, roots, and grass from borrow areas and the adjacent levee foundation and excavated material that does not meet levee embankment criteria) would be used in the reclamation of borrow areas or hauled off-site to landfills. Cleared vegetation (i.e., trees, brush) would be hauled off-site to landfills. After construction, the levee slopes and any previously vegetated areas disturbed during construction, including staging areas, would be seeded with a grass mix.

The major project elements and related activities are summarized in Table 1.

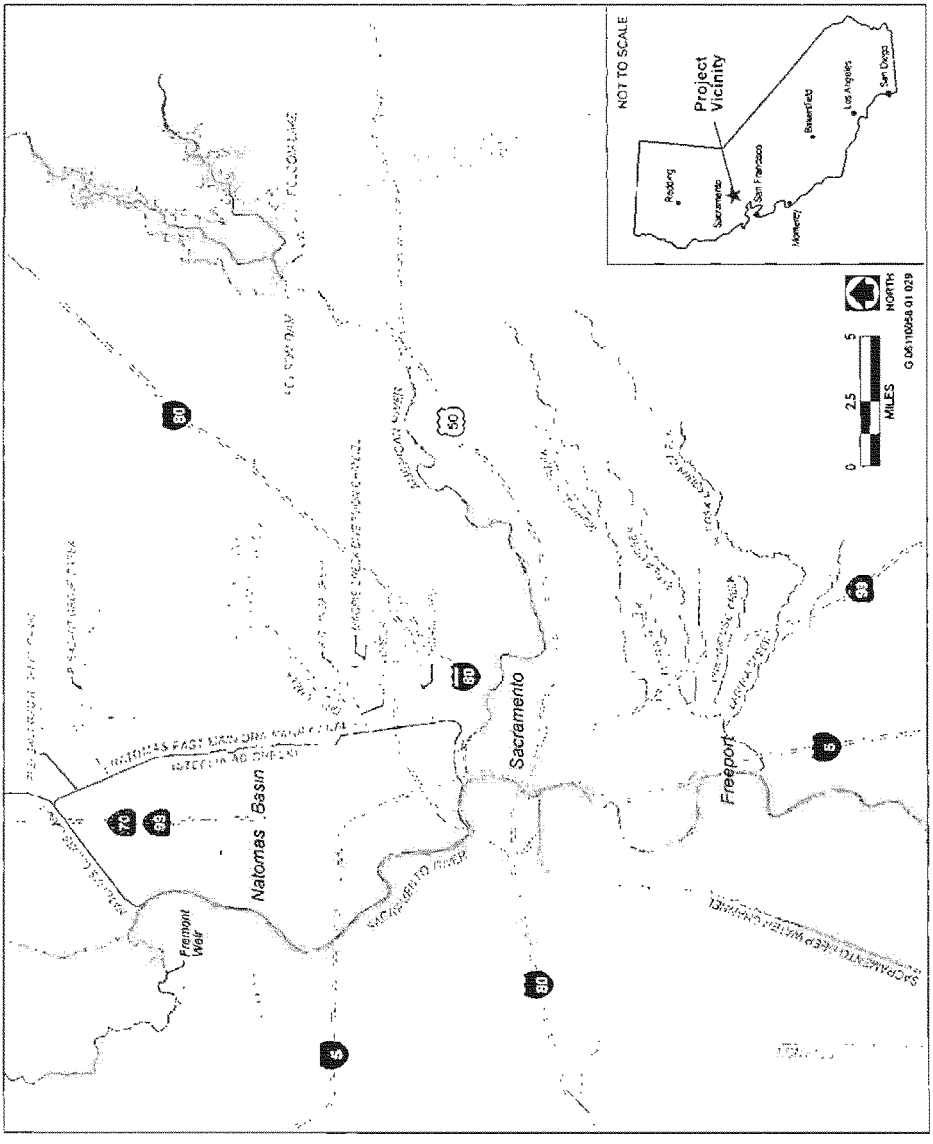
Table 1
Summary of the Major Elements of the Project

Project Element	Project Activity and Timing
2008 Construction	
Levee raising and seepage remediation: NCC south levee	Raise and realign the NCC south levee to provide additional freeboard and more stable waterside and landside slopes and to reduce the need for removal of waterside vegetation. (May 8–November 1, 2008) Construct a seepage cutoff wall through the levee crown in Reaches 3–7. (May 8–October 15, 2008)
Levee raising and seepage remediation: Sacramento River east levee (adjacent setback levee)	Construct a raised adjacent setback levee from the NCC to just south of the North Drainage Canal (Reaches 1–4B, except Stations 55+00 to 68+00 in Reach 2) with a 100-foot seepage berm in Reach 4A and a 300-foot seepage berm in Reach 4B. (May 1–November 1, 2008)
Improvements to major irrigation and drainage infrastructure	Construct a new canal designed to provide drainage and associated giant garter snake habitat (the GGS/Drainage Canal) between the North Drainage Canal and Elkhorn Reservoir. (May 1–November 1, 2008) Relocate the Elkhorn Canal (highline irrigation canal) between the North Drainage Canal and Elkhorn Reservoir in anticipation of the filling of the existing Elkhorn Canal at the toe of the Sacramento River east levee in late 2008 and in 2009. (May 1–November 1, 2008) Remove a deep culvert at the location of Pumping Plant No. 2. (May 1–November 1, 2008)
Habitat creation and management	Establish vegetative habitat features in the new GGS/Drainage Canal. (Fall 2008) Recontour and create managed marsh and grassland on lands used as borrow sources. (Fall 2008 or spring 2009) Establish grassland on the adjacent setback levee slopes and seepage berms. (August 1–December 31, 2008) Install woodland plantings to offset the loss of portions of tree groves in the landside levee footprint. (Fall 2008)
Right-of-way acquisition	Acquire right-of-way through fee title or easement interest within the footprint of the project features, at the borrow sites and along the flood control system. (Before construction)
2009–2010 Construction	
Levee raising and seepage remediation: Sacramento River east levee (adjacent setback levee)	Construct an adjacent setback levee along Stations 55+00 to 68+00 in Reach 2 and from just south of the North Drainage Canal to the American River north levee (Reaches 5A–20B), raised where needed to provide adequate freeboard, with seepage berms, relief wells, and cutoff walls for seepage remediation as required (specific seepage remediation measures are still under study). (May 1–November 1, 2009, and May 1–November 1, 2010)
Seepage remediation: PGCC west	Flatten waterside and landside slopes, and construct seepage berms along the PGCC west levee (specific berm widths and potential use of cutoff walls in some areas to be

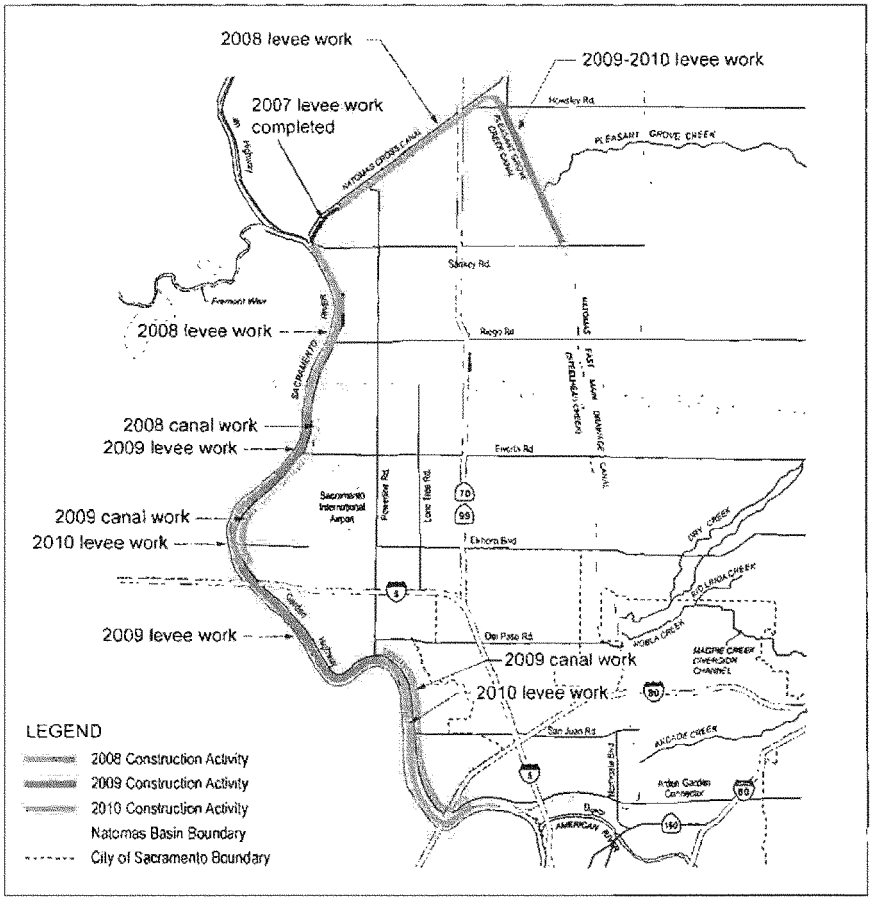
Table 1
Summary of the Major Elements of the Project

Project Element	Project Activity and Timing
levee	determined). (May 1–November 1, 2010)
Improvements to major irrigation and drainage infrastructure	Construct the new GGS/Drainage Canal between Elkhorn Reservoir and the West Drainage Canal (specific alignment to be determined), and improve the West Drainage Canal to provide enhanced giant garter snake habitat. (May 1–November 1, 2009) Implement Airport West Ditch improvements in connection with construction of the GGS/Drainage Canal to allow the Airport to decommission the agricultural irrigation function of this facility and eliminate the hazards currently associated with it. The Airport stormwater detention function provided by this ditch would continue. The ditch would therefore be recontoured as a gently sloping swale to facilitate periodic maintenance such as mowing. (May 1–November 1, 2009) Relocate the Riverside Canal and the Elkhorn Canal downstream of Elkhorn Reservoir (specific alignments to be determined) and fill the existing canals. (May 1–November 1, 2009) Construct RD 1000 Pumping Plant No. 2. (April 1, 2009–September 1, 2010)
Habitat creation and management	Establish habitat enhancements in the new GGS/Drainage Canal and improved West Drainage Canal. (Fall 2009) Recontour and create marsh and managed grassland on lands used as borrow sources. (Fall or spring after borrow excavation in 2009 and 2010) Establish grassland on the adjacent setback levee slopes and seepage berms. (Fall after construction in 2009 and 2010) Install woodland plantings to offset the loss of portions of tree groves in the landside levee footprint (locations to be determined). (Fall 2009 and 2010)
Additional actions to meet FEMA requirements: encroachment management on the Sacramento River east levee, and bridge crossing modifications at the NCC	Remove encroachments from a portion of the water side and land side of the Sacramento River east levee as needed to ensure that the levee can be certified as meeting the minimum requirements of the NFIP and USACE design criteria (specific criteria still under discussion). (Timing to be determined) Modify the SR 99/70 crossing of the NCC as needed to meet FEMA requirements. (Timing to be determined)
Right-of-way acquisition	Acquire right-of-way through fee title or easement interest within the footprint of the project features, at the borrow sites and along the flood control system. (Before construction)

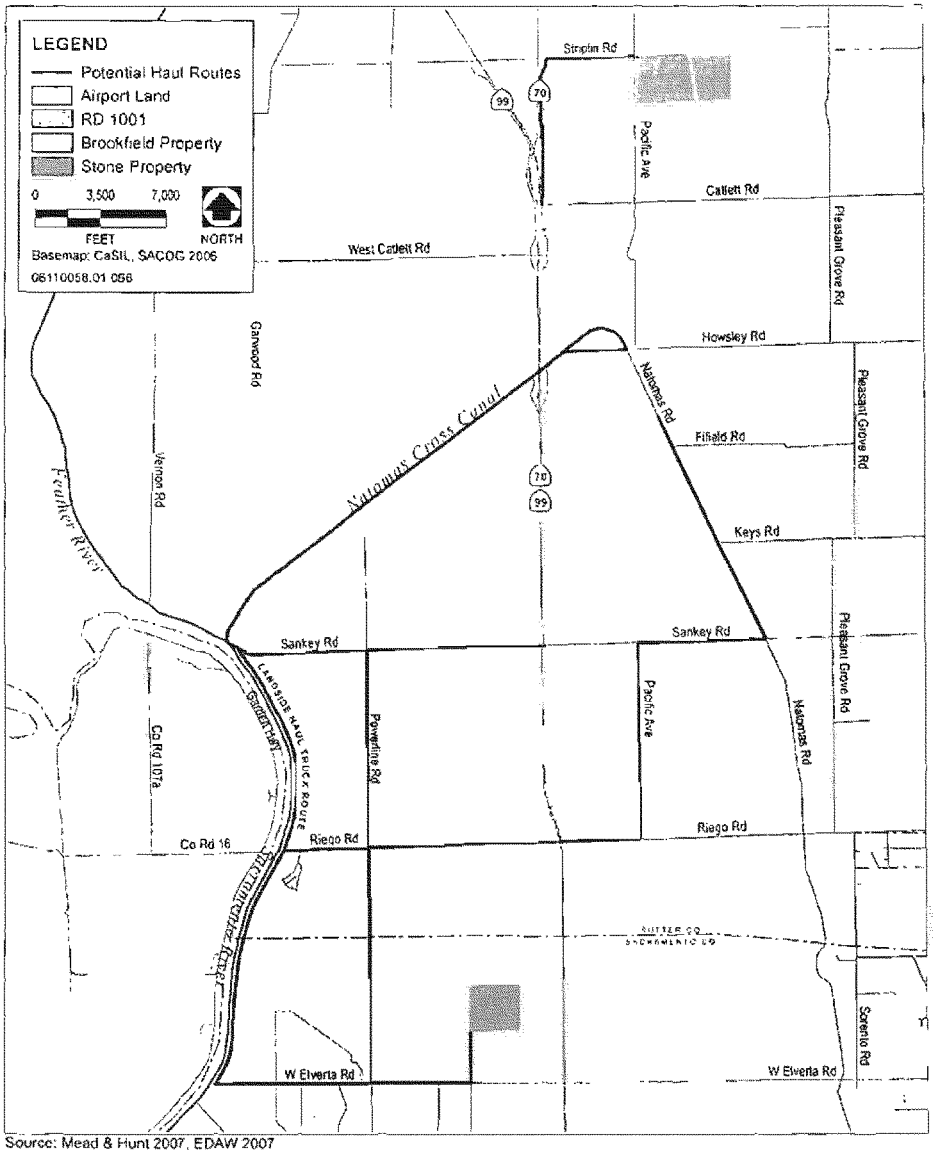
Notes: Airport = Sacramento International Airport; Elkhorn Canal = Elkhorn Main Irrigation Canal; FEMA = Federal Emergency Management Agency; GGS = Giant Garter Snake; NCC = Natomas Cross Canal; NFIP = National Flood Insurance Program; PGCC = Pleasant Grove Creek Canal; RD = Reclamation District; Riverside Canal = Riverside Main Irrigation Canal; SR = State Route; USACE = U.S. Army Corps of Engineers



Project Location **Exhibit 1**



Project Construction By Phase **Exhibit 2**



Source: Mead & Hunt 2007, EDAW 2007

Anticipated Borrow Areas and Local Haul Routes **Exhibit 3**

ENCLOSURE 4

PROGRAMMATIC AGREEMENT
NATOMAS LEVEE IMPROVEMENT PROJECT

PROGRAMMATIC AGREEMENT AMONG THE U.S. ARMY CORPS OF ENGINEERS, THE SACRAMENTO AREA FLOOD CONTROL AGENCY, AND THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER

REGARDING THE ISSUANCE OF PERMISSION UNDER THE AUTHORITY OF SECTION 408 OF THE RIVERS AND HARBORS ACT OF 1899 AND SECTION 404 OF THE CLEAN WATER ACT FOR THE NATOMAS LEVEE IMPROVEMENT PROGRAM, LANDSIDE IMPROVEMENTS PROJECT

WHEREAS, the U.S. Army Corps of Engineers, Sacramento District (Corps) proposes to review an application that seeks permission for alteration of flood control structures under the authority of Section 408 of the Rivers and Harbors Act and to issue one or more permits to discharge fill to the waters of the United States under the authority of Section 404 of the Clean Water Act to the Sacramento Area Flood Control Agency (SAFCA) for the Natomas Levee Improvement Program Landside Improvements Project (Project); and

WHEREAS, The Corps has determined that the issuance of these permissions and permits constitute an undertaking per 36 CFR 800.16(y), which require compliance with Section 106 of the National Historic Preservation Act (NHPA) of 1966 as amended (16 U.S.C. 470f); and

WHEREAS the Project includes improvements to an extensive levee system surrounding the Natomas Basin and landscape and irrigation/drainage infrastructure modifications that will be implemented in three construction phases, currently scheduled for 2008, 2009, and 2010; and

WHEREAS, the Corps has determined that this undertaking will have an adverse effect on at least one Historic Property that has been determined eligible for inclusion in the National Register of Historic Places (NRHP), CA-SAC-485/H; and

WHEREAS, because of the complex and phased nature of the improvements, the Corps has not yet determined the exact area of potential effects (APE), nor has SAFCA acquired all of the rights-of-entry, easements and ownership interests that would allow a complete inventory and determination of effects on Historic Properties; and

WHEREAS, the Natomas Basin is sensitive for buried archaeological resources that cannot be accurately located prior to construction; and such buried sites may also be Historic Properties, and therefore SAFCA and the Corps need to document a framework for managing post-review discoveries per 36 CFR Section 800.13, including evaluation of those resources, assessment of effects, and resolution of potential adverse effects; and

WHEREAS, at such time as any unevaluated cultural resource may be discovered, it may require archaeological data recovery and/or other historic preservation activities, in compliance with Section 106 of the National Historic Preservation Act, concurrent with *active* construction; and

WHEREAS, the urgency of flood control improvements require a management framework for Historic Properties that will be implemented after the execution of this agreement in an expedited manner that thus departs from the process normally used under 36 CFR Section 800 et seq., yet still fulfills the requirements of Section 106 of the NHPA; and

WHEREAS, SAFCA has been invited to participate as a signatory to this Programmatic Agreement (PA) by the Corps and the California State Historic Preservation Officer (SHPO; and

WHEREAS, the Corps has consulted The Ione Band of Miwok Indians, the Shingle Springs Band of Miwok Indians and the United Auburn Indian Community, and they have been invited to concur in this PA; and

WHEREAS, the Corps shall make the terms and conditions of this PA as part of the conditions of any permissions and permits issued by the Corps for this project; and

WHEREAS, The Central Valley Flood Protection Board has delegated all authority for SAFCA to comply with the terms of this agreement on its behalf; and

WHEREAS, the Corps has consulted with the SHPO and the Council in accordance with regulations implementing Section 106 of the NHPA;

WHEREAS, the Council has been consulted and declined to participate in this agreement;

NOW, THEREFORE, the Corps, the SHPO, and SAFCA agree that the Project shall be implemented in accordance with the following stipulations in order to take into account the effects of the undertaking on Historic Properties.

The Corps shall ensure that the following stipulations of this PA are carried out.

STIPULATIONS

I. DEFINITIONS

The terms used in this Programmatic Agreement shall be as defined in regulations implementing Section 106 of the NHPA, and as follows:

"APE (Area of Potential Effect)" means any location at which any Project development activity will be constructed; and locations of any Project-related construction staging areas, borrow areas, and materials stockpile areas; and the locations of any other Project development activities. The APE shall be defined so as to include the maximum spatial dimensions of all Project-related construction and operations rights-of-way, easements, areas which potentially may be affected by Project activities, and other properties to which SAFCA has access, whether on a temporary or permanent basis, or ownership for Project development.

"Concurring parties" means their concurrence indicates that they are in agreement with the terms of the PA.

"Consulting parties" means the Corps, the SHPO, and SAFCA who are signatories to this PA. Only signatories have the authority to amend or terminate this PA.

"Cultural resources" means any property or location that was created, modified, or used by people at least 50 years in the past. Cultural resources include but are not limited to Historic Properties and traditional cultural properties/places (i.e., NRHP listed or eligible properties as defined at 36 CFR Part 60).

"**Historic Property**" means a cultural resource that has been determined eligible for or is listed on the NRHP (i.e., NRHP listed or eligible properties as defined at 36 CFR Part 60), either by formal nomination and listing or by concurrence between federal agencies and the SHPO.

"**Historic preservation**" means any activity conducted in accordance with the NHPA and its implementing regulations to, among other things, inventory, evaluate, manage, or treat cultural resources such as buildings, structures, sites, districts, and objects eligible for, or that may be determined eligible for, listing in the NRHP according to eligibility criteria at 36 CFR Part 60.

"**Project development activities**" means any physical action related to the Project that has the potential to damage or otherwise alter those characteristics of Historic Properties that would make them eligible for listing in the NRHP.

II. STANDARDS

(A.) Professional Qualifications. All technical work required for historic preservation activities implemented pursuant to this Programmatic Agreement shall be carried out by or under the direct supervision of a person or persons meeting at a minimum the *Secretary of Interior's Professional Qualifications Standards* for archaeology or history, as appropriate (48 FR 44739). "Technical work" here means all efforts to inventory, evaluate, and perform subsequent treatment such as data recovery excavation or recordation that is required under this Programmatic Agreement. This stipulation shall not be construed to limit peer review, guidance, or editing of documents by SAFCA or SAFCA's consultants.

(B.) Historic Preservation Standards. Historic preservation activities carried out pursuant to this Programmatic Agreement shall meet the *Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation* (48 FR 44716-44740) as well as standards and guidelines for historic preservation activities established by the SHPO. The Corps shall ensure that all reports prepared pursuant to this Programmatic Agreement will be provided to the consulting parties and shall ensure that all such reports meet published standards of the California Office of Historic Preservation, specifically, *Preservation Planning Bulletin* Number 4(a), "Archaeological Resources Management Reports (ARMR): Recommended Contents and Format" (December 1989).

III. PROJECT DESCRIPTION

(A) PROJECT Description. A description of the Project is found in the Final Environmental Impact Report (November 2007). A summary of the Project's description in the environmental impact report is provided as **Attachment** A and is made a part of this Programmatic Agreement.

(B) Existing Conditions. An archival search and archaeological survey have been completed for all areas of the APE as currently defined to which SAFCA currently has access, and which currently are not covered by paving, built environment features, or agricultural crops. A report of the results of archival research and archaeological survey, "Cultural Resources Inventory Reports, Part 1 – Natomas Levee Improvement Program Landside Improvements Project, Sacramento and Sutter Counties, California" (October 2007) is made **Attachment B** to this Programmatic Agreement.

A number of prehistoric sites are known to be present along the banks of the Sacramento River. However, archaeological survey of the area is of limited value because the alluvial depositional environment may

obscure and bury sites, leaving no surface manifestation of those archaeological resources. For most of the length of the Project, levees have been built on the riverbanks. These levees are one focus of the Project's activity, and occupy a substantial portion of the Project's APE. Furthermore, it has not been established whether certain known sites in proximity to the Project's development activities extend under the existing levees. The existing levees both obscure ground surfaces and prevent subsurface archaeological testing within their footprints. Because of these conditions, a full assessment of archaeological sites that may be present in the APE cannot be made in advance of construction. There is no definitive information, even for sites known to be in Project's proximity, of site boundaries relative to the APE, or of the significance or integrity of any portions of such sites that may be within the APE. For these reasons, even though archaeological deposits may extend into the APE, and even though some of these deposits may qualify as Historic Properties, it is impossible to develop meaningful site-specific Historic Properties Treatment Plans (HPTP) prior to all construction, or to carry out all necessary data recovery in advance of the Corps' approvals, permitting and construction.

For these reasons, unforeseen discoveries shall be treated pursuant to the provisions of 36 CFR 800.13 (Post-review discoveries).

(C) Project Phasing and Potential Changes to the APE: Because the improvements will occur in three phases (anticipated to be 2008, 2009, and 2010), it will be necessary to define the APE for each phase. The APE for each phase shall be submitted with the cultural resources inventory reports, and shall be consulted upon as part of that document, pursuant to **Stipulation IV**, below.

After the initial concurrence, changes to the APE may be necessary as SAFCA refines its phased Project plans. In particular, the ability of SAFCA to obtain access permissions of private landowners, determination of borrow sites and ongoing negotiations with resource agencies regarding species mitigation requirements may affect final Project's design, and may expand the current APE in some areas. Any changes to the APE shall be made in accordance with subsections D and E (below) of this Stipulation III. The SHPO, Corps, and SAFCA shall consult and reach concurrence in any changes to the APE. The final APE shall account for all Project development activities for the as-built Project. SAFCA shall notify the Corps of any change in the APE and the Corps shall determine the potential for Project development activities in a revised APE to affect cultural resources, through cultural resources inventory and testing as needed.

(1) If there is the potential that cultural resources exist in the revised APE, SAFCA shall submit to the Corps:
   (a) a map of the revised APE; and
   (b) a description of Project development activities to take place in the revised APE; and
   (c) a description of the inventory, nature, location, and known or potential significance of cultural resources in the revised APE; and
   (d) a description of any archaeologically sensitive areas in the revised APE that require monitoring by an archaeologist, and Native American monitor as appropriate; and
   (e) a plan for managing cultural resources in a manner that either avoids Project-related effects to cultural resources, or which mitigates any adverse effects, and which provides for the management of unforeseen cultural resources discoveries.

(2) If no cultural resources are identified within a revised APE, SAFCA shall document such a determination, provide documentation to the Corps and keep such documentation on file at its

principal offices.

After the Corps and SAFCA agree to a revised APE and if such a change has the potential to have an effect on cultural resources, the Corps shall submit the documentation to the SHPO for their review. The SHPO shall have 30 calendar days from the date of receipt of the notice of a revision to the APE to review and to provide in writing either concurrence with or objection to the definition of the revised APE, and any proposed historic preservation activities. Should the SHPO not respond in writing within 30 calendar days, the Corps and SAFCA shall proceed as though the SHPO has concurred in the revised APE, and the proposed historic preservation activities, if any.

Should the SHPO object to the definition of the revised APE or proposed historic preservation activities, the Corps, SAFCA, and the SHPO shall consult for a period not to exceed 15 calendar days following the date of the receipt of the SHPO's written objection in an effort to come to agreement on the issues to which the SHPO has objected. Should the SHPO, the Corps, and SAFCA be unable to agree on the issues to which the SHPO has objected, the consulting parties to this Programmatic Agreement shall proceed in accordance with **Stipulation VIII (Resolving Objections)**, below.

(D) Scope of Identification Efforts in the APE: Inventories of Historic Properties within the established or revised APE shall be completed in accordance with **Stipulation IV (Inventory of Historic Properties)** of this Programmatic Agreement. Treatment of any adverse effects to Historic Properties within the established or revised APE shall be completed in accordance with **Stipulation V (Treatment of Effects)** of this Programmatic Agreement.

(E) Scope of the APE: For purposes of this Programmatic Agreement, a revised APE shall be defined to meet, at a minimum, the following criteria:

(1) The APE for any segment of the Natomas levees that are being improved as part of the Project and shall include the levee segment and a corridor extending not less than 75 feet from the land side toe of the levee segment. The APE also shall include:

- The extent of all Project construction and excavation activity required to construct flood control facilities and to modify irrigation and drainage infrastructure,
- The additional right-of-way/easements obtained by SAFCA as part of the Project's features,
- All areas used for excavation of borrow material and habitat creation, and
- All construction staging areas.

(2) The APE for Project activities shall include the direct footprint of the activity and a reasonable buffer determined by consultation between SAFCA and the Corps, according to the nature of the activity, SAFCA's ownership interest or easement, and the probability that ground-disturbing work may extend beyond the footprint of planned improvements and activities.

(3) The APE for any other type of Project development activities shall be defined by the Corps in consultation with the consulting parties.

IV. INVENTORY OF HISTORIC PROPERTIES

(A) Identification Efforts to Date and Further Work Required: An inventory of Historic Properties

within the APE has been initiated consistent with the *Secretary of Interior's Standards and Guidelines for Archeology and Historic Preservation* (48 FR 44716–44740). The SAFCA shall submit a completed inventory and evaluation for each phase of Project work (2008, 2009, 2010) to the Corps. Such inventory shall be deemed complete by the Corps when the SHPO concurs in the NRHP eligibility recommendation for all cultural resources within the APE for that phase.

Areas of Archaeological Sensitivity: Areas of archaeological sensitivity will be monitored in accordance with HPTPs.

(C) Changes in the APE: If areas are added to the Project development activities subsequent to the SHPO concurrence on the map of the APE for a specific phase, SAFCA shall complete an inventory of Historic Properties within the expanded APE. Such inventory shall be undertaken and completed consistent with the *Secretary of Interior's Standards and Guidelines for Archeology and Historic Preservation* (48 FR 44716–44740). Such inventory shall be deemed completed by the Corps at such time as the SHPO concurs in the NRHP eligibility of all cultural resources within the established and revised APE for the Project, pursuant to this Stipulation IV.

V. TREATMENT OF EFFECTS

(A) Historic Property Treatment Plans: If Historic Properties are identified in cultural resources inventories that would be adversely affected by the Project, SAFCA shall prepare a Historic Properties Treatment Plan (HPTP) for review and written approval by the Corps and the SHPO for those specific properties. An HPTP applicable to every Historic Property that may sustain adverse effects by the Project shall be prepared, including for those Historic Properties found during construction. An HPTP may address individual or multiple Historic Properties. An HPTP shall stipulate those actions SAFCA shall take to resolve the adverse effects of the Project on Historic Properties. SAFCA shall ensure that all provisions of an HPTP are carried out in a timely manner. Any changes to an HPTP shall be reviewed and approved by the Corps. Copies of all reports pertaining to the treatment of Historic Properties shall be submitted to the consulting parties to this Programmatic Agreement. Reports and other data pertaining to the inventory of, and treatment of effects on, Historic Properties may be distributed to concurring parties to this Programmatic Agreement and to other members of the public consistent with **Stipulation VII (Confidentiality)** of this Programmatic Agreement. Individual HPTPs may be submitted simultaneously with the cultural resources inventory report for specific Project phases. If HPTPs are submitted simultaneously with an inventory report for a Project phase or with an addendum to such report for an expanded APE or Project description, the Corps and SHPO review period for such HPTP shall run concurrently with the review period for the inventory report.

Review Schedule: The SHPO and the Corps shall have 30 calendar days to review and comment upon in writing any HPTP submitted by SAFCA. The SHPO and the Corps shall indicate in their review that they find the HPTP either acceptable or not. In the event that comments are not made by the SHPO within 30 calendar days, the Corps shall assume the SHPO has accepted the HPTP as submitted. In the event the Corps and/or the SHPO provide written comment within the 30-day period, either SAFCA shall accept the comments and revise the HPTP accordingly, or SAFCA and the Corps may object to some or all comments. Comments from the Corps or the SHPO that are not acceptable to SAFCA shall be resolved by consultation among the Corps, the SHPO, and SAFCA for a period of not more than 15 calendar days. Should the Corps, the SHPO, and SAFCA be unable to resolve any dispute regarding the Corps or the SHPO comments, the consulting parties shall proceed in accordance with **Stipulation VIII (Resolving**

Objections) of this Programmatic Agreement.

The Corps shall submit to the SHPO for review and comment any amendment, addendum, revision or other change to an HPTP. SAFCA shall proceed to make changes to an HPTP as per the procedure and schedule for the review and approval of an original HPTP. If a Historic Property is discovered within an expanded APE subsequent to an initial inventory effort for a phase, and the Corps and SAFCA agree that the Project may adversely affect the property, SAFCA shall submit an addendum to the HPTP or a new HPTP. The review schedule for this submittal follows the provisions of Stipulation V.

(B) Commencement of Construction and Project Work: Project development activities may commence within the APE after a Historic Properties inventory has been completed (per **Stipulations III and IV**, above), and prior to treatment of adverse effects on Historic Properties within the APE provided that:

(1) A plan to respond to inadvertent archaeological discoveries is prepared by SAFCA and approved by the Corps prior to the commencement of Project activities anywhere in the APE for that phase of the Project; and

(2) Project development activities do not encroach within 30 meters (100 ft) of the known boundaries of any Historic Property as determined from archaeological site record forms, other documentation, or as otherwise defined in consultation with the SHPO; and

(3) An archaeological monitor is present during any Project activities that are anticipated to extend either vertically or horizontally into any areas designated to be archaeologically sensitive by SAFCA in consultation with the Corps.

(C) Final Report Documenting Implementation of the Historic Properties Treatment Plan(s): Within one year after the completion of all work performed as part of the Project SAFCA shall submit to the Corps and SHPO a final report documenting the results of all work prepared under the HPTPs. This report shall be submitted to the Corps and SHPO for review and comments, which SAFCA shall incorporate.

VI. NATIVE AMERICAN AND OTHER PUBLIC CONSULTATION AND PUBLIC NOTICE

Members of the interested public shall be invited to consult regarding this Programmatic Agreement. Within 30 calendar days of the signing date of this Programmatic Agreement, the Corps, the SHPO, and SAFCA shall consult to compile a list of members of the interested public who shall be provided notice of this Programmatic Agreement. The opinions of local Native Americans with cultural ties to the APE and the opinions of other members of the public shall be taken into account by the consulting parties for historic preservation actions taken in accordance with this Programmatic Agreement. Native Americans and other members of the public may be invited to concur in this Programmatic Agreement. Native American monitor(s) shall be invited to assist SAFCA in the treatment of any Native American human remains and items associated with Native American burials discovered during the Project in accordance with California Public Resources Code Section 5097.98 and California Health and Safety Code Section 7050.5(b) and 7050.5(c).

VII. CONFIDENTIALITY

Confidentiality regarding the nature and location of the archaeological sites and any other cultural

resources discussed in this Programmatic Agreement shall be maintained on a "need-to know" basis limited to appropriate personnel and agents of SAFCA, the Corps, and the SHPO involved in planning, reviewing and implementing this Programmatic Agreement consistent with Section 304 of the NHPA.

VIII. RESOLVING OBJECTIONS

(A.) Should any party to this Programmatic Agreement object to any action proposed or carried out pursuant to this Programmatic Agreement, the Corps shall consult with the objecting party(ies) for a period of time not to exceed *30 calendar days* to resolve the objection. If the Corps determines that the objection cannot be resolved, the Corps shall forward all documentation relevant to the dispute to the Council. Within 30 calendar days after receipt of all pertinent documentation, the Council shall either:

(1) Provide the Corps with recommendations, which the Corps shall take into account in reaching a final decision regarding the objection; or

(2) Notify the Corps that the Council will comment in accordance with the requirements of Section 106 of the NHPA, and proceed to comment. Any Council comment provided in response shall be taken into account by the Corps, pursuant to the requirements of Section 106 of the NHPA.

(3) Should the Council not exercise one of the above options within 30 days after receipt of all pertinent documentation, the Corps may assume the Council's concurrence in its proposed response to the objection.

(4) The Corps shall take into account any Council recommendation or comment provided in accordance with this stipulation with reference only to the subject of the objection; the Corps' responsibility to carry out all actions under this Programmatic Agreement that are not the subjects of the objection shall remain unchanged.

(B.) At any time during implementation of the measures stipulated in this Programmatic Agreement should an objection pertaining to the Programmatic Agreement be raised by a member of the public, the Corps or SAFCA shall notify the consulting parties to the Programmatic Agreement and take the objection into account, consulting with the objector and, should the objector so request, with any of the consulting parties to this Programmatic Agreement to address the objection.

IX. AMENDMENTS

Any consulting party to this Programmatic Agreement may propose that the Programmatic Agreement be amended, whereupon the Corps shall consult with the other consulting parties to this Programmatic Agreement to consider such amendment. Any amendment shall be executed by the consulting parties in the same manner as the original Programmatic Agreement.

If the Project has not been completed within five years of the date of the execution of this Programmatic Agreement, the consulting parties shall consult on a date not less than 90 days prior to the fifth anniversary of this Programmatic Agreement to either amend this Programmatic Agreement and acknowledge its continued applicability for the undertaking for a designated period of time, or terminate this Programmatic Agreement and proceed to again consult regarding the undertaking in accordance with regulations implementing Section 106 of the NHPA.

All attachments to this Programmatic Agreement, and other instruments prepared pursuant to this agreement such as, but not limited to, the Project's description, initial cultural resource inventory report and maps of the APE, HPTPs, and monitoring and discovery plans may be amended without requiring amendment of this Programmatic Agreement. Such amendments will be consulted on by the concurring parties and shall be final when agreement is reached by the parties.

X. FAILURE TO CARRY OUT THE TERMS OF THE AGREEMENT

Should the Corps fail to ensure that the terms of this Programmatic Agreement are carried out, the Corps shall notify the parties to this Programmatic Agreement and again consult with the SHPO and the Council in accordance with regulations implementing Section 106 of the NHPA. The Corps shall not take any action or make any irreversible decision that would affect an Historic Property, preclude historic preservation alternatives, or foreclose any opportunities for the Council to comment on the undertaking prior to completion of the process for considering and resolving effects on Historic Properties provided in this document.

XI. SCOPE OF THE PROGRAMMATIC AGREEMENT

Execution of this Programmatic Agreement by the Corps, the SHPO, and SAFCA, and implementation of its terms, evidence that Corps has afforded the Council an opportunity to comment on the undertaking for SAFCA Natomas Levee Improvement Program Landside Improvements Project, pursuant to 16 U.S.C. 470f, and that the Corps has taken into account the effects of the undertaking on Historic Properties. This Programmatic Agreement is limited in scope to the undertaking defined herein and is entered into solely for that purpose.

CONSULTING PARTIES:

U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT

By: _____ Date:
Title: COL Thomas Chapman, District Engineer, Sacramento District, U.S. Army Corps of Engineers

SACRAMENTO AREA FLOOD CONTROL AGENCY

By: _____ Date:
Title: Stein M. Buer, Executive Director, Sacramento Area Flood Control Agency

CALIFORNIA STATE HISTORIC PRESERVATION OFFICER

By: _____ Date:
Title: Milford Wayne Donaldson, F.A.I.A., California State Historic Preservation Officer

CONCUR:

CENTRAL VALLEY FLOOD PROTECTION BOARD

By: _____ Date:

Title: Benjamin Carter, President, Central Valley Flood Protection Board

By: _____ Date:
Title:

Attachment A: Project Description Summary
Attachment B: "Cultural Resources Inventory Reports, Part 1 – Natomas Levee Improvement Program Landside Improvements Project, Sacramento and Sutter Counties, California" (report).

ATTACHMENT A

Project Description Summary

ATTACHMENT A

DESCRIPTION OF THE SACRAMENTO AREA FLOOD CONTROL AGENCY'S NATOMAS LEVEE IMPROVEMENT PROGRAM LANDSIDE IMPROVEMENTS PROJECT

PURPOSE AND NEED

PROJECT OVERVIEW

The Natomas Levee Improvement Program (NLIP) Landside Improvements Project proposed by the Sacramento Area Flood Control Agency (SAFCA) is intended to provide urgently needed flood control system improvements to the Natomas Basin in southern Sutter and northern Sacramento Counties, California (Exhibit 1). The project would improve the levee system that protects the 53,000-acre Natomas Basin, including a portion of the city of Sacramento. The Natomas Basin is bounded by leveed reaches of the Natomas Cross Canal (NCC) on the north, the Sacramento River on the west, the American River on the south, and the Pleasant Grove Creek Canal (PGCC) and Natomas East Main Drainage Canal (NEMDC)/Steelhead Creek on the east (Exhibit 1).

SAFCA's intent is to provide the Natomas Basin with at least a 100-year level of flood protection by the end of 2010 and a "200-year" level of protection by the end of 2012. Achievement of these aims would significantly reduce the risk of an uncontrolled flood in the Natomas Basin that would result in a catastrophic loss of property (estimated at $7 billion) and a prolonged interruption of commercial activity, including the operation of Sacramento International Airport (Airport) and closure of Interstate 5 (I-5) and State Route (SR) 99/70. Flooding is particularly hazardous in a heavily urbanized basin like Natomas because of the depths that floodwaters can reach—more than 10 feet in some areas.

DEFICIENCIES OF THE NATOMAS LEVEE SYSTEM AND PROPOSED REMEDIES

Approximately 26 miles of the NCC south levee, the Sacramento River east levee, and the PGCC west levee require one or more forms of remediation to address the potential for failure in a 100-year or "200-year" flood event, as follows:

- Inadequate freeboard—The NCC south levee and portions of the Sacramento River east levee must be raised to provide at least 3 feet of freeboard above the 100-year water surface elevation, and several reaches of the Sacramento River east levee must be raised to provide 3 feet of freeboard above the "200-year" design water surface elevation.

- Underseepage and through-seepage vulnerability—Most of these same reaches do not meet recently adopted federal criteria for safely containing underseepage and through-seepage when the water surface in the adjacent channel reaches the 100-year elevation or, in some cases, the "200-year" elevation.

Underseepage problems can occur where levees are constructed on low-permeability foundation soil (silt and clay) underlain by a layer of higher permeability (sand and gravel). Excessive underseepage makes the levee susceptible to failure during periods of high river stage. Under these conditions, seepage travels horizontally under the levee and then is forced vertically upward through the low-permeability foundation layer, often referred to as a "blanket." Failure of the blanket can occur either by uplift, a condition in which the blanket does not have enough weight to resist the confined pressure acting on the bottom of the blanket, or by piping (internal erosion) caused by water flowing under high vertical gradients through the erodible blanket and carrying fine soil particles out of the foundation materials. Through-seepage is seepage through a levee embankment that can occur during

periods of high river stage. Depending on the duration of high water and the permeability of embankment soil, seepage may exit the landside face of the levee. Seepage can also pass directly through pervious layers in the levee if such layers are present. Under these conditions, the stability of the landside levee slope may be reduced.

The project encompasses addressing freeboard deficiencies through levee raises; addressing seepage potential using a combination of seepage berms, cutoff walls, and relief wells; and acquiring additional right-of-way to construct the improvements and to prevent encroachment into the flood control system. In addition, the project has been designed to include an enlarged levee embankment (adjacent setback levee) along the land side of the existing Sacramento River east levee to preclude the need for substantial removal of vegetation and structural encroachments on the water side of this levee in compliance with U.S. Army Corps of Engineers (Corps) guidance. These improvements would include recontouring the levee slopes where necessary.

The following subsections summarize the methods to address freeboard deficiencies and seepage potential, which will be used in various combinations on the NCC south levee, Sacramento River east levee, and the PGCC west levee.

Levee Raises

The freeboard increases would be accomplished through raises of the existing NCC south levee or through construction of the raised adjacent setback levee adjacent to the existing Sacramento River east levee:

- Raise of existing levee (NCC south levee). A full levee raise is required for the NCC south levee, consisting of an embankment raise from the landside or waterside toe (or both) upward to the increased levee crown elevation. This requires partially excavating the levee slope to provide a working platform for equipment, typically 10 feet wide, and rebuilding the levee to the appropriate elevation by benching the new embankment material into the existing embankment material.

- Adjacent setback levee (Sacramento River east levee). The levee raise of the Sacramento River east levee would be accomplished through the construction of an "adjacent setback levee" adjoining the Sacramento River east levee. The adjacent setback levee would be constructed with a crown elevation 3 feet above the "200-year" water surface profile. In the upper reaches, where the existing levee has freeboard deficiencies of as much as 3 feet, the crown of the adjacent setback levee would be higher than the existing levee and Garden Highway roadway. In the lower reaches, where the existing levee has sufficient freeboard, the adjacent setback levee would be the same height as the existing levee.

Seepage Berms

Seepage berms are wide embankments placed outward from the landside toe of the levee to lengthen the underseepage path, thereby lowering, to acceptable levels, the erosive potential of seepage passing through permeable layers under the levees. Seepage berms typically extend 100 to 400 feet from the levee. The berm thickness depends on the severity of the seepage pressure, but generally berms are 5 feet thick near the landside toe and taper to a thickness of 3 feet at the prescribed distance from the toe. A seepage collection ditch is often constructed at the landward toe of all seepage berms. Seepage berms are planned for construction along portions of the Sacramento River east levee and the PGCC west levee.

Cutoff Walls

Conventional slurry cutoff walls are typically constructed using an excavator with a long-stick boom capable of digging a trench to the maximum required depth. Bentonite slurry is pumped into the trench during trench excavation to prevent caving. The soil, cement, and bentonite are mixed to achieve the required cutoff wall strength and permeability, and the mixture is backfilled into the trench. Select fill is used to rebuild the levee. The NLIP includes construction of cutoff walls along portions of the NCC south levee and the Sacramento east levee. Cutoff wall construction may also be required in some areas along the PGCC west levee.

For the NCC south levee, preparation for construction of the cutoff wall would begin with using scrapers (or other suitable equipment, depending on the slope) to clear and grub/strip the surface to a depth of 2 inches to remove low-growing vegetation, loose stone, and surface soils. The aggregate base from the operating road also would be removed and stockpiled for later reuse. Waste material would be hauled to an off-site location.

Construction of the cutoff wall would include degrading the existing levee to a depth equal to one-half its total height (approximately 9 feet). A 70-foot-deep cutoff wall would be constructed for the total length of 23,150 lineal feet, with the method of installation at the contractor's discretion. Material degraded to support cutoff wall construction would be compacted at the landside toe of the levee to support raising portions of the NCC south levee. Unsuitable material generated from cutoff wall construction would be disposed of off-site. Equipment that would be used in phases of the cutoff wall construction includes excavators, scrapers, loaders, bulldozers, rollers, haul trucks, water trucks, hydroseeding trucks, pickup trucks, slurry pumps, and generators.

Work on the Sacramento River east levee includes construction of an adjacent levee with construction of a cutoff wall to occur in several reaches of the adjacent levee. Borrow material would be excavated from several locations in the project area and would be delivered to the levee construction sites by scrapers or haul trucks where it would be spread by motor graders and compacted by sheepsfoot rollers to build the adjacent levee up to a height equal to about two-thirds of the height of the existing levee. This would create a working platform for cutoff wall installation using an excavator with a long-stick boom capable of digging a trench to a maximum depth of approximately 80 feet. Bentonite slurry would be pumped into the trench during excavation to prevent caving. The soil excavated from the trench would be mixed with bentonite and backfilled into the trench to create the cutoff wall.

Relief Wells

Relief wells provide protection against levee underseepage by providing a path for underseepage to exit to the ground surface at the landside toe of the levee without creating sand boils or piping levee foundation materials. Relief wells are an option for addressing underseepage in reaches where continuous sand and gravel layers have been identified by the geotechnical analysis.

Relief wells are constructed near the levee landside toe to provide pressure relief beneath surficial fine-grained soils. The wells are constructed using soil boring equipment to bore a hole vertically through the fine-grained blanket layer and into the coarse-grained aquifer layer beneath. Pipe casings and filters are installed to allow the pressurized water to flow to the ground surface, thereby relieving the pressures beneath the clay blanket. Relief wells either may discharge onto open ground or may require conveyance to a stormwater drainage system or a pump station. Relief wells cause the least amount of construction disturbance but require routine maintenance of the wells themselves and the drainage and pumping facilities necessary to support them.

EXISTING PROJECT FACILITIES AND POTENTIAL BORROW SITES

All project construction activities would take place within the Natomas Basin, except for the development of a borrow site on Reclamation District (RD) 1001 land northeast of the basin (Exhibit 2). The following sections describe the existing flood control facilities, their general setting, and adjacent irrigation infrastructure and the potential borrow sources. These features, as well as the borrow locations, constitute the physical infrastructure and locations where the project may result in effects on historic properties.

Flood Control and Irrigation Facilities

Natomas Cross Canal South Levee

The NCC is a 5.3-mile-long channel that carries water from several tributary watersheds in western Placer County and eastern Sutter County to the Sacramento River. The NCC begins at the PGCC and East Side Canal and extends southwest to its confluence with the Sacramento River near the Sankey Road/Garden Highway

intersection. During periods of flooding, the Sutter Bypass, Sacramento River, and NCC all contribute to raised water elevations that can affect the NCC levees. For engineering purposes, the levee is divided into seven reaches. Much of the south levee contains an existing stability berm with an internal drainage system. An approximately 80- to 100-foot maintenance access area extends along the land side of the levee through most of the NCC's length.

Farms and rural residences are located on both sides of the NCC, with rice the primary crop under cultivation. The Lucich North and Frazer Habitat Preserves, maintained by The Natomas Basin Conservancy (TNBC), lie south of the NCC south levee from the eastern end of Reach 2 through the western end of Reach 6. A drainage canal, referred to as the Vestal Drain, runs parallel to the NCC south levee through much of Reach 2, approximately 100 feet from the landside levee toe. A private irrigation pump and irrigation canal are located at the landside levee toe in Reach 1. Natomas Central Mutual Water Company's (NMWC's) Bennett Pumping Plant and RD 1000's Pumping Plant No. 4 are located in Reach 2, and the NMWC Northern Pumping Plant is located in Reach 3. NMWC's North Main Canal runs parallel to the levee through Reaches 4 and 5, approximately 100 feet from the landside levee toe.

SACRAMENTO RIVER EAST LEVEE

An 18-mile-long section of the east levee of the Sacramento River protects the west side of the Natomas Basin between the NCC and the American River. For planning purposes, the levee is divided into 20 reaches. The Garden Highway is located on top of the levee crown within all 20 reaches. A drained, 10-foot-wide stability berm is present on the landside slope of the levee between the NCC and Powerline Road (Reaches 1–12). Cutoff walls were previously constructed through the levee in Reaches 12–20.

The land uses along the levee vary from north to south. Along the land side, Reaches 1–13 are bordered mainly by private agricultural lands containing a few rural residences, Airport bufferlands, and two farmed TNBC parcels. Teal Bend Golf Club is west of the Airport, adjacent to the levee along Reach 6. The parcels bordering Reaches 14–18 contain more residences, several rural estates, and three TNBC parcels. The land side of Reaches 19 and 20 is bordered by residential subdivisions, a business park, and City parklands.

Several irrigation canals, pipelines, wells, and pump stations exist along the Sacramento River east levee. The Elkhorn Canal and the Riverside Canal are key agricultural irrigation canals in the NMWC system. The Elkhorn Canal runs parallel to the Sacramento River east levee from the North Drainage Canal in Reach 4B through Reach 8 and into the start of Reach 9 (1,250 feet south of Elkhorn Boulevard). The Riverside Canal extends from just north of Reach 13 to the middle of Reach 19. Several lateral canals connect to the Elkhorn and Riverside Canals. These canals have earthen embankments with side slopes that are nearly vertical, requiring regular maintenance. Both canals are supplied by pumping plants on the Sacramento River.

In addition to the NMWC irrigation systems, there are several landowner-operated systems along the levee. These facilities are located primarily in Reaches 1–4A and 9–12, in areas not currently served by the NMWC systems. The areas are serviced by either well pumps on the land side or river pumps, which discharge into buried pipelines, small irrigation ditches, or directly onto fields. The distribution systems run along the landside toe of the levee to supply fields that slope away from the levee.

Several drainage pumping plants are operated by RD 1000 along the Sacramento River east levee. These facilities pump drain water from the main drainage canal system into the river. They include Pumping Plant No. 2, located in Reach 4B; Pumping Plant No. 5, located in Reach 10; Pumping Plant No. 3, located in Reach 13; and Pumping Plant No. 1, located in Reach 20A. Pumping Plant No. 2 was temporarily removed as part of an emergency levee repair in 2006 and would be replaced as an element of the project in 2009–2010. In addition to these RD 1000 pumping stations, the City of Sacramento operates the Willow Creek drainage pumping station which is located in Reach 19B.

Pleasant Grove Creek Canal West Levee

The PGCC west levee extends southerly from the east end of the NCC south levee to the north end of the NEMDC/Steelhead Creek levee near the Sankey Road crossing. The PGCC west levee protects the Natomas Basin from flood flows from Pleasant Grove Creek and other creeks in western Placer County, as well as from water that backs up in the NCC during high river stages in the Sacramento River. Natomas Road is located on top of the levee crown. No berms support this levee. A private canal extends parallel to the PGCC west levee for about 1,500 feet at the landside levee toe. Farms and scattered rural residences are located on the land side of the PGCC west levee, and a manufacturing facility and a railroad siding are located within several hundred feet of the levee, just south of Sankey Road.

Borrow Sites

Borrow sites are areas from which earthen materials would be removed for use in construction. The sites would be recontoured and developed as either managed marsh or grassland habitat following excavation for this use. Where borrow sites would be used over more than one construction season, the work would progress in cells that would be incrementally developed as habitat as the borrow activities are completed.

SAFCA has identified borrow sources for the project in 2008, 2009, and 2010 flood control and irrigation infrastructure improvements and redundant sources that may be pursued if negotiations regarding the preferred sources are unsuccessful or additional quantities are found to be needed during construction:

- Brookfield property (2008 preferred, 2009 preferred, 2010 preferred)
- Airport bufferlands north of the Airport complex (2008 preferred, 2009 preferred, 2010 potential)
- Fisherman's Lake area (2010 preferred) (no specific parcels identified for this borrow site)
- RD 1001 (2008 potential, 2009–2010 potential)

Except for the Fisherman's Lake area in the southern part of the Natomas Basin, these borrow areas are shown in Exhibit 3.

DESCRIPTION OF PROJECT ELEMENTS AND ACTIVITIES

The elements of the project are described in this section in four broad, overlapping categories:

- levee raising and seepage remediation,
- improvements to major irrigation and drainage infrastructure,
- habitat development and management, and
- additional actions to meet Federal Emergency Management Agency (FEMA) requirements: encroachment management and bridge crossing modifications.

Expanding the landside footprint of the Sacramento River east levee necessitates redesigning and relocating the irrigation and drainage infrastructure currently located along the landside toe of the levee. Relocation of other major and minor irrigation and drainage canals located near the NCC south levee and the PGCC west levee will be necessary with implementation of levee improvements. Modifications to the existing irrigation and drainage systems will include creation of a new canal designed to provide giant garter snake (GGS) habitat and improved stormwater drainage west of the Airport (GGS/Drainage Canal).

Site preparation would entail removing trees and other large vegetation from the construction area and stripping the top 6 inches of material from the landside slope of the existing levee, the footprint of the adjacent setback levee, the seepage berm areas, and the 50-foot-wide permanent maintenance access corridor. Large roots and

deleterious material would then be grubbed from the working area. To the extent feasible, trees that must be removed from within the footprint of the adjacent setback levee or berms would be relocated outside of the footprint to new woodland planting areas, where a substantial number of new trees would also be planted. Excess earth materials (organic soils, roots, and grass from borrow areas and the adjacent levee foundation and excavated material that does not meet levee embankment criteria) would be used in the reclamation of borrow areas or hauled off-site to landfills. Cleared vegetation (i.e., trees, brush) would be hauled off-site to landfills. After construction, the levee slopes and any previously vegetated areas disturbed during construction, including staging areas, would be seeded with a grass mix.

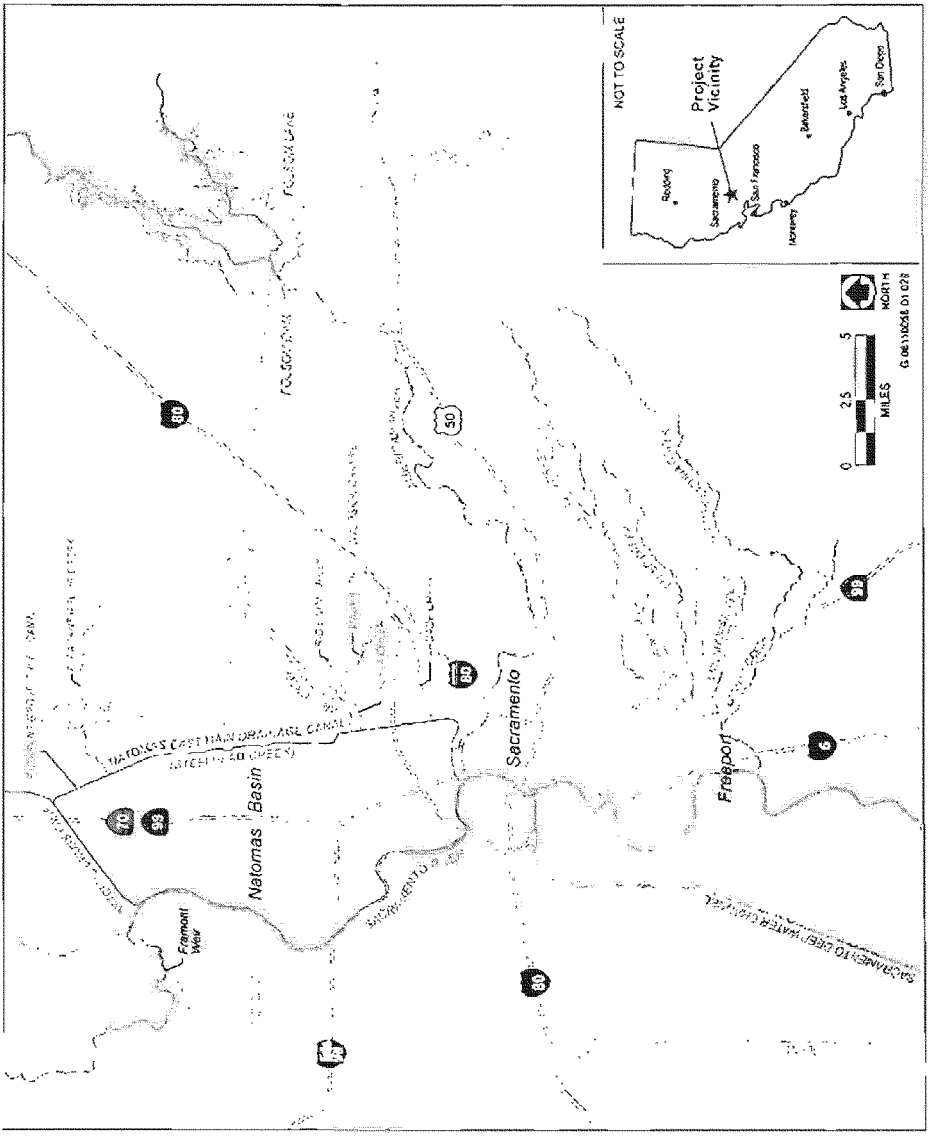
The major project elements and related activities are summarized in Table 1.

Table 1
Summary of the Major Elements of the Project

Project Element	Project Activity and Timing
2008 Construction	
Levee raising and seepage remediation: NCC south levee	Raise and realign the NCC south levee to provide additional freeboard and more stable waterside and landside slopes and to reduce the need for removal of waterside vegetation. (May 8–November 1, 2008) Construct a seepage cutoff wall through the levee crown in Reaches 3–7. (May 8–October 15, 2008)
Levee raising and seepage remediation: Sacramento River east levee (adjacent setback levee)	Construct a raised adjacent setback levee from the NCC to just south of the North Drainage Canal (Reaches 1–4B, except Stations 55+00 to 68+00 in Reach 2) with a 100-foot seepage berm in Reach 4A and a 300-foot seepage berm in Reach 4B. (May 1–November 1, 2008)
Improvements to major irrigation and drainage infrastructure	Construct a new canal designed to provide drainage and associated giant garter snake habitat (the GGS/Drainage Canal) between the North Drainage Canal and Elkhorn Reservoir. (May 1–November 1, 2008) Relocate the Elkhorn Canal (highline irrigation canal) between the North Drainage Canal and Elkhorn Reservoir in anticipation of the filling of the existing Elkhorn Canal at the toe of the Sacramento River east levee in late 2008 and in 2009. (May 1–November 1, 2008) Remove a deep culvert at the location of Pumping Plant No. 2. (May 1–November 1, 2008)
Habitat creation and management	Establish vegetative habitat features in the new GGS/Drainage Canal. (Fall 2008) Recontour and create managed marsh and grassland on lands used as borrow sources. (Fall 2008 or spring 2009) Establish grassland on the adjacent setback levee slopes and seepage berms. (August 1–December 31, 2008) Install woodland plantings to offset the loss of portions of tree groves in the landside levee footprint. (Fall 2008)
Right-of-way acquisition	Acquire right-of-way through fee title or easement interest within the footprint of the project features, at the borrow sites and along the flood control system. (Before construction)
2009–2010 Construction	
Levee raising and seepage remediation: Sacramento River east levee (adjacent setback levee)	Construct an adjacent setback levee along Stations 55+00 to 68+00 in Reach 2 and from just south of the North Drainage Canal to the American River north levee (Reaches 5A–20B), raised where needed to provide adequate freeboard, with seepage berms, relief wells, and cutoff walls for seepage remediation as required (specific seepage remediation measures are still under study). (May 1–November 1, 2009, and May 1–November 1, 2010)
Seepage remediation: PGCC west	Flatten waterside and landside slopes, and construct seepage berms along the PGCC west levee (specific berm widths and potential use of cutoff walls in some areas to be

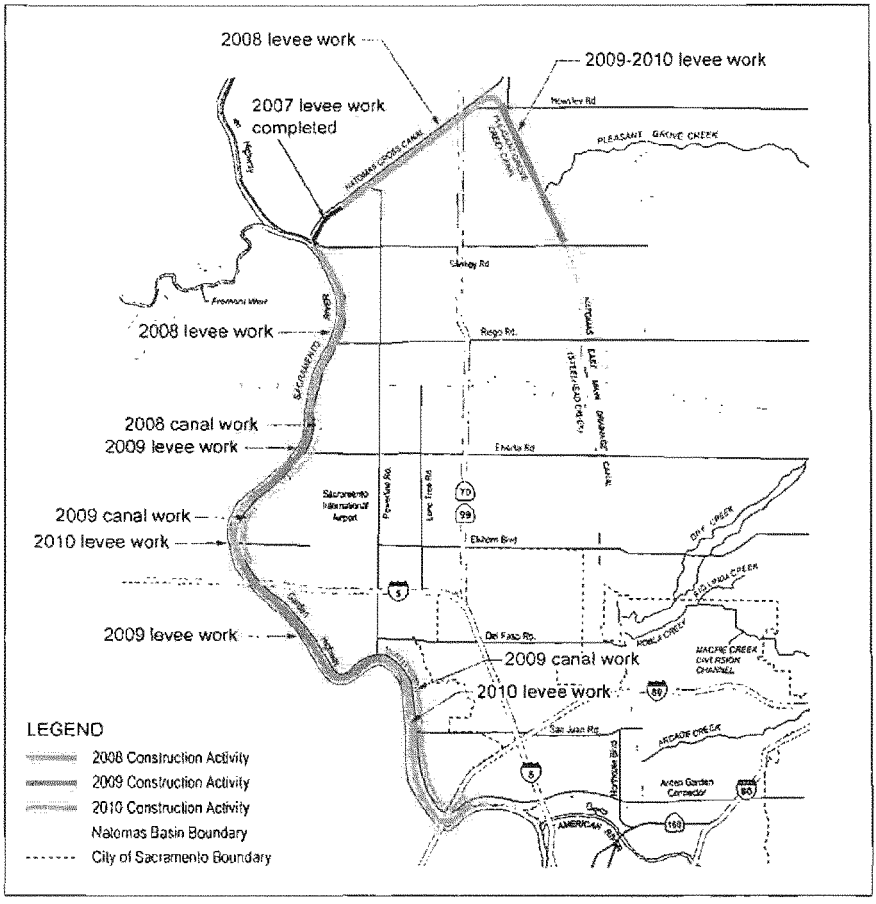
Table 1 Summary of the Major Elements of the Project	
Project Element	Project Activity and Timing
levee	determined). (May 1–November 1, 2010)
Improvements to major irrigation and drainage infrastructure	Construct the new GGS/Drainage Canal between Elkhorn Reservoir and the West Drainage Canal (specific alignment to be determined), and improve the West Drainage Canal to provide enhanced giant garter snake habitat. (May 1–November 1, 2009) Implement Airport West Ditch improvements in connection with construction of the GGS/Drainage Canal to allow the Airport to decommission the agricultural irrigation function of this facility and eliminate the hazards currently associated with it. The Airport stormwater detention function provided by this ditch would continue. The ditch would therefore be recontoured as a gently sloping swale to facilitate periodic maintenance such as mowing. (May 1–November 1, 2009) Relocate the Riverside Canal and the Elkhorn Canal downstream of Elkhorn Reservoir (specific alignments to be determined) and fill the existing canals. (May 1–November 1, 2009) Construct RD 1000 Pumping Plant No. 2. (April 1, 2009–September 1, 2010)
Habitat creation and management	Establish habitat enhancements in the new GGS/Drainage Canal and improved West Drainage Canal. (Fall 2009) Recontour and create marsh and managed grassland on lands used as borrow sources. (Fall or spring after borrow excavation in 2009 and 2010) Establish grassland on the adjacent setback levee slopes and seepage berms. (Fall after construction in 2009 and 2010) Install woodland plantings to offset the loss of portions of tree groves in the landside levee footprint (locations to be determined). (Fall 2009 and 2010)
Additional actions to meet FEMA requirements: encroachment management on the Sacramento River east levee, and bridge crossing modifications at the NCC	Remove encroachments from a portion of the water side and land side of the Sacramento River east levee as needed to ensure that the levee can be certified as meeting the minimum requirements of the NFIP and USACE design criteria (specific criteria still under discussion). (Timing to be determined) Modify the SR 99/70 crossing of the NCC as needed to meet FEMA requirements. (Timing to be determined)
Right-of-way acquisition	Acquire right-of-way through fee title or easement interest within the footprint of the project features, at the borrow sites and along the flood control system. (Before construction)

Notes: Airport = Sacramento International Airport; Elkhorn Canal = Elkhorn Main Irrigation Canal; FEMA = Federal Emergency Management Agency; GGS = Giant Garter Snake; NCC = Natomas Cross Canal; NFIP = National Flood Insurance Program; PGCC = Pleasant Grove Creek Canal; RD = Reclamation District; Riverside Canal = Riverside Main Irrigation Canal; SR = State Route; USACE = U.S. Army Corps of Engineers

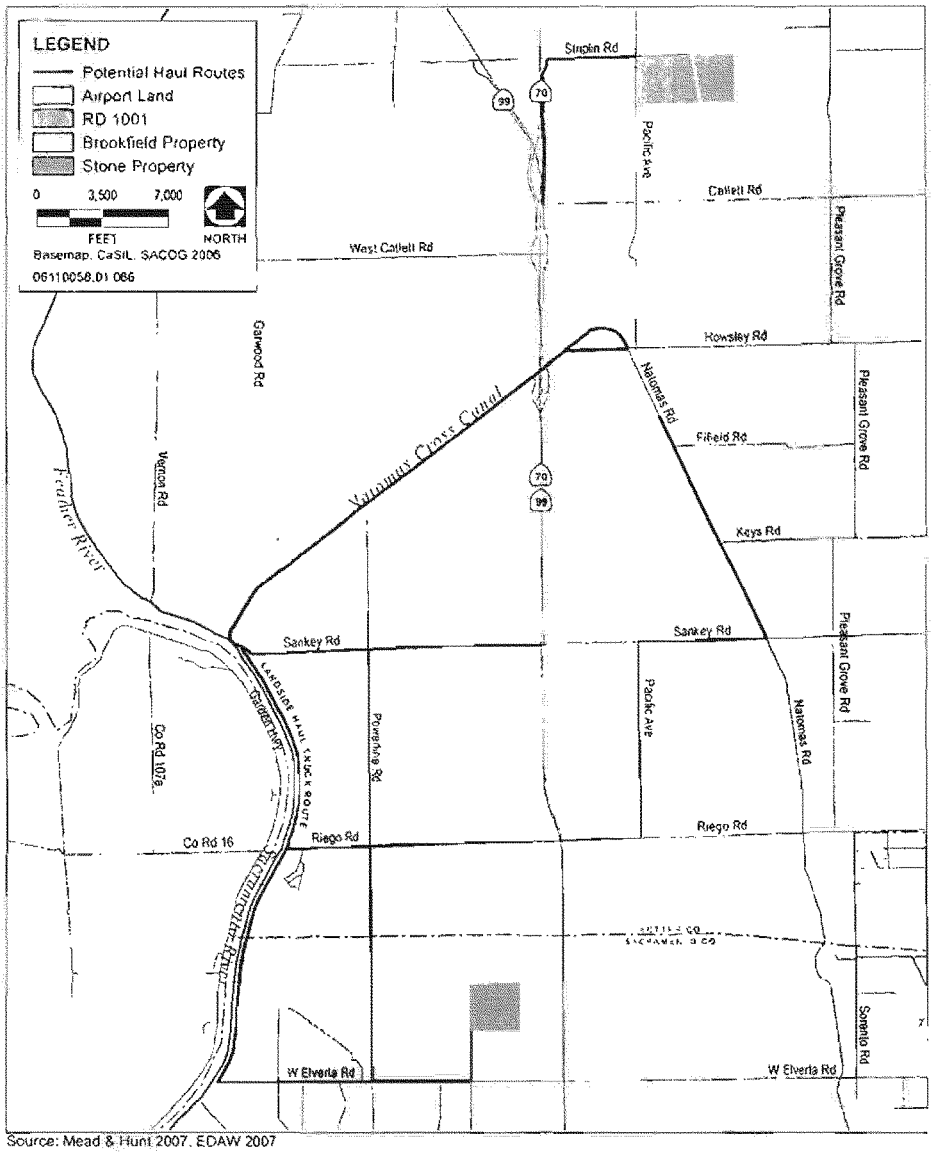


Project Location

Exhibit 1



Project Construction By Phase **Exhibit 2**



Source: Mead & Hunt 2007, EDAW 2007

Anticipated Borrow Areas and Local Haul Routes **Exhibit 3**

ATTACHMENT B

Cultural Resources Inventory Reports, Part 1
Natomas Levee Improvement Program Landside Improvements Project
Sacramento and Sutter Counties, California

Natomas Levee Improvement Program
Landside Improvements Project
Sacramento and Sutter Counties, California

Prepared for:

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October 2007

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A Project Correspondence
B Department of Parks and Recreation Site Record Forms

ACRONYMS AND ABBREVIATIONS

ACHP	Advisory Council on Historic Preservation
Airport	Sacramento International Airport
APE	area of potential effect
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
cmbs	centimeters below surface
CRHR	California Register of Historical Resources
HPTP	historic property treatment plan
I-5	Interstate 5
I-80	Interstate 80
MLD	Most Likely Descendant
MOA	Memorandum of Agreement
NAHC	Native American Heritage Commission
NCC	Natomas Cross Canal
NCIC	North Central Information Center
NEIC	Northeast Information Center
NEMDC	Natomas East Main Drainage Canal
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NLIP	Natomas Levee Improvement Program
NRHP	National Register of Historic Places
PA	Programmatic Agreement
PGCC	Pleasant Grove Creek Canal
PRC	Public Resources Code
RD	Reclamation District
SAFCA	Sacramento Area Flood Control Agency
SHPO	State Historic Preservation Officer
SRFCP	Sacramento River Flood Control Project
STP	shovel test pit
The Reclamation Board	State of California Reclamation Board
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey

INTRODUCTION

PURPOSE OF THIS REPORT

This report describes the work completed to date to identify cultural resources that have the potential to be affected by the Natomas Levee Improvement Program (NLIP) Landside Improvements Project, which is proposed for implementation by Sacramento Area Flood Control Agency (SAFCA). The proposed project consists of improvements to the levee system in the Natomas Basin and related landscape modifications and drainage and irrigation infrastructure improvements. This work will be completed in phases, starting in 2008 and continuing through 2010. As a local public agency in California, SAFCA must comply with the requirements of the California Environmental Quality Act (CEQA) regarding unique archaeological resources and historical resources as defined in Public Resources Code (PRC) Section 21083.2(g) and California Code of Regulations (CCR) Section 15064.5(a), respectively, and has prepared a draft environmental impact report that meets CEQA requirements. The project requires approvals from the U.S. Army Corps of Engineers (USACE), which must comply with the requirements of Section 106 of the National Historic Preservation Act (NHPA) for assessing impacts of projects on historic properties. Therefore, project implementation also must meet Section 106 requirements. This report provides preliminary information to support Section 106 compliance for the project.

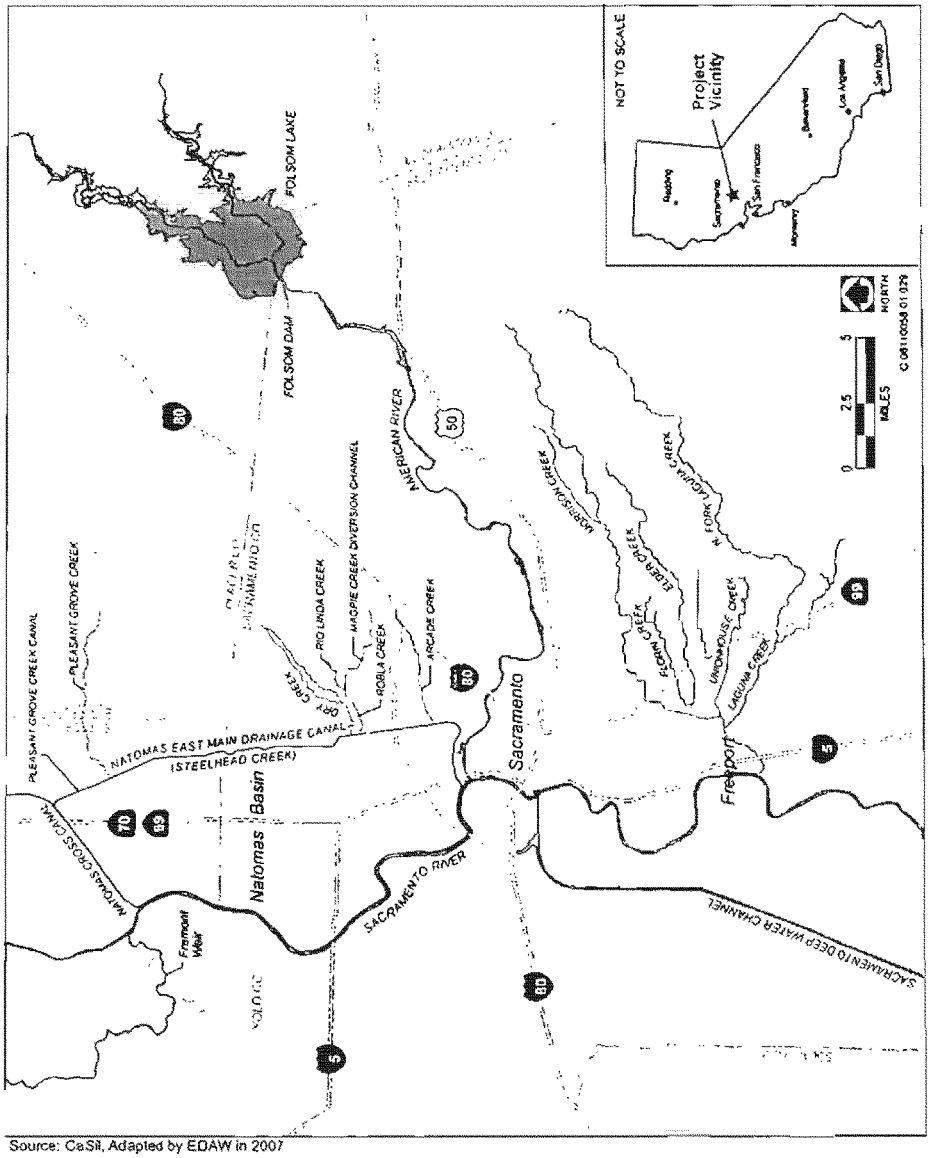
The report provides an overview of the proposed project; presents relevant setting information for the project area; and describes the following components of Section 106 compliance for the project:

- the regulatory context for cultural resources, including an existing programmatic agreement (PA) between USACE, the Bureau of Reclamation, the California State Office of Historic Preservation (SHPO), and the Advisory Council on Historic Preservation (ACHP) for projects that are a part of the federal American River Watershed Project. Additional signatories of the PA include the State of California Reclamation Board (The Reclamation Board) and SAFCA;
- the phased approach proposed for identification of cultural resources, pursuant to 36 Code of Federal Regulations (CFR) Section 800.4(b)(2);
- cultural resources identification efforts performed to date; and
- the scope of remaining identification and management efforts that will be undertaken.

PROJECT LOCATION AND GENERAL CHARACTERISTICS OF THE PROJECT AREA

The project area is located in Townships 9-11 North and Ranges 3-5 East, as depicted on the Sacramento East, Sacramento West, Gray's Bend, Taylor Monument, Verona, Pleasant Grove, and Rio Vista U.S. Geological Survey (USGS) 7.5'quadrangle maps. Elevations across the project area generally range from 20 feet to 40 feet (at the top of the levees) above mean sea level.

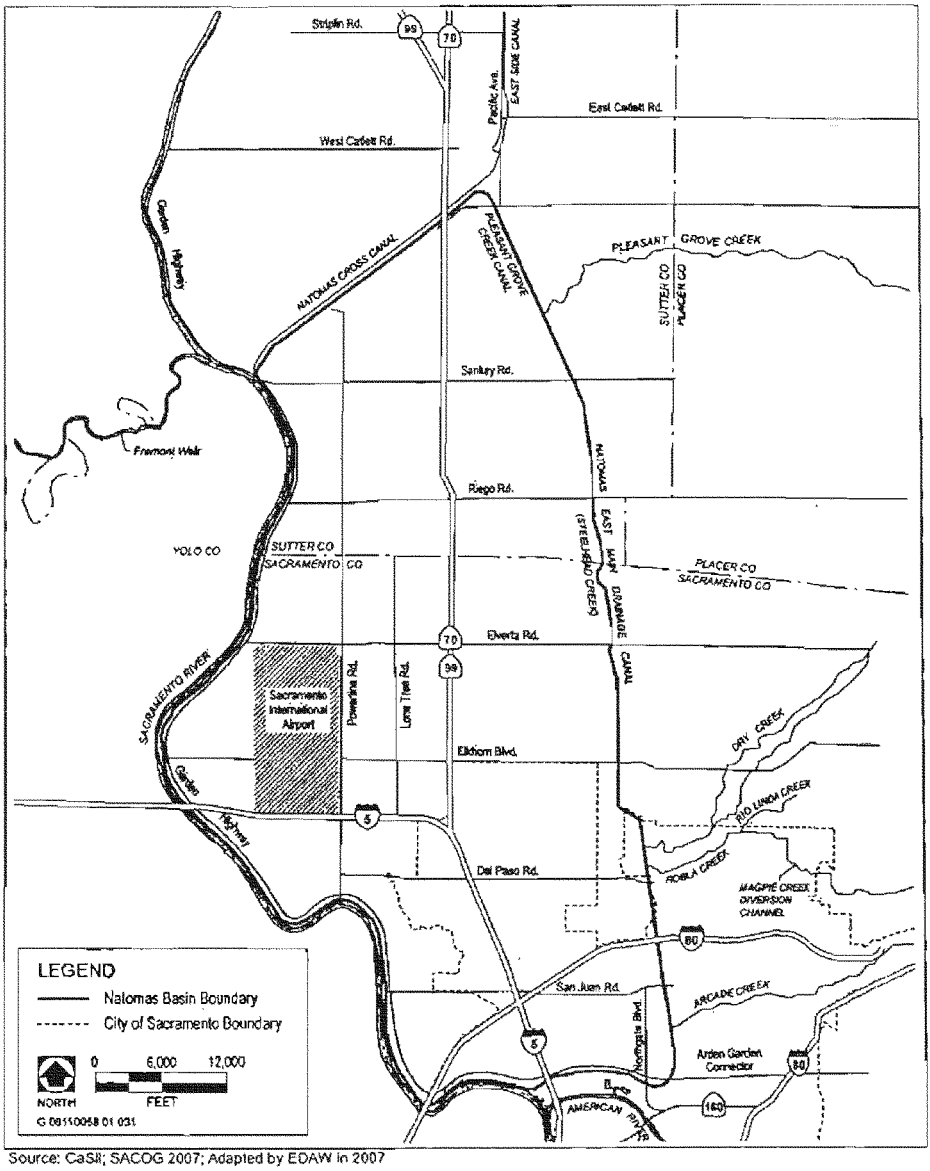
The project area is in the Natomas Basin in northern Sacramento and southern Sutter Counties, which is bounded by the Natomas Cross Canal (NCC) to the north, the Sacramento River to the west, the Sacramento and American rivers to the south, and the Pleasant Grove Creek Canal (PGGC) and the Natomas East Main Drainage Canal (NEMDC)/Steelhead Creek to the east. The regional and local settings of the Landside Improvements Project are shown in Exhibits 1 and 2, respectively. Most of the project activities would take place in the western portion of the Natomas Basin and along the NCC and PGCC.



Source: CaSil, Adapted by EDAW in 2007

Regional Setting

Exhibit 1



Source: CaSIL; SACOG 2007; Adapted by EDAW in 2007

Local Setting **Exhibit 2**

The project area is mainly used for agriculture, although the southern portion of the area is urbanized and lies within the City of Sacramento. The dominant landscape features of most of the area are elements of Reclamation District (RD) 1000, which are described below.

PROJECT DESCRIPTION

The Landside Improvements Project and the NLIP as a whole are part of the American River Common Features program of improvements to the flood control system protecting the Sacramento area that was initiated as part of the American River Watershed Investigation following the record flood of 1986. The NLIP Landside Improvement Project will address deficiencies in the peripheral levee system of the 53,000-acre Natomas Basin, specifically the NCC south levee, the Sacramento River east levee, and the PGCC west levee. Subsequent phases of the NLIP will address the NEMDC west levee and American River north levee following completion of additional geotechnical and hydraulic investigations.

The overall objectives of SAFCA's flood control improvement program, including the NLIP, are to:

(1) complete the projects necessary to provide 100-year flood protection for developed areas in Sacramento's major floodplains as quickly as possible,

(2) provide urban-standard ("200-year") flood protection for developed areas in Sacramento's major floodplains over time, and

(3) ensure that new development in the undeveloped areas of Sacramento's major floodplains does not substantially increase the expected damage of an uncontrolled flood.

The specific objectives of the proposed NLIP Landside Improvements Project are to:

(1) provide at least 100-year flood protection as quickly as possible while laying the groundwork to achieve at least "200-year" flood protection over time,

(2) use flood control projects in the vicinity of Sacramento International Airport (Airport) to facilitate changes in the management of Airport lands that reduce hazards to aviation safety, and

(3) use flood control projects to enhance habitat values by increasing the extent and connectivity of the lands in Natomas being managed to provide habitat for giant garter snake, Swainson's hawk, and other special-status species.

To meet these project objectives, SAFCA proposes the following project activities:

- 2008 construction
    - Along the 5.3-mile NCC south levee, raise the levee to provide additional freeboard; realign the levee to provide a more stable waterside slope and to reduce the need for removal of waterside vegetation, and construct a seepage cutoff wall in the eastern 4.3 miles (approximately) of the levee to reduce the risk of levee failure due to seepage and stability concerns.
    - Along the Sacramento River east levee, construct a raised adjacent setback levee from the NCC to 1,700 feet south of the North Drainage Canal with seepage berms, relief well, and cutoff walls where required to reduce seepage potential, and install woodland plantings.
    - Construct a new canal designed to provide drainage and associated giant garter snake habitat (referred to as the "GGS/Drainage Canal"), relocate the Elkhorn Canal between the North Drainage Canal and the

Elkhorn Reservoir settling basin ("Elkhorn Reservoir"), and remove a deep culvert from under the levee near the Pumping Plant No. 2 site.

- Recontour the land and create marsh and upland habitat at borrow locations.

- 2009 and 2010 construction

  - Along the Sacramento River east levee south of the limits of the 2008 improvements, construct an adjacent setback levee (raised where needed to provide adequate freeboard) with seepage berms, relief wells, and cutoff walls as required, and install woodland plantings.

  - Along the PGCC west levee, widen the levee, flatten the waterside and landside slopes, and construct seepage berms.

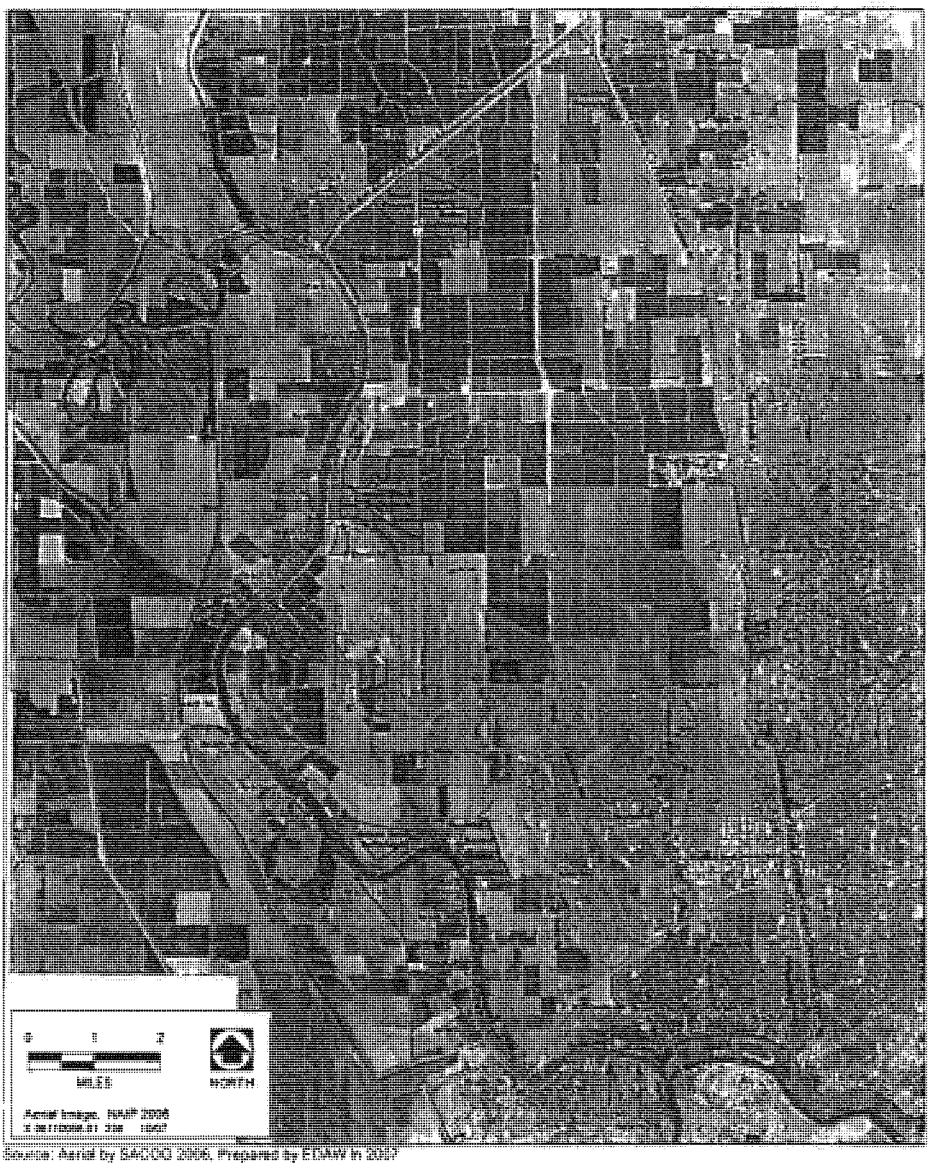
  - Construct a new GGS/Drainage Canal between Elkhorn Reservoir and the West Drainage Canal, improve the West Drainage Canal, relocate the Riverside Canal and the Elkhorn Canal downstream of Elkhorn Reservoir, and reconstruct the Reclamation District 1000 Pumping Plant No. 2.

  - Recontour the land and create marsh and upland habitat at borrow locations.

  - Remove encroachments from the water side of the Sacramento River east levee as needed to ensure that the levee can be certified as meeting the minimum requirements of the National Flood Insurance Program and USACE design criteria, and address Federal Emergency Management Agency requirements for the State Route (SR) 99/70 bridge crossing of the NCC.

Project construction would include a range of soil-disturbing activities in a region that is highly sensitive for cultural resources, particularly prehistoric archaeological sites. Levee improvements would require the excavation of inspection and cutoff wall trenches and extensive soil stripping and grading in the footprint of the adjacent setback levee along the existing Sacramento River east levee and where 100- to 300-foot-wide seepage berms would be constructed along the Sacramento River east levee and the PGCC west levee. Borrow material would be obtained through shallow excavation of several hundred acres of land in the Natomas Basin and excavation of a site northeast of the basin. The new GGS/Drainage Canal would be excavated for approximately 8 miles through the western part of the basin. Project implementation also would alter structures and landscapes associated with Reclamation District (RD) 1000, a resource eligible for listing on the National Register of Historic Places (NRHP).

The approximately 1 million cubic yards of borrow material for the NCC south levee and PGCC west levee improvements would be obtained from land owned by RD 1001 northeast of the Natomas Basin. Approximately 4.4 million cubic yards of soil material would be needed for construction of the levee embankment, berms, and relocated canals along the Sacramento River east levee. About 600,000 cubic yards would be obtained through excavation of the new GGS/Drainage Canal between RD 1000's existing North Drainage Canal north of the Airport and its existing West Drainage Canal southwest of the Airport. SAFCA would obtain the balance of the fill material it needs for the improvements along the Sacramento River east levee from parcels in the Airport bufferlands, land planned for habitat development by The Natomas Basin Conservancy, and nearby privately owned agricultural land (Exhibit 3).



Potential Borrow Areas **Exhibit 3**

BACKGROUND INFORMATION

REGULATORY SETTING

The project is subject to the provisions of CEQA, as well as Section 106 of the NHPA.

CALIFORNIA ENVIRONMENTAL QUALITY ACT

CEQA includes provisions that specifically address the protection of cultural resources. CEQA requires consideration of impacts of a project on unique archaeological resources and historical resources. A unique archaeological resource, as defined in PRC Section 21083.2(g), is an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it:

(1) contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information;

(2) has a special and particular quality such as being the oldest of its type or the best available example of its type; or

(3) is directly associated with a scientifically recognized important prehistoric or historic event or person.

Section 15064.5(a) of the State CEQA Guidelines generally defines a historical resource as:

(1) a resource listed in, or determined to be eligible by the State Historical Resources Commission for listing in, the California Register of Historical Resources (CRHR);

(2) a resource included in a local register of historical resources or identified as significant in a historical resource survey; and

(3) any other object, building, structure, site, area, place, record, or manuscript that a lead agency determines to be historically significant, provided that the lead agency's determination is supported by substantial evidence.

CALIFORNIA REGISTER OF HISTORICAL RESOURCES

The CRHR includes resources that are listed in or formally determined eligible for listing in the NRHP (see below), as well as some California State Landmarks and Points of Historical Interest (PRC Section 5024.1, 14 CCR Section 4850). Properties of local significance that have been designated under a local preservation ordinance (local landmarks or landmark districts) or that have been identified in a local historical resources inventory may be eligible for listing in the CRHR and are presumed to be significant resources for purposes of CEQA unless a preponderance of evidence indicates otherwise (State CEQA Guidelines Section 15064.5[a][2]). The eligibility criteria for listing in the CRHR are similar to those for NRHP listing but focus on the importance of the resources to California history and heritage. A cultural resource may be eligible for listing in the CRHR if it:

(1) is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;

(2) is associated with the lives of persons important in our past;

(3) embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or

(4) has yielded, or may be likely to yield, information important in prehistory or history.

(See 14 CCR Section 4852.)

NATIVE AMERICAN HERITAGE COMMISSION

The Native American Heritage Commission (NAHC) identifies and catalogs places of special religious or social significance to Native Americans and known graves and cemeteries of Native Americans on private lands, and performs other duties regarding the preservation and accessibility of sacred sites and burials and the disposition of Native American human remains and burial items.

NATIONAL HISTORIC PRESERVATION ACT

Section 106 of the NHPA and its implementing regulations (36 CFR 800, as amended in 2004) require federal agencies to consider the potential effects of their proposed undertakings on historic properties. Historic properties are cultural resources that are listed on, or are eligible for listing on, the NRHP (36 CFR 800.16[l]). Undertakings include activities directly carried out, funded, or permitted by federal agencies. Federal agencies must also allow the Advisory Council on Historic Preservation (ACHP) to comment on the proposed undertaking and its potential effects on historic properties. Implementation of the proposed project would require permitting under Section 404 of the Clean Water Act and Section 408 approval from the USACE. Therefore, USACE compliance with Section 106 is required in relation to the proposed project.

SECTION 106 PROCESS

The implementing regulations for Section 106 of the NHPA require consultation with the State Historic Preservation Officer (SHPO), the ACHP, federally recognized Indian tribes and other Native Americans, and interested members of the public throughout the compliance process. The four principal steps are:

- Initiate the Section 106 process (36 CFR Section 800.3).
- Identify historic properties, resources eligible for inclusion in the NRHP (36 CFR Section 800.4).
- Assess the effects of the undertaking to on historic properties within the area of potential effect (APE) (36 CFR Section 800.5).
- Resolve adverse effects (36 CFR Section 800.6).

Adverse effects on historic properties are often resolved through preparation of a memorandum of agreement or PA developed in consultation between the federal agency, the SHPO, Indian tribes, and interested members of the public. The ACHP is also invited to participate. The agreement describes stipulations to mitigate adverse effects on historic properties.

NATIONAL REGISTER OF HISTORIC PLACES

The NRHP listing criteria are as follows (36 CFR Section 60.4):

The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and:

(a) that are associated with events that have made a significant contribution to the broad patterns of our history; or

(b) that are associated with the lives of persons significant in our past; or

(c) that embody the distinctive characteristics of a type, period or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

(d) that have yielded, or may be likely to yield, information important in prehistory or history.

RURAL HISTORIC LANDSCAPES

The rural historic landscape is a category of resources that is evaluated under the Section 106 process. This resource category is relevant to this project because RD 1000, the local geographic setting of the proposed project, is eligible for NRHP listing as a Rural Historic Landscape District. National Register Bulletin 30 defines a rural historic landscape as a geographical area that historically has been used by people or shaped or modified by human activity, occupancy, or intervention and that possesses a significant concentration, linkage, or continuity of areas of land use, vegetation, buildings and structures, roads and waterways, and natural features. Rural landscapes commonly reflect the day-to-day occupational activities of people engaged in traditional work such as mining, fishing, and various types of agriculture. Often, they have developed and evolved in response to both the forces of nature and the pragmatic need of people to make a living. Landscapes that are small and that have no buildings or structures, such as an experimental orchard, are classified as sites. Most, however, being extensive in acreage and containing a number of buildings, sites, and structures—such as a ranch or farming community—are classified as historic districts. Large acreage and a proportionately small number of buildings and structures differentiate rural historic landscapes from other kinds of historic properties.

National Register Bulletin 30 distinguishes rural historic landscapes from designed landscapes. Rural landscapes usually are not the work of a professional designer and have not been developed according to academic or professional design standards, theories, or philosophies of landscape architecture. These properties possess tangible features, called landscape characteristics, that have resulted from historic human use. In this way, they also differ from natural areas that embody important cultural values but have experienced little modification, such as sites having religious meaning for Native American groups.

EXISTING PROGRAMMATIC AGREEMENT

USACE, the SHPO, the Bureau of Reclamation, and the ACHP in 1991 executed a PA that governs the Section 106 process for implementation of the American River Watershed Project, including constructing levee, channel, and related flood control improvements in the Natomas Basin. The PA covers implementation of the specific elements of the proposed improvements that would involve the USACE as the federal lead agency. Additional signatories of the PA include The Reclamation Board and SAFCA.

The PA is relevant to the present study because it controls the Section 106 process for work within the American River Watershed Project, a flood control program that coincides in part with the proposed project. Furthermore, it acknowledges the following: "the Project may be modified based on public input, congressional authorization, and ongoing negotiations among the primary sponsors." Portions of the proposed project that also coincide with the American River Watershed Project must satisfy the provisions of the PA.

The PA includes procedures for the treatment of indirect and direct impacts of the levee improvements associated with the American River Watershed Project. The executed PA specifies inventory and NRHP evaluation procedures for historic properties, as well as the process for development of Historic Property Treatment Plans (HPTPs). Additionally, the PA details report format and review, participation of interested parties, curation of

recovered materials, and professional qualifications. Mitigation measures may include archaeological documentation, architectural and engineering documentation, and historical documentation, following standards and guidelines promulgated by the Secretary of the Interior.

NATURAL SETTING

The geological information presented here is taken from SAFCA's Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area (SAFCA 2007).

The project area lies in the Sacramento Valley portion of the Great Valley Geomorphic Province. The Great Valley is a large valley trending northwest-southeast that is bounded by the Sierra Nevada to the east and south, the Coast Ranges to the west, and the Klamath Mountains to the north. The Great Valley is drained by the Sacramento and San Joaquin Rivers, which join and flow out of the Great Valley province through San Francisco Bay. This geomorphic province is an asymmetric trough approximately 400 miles long and 50 miles wide that is characterized by a relatively flat alluvial plain made up of a deep sequence of sediment deposits from Jurassic to Recent age. The sediments in the Great Valley vary between 3 and 6 miles in thickness and were derived primarily from erosion of the Sierra Nevada to the east, with lesser material fro the Coast Ranges to the west. The eastern edge of the Sacramento Valley is flanked by uplifted and tilted sedimentary strata that overlie rocks of the Foothills Metamorphic Belt and are in turn overlain on the west by younger alluvium.

The Sacramento Valley has been a depositional basin throughout most of the late Mesozoic and Cenozoic time. A vast accumulation of sediments was deposited during cyclic transgressions and regressions of a shallow sea that once inundated the valley. Overlying the thick sequence of sedimentary rock units that form the deeply buried bedrock units in the mid-basin areas of the valley are Late Pleistocene and Holocene (Recent) alluvial deposits, consisting of reworked fan and stream materials that were deposited by streams prior to the construction of the existing flood control systems. The youngest geomorphic features in the area are low floodplains, which are found primarily along the Sacramento and American Rivers. The natural floodplains of these rivers are very wide in this area because the land is relatively flat. These major drainage ways were originally confined within broad natural levees sloping away from the rivers or streams. The natural levees formed through the deposition of alluvium during periods of flooding. As flood waters lost energy, the coarser materials settled out nearest the rivers and streams, forming the natural levees and sand bars in the vicinity of the river channel. The finer material was carried in suspension farther from the rivers or streams, and settled out in quiet water areas such as swales, abandoned meander channels, and lakes. However, because the streams have meandered and reworked the previously deposited sediments, extreme variations in material types may be found over a limited distance or depth.

Flanking the Recent alluvial deposits are late Pleistocene alluvial fan and terrace deposits of the Modesto and Riverbank Formations (Helley and Harwood 1985). Stream terrace deposits, mapped as the Modesto Formation, are higher in elevation and older than floodplain sediments. Before the construction of the existing levees, these stream terraces were occasionally flooded, but only small amounts of sediment were deposited during flood events. The lower fan terraces of the Riverbank Formation are higher in elevation and older than stream terraces, and were only rarely flooded.

The Natomas Basin is situated within the climatic band classified as the Lower Sonoran Zone. The climatic pattern is characterized as Mediterranean, with cool, wet winters and hot, dry summers. Locally, this pattern consists of approximately 17 inches of annual rainfall, high summer temperatures, and low humidity. The dominant vegetative communities in this area are prairie grasslands and tule marshes, with some areas of riparian woodland. Valley oak (*Quercus lobata*), cottonwood (*Populus fremontii*), sycamore (*Platanus racemosa*), and willow trees (*Salix* spp.) once grew on the verge of streams and rivers. Tule marshes included stands of tules, cattails, sedges, rushes, and clumps of willow trees.

Faunal species that frequented the prehistoric prairie grasslands and tule marshes included mule deer (*Odocoileus hemionus*), tule elk (*Cervus elaphus*), antelope (*Antilocapra americana*), weasel (*Mustela frenata*), river otter (*Lutra canadensis*), raccoon (*Procyon lotor*), and beaver (*Castor canadensis*). Migratory waterfowl, such as geese (*Branta canadensis*) and swans (*Olor* sp.), passed through during winter, joining resident white pelicans (*Pelecanus erythrorhynchus*), great blue and black-crowned herons (*Ardea herodias*, *Nycticorax nycticorax*), ibis (*Plegadis guarauna*), cranes (*Grus canadensis*), cormorants (*Phalacrocorax* sp.), and eagles (*Haliaetus leucocephalus*). Badgers (*Taxidea taxus*), coyotes (*Canis latrans*), skunks (*Mephitis mephitis*), jackrabbits (*Lepus californicus*), and cottontail rabbits (*Sylvilagus audubonii*) inhabited higher ground.

Within the waterways, chinook salmon (*Oncorhynchus tshawytscha*), rainbow trout (*Salmo gairdneri*), Pacific lamprey (*Lampetra tridentate*), and white sturgeon (*Acipenser transmontanus*) seasonally joined the other fish species indigenous to the area. Predators such as mountain lions (*Felis concolor*), grizzly bears (*Ursus americanus*), wolves (*Canis lupus*), kit fox (*Vulpes macrotis*), and bobcats (*Lynx rufus*) also roamed the area (Moratto 1984).

PREHISTORIC SETTING

PALEO-INDIAN AND LOWER ARCHAIC PERIODS

The earliest well-documented entry and spread of humans into California occurred at the beginning of the Paleo-Indian Period (10,000–6000 B.C.). Social units are thought to have been small and highly mobile. Known occupation sites have been identified within the contexts of ancient pluvial lake shores and coastlines, where characteristic hunting implements, such as fluted projectile points and chipped stone crescent forms, have been found. Prehistoric adaptations over the ensuing centuries have been identified in the archaeological record by numerous researchers working in the area since the early 1900s, as summarized by Fredrickson (1974) and Moratto (1984). Because of its plentiful resources and temperate climate, the Central Valley was well populated prehistorically and served as the location for some of the more substantial village sites known in California.

Beardsley (1948), Heizer and Fenenga (1939), and others conducted numerous studies that form the core of our early understanding of upper Central Valley archaeology. Little has been found archaeologically that dates to the Paleo-Indian or Lower Archaic (6000–3000 B.C.) time periods. However, archaeologists have recovered much data from sites occupied by the Middle Archaic period. The lack of discovery of sites from earlier periods may be the result of high sedimentation rates that have left the earliest sites deeply buried and inaccessible.

MIDDLE ARCHAIC, UPPER ARCHAIC, AND EMERGENT PERIODS

During the Middle Archaic Period (3000–1000 B.C.), the broad regional patterns of foraging subsistence strategies gave way to more intensive procurement practices. Subsistence economies were more diversified, possibly including the introduction of acorn processing technology. Human populations were growing and occupying more diverse settings. Permanent villages occupied year-round were established, primarily along major waterways. The onset of status distinctions and other indicators of growing sociopolitical complexity mark the Upper Archaic Period (1000 B.C.–A.D. 500). Exchange systems become more complex and formalized. Evidence of regular, sustained trade between groups was seen for the first time.

Several technological and social changes characterized the Emergent Period (A.D. 500–1800). The bow and arrow were introduced, ultimately replacing the dart and atlatl. Territorial boundaries between groups became well established. It became increasingly common that distinctions in an individual's social status could be linked to acquired wealth. Exchange of goods between groups became more regularized with more goods, including raw materials, entering into the exchange networks. In the latter portion of this period (A.D. 1500–1800), exchange relations became highly regularized and sophisticated. The clamshell disk bead became a monetary unit for exchange, and increasing quantities of goods moved greater distances. Specialists arose to govern various aspects of production and exchange.

The Middle and Upper Archaic and Emergent Periods are further broken down under the Central California Taxonomic System. These three time periods are well represented in archaeological assemblages in the vicinity of the project area. The assemblages are discussed in detail in Bennyhoff and Fredrickson (1969) and Moratto (1984) and are summarized here.

The **Windmiller Pattern** (3000–500 B.C.) of archaeological assemblages included an increased emphasis on acorn use and a continuation of hunting and fishing activities. Ground and polished charmstones, twined basketry, baked-clay artifacts (frequently used as a substitute for stone in the Central Valley), and worked shell and bone were hallmarks of Windmiller culture. Widely ranging trade patterns brought goods in from the Coast Range and trans-Sierran sources as well as closer trading partners. Perforated charmstones were associated with some burials. Mano and metate and small mortars were used but were rare.

Distinctive burial practices (ventrally extended, oriented westward) identified with the Windmiller Pattern also appeared in the Sierra Nevada foothills, indicating possible seasonal migration into the Sierra Nevada. The specific orientation of burials reinforces the idea that summers were spent in the Sierra Nevada and winters in the Central Valley. Men were generally buried in separate areas, in deeper graves, and with more artifacts than women, possibly indicating a higher social status. However, the rich offerings found with some women and children suggest that wealth also followed lineages or some sort of social patterns as well.

The **Berkeley Pattern (200 B.C.–A.D. 700)** represented a greater reliance on acorns as a food source than was seen previously. Distinctive stone and shell artifacts distinguished it from earlier or later cultural expressions, and may indicate the arrival and spread of ancestral Plains Miwok from the Bay Area region. Burials were predominantly placed in a tightly flexed position and frequently included red ochre. Minimally shaped mortar and pestle technology was much more prevalent than mano/metate. Nonstemmed projectile points become more common.

The **Augustine Pattern (A.D. 700–1800)** was marked by increasing populations resulting from more intensive food procurement strategies, and also by a marked change in burial practices and increased trade activities. Intensive fishing, hunting and gathering, complex exchange systems, and a wider variety in mortuary patterns were all hallmarks of this period. Mortars and pestles were more carefully shaped, and bow-and-arrow technology was present. Fishing implements became more common, trade increased, and cremation was used for some higher-status individuals. A well-developed ceramic industry has been noted at a site near Sloughhouse, east of Sacramento.

ETHNOGRAPHIC SETTING

The project area is situated within the lands traditionally occupied by the Nisenan, or Southern Maidu. The language of the Nisenan, which includes several dialects, is classified within the Maiduan family of the Penutian linguistic stock (Kroeber 1925). The western boundary of Nisenan territory was the western bank of the Sacramento River and the area between present-day Sacramento and Marysville. In the Sacramento Valley, the triblet, consisting of a primary village and a few satellite villages, served as the basic political unit (Moratto 1984). Valley Nisenan territory was divided into three triblet areas, each populated with several large villages (Wilson and Towne 1978), generally located on low, natural rises along streams and rivers or on slopes with a southern exposure. One important village, *Pusune*, near Discovery Park, appears to have been recorded as CA-SAC-26. Other villages—*Wollok, Leuchi, Wishuna, Totola,* and *Nawrean*—were located east of the confluence of the Feather and Sacramento Rivers, near the northwestern portion of the Natomas Basin.

Nisenan houses were domed structures covered with earth and tule or grass and measured 10–15 feet in diameter. Brush shelters were used in the summer and at temporary camps during food-gathering rounds. Larger villages often had semisubterranean dance houses that were covered in earth and tule or brush and had a central smoke hole at the top and an east-facing entrance, as well as smaller sweathouses. Another common village structure was a granary, which was used for storing acorns (Wilson and Towne 1978). Valley Nisenan people followed a

seasonal round of food gathering, as did most California Indians. The wide variety of food resources available was exploited year round, but hunting and gathering activities were at their most intense in late summer and early fall. Food staples included acorns, buckeyes, pine nuts, hazelnuts, various roots, seeds, mushrooms, greens, berries, and herbs. Game, roasted, baked, or dried, included mule deer, elk, antelope, black bear, beaver, squirrels, rabbits, fish, shellfish, and other small animals and insects (Wilson and Towne 1978). Seasonal harvests were carried out by families or the larger community, engendering social behavior such as sharing, trading, and conducting ceremonies.

Euro-American contact with the Nisenan began with infrequent excursions by Spanish explorers and Hudson Bay Company trappers traveling through the Sacramento and San Joaquin Valleys in the early 1800s. In general, Nisenan lifeways remained stable for centuries until the early to middle decades of the 19th century. With the coming of Russian trappers and Spanish missionaries, cultural patterns began to be disrupted as social structures were stressed. An estimated 75% of the Valley Nisenan population died in the malaria epidemic of 1833. With the influx of Europeans during the Gold Rush era, the population was further reduced as a result of disease and violent relations with the miners. However, today the Maidu are reinvesting in their traditional culture and, through newfound political, economic, and social influence, now constitute a growing and thriving native community in California.

HISTORIC SETTING

EARLY EXPLORATION

Although Russian trappers and traders associated with the Hudson's Bay Company likely traveled through Sacramento, Sutter, and Yuba Counties during earlier years, the first well-documented European exploration of the general region occurred in 1808, when Spanish explorer Gabriel Moraga led an expedition from Mission San Jose to the northern Sacramento Valley (Hoover, Rensch, and Rensch 1966). The earliest Euro-American settlement coincided with the establishment of land grants by the Mexican government in the 1840s. John A. Sutter obtained the first such grant in the region in 1841. Sutter's New Helvetia Rancho encompassed lands on the east bank of the Feather and Sacramento Rivers within the project area (Beck and Haase 1974).

MINING

Although there are no records of large-scale mining having been conducted in the project area or in the immediate vicinity, the industry had considerable indirect effects on historical developments in the region. The diggings and mines in the Sierra Nevada foothills dramatically increased economic activity in the region, leading to increased prosperity and the rise of larger and more numerous support industries, such as cattle ranches and farms. In addition, sediments washing into the Central Valley watercourses, including the Feather, Sacramento, and American Rivers, had a negative impact on water quality and on the scale and frequency of seasonal flooding.

Hydraulic mining, first conducted in Nevada in 1852, was the most cost-effective means of recovering placer gold from deeply buried gravels along and near river and stream channels. To access these deeply buried deposits, miners used streams of water under high pressure to wash away sediments and gravels. The sands and gravels were passed through sluices that separated out the placer gold. Silt and sand washed into nearby creeks, streams, and rivers, raising watercourse beds, clogging the channels, and generally polluting the waters. Between 1849 and 1909, 195 million cubic meters of mining debris entered the channels of the American River basin. The deposition of silt in the rivers resulted in the raising of the riverbeds and increased flooding. After 1861, catastrophic floods became more common, prompting the development of a levee system and beginning the process of land reclamation for agricultural purposes.

Construction of a railroad was a natural outgrowth of Sacramento's expansion and the need to deliver supplies to the California foothills. The railroad was completed by February 1856. The first rail line ran to the town of Folsom, where at least 21 different wagon trains then carted goods from the train to outlying areas as far away as Carson City, Nevada. The Central Pacific Railroad bought the Sacramento Valley Railroad in 1865 and added its

facilities to those already being built for the Transcontinental Railroad. The Central Pacific and its successor, the Southern Pacific Railroad, became the major industry in Sacramento after 1863. It is estimated that early in its history, the railroad employed 20–30% of salaried employees in Sacramento (Historic Environment Consultants 1998).

AGRICULTURE AND FLOOD CONTROL

GENERAL

Agriculture and ranching were the primary industries in the present-day Sacramento and Sutter County region during the historic period. Regional ranching originated on the New Helvetia rancho in the early 1840s. The Gold Rush precipitated growth in agriculture and ranching, as ranchers and farmers realized handsome returns from supplying food and other goods to miners. Frequent floods plagued the residents of the region, however, and posed a significant threat to the viability of agricultural interests and further settlement.

Initial efforts at flood control were usually uncoordinated and consisted of small levees and drains constructed by individual landowners. These features proved insufficient to protect cultivated land, and much of the project area flooded regularly (Dames & Moore 1994a). In 1861, the California Legislature created the State Board of Swampland Commissioners to reclaim swamp and overflow lands. The State Board of Swampland Commissioners established 32 districts that attempted to enclose large areas with natural levees. Lack of cooperation among the landowners in the districts led to chronic financial crises. When the legislature terminated the State Board of Swampland Commissioners in 1866, responsibility for swamp and overflow land fell to the individual counties. Many counties offered incentives to landowners for reclaiming agriculturally unproductive land. If a landowner could certify that he had spent at least $2 per acre in reclamation, the county would refund the purchase price of the property to the owner. Speculators took advantage of this program and a period of opportunistic and often-irrational levee building followed (Thompson 1958).

In the early part of the 20th century, the state legislature established The Reclamation Board to exercise jurisdiction over reclamation districts and levee plans. That year, the state approved and began implementation of the Sacramento River Flood Control Project (SRFCP). The ambitious project included the construction of levees, weirs, and bypasses along the river to channel floodwaters away from population centers. Under the SRFCP, new reclamation districts were created, including RD 1000, consisting of approximately 55,000 acres in the Natomas Basin. RD 1000 was largely controlled by the Natomas Company, which had access to more money than any individual landowner. The Natomas Company was formed in 1851 in Sacramento County to supply water for placer mining and irrigation. It later became involved in dredging for gold and expanded its water supply business. The Natomas Company became involved in land reclamation in part as a rebuttal of criticism that farmland was being destroyed by the company's gold dredging activities (Dames & Moore 1994a).

RD 1000 RURAL HISTORIC LANDSCAPE DISTRICT

The infrastructure of RD 1000 (Exhibit 4) was completed in the 1920s. It includes levees, drainage canals, pumps, irrigation systems, agricultural fields, and roads, as well as remnant natural features. The originally constructed features included levees and exterior drainage canals, an interior drainage canal system, nine pumping plants, a series of levee and interior roads, and unpaved rights-of-way between the farm fields.

Previous efforts to document and mitigate impacts on elements of RD 1000 are relevant to the proposed project. The RD 1000 area has been identified as eligible for inclusion in the NRHP as a Rural Historic Landscape District. The evaluation process was conducted both to determine the NRHP eligibility of the district and to evaluate whether the district would be significantly affected by flood control projects planned and subsequently implemented by the USACE as part of the American River Watershed Project (Dames & Moore 1994a). The "determination of effects" statement concluded that the USACE projects would adversely affect both contributing

and noncontributing elements of the Rural Historic Landscape District by allowing for greater development to occur in the region. Mitigation measures were recommended and adopted. These consisted of Historic American Engineering Record documentation, which was prepared by Peak & Associates (1997); videotapes of historic properties; and a list of repositories where copies of the information would be made available to the public.

Dames & Moore determined that RD 1000 appears to be eligible for listing as a Rural Historic Landscape District at the state level of significance for the period from 1911 to 1939 under Criterion A. The area of significance was listed as reclamation and the historical context was listed as the flood control and reclamation of the Sacramento River basin within the SRFCP as an important part of the history of reclamation and flood control. The district retains much of its historic integrity, including location design, setting, materials, workmanship, feeling, and association. The contributing and noncontributing elements of the district were defined as part of this effort. Contributing elements were described as follows:

- **Drainage System:** East Levee, River Levee, Cross Canal Levee; Natomas East Main Drainage Canal; Cross Canal; Pleasant Grove Canal; Pumping Plants No. 1-A, 2, and 3; the canal connecting Pumping Plant No. 3 and the West Drainage Canal, North Drainage Canal, East Drainage Canal, West Drainage Canal, Natomas Main Drainage Canal, and the drainage ditches within the areas of contributing large-scale land patterns.

- **Road System:** Garden Highway from Orchard Lane north to the Cross Canal; East Levee/Natomas Road; Sankey Road; Riego Road; Elverta Road; Elkhorn Boulevard from Garden Highway to the western boundary of the Sacramento Airport; Del Paso Road from Powerline Road to its intersection with Interstate 5 (I-5); San Juan Road from Garden Highway to its intersection with I-5; Powerline Road; El Centro Road from north of Interstate 80 (I-80) to its intersection with Bayou Way; and the right-of-way roads within fields in the areas of contributing large scale land patterns.

- **Large-Scale Land Patterns:** Land area that consists of open fields formed by the intersection of the canals and roads in the area bounded as follows: west of the East Levee; west of Sorrento Road, north of Del Paso Road between the East Levee and I-5, west of I-5 from its intersection with Del Paso Road to its intersection with I-80; north of I-80 from its intersection with I-5 to the River Levee; east of the River Levee; and south of the Cross Canal Levee.

Noncontributing resources include parts of the drainage system (some pumping plants and associated branch canals); parts of the road system; some large-scale land patterns (the area bounded by Sorrento Road to the east levee, south of Del Paso Road between I-5 and the east levee, south of I-80, and the Airport); and some land uses, vegetation, boundary demarcations, buildings, and structures such as those more closely associated with agriculture than reclamation, municipal structures, commercial structures, and electric power lines.

STUDY METHODOLOGY

This section describes the methods used to date to identify cultural resources in the study area and to satisfy the relevant statutory and regulatory framework. The methodology is consistent with state and federal standards, was developed to meet the requirements of CEQA and NHPA Section 106, and is consistent with the PA. All study elements described in this section have been completed by archaeologists that meet the Secretary of the Department of the Interior's professional qualification standards.

The cultural resource inventory efforts will be completed in phases, as access to project lands is acquired. A phased identification process is specifically authorized at 36 CFR Section 8004.2(b)(2):

> Where alternatives under consideration consist of corridors or large land areas, or where access to properties is restricted, the agency official may use a phased process to conduct identification and evaluation efforts. The agency official may also defer final identification and evaluation of historic properties if it is specifically provided for in a memorandum of agreement executed pursuant to § 800.6, a programmatic agreement executed pursuant to § 800.14 (b), or the documents used by an agency official to comply with the National Environmental Policy Act pursuant to § 800.8. The process should establish the likely presence of historic properties within the area of potential effects for each alternative or inaccessible area through background research, consultation and an appropriate level of field investigation, taking into account the number of alternatives under consideration, the magnitude of the undertaking and its likely effects, and the views of the SHPO/THPO and any other consulting parties. As specific aspects or locations of an alternative are refined or access is gained, the agency official shall proceed with the identification and evaluation of historic properties in accordance with paragraphs (b)(1) and (c) of this section.

The following sections describe background research conducted to identify existing resources and sensitivity of resources, completed identification efforts, and future work required under the phased approach.

NATIVE AMERICAN CONTACT PROGRAM

EDAW sent a letter of inquiry to the NAHC on June 12, 2007, asking for information or concerns regarding the project area, as well as a list of individuals or organizations that might have information or concerns regarding the project area (Appendix A). On June 19, 2007, Debbie Pilas-Treadway of the NAHC responded and indicated that no known sites were found in the Sacred Lands File that were located within the project area or in the immediate vicinity. Ms. Pilas-Treadway also provided EDAW with a list of individuals who could be contacted concerning cultural resources in the project area. These individuals were sent contact letters on June 21, 2007, with information regarding the proposed project and a request for any information they might provide or concerns that they might have about the project. No written responses were received; therefore, follow-up phone calls were made on July 9, 2007. Only one individual, Rose Enos (referred to by the NAHC as "Miwok/Maidu"), answered. Ms. Enos expressed general concern regarding avoidance of burial sites and asked to be contacted if work is conducted on such sites. Messages were left for the remaining people on the contact list; however, no response from any of these individuals has been received. In addition, EDAW contacted Randy Yonemura of the Ione Band of the Miwok to request information on areas of concern. Mr. Yonemura led an EDAW archaeologist on a field visit of the project area and provided anecdotal information on areas of potential Native American burials.

INFORMATION CENTER RECORDS SEARCHES

Records searches were conducted in stages in 2006 and 2007 for different portions of the proposed project footprint. Most of the searches were conducted at the North Central Information Center (NCIC) of the California Historical Resources Information System, located at California State University, Sacramento. The NCIC records search covered portions of the project area in Sacramento County. Records searches were also conducted at the

Northeast Information Center (NEIC), which maintains cultural resource records for Sutter County. The searches at both facilities included, but were not necessarily restricted to, an examination of the following resources:

- The State Office of Historic Preservation's *Historic Property Directory and Determination of Eligibility* (2006)
- The National and California Registers of Historic Places (2006)
- *California Inventory of Historic Resources* (1976 and updates)
- *Historic Properties Directory* (2006)
- *California Historical Landmarks* (1996 and updates)
- *California Points of Historical Interest* (1992 and updates)
- *Caltrans Local Bridge Survey* (1987)
- Various historic maps

The NEIC and NCIC reported that several cultural resource inventories have been conducted within the project area. These are listed in Tables 1 and 2, respectively.

Table 1
Previous Cultural Resources Surveys Conducted in the Project Area in Sutter County

NEIC Report No.	Author(s)	Title	Date
1135	Bass, H. O.	*Department of Transportation Negative Archaeological Survey Report: State Route 99*	1983
7173	Cultural Resources Unlimited	*A Cultural Resources Study for Sutter Bay Project, Sutter County, California*	1992
7175	Cultural Resources Unlimited	*A Cultural Resources Study for Sutter Bay Project Highway 99/70 Interchange/Crossroad Improvements Sutter County, California*	1992
3469B	Dames & Moore	*Rural Historic Landscape Report for Reclamation District 1000 for the Cultural Resources Inventory and Evaluations for the American River Watershed Investigation, Sacramento and Sutter Counties, California*	1996
5777	Dames & Moore	*Historic Property Treatment Plan for Reclamation District 1000 Rural Historic Landscape District for the Cultural Resources Inventory and Evaluations for the American River Watershed Investigation, Sacramento and Sutter Counties, California*	1994a
4197	Dames & Moore	*Archaeological Inventory Report, Natomas Locality, Cultural Resources Inventory and Evaluation, American River Watershed Investigation, El Dorado, Placer, Sacramento, and Sutter Counties, California*	1994b
6892	Derr, E. H.	*American Basin Fish Screen and Habitat Improvement Project, Feasibility Study: Alternative 1C, 2C, 3, Sacramento and Sutter Counties, California*	2002
6944	Ebasco Environmental	*Cultural Resources Survey of the Sacramento Energy Project Sacramento County, California*	1992
5655	Egherman, R., and B. Hatoff	*Roseville Energy Facility Cultural Resources Appendix J-1 of Application for Certification*	2002
6945	Foster, J. W., and D. G. Foster	*An Archaeological Survey of the South Sutter Industrial Center Property, Sutter County, California*	1992
2987	Jensen, P.	*Historic Properties Survey Report for the Proposed Fifield Road at Pleasant Grove Creek Canal, Caltrans District 3, Sutter County, California*	1999
6893	Kaptain, N.	*Historic Property Survey Report for the State Route 99/Riego Road Interchange Project Sutter and Sacramento Counties*	2005
4658	Nelson, W. J., M. Carpenter, and K. L. Holanda	*Cultural Resources Survey for the Level (3) Communications Long Haul Fiber Optics Project. Segment WPO4: Sacramento to Redding*	2000
3469A	Peak & Associates	*Historic American Engineering Record Reclamation District 1000 HAER No CA-187*	1997
1141	Wilson, K.L.	*Sacramento River Bank Protection Unit 34 Cultural Resources Survey Final Report*	1978

Note: NEIC = Northeast Information Center
Source: Data provided by the Northeast Information Center in 2007

Table 2
Previous Cultural Resources Surveys Conducted in the Project Area in Sacramento County

NCIC Report No.	Author(s)	Title	Date
–	Banek, B.	*An Archaeological Reconnaissance of the South Natomas Area for the River Bank Holding Company, Sacramento County, California*	1982
4188	Billat, L. B.	*Nextel Communications Wireless Telecommunications Service Facility—Sacramento County*	2001
–	Bouey, P. D.	*Cultural Resources Inventory and Evaluation: Sacramento River Bank Protection (Unit 44) Project*	1989
4206, part 1	Bouey, P. D., and R. Herbert	*Intensive Cultural Resources Survey and National Register Evaluation: Sacramento Urban Area Flood Control Project*	1990
6519	Bouey, P., J. Berg, J., and C. A. Hunter	*Cultural Resources Test Excavations, Sacramento Urban Area Flood Control Project, Sacramento County, California*	1991
4457	California Department of Transportation	*Negative Historic Property Survey Report for the Proposed Installation of Automatic Vehicle Census Systems on Interstate 80 East of the West El Camino Over-Crossing and on Highway 51 East of the "E" Street Ramps, Sacramento County, California*	2003
4194	Chavez, D., L. H. Shoup, C. Desgrandchamp, and W. G. Slater	*Cultural Resources Evaluations for the North Natomas Community Plan Study Area, Sacramento, California*	1984
4193	County of Sacramento Department of Environmental Review and Assessment	*Draft Environmental Impact Report for Teal Bend Golf Course Use Permit*	1995
4190	CRS Archaeological Consulting and Research Services	*Sacramento Metro Airport Airmail Facility*—letter report	1988
3409	Cultural Resources Unlimited	*A Cultural Resources Study for Sacramento Area Flood Control Agency Borrow Sites Project Sacramento County*	1993
4463	Cultural Resources Unlimited	*A Cultural Resources Survey and Archival Review for the Arden-Garden Connector Project Sacramento County, California*	1992
3469B	Dames & Moore	*Rural Historic Landscape Report for Reclamation District 1000 for the Cultural Resources Inventory and Evaluations for the American River Watershed Investigation, Sacramento and Sutter Counties, California*	1996
4197	Dames & Moore	*Archaeological Inventory Report, Natomas Locality, Cultural Resources Inventory and Evaluation, American River Watershed Investigation, El Dorado, Placer, Sacramento, and Sutter Counties, California*	1994b
5777	Dames & Moore	*Historic Property Treatment Plan for Reclamation District 1000 Rural Historic Landscape District for the Cultural Resources Inventory and Evaluations for the American River Watershed Investigation, Sacramento and Sutter Counties, California*	1996
4195	Derr, E.	*Cultural Resources Report: North Natomas Comprehensive Drainage Plan; Levee Improvements, Canal Widening and Additional Pumping Capacity*	1997
4466	Derr, E.	*Historic Resource Evaluation Report for the Arden-Garden Connector Project CT-03-30274.B1 Sacramento County, California*	1983
6892	Derr, E. H.	*American Basin Fish Screen and Habitat Improvement Project, Feasibility Study: Alternative 1C, 2C, 3, Sacramento and Sutter Counties, California*	2002
6944	Ebasco Environmental	*Cultural Resources Survey of the Sacramento Energy Project Sacramento County, California*	1992

Table 2
Previous Cultural Resources Surveys Conducted in the Project Area in Sacramento County

NCIC Report No.	Author(s)	Title	Date
5655	Egherman, R., and B. Hatoff	*Roseville Energy Facility Cultural Resources Appendix J-1 of Application for Certification*	2002
3489A	Far Western Anthropological Research Group	*Report on the First Phase of Archaeological Survey for the Proposed SMUD Gas Pipeline Between Winters and Sacramento Yolo and Sacramento Counties, California*	1993
3489B	Far Western Anthropological Research Group	*Addendum to the Report on the First Phase of Archaeological Survey for the Proposed SMUD Gas Pipeline Between Winters and Sacramento Yolo and Sacramento Counties, California*	1993
4206, part 2	Far Western Anthropological Research Group	*Intensive Cultural Resources Survey and National Register Evaluation: Sacramento Urban Area Flood Control Project*—letter report to SHPO	2005
–	Foster, J. W.	*A Cultural Resource Investigation of the Blue Oaks Skilled Nursing Facility Site Auburn, California*	1995
–	Glover, L. C., and P. D. Bouey	*Sacramento River Flood Control System Evaluation, Mid-Valley Area Cultural Resources Survey, Colusa, Sacramento, Sutter, Yolo, and Yuba Counties, California*	1990
4449	Herbert, R. F.	*Report on the National Register Eligibility of the Sacramento River Docks Building 37 McClellan Air Force Base, Sacramento, California*	1995
5803	Herbert, R. F.	*Report on the National Register Eligibility of the Sacramento River Dock Complex including Building 4635 (Dock) and Building 4637 (Warehouse) McClellan Air Force Base, Sacramento, California*	1995
4202	Humphreys, S., and L. McBride	*A Review of the Work Carried Out at Sacramento 16, the Bennett Mound*	1966
4178	Jones & Stokes	*Archaeological Survey Report for the North Natomas Drainage System's San Juan Pump Station*	1992
2956	Nadolski, J. A.	*Archaeological Survey Report for the Jibboom Street Bridge Project Sacramento, California*	2001
4435	Nadolski, J. A.	*Archaeological Investigations for the Sacramento-KOVR Diverse Lateral Overbuild in Sacramento and Yolo Counties*	2001
5810	PAR Environmental Services, Inc.	*Northgate Boulevard/Arden-Garden Intersection Cultural Resources Investigation, City of Sacramento, Sacramento County, California*	n.d.
4187	Pastron, A. G., and R. K. Brown	*Historical and Cultural Resource Assessment Proposed Telecommunications Facility Natomas Park, Site No. SA-750-01 2450 Del Paso Road, Sacramento County, California*	2001
173	Peak, A. S.	*American River Parkway An Archaeological Perspective*	1973
2764	Peak & Associates	*Historic Property Survey Report and Finding of No Adverse Effect for the Proposed American River Parkway Bike Trail Improvement Project, City and County of Sacramento, California*	2001
2765	Peak & Associates	*Archaeological Survey Report for the Proposed American River Parkway Bike Trail Improvement Project, City and County of Sacramento, California*	
3469A	Peak & Associates	*Historic American Engineering Record Reclamation District 1000 HAER No. CA-187*	1997
4173	Peak & Associates	*Report on the Archaeological Testing Within the Riverbend Classics Project Area, City of Sacramento, California*	1999
4181	Peak & Associates	*Cultural Resources Overview for the North Natomas Long-Term Planning Area, Sacramento County, California*	4181

Table 2
Previous Cultural Resources Surveys Conducted in the Project Area in Sacramento County

NCIC Report No.	Author(s)	Title	Date
6830	Peak & Associates	*Determination of Eligibility and Effect for the Natomas Panhandle Annexation Project Area Sacramento County, California*	2005
4201	Peak, A. S., H. L. Crew, and R. Gerry	*The 1971 Archaeological Salvage of the Bennett Mound, CA-SAC-16, Sacramento, CA*	1984
4456	Ritchie, M.	*Finding of Effect for the Proposed Safety Improvements and Rehabilitation of the Jibboom Street Bridge on Jibboom Street, Bridge No. 24C-022, Sacramento, Sacramento County, California*	2001
–	Snyder, J.W.	*Historic Property Survey Report (Positive) for the Jibboom Street Bridge Safety Improvements and Rehabilitation Project Jibboom Street, Sacramento County, California*	2003
4441	Sonoma State Anthropological Studies Center	*Archaeological Surface Reconnaissance and Backhoe Testing for the South Natomas Projects (P92-122, P92-160) Sacramento County, California*	
3408	Theodoratus Cultural Research	*Discovery Park Construction Site Examination for Archaeological Resources in the Area of CA-Sac-26*—letter report	1981
4458	True, D. L.	*8-Acre Survey at 1801 Garden Highway, Sacramento, California*	1983
1141	Wilson, K. L.	*Sacramento River Bank Protection Unit 34 Cultural Resources Survey Final Report*	1978

Note: SHPO = State Historic Preservation Officer
Source: North Central Information Center Record Search 2007

Numerous archaeological investigations have covered portions of the Natomas Basin. These have generally focused on areas closest to the rivers and levees. There has been very little archaeological inventory of lands more than 100 feet from the levee toes, and ground surface visibility has frequently been poor even in surveyed areas.

The most comprehensive of these investigations were completed by Dames & Moore and Far Western. In 1994, Dames & Moore (1994b) conducted a broad survey in the Natomas Basin as part of the American River Watershed Investigation. Surveying of selected parcels along the Sacramento River resulted in the identification of 17 primarily historic sites. During the same effort, Dames & Moore visited an additional 10 previously identified cultural resources to update site records for those locations. At the same time, Dames & Moore (1994a) prepared a draft Historic Property Treatment Plan that explored the history and elements of RD 1000. In 1996, Dames & Moore completed its evaluation of RD 1000, concluding that it appeared to be eligible for listing on the NRHP under Criterion A at a state level of significance as an example of reclamation and flood control in the Sacramento River basin during the period 1911–1939. This report extensively documents both the contributing and noncontributing resources of RD 1000. Previously, in 1990, Far Western had conducted surveys of areas along the same route surveyed by Dames & Moore in 1994 (Dames & Moore 1994b), as well as of additional areas (Bouey and Herbert 1990). Far Western (Bouey, Berg, and Hunter 1991) followed up with limited test excavations of two sites that may be within or near the footprint of 2009–2010 project components (borrow areas) that have not yet been fully defined.

Numerous cultural resources were identified in the course of previous survey efforts, including ranches and farms; agricultural, transportation, and reclamation features; and debris scatters, as well as prehistoric occupation and burial sites consisting of mounds or the disturbed remnants of mounds (Tables 3 and 4).

EDAW FIELD SURVEYS

Fieldwork undertaken by EDAW in 2007 focused on the areas that would be affected by project construction in 2008: the NCC south levee, Sacramento River east levee Reaches 1–4B to Station 214+00, the proposed right-of-way of the relocated Elkhorn Canal and the new GGS/Drainage Canal, and potential borrow sites. EDAW conducted pedestrian surveys of those portions of these areas that were accessible; however, only a small proportion of the land area in the potential project footprint for 2008 was accessible to surveys, mainly because of the presence of crops. As access to the unsurveyed lands becomes available, pedestrian surveys will be completed in these areas.

In April/May 2007, an EDAW archaeologist examined the NCC south levee and adjacent lands within the existing maintenance right-of-way. In July/August 2007, a crew of EDAW archaeologists conducted field surveys in accessible parcels within Sacramento County–owned Airport bufferlands north of the Airport. On the Airport bufferlands, the surveys covered a 400-foot-wide strip east of the Sacramento River east levee and small portions of the proposed borrow sites in the Airport north bufferlands. Survey areas within 1,000 feet of the Sacramento River and the locations of prehistoric lakebeds were walked using transects 15 meters apart. Farther from the Sacramento River and prehistoric lakebeds, the transect interval was widened to 30 meters. The potential borrow sites were almost completely inaccessible because they contained rice crops. Exhibit 5 shows those portions of the project area that were surveyed by EDAW in 2007. Areas with poor ground surface visibility (i.e., less than 50%), would require subsequent survey at a time of year when ground surface visibility would be improved.

Two new historic sites, NLIP-1 and NLIP-2, were identified during the surveys adjacent to Garden Highway, and four groups of farm buildings, NLIP-3 through NLIP-6, were also identified and evaluated (Appendix B).

As mentioned above, Randy Yonemura of the Ione Band of the Miwok also showed an EDAW archaeologist the locations of subsurface cultural resources that have not been recorded in any of the previously prepared documentation filed with the NCIC and NEIC, which are known to him from anecdotal information.

IDENTIFIED CULTURAL RESOURCE SITES IN THE SUTTER COUNTY PORTION OF THE PROJECT AREA

Table 3 lists the known cultural resource sites in the Sutter County portion of the project area. Most of the listed sites are in areas proposed for 2009–2010 construction. The sites that may be affected by 2008 construction are shown with an asterisk. The sites listed in Table 3 are described below.

Table 3
Cultural Resources in the Sutter County Portion of the Project Area

Trinomial*	P-No.*	Historic/ Prehistoric	Description	Date Recorded	Quadrangle	NRHP/CRHR Status If Known
CA-SUT-84H*	51-000084	Historic	Natomas Cross Canal/Pleasant Grove Creek Canal levees	1994	Pleasant Grove, Verona	Eligible
	51-000096H*	Historic	1950s-era ranch	2002	Taylor Monument	
NLIP-3*		Historic	Farm Complex	2007	Verona	Not eligible
NLIP-4*		Historic	Farm Complex	2007	Verona	Not eligible
NLIP-5*		Historic	Farm Complex	2007	Verona	Not eligible
NLIP-6*		Historic	Farm Complex	2007	Verona	Not eligible
Barney Mound*		Prehistoric	Intact occupation mound site	not	Verona	Potentially eligible

Notes:
CRHR = California Register of Historic Resources; NRHP = National Register of Historic Places.
* Sites that would be or may be affected by the 2008 construction elements are marked with an asterisk.
Source: Data compiled by EDAW in 2007

CA-SUT-84H (P-51-000084)

This trinomial includes both the NCC south levee and the Pleasant Grove Creek Canal (PGCC) west levee, the northernmost contributing resources to RD 1000. The NCC levee measures approximately 25 feet wide at the top, 75 feet wide at the base, and 15 feet high. The top has been graded and graveled for vehicle traffic. The PGCC levee is smaller, measuring approximately 20 feet wide at the top, 60 feet wide at the base, and 10 feet high. There is also an associated retention basin, constructed of concrete and measuring 50 feet by 35 feet across and 15 feet deep. A concrete and steel pump foundation is located within the basin. Concrete footings running from a hole in the side of the basin to the top of the NCC levee indicate that a large pipe once connected the two features.

Archaeologists reported that the levee (unclear which one) was raised and strengthened twice, after flooding during 1938–1939 and after flooding in RD 1001 during 1955. RD 1000 modified the NCC south levee and its adjacent canals in 1987 and SAFCA modified them in 1996. SAFCA constructed a cutoff wall in the western portion of the NCC south levee in 2007.

P-51-000096H

Located on the Sacramento/Sutter county line and at the edge of a proposed borrow area, this resource consists of a historic ranch complex that includes two residences, four sheds or barns, and a trailer. The archaeological survey crew was not allowed on the property to record the structures in more detail.

NLIP-3, 7240 Garden Highway

The Sutter County Assessor's records currently list this property along the Sacramento River east levee south of Sankey Road as vacant. No construction date is on file for the buildings. The construction methods and materials appear to date to the early 20th century. This property appears to have always functioned as a residential and agricultural complex. The buildings are in good condition but lack the historic associations or architectural distinctions that would make them eligible for listing on the CRHR or NRHP.

NLIP-4, 11000 Garden Highway

This property is near the Sacramento River east levee north of Riego Road. The Sutter County Assessor's records list one of the two residences on the property as being constructed in 1957. The property has been in the Lauppe family since that time. The land, originally listed as Assessor's Parcel Number 35-020-15, was split into separate parcels several years ago as part of a lot-line adjustment. Because of the split, the 35-020-15 parcel number was retired, and additional parcel numbers (35-020-18, 35-020-19) were assigned.

Research did not reveal this property to be significantly associated with an important historic event, and the historic-era building located here is not known to be associated with an individual considered important in local history. The property itself has undergone regular periods of construction over the years, with new buildings added and older structures modified. The buildings lack the historic associations or architectural distinctions that would make them eligible for listing on the CRHR or NRHP.

NLIP-5, Howsley Road at the Natomas Cross Canal

This small complex includes a mid-20th century residence and several turn-of-the-century horse stalls. The buildings are in good condition but lack the historic associations or architectural distinctions that would make them eligible for listing on the CRHR or NRHP.

Survey Coverage Map
Exhibit 5
NLR Landsat Improvements Project
Sacramento Area Flood Control Agency
EDAW
Cultural Resources Inventory

Source: Dames & Moore 1995

Exhibit 4

Contributing Features of the RD 1000 Rural Historic Landscape District

NLIP Landside Improvements Project
Sacramento Area Flood Control Agency

15

EDAW
Cultural Resources Inventory

NLIP-6, Howsley Road at the Pleasant Grove Creek Canal

This is a small residential complex dating to the mid-20th century. The buildings are in good condition but lack the historic associations or architectural distinctions that would make them eligible for listing on the CRHR or NRHP.

Barney Mound

This is an unrecorded prehistoric occupation mound with a residence on top, located along Powerline Road north of Sankey Road. Although the site has not been recorded officially, it is well known in the region and, as an intact prehistoric mound site in an area where almost all such sites have been destroyed, is likely to be eligible for CRHR and NRHP listing.

IDENTIFIED CULTURAL RESOURCE SITES IN THE SACRAMENTO COUNTY PORTION OF THE PROJECT AREA

Table 4 lists the known cultural resource sites in the Sacramento County portion of the project area. This table does not include several known sites in the southeastern portion of the Natomas Basin (located mainly along the Natomas East Main Drainage Canal [NEMDC]/Steelhead Creek) because there are no proposed project elements in that part of the basin. Most of the listed sites are in areas proposed for 2009–2010 construction. The sites that may be affected by 2008 construction are shown with an asterisk, and those that may be affected by 2009–2010 construction are shown with a plus sign. The sites listed in Table 4 are described below.

Table 4
Cultural Resources in the Sacramento County Portion of the Project Area

Trinomial[a,b]	P-No.[a]	Historic/ Prehistoric	Description	Date Recorded	Quadrangle	NRHP/CRHR Status if Known
CA-Sac-15/H*	34-000042	Both	Occupation mound with historic debris	1934, 1990, 1993	Taylor Monument	
CA-Sac-16/H*	34-000043	Both	Occupation/burial mound with historic debris and foundations	1934, 1966, 1984, 1987, 1990, 1993	Taylor Monument	Potentially eligible
CA-Sac-17*	34-000044	Prehistoric	May have been destroyed	1934, 1990	Taylor Monument	
CA-Sac-18	34-000045	Prehistoric	Lithic scatter	1934, 1994	Taylor Monument	
CA-Sac-160/H*	34-000187	Both	Occupation/burial mound with historic farm	1947, 1949, 1994	Taylor Monument	
CA-Sac-164+	34-000191	Prehistoric	Occupation/burial site nominated to NRHP	1972, 1982, 1988, 1989, 1990, 1991, 2001–2007	Sacramento West	Eligible
CA-Sac-430H	34-000457	Historic	West drainage canal	1991, 1993, 1997	Taylor Monument	
CA-Sac-485/H*+	34-000512	Both	Occupation mound and historic home site	1994	Taylor Monument	Potentially eligible
CA-Sac-486H	34-000513	Historic	Historic home site	1994	Taylor Monument	
CA-Sac-487H	34-000514	Historic	Historic debris and vegetation	1994	Taylor Monument	
CA-Sac-488H	34-000515	Historic	Historic debris and vegetation	1994	Taylor Monument	
CA-Sac-489H	34-000516	Historic	Historic debris and vegetation	1994	Taylor Monument	

Table 4
Cultural Resources in the Sacramento County Portion of the Project Area

Trinomial[a,b]	P-No.[a]	Historic/ Prehistoric	Description	Date Recorded	Quadrangle	NRHP/CRHR Status If Known
CA-Sac-490H	34-000517	Historic	Historic debris and vegetation	1994	Taylor Monument	
CA-Sac-491H	34-000518	Historic	Historic debris and vegetation	1994	Taylor Monument	
CA-Sac-492H	34-000519	Historic	Historic well, pipes and vegetation	1994	Taylor Monument	
CA-Sac-493H	34-000520	Historic	Historic debris	1994	Taylor Monument	
CA-Sac-494H*	34-000521	Historic	Historic debris	1994	Taylor Monument	
CA-Sac-569H	34-000741	Historic	Paved road	1994, 1998	Taylor Monument, Rio Linda	
CA-Sac-836H*	34-001354	Historic	Farm complex	2005	Taylor Monument	Not eligible
	34-000883	Historic	Paved road	1998	Taylor Monument	
	34-000884	Historic	Paved road	1998	Taylor Monument	
	34-000886	Historic	Paved road	1998	Rio Linda, Taylor Monument	
	34-001552	Historic	House	2002	Taylor Monument	
	34-001557*	Historic	Pumping plant	2006	Taylor Monument	
	34-001558*	Historic	Pumping plant	2006	Taylor Monument	
	34-001559*	Historic	Pumping plant	2006	Taylor Monument	
NLIP-1*		Historic	Lean-to and shed	2007	Taylor Monument	Not eligible
NLIP-2*		Historic	Historic debris scatter	2007	Taylor Monument	Not eligible

Note:
[a] Sites that would be or may be affected by the 2008 construction elements are marked with an asterisk.
[b] Sites that may be affected by 2009–2010 construction elements are marked with a plus sign.
Source: Data provided by EDAW in 2007

CA-Sac-15/H

This site, near the Sacramento River east levee south of I-5, consists of a prehistoric occupation midden mound with a concentration of debitage, flaked stone tools, shell artifacts, faunal remains, fire-cracked rock, and baked clay objects. The mound has been heavily affected by farming and ranching activities. There is a ranch complex including a bunkhouse, garden, shed, chicken coop, water tower, garage, and driveway on the mound; historic debris on the site includes glass and broken ceramic fragments. A limited auger testing program was carried out west of the mound along the Sacramento River east levee and found no cultural materials along that transect (Bouey and Herbert 1990), however the authors suggested that the site may have been mis-mapped.

CA-Sac-16/H (P-34-000043)

CA-Sac-16/H is south of the Airport on a property that would be a potential borrow source for the proposed project. This site has been variously called the Bennett Mound, Mound Ranch, Willey Mound, and S-16. It includes the remains of a prehistoric occupation mound, possibly the largest in the Sacramento Valley, but has been leveled in stages by agricultural activities. The site location corresponds to the ethnographic village of *Nawrean*. What remains today consists of dark midden soils in plowed fields with fragments of human remains, shell, fire-cracked rock, baked clay objects, groundstone, faunal bone, flaked stone artifacts, and debitage. A few historic artifacts, such as brick and ceramic fragments, are also present. Today, two separate loci have been identified and recorded as CA-Sac-16/H; the larger, Locus I, represents the approximate original location of the

mound. Locus II is an area of redeposited soil taken from the mound in the past. There is also a historic-era component of the site from the remnants of a slaughterhouse and brick factory present before the 1930s. Historic artifacts noted include bricks, sawed mammal bone, a filled-in privy, bottles, ceramic and metal fragments, and glass.

The site was originally described as very large, up to 7 acres in area, and 20 feet high. The earliest investigations were conducted in 1923 by Zallio, who excavated at the site a number of times and recovered projectile points, bone tools, Haliotis ornaments, and other artifacts (Bouey, Berg, and Hunter 1991). It was first formally recorded in 1934 by Heizer, who identified it as a large mound with stone artifacts and freshwater shell on the surface. Sacramento Junior College excavated pits and trenches up to 18 feet deep in 1936–1937. The main focus of this effort was on recovery of mortuary remains; however, considerable quantities of nonburial associated artifacts were also documented. More excavations were conducted by Sacramento State College in 1953 and by American River College between 1966 and 1971, and more artifacts and burials were salvaged by Peak, Crew, and Gerry (1984) when what was left of the mound was leveled. At that time, Peak, Crew, and Gerry estimated that as much as 13 feet of the mound might still be present below the plowed surface. As an interesting side note—and as an indication of the original CA-Sac-16/H mound's prominence—Peak, Crew, and Gerry mention that Heinrich Schliemann (an amateur archaeologist and later the discoverer of Troy) visited the site in 1851–1852.

More recently, Bouey and Herbert (1990) completed a surface survey and excavated two auger holes at the toe of the levee that forms the western boundary of the site; they reported evidence of subsurface cultural deposits, including shell midden. Larger-scale excavations (Bouey, Berg, and Hunter 1991), dug within 100 feet of the levee toe and the ramp leading up to Garden Highway, confirmed that midden deposits still exist; however, agricultural activity seems to have destroyed any stratigraphic integrity the deposits might have had that close to the levee. Testing farther from the levee toe was not undertaken.

The summary of the research done by 1991 (Bouey, Berg, and Hunter 1991) agreed with the conclusions of Derr (1983) that the site was a large, permanent habitation locus occupied from the Upper Archaic (ca. 1000 B.C.) to just after the beginning of European contact. Derr found that the upper 20–60 centimeters of soil (in the areas he examined near the levee) consisted of redistributed midden with artifacts and isolated human remains. What appears to be missing from any of these analyses is an attempt to define the original mound or to find intact elements of the site that may have been located beyond the original mound. If there are intact subsurface deposits associated with CA-Sac-16/H, then the site may be eligible for listing on the CRHR or NRHP because of the potential information contained in those deposits.

The earliest documentation, Heizer's site record form from 1934, does not give dimensions for the mound and does not contain specific enough information to provide for relocation of the original boundaries of the mound. It is presumed that the dispersed midden from the mound now covers a larger surface area than the mound used to occupy. However, it is unclear exactly how large an area that is because various investigations have reported Locus I (the larger site deposit) as measuring 110 meters by 185 meters (Bouey and Herbert 1990), 250 meters by 250 meters (Kauffman and Kauffman 1983), and 450 meters by 850 meters (Dames & Moore 1993). The Dames & Moore site record form appears to be the only one that maps out the secondary Locus II area, northeast of the main deposit and east of a drainage ditch (as of 1993).

CA-Sac-17 (P-34-000044)

This is the location of a mound site reported by Heizer in 1934 west of Fisherman's Lake; however, none of the mound remains. In 1990, Bouey and Herbert attempted to locate any cultural remains but could not find any evidence of cultural deposits on the surface or in auger holes. The site is near the Undercome Ranch.

CA-Sac-18 (P-34-000045)

This site, landward of the Sacramento River east levee north of San Juan Road, consists of a sparse scatter of basalt debitage, one cryptocrystalline biface fragment, a polished stone, and possible fire-cracked rock. It was originally described by Heizer as a mound 30 yards in diameter and 5 feet high; however, Heizer may have misinterpreted a natural rise in the landscape as a mound. CA-Sac-18 appears to be lacking the intensive cultural deposits that are the hallmark other nearby known mound sites (Dames & Moore 1994b).

CA-Sac-160/H (P-34-000187)

This is a multicomponent site near the Sacramento River east levee north of San Juan Road. It includes a prehistoric occupation mound with a farm complex situated on top. Excavations in the 1940s removed numerous burials and artifacts including groundstone, flaked stone tools, shell beads and ornaments, fire-cracked rock, baked clay objects, stone beads, faunal remains, bone awls, bird bone tubes and whistles, obsidian drills, quartz crystals, charmstones, and historic glass trade beads, as well as historic debris related to farming and occupation of the top of the mound.

CA-Sac-164 (P-34-000191)

CA-Sac-164 is a very large, deeply stratified prehistoric occupation and burial mound near Sand Cove Park on the Sacramento River that has been explored a number of times using archaeological techniques; however, in spite of these efforts, the true boundaries of the site remain unknown. The site includes shell midden with abundant cultural materials including fire-cracked rock, flaked and ground stone tools, charmstones, polished bone implements, debitage, quartz crystals, bone and shell beads, baked clay objects, and plentiful faunal remains. Large fire-cracked rock features and hearths have also been noted. Because of its significant scientific value and the integrity, CA-Sac-164 was nominated for NRHP listing in 2001.

The site was first recorded in 1951, after a newspaper article reported that human remains and stone tools were eroding out of the cutbank and into the Sacramento River. Observers who walked along the edge of the cutbank in summer and fall when the river was at its lowest noted that site deposits, interspersed with flood-deposited silt, extended at least 4 meters below the current-day surface. Excavations in the 1970s, 1980s, and 1990s confirmed the depth of intact and resource-bearing cultural strata at the site, at least along the river exposure. Work on the land side of the Sacramento River levee indicated that downward-trending cultural strata might be found there as well, beginning well over a meter below the ground surface, however the site's depth, extent, and boundaries have never been completely defined.

Annual river height fluctuation, wave action resulting from boat wakes, and looting combined to cause continual erosion and collapse of the cutbank. This resulted in artifacts and remains falling onto the beach area below, where they either washed into the river or collected by the public. To address this issue, a site stabilization program was implemented in 2005 that included placing dirt and plantings over the cutbank and creating a wave break near the river's edge of the site.

CA-Sac-430H (P-34-000457)

This feature is the West Drainage Canal, a relatively unmodified canal that originates at Fisherman's Lake and flows southeast to the East and Main Drainage Canals.

CA-Sac-485/H (P-34-000512)

This site, between the Sacramento River east levee and the proposed location of the relocated Elkhorn Canal, was once a prehistoric occupation and burial mound that has been leveled by agricultural activities and was documented by Dames & Moore in 1994. The remains of a historic-era homestead, consisting mainly of

ornamental vegetation, driveway, and historic debris, were noted on top of the prehistoric site. Dames & Moore archaeologists noted that the prehistoric component was large, measuring 220 meters by 160 meters with two depositional loci—a larger area near Garden Highway and a smaller deposit to the east. Prehistoric artifacts noted at the time included obsidian and basalt flakes and tools, shell beads and ornaments, faunal remains, groundstone fragments, charmstones, baked clay, imported exotic tool stone, and shell.

In August 2007, EDAW archaeologists undertook a limited shovel testing program at CA-Sac-485/H to determine whether there was an undisturbed subsurface deposit that could be affected by the proposed canal construction in the vicinity of this site (Exhibit 6). The August investigation began with a survey of the site area where a sparse assortment of artifacts was visible; because no concentrations of artifacts were identified on the surface, the Dames & Moore archaeological site map was used to guide the placement of shovel test pits (STPs). Brian Padilla, of the El Dorado Miwok, was present while the STPs were excavated.

During the course of excavations, archaeologists uncovered artifacts including obsidian and basalt flakes; clamshell disk beads; burned earth; faunal remains, including freshwater mussel shell; and fire-cracked rock. Human remains were uncovered in three of the STPs; the Sacramento County coroner and NAHC were contacted, excavation of each of those three STPs was halted immediately, and the remains were reburied where they were found. None appeared to be part of a larger, intact burial and all were found in the upper 50 centimeters of soil.

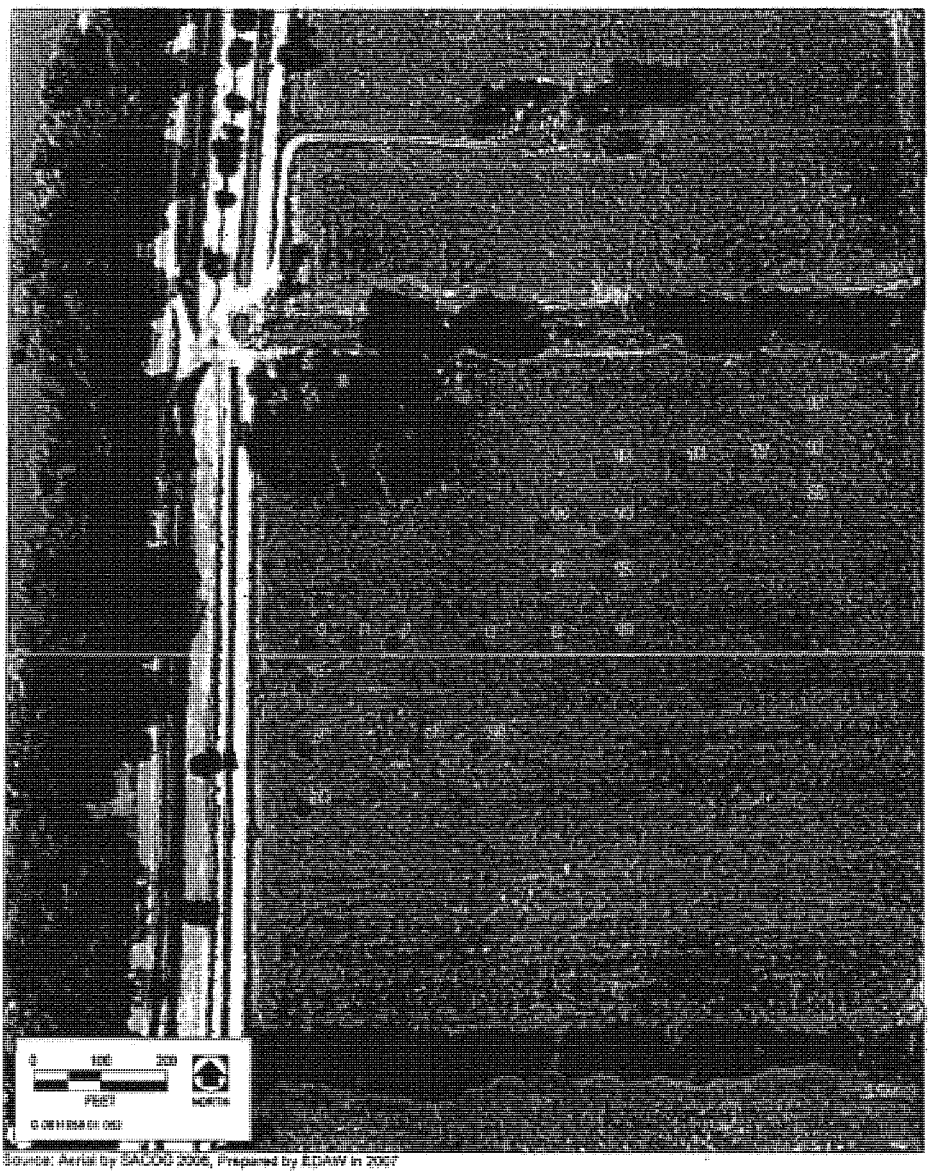
In general, site soils consisted of dry compact silts with a small sand and clay content; excavation and screening were difficult because the soils were very dry and hard. If artifacts were recovered, excavation generally proceeded to 100 centimeters below surface (cmbs); where no artifacts were found, excavations terminated around 80 cmbs. A deeply buried midden layer was identified in each of the four STPs (Nos. 4, 6, 21, and 24) closest to the levee, beginning anywhere from 55 cmbs to 80 cmbs. Excavation halted at approximately 100 cmbs in these STPs without reaching the bottom of the midden deposit; a split-spoon probe was used in STP No. 21 to find the bottom of the deposit, which was reached at approximately 160 cmbs. Although the northern and southern edges of the midden deposit were not located, the STP program was halted on the assumption that a more formal testing program, using a combination of test units and additional STPs, would be implemented as part of more detailed design of the proposed project. Based on the data collected during the brief testing at CA-Sac-485/H, it appears that significant intact prehistoric deposits may be found below capping soils at the site. If this is true, CA-Sac-485/H may be eligible for listing on the CRHR or NRHP for the site's data potential.

CA-Sac-486H (P-34-000513)

This site near the Sacramento River east levee below the North Drainage Canal consists of the remains of a historic-era homestead. The structure that once stood on the site has been demolished. Remnant landscape plantings and debris consisting of ceramic fragments, bottle glass, ceramic, bricks, mortar, and metal fragments were noted. The structures were visible in a 1937 aerial photograph and were depicted on the 1967 U.S. Geological Survey topographic quadrangle map. The archaeologists who identified the site in 1994 noted that some of the trees appeared to be less than 30 years old, although a fragment of amethyst glass (generally associated with the turn of the century) was noted.

CA-Sac-487H (P-34-000514)

Like CA-Sac-486H, this location near the Sacramento River east levee below the North Drainage Canal includes historic debris, such as concrete fragments, milled lumber, metal fence posts, wire, farm machinery parts, clear and green glass, window glass, and ornamental plantings, all of which indicate that a structure existed at the site at one point but has since been demolished. Also like the previous site, a structure was visible in this location in a 1937 aerial photograph; several structures were indicated on the 1950 and 1975 topographic quadrangle maps for the area.



Source: Aerial by SACOG 2006, Prepared by EDAW in 2007

CA-Sac-485/H Shovel Test Map **Exhibit 6**

CA-Sac-488H (P-34-000515)

This is another site near the Sacramento River east levee below the North Drainage Canal where a structure appeared on a 1937 aerial photograph and 1950 topographic quadrangle map, although no building is on the site today. Historic debris, ornamental vegetation, and a fence line remain. The debris included various concrete fragments, corrugated metal, wire, culvert pipe, and a large section of iron pipe.

CA-Sac-489H (P-34-000516)

This is another site near the Sacramento River east levee below the North Drainage Canal where a structure appeared on a 1937 aerial photograph and 1950 topographic quadrangle map, although no building is on the site today. The associated debris includes a fenced-off well head, concrete fragments, lumber, window glass, wooden posts, galvanized pipes, old fencing overgrown by an oak tree, an enamelware bucket, tires, ceramic fragments, bottle glass, and a metal bucket. Ornamental landscaping plants were also noted.

CA-Sac-490H (P-34-000517)

This site, near the south end of Powerline Road, had three structures that appeared on a 1937 aerial photograph and 1950 topographic quadrangle map, although no building is on the site today. The historic debris is similar to the debris found at sites CA-Sac-486H through CA-Sac-489H, including concrete, brick, iron piping, a fence post, bottle glass, ceramic fragments, and galvanized metal pipe, as well as remnant ornamental vegetation.

CA-Sac-491H (P-34-000518)

This site, also near the south end of Powerline Road, was likely used in association with four structures that appeared on the 1950 topographic quadrangle map. The 1937 aerial photograph associated with other sites listed here includes coverage of this property, however, only trees are clearly visible in the photograph. The artifacts consist of a sparse scatter, including a wood fence, concrete fragments, bricks, and metal fence posts. Ornamental vegetation was noted nearby.

CA-Sac-492H (P-34-000519)

This site, near the south end of Powerline Road, consists of a concrete-capped well, associated water pipes, and remnant ornamental vegetation and fruit trees that were likely associated with a structure visible on the 1950 topographic quadrangle map of the area. A cluster of trees is visible in the 1937 aerial photograph, but no structures are clearly visible. The site is now used to keep honeybees.

CA-Sac-493H (P-34-000520)

The 1950 topographic quadrangle map and 1937 aerial photograph of the region indicate that there was once a large barn and associated structure at this location near the Sacramento River east levee south of I-5. Today, scattered historic debris—clear and colored glass, porcelain and earthenware, iron pipe, bone fragments, brick, and a white ceramic insulator—is all that remains.

CA-Sac-494H (P-34-000521)

This is another site, west of Fisherman's Lake, where a structure appeared on a 1937 aerial photograph and 1950 topographic quadrangle map, although no building is present today. Associated debris documented by an archaeological team in 1994 included concrete and brick fragments, an iron water pipe, white ceramic insulators, and clear bottle glass. In addition, the archaeologists noted abundant modern debris on the site, making it difficult to distinguish between modern and historic artifacts.

ADDITIONAL EFFORTS TO BE UNDERTAKEN

The project area, including portions of the area that may be within the footprint of 2008 construction elements, has not been completely surveyed to date. As shown in Table 5, several sites that are potentially eligible for CRHR or NRHP listing may be affected by the proposed project, and elements of RD 1000 would be modified. For sites that do not appear to be eligible for listing in the NRHP or on the CRHR, or that are eligible but that would not be affected by a proposed project, no further action would be recommended. A draft Research Design is being prepared to describe recommended efforts to define the sites listed in Table 5 to determine the potential for their avoidance, if possible; methods for testing to determine their eligibility for listing as necessary; and a plan for identifying potential cultural resources that are not known from the published records.

In addition, for each phase of the NLIP Levee Improvements Project, the following efforts will be conducted:

- completion of pedestrian surveys for the entire project footprint, once access is acquired;
- preparation of further Cultural Resources Inventory Reports with recommendations of eligibility, finding of effects, and recommended mitigation measures; and
- preparation of a Historic Property Treatment Plan for resources determined to be eligible or recommended as eligible for NRHP listing, in accordance with Stipulation 4 of the PA.

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APPENDIX A

Project Correspondence

EDAW | AECOM

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 7, 2007

Debbie Pilas-Treadway
Native American Heritage Commission
915 Capitol Mall, Room 364
Sacramento, Ca 95814

RE: Natomas Levee Improvement Project

Dear Ms. Pilas-Treadway:

EDAW is conducting cultural resources studies for the above-referenced project located generally north of the City of Sacramento, in Sacramento and Sutter counties, and located on the Grays Bend, Taylor Monument, Verona, Rio Linda, Pleasant Grove, Sacramento East, and Sacramento West USGS quadrangle maps. Background research and field studies conducted for this project will identify cultural resources that may be impacted by proposed levee improvements throughout the American River basin. This letter is intended to initiate part of the consultation process that will eventually be required under Section 106 National Historic Preservation Act.

I am pleased to bring this activity to your attention, and would appreciate any information you can provide regarding prehistoric, historic, or ethnographic Native American land use. I am interested in any contemporary Native American values that may be present near or within the project area and would like to request a search of the NAHC Sacred Land files.

Please send via mail or facsimile (916-414-5850) a listing of local Native American representatives at your earliest convenience, so that I may contact appropriate individuals and account for their potential concerns in the planning process.

If you have any questions or comments feel free to contact me at my office. I can be reached by email at charlane.gross@edaw.com, or by phone at 916-414-5800. I look forward to hearing from you soon.

Sincerely,

Charlane Gross, M.A., R.P.A.
Senior Archaeologist

STATE OF CALIFORNIA — Arnold Schwarzenegger, Governor

NATIVE AMERICAN HERITAGE COMMISSION
915 CAPITOL MALL, ROOM 364
SACRAMENTO, CA 95814
(916) 653-4082
Fax (916) 657-5390

June 19, 2007

Charlene Gross
EDAW Inc.
2011 J Street
Sacramento, CA 95814

Sent Via Fax: 916-414-5850
Of Pages: 3

RE: Natomas Levee Improvement project, Sacramento and Sutter Counties

Dear Ms. Gross:

The Native American Heritage Commission has reviewed the Sacred Lands File and found several burial/recorded sites in/near the project area. The location of sites is confidential.

I recommend that you contact the North Central Information Center, Ca State University, Sacramento, 6000 J Street, Adams Building, Suite 103, Sacramento, CA 916-278-6217 for sites in Sacramento County and Northeast Information Center, Ca State University, Chico, Building 25, Suite 204, Chico, CA 95929, 530-898-4413 for Sutter County, for further information of recorded sites located in/near the APE.

I have enclosed a list of Native Americans individuals/organizations contacts may have knowledge of additional cultural resources in the project area. The Commission makes no recommendation or preference of a single individual, or group over another. These lists should provide a starting place in locating areas of potential adverse impact within the proposed project area. I suggest you contact all of those indicated, if they cannot supply information, they might recommend other with specific knowledge. A minimum of two weeks must be allowed for responses after notification.

If you receive notification of change of addresses and phone numbers from any these individuals or groups, please notify me. With your assistance we are able to assure that our lists contain current information. If you have any questions or need additional information, please contact me at (916) 653-4038.

If you have any questions or need additional information, please contact me.

Sincerely,

Debbie Pilas-Treadway
Environmental Specialist III

Native American Contacts
Sacramento and Sutter Counties
June 19, 2007

√ = CALL
√ = CALL W/MESSAGE
√ = CALL SPOKE W/INDIVIDUAL (SEE CALL LOG RECORD)

√
Rose Enos
15310 Bancroft Road — Maidu
Auburn , CA 95603 — Washoe
(530) 878-2378

Shingle Springs Band of Miwok Indians
Nicholas Fonseca, Chairperson
P.O. Box 1340 — Miwok
Shingle , CA 95682 — Maidu
nfonseca@ssband.org
(530) 676-8010
(530) 676-8033 Fax

√
Enterprise Rancheria of Maidu Indians
Frank Watson, Vice Chairperson
1940 Feather River Blvd., Suite B — Maidu
Oroville , CA 95965
eranch@cncnet.com
(530) 532-9214
(530) 532-1768 FAX

Strawberry Valley Rancheria
Calvine Rose, Chairperson
PO Box 667 — Maidu
Marysville , CA 95901 — Miwok

√
Enterprise Rancheria of Maidu Indians
Glenda Nelson, Chairperson
1940 Feather River Blvd., Suite B — Maidu
Oroville , CA 95965
eranch@cncnet.com
(530) 532-9214
(530) 532-1768 FAX

Strawberry Valley Rancheria
Robert Kerfoot
PO Box 667 — Maidu
Marysville , CA 95901 — Miwok

√
Shingle Springs Band of Miwok Indians
Jeff Murray, Cultural Resources Manager
P.O. Box 1340 — Miwok
Shingle , CA 95682 — Maidu
jmurray@ssband.org
(530) 676-8010
(530) 676-8033 Fax

√
United Auburn Indian Community of the Auburn
Jessica Tavares, Chairperson
575 Menlo Drive, Suite 2 — Maidu
Rocklin , CA 95765 — Miwok
916 663-3720
916 663-3727 - Fax

This list is current only as of the date of this document.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources for the proposed Natomas Levee Improvement project, Sacramento and Sutter Counties.

Native American Contacts
Sacramento and Sutter Counties
June 19, 2007

United Auburn Indian Community of the Auburn
Tribal Preservation Committe
575 Menlo Drive, Suite 2 Maidu
Rocklin , CA 95765 Miwok
916 663-3720
916 663-3727 - Fax

This list is current only as of the date of this document.

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EDAW | AECOM

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

United Auburn Indian Community of the Auburn
Tribal Preservation Committee
575 Menlo Drive, Suite 2
Rocklin, CA 95765

Subject: Natomas Levee Improvement Project(s)

To Whom It May Concern:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

We would appreciate your help in identifying any concerns you or your community may have regarding any cultural resources in the study area. Please return the enclosed response form. Returning this form does not imply that you approve or disapprove of the study, nor does it limit your opportunity to comment at a later time. Efforts to address your concerns will be included in the planning process.

In order to incorporate your concerns and/or input in any forthcoming reports, we would appreciate receiving your comments by July 10th.

If you have questions, please contact me at (916) 414-5800.

Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW | AECOM

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

United Auburn Indian Community of the Auburn
Jessica Tavares, Chairperson
575 Menlo Drive, Suite 2
Rocklin, CA 95765

Subject: Natomas Levee Improvement Project(s)

Dear Ms. Tavares:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

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Senior Archaeologist

Enclosures: Map, Response form, SASE

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EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Strawberry Valley Rancheria
Robert Kerfoot
P.O. Box 667
Marysville, CA 95901

Subject: Natomas Levee Improvement Project(s)

Dear Mr. Kerfoot:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

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Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW | AECOM

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Strawberry Valley Rancheria
Calvine Rose, Chairperson
P.O. Box 667
Marysville, CA 95901

Subject: Natomas Levee Improvement Project(s)

Dear Mr. Rose:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

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Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW | AECOM

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Single Springs Band of Miwok Indians
Nicholas Fonseca, Chairperson
P.O. Box 1340
Shingle Springs, CA 95682

Subject: Natomas Levee Improvement Project(s)

Dear Mr. Fonseca:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

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Senior Archaeologist

Enclosures: Map, Response form, SASE

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EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Shingle Springs Band of Miwok Indians
Jeff Murray, Cultural Resources Manager
P.O. Box 1340
Shingle Springs, CA 95682

Subject: Natomas Levee Improvement Project(s)

Dear Mr. Murray:

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Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW | AECOM

EDAW inc
2022 J Street Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Enterprise Rancheria of Maidu Indians
Glenda Nelson, Chairperson
1940 Feather River Blvd., Suite B
Oroville, CA 95965

Subject: Natomas Levee Improvement Project(s)

Dear Ms. Nelson:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

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Sincerely,

Charlene Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW | AECOM

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Enterprise Rancheria of Maidu Indians
Frank Watson, Vice Chairperson
1940 Feather River Blvd., Suite B
Oroville, CA 95965

Subject: Natomas Levee Improvement Project(s)

Dear Mr. Watson:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

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Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW | AECOM

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

June 21, 2007

Rose Enos
15310 Bancroft Road
Auburn, CA 95603

Subject: Natomas Levee Improvement Project(s)

Dear Ms. Enos:

EDAW, Inc., an environmental firm, has been retained to complete an Environmental Impact Report (EIR) for various SAFCA (Sacramento Area Flood Control Agency) levee improvement projects throughout the American River Basin in both Sacramento and Sutter Counties (see attached map). There are few specific planned improvements as yet, but the projects may include levee strengthening or widening, excavation for slurry walls or canals, soil removal from various borrow sites throughout the basin, and similar types of projects. The work will be conducted over the next several years, but EDAW is collecting cultural resources information now to help guide planning decisions made for the individual elements of this much larger effort.

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If you have questions, please contact me at (916) 414-5800.

Sincerely,

Charlane Gross, M.A., RPA
Senior Archaeologist

Enclosures: Map, Response form, SASE

EDAW

Project Name: 05110058.01
Project Number: SAFCA/N. NAMOMAS LEVEE

Telephone Contact Report

CONFIDENTIAL

Call Participants: LBH — ROSIE ENOS
Title: ? — NATION/WASHOE CONTACT

Initiated By: LBH
Organization: (SEE ABOVE)

Phone Number: 530-878-2378
Location: EDAW SAC

Subject: SAFCA, NAMOMAS L.C. LEVEE
Date/Time: 7-9-07 12:30

Discussion Item(s):

— CONCERN IS BURIAL SITE AVOIDANCE

— WOULD LIKE ANY INFORMATION CONCERNING ANY FURTHER WORK CONCERNING SUCH SITES

Action Item(s):

Distribution:

This phone note may contain confidential and proprietary information. It is intended for use by EDAW, Inc., its clients, vendors, and other associates.

APPENDIX B

Department of Parks and Recreation Site Record Forms

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code

Other Listings
Review Code | Reviewer | Date

Page 1 of 2 *Resource Name or #: NLIP-1

P1. Other Identifier:
P2. Location: ☒Not for Publication ☐Unrestricted *a. County: Sutter
and (P2b and P2c or P2d. Attach a Location Map as necessary.)
b. USGS 7.5' Quad: Date:
Taylor Monument 7-31-07 T10N; R4E; NW¼ of NW ¼ of Sec 6 ; Mount Diablo B.M.
c. Address: City: Zip:
d. UTM: Zone 10S ; 622214 mE/ 4289367 mN, 622229 mE/ 4289319 mN, 622244 mE/ 4289358 mN
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate)
The lean-to structure, shed, associated debris and looter's pit are located approximately (?) feet east of Garden Highway, south of the intersectionof Garden Highway Reigo Road.

P3a. Description: The dilapidated remains of of a structure and shed include a rectangular wood frame "lean-to" style building with a corrugated metal roof, which stands on a concrete pad, and a smaller , square wooden shed. An assortment of debris litters the area between the two structures and includes: white earthenware, tires, window glass, clear and brown bottle glass, corrugated metal sheets, and rusted metal objects., milled lumber fragments, tires, window blind fragments, and pieces of dislodged mortar. Also, what appears to be a looter's pit is nearbay with 1950'S and 1960's era bottles, plastic, and a porcelain drawer pull within or near it. The site was found in a dense cluster of trees, poison oak and blackberry brambles; the numerous blackberry bushes and other groundcover obscure the availability of a full description of the structure. None of the site components appeared to be more than 40-50 years old. The Taylor Monument USGS quadrangle indicates two structures that match the site location, and both of these appear as a part of the 1980 photorevision of the 1967 original. This site does not appear to contain values that would make it eligible for listing on the CRHR or NRHP.

P3b. Resource Attributes:
AH2 (structure pad), AH15 (standing structure), AH4 (trash scatter)
P4. Resources Present: ☐Building ☐Structure ☐Object ☐Site ☐District ☐Element of District ☐Other (Isolates, etc.)

P5b. Description of Photo:
Remnants of structure-facing north-northeast
P6. Date Constructed/Age and Sources: ☒Historic ☐Prehistoric ☐Both

P7. Owner and Address:

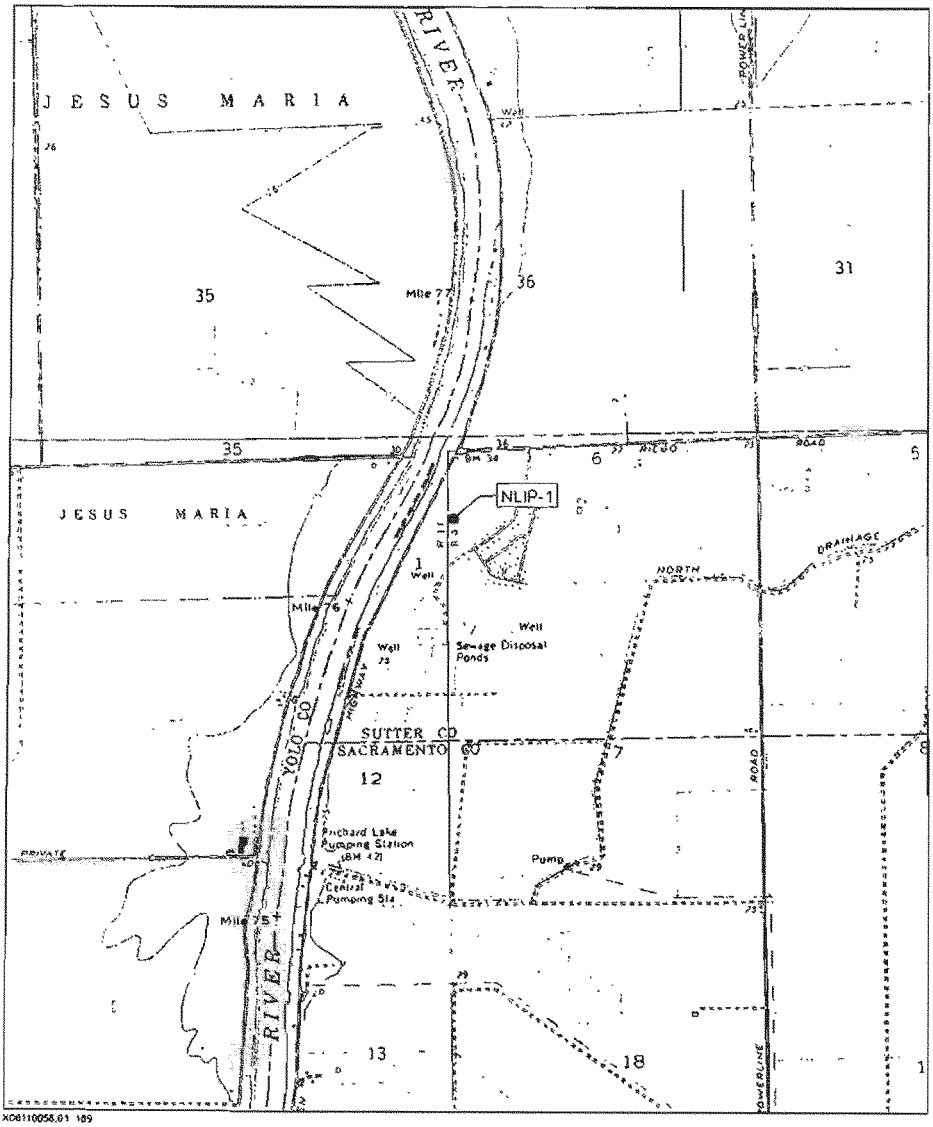
P8. Recorded by:
Charlane Gross
EDAW
2022 J Street
Sacramento, CA 95811

P9. Date Recorded:
7-31-07

P10. Survey Type:
Intensive

P11. Report Citation:

*Attachments: ☐NONE ☒Location Map ☐Sketch Map ☐Continuation Sheet
☐Building, Structure/Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record
☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record
☐Other (List):



Source: Taylor Monument Quad, 08-027-07

NLIP-1

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code

Other Listings
Review Code | Reviewer | Date

Page 1 of 2 *Resource Name or #: NLIP-2

P1. Other Identifier:

P2. Location: ☒Not for Publication ☐Unrestricted *a. County: Sacramento
and (P2b and P2c or P2d. Attach a Location Map as necessary.)

b. USGS 7.5' Quad: Date:
Taylor Monument 7-31-07 T10N; R4E; SW¼ of SW ¼ of Sec 13 ; Mount Diablo B.M.

c. Address: City: Zip:

d. UTM: Zone 10S ; 621430 mE/ 4286256 mN

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate)
East of the Garden Highway approximately (?) feet

P3a. Description: This site consisted of a small historic debris scatter noted in a dirt farm road east of the Sacramento River East Levee and a drainage ditch. There appeared to be a mix of modern debris and a fragment of amethyst glass. It is presumed that this deposit was relocated from one of the nearby farm sites. The mixture of historic and modern debris and the location in an area disturbed by levee, ditch, and road construction all indicate that this site does not retain sufficient integrity to make it eligible for listing on the CRHR or NRHP.

P3b. Resource Attributes:
AH4 (trash scatter)

P4. Resources Present: ☐Building ☐Structure ☐Object ☐Site ☐District ☐Element of District ☒Other (Isolates, etc.)

P5b. Description of Photo:
None available

P6. Date Constructed/Age and Sources:
☒Historic
☐Prehistoric ☐Both

P7. Owner and Address:

P8. Recorded by:
Charlane Gross
EDAW
2022 J Street
Sacramento, CA 95811

P9. Date Recorded:

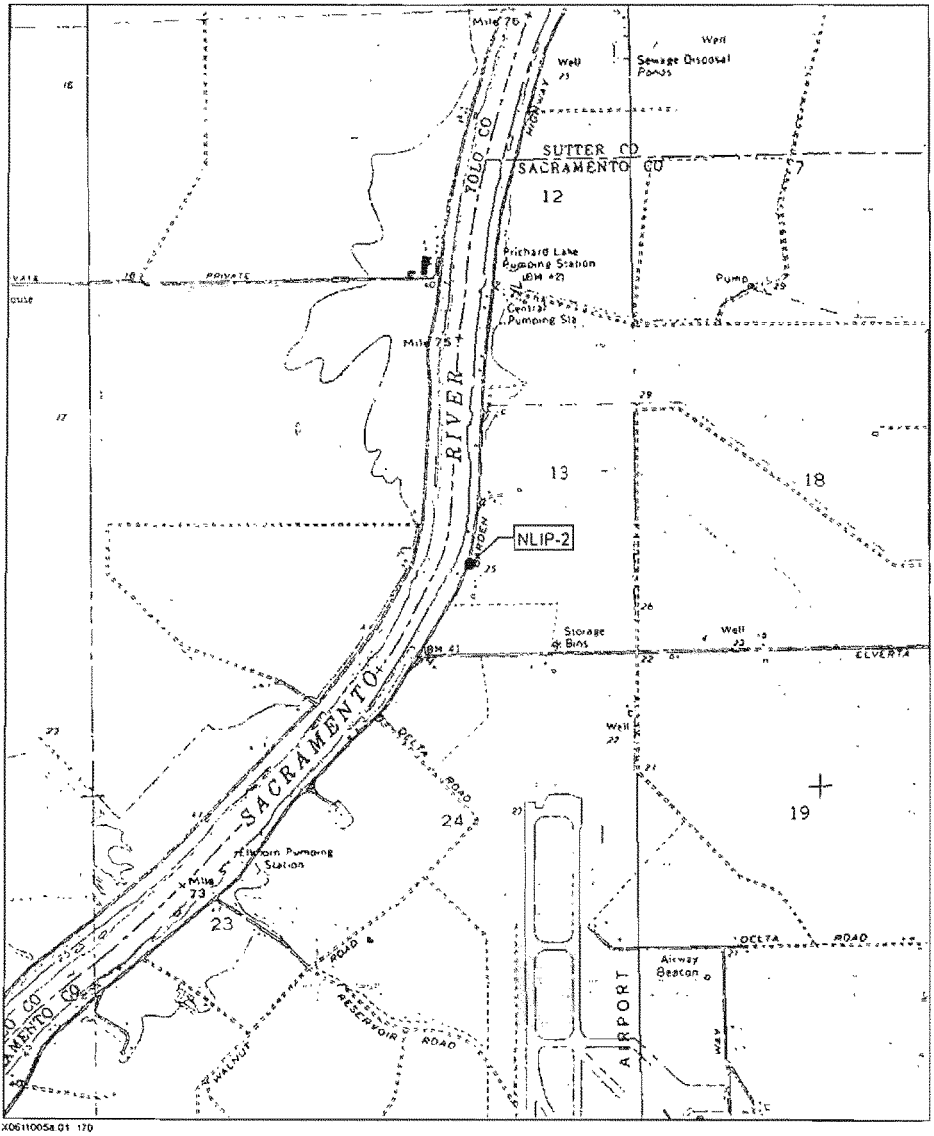
7-31-07

P10. Survey Type:

Intensive

P11. Report Citation:

*Attachments:
☐NONE ☒Location Map ☐Sketch Map ☐Continuation Sheet
☐Building, Structure/Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record
☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record
☐Other (List):



X0611005a.01 170

Source: Taylor Monument Quad, 08-027-07

NLIP-2

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code

Other Listings
Review Code | Reviewer | Date

Page 1 of 5 *Resource Name or #: NLIP-3 7240 Garden Highway

P1. Other Identifier:
*P2. Location: ☐Not for Publication ☐Unrestricted *a. County: Sutter
and (P2b and P2c or P2d. Attach a Location Map as necessary.)
*b. USGS 7.5' Quad: Date:
Verona 1967 T 11N ; R 3E ; ¼ of ¼ of Sec ; Mount Diablo B.M.
c. Address: 7240 Garden Highway City: Nicolaus Zip: 95659
d. UTM: Zone ; mE/ mN
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate)
APN: 935-0020-011

*P3a. **Description:** (Describe resource and major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
Barn

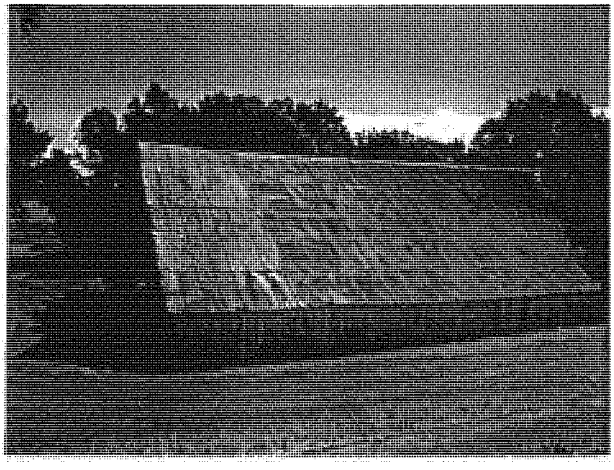
Two-story, wood-frame building with a corrugated metal gable roof tilted with an outrigger on the northern façade. The exterior of this building features both vertical and board and batten siding. Two double-wide openings and a single-entry door are located on the northern elevation.

House 1

East of the barn is a small wood-frame house. (see Continuation).

*P3b. **Resource Attributes:** (List attributes and codes)
HP2 – House; HP4 – Barn, shed.

*P4. **Resources Present:** ☒Building ☐Structure ☐Object ☐Site ☐District ☐Element of District ☐Other (Isolates, etc.)



P5b. Description of Photo:
(View, date, accession #)
Photo 19, Lkg East

*P6. Date Constructed/Age and Sources: ☒Historic ☐Prehistoric ☐Both
Ca. 1920

*P7. Owner and Address:
William Cummings
1625 Creekside Dr.
Folsom, CA 95630

*P8. Recorded by:
Tomes, A.
EDAW, Inc.
2022 J Street
Sacramento, CA 95814

*P9. Date Recorded:
8/6/07

*P10. Survey Type: (Describe)
Reconnaissance

*P11. Report Citation: (Cite survey report and other sources, or enter "none".)

*Attachments: ☐NONE ☐Location Map ☐Sketch Map ☒Continuation Sheet
☒Building, Structure/Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record
☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record
☐Other (List):

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
BUILDING, STRUCTURE, AND OBJECT RECORD

Primary #
HRI #
*NRHP Status Code

Page 2 of 5 *Resource Name or #: NLIP-3 7240 Garden Highway

B1. Historic Name: Unknown
B2. Common Name: N/A
B3. Original Use: Agricultural Complex B4. Present Use: Vacant
*B5. Architectural Style:
Vernacular
*B6. Construction History: (Construction date, alterations, and date of alterations)
Constructed ca. 1920
*B7. Moved? ☒No ☐Yes ☐Unknown Date: Original Location:
*B8. Related Features:
Outbuildings: Sheds, Barn.
B9a. Architect: Unknown B9b. Builder: Unknown
*B10. Significance: Theme Agricultural Architecture Area Nicolaus, CA
Period of Significance N/A Property Type Agricultural Applicable Criteria N/A
(Discuss importance in terms of historical or architectural context as defined by theme, period and geographic scope. Also address integrity.)

Sutter County Assessor's records currently list this property as vacant. No construction date is listed on file for the buildings; however the construction methods and materials appear to date to the early twentieth century.

The earliest known owners of this property were G.H. Lyall and Hardin et al. Currently, the property is owned by William C. Cummings (Verona Farming Partnership). Cummings received ownership of the parcel in October 2004, in a grant deed from Metro Air Park, LLC (Assessor document # 0029189). (see Continuation)

B11. Additional Resource Attributes: (List attributes and codes)

*B12. References:
Sutter County Asseessor's records.

B13. Remarks:

*B14. Evaluator:
Tomes, A.
*Date of Evaluation:
8/7/07

(Sketch Map with north arrow required.)

State of California C The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
CONTINUATION SHEET

Primary # _____
HRI # _____
Trinomial _____

Page 3 of 5 *Resource Name or # NLIP-3 7240 Garden Highway

*Recorded by: Tomes, A. *Date: ☒ Continuation ☐ Update

Affiliation: EDAW, 2022 J Street, Sacramento, CA

P3a (Description) continued:

This building is partially obscured by tree cover, and was not completely visible during the field visit. The building appeared to be situated on a concrete foundation.

Shed 1

A wood-frame shed is located northeast of the house. This building features a saltbox roof with exposed rafter tails. Sash window openings (minus glazing) are located on the northern elevation. The east façade displays two single-entry doors.

House 2

This building is a single-story, wood-frame house with a corrugated metal roof and little eave overhang. The exterior of this building features shiplap siding. A boarded up window opening is present on the eastern façade. This building sits upon a concrete foundation.

House 3

This is a wood-frame building with a partially collapsing flat roof. A porch, supported by square wooden posts, is located on the western elevation. This building is partially concealed by tree cover, and was not completely visible during the field visit.

Shed 2

This small building is of wood construction and features a shed roof.

State of California C The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
CONTINUATION SHEET

Primary # _____
HRI # _____
Trinomial _____

Page 4 of 5 *Resource Name or # NLIP-3 7240 Garden Highway

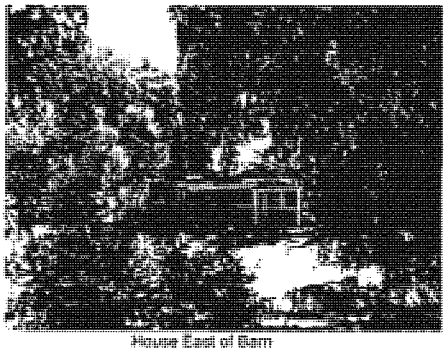
*Recorded by: Tomes, A. *Date: ☒ Continuation ☐ Update

Affiliation: EDAW, 2022 J Street, Sacramento, CA

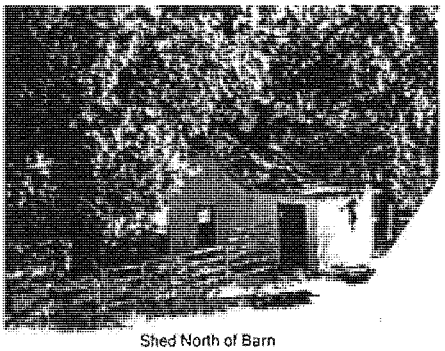
B10 (Significance) continued:

This property appears to have always functioned as a residential and agricultural complex. Research did not reveal the property to be significantly associated with an important historic event (CRHR Criterion 1). Little information was found on early owners of the property, George Lyall and James Hardin. Lyall was originally from Illinois, and settled in the Verona Township of Sutter County sometime between 1880 and 1900. Hardin was originally from Tennessee, and settled in the Nicolaus Township of Sutter County around the same time (Sutter County Census records). Neither the property nor known past owners are listed in the various secondary references reviewed during this study which chronicled significant properties and pioneers in Sutter County history.

The buildings on this property do not appear to be significantly associated with an important individual(s) in local history (CRHR Criterion 2). Although the buildings appear to exhibit a good degree of integrity, they do not embody distinctive architectural characteristics, nor do they represent the work of a master (CRHR Criterion 3). While buildings and structures can sometimes provide important information on historic construction techniques and technologies, these types of buildings are well represented in both written and visuals sources, and do not appear likely to yield important primary information (CRHR Criterion 4). These buildings do not appear to be eligible for listing on the CRHR.



House East of Barn



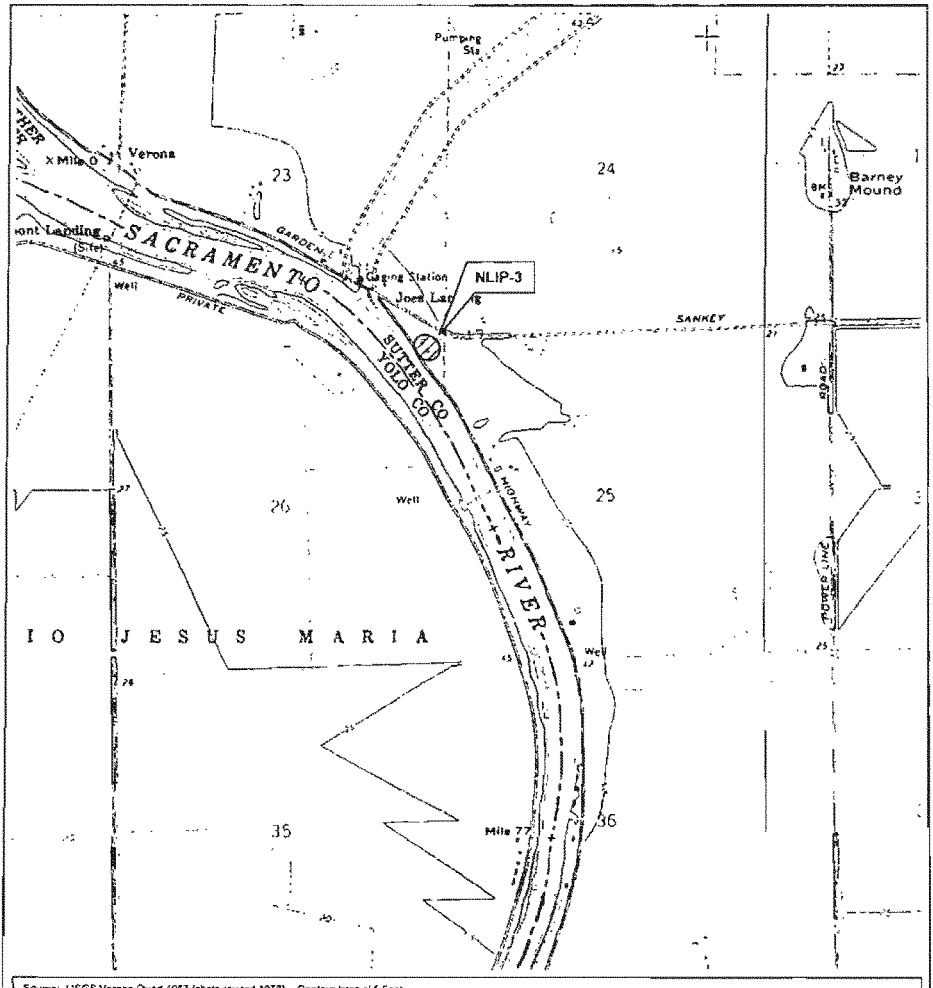
Shed North of Barn

State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary #
HRI#
Trinomial

Page 5 of 5 *Resource Name or # (Assigned by recorder) NLIP-3

*Map Name: USGS Verona Quad *Scale: 1:24 000 *Date of Map: 1978



Source: USGS Verona Quad 1967 (photo revised 1978) – Contour Interval 5 Feet

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER

TN

DPR 523J (1/95) *Required Information

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code

Other Listings
Review Code | Reviewer | Date

Page 1 of 4 *Resource Name or #: NLIP-4 11100 Garden Highway

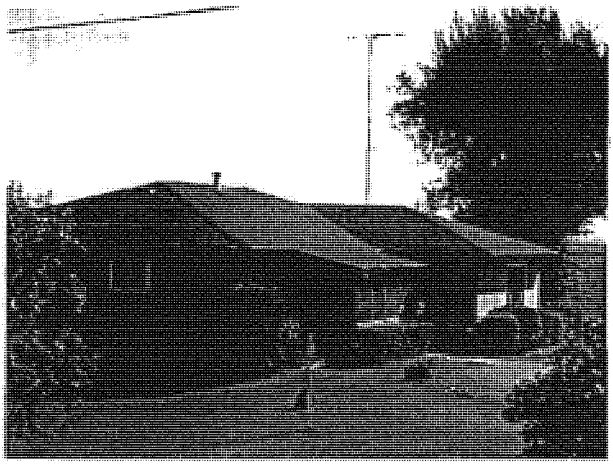
P1. Other Identifier:
*P2. Location: ☐Not for Publication ☐Unrestricted *a. County: Sutter
and (P2b and P2c or P2d. Attach a Location Map as necessary.)
*b. USGS 7.5' Quad: Date:
Verona 1967 T 11N ; R 3E ; ¼ of ¼ of Sec ; Mount Diablo B.M.
c. Address: 11100 Garden Highway City: Nicolaus Zip: 95837
d. UTM: Zone ; mE/ mN
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate)
APN: 935-0020-015

*P3a. Description: (Describe resource and major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

The historic-era residence on this property is a wood-frame building with a hipped roof and composition shingles. The exterior features stucco siding, and a combination of aluminum sliding and one-over-one sash windows. An enclosed porch is located on the southern façade. This building is situated on a gentle slope, and sits upon a concrete foundation.

*P3b. Resource Attributes: (List attributes and codes)
HP2 - House

*P4. Resources Present: ☒Building ☐Structure ☐Object ☐Site ☐District ☐Element of District ☐Other (Isolates, etc.)



P5b. Description of Photo:
(View, date, accession #)
Photo 8; Lkg NE

*P6. Date Constructed/Age and Sources: ☒Historic ☐Prehistoric ☐Both

*P7. Owner and Address:
Burton Lauppe
11100 Garden Highway
Sacramento, CA 95837

*P8. Recorded by:
Tomes, A.
EDAW, Inc.
2022 J Street
Sacramento, CA 95814

*P9. Date Recorded:
8/7/07

*P10. Survey Type: (Describe)
Reconnaissance

*P11. Report Citation: (Cite survey report and other sources, or enter "none".)

*Attachments: ☐NONE ☐Location Map ☐Sketch Map ☒Continuation Sheet
☒Building, Structure/Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record
☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record
☐Other (List):

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
BUILDING, STRUCTURE, AND OBJECT RECORD

Primary #
HRI #
*NRHP Status Code

Page 2 of 4 *Resource Name or #: NLIP-4 11100 Garden Highway

B1. Historic Name: Unknown
B2. Common Name: N/A

B3. Original Use: Residence B4. Present Use: Residence

*B5. Architectural Style:
Vernacular

*B6. Construction History: (Construction date, alterations, and date of alterations)
Constructed 1957

*B7. Moved? ☒No ☐Yes ☐Unknown Date: Original Location:

*B8. Related Features:
Sheds

B9a. Architect: B9b. Builder:

*B10. Significance: Theme Residential Architecture Area Nicolaus
Period of Significance N/A Property Type Residence Applicable Criteria N/A
(Discuss importance in terms of historical or architectural context as defined by theme, period and geographic scope. Also address integrity.)
This residential complex is mostly comprised of contemporary (post-1957) buildings. Sutter County Assessor records list one of the two residences on the property as being constructed in 1957. The property has been in the Lauppe family since this time. The parcel is currently owned by Alan Lauppe, who received the property from Burton and Kathryn Lauppe in December 2006 (Assessor document # 0030459). (see Continuation).

B11. Additional Resource Attributes: (List attributes and codes)

*B12. References:
Sutter County Assessor's records.

B13. Remarks:

*B14. Evaluator:
Tomes, A
*Date of Evaluation:
8/7/07

(Sketch Map with north arrow required.)

State of California C The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
CONTINUATION SHEET

Primary # _____
HRI # _____
Trinomial _____

Page 3 of 4 *Resource Name or # NLIP-4 11100 Garden Highway

*Recorded by: Tomes, A. *Date: ☒ Continuation ☐ Update

Affiliation: EDAW, 2022 J Street, Sacramento, CA

B10 (Significance) continued:

The land, originally listed as APN: 35-020-15, was split into separate parcels several years ago due to a lot line adjustment. Because of the split, the 35-020-15 parcel number was retired, and additional parcel numbers (35-020-18, 35-020-19) were assigned (Sutter County Assessor).

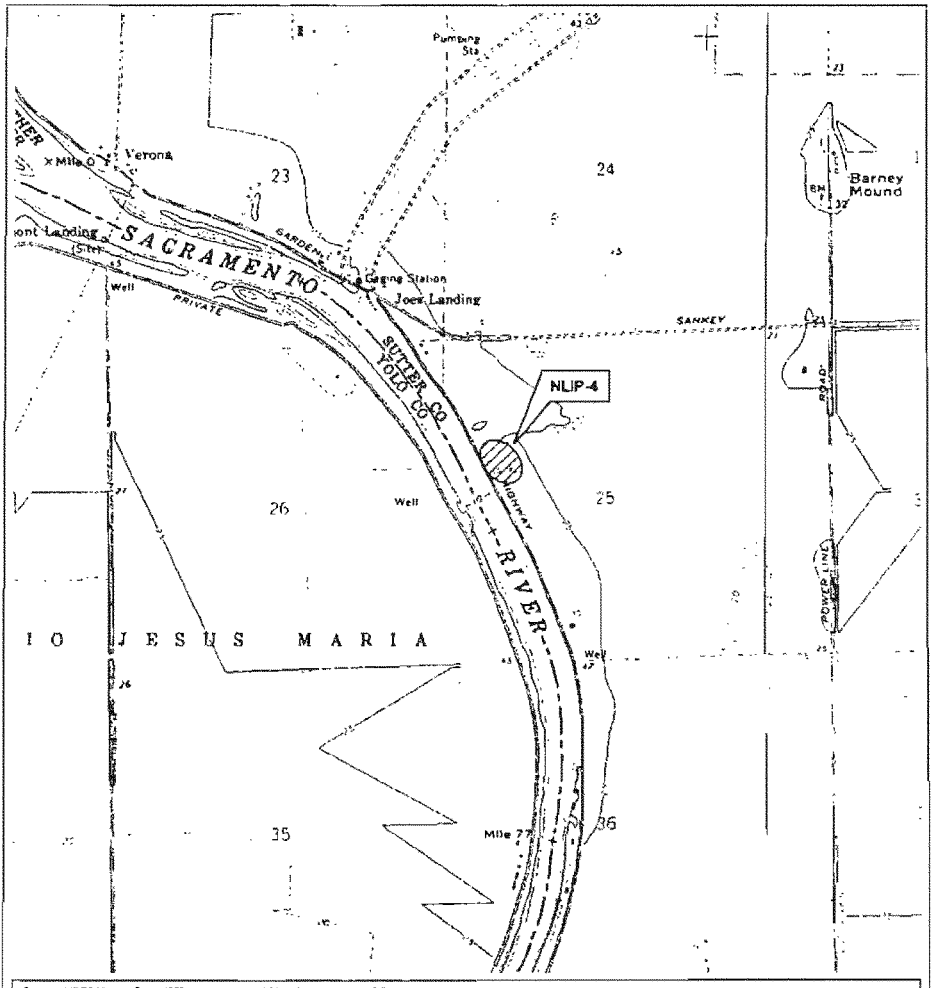
Research did not reveal this property to be significantly associated with an important historic event (CRHR Criterion 1). The historic-era building on this property is not known to be associated with an individual(s) considered important in local history (CRHR Criterion 2). The property itself has undergone regular intervals of construction over the years, with new buildings (e.g. garage-1987, second residence- 1977, and sheds) being built on the property. The historic-era residence maintains only a fair degree of integrity; the porch on the southern façade has been enclosed, and some of the windows have been replaced over the years. This simple vernacular building, in its current configuration, does not embody distinctive architectural characteristics, nor does it appear to be the work of a master (CRHR Criterion 3). This type of building is well represented locally and on a state-wide level, and therefore does not appear likely to yield important primary information (CRHR Criterion 4). This building does not appear eligible for CRHR listing.

State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary # _____
HRI# _____
Trinomial _____

Page 4 of 4 *Resource Name or # (Assigned by recorder) NLIP-4

*Map Name: USGS Verona Quad *Scale: 1:24 000 *Date of Map: 1978



DPR 523J (1/95) *Required Information

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code

Other Listings
Review Code | Reviewer | Date

Page 1 of 4 *Resource Name or #: NLIP-5 2434 Howsley Road

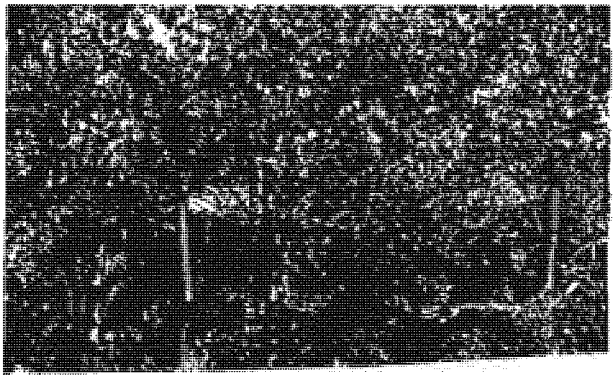
P1. Other Identifier:
*P2. Location: ☐Not for Publication ☐Unrestricted *a. County: Sutter
and (P2b and P2c or P2d. Attach a Location Map as necessary.)
*b. USGS 7.5' Quad: Verona Date: 1967 T ; R ; ¼ of ¼ of Sec ; Mount Diablo B.M.
c. Address: 2434 Howsley Road City: Pleasant Grove Zip: 95668
d. UTM: Zone ; mE/ mN
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate)
APN: 35-050-030

*P3a. Description: (Describe resource and major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
The historic-era buildings on this property include a residence, and what appear to be stalls. The residence was constructed in 1952 (Sutter County Assessor's records). The two stalls, although not listed in the assessor's records, appear to predate the residence by approximately 10 – 15 years.

The residence on the property is partially obscured by tree cover, and was not completely visible during the field visit. What was visible showed a single-story residence with an overall L-shape plan, and cross-gable roof. A full-width porch is present on the southern façade. This building sits upon a concrete foundation. (see Continuation).

*P3b. Resource Attributes: (List attributes and codes)
HP2 – House; HP2 – Animal stall

*P4. Resources Present: ☒Building ☐Structure ☐Object ☐Site ☐District ☐Element of District ☐Other (Isolates, etc.)



P5b. Description of Photo: (View, date, accession #)
Photo 13; Lkg North

*P6. Date Constructed/Age and Sources: ☒Historic ☐Prehistoric ☐Both
1952

*P7. Owner and Address:
Warren Shelley
2434 Howsley Road
Pleasant Grove, CA 95668

*P8. Recorded by:
Tomes, A.
EDAW, Inc.
2022 J Street
Sacramento, CA 95814

*P9. Date Recorded:
8/17/07

*P10. Survey Type: (Describe)
Reconnaissance

*P11. Report Citation: (Cite survey report and other sources, or enter "none".)

*Attachments: ☐NONE ☐Location Map ☐Sketch Map ☒Continuation Sheet
☒Building, Structure/Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record
☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record
☐Other (List):

DPR 523A (1/95)

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
BUILDING, STRUCTURE, AND OBJECT RECORD

Primary #
HRI #
*NRHP Status Code

Page 2 of 4 *Resource Name or #: NLIP-5 2434 Howsley Road

B1 Historic Name: Unknown
B2. Common Name: N/A

B3. Original Use: Ranch B4. Present Use: Ranch

*B5. Architectural Style:
Vernacular

*B6. Construction History: (Construction date, alterations, and date of alterations)
Constructed in 1952.

*B7. Moved? ☒No ☐Yes ☐Unknown Date: Original Location:

*B8. Related Features:
Outbuildings: Sheds, stalls, trailers.

B9a. Architect: Unknown B9b. Builder: Unknown

*B10. Significance: Theme Residential Architecture Area Pleasant Grove, CA
Period of Significance N/A Property Type Residence Applicable Criteria N/A
(Discuss importance in terms of historical or architectural context as defined by theme, period and geographic scope. Also address integrity.)

The community of Pleasant Grove was established ca. 1867 at its present location. Originally known as Gouge Eye, the name was changed to Pleasant Grove Creek that same year when a post office was established. In 1875 the name was shortened to the present name Pleasant Grove.

Early buildings in the community included a saloon, hotel, boarding house, shoe shop, schoolhouse, and doctor's office. Approximately a dozen dwellings and two blacksmith shops were located in the immediate vicinity. The primary impetus to the economy was agriculture, with grain and livestock forming the principal crops. In later years rice also became an important crop. (see Continuation).

B11. Additional Resource Attributes: (List attributes and codes)

*B12. References:
Sutter County Assessor's Records.
Wagner, Phydelia. 1992. A Brief History of Pleasant Grove.
Thompson and West. 1879. History of Sutter County, CA.

B13. Remarks:

*B14. Evaluator:
Tomes, A.
*Date of Evaluation:
8/17/07

(Sketch Map with north arrow required.)

State of California C The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
CONTINUATION SHEET

Primary # _____
HRI # _____
Trinomial _____

Page 3 of 4 *Resource Name or # NLIP-5 2434 Howsley Road

*Recorded by: Tomes, A. *Date: ☒ Continuation ☐ Update

Affiliation: EDAW, 2022 J Street, Sacramento, CA

P3a (Description) continued:

The stalls on this property are of wood construction, and feature horizontal milled wood, and shed roofs covered with corrugated metal. Openings are located on the buildings northern facades. The buildings are in disrepair, and feature sway braces propped against the southern façade of the eastern-most stall. These stalls are situated upon earthen foundations. Other buildings on this property include modern trailers and metal-covered sheds.

B10 (Significance) continued:

One of the largest early ranches in Pleasant Grove was the Spanish Ranch. It contained 2000 acres, and was owned by State Senator Frederick Cox of Sacramento County. The land was later leased by Reese D. Murphy who farmed it for several years (Wagner 1992). Over the years, the Spanish Ranch was broken up into smaller parcels, of which the subject property was part.

2434 Howsley Road (APN: 35-050-030)

This property is zoned as an animal farm. The Sutter County Assessor's Office lists the residence on this property as having been built in 1952. The earliest known owners of the property were N.P. Rogers and an individual with the initials F.E.F. Today, the property is owned by Warren A. Shelley (Sutter County Assessor's records).

This property also appears to be a parcel which was originally part of the larger Spanish Ranch. This property has always functioned for agricultural (husbandry) purposes. Because none of the existing buildings appear to date to the property's earliest usage, research did not reveal the property, in its current configuration, to be significant within that theme (CRHR Criterion 1). This property is not associated with person(s) considered important in local or state history (CRHR Criterion 2). Little information was found on Nathaniel Rogers, other than that he was an early settler in Pleasant Grove. F.E.F. could possibly have been Eben Fifield, of which there is currently a road named near the project area. Fifield, born in Maine in 1834, came to California in 1859. He resided in Amador County for approximately nine years, then in San Joaquin County for approximately five years. He later settled in Sutter County (Thompson and West 1879). Although these individuals were early settlers in the community, none of the existing buildings on the subject property date to their ownership/occupation. None of the buildings, therefore, have an association to, or are eligible for CRHR listing due to an association with these individuals.

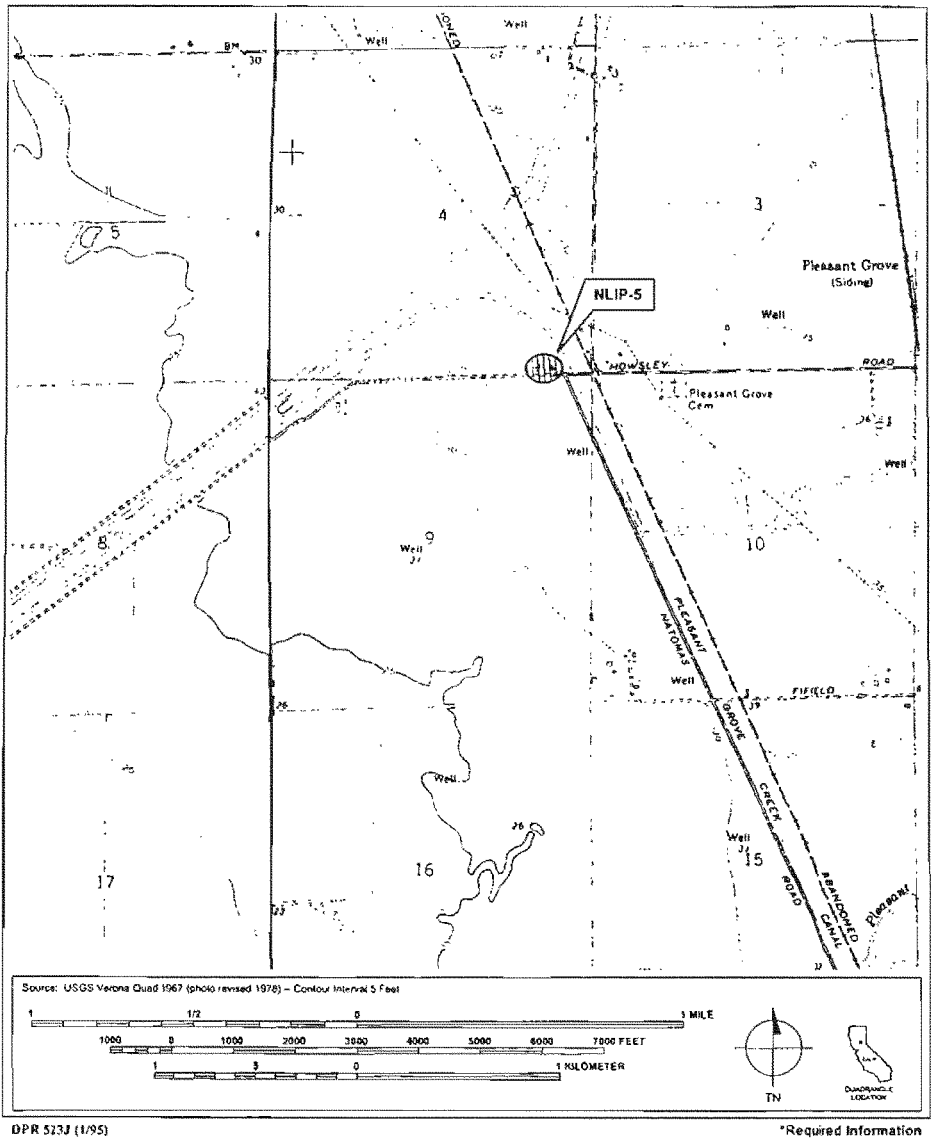
The subject buildings on this property retain a good degree of integrity, however, they do not display distinguishing architectural characteristics; nor do they appear to be the work of a master (CRHR Criterion 3). While buildings and structures can sometimes yield important information on historic construction techniques or technologies (CRHR Criterion 4), these types of buildings are well documented in both written and visual material, and do not appear to be sources of important primary information. These buildings do not appear to be CRHR eligible.

State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary # _____
HRI# _____
Trinomial _____

Page 4 of 4 *Resource Name or # (Assigned by recorder) NLIP-5

*Map Name: USGS Verona Quad *Scale: 1:24 000 *Date of Map: 1978



Source: USGS Verona Quad 1967 (photo revised 1978) – Contour Interval 5 Feet

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER

TN

QUADRANGLE LOCATION

DPR 523J (1/95) *Required Information

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code
Other Listings
Review Code | Reviewer | Date

Page 1 of 4 *Resource Name or #: NLIP-6 2145 Howsley Road

P1. Other Identifier:
*P2. Location: ☐Not for Publication ☐Unrestricted *a. County: Sutter
and (P2b and P2c or P2d. Attach a Location Map as necessary.)
*b. USGS 7.5' Quad: Date:
Vernona 1967 T 11N ; R 4E ; ¼ of ¼ of Sec ; Mount Diablo B.M.
c. Address: 2145 Howsley Road City: Pleasant Grove Zip: 95668
d. UTM: Zone ; mE/ mN
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate)
APN: 35-080-025

*P3a. Description: (Describe resource and major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
This residential complex features a mix of contemporary and historic-era buildings. The southern-most residence on the property was constructed in 1957 (Sutter County Assessor's records). This residence is a single-story, wood-frame building with a cross-gable roof and moderate eave overhang. The roofing is composed of composite shingles. This building also features aluminum-sliding windows, and a single-entry door on the northern façade. This residence is situated upon a concrete slab foundation.

Southwest of the residence is a 3-car garage. (see Continuation).

*P3b. Resource Attributes: (List attributes and codes)
HP2 – House; HP4 – Detached Garage

*P4. Resources Present: ☒Building ☐Structure ☐Object ☐Site ☐District ☐Element of District ☐Other (Isolates, etc.)

P5b. Description of Photo: (View, date, accession #)
Photo 2, Lkg SE

*P6. Date Constructed/Age and Sources: ☒Historic ☐Prehistoric ☐Both
1957

*P7. Owner and Address:
Morrison 2000
3559 Howsley Road
Pleasant Grove, CA

*P8. Recorded by:
Tomes, A.
EDAW, Inc.
2022 J Street
Sacramento, CA 95814

*P9. Date Recorded:
8/15, 2007

*P10. Survey Type: (Describe)
Reconnaissance

*P11. Report Citation: (Cite survey report and other sources, or enter "none".)

*Attachments: ☐NONE ☐Location Map ☐Sketch Map ☒Continuation Sheet
☒Building, Structure/Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record
☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record
☐Other (List):

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
Primary #
HRI #
BUILDING, STRUCTURE, AND OBJECT RECORD
*NRHP Status Code

Page 2 of 4 *Resource Name or #: NLIP-6 2145 Howsley Road

B1. Historic Name: Unknown
B2. Common Name: N/A
B3. Original Use: Homestead B4. Present Use: Residential Complex
*B5. Architectural Style:
Vernacular
*B6. Construction History: (Construction date, alterations, and date of alterations)
Constructed in 1957.
*B7. Moved? ☒No ☐Yes ☐Unknown Date: Original Location:
*B8. Related Features:
Outbuildings: Shed and garages.
B9a. Architect: Unknown B9b. Builder: Unknown
*B10. Significance: Theme Residential Architecture Area Pleasant Grove, CA
Period of Significance N/A Property Type Residence Applicable Criteria N/A
(Discuss importance in terms of historical or architectural context as defined by theme, period and geographic scope. Also address integrity.)

The community of Pleasant Grove was established ca. 1867 at its present location. Originally known as Gouge Eye, the name was changed to Pleasant Grove Creek that same year when a post office was established. In 1875 the name was shortened to the present name Pleasant Grove.

Early buildings in the community included a saloon, hotel, boarding house, shoe shop, schoolhouse, and doctor's office. Approximately a dozen dwellings and two blacksmith shops were located in the immediate vicinity. The primary impetus to the economy was agriculture, with grain and livestock forming the principal crops. In later years rice also became an important crop. (see Continuation).

B11. Additional Resource Attributes: (List attributes and codes)

*B12. References:
Sutter County Assessor's Records.
Thompson and West. 1879. History of Sutter County, CA.
Wagner, Phydelia. 1992. A Brief History of Pleasant Grove.

B13. Remarks:

*B14. Evaluator:
Tomes, A.
*Date of Evaluation:
8/17/07

(Sketch Map with north arrow required.)

State of California C The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
CONTINUATION SHEET

Primary # _____
HRI # _____
Trinomial _____

Page 3 of 4 *Resource Name or # NLIP-6 2145 Howsley Road

*Recorded by: Tomes, A. *Date: ☒ Continuation ☐ Update

Affiliation: EDAW, 2022 J Street, Sacramento, CA

P3a (Description) continued:

This wood-frame, corrugated metal-covered building displays a salt-box shaped roof, and 3 bays on its northern façade. This building is contemporaneous with the residence. The other buildings on this property are contemporary and include: a large metal storage building, a second residence, and a second garage.

B10 (Significance) continued:

One of the largest early ranches in Pleasant Grove was the Spanish Ranch. It contained 2000 acres, and was owned by State Senator Frederick Cox of Sacramento County. The land was later leased by Reese D. Murphy who farmed it for several years (Wagner 1992). Over the years, the Spanish Ranch was broken up into smaller parcels, of which the subject property was part.

2145 Howsley Road (APN: 35-080-025)

This property, in its current configuration, has always functioned as a residential complex. Other parcel numbers for this property have included 35-080-002, and 35-080-023, both of which have been retired (Sutter County Assessor's records).

The property appears to have originally been part of the larger Spanish Ranch, which was later split into several smaller parcels. The earliest known occupants of this parcel were R. Murphy and M. Donaldson. Today the owner of the property is listed as Morrison 2000 (Sutter County Assessor's records).

Research did not reveal this property, in its current configuration, to be associated with an important historic trend or event (CRHR Criterion 1). This property is not known to be associated with an individual considered important in local or state history (CRHR Criterion 2). R. Murphy, born in Missouri in 1863, came to California with his mother in 1872. They settled in Nicolaus, and later purchased a ranch at Pleasant Grove. Mary Donaldson was the wife of Alex, a farmer and stock-raiser. Alex Donaldson came to Sutter County ca. 1861. He was in the mercantile business for a short time, before turning to agriculture. He married Mary Pierce on June 30, 1869 (Thompson and West 1879). Alex stops appearing in the Sutter County Census records in 1900, and is presumed to have died sometime between 1880 (last census he appears in) and 1900. The 1890 census was destroyed in a fire. Although these individuals were early settlers in the community, none of the existing buildings on the subject property dates to their ownership/occupation. None of the buildings, therefore, have an association to, or are eligible for CRHR listing due to an association with these individuals.

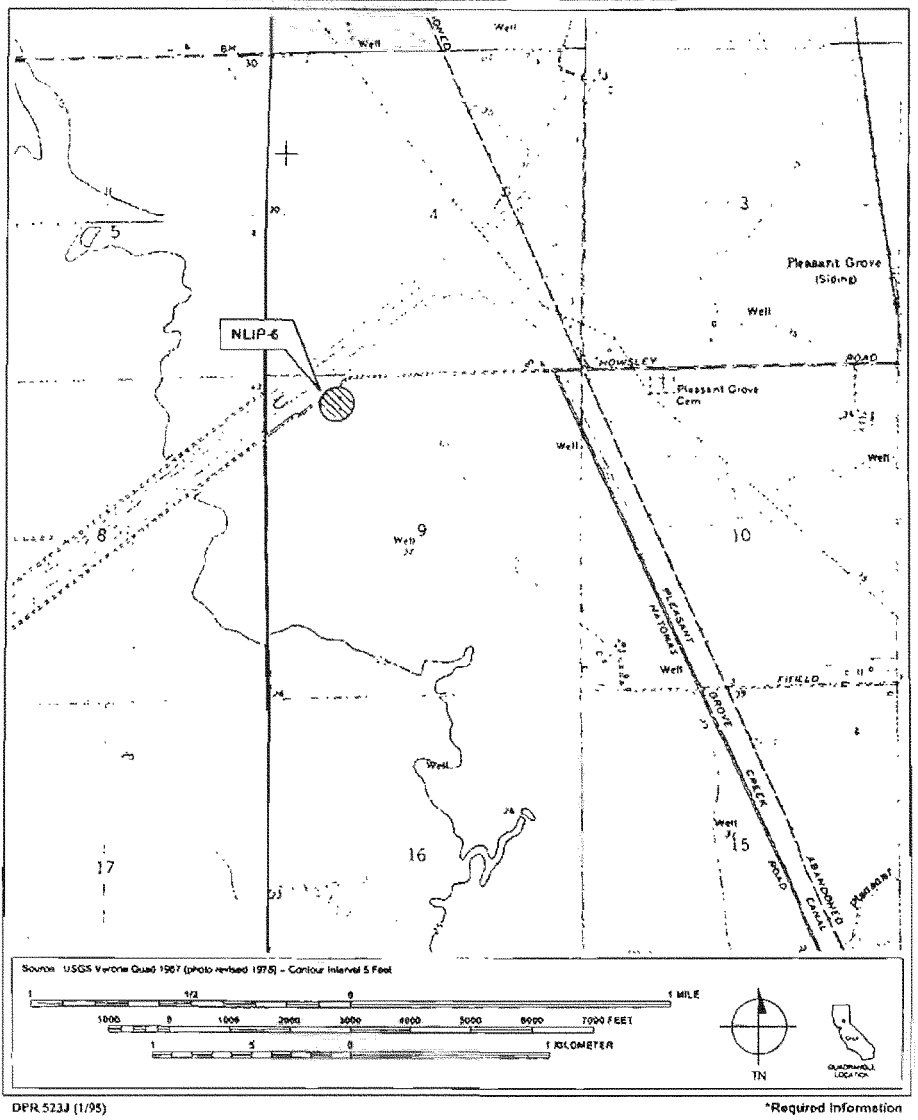
Although the buildings retain a good degree of integrity, they are vernacular in style to the 1950s, and do not display distinguishing architectural characteristics that make them notable examples of vernacular architecture. These buildings do not represent the work of a master (CRHR Criterion 3). While buildings and structures can sometimes yield important information on historic construction techniques or technologies (CRHR Criterion 4), these types of buildings are well documented in both written and visual material, and do not appear to be sources of important primary information. The buildings on this property do not appear to be eligible for listing on the CRHR.

State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary # _____
HRI# _____
Trinomial _____

Page 4 of 4 *Resource Name or # (Assigned by recorder) NLIP-6

*Map Name: USGS Verona Quad *Scale: 1:24 000 *Date of Map: 1978



DPR 523J (1/95) *Required Information

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. Milford Wayne Donaldson
State Historic Preservation Officer
Office of Historic Preservation
P.O. Box 942896
Sacramento, California 94296-0001

Dear Mr. Donaldson:

Pursuant to the provisions of Section 106 per 36 CFR Section 800.3(c)(3) the U.S. Army Corps of Engineers (Corps) is initiating consultation regarding the issuance of approvals and permits for the Natomas Levee Improvement Program Landside Improvements Project (NLIP.) This letter describes the project proposed by Sacramento Area Flood Control Agency (SAFCA), the NLIP, and the approach proposed by the Corps for satisfying Section 106 of the National Historic Preservation Act (NHPA) for this undertaking. The project is intended to provide urgently needed flood control system improvements and provide at least 100-year flood protection as quickly as possible to the Natomas Basin in southern Sutter and northern Sacramento Counties (Enclosure 1), while laying the groundwork to achieve at least urban-standard ("200-year") flood protection over time.

The project includes improving various portions of the Natomas Basin flood control system and making related landscape and irrigation/drainage infrastructure modifications in three phases in 2008, 2009, and 2010. Enclosure 2 shows the anticipated phases of construction along the levee system. Project activities are summarized as follows and more details are provided in Enclosure 3:

2008 construction

- Along the 5.3-mile Natomas Cross Canal (NCC) south levee, raise the levee to provide additional freeboard; realign the levee to provide a more stable waterside slope and to reduce the need for removal of waterside vegetation, and construct a seepage cutoff wall in the eastern 4.3 miles (approximately) of the levee to reduce the risk of levee failure due to seepage and stability concerns.

- Along the Sacramento River east levee, construct a raised adjacent setback levee from the NCC to about 3,100 feet south of the North Drainage Canal with seepage berms where required to reduce seepage potential, and install woodland plantings.

- Construct a new canal designed to provide drainage and associated giant garter snake habitat (referred to in this EIR as the "GGS/Drainage Canal"), relocate the Elkhorn Canal between the North Drainage Canal and the Elkhorn Reservoir settling basin ("Elkhorn Reservoir"), and remove a deep culvert from under the levee near the Reclamation District 1000 Pumping Plant No. 2 site.

- Re-contour the land and create marsh and upland habitat at borrow locations.

2009 and 2010 construction

Along the Sacramento River east levee south of the limits of the 2008 improvements, construct an adjacent setback levee (raised where needed to provide adequate freeboard) with seepage berms, relief wells, and cutoff walls as required, and install woodland plantings.

- Widen the levee and construct seepage berms along the Pleasant Grove Creek Canal west levee.

- Construct a new GGS/Drainage Canal between Elkhorn Reservoir and the West Drainage Canal, improve the West Drainage Canal, relocate the Riverside Canal and the Elkhorn Canal downstream of Elkhorn Reservoir, and reconstruct the Reclamation District 1000 Pumping Plant No. 2.

  Re-contour the land and create marsh and upland habitat at borrow locations.

- Remove encroachments from the water side of the Sacramento River east levee as needed to ensure that the levee can be certified as meeting the minimum requirements of the National Flood Insurance Program and USACE design criteria, and address Federal Emergency Management Agency (FEMA) requirements for the State Route 99/70 bridge crossing of the NCC.

Through discussion with your office, we have determined that a Programmatic Agreement (PA) is the appropriate vehicle for satisfying Section 106. The nature of the undertaking, the cultural resources management efforts required, and the necessary federal authorizations and permits require a departure from the process for satisfying Section 106 described in 36 CFR Section 800 et. seq. The standard Section 106 process requires federal agencies to identify all historic properties, determine the effect of the undertaking on those resources, and complete dialogue with consulting parties before Section 106 is complete. For the following reasons, this procedure is not possible in this instance:

- The applicant requires both permission to alter federal flood control structures under Section 408 of the Rivers and Harbors Act (33 U.S. Code Section 408) and one or more individual permits to discharge fill to jurisdictional waters under Section 404 of the Clean Water Act (33 U.S. Code Section 1344). The Section 408 permission will be granted separately for each year of project construction, corresponding to the three years of project work (2008, 2009, and 2010) that collectively constitute the entire project.

- The undertaking will likely have an adverse effect on at least one historic property, CA-Sac-485/H. This adverse effect must be resolved via the Section 106 process, and the method of resolution should be documented in an agreement document.

- The Area of Potential Effect (APE) will consist of the work described in the Environmental Impact Report (EIR) on the Natomas Levee Improvement Program Landside Improvements Project. The exact APE for all phases of construction remains unclear.

- The applicant is in the process of acquiring rights-of-entry, easements, and ownership interests in the project footprint where effects on historic properties may occur. This phased access will require an ongoing effort to inventory historic properties in the APE, rather than a single inventory effort.

- The project includes landside improvements to the levee along the east bank of the Sacramento River, an area that is sensitive for buried archaeological sites. The method for dealing with unanticipated discoveries needs to be in an agreement document and described in detail in a manner that incorporates the framework provided in 36 CFR Section 800.13 *Post-review Discoveries*.

- The complexity and phased nature of the project dictates that ongoing consultation with federally recognized tribes and other Native American groups and individuals is the best method for incorporating their concerns and input.

The Corps proposes that SAFCA, the USACE, and the SHPO adopt a Programmatic Agreement (PA) providing for a phased identification of resources and assessment of effects. We have included a draft PA (Enclosure 4) for your consideration. Upon receipt of your concurrence, we will notify the Advisory Council on Historic Preservation (ACHP) pursuant to 36 CFR Section 800.14 et. seq. If the ACHP declines to participate, we will collaborate with your office to develop and finalize the management framework provided in the PA. If you have any questions or need any additional information, please do not hesitate to contact me so that we can remedy any information gaps. Comments or questions may be sent to Mr. Daniel A. Bell, U.S. Army Corps of Engineers, CESPK-PD-RA, 1325 J Street, Sacramento, California 95814; email at daniel.a.bell@usace.army.mil; phone at (916) 557-6818, or fax at (916) 557-7856.

Sincerely,

for Francis C. Piccola
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINER DISTRICT, SACRAMENTO
1325 J STREET
SACRAMENTO, CALIFORNA 95814

REPLY TO
ATTENTION OF

Environmental Resources Branch

FEB 1 - 2008

Ms. Jessica Taveres, Chairperson
United Auburn Indian Community of Auburn
575 Menlo Drive, Suite 2
Rocklin, California 95765

Dear Chairperson;

The U.S. Army Corps of Engineers (Corps), Sacramento District, is writing you in accordance with the National Historic Preservation Act, to inform you of the proposed Natomas Levee Improvement Program Landside Improvements Project (Project) located along the Sacramento River in Sutter and Sacramento Counties. The project requires that the Sacramento Area Flood Control Agency obtain permits from the U.S. Army Corps of Engineers, Sacramento District (Corps), and is therefore considered a federal undertaking pursuant to Section 106 of the National Historic Preservation Act (NHPA) and is subject to the requirements of Section 106 of the National Historic Preservation Act. We are also inviting you to participate as a concurring party in the development and execution of a Programmatic Agreement (PA). The Area of Potential Effects (APE) for the proposed project is shown on the enclosed topographic map (enclosure 1).

The proposed project is intended to provide urgently needed flood control system improvements and provide at least 100-year flood protection as quickly as possible to the Natomas Basin in southern Sutter and northern Sacramento Counties, while laying the groundwork to achieve at least urban-standard ("200-year") flood protection over time.

The proposed project includes improving various portions of the Natomas Basin flood control system and making related landscape and irrigation/drainage infrastructure modifications in three phases in 2008, 2009, and 2010. Enclosure 2 shows the anticipated phases of construction along the levee system. Project activities are summarized as follows:

2008 construction

- Along the 5.3-mile Natomas Cross Canal (NCC) south levee, raise the levee to provide additional freeboard; realign the levee to provide a more stable waterside slope and to reduce the need for removal of waterside vegetation, and construct a seepage cutoff wall in the eastern 4.3 miles (approximately) of the levee to reduce the risk of levee failure due to seepage and stability concerns.

- Along the Sacramento River east levee, construct a raised adjacent setback levee from the NCC to about 3,100 feet south of the North Drainage Canal with seepage berms where required to reduce seepage potential, and install woodland plantings.

- Construct a new canal designed to provide drainage and associated giant garter snake habitat (referred to in this EIR as the "GGS/Drainage Canal"), relocate the Elkhorn Canal between the North Drainage Canal and the Elkhorn Reservoir settling basin ("Elkhorn Reservoir"), and

remove a deep culvert from under the levee near the Reclamation District 1000 Pumping Plant No. 2 site.

- Recontour the land and create marsh and upland habitat at borrow locations.

2009 and 2010 construction

- Along the Sacramento River east levee south of the limits of the 2008 improvements, construct an adjacent setback levee (raised where needed to provide adequate freeboard) with seepage berms, relief wells, and cutoff walls as required, and install woodland plantings.

- Widen the levee and construct seepage berms along the Pleasant Grove Creek Canal west levee.

- Construct a new GGS/Drainage Canal between Elkhorn Reservoir and the West Drainage Canal, improve the West Drainage Canal, relocate the Riverside Canal and the Elkhorn Canal downstream of Elkhorn Reservoir, and reconstruct the Reclamation District 1000 Pumping Plant No. 2.

- Recontour the land and create marsh and upland habitat at borrow locations.

- Remove encroachments from the water side of the Sacramento River east levee as needed to ensure that the levee can be certified as meeting the minimum requirements of the National Flood Insurance Program and USACE design criteria, and address Federal Emergency Management Agency (FEMA) requirements for the State Route 99/70 bridge crossing of the NCC.

The level of effort towards identifying historic properties will be conducted pursuant to 36 CFR 800.4(b)(1) and will include an updated records and literature search, and field survey. We have developed a draft PA to take into account any adverse affects to historic properties as a result of project construction. A PA is a compliance document that specifies procedures that a Federal agency will follow on a project when all of the potential adverse effects are not known. PA's are negotiated and executed between the Federal agency, the State Historic Preservation Officer, and occasionally the Advisory Council on Historic Preservation. Stipulations in the draft PA have been included to take into account any issues or concerns that you may have regarding cultural resources and potential adverse effects on them. We are also requesting information regarding the presence of any traditional cultural properties, sacred sites, or other areas of cultural interest to the members of the Paskenta Band in the project area. A copy of the draft PA is provided for your review and comment (enclosure 3).

We request that you respond within 45 days of receipt of this letter. We would appreciate knowing if you wish to participate in consultation on the PA, and we welcome your comments and suggestions that you may have. Please direct any comments on the draft PA, cultural resources investigation, or any other aspect of our work on the Project to Mr. Daniel A. Bell, Archeologist, at (916) 557-6818, email: daniel.a.bell@usace.army.mil. Questions regarding the overall project may be directed to Mr. Daniel Tibbits, Project Manager, at (916) 557-7372, or email dan.p.tibbits@usace.army.mil. Your time and consideration are greatly appreciated.

Sincerely,

Francis C. Piccola

Francis C. Piccola
Chief, Planning Division

Enclosures

SHINGLE SPRINGS RANCHERIA
P.O. BOX 1340; SHINGLE SPRINGS, CA 95682
(530) 676-8010; FAX (530) 676-8033

May 8, 2008

Office of State Historic Preservation
1416 9th Street, Room 1442-7
Sacramento, CA 95814
Attn: Dwight Dutschke, Associate Park & Recreation Specialist, Project Review Unit
Email: ddutschke@parks.ca.gov
Fax: 916-653-9824

U.S. Army Corps of Engineers
Sacramento District
1325 J Street, Room 840
Sacramento, CA 95814
Attn: Col. Thomas C. Chapman, District Engineer
Email: lori.d.whitmer@usace.army.mil
Fax: 916-557-7859
Attn: Linda Brown

Sacramento Area Flood Control Agency [SAFCA]
1007 – 7th Street, 7th Floor
Sacramento, CA 95814
Attn: Stein M. Buer, Executive Director
John Bassett, Director of Engineering
Email: info@safca.org
Fax: 916-874-8289

Re: Draft Programmatic Agreement for the Natomas Levee Improvement Program; Notification of Ongoing Consultation Issues Arising from Ongoing Work at Site

Dear Mr. Dutschke, Col. Chapman, Ms. Brown, Mr. Buer, and Mr. Bassett:

The Shingle Springs Band of Miwok Indians [the Band], designated as the Most Likely Descendant [MLD] by the Native American Heritage Commission, takes this opportunity to provide preliminary comments on the proposed Programmatic Agreement and to request formal consultation before the Programmatic Agreement is finally negotiated, especially to include protocols for the respectful treatment and disposition of human remains, associated funerary objects, and other cultural items.

As a preliminary matter, we wish to advise the addressed agencies that by this letter the Band does not intend to imply that the agencies have not tried to contact the Band's prior representative for these matters, Mr. Jeff Murray. In order to avoid any further delays, the Band has identified John Tayaba, Tribal Vice Chair, to take all responsive actions with regard to our obligations as MLD. Please also understand that our comments are preliminary. The Band has asked our attorney, Brigit S. Barnes, to review the proposed Programmatic Agreement, relevant portions of the NLIP Landside Improvements EIR, and related federal reviews so as to advise Mr. Tayaba on these matters, as well as a pressing issue which must be addressed regardless of the status of negotiations on the Programmatic Agreement. We ask that copies of any and all correspondence to the Band be sent to Mrs. Barnes at Brigit S. Barnes & Associates, Inc., 3262 Penryn Road, Suite 200, Loomis, CA 95650; Telephone: (916) 660-9555; Fax: (916) 660-9554; Email: bsbarnes@landlawbybarnes.com.

Please also consider this letter to request that the Band be treated as a "consulting party" for the Programmatic Agreement, and for all future work along the Natomas River, pursuant to 36 CFR 800.3(f)(3).

1. Possible Disrespectful Treatment of Native American Remains During Sampling by EDAW On Site

The Band has been informed, and its preliminary investigation confirms, that while EDAW was conducting small-scale shovel testing along the eastern side of CA-Sac-485/H, a preliminarily identified burial site was rough-dug, thus resulting in potential damage to the human remains located within the pit. Based on what we have been informed of, the treatment of the site overall does not comport with state or federal law, and we request an immediate investigation into the manner of excavation used by EDAW at the site.

2. Comments to Draft Programmatic Agreement [PA]

General. Has the Advisory Council on Historic Preservations Been Invited to Participate? We request that the Council be involved or otherwise have an opportunity to comment if consultation with the Tribes is inadequate. We do not know whether any of the Tribes identified in the NLIP EIR have been given an ability to speak to the language of this PA, or been invited to be formal signatories to this PA. As the MLD, we request the right to be a formal signatory to this PA after negotiation.

I. DEFINITIONS

APE. The Native American community should be allowed to comment on the Area of Potential Effects [APE] before it is altered. We formally request that the PA definition notes that "the Tribes have been consulted about the nature and location of the APE and their concerns have been adequately considered", or some similar language.

Cultural Resources. It is appropriate to include traditional cultural places in this definition, but traditional cultural properties should be moved to the following definition.

"Historic Property" explicitly includes traditional cultural properties as properties of value to cultural groups that have been determined eligible for or are listed on the National Register of Historic Places.

II. STANDARDS

(A.) Professional Qualifications. Please include specific mention of an ethnographer for places of value to the Native American community. The perspective of the Tribes needs to be addressed by a professional who understands and communicates tribal interests, and whose values are not at odds with tribal values.

(B.) Historic Preservation Standards. Please include the following: "The Corps shall insure that the Tribes are provided with all draft reports prepared pursuant to this Programmatic Agreement, and that the Tribes will be offered the opportunity to review and comment on the reports. All comments by the Tribes shall be appropriately considered in the preparation of the final report."

III. PROJECT DESCRIPTION

(C.) Project Phasing and Potential Changes to the APE. Please note our request under definition of the APE above, and include throughout this document as necessary.

IV. INVENTORY OF HISTORIC PROPERTIES

(C.) Changes to the APE. Please note our request under the definition of APE above.

V. TREATMENT OF EFFECTS

(A.) Historic Property Treatment Plans. The Tribes wish to be included in the review and comment of HPTPs that involve resources of value to the Native American community. The PA says that concurring parties may be distributed to the Tribes as concurring parties. We request that this word be changed to "shall".

Review Schedule. The Tribes should be included in the 30-day review period.

(C.) Final Report. The Tribes should be offered the draft report and an opportunity to review and comment. A copy of the revised final report shall be provided to the Tribes.

VI. NATIVE AMERICANS AND OTHER PUBLIC CONSULTATION AND PUBLIC NOTICE

The Tribes are not members of the public for purposes of consultation, and should be afforded their full role as specified in the 2001 Final Rule of 36 CFR 800 and the intent within the 1999 revisions to Section 106 of the National Historic Preservation Act.

IX. AMENDMENTS

Please include the concurring parties at the table for amendments if the Project has not been completed within five years.

Concurring Parties Signature Page. The Tribes should be individually listed and afforded a place for signature on page 10 of 10.

We hope that receipt of this letter will result in a consultation to resolve many of our questions regarding the treatment of historic and culturally significant finds along the Natomas River.

Sincerely,

THE SHINGLE SPRINGS BAND OF MIWOK INDIANS

By: John Tayaba, Tribal Vice Chair

cc: Debbie Pilas-Treadway, Native American Heritage Commission

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

Executive Office

JUN 1 1 2008

Mr. John Tayaba, Tribal Vice Chair
Shingle Springs Rancheria
Post Office Box 1340
Shingle Springs, California 95682

Dear Vice Chair Tayaba:

I am responding to your May 8, 2008, letter requesting that the Shingle Springs Band of Miwok Indians (The Band) be treated by the U.S. Army Corps of Engineers (Corps) as a "consulting party" for the National Historic Preservation Act (NHPA) Programmatic Agreement (PA) for the Natomas Levee Improvement Program, Landside Improvements Project (NLIP).

Your correspondence indicates you have three primary areas of concern. First, you notified the Corps that The Band is designated as the Most Likely Descendant (MLD) by the Native American Heritage Commission, for certain actions involving the NLIP. Second, requested we investigate the actions of EDAW, a consulting firm to the Sacramento Area Flood Control Agency (SAFCA), regarding its treatment of Native American remains during recent field investigations at the site identified as CA-Sac-485/H. Lastly, you requested to be treated as a consulting party on the NLIP PA and provided substantive comments for our consideration.

We appreciate your desire to be fully engaged with all aspects of the PA. Please find enclosed a copy of the executed PA, dated May 1, 2008. As an alternative to amending the completed PA, the Corps would like invite you to consult on the creation of the Historic Properties Treatment Plan (HPTP). It is our belief that the concerns you expressed in your May 8 correspondence can be adequately addressed in the HPTP. Additionally, upon receipt of your letter the Corps, initiated an inquiry into EDAW's actions, and will share the results of this effort with you as soon as we can meet. While the Corps does not have the authority to direct the activities of EDAW or SAFCA, it has been in close contact with both entities and has recommended EDAW, who is acting through SAFCA, review its MLD procedures with the Native American Heritage Commission. That said, we understand controlled investigations/excavations may be continuing, by-way-of field consultations with input from one of the Band's representatives, as a standard operating procedure. Further, EDAW and SAFCA have assured the Corps that every effort is being made to address the Band's concerns and that they will continue to do so.

The Corps acknowledges that the Shingle Springs Band of Miwok Indians is a federally recognized tribe and desire to meet with you and/or your staff as soon as practicable. In preparation for our meeting, please let me know if I have not fully captured your concerns and if there are any other concerns which we may prepare to address.

Mr. Mark Gilfillan is the District's Tribal Liaison and point of contact for all Sacramento District and Tribal Nation consultations and concerns. Mr. Gilfillan will soon be in contact with you or your designated staff to facilitate and arrange our meeting with dates amenable to The Band. If you have any questions regarding our meeting, please contact Mr. Gilfillan at our Colorado West Regulatory Branch, 400 Rood Avenue, Room 142, email address *mark.a.gilfillan@usace.army.mil*, or telephone (970) 243-1199, extension 15. I look forward to our meeting and addressing your concerns.

Sincerely,

Original Signed

Thomas C. Chapman, P.E.
Colonel, U.S. Army
District Engineer

Enclosure

GILFILLAN/rr
CESPK-RD-C

JACOBSON
CESPK-RD-C

JEWELL
CESPK-RD

KORMAN
CESPK-DC

COWAN
CESPK-DE-EA

ALTENDORF
CESPK-DE-PM

PORTER
CESPK-DDE

CHAPMAN
CESPK-DE

SAFCA

Sacramento Area Flood Control Agency

June 12, 2008

Mr. John Tayaba

Tribal Vice Chair
Shingle Springs Rancheria
P.O. Box 1340
Shingle Springs, CA
95682

Dear Mr. Tayaba:

RE: Your letter of May 08, 2008 and our meeting on June 04, 2008.

On behalf of the Sacramento Area Flood Control Agency (SAFCA) we wish to thank you for the opportunity to meet in person last week in the office of the Native American Heritage Commission. This letter is in response to the concerns raised in your letter of May 8, 2008 and at our meeting on June 4th regarding the treatment of historic properties that could be affected by the Natomas Levee Improvement Program (Program). This urgently needed Program will address identified deficiencies in the levee system protecting the Natomas Basin and will provide the 80,000 residents of the basin with a high level of protection against potentially catastrophic flooding.

SAFCA values the input of the Shingle Springs Band of Miwok Indians (Band) as we make important decisions about the management of historic properties that could be affected by the Program. We recognize that the Band has a significant role in determining the treatment of historic properties as a consulting party under Section 106 of the National Historic Preservation Act, in addition to your role as the most likely descendant (MLD) under California Public Resources Code Section 5097.98. It is our intention to make every effort to incorporate your input and be responsive to your concerns as we move forward with the Program in a timely fashion. This letter provides a brief discussion of three items of critical concern, and then addresses other issues raised in your letter and at our meeting.

Future Steps for 106 Consultations

The Corps, SAFCA, and the California State Historic Preservation Officer (SHPO) have executed a programmatic agreement (PA) that governs treatment of significant cultural resources that may be affected by the Program. The PA requires consultation with the public and Native American individuals and

organizations (Stipulation VI). We expect to collaborate closely with you as the MLD on behalf of the Band in determining how cultural resources are managed for the Program. For each phase of construction (2008, 2009, 2010) we will consult with you regarding the area of potential effects, the inventory of historic properties, and the management of potentially adverse effects under historic property treatment plans.

Excavation of Skeletal Remains at CA-SAC-485/H

SAFCA's consultant, EDAW, is conducting ongoing excavations at CA-SAC-485/H. This site contains burial features and skeletal remains. In accordance with State law, EDAW contacted the Native American Heritage Commission (NAHC) in early March 2008, during the 2008 season of fieldwork, when human remains were encountered during archaeological excavations needed for compliance with Section 106. The NAHC assigned you as MLD on April 15, 2008. To enlist your input and ensure appropriate treatment of human remains, our Consultant has provided the Band (email of May 21, 2008) with proposed field protocols for dealing with cultural resources and a draft burial treatment plan. The Band's review and comment on these documents would be greatly appreciated.

In your May 8th letter you indicate that the burial site may have been inappropriately excavated, and the treatment of the site may not comply with Federal and State law. We are not presently aware of any violation of federal or state law, including your right to determine disposition of human remains under Section 5097.98 of the California Public Resources Code. However, we will conduct an impartial investigation of events at CA-SAC-485/H to determine if the previous activities at the site were in compliance with State and Federal laws as well as standard protocols for site investigation. We will follow up with you as this process moves forward.

Independent Peer Review

As part of our effort to ensure sufficient and appropriate identification and treatment of cultural resources, we are prepared to provide an ethnographer for assistance in the identification process and to retaining consultants acceptable to the Band to conduct an external peer review of EDAW's ongoing efforts and strategy. We have identified Far Western Anthropological Research Group as a firm with regional expertise in archaeology and geomorphology. However, as discussed at the June 4th meeting, we would welcome any alternative suggestions you may have regarding a qualified ethnographer and a firm to conduct the peer review.

Other Concerns

1. **Definition of Historic Properties**

The Band notes that it is appropriate to include traditional cultural places (TCPs) in the definition of historic properties. Eligible and National Register of Historic Places (NRHP) listed TCPs are included in the definition of historic properties in the implementing regulations, and are included in our definitions by reference to the regulations in the PA.

2. Ongoing Communication & MLD Liaison

SAFCA would appreciate your clarification regarding how SAFCA and its consultants should communicate with the MLD, the Band and its representatives. A clear definition of contacts and their specific roles will help us meet your expectations and facilitate cooperation as the project moves forward.

3. Modified Construction Methods

As discussed at our June 4th meeting SAFCA's engineering staff are developing a series of modifications to standard construction methods proposed for sensitive historic properties. We will be circulating a memo identifying these methods and hope to discuss them with you when we meet again. As the Band offered during the meeting, SAFCA would appreciate receiving the results of the cultural resources 'damage' study that was prepared for an undisclosed site. This study should assist us as we develop our modified construction methods.

4. Final Report

SAFCA will forward a copy of the draft final report(s) to be prepared per Stipulation V(C) of the PA and will consider the Band's comments in making final revisions to that document.

Summary

SAFCA seeks to accomplish the Program in a manner which is respectful and sensitive to Native American heritage. We appreciate your input and welcome your continued assistance in implementing the PA and managing historic properties associated with this important Program. We also look forward to hosting you on a Program field trip at a mutually convenient time. Please contact Peter Buck at 916-874-4581 if you have any questions or need further information, and please coordinate with him by phone or e-mail regarding when you are available to meet with the PA signatories.

Sincerely yours,

Stein M. Buer

Stein M. Buer
Executive Director

cc.

Col. Thomas C. Chapman, District Engineer, US Army Corps of Engineers.
Larry Myers, Executive Secretary, Native American Heritage Commission.
Dwight Dutchske, Assoc. Park & Recreation Specialist, State Historic Preservation Office.
Brigit Barnes, Attorney for the Band, Brigit S. Barnes & Associates Inc.
Michelle LaPena, Attorney, LaPena Law Corporation.

SAFCA
Sacramento
Area Flood
Control
Agency

July 23, 2008

Janis Offermann
Senior Environmental Planner
Department of Water Resources
Division of Environmental Services
Environmental Compliance and Evaluation Branch
1725 23rd Street, Suite 220
Sacramento, CA 95816

Dear Ms. Offermann:

The Sacramento Area Flood Control Agency (SAFCA) is constructing the Natomas Levee Improvement Program (NLIP), Landside Improvements Project. This project will provide necessary improvements to the levee system that surrounds the Natomas Basin, including portions of Sutter County, Sacramento County and the City of Sacramento, California. This project requires permits and authorization from the U.S. Army Corps of Engineers (Corps) to discharge fill to waters of the United States and to modify federal flood control structures. These federal actions require that the Corps comply with Section 106 of the National Historic Preservation Act (NHPA).

Section 106 mandates that federal agencies consider the effects of their undertakings on historic properties and allow the Advisory Council on Historic Preservation (ACHP) a reasonable time to comment on the action. Historic properties are cultural resources such as archaeological sites, historic buildings and objects, and traditional cultural places that are listed on, or are eligible for listing on, the National Register of Historic Places (NRHP).

Compliance with Section 106, as defined in Part 800 of Title 36 of the Code of Federal Regulations (CFR), normally requires five sequential steps:

- determination of the area in which the undertaking may affect historic properties (also referred to as the area of potential effects or "APE")
- identification of cultural resources within the APE
- evaluation of those resources for listing on the NRHP
- identification of adverse effects on NRHP-eligible resources that would result from the undertaking
- and resolution of adverse effects

The Section 106 process also requires the federal agency to consult with the public, Indian Tribes, and the State Historic Preservation Officer (SHPO) during the identification and evaluation of historic properties and to consider ways to minimize adverse effects of the undertaking on those properties. These steps may occur

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Sacramento, CA 95814-3407

sequentially as the federal agency consults with these parties in the context of routine federal undertakings. For complex undertakings such as the NLIP, however, the Section 106 regulations provide alternate pathways to Section 106 compliance. Agencies may perform phased identification, evaluation, and resolution of adverse effects as an undertaking proceeds, per 36 CFR Part 800.4(b)(2). This section allows a phased management of resources if a specific process is defined in an agreement document such as a programmatic agreement (PA) or memorandum of agreement (MOA).

The Corps, in consultation with SAFCA and the California SHPO, has developed a PA for the NLIP detailing a phased identification, evaluation, and treatment process for this undertaking (a copy of the executed PA is attached for your information and use). This stepwise process will track the phases of project construction during 2008, 2009 and 2010. This phasing is necessary because the Corps must issue separate authorizations and permits under the Rivers and Harbor Act and the Clean Water Act for each year of work. The geographic scale of the construction involved and uncertainty about the exact nature of work for future phases also dictates that the inventory, evaluation, and treatment of historic properties be developed as phases of the NLIP proceed. These circumstances require that historic properties are identified and managed separately for each year of planned project construction. The PA provides for the following steps to comply with Section 106:

- Inventory of historic properties prior to each year of construction, and submission to the Corps and SHPO of an inventory report and APE map for each year (Stipulation III[C], Stipulation IV). This document will evaluate identified resources and make a finding of effects based on the potential of the undertaking to result in adverse effects.
- Resolution of adverse effects by preparation of a historic properties treatment plan for each adversely affected property (Stipulation V[A]).
- Consultation with the public at large and Native American individuals and organizations with cultural ties to the APE.

In summary, SAFCA and the Corps will identify and manage historic properties in phases related to construction activities over the next few years. We understand that this undertaking has the potential to effect historic properties with noteworthy values to both the archaeological and Native American communities. Such resources include CA-SAC-485/H, the remains of a prehistoric site containing numerous features and Native American burials. The full list of potentially affected resources that have been identified within the project area is provided in the Draft Environmental Impact Report (SAFCA, 2007) prepared for the project. We are currently conducting additional archaeological inventory for the 2008 construction season and additional site evaluation efforts are needed for the planned 2009 construction season.

We are contacting you to fulfill the consultation requirements under the PA and to provide you with the opportunity to consult regarding substantive decisions about how to resolve adverse effects on historic properties. This consultation replaces the general

requirement for public and Native American consultation under the Section 106 regulations because the PA replaces these regulations, in part, for these undertakings. A key part of the consultation process is to provide notice and opportunity to participate in the decision making process to determine how adverse effects will be resolved. We are preparing a draft historic property treatment plan to manage potential adverse effects on CA-SAC-485/H. If you would like to review this document please contact our office to be placed on the distribution list. We are also consulting with the Most Likely Descendant designated for CA-SAC-485/H, Mr. John Tayaba of the Shingle Springs Band of Miwok Indians, as required under state law.

Please contact Peter Buck of SAFCA, at 916-874-4581 or buckp@saccounty.net should you have questions or need further information regarding the identification or treatment of historic properties for this undertaking.

Sincerely,

John A. Bassett
Director of Engineering
Design Construction Maintenance

APPENDIX F

Air Quality Modeling Results

Appendix F - Emissions Worksheet Index	
No.	**Title**
Table 1	Phase 3 - NEMDC South - Cutoff Wall Installation
Table 2	Phase 4a - SREL Summary
Table 3	ARNL Reach I: 1-4
Table 4	PGCC&NEMDC South - Waterside
Table 5	PGCC&NEMDC South - Levee Raise
Table 6	PGCC Culvert
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Table 8	NEMDC North
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Table 13	District 1000 Pumping Plants
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Table 15	Triangle Properties Borrow Site
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Table 17	Phase 4b Summary by Element
Table 18	Fix-In-Place Alternative
Table 19a	Fix-In-Place Summary - Sutter County
Table 19b	Fix-In-Place Summary - Sacramento County
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Table 20	No Action Alternative - Emissions Summary
Table 21	Conformity Table
Table 22	SMAQMD Offset Mitgation Fee Summary

Table 1: Phase 3 - NEMDC South - Cutoff Wall Installation[1]							
Unmitigated 2011 Emissions*							
Phase Element	Emissions, Worst-Case (lb/day)			Emissions (tons/year)			
	ROG	NOX	PM10	ROG	NOX	PM10	CO2
NEMDC South Total	31.0	195.0	306.0	1.0	8.0	13.0	581.0
Mitigated 2011 Emissions							
% Reduction	5%	20%	85%	5%	20%	85%	-
TOTAL	29.5	156.0	45.9	1.0	6.4	2.0	-

Notes:

1. Phase 3 NEMDC South could be constructed in 2015 concurrent with Phase 4b
2. All work conducted in Sacramento County

*Emissions data presented as analyzed in Phase 3 EIS/EIR

Table 2: Phase 4a - SREL Summary[1]								
	Emissions (lb/day) - Worst Case				Emissions (tons/yr)			
Project Element	ROG	NOX	PM10	CO2	ROG	NOX	PM10	CO2
Total from SREL Reaches 13-15	69.0	409.3	3799.0	-	4.4	25.6	365.2	2896.4
Total from Riverside Canal	21.7	101.0	1645.8	-	1.0	5.4	60.5	693.4
Phase 4a - SREL, Mitigated Emission								
	Emissions (lb/day) - Worst Case				Emissions (tons/yr)			
Mitigation Reductions	5%	20%	85%	-	5%	20%	85%	-
Total Mitigated Phase 4a - SREL R:13-15 and Riverside Canal, Sacramento County	86.2	327.4	569.8	-	4.2	20.5	54.8	2896.4

Notes:

1. 100% of Phase 4a - SREL R:13-15 and 100% of Riverside Canal could be constructed during 2012, overlapping with Phase 4b components constructed during 2012.

3. All work conducted in Sacramento County

*Emissions data presented as analyzed in Phase 4a EIS/EIR, August 28, 2009

Table 3: American River North Levee (ARNL) Reach I: 1-4 - Phase 4b Improvements

Phase 4b American River North Levee (ARNL) Reach I: 1-4 includes slope flattening and seepage remediation
Work Schedule : May - Nov., 2012 (1, 2, and 3)
Work Schedule: May-Nov., 2013 (4, 5, and 6)

Total ARNL Reaches 1-4 length in Phase 4b =	2.3	mi
	12144.0	ft
ARNL Reaches 1-4 length in Sacramento County =	12144.0	ft
	100.0%	of the total length

Conversion	
0.00220462	lb/gram
2000	lb/ton

	Qty	Unit	Emission Factor						Emissions (lb/yr)								Input Data					
			ROG	NOX	PM10	PM2.5	CO2	Unit	ROG	NOX	PM10 Combustion	PM10 Earthmoving	PM10 COMB	PM2.5 EM	CO2	Unit	Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
[1] Site Preparation																						
Mobile Sources																						
Haul Truck(s)	6	trucks	1.19	15.62	0.62	0.57	1847.96	lb/day	185.3	2561.2	100.4	-	92.4	-	295569.5	lb/yr	-	-	-	4.0	648.00	24.90
Haul Truck(s)	192	trips	11.23	8.02	0.02	0.01	271.22	g/trip[2]	4.6	3.4	0.01	-	0.01	-	996.9	lb/yr			Activity Period (days) =		27.0	
Water Truck(s)	1		0.16	1.27	0.05	0.05	163.47	lb/day	3.7	34.3	1.4	-	1.3	-	4413.7	lb/yr	*Assumes haul load is approximately 4 miles roundtrip					
Scraper(s)	2		0.45	4.26	0.16	0.16	499.64	lb/day	25.1	235.5	9.5	-	9.0	-	22115.4	lb/yr	*Assumes haul load=14 yd^3					
Loader(s)	2		0.43	3.33	0.10	0.10	307.16	lb/day	23.1	179.9	10.4	-	9.6	-	16586.5	lb/yr	*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes					
Crawler Tractors	2		0.48	4.45	0.19	0.17	369.73	lb/day	26.9	240.5	19.0	-	9.2	-	19965.3	lb/yr	Notes:					
Motor Grader(s)	2		0.49	3.79	0.22	0.20	346.97	lb/day	26.4	204.9	11.9	-	10.9	-	18736.6	lb/yr	1. Emission factor represents running exhaust (grams/mile)					
Chipper/Grinder(s)	4		0.59	3.78	0.32	0.30	352.66	lb/day	62.4	407.7	35.0	-	32.2	-	39567.6	lb/yr	2. Emission factor represents start emission rate @480 minutes (grams/trip)					
Employee Trips	25	employees	0.02	0.03	0.00	0.00	39.26	lb/day/employee	15.5	19.6	2.7	-	2.6	-	29497.1	lb/yr						
Fugitive Sources																						
Travel on unpaved roads	324	VMT/year	-	-	0.80	0.08	-	lb/VMT	-	-	-	290.9	-	27.2	-	lb/yr						
Travel on paved roads	324	VMT/year	-	-	0.28	0.04	-	lb/VMT	-	-	-	91.5	-	13.4	-	lb/yr						
								Total Emissions (lb/year) =	**378.5**	**3888.4**	**181.3**	**382.3**	**166.9**	**40.7**	**445868.5**	**lb/yr**						
								Total Emissions (lb/day) =	**14.0**	**144.0**	**6.7**	**14.2**	**6.2**	**1.5**	**16513.6**	**lb/day**						
[2] Removal of Landside Structures and Other Facilities																						
Mobile Sources																						
Haul Truck(s)	6	trucks	1.19	15.62	0.62	0.57	1847.96	g/mile[1]	2.0	26.8	1.0	-	1.0	-	3128.9	lb/yr	-	-	-	4.0	768.00	32.00
Haul Truck(s)	192	trips	11.23	8.02	0.02	0.01	271.22	g/trip[2]	4.6	3.4	0.01	-	0.01	-	154.80	lb/yr			Activity Period (days) =		24.0	
Excavator(s)	2		0.46	4.38	0.18	0.18	499.64	lb/day	22.3	209.3	8.5	-	7.8	-	19658.1	lb/yr	*Assumes haul load is approximately 4 miles roundtrip					
Loader(s)	1		0.43	3.33	0.10	0.10	307.16	lb/day	10.3	79.9	4.6	-	4.3	-	7371.6	lb/yr	*Assumes haul load=14 yd^3					
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/employee	9.3	10.4	1.4	-	1.4	-	14131.8	lb/yr	*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes					
Fugitive Sources																	Notes:					
Travel on unpaved roads	324	VMT/year	-	-	0.80	0.09	-	lb/VMT	-	-	-	344.72	-	32.29	-	lb/yr	1. Emission factor represents running exhaust (grams/mile)					
Travel on paved roads	324	VMT/year	-	-	0.28	0.04	-	lb/VMT	-	-	-	108.43	-	15.83	-	lb/yr	2. Emission factor represents start emission rate @480 minutes (grams/trip)					
								Total Emissions (lb/year) =	**47.6**	**329.8**	**15.6**	**453.2**	**14.4**	**48.2**	**44405.4**	**lb/yr**						
								Total Emissions (lb/day) =	**2.0**	**13.7**	**0.6**	**18.9**	**0.6**	**2.0**	**1850.2**	**lb/day**						
[3] Flattening Slope																						
Mobile Sources																						
Haul Truck(s)	16	trucks	1.19	15.62	0.62	0.57	1847.96	g/mile[1]	145.8	1933.4	75.8	-	69.7	-	229819.1	lb/yr	Levee Fill	167,000	11,926.57	4.0	47,714.29	340.82
Haul Truck(s)	14440	trips	11.23	8.02	0.02	0.01	271.22	g/trip[2]	357.5	255.2	0.5	-	0.5	-	8634.2	lb/yr	Waste Material	27000	1926.57	4	7,714.29	55.10
Excavator(s)	2		0.42	3.22	0.19	0.18	324.72	lb/day	118.8	902.9	53.3	-	49.5	-	90792.1	lb/yr	Aggregate Base**	6960	497.14	60	29,828.57	213.06
Loader(s)	2		0.43	3.33	0.10	0.10	307.16	lb/day	119.7	932.6	53.9	-	49.8	-	89604.1	lb/yr	Asphalt Concrete**	1200	85.71	60	5,142.86	36.73
Scraper(s)	2		0.45	4.26	0.16	0.16	499.64	lb/day	130.1	1221.1	49.3	-	45.4	-	114672.3	lb/yr	**Total Material =**	**202,160**	**14,440**	**129**	**80,400**	**646**
Dozer(s)	2		0.45	4.06	0.17	0.16	335.60	lb/day	126.2	1136.4	48.5	-	44.8	-	93967.4	lb/yr	**Material**	**Tons/CY**	**Tons/day**			
Compactor(s)	2		0.29	1.89	0.09	0.09	244.58	lb/day	80.1	505.5	24.9	-	22.0	-	68456.8	lb/yr		1.25	1925.0			
Grader(s)	2		0.49	3.79	0.22	0.20	346.97	lb/day	137.0	1062.4	61.5	-	56.6	-	97152.8	lb/yr	Activity Period (days) =				180.0	
Water Truck(s)	1		0.16	1.27	0.05	0.05	163.47	lb/day	14.0	177.6	7.0	-	6.4	-	22665.6	lb/yr	Haul Truck capacity (CY) =				14.0	
Employee Trips	25	employees	0.02	0.03	0.00	0.00	39.26	lb/day/employee	80.5	101.5	14.0	-	12.5	-	137392.5	lb/yr	*Assumes haul load is approximately 4 miles roundtrip					
Fugitive Sources																	*Assumes haul load=14 yd^3					
Travel on unpaved roads	45260	VMT/Yr	-	-	0.80	0.08	-	lb/VMT	-	-	-	40576.6	-	3800.5	-	lb/yr	*Assumes that material hauling occurs on 50% paved and 50% unpaved haul routes					
Travel on paved roads	45260	VMT/Yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	12763.4	-	1875.1	-	lb/yr	** Commercial Source					
Material Handling																	Notes:					
Truck Unloading				-	0.01	0.00		lb/ton	-	-	-	1326.7	-	33.6	-	lb/yr	1. Emission factor represents running exhaust (grams/mile)					
Bulldozing	8	lb/day		-	0.75	0.11	-	lb/hr	-	-	-	843.1	-	119.0	-	lb/yr	3. Emission factor represents start emission rate @480 minutes (grams/trip)					
Scraper Unloading				-	0.03	0.00		lb/ton	-	-	-	7581.0	-	1961.3	-	lb/yr						
								Total Emissions (lb/year) =	**1,311.7**	**8,226.9**	**388.2**	**63,090.8**	**357.7**	**6,888.6**	**945,795.1**	**lb/yr**						
								Total Emissions (lb/day) =	**9.4**	**58.8**	**2.8**	**450.8**	**2.6**	**49.2**	**6,755.7**	**lb/day**						
[4] Cutoff Wall Construction																						
Mobile Sources																						
Haul Truck(s)	2	trucks	1.19	15.62	0.62	0.57	1847.96	g/mile[1]	1.3	16.7	0.7	-	0.6	-	1955.5	lb/yr	-	-	-	4.0	480.00	8.00
Haul Truck(s)	120	trips	11.23	8.02	0.02	0.01	271.22	g/trip[2]	3.0	2.1	0.01	-	0.01	-	77.6	lb/yr			Activity Period (days) =		60.0	
Loader(s)	6		0.43	3.33	0.10	0.10	307.16	lb/day	153.8	1199.1	69.2	-	63.7	-	119576.8	lb/yr	*Assumes haul load is approximately 4 miles roundtrip					
Dozer(s)	12		0.45	4.06	0.17	0.16	335.60	lb/day	329.7	2922.2	124.6	-	114.7	-	241539.4	lb/yr	*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes					
Pallet Loader(s) (Forklift)	6		0.66	4.01	0.27	0.24	341.29	lb/day	259.1	1842.6	133.2	-	122.6	-	122853.1	lb/yr	Notes:					
Generator(s)	6		0.39	3.78	0.11	0.10	420.92	lb/day	164.2	1351.4	41.0	-	37.7	-	151531.1	lb/yr	1. Emission factor represents running exhaust (grams/mile)					
Pumps	6		0.78	4.91	0.40	0.36	420.92	lb/day	274.5	1758.2	142.4	-	131.0	-	151531.1	lb/yr	2. Emission factor represents start emission rate @480 minutes (grams/trip)					
Pickup(s)	6		0.02	0.03	0.00	0.00	39.26	lb/day	8.3	10.4	1.4	-	1.4	-	14131.8	lb/yr						
Excavator(s)	2		0.42	3.22	0.19	0.18	324.72	lb/day	50.9	387.0	23.0	-	21.2	-	38906.6	lb/yr						

Table 3: American River North Levee (ARNL) Reach I: 1-4 - Phase 4b Improvements

Phase 4b American River North Levee (ARNL) Reach I: 1-4 includes slope flattening and seepage remediation

Deep Soil Mix Rig	6		0.20	2.34	0.06	0.06	436.61	lb/day	73.5	841.9	30.3	-	27.2	-	153376.7	lb/yr
Employee Trips	120	employees	0.02	0.03	0.00	0.00	39.26	lb/day/employee	165.6	206.9	28.8	-	27.8	-	28283.0	lb/yr
Fugitive Sources																
Travel on unpaved roads	240	VMT/yr	-	-	0.90	0.09	-	lb/VMT	-	-	-	215.5	-	20.2	-	lb/yr
Travel on paved roads	240	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	67.6	-	10.0	-	lb/yr
Material Handling																
Bulldozing	8	hrs/day	-	-	0.75	0.11		lb/hr				261.3		75.6		lb/yr
								Total Emissions (lb/year) =	**1403.9**	**10160.3**	**594.7**	**844.5**	**548.5**	**80.7**	**1269413.0**	**lb/yr**
								Total Emissions (lb/day) =	**23.4**	**169.3**	**9.9**	**10.7**	**9.1**	**1.3**	**21156.9**	**lb/day**

[5] Reconstruction of Garden Highway at four intersections

Mobile Sources																	Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
Haul Truck(s)	12	trucks	1.193	15.822	0.829	0.570	1847.980	g/mile[1]	3.41	45.21	1.77	-	1.63	-	5279.98	lb/yr	-	-	-	4.0	1,296.00	48.00
Haul Truck(s)	324	trips	10.736	0.000	0.015	0.015	209.040	g/trip[2]	7.67	0.00	0.01	-	0.01	-	149.32	lb/yr				Activity Period (days) =		27.0
Backhoe(s)	4		0.184	1.194	0.046	0.043	312.946	lb/day	19.68	126.91	4.99	-	4.59	-	33797.35	lb/yr	*Assumes haul road is approximately 4 miles roundtrip					
Compactor(s)	4		0.285	1.763	0.071	0.066	244.569	lb/day	30.75	152.58	7.69	-	7.07	-	26415.57	lb/yr	*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes					
Pavers(s)	2		0.749	4.451	0.356	0.355	352.665	lb/day	40.46	241.97	21.41	-	19.69	-	19043.79	lb/yr	Notes:					
Off-Highway Trucks	3		0.269	2.319	0.084	0.077	334.222	lb/day	14.55	125.24	4.54	-	4.17	-	17597.88	lb/yr	1. Emission factor represents running exhaust (grams/mile)					
Truck-Mounted Augers	3		0.269	2.319	0.084	0.077	334.222	lb/day	14.55	125.24	4.54	-	4.17	-	17597.88	lb/yr	2. Emission factor represents start emission rate @480 minutes (grams/trip)					
Employee Trips	15	employees	0.033	0.039	0.004	0.004	39.255	lb/day/employee	9.33	11.75	1.62	-	1.56	-	15688.28	lb/yr						
Fugitive Sources																						
Travel on unpaved roads	648	VMT/yr	-	-	0.90	0.09	-	lb/VMT	-	-	-	581.72	-	54.49	-	lb/yr						
Travel on paved roads	648	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	182.5	-	26.9	-	lb/yr						
								Total Emissions (lb/year) =	**140.6**	**870.9**	**46.6**	**764.7**	**42.9**	**81.4**	**135590.2**	**lb/yr**						
								Total Emissions (lb/day) =	**5.2**	**32.3**	**1.7**	**28.3**	**1.6**	**3.0**	**5021.9**	**lb/day**						

[6] Site Restoration/Demobilization

Mobile Sources																	Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
Haul Truck(s)	3	trucks	1.19	15.82	0.82	0.57	1847.98	g/mile[1]	1.1	14.2	0.6	-	0.5	-	1662.2	lb/yr	-	-	-	4.0	408.00	12.00
Haul Truck(s)	102	trips	10.74	0.00	0.02	0.01	209.04	g/trip[2]	2.4	0.0	0.0	-	0.0	-	47.0	lb/yr				Activity Period (days) =		34.0
Off-Highway Trucks	3		0.27	2.32	0.08	0.08	334.22	lb/day	27.5	236.6	9.5	-	7.9	-	33970.6	lb/yr	*Assumes haul road is approximately 4 miles roundtrip					
Water Truck(s)	3		0.30	1.27	0.05	0.05	183.47	lb/day	19.2	125.5	5.1	-	4.7	-	18873.9	lb/yr	*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes					
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/employee	11.7	14.6	2.0	-	2.0	-	2002.0	lb/yr	Notes:					
Fugitive Sources																						
Travel on unpaved roads	204	VMT/yr	-	-	0.90	0.09	-	lb/VMT	-	-	-	183.1	-	17.2	-	lb/yr	1. Emission factor represents running exhaust (grams/mile)					
Travel on paved roads	204	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	57.5	-	8.5	-	lb/yr	2. Emission factor represents start emission rate @480 minutes (grams/trip)					
								Total Emissions (lb/year) =	**52.9**	**395.1**	**16.3**	**240.7**	**15.1**	**25.6**	**71473.8**	**lb/yr**						
								Total Emissions (lb/day) =	**1.5**	**11.6**	**0.5**	**7.1**	**0.4**	**0.8**	**2102.2**	**lb/day**						

Summary - ARNL

	ROG	NOX	PM10		PM2.5		CO2
			Combustion	Earthmoving	Combustion	Earthmovi	
2012 Total from ARNL Reaches 1-4 (tons/year)	**0.9**	**5.2**	**0.3**	**32.0**	**0.3**	**3.5**	**718.0**
2012 Total from ARNL Reaches 1-4 Worst Case Day (lb/day)	**14.0**	**144.0**	**6.7**	**450.6**	**6.2**	**49.2**	**16513.6**
2013 Total from ARNL Reaches 1-4 (tons/year)	**0.8**	**5.7**	**0.3**	**0.8**	**0.3**	**0.1**	**736.2**
2013 Total from ARNL Reaches 1-4 Worst Case Day (lb/day)	**23.4**	**169.3**	**9.9**	**28.3**	**9.1**	**3.0**	**21156.9**

*These calculations represent worst-case emissions from construction activities associated with American River North Levee Reaches 1-4 work

Year	Group	Phase	Emissions (lb/day)						
			ROG	NOx	PM10		PM2.5		CO2
					Combustion	Earthmov	Combustic	Earthmoving	
2012	I	1	14.0	144.0	6.7	14.2	6.2	1.5	16513.6
	II	2	2.0	13.7	0.6	18.9	0.6	2.0	1850.2
	III	3	9.4	58.8	2.8	450.6	2.6	49.2	6755.7
	Worst-case lb/day		14.0	144.0	6.7	450.6	6.2	49.2	16513.6
2013	IV	4	23.4	169.3	9.9	10.7	9.1	1.3	21156.9
	V	5	5.2	32.3	1.7	28.3	1.6	3.0	5021.9
	VI	6	1.6	11.6	0.5	7.1	0.4	0.8	2102.2
	Worst-case lb/day		23.4	169.3	9.9	28.3	9.1	3.0	21156.9

Table 4: Pleasant Grove Creek Canal (PGCC) and Natomas East Main Drainage Canal South Reaches E and H (NEMDC South) - Waterside Improvements - Phase 4b Improvements

Project Information

Phase 4b PGCC and NEMDC Canal South Reaches E and H (NEMDC South) Waterside improvements includes levee raising and slope flattening

PGCC/NEMDC South - Waterside Improvements Work Schedule: May-Nov 2015

Total PGCC/NEMDC South - Waterside Improvements length in Phase 4b	0.8	mi		
	4224.0	ft		
PGCC/NEMDC South length in Sutter County =	1200.0	ft	28.4%	of the total length
PGCC/NEMDC South length in Sacramento County =	2900.0	ft	68.7%	of the total length

0.002204623 lb/gram

2000 lb/ton

	Qty	Unit	Emission Factor						Emissions (lb/yr)								Input Data
			ROG	NOX	PM10	PM2.5	CO2	Unit	ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	CO2	Unit	
[1] Erosion Repair and Rock Slope Protection Installation																	
Mobile Sources																	
Haul Truck(s)	15	trucks	1.193	15.82	0.62	0.57	1947.96	g/mile[1]	3.72	49.37	1.93	-	1.78	-	5766.15	lb/yr	
Haul Truck(s)	354	trips	11.23	8.02	0.02	0.01	271.22	g/trip[1]	8.76	6.25	0.01	-	0.01	-	211.57	lb/yr	
Pick-up Truck(s)	2		0.02	0.03	0.00	0.00	39.26	lb/day	1.0	1.2	0.2	-	0.2	-	1648.7	lb/yr	
Water Truck(s)	2		0.10	1.27	0.05	0.05	163.47	lb/day	4.2	53.3	2.1	-	1.9	-	6865.7	lb/yr	
Excavator(s)	3		0.42	3.22	0.19	0.18	324.22	lb/day	26.7	203.2	12.1	-	11.1	-	20426.0	lb/yr	
Loader(s)	4		0.43	3.33	0.19	0.18	307.16	lb/day	35.9	279.8	16.2	-	14.9	-	25801.2	lb/yr	
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/employ	7.2	9.1	1.3	-	1.2	-	12365.3	lb/yr	
Fugitive Sources																	
Travel on unpaved roads	708	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	635.3	-	59.5	-	lb/yr	
Travel on paved roads	708	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	199.8	-	29.4	-	lb/yr	
								Total Emissions (lb/year) =	87.5	602.3	33.7	835.1	31.1	88.9	73084.7	lb/yr
								Total Emissions (lb/day) =	4.17	28.68	1.61	39.77	1.48	4.23	3480.22	lb/day
[2] Beaver Protection Wall Installation (Independent of No. 1) - Work conducted in 10-hour shifts, 6 days per week																	
Mobile Sources																	
Water Truck	1		0.13	1.59	0.06	0.06	204.34	lb/day	10.00	127.00	5.00	-	4.60	-	16347.00	lb/yr	
Backhoe(s)	3		0.24	1.60	0.07	0.06	391.06	lb/day	58.08	383.10	16.41	-	15.10	-	93853.70	lb/yr	
Loader(s)	2		0.53	4.16	0.24	0.22	363.95	lb/day	85.48	666.19	39.48	-	35.40	-	61431.53	lb/yr	
Light-Duty Crane	1		0.31	3.01	0.12	0.11	305.74	lb/day	24.72	240.61	9.29	-	8.55	-	24458.85	lb/yr	
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/employ	27.60	34.80	4.80	-	4.63	-	47106.00	lb/yr	
Fugitive Sources																	
Travel on unpaved roads	172.0	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	154.4	-	14.5	-	lb/yr	
Travel on paved roads	172.0	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	48.6	-	7.1	-	lb/yr	
								Total Emissions (lb/year) =	205.9	1451.7	74.0	203.0	68.3	21.6	243197.1	lb/yr
								Total Emissions (lb/day) =	2.6	18.1	0.9	2.5	0.9	0.3	3040.0	lb/day
[3] NEMDC Low Flow Channel Relocation (Independent of No. 1 and 2) - Work conducted in 10-hr shifts, 6 days per week																	
Mobile Sources																	
Excavator(s)	1		0.47	3.48	0.21	0.19	405.28	lb/day	14.00	104.36	6.18	-	5.69	-	12158.32	lb/yr	
Vibratory Roller	1		0.71	4.47	0.39	0.36	398.17	lb/day	21.40	134.13	11.66	-	10.73	-	11945.03	lb/yr	
Loader(s)	2		0.48	3.67	0.21	0.19	363.95	lb/day	28.52	220.01	12.69	-	11.66	-	23036.82	lb/yr	
Employee Trips	12	employees	0.02	0.03	0.00	0.00	39.26	lb/day/employ	8.29	10.44	1.44	-	1.39	-	14131.66	lb/yr	
								Total Emissions (lb/year) =	72.2	468.9	32.0	0.0	29.5	0.0	61272.0	lb/yr
								Total Emissions (lb/day) =	2.4	15.6	1.1	0.0	1.0	0.0	2042.4	lb/day

Input Data					
Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
Rock slope protection	4,246.00	354	4.00	1,415.33	8
Material	Tons/CY	Tons/day			
	1.25	252.7			
			Activity Period (days) =	21.0	
			Haul Truck capacity (CY)** =	12.0	

*Assumes that material hauling occurs on 50% paved and 50% unpaved haul routes

**Truck capacity provided by HDR

Notes:

1. Emission factor represents running exhaust (grams/mile)
2. Emission factor represents start emission rate @ 480 minutes (grams/trip)

Input Data					
Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
--	-	-	4.00	344.00	4.3
			Activity Period (days) =	80.0	

*Assumes haul load is approximately 4 miles roundtrip

*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes

Input Data					
Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
-	-	-	4.00	129.00	4.3
			Activity Period (days) =	30.0	

*Assumes haul load is approximately 4 miles roundtrip

Summary - PGCC/NEMDC South Waterside Improvements	ROG	NOx	PM10 Combustion	PM10 Earthmoving	PM2.5 Combustion	PM2.5 Earthmoving	CO2
2015 Total from PGCC/NEMDC South - Waterside Improvements (tons/year) =	0.2	1.3	0.1	0.5	0.1	0.1	188.8
2015 Total from PGCC/NEMDC South - Waterside Improvements (lb/day) - Worst Case Day =	4.2	28.7	1.6	39.8	1.5	4.2	3480.2
Emissions in Sacramento County (tons/year) = 68.7%	0.13	0.87	0.05	0.36	0.04	0.04	129.61
Emissions in Sacramento County (lb/day)- Worst Case = 68.7%	2.9	19.7	1.1	27.3	1.0	2.9	2389.4
Emissions in Sutter County (tons/year) = 28.4%	0.1	0.4	0.0	0.1	0.0	0.0	53.6
Emissions in Sutter County (lb/day)- Worst Case = 28.4%	1.2	8.1	0.5	11.3	0.4	1.2	988.7

*These calculations represent worst-case emissions from construction activities associated with NEMDC South - Waterside work

Year	Group	Phase	Emissions (lb/day) ROG	NOx	PM10 Combustion	PM10 Earthmoving	PM2.5 Combustion	PM2.5 Earthmoving	CO2
2015	1	1	4.2	28.7	1.6	39.8	1.5	4.2	3480.2
	2	2	2.6	18.1	0.9	2.5	0.9	0.3	3040.0
	3	3	2.4	15.6	1.1	0.0	1.0	0.0	2042.4
	Worst-case lb/day		4.2	28.7	1.6	39.8	1.5	4.2	3480.2

Table 5: Pleasant Grove Creek Canal (PGCC) and Natomas East Main Drainage Canal South Reaches E and H (NEMDC South) - Levee Raise - Phase 4b Improvements

Project Information

Phase 4b PGCC and NEMDC Canal South Reaches E and H (NEMDC South) Levee Raise includes levee raising and slope flattening

PGCC/NEMDC South - Levee Raise Work Schedule: May-Nov 2015 (1 through 5)

Total PGCC/NEMDC South - Levee Raise length in Phase 4b	0.1	mi		
	528.0	ft		
PGCC/NEMDC South length in Sutter County =	28.0	ft	5.3%	of the total length
PGCC/NEMDC South length in Sacramento County =	500.0	ft	94.7%	of the total length

0.00220462	lb/gram
2000	lb/ton

	Qty	Unit	Emission Factor ROG	NOX	PM10	PM2.5	CO2	Unit	Emissions (lb/yr) ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	CO2	Unit
(1) Clearing and grubbing/stripping																
Mobile Sources																
Haul Truck(s)	15	trucks	1.193	16.82	0.52	0.57	1847.96	g/mile[1]	0.16	2.09	0.08	-	0.08	-	244.44	lb/yr
Haul Truck(s)	150	trips	11.23	8.02	0.02	0.01	271.22	g/trip[2]	3.71	2.65	0.00	-	0.00	-	89.69	lb/yr
Pick-up Truck(s)	6		0.02	0.03	0.00	0.00	39.26	lb/day	1.2	1.5	0.2	-	0.2	-	1962.8	lb/yr
Water Truck(s)	2		0.19	1.27	0.05	0.05	163.47	lb/day	2.0	25.4	1.0	-	0.9	-	3269.4	lb/yr
Scraper(s)	4		0.46	4.36	0.18	0.16	409.54	lb/day	18.6	174.4	7.0	-	6.5	-	16381.8	lb/yr
Loader(s)	2		0.43	3.33	0.19	0.18	307.16	lb/day	8.5	66.6	3.6	-	3.5	-	6143.2	lb/yr
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/employee	3.5	4.4	0.6	-	0.6	-	5888.3	lb/yr
Fugitive Sources																
Travel on unpaved roads	30	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	26.93	-	2.52	-	lb/yr
Travel on paved roads	30	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	8.47	-	1.24	-	lb/yr
								Total Emissions (lb/year) =	37.6	277.0	12.8	36.4	11.8	3.8	33979.4	lb/yr
								Total Emissions (lb/day) =	3.76	27.70	1.28	3.64	1.18	0.38	3397.94	lb/day
(2) Borrow Site Preparation (concurrent with no. 1)																
Mobile Sources																
Water Truck	1		0.19	1.27	0.05	0.05	163.47	lb/day	0.60	6.35	0.25	-	0.23	-	817.35	lb/yr
Tractor/Scraper(s)	2		0.46	4.36	0.18	0.16	409.54	lb/day	4.64	43.61	1.76	-	1.62	-	4095.44	lb/yr
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/employee	1.73	2.18	0.30	-	0.29	-	2944.13	lb/yr
								Total Emissions (lb/year) =	6.9	52.1	2.3	0.0	2.1	0.0	7856.9	lb/yr
								Total Emissions (lb/day) =	1.4	10.4	0.5	0.0	0.4	0.0	1571.4	lb/day
(3) Levee Embankment Placement (follows no. 1 and 2) - *Peak activity to occur in two 12-hour shifts, 6 days per week																
Mobile Sources																
Haul Truck(s)	3	trucks	1.193	15.822	0.67	0.670	1847.96	g/mile[1]	119.29	1682.13	82.00	-	57.04	-	184767.50	lb/yr
Haul Truck(s)	45,357	trips	10.736	0	0.015	0.015	209.04	g/trip[2]	1073.56	0.00	1.50	-	1.46	-	20903.04	lb/yr
Pickup Truck(s)	5		0.069	0.087	0.012	0.012	117.766	lb/day	37.8	34.8	4.8	-	4.6272	-	47106	lb/yr
Scraper(s)	16		1.2732	11.5276	0.4845	0.42	1228.6314	lb/day	1829.70	16755.58	381.76	-	335.22	-	1572648.19	lb/yr
Excavator(s)	2		1.12	8.35	0.49	0.45	972.67	lb/day	179.18	1335.84	79.16	-	72.78	-	155626.51	lb/yr
Loader(s)	2		1.14	8.80	0.51	0.47	921.47	lb/day	182.50	1408.03	81.12	-	74.63	-	147435.56	lb/yr
Employee Trips	55	employees	0.02	0.03	0.00	0.00	39.26	lb/day/employee	101.23	127.60	17.60	-	15.97	-	172722.00	lb/yr
Fugitive Sources																
Travel on unpaved roads	22679	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	20058.8	-	1906.9	-	lb/yr
Travel on paved roads	22679	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	6403.8	-	940.8	-	lb/yr
Material Handling																
Truck Unloading			-	-	0.01	0.00	-	lb/ton	-	-	-	4167.19	-	105.57	-	lb/yr
Scraper Unloading			-	-	0.03	0.00	-	lb/ton	-	-	-	23912.60	-	3333.75	-	lb/yr
								Total Emissions (lb/year) =	3313.0	19244.0	627.9	54742.4	762.7	6287.0	2301226.9	lb/yr
								Total Emissions (lb/day) =	41.4	240.5	10.3	684.3	9.5	78.6	28765.4	lb/day
(4) East Levee Road/Natomas Road (follows no. 3) - *Peak activity to occur in two 12-hour shifts, 6 days per week																
Mobile Sources																
Water Truck(s)	2		0.30	3.81	0.15	0.14	490.41	lb/day	18.00	228.60	9.00	-	8.28	-	29424.60	lb/yr
Drum Roller(s)	8		1.71	10.73	0.93	0.86	955.69	lb/day	410.90	2575.37	223.65	-	205.94	-	229344.48	lb/yr
Concrete Paver(s)	6		2.25	13.44	1.19	1.09	1057.99	lb/day	397.19	2016.46	178.38	-	164.11	-	158888.17	lb/yr
Asphalt Delivery Truck(s)	50		0.8082	6.9679	0.252	0.23184	972.6657	lb/day	1212.3	10436.88	378	-	347.76	-	1458998.55	lb/yr
Employee Trips	45	employees	0.02	0.03	0.00	0.00	39.26	lb/day/employee	31.05	39.15	5.40	-	5.31	-	52994.25	lb/yr
Fugitive Sources																
Travel on unpaved roads	43	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	39.0	-	3.7	-	lb/yr
Travel on paved roads	43	VMT/yr	-	-	0.23	0.04	-	lb/VMT	-	-	-	12.3	-	1.8	-	lb/yr
Material Handling																
Truck Unloading			-	-	0.01	0.00	-	lb/ton	-	-	-	2.0	-	0.1	-	lb/yr
								Total Emissions (lb/year) =	2009.4	15296.4	794.6	53.2	731.3	5.5	1929460.1	lb/yr
								Total Emissions (lb/day) =	67.0	509.9	26.5	1.8	24.4	0.2	64315.3	lb/day
(5) Cleanup/demobilization (follows no. 4)																
Mobile Sources																
Haul Truck(s)	2	trucks	1.19	16.82	0.52	0.57	1847.96	g/mile[1]	0.28	3.36	0.13	-	0.12	-	391.11	lb/yr
Haul Truck(s)	24	trips	10.74	0.00	0.02	0.01	209.04	g/trip[2]	0.57	0.00	0.00	-	0.00	-	11.06	lb/yr
Water Truck(s)	2		0.10	1.27	0.05	0.05	163.47	lb/day	2.40	30.48	1.20	-	1.10	-	3923.28	lb/yr
Off-highway Truck(s)	2		0.27	2.32	0.08	0.08	324.22	lb/day	6.47	55.66	2.02	-	1.85	-	7781.33	lb/yr
Loader(s)	1		0.38	2.93	0.17	0.16	307.16	lb/day	4.56	35.20	2.03	-	1.87	-	3685.89	lb/yr
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.20	lb/day/employee	4.14	5.22	0.72	-	0.59	-	7065.90	lb/yr
Fugitive Sources																
Travel on unpaved roads	48	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	43.3	-	4.0	-	lb/yr
Travel on paved roads	48	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	13.6	-	2.0	-	lb/yr
								Total Emissions (lb/year) =	18.4	129.9	6.1	56.6	5.6	6.0	22858.6	lb/yr
								Total Emissions (lb/day) =	1.5	10.8	0.5	4.7	0.5	0.5	1904.9	lb/day

Input Data

(1) Clearing and grubbing/stripping

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
-	-	-	4.00	60.00	6.00
			Activity Period (days) =	10.0	

*Assumes haul load is approximately 4 miles roundtrip

*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes

Notes:

1. Emission factor represents running exhaust (grams/mile)
2. Emission factor represents start emission rate @ 480 minutes (grams/trip)

(2) Borrow Site Preparation

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
--	-	-	4.00	20.00	4
			Activity Period (days) =	5.0	

*Assumes haul load is approximately 4 miles roundtrip

(3) Levee Embankment Placement

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
Borrow Site Excavation	345,000.00	24,642.86	1.00	24,642.86	308.04
Levee Embankment Fill	290,000.00	20,714.29	1.00	20,714.29	258.93
Material	**Tons/CY**	**Tons/day**			
	1.25	9921.9			
			Activity Period (days) =	80.0	
			Haul Truck capacity (CY) =	14.0	

*Assumes haul load=14 yd^3

*Assumes that material hauling occurs on 50% paved and 50% unpaved haul routes

Notes:

1. Emission factor represents running exhaust (grams/mile)
2. Emission factor represents start emission rate @ 480 minutes (grams/trip)

(4) East Levee Road/Natomas Road

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
Class 2 Aggregate Surfacing	272.00	19	4.00	77.71	2.59
Asphalt Concrete Paving	32.00	2	4.00	9.14	0.30
Material	**Tons/CY**	**Tons/day**			
	1.25	12.7			
			Activity Period (days) =	30.0	
			Haul Truck capacity (CY) =	14.0	

*Assumes haul load is approximately 4 miles roundtrip

*Assumes that material hauling occurs on 50% paved and 50% unpaved haul routes

*Assumes haul load=14 yd^3

(5) Cleanup/demobilization

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
-	-	-	4.00	96.00	8
			Activity Period (days) =	12.0	

*Assumes haul load is approximately 4 miles roundtrip

*Assumes haul load=14 yd^3

*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes

Notes:

1. Emission factor represents running exhaust (grams/mile)
2. Emission factor represents start emission rate @ 480 minutes (grams/trip)

Summary - PGCC/NEMDC Levee Raise		ROG	NOx	PM10 Combustion	PM10 Earthmoving	PM2.5 Combustion	PM2.5 Earthmoving	CO2
2015 Total from PGCC/NEMDC South - Levee Raise (tons/year) =		2.7	17.5	0.8	27.4	0.8	3.2	2147.7
2015 Total from PGCC/NEMDC South - Levee Raise (lb/day) - Worst Case Day =		67.0	509.9	26.5	684.3	24.4	78.6	64316.3
Emissions in Sacramento County (tons/year) =	94.7%	2.5	16.6	0.8	26.0	0.7	3.0	2033.8
Emissions in Sacramento County (lb/day) - Worst Case =	94.7%	63.4	482.8	25.1	648.0	23.1	74.4	60904.7
Emissions in Sutter County (tons/year) =	5.3%	0.1	0.9	0.0	1.5	0.0	0.2	113.9
Emissions in Sutter County (lb/day) - Worst Case =	5.3%	3.6	27.0	1.4	36.3	1.3	4.2	3410.7

*These calculations represent worst-case emissions from construction activities associated with PGCC/NEMDC South - Levee Raise work

Table 5: Pleasant Grove Creek Canal (PGCC) and Natomas East Main Drainage Canal South Reaches E and H (NEMDC South) - Levee Raise - Phase 4b Improvements

Project Information

Year	Group	Phase	Emissions (lb/day)						
			ROG	NOx	PM10		PM2.5		CO2
					COMB	EM	COMB	EM	
2015	1	1	3.8	27.7	0.5	3.5	1.2	9.4	3397.8
		2	1.4	10.4	0.8	0.0	0.4	0.0	1571.4
		TOTAL	5.1	38.1	1.3	3.5	1.6	9.4	4969.2
	2	3	41.4	240.5	10.3	684.3	9.5	78.6	20725.4
	3	4	67.0	509.9	26.5	1.3	24.4	0.2	64315.3
	4	5	1.5	10.8	0.5	4.7	0.5	2.5	1904.9
	Worst-case lb/day		67.0	509.9	26.5	684.3	24.4	78.6	64315.3

Table 6: Pleasant Grove Creek Canal (PGCC) Culvert Remediation - Phase 4b Improvements

Project Information
Phase 4b PGCC Culvert Remediation includes culvert upgrades or removal
PGCC Culvert Work Schedule: May-Nov 2014

Total PGCC length in Phase 4b	3.3	mi		
	17424	ft		
PGCC length in Sutter County =	17424		100.0%	of the total length

Conversion	
0.002204623	lb/gram
2000	lb/ton

	Qty	Unit	Emission Factor ROG	NOX	PM10	PM2.5	CO2	Unit	Emissions (lb/yr) ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	CO2	Unit
[1] Culvert Removal																
Mobile Sources																
Haul Truck(s)	2	trucks	1.19	15.82	0.62	0.57	1847.96	g/mile[1]	0.32	4.19	0.16	-	0.15	-	488.89	lb/yr
Haul Truck(s)	30	trips	10.74	0.00	0.02	0.01	209.04	g/trip[2]	0.71	0.00	0.00	-	0.00	-	13.65	lb/yr
Pick-up Truck(s)	5		0.02	0.03	0.00	0.00	39.26	lb/day	1.73	2.18	0.30	-	0.29	-	2844.13	lb/yr
Water Truck(s)	1		0.10	1.27	0.05	0.05	183.47	lb/day	1.50	19.05	0.75	-	0.69	-	2452.05	lb/yr
Loader(s)	2		0.38	2.93	0.17	0.16	307.16	lb/day	11.41	88.00	5.07	-	4.66	-	9214.73	lb/yr
Rollers	2		0.57	3.58	0.31	0.29	318.53	lb/day	17.12	107.31	9.33	-	8.58	-	9556.02	lb/yr
Excavator(s)	2		0.37	2.78	0.18	0.15	324.22	lb/day	11.20	83.49	4.94	-	4.55	-	9726.66	lb/yr
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	5.16	6.53	0.90	-	0.87	-	9832.39	lb/yr
Fugitive Sources																
Travel on unpaved roads	60	VMT/yr	-	-	0.90	0.09	-	lb/VMT	-	-	-	53.9	-	5.0	-	lb/yr
Travel on paved roads	60	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	16.9	-	2.5		lb/yr
								Total Emissions (lb/year) =	49.2	310.7	21.5	70.8	19.8	7.5	43226.7	lb/yr
								Total Emissions (lb/day) =	3.28	20.72	1.43	4.72	1.32	0.50	2881.91	lb/day
[2] Detention Basin Area Stripping																
Mobile Sources																
Water Truck	2		0.10	1.27	0.05	0.05	183.47	lb/day	1.0	12.7	0.5	-	0.5	-	1834.7	lb/yr
Scraper(s)	4		0.42	3.94	0.15	0.14	409.54	lb/day	8.5	78.9	3.0	-	2.9	-	8190.9	lb/yr
Loader(s)	2		0.38	2.93	0.17	0.16	307.16	lb/day	3.8	29.3	1.7	-	1.6	-	3071.6	lb/yr
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	1.7	2.2	0.3	-	0.3	-	2944.1	lb/yr
Fugitive Sources																
Travel on unpaved roads	20.0	VMT/yr	-	-	0.90	0.09	-	lb/VMT	-	-	-	18.0	-	1.7	-	lb/yr
Travel on paved roads	-	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	-	-	-	-	lb/yr
								Total Emissions (lb/year) =	15.0	121.1	5.5	18.0	5.1	1.7	15841.3	lb/yr
								Total Emissions (lb/day) =	3.0	24.2	1.1	3.6	1.0	0.3	3168.3	lb/day
[3] Detention Basin Excavation (follows no. 2) - Work conducted in 10-hr shifts, 6 days per week																
Mobile Sources																
Scraper(s)	15		0.53	4.80	0.19	0.17	511.93	lb/day	238.73	2161.46	85.22	-	78.40	-	230368.39	lb/yr
Water Truck(s)	2		0.13	1.59	0.06	0.06	204.34	lb/day	7.50	95.25	3.75	-	3.45	-	12260.25	lb/yr
Motor Grader(s)	5		0.55	4.18	0.24	0.22	433.72	lb/day	91.83	627.56	36.21	-	33.31	-	65057.72	lb/yr
Employee Trips	40	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	27.60	34.80	4.80	-	4.63	-	47106.00	lb/yr
Fugitive Sources																
Travel on unpaved roads	1518	VMT/yr	-	-	0.90	0.09	-	lb/VMT	-	-	-	1362.6	-	127.6	-	lb/yr
Travel on paved roads	1518	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	429.6	-	63.0	-	lb/yr
Material Handling																
Scraper Unloading			-	-	0.03	0.00	-	lb/ton	-	-	398.4		55.8			lb/yr
								Total Emissions (lb/year) =	355.7	2919.1	528.4	1791.2	175.6	190.6	354792.4	lb/yr
								Total Emissions (lb/day) =	11.9	97.3	17.6	59.7	5.9	6.4	11826.4	lb/day
[4] Demobilization/cleanup (follows no. 3)																
Mobile Sources																
Haul Truck(s)	2	trucks	1.19	15.82	0.62	0.57	1847.96	g/mile[1]	0.3	3.3	0.1	-	0.1	-	391.1	lb/yr
Haul Truck(s)	24	trips	10.18	0.00	0.01	0.01	199.87	g/trip[2]	0.54	0.00	0.00	-	0.00	-	10.58	lb/yr
Water Truck(s)	2		0.10	1.27	0.05	0.05	183.47	lb/day	2.4	30.5	1.2	-	1.1	-	3923.3	lb/yr
Off-Highway Truck(s)	2		0.26	2.13	0.08	0.07	324.22	lb/day	6.20	51.10	1.81	-	1.65	-	7781.33	lb/yr
Employee Trips	25	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	6.9	9.7	1.2	-	1.2	-	11776.5	lb/yr
Fugitive Sources																
Travel on unpaved roads	48	VMT/yr	-	-	0.90	0.09	-	lb/VMT	-	-	-	43.1	-	4.0	-	lb/yr
Travel on paved roads	48	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	13.6	-	2.0		lb/yr
								Total Emissions (lb/year) =	16.3	93.6	4.3	56.6	4.0	6.0	23882.8	lb/yr
								Total Emissions (lb/day) =	1.4	7.8	0.4	4.7	0.3	0.5	1990.2	lb/day

Input Data

[1] Culvert Removal

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
--	-	-	4.00	120.00	8
		Activity Period (days) =		15.0	

*Assumes haul load is approximately 4 miles roundtrip
*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes
Notes:
1. Emission factor represents running exhaust (grams/mile)
2. Emission factor represents start emission rate @ 480 minutes (grams/trip)

[2] Detention Basin Area Stripping

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
-	-	-	1.00	20.00	4
		Activity Period (days) =		5.0	

*Assumes scrapers travel 100% on unpaved road

[3] Detention Basin Excavation (follows no. 2) - Work conducted in 10-hr shifts, 6 days per week

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
Excavation	4,750.00	339.29	4.00	1357.14	45.24
Backfill	5,875.00	419.64	4.00	1678.57	55.95
Material	**Tons/CY**	**Tons/day**			
	1.25	442.7			
		Activity Period (days) =		30.0	
		Haul Truck capacity (CY) =		14.0	

*Assumes haul load is approximately 4 miles roundtrip
*Assumes that material hauling is along 50% paved and 50% unpaved haul routes

[4] Demobilization/cleanup (follows no. 3)

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
-	-	-	4.00	96.00	8.00
		Activity Period (days) =		12.0	

*Assumes haul load is approximately 4 miles roundtrip
*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes
Notes:
1. Emission factor represents running exhaust (grams/mile)
2. Emission factor represents start emission rate @ 480 minutes (grams/trip)

Summay - PGCC Culvert Remediation	ROG	NOx	PM10 combust	PM10 fugit/entrainment	PM2.5 combust	PM2.5 fugit/entrainment	CO2
2014 Total PGCC Culverts Emissions (tons/year) =	0.2	1.7	0.3	1.0	0.1	0.1	218.9
2014 Total PGCC Culverts Emissions, Worst Case (lb/day) =	11.9	97.3	17.6	59.7	5.9	6.4	11826.4

Table 6: Pleasant Grove Creek Canal (PGCC) Culvert Remediation - Phase 4b Improvements

Project Information

*These calculations represent worst-case emissions from construction activities associated with PGCC Culvert Remediation work

Year	Group	Phase	Emissions (lb/day)						
					PM10		PM2.5		
			ROG	NOx	COMB	EM	COMB	EM	CO2
2014	I	1	3.3	20.7	1.4	4.7	1.3	0.5	2881.9
		2	3.0	24.2	1.1	3.6	1.0	0.3	3168.3
		Total	*6.3*	*44.9*	*2.5*	*8.3*	*2.3*	*0.8*	*6050.2*
	II	3	11.9	97.3	17.6	59.7	5.9	6.4	11826.4
		Total	11.9	97.3	17.6	59.7	5.9	6.4	11826.4
	III	4	1.4	7.8	0.4	4.7	0.3	0.5	1990.2
		Total	1.4	7.8	0.4	4.7	0.3	0.5	1990.2
	Worst-case lb/day		11.9	97.3	17.6	59.7	5.9	6.4	11826.4

Table 7: Sacramento River East Levee Reaches (SREL) 16-20 - Phase 4b Improvements

Phase 4b Sacramento River East Levee (SREL) Reaches 16-20 includes levee widening, rehabilitation, and seepage remediation
SREL Reaches 16-20 Work Schedule: May - Nov. 2013 (50%)
SREL Reaches 16-20 Work Schedule: May - Nov. 2014 (50%)

Total SREL Reaches 16-20 length in Phase 4b =	3.4	mi
	17688.0	ft
SREL Reaches 16-20 length in Sacramento County =	17688.0	ft
100.0%	of the total length	

Conversion	
0.002204623	lb/gram
2000	lb/ton

	Qty	Unit	Emission Factor ROG	NOX	PM10	PM2.5	CO2	Unit	Emissions (lb/yr) ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	CO2	Unit
[1] Site Preparation (concurrent with 2)																
Mobile Sources																
Haul Truck(s)	10	trucks	1.19	15.82	0.62	0.57	1,847.96	g/mile[1]	2.84	37.67	1.48	-	1.36	-	4,399.98	lb/yr
Haul Truck(s)	270	trips	10.74	-	0.02	0.01	209.04	g/trip[2]	6.39	-	0.01	-	0.01	-	124.43	lb/yr
Water Truck(s)	2		0.10	1.27	0.05	0.05	163.47	lb/day	5.40	68.58	2.70	-	2.48	-	8,827.38	lb/yr
Scraper(s)	6		0.42	3.84	0.15	0.14	409.54	lb/day	68.75	622.50	24.54	-	22.58	-	66,346.10	lb/yr
Loader(s)	2		0.38	2.93	0.17	0.16	307.16	lb/day	20.53	158.40	9.13	-	8.40	-	16,585.51	lb/yr
Grader(s)	2		0.44	3.35	0.19	0.18	346.97	lb/day	23.57	180.74	10.43	-	9.59	-	18,736.62	lb/yr
Chipper(s)	4		0.56	4.34	0.25	0.23	443.67	lb/day	59.95	468.91	27.16	-	24.99	-	47,918.60	lb/yr
Crawler Tractor(s)	2		0.18	1.19	0.05	0.04	312.85	lb/day	9.94	64.45	2.49	-	2.30	-	16,893.67	lb/yr
Employee Trips	30	employees	0.02	0.03	0.00	0.00	39.26	lb/day/emp	18.63	23.49	3.24	-	3.12	-	31,796.55	lb/yr
Fugitive Sources																
Travel on unpaved roads	540	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	484.76	-	45.40	-	lb/yr
Travel on paved roads	540	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	152.48	-	22.40	-	lb/yr
								Total Emissions (lb/year) =	**216.00**	**1,624.75**	**81.18**	**637.25**	**74.83**	**67.81**	**211,627.84**	**lb/yr**
								Total Emissions (lb/day) =	**8.00**	**60.18**	**3.01**	**23.60**	**2.77**	**2.51**	**7,838.07**	**lb/day**
[2] Removal of Landside Structures and Other Facilities (concurrent with 1)																
Mobile Sources																
Haul Truck(s)	24	trucks	1.19	15.82	0.62	0.57	1,847.96	g/mile[1]	6.06	80.37	3.15	-	2.90	-	9,386.62	lb/yr
Haul Truck(s)	576	trips	10.74	-	0.02	0.01	209.04	g/trip[2]	13.63	-	0.02	-	0.02	-	265.45	lb/yr
Excavator(s)	2		0.37	2.78	0.16	0.15	324.22	lb/day	17.92	133.58	7.91	-	7.28	-	15,562.65	lb/yr
Loader(s)	1		0.38	2.93	0.17	0.16	307.16	lb/day	9.12	70.40	4.06	-	3.73	-	7,371.78	lb/yr
Employee Trips	30	employees	0.02	0.03	0.00	0.00	39.26	lb/day/emp	18.56	20.88	2.88	-	2.78	-	28,263.60	lb/yr
Fugitive Sources																
Travel on unpaved roads	1152	VMT/year	-	-	0.90	0.08	-	lb/VMT	-	-	-	1,034.17	-	96.96	-	lb/yr
Travel on paved roads	1152	VMT/year	-	-	0.28	0.04	-	lb/VMT	-	-	-	325.90	-	47.79	-	lb/yr
								Total Emissions (lb/year) =	**63.3**	**305.2**	**18.0**	**1359.5**	**16.7**	**144.7**	**60850.1**	**lb/yr**
								Total Emissions (lb/day) =	**2.6**	**12.7**	**0.8**	**56.6**	**0.7**	**6.0**	**2535.4**	**lb/day**
[3] Construction of Adjacent Levee Raise & Seepage Berms - Reaches 16-20																
Mobile Sources																
Haul Truck(s)	50	trucks	1.19	15.82	0.62	0.57	1,847.96	g/mile[1]	987.32	12,928.03	502.71	-	462.50	-	1,498,379.27	lb/yr
Haul Truck(s)	75600	trips	10.74	-	0.02	0.01	209.04	g/trip[2]	1,789.36	-	2.50	-	2.44	-	34,840.59	lb/yr
Water Truck(s)	2		0.10	1.27	0.05	0.05	163.47	lb/day	28.00	355.60	14.00	-	12.88	-	45,771.60	lb/yr
Scraper(s)	5		0.42	3.84	0.15	0.14	409.54	lb/day	297.08	2,689.62	108.05	-	97.57	-	286,680.66	lb/yr
Loader(s)	5		0.38	2.93	0.17	0.16	307.16	lb/day	266.14	2,053.36	118.30	-	108.84	-	215,010.32	lb/yr
Bulldozer(s)	5		0.42	3.65	0.15	0.14	335.60	lb/day	295.17	2,554.44	107.10	-	98.53	-	234,918.74	lb/yr
Compactor(s)	2		0.28	1.78	0.07	0.07	244.59	lb/day	79.72	499.24	19.94	-	18.34	-	68,484.61	lb/yr
Grader(s)	2		0.44	3.35	0.19	0.18	346.97	lb/day	122.19	937.16	54.07	-	49.74	-	97,152.66	lb/yr
Excavator(s)	5		0.37	2.78	0.16	0.15	324.22	lb/day	261.31	1,948.10	115.36	-	106.13	-	226,955.33	lb/yr
Employee Trips	60	employees	0.02	0.03	0.00	0.00	39.26	lb/day/emp	193.20	243.60	33.60	-	32.39	-	329,742.00	lb/yr
Fugitive Sources																
Travel on unpaved roads	183893	VMT/yr	-	-	0.90	0.09	-	lb/VMT	-	-	-	165,082.86	-	15,452.20	-	lb/yr
Travel on paved roads	183893	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	51,926.85	-	7,626.79	-	lb/yr
Material Handling																
Scraper Unloading			-	-	0.03	0.00	-	lb/ton	-	-	-	44,396.25	-	6,215.48	-	lb/yr
Truck Unloading			-	-	0.01	0.00	-	lb/ton	-	-	-	7,769.34	-	196.62	-	lb/yr
Bulldozing	8	hrs/day	-	-	0.75	0.11	-	lb/hr	-	-	-	843.09	-	118.03	-	lb/yr
								Total Emissions (lb/year) =	**4,300.5**	**24,110.3**	**1,073.6**	**270,018.5**	**989.4**	**29,621.3**	**3,037,936.2**	**lb/yr**
								Total Emissions (lb/day) =	**30.7**	**172.2**	**7.7**	**1,928.7**	**7.1**	**211.6**	**21,699.5**	**lb/day**
[4] Cutoff Wall Construction (24 hours per day day, 7 days per week)																
Mobile Sources																
Haul Truck(s)	8	trucks	1.19	15.82	0.62	0.57	1,847.96	g/mile[1]	5.05	66.97	2.62	-	2.41	-	7,822.19	lb/yr
Haul Truck(s)	480	trips	10.74	-	0.02	0.01	209.04	g/trip[2]	11.36	-	0.02	-	0.02	-	221.21	lb/yr
Loader(s)	10		1.14	8.80	0.51	0.47	921.47	lb/day	684.38	5,280.12	304.20	-	279.86	-	552,883.68	lb/yr
Bulldozer(s)	20		1.27	10.95	0.46	0.42	1,006.79	lb/day	1,523.16	13,137.12	550.80	-	506.74	-	1,208,153.52	lb/yr
Pallet Loader(s) (Forklifts	10		1.71	10.55	0.96	0.89	1,023.86	lb/day	1,023.84	6,327.72	577.26	-	531.08	-	614,315.16	lb/yr
Generator(s)	10		0.73	9.76	0.28	0.26	1,262.76	lb/day	439.58	5,853.60	167.76	-	154.34	-	757,655.28	lb/yr
Pump(s)	10		1.97	13.08	1.06	0.97	1,262.76	lb/day	1,179.36	7,847.82	634.32	-	583.57	-	757,655.46	lb/yr
Pickup(s)[3]	8		0.03	0.04	0.01	0.01	58.88	lb/day	16.56	20.88	2.88	-	2.78	-	28,263.60	lb/yr

Input Data

[1] Site Preparation

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
-	-	-	4.0	1080	40
			Activity Period (days) =	27	

*Assumes haul load is approximately 4 miles roundtrip
*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes
Notes:
1. Emission factor represents running exhaust (grams/mile)
2. Emission factor represents start emission rate @ 480 minutes (grams/trip)

[2] Removal of Landside Structures and Other Facilities

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
--	--	--	4.0	2304	96
			Activity Period (days) =	24	

*Assumes haul load is approximately 4 miles roundtrip
*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes
Notes:
1. Emission factor represents running exhaust (grams/mile)
2. Emission factor represents start emission rate @ 480 minutes (grams/trip)

[3] Construction of Adjacent Levee Raise & Seepage Berms

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
Levee Fill	505000	36071	4.0	144286	1031
Seepage Berm Fill	663000	47357	4.0	189429	1353
**Aggregate	15900	1136	30.0	34071	243
Material	**Tons/CY**	**R16-20 Tons/day**		**367786**	
Aggregate	1.25	10670.5			

Reaches 16-19A*	
Activity Period (days)* =	140.0
Haul Truck capacity (CY) =	14.0
Truck Trips (trips/day)* =	540

Assumes quantity of material is based on given # of trips per day times haul capacity times activity period (540 trips/day 14 cy*140 days), total fill material for Reaches 16-20 = 1,168,000 cy
*Assumes haul load is approximately 4 miles roundtrip
*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes
*Date provided by HDR One Company, Inc
**Commercial Source; approximately 60 miles round trip
**Assumes 50% of aggregate material hauled in 16-19A and 50% hauled in 19B-20
Notes:
1. Emission factor represents running exhaust (grams/mile)

[4] Cutoff Wall Construction

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
-	-	-	4.0	1920	32
			Activity Period (days) =	60.0	
			Haul Truck capacity (CY) =	14.0	

*Assumes haul load is approximately 4 miles roundtrip
*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes
Notes:
1. Emission factor represents running exhaust (grams/mile)
2. Emission factor represents start emission rate @ 480 minutes (grams/trip)

Table 7: Sacramento River East Levee Reaches (SREL) 16-20 - Phase 4b Improvements

Phase 4b Sacramento River East Levee (SREL) Reaches 16-20 includes levee widening, rehabilitation, and seepage remediation

Excavator(s)	6		0.57	8.35	0.48	0.45	972.67	lb/day	134.39	3,005.64	177.98	-	163.75	-	350,159.65	lb/yr
Deep Soil Mix Rigs	10		0.19	5.40	0.18	0.15	1,270.62	lb/day	111.18	3,240.36	107.46	-	99.86	-	767,594.22	lb/yr
Employee Trips	120	employees	0.02	0.03	0.00	0.00	39.26	lb/day/emp	165.60	206.80	26.80	-	27.76	-	282,636.00	lb/yr
Fugitive Sources																
Travel on unpaved roads	960	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	991.50	-	89.72	-	lb/yr
Travel on paved roads	960	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	271.08	-	39.83	-	lb/yr
Material Handling																
Bulldozing	24	hrs/day	-	-	0.75	0.11	-	lb/day	-	-	-	1,083.95	-	151.76	-	lb/yr
								Total Emissions (lb/year) =	**5,294.4**	**44,989.0**	**2,554.1**	**2,216.9**	**2,351.2**	**272.3**	**5,327,660.0**	**lb/yr**
								Total Emissions (lb/day) =	**88.2**	**749.8**	**42.6**	**36.9**	**39.2**	**4.5**	**88,794.3**	**lb/day**

3. Pickup truck use is assumed to be half of the work day (~12 hours of use); emission factor times 1.5 to represent 12 hours of operation/day

[5] Reconstruct Garden Hwy at one intersection (concurrent with 5 and 6)

Mobile Sources																
Haul Truck(s)	3	trucks	1.19	15.62	0.62	0.57	1847.96	g/mile[1]	0.9	11.3	0.4	-	0.4	-	1320.0	lb/yr
Haul Truck(s)	81	trips	10.74	0.00	0.02	0.01	209.04	g/trip[2]	1.9	0.0	0.0	-	0.0	-	37.3	lb/yr
Backhoe(s)	1		0.18	1.19	0.05	0.04	312.95	lb/day	5.0	32.2	1.2	-	1.1	-	8448.8	lb/yr
Smooth Drum Compactor(s)	1		0.28	1.78	0.07	0.07	244.59	lb/day	7.7	48.1	1.9	-	1.8	-	6603.8	lb/yr
Off-Highway Truck(s)	1		0.27	2.32	0.08	0.08	324.22	g/mile	0.2	1.7	0.1	-	0.1	-	231.6	lb/yr
Truck Mounter Auger(s)	1		0.27	2.32	0.08	0.08	324.22	lb/day	7.3	62.6	2.3	-	2.1	-	8754.3	lb/yr
Paver(s)	1		0.75	4.48	0.40	0.36	352.68	lb/day	20.2	121.0	10.7	-	9.8	-	9521.9	lb/yr
Employee Trips	80	employees	0.02	0.03	0.00	0.00	39.26	lb/day/emp	37.3	47.0	6.5	-	6.2	-	83593.1	lb/yr
Fugitive Sources																
Travel on unpaved road	162	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	145.4	-	13.6	-	lb/yr
Travel on paved road	162	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	45.7	-	6.7	-	lb/yr
								Total Emissions (lb/year) =	**80.4**	**323.9**	**23.1**	**191.2**	**21.6**	**20.3**	**98,508.6**	**lb/yr**
								Total Emissions (lb/day) =	**3.0**	**12.0**	**0.9**	**7.1**	**0.8**	**0.8**	**3,648.5**	**lb/day**

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
-	-	-	4.0	324	12
		Activity Period (days) =		27	

*Assumes haul load is approximately 4 miles round trip
*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes
Notes:
1. Emission factor represents running exhaust (grams/mile)
2. Emission factor represents start emission rate @ 480 minutes (grams/trip)

[6] Site Restoration/Demobilization

Mobile Sources																
Haul Truck(s)	2	trucks	1.19	15.62	0.62	0.57	1,847.96	g/mile	0.72	9.49	0.37	-	0.34	-	1,108.14	lb/yr
Haul Truck(s)	68	trips	10.74	-	0.02	0.01	209.04	g/trip	1.61	-	0.00	-	0.00	-	31.24	lb/yr
Off-Highway Truck(s)	3		0.27	2.32	0.08	0.08	324.22	lb/day	27.48	236.57	8.57	-	7.88	-	33,070.63	lb/yr
Water Truck(s)	3		0.10	1.27	0.05	0.05	163.47	lb/day	10.20	129.54	5.10	-	4.69	-	16,673.94	lb/yr
Employee Trips	60	employees	0.02	0.03	0.00	0.00	39.26	lb/day/emp	46.92	59.18	8.18	-	7.67	-	80,060.20	lb/yr
Fugitive Sources																
Travel on unpaved road	138	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	122.09	-	11.44	-	lb/yr
Travel on paved road	136	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	38.40	-	5.64	-	lb/yr
								Total Emissions (lb/year) =	**86.9**	**434.8**	**22.2**	**160.5**	**20.8**	**17.1**	**130,964.3**	**lb/yr**
								Total Emissions (lb/day) =	**2.6**	**12.8**	**0.7**	**4.7**	**0.6**	**0.5**	**3,851.9**	**lb/day**

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
-	-	-	4.0	272	8
		Activity Period (days) =		34	

*Assumes haul load is approximately 4 miles round trip
*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes
Notes:
1. Emission factor represents running exhaust (grams/mile)
2. Emission factor represents start emission rate @ 480 minutes (grams/trip)

Summary - SREL Reaches 16-20	ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	CO2
Total from SREL Reaches 16-20 (tons/year) =	**5.02**	**35.89**	**1.89**	**137.20**	**1.74**	**15.07**	**4433.77**
Total from SREL Reaches 16-20 Worst-Case Day (lb/day) =	**88.2**	**749.8**	**42.6**	**1928.7**	**39.2**	**211.6**	**88794.3**
2013 Total from SREL Reaches 16-20 (tons/year) =	**50.0%**	**2.5**	**17.9**	**0.9**	**68.6**	**0.9**	**7.5**	**2216.9**
2013 Total from SREL Reaches 16-20 Worst-Case Day (lb/day) =	**50.0%**	**44.1**	**374.9**	**21.3**	**964.4**	**19.6**	**105.8**	**44397.2**
2014 Total from SREL Reaches 16-20 (tons/year) =	**50.0%**	**2.5**	**17.9**	**0.9**	**68.6**	**0.9**	**7.5**	**2216.9**
2014 Total from SREL Reaches 16-20 Worst-Case Day (lb/day) =	**50.0%**	**44.1**	**374.9**	**21.3**	**964.4**	**19.6**	**105.8**	**44397.2**

*These calculations represent worst-case emissions from construction activities associated with Sacramento East River Levee work

Year	Group	Phase	Emissions (lb/day) ROG	NOx	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	CO2
2013-14 - SREL Reaches 16-20	I	1	8.0	60.2	3.0	23.6	2.8	2.5	7838.1
		2	2.6	12.7	0.8	56.6	0.7	6.0	2535.4
		Total	*10.6*	*72.9*	*3.8*	*80.2*	*3.5*	*8.5*	*10373.5*
	II	3a	30.7	172.2	7.7	1928.7	7.1	211.6	21699.5
		Total	*30.7*	*172.2*	*7.7*	*1928.7*	*7.1*	*211.6*	*21699.5*
	III	4	88.2	749.8	42.6	36.9	39.2	4.5	88794.3
		Total	*88.2*	*749.8*	*42.6*	*36.9*	*39.2*	*4.5*	*88794.3*
	IV	5	3.0	12.0	0.9	7.1	0.8	0.8	3648.5
		6	2.6	12.8	0.7	4.7	0.6	0.5	3851.9
		Total	*5.5*	*24.8*	*1.5*	*11.8*	*1.4*	*1.3*	*7500.4*
	Worst-case lb/day =		*88.2*	*749.8*	*42.6*	*1928.7*	*39.2*	*211.6*	*88794.3*

Table 8: Natomas East Main Drainage Canal West Levee Reaches F-G (NEMDC North) - Phase 4b Improvements

Project Information

Phase 4b NEMDC West Levee (NEMDC North) includes levee raising, slope flattening, and seepage remediation

Work Schedule : May - Nov., 2016

Total NEMDC North length in Phase 4b =	6.8	mi		
	35689.9	ft		
NEMDC North length in Sacramento County =	18453.0	ft	51.7%	of the total length
NEMDC North length in Sutter County =	17450.0	ft	48.9%	of the total length

Conversion	
0.002204623	lb/gram
2000	lb/ton

	Qty	Unit	Emission Factor ROG	NOX	PM10	PM2.5	CO2	Unit	Emissions (lb/yr) ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	CO2	Unit
[1] Site Preparation																
Mobile Sources																
Pick-up Truck(s)	5		0.03	0.03	0.00	0.00	39.36	lb/day	1.15	1.45	0.20	-	0.19	-	1,962.75	lb/yr
Water Truck(s)	2		0.10	1.27	0.05	0.05	163.47	lb/day	2.00	25.40	1.00	-	0.92	-	3,269.40	lb/yr
Scraper(s)	8		0.42	3.84	0.15	0.14	409.54	lb/day	33.95	307.41	12.12	-	11.15	-	32,763.50	lb/yr
Loader(s)	4		0.38	2.93	0.17	0.16	307.16	lb/day	15.21	117.34	6.76	-	6.22	-	12,286.30	lb/yr
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	3.45	4.35	0.60	-	0.53	-	5,888.25	lb/yr
Fugitive Sources																
Travel on unpaved roads	100	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	89.77	-	8.41	-	lb/yr
Travel on paved roads	100	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	28.34	-	4.15	-	lb/yr
								Total Emissions (lb/year) =	**55.8**	**455.9**	**20.7**	**118.0**	**19.1**	**12.6**	**56170.2**	**lb/yr**
								Total Emissions (lb/day) =	**5.58**	**45.59**	**2.07**	**11.80**	**1.91**	**1.26**	**5617.02**	**lb/day**
[2] Borrow Site Preparation (Concurrent with 1)																
Mobile Sources																
Water Truck	1		0.10	1.27	0.05	0.05	163.47	lb/day	2.00	25.40	1.00	-	0.92	-	3,269.40	lb/yr
Scraper(s)	2		0.42	3.84	0.15	0.14	409.54	lb/day	16.98	153.70	6.06	-	5.58	-	16,381.75	lb/yr
Tractor	2		0.18	1.19	0.05	0.04	312.85	lb/day	7.36	47.74	1.85	-	1.70	-	12,513.83	lb/yr
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	6.90	8.70	1.20	-	1.16	-	11,776.50	lb/yr
Fugitive Sources																
Travel on unpaved roads	43.0	VMT/yr	-	-	0.9	0.1	-	lb/VMT	-	-	-	38.6	-	3.6	-	lb/yr
Travel on paved roads	43.0	VMT/yr	-	-	0.3	0.0	-	lb/VMT	-	-	-	12.1	-	1.8	-	lb/yr
								Total Emissions (lb/year) =	**33.2**	**235.5**	**10.1**	**50.7**	**9.4**	**5.4**	**43941.5**	**lb/yr**
								Total Emissions (lb/day) =	**1.7**	**11.8**	**0.5**	**2.5**	**0.5**	**0.3**	**2197.1**	**lb/day**
[3] Working Surface Construction (Follows 2)																
Mobile Sources																
Water Truck(s)	3		0.10	1.27	0.05	0.05	163.47	lb/day	6.00	76.20	3.00	-	2.76	-	9,808.20	lb/yr
Roller(s)	5		0.57	3.58	0.31	0.29	318.53	lb/day	57.07	357.89	31.09	-	28.60	-	31,853.40	lb/yr
Scraper(s)	15		0.42	3.84	0.15	0.14	409.54	lb/day	127.32	1,152.78	45.45	-	41.81	-	122,863.14	lb/yr
Excavator(s)	3		0.37	2.78	0.16	0.15	324.22	lb/day	22.40	166.98	9.89	-	9.10	-	19,453.31	lb/yr
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	6.90	8.70	1.20	-	1.16	-	11,776.50	lb/yr
Fugitive Sources																
Travel on unpaved roads	43	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	38.60	-	3.62	-	lb/yr
Travel on paved roads	43	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	12.14	-	1.78	-	lb/yr
								Total Emissions (lb/year) =	**219.69**	**1,762.35**	**90.63**	**50.74**	**83.43**	**5.40**	**195,754.55**	**lb/yr**
								Total Emissions (lb/day) =	**10.98**	**88.12**	**4.53**	**2.54**	**4.17**	**0.27**	**9,787.73**	**lb/day**
[4] Cutoff Wall Construction (Follows 3) (24 hours per day, 7 days per week)																
Mobile Sources																
Haul Truck(s)	3	trucks	1.19	15.92	0.62	0.57	1,847.96	g/mile[1]	725.16	9,617.34	376.66	-	348.72	-	1,123,275.20	lb/yr
Haul Truck(s)	68,929	trips	10.74	7.79	0.02	0.01	269.04	g/trip[2]	1,631.46	1,183.46	2.28	-	2.22	-	31,766.03	lb/yr
Loader(s)	3		1.14	8.80	0.51	0.47	921.47	lb/day	290.85	2,244.05	129.29	-	118.94	-	234,975.56	lb/yr
Pallet Loader(s) [Forklifts]	1		1.71	10.55	0.96	0.89	1,023.86	lb/day	145.04	896.43	81.78	-	75.34	-	87,027.98	lb/yr
Generator(s)	2		0.73	9.76	0.28	0.26	1,262.76	lb/day	124.54	1,659.52	47.53	-	43.73	-	214,669.06	lb/yr
Pump(s)	2		1.97	13.08	1.06	0.97	1,262.76	lb/day	334.15	2,223.55	179.72	-	165.35	-	214,669.06	lb/yr
Pickup(s)[3]	5		0.03	0.04	0.01	0.01	58.88	lb/day	14.66	18.49	2.55	-	2.46	-	25,025.06	lb/yr
Excavator(s)	6		1.12	8.35	0.49	0.45	972.67	lb/day	571.15	4,257.99	252.14	-	231.97	-	496,059.51	lb/yr
Water Truck(s)[3]	2		0.15	1.91	0.08	0.07	245.21	lb/day	25.50	323.85	12.75	-	11.73	-	41,684.85	lb/yr
Employee Trips	15	employees	0.02	0.02	0.02	0.03	0.60	lb/day/empl	29.33	29.33	29.33	-	36.98	-	5.10	lb/yr
Fugitive Sources																
Travel on unpaved roads	27,571	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	24,751.2	-	2,318.3	-	lb/yr
Travel on paved roads	246,143	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	70,069.5	-	10,294.2	-	lb/yr
								Total Emissions (lb/year) =	**3,891.85**	**22,453.02**	**1,114.23**	**94,820.71**	**1,035.33**	**12,612.47**	**2,469,157.34**	**lb/yr**
								Total Emissions (lb/day) =	**45.79**	**264.15**	**13.11**	**1,115.54**	**12.18**	**148.38**	**29,048.91**	**lb/day**
[5] Levee Raising/Widening (lags no. 4 by 21 days)																
Mobile Sources																
Haul Truck(s)	15	trucks	1.19	15.82	0.62	0.57	1,847.96	g/mile[1]	741.39	9,832.61	335.30	-	354.48	-	1,148,417.94	lb/yr
Haul Truck(s)	70,471	trips	10.74	-	0.02	0.01	209.04	g/trip[2]	1,667.98	-	2.33	-	2.27	-	32,477.07	lb/yr
Water Truck(s)	3		0.10	1.27	0.05	0.05	163.47	lb/day	27.00	342.90	13.50	-	12.42	-	44,136.90	lb/yr
Scraper(s)	20		0.42	3.84	0.15	0.14	409.54	lb/day	763.92	6,916.66	272.70	-	250.86	-	737,178.84	lb/yr
Roller(s)	5		0.57	3.58	0.31	0.29	318.53	lb/day	256.82	1,609.61	139.91	-	128.71	-	143,340.30	lb/yr
Grader(s)	2		0.44	3.35	0.19	0.18	346.97	lb/day	78.55	602.46	34.76	-	31.98	-	62,455.41	lb/yr
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	31.05	39.15	5.40	-	5.21	-	52,984.25	lb/yr
Fugitive Sources																
Travel on unpaved roads	14,094	VMT/yr			0.90	0.08		lb/VMT	-	-	-	12,652.62	-	1,185.09	-	lb/yr
Travel on paved roads	267,791	VMT/yr			0.28	0.04		lb/VMT	-	-	-	75,617.76	-	11,109.31	-	lb/yr
Material Handling																
Truck Unloading			-	-	0.01	0.00		lb/ton	-	-	-	6474.56	164.02	-	-	lb/yr

Input Data

[1] Site Preparation

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
-	-	-	4	200	20
			Activity Period (days) =	10.0	

[a] Assumes haul load is approximately 4 miles roundtrip

[b] Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes

[2] Borrow Site Preparation

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
-	-	-	4	80	4
			Activity Period (days) =	20.0	

[a] Assumes haul load is approximately 4 miles roundtrip

[b] Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes

[3] Working Surface Construction

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
-	-	-	4	85	4
			Activity Period (days) =	20.0	

[a] Assumes haul load is approximately 4 miles roundtrip

[b] Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes

Adjacent Levee Option ([4] Cutoff Wall Construction)

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
Borrow Site Excavation	965000	68923	4.00	275,714	3244
Material	**Tons/CY**	**Tons/day**			
--	**1.25**	**14191.2**			
			Activity Period (days) =	85.0	
			Haul Truck capacity (CY) =	14.0	

[a] Adjacent levee option represents the worst-case emissions scenario, proposed alternate options would result in lessor emissions

[b] Assumes haul load=14 yd^3

[c] Assumes haul load is approximately 4 miles roundtrip

[d] Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes

1. Emission factor represents running exhaust (grams/mile)

2. Emission factor represents start emission rate @ 480 minutes (grams/trip)

3. Pickup truck/water truck use is assumed to be half of the work day (~12 hours of use); emission factor times 1.5 to represent 12 hours of operation/day

Adjacent Levee Option ([5] Levee Raising/Widening)

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
Levee Embankment Degrade	0	0	4	0	0
Levee Embankment Fill	965000	68929	4	275714	3063
Class 2 Aggregate Surfacing	21600	1543	4	6171	69
Total	**986600**	**70471**	**12**	**281886**	**3132**
Material	**Tons/CY**	**Tons/day**			
--	**1.25**	**13702.8**			
			Activity Period (days) =	90.0	
			Haul Truck capacity (CY) =	14.0	

[a] Adjacent levee option represents the worst-case emissions scenario, proposed alternate options would result in lessor emissions

[b] Assumes haul load=14 yd^3

[c] Assumes haul load is approximately 4 miles roundtrip

Table 8: Natomas East Main Drainage Canal West Levee Reaches F-G (NEMDC North) - Phase 4b Improvements

Project Information

Scraper Unloading					0.00	0.00	lb/ton	-	-	-	-	36997.50	5179.65	-	lb/yr
							Total Emissions (lb/year) =	3,566.71	19,343.40	853.89	131,742.44	6,129.62	12,284.40	2,221,000.70	lb/yr
							Total Emissions (lb/day) =	39.63	214.93	9.49	1,463.80	68.11	136.60	24,677.79	lb/day

*Assumes that material hauling is along 90% paved and 10% unpaved haul routes based on location of borrow areas.
1. Emission factor represents running exhaust (grams/mile)
2. Emission factor represents start emission rate @ 480 minutes (grams/trip)

[6] Demobilization/cleanup (Follows No. 5)

Mobile Sources															
Haul Truck(1)	2	trucks	1.19	15.62	0.62	0.57	1,847.96	g/mile[1]	0.14	1.50	0.07	-	0.06	-	210.22	lb/yr
Haul Truck(2)	24	trips	10.16	-	0.01	0.01	139.87	g/trip[2]	0.54	0.60	-	-	0.60	-	10.56	lb/yr
Off-Highway Truck	2		0.26	2.19	0.09	0.07	324.22	lb/day	9.35	51.10	1.91	-	1.88	-	2,781.33	lb/yr
Pallet Loader	1		0.38	2.75	0.16	0.14	307.16	lb/day	4.20	33.91	1.66	-	1.71	-	3,685.89	lb/yr
Employee Trips	15	employees	0.02	0.03	0.00	0.00	89.35	lb/day/emp[3]	4.34	5.23	0.72	-	0.49	-	7,085.80	lb/yr
Fugitive Sources															
Travel on unpaved roads	26	VMT/yr	-	-	0.00	0.00	-	lb/VMT	-	-	-	23.16	-	3.17	-	lb/yr
Travel on paved roads	20	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	7.20	-	1.07	-	lb/yr
							Total Emissions (lb/year) =	15.32	91.13	4.46	30.45	4.14	3.24	19,753.92	lb/yr
							Total Emissions (lb/day) =	1.28	7.59	0.37	2.54	0.34	0.27	1,562.83	lb/day

Import Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
-	-	-	1.00	52	4.3
		Activity Period (days) =	12.0		

*Assumes haul load is approximately 1 miles round-trip
*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes
1. Emission factor represents running exhaust (grams/mile)
2. Emission factor represents start emission rate @ 480 minutes (grams/trip)

Summary - NEMDC North	ROG	NOX	PM10		PM2.5		CO2
			COMB	EM	COMB	EM	
2016 Total from NEMDC North (tons/year) =	3.9	22.2	1.0	113.4	3.6	12.5	2502.4
2016 Total from NEMDC North (lb/day) - Worst Case =	45.8	264.2	13.1	1463.8	68.1	148.4	29048.9
2016 Emissions in Sacramento County (tons/year) =	51.7%	2.01	11.46	0.54	58.64	1.88	6.45	1293.93
2016 Emissions in Sacramento County (lb/day)- Worst Case	51.7%	23.7	136.6	6.8	756.8	35.2	78.7	15019.3
2016 Emissions in Sutter County (tons/year) =	48.9%	1.90	10.84	0.51	55.45	1.78	6.10	1223.58
2016 Emissions in Sutter County (lb/day)- Worst Case	48.9%	22.4	129.2	6.4	715.7	33.3	72.5	14203.0

*These calculations represent worst case emissions from construction activities associated with NEMDC North work

Year	Group	Phase	Emissions (lb/day) ROG	NOx	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	CO2
2016	I	1	5.6	45.6	2.1	11.8	1.9	1.3	5617.0
		2	1.7	11.8	0.5	2.6	0.5	0.3	2197.1
		Total	*7.2*	*57.4*	*2.6*	*14.3*	*2.4*	*1.5*	*7814.1*
	II	3	11.0	88.1	4.5	2.5	4.2	0.3	9787.7
		Total	*11.0*	*88.1*	*4.5*	*2.5*	*4.2*	*0.3*	*9787.7*
	III	4	45.8	264.2	13.1	1115.5	12.2	148.4	29048.9
		Total	*45.8*	*264.2*	*13.1*	*1115.5*	*12.2*	*148.4*	*29048.9*
	IV	5	39.6	214.9	9.5	1463.8	68.1	136.6	24677.8
		Total	*39.6*	*214.9*	*9.5*	*1463.8*	*68.1*	*136.6*	*24677.8*
	V	6	1.3	7.6	0.4	2.5	0.3	0.3	1562.8
		Total	*1.3*	*7.6*	*0.4*	*2.5*	*0.3*	*0.3*	*1562.8*
		Worstcase lb/day =	45.8	264.2	13.1	1463.8	68.1	148.4	29048.9

Table 9: West Drainage Canal - Phase 4b Improvements

Project Information
Phase 4b West Drainage Canal (WDC) includes canal realignment
Work Schedule: May - Nov., 2013

Total WDC length in Phase 4b =	3.2	mi
	16896.0	ft
WDC length in Sacramento County =	16896.0	ft	100.0% of the total length

Conversion	
0.002204623	lb/gram
2000	lb/ton

	Qty	Unit	Emission Factor ROG	NOX	PM10	PM2.5	CO2	Unit	Emissions (lb/yr) ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	CO2	Unit
[1] Mobilization																
Mobile Sources																
Scraper	1		0.46	4.36	0.18	0.16	409.54	lb/day	3.72	34.89	1.41	-	1.30	-	3,276.35	lb/yr
Dozer	1		0.46	4.06	0.17	0.16	335.60	lb/day	1.83	16.23	0.69	-	0.64	-	1,342.39	lb/yr
Compactor	1		0.29	1.90	0.09	0.08	244.59	lb/day	0.57	3.80	0.17	-	0.16	-	489.18	lb/yr
Loader	1		0.43	3.33	0.19	0.18	307.16	lb/day	1.30	9.99	0.58	-	0.53	-	921.47	lb/yr
Backhoe	1		0.19	1.28	0.05	0.05	312.85	lb/day	0.19	1.28	0.05	-	0.05	-	312.85	lb/yr
Employee Trips	1	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	0.41	0.52	0.07	-	0.07	-	706.59	lb/yr
								Total Emissions (lb/year) =	**8.0**	**66.5**	**3.0**	**0.0**	**2.7**	**0.0**	**7048.8**	**lb/yr**
								Total Emissions (lb/day) =	**0.44**	**3.70**	**0.17**	**0.00**	**0.15**	**0.00**	**391.60**	**lb/day**
[2] Clear and Grub																
Mobile Sources																
Water Truck	1		0.10	1.27	0.05	0.05	163.47	lb/day	0.50	6.35	0.25	-	0.23	-	817.35	lb/yr
Scraper(s)	8		0.46	4.36	0.18	0.16	409.54	lb/day	18.58	174.44	7.05	-	6.49	-	16,381.75	lb/yr
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	1.73	2.18	0.30	-	0.29	-	2,944.13	lb/yr
Fugitive Sources																
Travel on unpaved roads	719.5	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	645.9	-	60.5	-	lb/yr
Travel on paved roads	719.5	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	203.2	-	29.9	-	lb/yr
Material Handling																
Scraper Unloading			-	-	0.03	0.00	-	lb/ton	-	-		1,349.1		188.8	-	lb/yr
								Total Emissions (lb/year) =	**20.8**	**183.0**	**7.6**	**2198.3**	**7.0**	**279.2**	**20143.2**	**lb/yr**
								Total Emissions (lb/day) =	**4.2**	**36.6**	**1.5**	**439.7**	**1.4**	**55.8**	**4028.6**	**lb/day**
[3] Canal Excavation																
Mobile Sources																
Water Truck(s)	2		0.10	1.27	0.05	0.05	163.47	lb/day	5.60	71.12	2.60	-	2.58	-	9,154.32	lb/yr
Scraper(s)	8		0.46	4.36	0.18	0.16	409.54	lb/day	104.05	976.89	39.47	-	36.32	-	91,737.61	lb/yr
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	9.68	12.18	1.69	-	1.62	-	16,487.10	lb/yr
Fugitive Sources																
Travel on unpaved roads	3556	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	3,198.63	-	299.13	-	lb/yr
Travel on paved roads	3556	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	1,004.56	-	147.58	-	lb/yr
Material Handling																
Scraper Unloading			-	-	0.03	0.00	-	lb/ton	-	-	-	6,670.4		933.8	-	lb/yr
								Total Emissions (lb/year) =	**119.31**	**1,060.19**	**43.95**	**10,868.54**	**40.51**	**1,380.56**	**117,379.23**	**lb/yr**
								Total Emissions (lb/day) =	**4.26**	**37.86**	**1.57**	**388.16**	**1.45**	**49.31**	**4,192.12**	**lb/day**
[4] Canal Embankment																
Mobile Sources																
Dump Truck(s)	10		0.30	2.78	0.10	0.10	324.22	lb/day	35.60	331.38	12.44	-	11.45	-	38,906.66	lb/yr
Dozer(s)	4		0.46	4.66	0.17	0.16	335.60	lb/day	16.40	146.11	6.23	-	5.73	-	12,081.52	lb/yr
Water Truck(s)	2		0.10	1.27	0.05	0.05	163.47	lb/day	1.30	16.34	0.60	-	0.55	-	1,961.64	lb/yr
Compactor(s)	2		0.29	1.80	0.09	0.08	244.59	lb/day	2.28	14.39	0.66	-	0.63	-	1,956.71	lb/yr
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	10.70	13.49	1.86	-	1.79	-	18,253.58	lb/yr
Fugitive Sources																
Travel on unpaved roads	5,360	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	4,811.4	-	450.7	-	lb/yr
Travel on paved roads	5,360	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	1,513.4	-	222.3	-	lb/yr
Material Handling																
Truck Unloading			-	-	0.01	0.00	-	lb/ton	-	-	-	143.73	-	3.64	-	lb/yr
Bulldozing	8	hrs/day	-	-	0.75	0.11	-	lb/hr	-	-	-	54.2	-	7.6	-	lb/yr
								Total Emissions (lb/year) =	**66.27**	**620.61**	**21.82**	**6,522.74**	**20.16**	**684.22**	**73,160.11**	**lb/yr**
								Total Emissions (lb/day) =	**2.14**	**16.79**	**0.70**	**210.41**	**0.65**	**22.07**	**2,360.00**	**lb/day**
[5] Canal Abondonment																
Mobile Sources																
Dump Truck(s)	10		0.27	2.52	0.08	0.08	324.22	lb/day	32.39	276.32	10.09	-	9.27	-	38,906.63	lb/yr
Dozer(s)	4		0.42	3.65	0.15	0.14	335.60	lb/day	15.23	131.37	5.61	-	5.07	-	12,081.54	lb/yr
Water Truck(s)	2		0.10	1.27	0.05	0.05	163.47	lb/day	1.30	15.24	0.60	-	0.55	-	1,961.64	lb/yr
Compactor(s)	2		0.29	1.78	0.07	0.07	244.59	lb/day	2.28	14.26	0.57	-	0.52	-	1,956.71	lb/yr
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	10.70	13.49	1.86	-	1.79	-	18,253.58	lb/yr
Fugitive Sources																
Travel on unpaved roads	16,968	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	15,232.5	-	1,426.7	-	lb/yr
Travel on paved roads	16,968	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	4,791.4	-	703.9	-	lb/yr
Material Handling																
Truck Unloading			-	-	0.01	0.00	-	lb/ton	-	-	-	488.18	-	12.37	-	lb/yr
Bulldozing	8	hrs/day	-	-	0.75	0.11	-	lb/hr	-	-	-	192.7	-	27.0	-	lb/yr
								Total Emissions (lb/year) =	**61.73**	**452.58**	**18.62**	**20,704.79**	**17.21**	**2,170.00**	**73,160.09**	**lb/yr**
								Total Emissions (lb/day) =	**0.59**	**4.31**	**0.18**	**197.19**	**0.16**	**20.67**	**696.76**	**lb/day**
[6] Topsoil Respread																
Mobile Sources																
Loader(s)	3		0.39	2.93	0.17	0.16	307.16	lb/day	14.83	134.40	6.59	-	6.06	-	11,979.15	lb/yr
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	4.49	5.66	0.78	-	0.75	-	7,654.73	lb/yr
Fugitive Sources																
Travel on unpaved roads	2765	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	2,482.88	-	232.55	-	lb/yr
Travel on paved roads	2765	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	780.99	-	114.74	-	lb/yr
Material Handling																
Truck Unloading			-	-	0.01	0.00		lb/ton	-	-	-	84.70	-	2.16	-	
								Total Emissions (lb/year) =	**19.31**	**120.06**	**7.37**	**3,348.57**	**6.82**	**349.44**	**19,633.87**	**lb/yr**
								Total Emisions (lb/day) =	**1.49**	**9.24**	**0.57**	**257.58**	**0.52**	**26.88**	**1,510.30**	**lb/day**

Input Data

[1] Mobilization

Equipment	Activity Period (days)
Scraper	6
Dozer	4
Compactor	2
Loader	3
Backhoe	1
Total =	18

*Data provided by HDR

[2] Clear and Grub

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
Topsoil Removal	35,977.00	2,569.79	0.56	1,439.08	287.82
Material	**Tons/CY**	**Tons/day**			
--	**1.25**	**8994.3**			
			Activity Period (days) =	5.0	
			Haul Truck capacity (CY) =	14.0	

*Data provided by HDR
*Assumes haul load= 14 yd³

[3] Canal Excavation

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
Excavation	177,876.00	12,705.43	0.56	7,115.04	254.11
Material	**Tons/CY**	**Tons/day**			
	1.25	**7940.9**			
			Activity Period (days) =	28.0	
			Haul Truck capacity (CY) =	14.0	

*Assumes that material hauling occurs on 50% paved and 50% unpaved haul routes
*Assumes haul load= 14 yd³
*Data provided by HDR

[4] Canal Embankment

Import/ Export	Qty (CY)	Equipment	Activity Period (days)	Haul Load Capacity (cy/day)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
Stockpile Excavation	21932	Dump Truck	12	180	180	2.0	360.00	30.00
--		Dozer	3	580	373	0.1	18.64	2.07
Tons/CY	**Tons/day**	Water Truck	6	1889	809.1	6.0	4,854.86	809.14
1.25	**883.1**	Compactor	4	3000	857.1	6.4	5,485.71	1371.43
		Total =	**31**		**2219.1**	**14.5**	**10719.2**	**2212.6**
		Dump Truck Haul Capacity (CY) =	12.0					
		Haul Truck capacity (CY) =	14.0					

*Assumes that material hauling occurs on 50% paved and 50% unpaved haul routes
*Assumes haul load=14 yd³
*Data provided by HDR

[5] Canal Abondonment

Import/ Export	Qty (CY)	Equipment	Activity Period (days)	Haul Load Capacity (cy/day)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
Fill Material	74389	Dump Truck	41	180	615	2.0	1,230.00	30.00
--		Dozer	32	580	1326	0.1	65.29	2.07
Tons/CY	**Tons/day**	Water Truck	20	1888	2597.1	6.0	15,182.86	809.14
1.25	**885.6**	Compactor	12	3000	2571.4	6.4	16,457.14	1371.43
		Total =	**105**		**7209**	**14.5**	**33936.3**	**2212.6**
		Dump Truck Haul Capacity (CY) =	12.0					
		Haul Truck capacity (CY) =	14.0					

*Assumes that material hauling occurs on 50% paved and 50% unpaved haul routes
*Assumes haul load=14 yd³
*Data provided by HDR

[6] Topsoil Respread

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
--	12,907.00	921.93	6.00	5,531.57	425.51
Material	**Tons/CY**	**Tons/day**			
--	**1.25**	**1241.1**			
			Activity Period (days) =	13.0	
			Haul Truck capacity (CY) =	14.0	

*Assumes haul load= 14 yd³
*Assumes that material hauling is along 50% paved and 50% unpaved haul routes
*Data provided by HDR

Table 9: West Drainage Canal - Phase 4b Improvements

Project Information

[1] Seeding

Mobile Sources

Off-Highway Trucks(1)	1		0.27	2.97	0.08	0.08	324.22	lb/day	7.84	64.84	2.06	-	2.16	-	3,078.31	lb/yr
Water Truck(2)	4		0.13	1.27	0.05	0.05	163.47	lb/day	5.20	76.26	1.03	-	2.76	-	9,899.05	lb/yr
Employee Trips	10	employees	0.62	0.80	0.00	0.00	39.29	lb/day/employee	16.01	17.42	1.74	-	1.60	-	17,805.65	lb/yr

Fugitive Sources

Travel on unpaved roads	16	VMT/yr	-	-	8.90	0.85	-	lb/VMT	-	-	-	45.16	-	1.51	-	lb/yr
Travel on paved roads	16	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	5.08	-	0.72	-	lb/yr
Total Emissions (lb/year) =									**23.55**	**153.76**	**7.09**	**21.24**	**6.68**	**2.26**	**35,982.34**	**lb/yr**
Total Emissions (lb/day) =									**0.11**	**5.38**	**0.24**	**0.73**	**0.23**	**0.08**	**1,240.08**	**lb/day**

*Assumes haul load=14 yd³
*Data provided by HDR

Equipment	Activity Period (days)	Round-trip (miles)	Total Miles	Total Miles/day
Off-Highway Truck	14	6.00	12.09	0.87
Water Truck	15	6.00	24.03	0.83
Total =	29	-	36.09	1.24
			Haul Truck capacity (CY) =	14.0

[2] Pipe Installation

Mobile Sources

Backhoe	1		0.14	1.19	0.05	0.04	312.85	lb/day	0.59	5.03	0.14	-	0.51	-	858.54	lb/yr
Dozer	1		0.42	3.95	0.15	0.14	935.40	lb/day	0.40	3.95	0.15	-	0.54	-	855.60	lb/yr
Water Truck	1		0.13	1.27	0.05	0.05	163.47	lb/day	0.16	1.27	0.05	-	0.03	-	163.47	lb/yr
Compactor	1		0.09	1.16	0.07	0.07	244.59	lb/day	0.09	1.16	0.07	-	0.07	-	364.59	lb/yr
Employee Trips	13	employees	0.62	0.80	0.00	0.00	39.29	lb/day/employee	1.73	2.18	0.20	-	0.29	-	1944.15	lb/yr

Fugitive Sources

Travel on unpaved roads	16	VMT/yr	-	-	8.90	0.85	-	lb/VMT	-	-	-	2.93	-	0.97	-	lb/yr
Travel on paved roads	16	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	2.93	-	0.42	-	lb/yr
Total Emissions (lb/year) =									**3.09**	**12.46**	**0.71**	**12.15**	**0.67**	**1.29**	**4,626.32**	**lb/yr**
Total Emissions (lb/day) =									**0.62**	**2.49**	**0.14**	**2.43**	**0.13**	**0.26**	**925.26**	**lb/day**

*Assumes haul load=14 yd³
*Data provided by HDR

Import/ Export	Qty (CY)	Equipment	Activity Period (days)	Capacity (cy/day)	# of Haul Loads	trip (miles)	Total Miles	Total Miles/day
Excavation	560	Backhoe	5	400	56	6.0	12.09	4.80
-	-	Dozer	1	500	4.1	0.1	0.89	0.89
Tons/CY	Tons/day	Water Truck	8	1000	0.0	0.1	3.69	-
1.25	80.0	Compactor	1	200	20.0	0.1	2.89	2.89
		Total =	5		147	0.5	20.6	12.6
				Haul Truck capacity (CY) =	14.0			

[3] Demobilization

Mobile Sources

Scraper	1		0.40	3.84	0.15	0.14	909.54	lb/day	3.46	30.74	1.21	-	1.12	-	3,078.36	lb/yr
Dozer	1		0.42	3.95	0.15	0.14	935.40	lb/day	1.69	14.66	0.61	-	0.56	-	1,362.38	lb/yr
Compactor	1		0.09	1.16	0.07	0.07	244.59	lb/day	0.57	3.97	0.14	-	0.13	-	489.18	lb/yr
Loader	3		0.28	2.85	0.17	0.16	287.16	lb/day	1.14	6.92	0.51	-	0.47	-	921.47	lb/yr
Backhoe	1		0.14	1.19	0.05	0.04	312.85	lb/day	0.18	1.19	0.05	-	0.04	-	312.85	lb/yr
Employee Trips	1	employees	0.62	0.80	0.00	0.00	39.29	lb/day/employee	0.41	0.52	0.07	-	0.07	-	708.38	lb/yr
Total Emissions (lb/year) =									**7.4**	**59.4**	**2.6**	**0.0**	**2.4**	**0.0**	**7648.6**	**lb/yr**
Total Emissions (lb/day) =									**0.41**	**3.30**	**0.14**	**0.00**	**0.13**	**0.00**	**391.60**	**lb/day**

Equipment	Activity Period
Scraper	3
Dozer	2
Compactor	2
Loader	3
Backhoe	1
Total =	10

Summary - West Drainage Canal	ROG	NOX	PM10		PM2.5		CO2
			COMB	EM	COMB	EM	
2013 Total from WDC (tons/year) =	0.2	1.3	0.1	21.8	0.1	2.4	179.1
2013 Total from WDC (lb/day) - Worst Case =	4.3	37.9	1.6	459.7	1.4	53.8	4192.1

*These calculations represent worst-case emissions from construction activities associated with WDC work

Year	Phase	Emissions (lb/day)						
		ROG	NOx	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	CO2
2013	1	0.4	3.7	0.2	0.0	0.2	0.0	391.6
	2	4.2	36.8	1.5	439.7	1.4	50.8	4029.6
	3	4.3	37.9	1.6	388.2	1.4	49.3	4192.1
	4	2.1	16.8	0.7	210.4	0.7	22.1	2360.0
	5	0.6	4.3	0.2	197.2	0.2	20.7	696.8
	6	1.5	9.2	0.6	257.6	0.5	26.9	1510.3
	7	0.81	5.30	0.24	0.73	0.23	0.08	1240.08
	8	0.6	2.5	0.1	2.4	0.1	0.3	925.3
	9	0.4	3.3	0.1	0.0	0.1	0.0	391.6
Worst-case lb/day =		4.3	37.9	1.6	439.7	1.4	50.8	4192.1

Table 10: Riego Road Canal Relocation - Phase 4b Improvements

Project Information
Phase 4b Riego Road Canal Relocation includes canal relocation and irrigation
Work Schedule: May - Nov, 2014 (1 through 9)

Total Riego Road Canal Relocation length in Phase 4b =	0.8	mi		
	3960.0	ft		
Riego Road Canal Relocation length in Sutter County =	3960.0	ft	100.0%	of the total length

Conversion	
0.002204623	lb/gram
2000	lb/ton

	Qty	Unit	Emission Factor ROG	NOX	PM10	PM2.5	CO2	Unit	Emissions (lb/yr) ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	CO2	Unit
[1] Mobilization																
Mobile Sources																
Scraper	1		0.46	4.36	0.18	0.16	409.54	lb/day	0.93	8.72	0.35	-	0.32	-	819.09	lb/yr
Dozer	1		0.46	4.06	0.17	0.16	335.60	lb/day	0.92	8.12	0.35	-	0.32	-	671.20	lb/yr
Compactor	1		0.29	1.80	0.08	0.08	244.59	lb/day	0.57	3.60	0.17	-	0.16	-	489.18	lb/yr
Loader	1		0.43	3.33	0.19	0.18	307.16	lb/day	0.85	6.66	0.38	-	0.35	-	614.32	lb/yr
Backhoe	1		0.19	1.28	0.06	0.05	312.85	lb/day	0.19	1.28	0.06	-	0.05	-	312.85	lb/yr
Employee Trips	1	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	0.21	0.26	0.04	-	0.03	-	353.30	lb/yr
							Total Emissions (lb/year) =		3.7	28.6	1.3	0.0	1.2	0.0	3259.9	lb/yr
							Total Emissions (lb/day) =		0.41	3.18	0.15	0.00	0.14	0.00	362.21	lb/day
[2] Clear and Grub																
Mobile Sources																
Water Truck	1		0.10	1.27	0.05	0.05	163.47	lb/day	0.70	8.89	0.35	-	0.32	-	1,144.29	lb/yr
Scraper(s)	2		0.46	4.36	0.18	0.16	409.54	lb/day	6.50	61.06	2.47	-	2.27	-	5,733.61	lb/yr
Employee Trips	3	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	0.46	0.61	0.08	-	0.08	-	824.36	lb/yr
Fugitive Sources																
Travel on unpaved roads	269.2	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	241.7	-	22.6	-	lb/yr
Travel on paved roads	269.2	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	76.0	-	11.2	-	lb/yr
Material Handling																
Scraper Unloading			-	-	0.03	0.00	-	lb/ton	-	-	-	441.6	-	61.8	-	lb/yr
							Total Emissions (lb/year) =		7.7	70.6	2.9	759.3	2.7	95.6	7702.3	lb/yr
							Total Emissions (lb/day) =		1.1	10.1	0.4	108.5	0.4	13.7	1100.3	lb/day
[3] Canal Excavation																
Mobile Sources																
Water Truck(s)	1		0.10	1.27	0.05	0.05	163.47	lb/day	0.20	2.54	0.10	-	0.09	-	326.94	lb/yr
Scraper(s)	2		0.46	4.36	0.18	0.16	409.54	lb/day	1.86	17.44	0.70	-	0.65	-	1,638.18	lb/yr
Employee Trips	3	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	0.14	0.17	0.02	-	0.02	-	235.53	lb/yr
Fugitive Sources																
Travel on unpaved roads	70	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	63.14	-	5.31	-	lb/yr
Travel on paved roads	70	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	19.06	-	2.92	-	lb/yr
Material Handling																
Scraper Unloading			-	-	0.03	0.00	-	lb/ton	-	-	-	115.4	-	16.2	-	lb/yr
							Total Emissions (lb/year) =		2.20	20.16	0.83	198.38	0.76	24.99	2,200.65	lb/yr
							Total Emissions (lb/day) =		1.10	10.08	0.41	99.19	0.38	12.49	1,100.32	lb/day
[4] Canal Embankment																
Mobile Sources																
Dump Truck(s)	10		0.30	2.76	0.10	0.10	324.22	lb/day	23.73	220.92	8.30	-	7.83	-	25,937.77	lb/yr
Dozer(s)	2		0.46	4.06	0.17	0.16	335.60	lb/day	10.99	97.41	4.15	-	3.82	-	8,054.35	lb/yr
Water Truck(s)	2		0.10	1.27	0.05	0.05	163.47	lb/day	0.80	10.16	0.40	-	0.37	-	1,307.76	lb/yr
Compactor(s)	2		0.29	1.80	0.08	0.08	244.59	lb/day	2.29	14.39	0.68	-	0.63	-	1,956.71	lb/yr
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	9.66	12.18	1.83	-	1.62	-	16,487.10	lb/yr
Fugitive Sources																
Travel on unpaved roads	607	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	544.5	-	51.0	-	lb/yr
Travel on paved roads	607	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	171.3	-	25.2	-	lb/yr
Material Handling																
Truck Unloading			-	-	0.01	0.00	-	lb/ton	-	-	-	89.91	-	2.28	-	lb/yr
Bulldozing	8	hrs/day	-	-	0.75	0.11	-	lb/hr	-	-	-	72.3	-	10.1	-	lb/yr
							Total Emissions (lb/year) =		47.47	365.06	15.21	877.92	14.07	88.65	53,743.69	lb/yr
							Total Emissions (lb/day) =		1.70	12.68	0.54	31.36	0.50	3.16	1,919.42	lb/day
[5] Irrigation Canal Abondonment																
Mobile Sources																
Dump Truck(s)	10		0.30	2.76	0.10	0.10	324.22	lb/day	17.80	165.69	6.22	-	5.72	-	19,453.33	lb/yr
Dozer(s)	2		0.46	4.06	0.17	0.16	335.60	lb/day	9.16	81.17	3.46	-	3.19	-	6,711.96	lb/yr
Water Truck(s)	3		0.10	1.27	0.05	0.05	163.47	lb/day	0.90	11.43	0.45	-	0.41	-	1,471.23	lb/yr
Compactor(s)	2		0.29	1.80	0.09	0.08	244.59	lb/day	1.14	7.19	0.34	-	0.31	-	978.35	lb/yr
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	7.25	9.14	1.29	-	1.21	-	12,365.33	lb/yr
Fugitive Sources																
Travel on unpaved roads	401	VMT/yr	-	-	0.93	0.09	-	lb/VMT	-	-	-	360.2	-	33.7	-	lb/yr
Travel on paved roads	401	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	113.3	-	16.6	-	lb/yr
Material Handling																
Truck Unloading			-	-	0.01	0.00	-	lb/ton	-	-	-	72.51	-	1.84	-	lb/yr
Bulldozing	8	hrs/day	-	-	0.75	0.11	-	lb/hr	-	-	-	60.2	-	8.4	-	lb/yr
							Total Emissions (lb/year) =		36.25	274.62	11.74	606.22	10.85	60.85	40,980.20	lb/yr
							Total Emissions (lb/day) =		1.73	13.08	0.56	28.87	0.52	2.89	1,951.44	lb/day
[6] Topsoil Respread																
Mobile Sources																
Loader(s)	3		0.43	3.33	0.19	0.18	307.16	lb/day	7.69	59.96	3.48	-	3.19	-	5,528.84	lb/yr
Employee Trips	3	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	0.41	0.52	0.07	-	0.07	-	706.58	lb/yr
Fugitive Sources																
Travel on unpaved roads	126	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	113.26	-	10.61	-	lb/yr
Travel on paved roads	126	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	35.63	-	6.24	-	lb/yr
Material Handling																

Input Data

[1] Mobilization

Equipment	Activity Period (days)
Scraper	2
Dozer	2
Compactor	2
Loader	2
Backhoe	1
Total =	9

*Data provided by HDR

[2] Clear and Grub

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
Topsoil Removal	11,777.80	841.27	0.64	538.38	76.91
Material	Tons/CY	Tons/day			
--	1.25	2103.0			
			Activity Period (days) =	7.0	
			Haul Truck capacity (CY) =	14.0	

*Data provided by HDR
*Assumes haul load=14 yd³

[3] Canal Excavation

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
Excavation	3,077.00	219.79	0.64	140.66	70.33
Material	Tons/CY	Tons/day			
	1.25	1923.1			
			Activity Period (days) =	2.0	
			Haul Truck capacity (CY) =	14.0	

*Assumes haul load=14 yd³
*Assumes that material hauling is along 50% paved and 50% unpaved haul routes

[4] Canal Embankment

Import/ Export	Qty (CY)	Equipment	Activity Period (days)	Haul Load Capacity (cy/day)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
Stockpile Excavation	13791	Dump Truck	8	180	120	0.6	76.80	9.60
--		Dozer	12	580	497	0.6	298.28	24.86
Tons/CY	Tons/day	Water Truck	4	1988	539.4	0.6	323.66	80.91
1.25	611.7	Compactor	4	3060	857.1	0.6	514.29	128.57
		Total =	28		2013.7	2.4	1213.0	243.9
		Dump Truck Haul Capacity (CY) =	12.0					
		Haul Truck capacity (CY) =	14.0					

*Assumes haul load=14 yd³
*Assumes that material hauling is along 50% paved and 50% unpaved haul routes

[5] Irrigation Canal Abondonment

Import/ Export	Qty (CY)	Equipment	Activity Period (days)	Haul Load Capacity (cy/day)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
Fill Material	11049	Dump Truck	6	180	90	0.6	54.00	9.00
--		Dozer	10	580	414	0.6	248.57	24.86
Tons/CY	Tons/day	Water Truck	3	1988	404.6	0.6	242.74	80.91
1.25	657.7	Compactor	2	3060	428.6	0.6	257.14	128.57
		Total =	21		1337	2.4	802.5	243.3
		Dump Truck Haul Capacity (CY) =	12.0					
		Haul Truck capacity (CY) =	14.0					

*Assumes haul load=14 yd³
*Assumes that material hauling is along 50% paved and 50% unpaved haul routes

[6] Topsoil Respread

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
--	5,889.00	420.64	0.60	252.39	42.06
Material	Tons/CY	Tons/day			
--	1.25	1226.9			
			Activity Period (days) =	6.0	
			Haul Truck capacity (CY) =	14.0	

*Assumes haul load=14 yd³

Table 10: Riego Road Canal Relocation - Phase 4b Improvements

Project Information

Truck Unloading			-	-	0.01	0.00	Acre	-	-	-	38.65	-	0.96	- lb/yr
							Total Emissions (lb/year) =	**8.11**	**60.48**	**3.54**	**187.57**	**3.26**	**15.82**	**6,235.43 lb/yr**
							Total Emissions (lb/day) =	**1.35**	**10.08**	**0.59**	**31.26**	**0.54**	**2.80**	**1,039.24 lb/day**

*Assumes that material hauling is along 50% paved and 50% unpaved haul routes

[7] Seeding

Mobile Sources

Off-Highway Truck(s)	1		0.97	2.39	0.10	0.10	234.23	lb/day	1.33	11.05	0.43	-	0.38	- 1,298.99 lb/yr
Water Truck(s)	2		0.16	1.27	0.05	0.05	160.47	lb/day	0.88	10.16	0.40	-	0.37	- 1,107.78 lb/yr
Employee Trips	3	employees	0.02	0.03	0.00	0.00	31.26	lb/day/empl	0.05	0.75	0.10	-	0.08	- 342.12 lb/yr

Equipment	Activity Period (days)	Round-trip (miles)	Total Miles	Total Miles/day
Off-Highway Truck	4	0.80	0.60	0.05
Water Truck	4	0.80	1.20	0.15
Total =	8		1.80	0.20
			Haul Truck capacity (CY) =	14.0

Fugitive Sources

Travel on unpaved roads	1	VMT/yr	-	-	0.96	0.09	-	lb/VMT	-	-	-	0.81	-	0.08	- lb/yr
Travel on paved roads	1	VMT/yr	-	-	0.28	0.03	-	lb/VMT	-	-	-	0.22	-	0.04	- lb/yr
							Total Emissions (lb/year) =	**2.54**	**21.90**	**0.91**	**1.06**	**0.84**	**0.11**	**3,546.77 lb/yr**
							Total Emissions (lb/day) =	**0.32**	**2.74**	**0.11**	**0.13**	**0.11**	**0.01**	**443.35 lb/day**

*Assumes haul load is 4 yd³

*Assumes that material hauling is along 50% paved and 50% unpaved haul routes

[8] Pipe Installation

Mobile Sources

Backhoe	1		0.19	1.26	0.05	0.05	312.85	lb/day	0.19	1.26	0.05	-	0.05	- 312.85 lb/yr
Dozer	1		0.46	4.06	0.17	0.16	235.60	lb/day	0.46	4.06	0.17	-	0.16	- 235.60 lb/yr
Water Truck	1		0.13	1.27	0.05	0.05	160.47	lb/day	0.13	1.27	0.05	-	0.05	- 160.47 lb/yr
Compactor	1		0.29	1.95	0.08	0.08	244.98	lb/day	0.29	1.95	0.08	-	0.08	- 244.98 lb/yr
Employee Trips	3	employees	0.02	0.03	0.00	0.00	33.35	lb/day/empl	0.14	0.17	0.02	-	0.02	- 236.53 lb/yr

Import/ Export	City (CY)	Equipment	Activity Period (days)	Capacity (cy/day)	# of Haul Loads	trip (miles)	Total Miles	Total Miles/day
Excavation	178	Backhoe	1	400	22	0.04	1.14	1.14
		Dozer	0	680	0	0.04	0.00	-
Tons/CY	Tons/day	Water Truck	0	1800	0.0	0.04	0.00	-
1.25	**111.3**	Compactor	1	280	20.3	0.04	0.80	0.80
		Total =	**2**		**43**	**0.2**	**1.9**	**1.9**
		Haul Truck capacity (CY) =		14.0				

Fugitive Sources

Travel on unpaved roads	1	VMT/yr	-	-	0.93	0.09	-	lb/VMT	-	-	-	0.87	-	0.09	- lb/yr
Travel on paved roads	1	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	0.27	-	0.04	- lb/yr
							Total Emissions (lb/year) =	**1.19**	**8.58**	**0.35**	**1.15**	**0.36**	**0.12**	**1,292.83 lb/yr**
							Total Emissions (lb/day) =	**0.59**	**4.29**	**0.18**	**0.57**	**0.18**	**0.06**	**646.02 lb/day**

*Assumes haul load is 4 yd³

*Assumes that material hauling is along 50% paved and 50% unpaved haul routes

[9] Demobilization

Mobile Sources

Scraper	1		0.46	4.36	0.18	0.18	409.54	lb/day	0.92	8.72	0.35	-	0.22	- 819.36 lb/yr
Dozer	1		0.46	4.06	0.17	0.16	235.60	lb/day	0.92	8.12	0.35	-	0.22	- 471.20 lb/yr
Compactor	1		0.29	1.95	0.09	0.08	244.63	lb/day	0.57	3.90	0.17	-	0.15	- 489.18 lb/yr
Loader	1		0.43	3.33	0.19	0.18	307.16	lb/day	0.86	6.66	0.38	-	0.35	- 614.32 lb/yr
Backhoe	1		0.19	1.26	0.05	0.05	312.85	lb/day	0.19	1.26	0.05	-	0.05	- 312.85 lb/yr
Employee Trips	1	employees	0.02	0.03	0.00	0.00	29.26	lb/day/empl	0.21	0.26	0.04	-	0.03	- 263.30 lb/yr

Equipment	Activity Period
Scraper	2
Dozer	2
Compactor	2
Loader	2
Backhoe	1
Total =	**9**

Fugitive Sources

Travel on unpaved roads			-	-	0.93	0.09	-	lb/VMT	-	-	-	-	-	-	lb/yr
Travel on paved roads			-	-	0.28	0.04	-	lb/VMT	-	-	-	-	-	-	lb/yr
							Total Emissions (lb/year) =	**5.7**	**28.6**	**1.3**	**0.0**	**1.2**	**0.0**	**3259.9 lb/yr**
							Total Emissions (lb/day) =	**0.41**	**3.18**	**0.15**	**0.00**	**0.14**	**0.00**	**362.21 lb/day**

Summary - Riego Road Canal Relocation	ROG	NOX	PM10		PM2.5		CO2
			COMB	EM	COMB	EM	
2014 Total from Riego Road (tons/year) =	**0.1**	**0.4**	**0.0**	**1.3**	**0.0**	**0.1**	**61.1**
2014 Total from Riego Road (lb/day) - Worst Case =	**1.7**	**13.1**	**0.6**	**198.5**	**0.5**	**13.7**	**1951.4**

*Steam calculations represent worst-case emissions from construction activities associated with Riego Road Canal Relocation work.

		Emissions (lb/day)						
				PM10		PM2.5		
Year	Phase	ROG	NOx	COMB	EM	COMB	EM	CO2
2014	1	0.4	3.2	0.1	0.0	0.1	0.0	362.2
	2	1.1	10.1	0.4	106.5	0.4	13.7	1100.3
	3	1.1	10.1	0.4	99.2	0.4	12.5	1100.3
	4	1.7	12.7	0.5	31.4	0.5	3.2	1919.4
	5	1.7	13.1	0.6	28.9	0.5	2.9	1951.4
	6	1.4	10.1	0.6	31.3	0.5	2.8	1039.2
	7	0.3	2.7	0.1	0.1	0.1	0.0	443.3
	8	0.6	4.3	0.2	0.6	0.2	0.1	646.0
	9	0.4	3.2	0.1	0.0	0.1	0.0	362.2
Worst-case lb/day =		1.7	13.1	0.6	106.5	0.5	13.7	1951.4

Table 11: Natomas Cross Canal (NCC) Bridge Cutoff Wall and Closure Structure Work - Phase 4b Improvements

Project Information

Phase 4b NCC Bridge Cutoff Wall and Closure Structure Work includes construction of moveable barrier, modifications of bridge decks, and seepage remediation

Work Schedule: May - Nov, 2012 (1 through 5)

Total NCC Bridge Cutoff Wall length in Phase 4b =	0.1	mi	
	476.2	ft	
NCC Bridge Cutoff Wall length in Sutter County =	476.2	ft	100.0% of the total length

Conversion	
0.002204623	lb/gram
2000	lb/ton

	Qty	Unit	Emission Factor ROG	NOX	PM10	PM2.5	CO2	Unit	Emissions (lb/yr) ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	CO2	Unit
(1) Traffic Bypass Construction																
Mobile Sources																
Motor Grader	1		0.49	3.79	0.22	0.20	346.67	lb/day	4.89	37.94	2.20	-	2.02	-	3,469.74	lb/yr
Water Truck	1		0.10	1.27	0.05	0.05	153.47	lb/day	1.00	12.70	0.50	-	0.46	-	1,534.70	lb/yr
Front-end Loader	1		0.43	3.33	0.19	0.18	307.16	lb/day	4.27	33.31	1.92	-	1.77	-	3,071.58	lb/yr
Paver	1		0.84	8.04	0.44	0.40	352.66	lb/day	8.36	80.39	4.26	-	4.01	-	3,526.63	lb/yr
Pickup Truck	2		0.02	0.02	0.00	0.00	39.26	lb/day	0.46	0.58	0.06	-	0.06	-	785.10	lb/yr
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/employee	3.45	4.25	0.60	-	0.58	-	5,888.25	lb/yr
Fugitive Sources																
Travel on unpaved roads	2	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	1.62	-	0.15		lb/yr
Travel on paved roads	2	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	0.51	-	0.07		lb/yr
								Total Emissions (lb/year) =	**22.43**	**138.28**	**9.66**	**2.12**	**8.92**	**0.23**	**18,376.00**	**lb/yr**
								Total Emissions (lb/day) =	**2.24**	**13.83**	**0.97**	**0.21**	**0.89**	**0.02**	**1,837.60**	**lb/day**
(2) Cutoff Wall Installation - Southbound Lanes (follows no. 1) - Activity occurs 24 hours per day, 7 days per week																
Mobile Sources																
Mix Rig	1		1.73	11.33	0.97	0.89	1,057.99	lb/day	10.38	67.96	5.83	-	5.36	-	6,347.93	lb/yr
Excavator	1		1.27	9.67	0.58	0.53	972.67	lb/day	7.64	58.04	3.48	-	3.16	-	5,835.99	lb/yr
Loader	1		1.28	9.99	0.56	0.52	921.47	lb/day	7.69	59.96	3.46	-	3.19	-	5,528.84	lb/yr
Employee Trips	35	employees	0.02	0.03	0.00	0.00	39.26	lb/day/employee	4.83	6.05	0.84	-	0.81	-	8,243.55	lb/yr
Fugitive Sources																
Travel on unpaved roads[1]	214.3	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	192.4	-	18.0	-	lb/yr
Travel on paved roads	1928.9	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	544.7	-	80.0	-	lb/yr
Material Handling																
Truck Unloading			-	-	0.01	0.00	-	lb/ton	-	-	-	3.4	-	0.1		lb/yr
								Total Emissions (lb/year) =	**30.55**	**192.05**	**13.58**	**740.50**	**12.53**	**98.13**	**25,956.31**	**lb/yr**
								Total Emissions (lb/day) =	**5.09**	**32.01**	**2.26**	**123.42**	**2.09**	**16.35**	**4,326.05**	**lb/day**
(3) Traffic Bypass Reconfiguration (follows no. 2) - Work conducted in 10-hr shifts, 6 days per week																
Mobile Sources																
Motor Grader	1		0.61	4.74	0.27	0.25	433.72	lb/day	5.13	47.43	2.75	-	2.53	-	4,337.18	lb/yr
Water Truck	1		0.13	1.59	0.06	0.06	204.34	lb/day	1.25	15.88	0.63	-	0.58	-	2,043.38	lb/yr
Front-end Loader	1		0.53	4.16	0.24	0.22	383.95	lb/day	5.34	41.64	2.41	-	2.21	-	3,839.47	lb/yr
Paver	1		1.04	8.17	0.54	0.50	440.83	lb/day	10.45	81.74	5.46	-	5.01	-	4,408.28	lb/yr
Pickup Truck(s)	2		0.02	0.03	0.00	0.00	39.26	lb/day	0.46	0.58	0.06	-	0.06	-	785.10	lb/yr
Employee Trips	25	employees	0.02	0.03	0.00	0.00	39.26	lb/day/employee	5.75	7.25	1.00	-	0.98	-	8,813.75	lb/yr
Fugitive Sources																
Travel on unpaved roads	5	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	4.62	-	0.43	-	lb/yr
Travel on paved roads	5	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	1.45	-	0.21	-	lb/yr
Material Handling																
Truck Unloading			-	-	0.01	0.00	-	lb/ton	-	-	-	5.3	-	0.1		lb/yr
								Total Emissions (lb/year) =	**29.37**	**174.51**	**17.55**	**61.50**	**11.50**	**0.65**	**25,227.16**	**lb/yr**
								Total Emissions (lb/day) =	**2.94**	**17.45**	**1.76**	**0.61**	**1.15**	**0.06**	**2,522.72**	**lb/day**
(4) Cutoff Wall Installation - Northbound Lanes (follows no. 3) (Activity occurs 24 hours per day, 7 days per week)																
Mobile Sources																
Mix Rig	1		1.73	11.33	0.97	0.89	1,057.99	lb/day	10.39	67.96	5.83	-	5.36	-	6,347.93	lb/yr
Excavator	1		1.27	9.67	0.58	0.53	972.67	lb/day	7.64	58.04	3.48	-	3.16	-	5,835.99	lb/yr
Loader	1		1.28	9.99	0.56	0.52	921.47	lb/day	7.69	59.96	3.46	-	3.19	-	5,528.84	lb/yr
Employee Trips	35	employees	0.02	0.03	0.00	0.00	39.26	lb/day/employee	4.83	6.05	0.84	-	0.81	-	8,243.55	lb/yr
Fugitive Sources																
Travel on unpaved roads[1]	214.3	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	192.4	-	18.0	-	lb/yr
Travel on paved roads	1928.9	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	544.7	-	80.0	-	lb/yr
Material Handling																
Truck Unloading			-	-	0.01	0.00	-	lb/ton	-	-	-	4.0	-	0.1		lb/yr
								Total Emissions (lb/year) =	**30.55**	**192.05**	**13.58**	**741.32**	**12.53**	**98.15**	**25,956.31**	**lb/yr**
								Total Emissions (lb/day) =	**5.09**	**32.01**	**2.26**	**123.55**	**2.09**	**16.36**	**4,326.05**	**lb/day**
(5) Closure Structure Construction (follows no. 4)																
Mobile Sources																
Pickup Truck(s)	2		0.02	0.03	0.00	0.00	39.26	lb/day	1.38	1.74	0.24	-	0.22	-	2,355.30	lb/yr
Light Duty Crane	1		0.25	2.41	0.09	0.09	244.59	lb/day	7.42	72.16	2.79	-	2.58	-	7,337.65	lb/yr
Concrete Truck(s)	7		0.71	4.20	0.37	0.34	391.47	lb/day	149.04	882.68	77.74	-	71.52	-	82,208.65	lb/yr

Input Data

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
			0.18	3.60	0.90
		Activity Period (days) =		18.0	

*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
Reinforced Concrete	25.00	2	0.16	0.32	0.05
Aggregate Base Rock**	500.00	36	60.00	2,142.86	357.14
Total =	**525.00**	**37.50**	**60.18**	**2,143.18**	**357.20**
Material	**Tons/CY**	**Tons/day**			
--	**1.25**	**109.4**			
		Activity Period (days) =		6.0	
		Haul Truck capacity (CY) =		14.0	

1. Assumes 10% of VMT occur on unpaved roads, 90% of VMT occurs during material transport to and from commercial location

*Assumes haul load=14 yd³

*Assumes 50% of material used in No. 2 and 50% used in No. 4

**Aggregate material would come from commercial source up to 30 miles away

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
Asphalt Concrete Paving	800.00	57	0.18	10.29	1.63
Material	**Tons/CY**	**Tons/day**			
	1.25	**100.0**			
		Activity Period (days) =		18.0	
		Haul Truck capacity (CY) =		14.0	

*Assumes haul load=14 yd³

*Assumes that material hauling occurs on 50% paved and 50% unpaved haul routes

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
Reinforced Concrete	25.00	2	0	0.32	0.05
Aggregate Base Rock**	500.00	36	60	2,142.86	357.14
Total =	**525.00**	**37.50**	**60.18**	**2,143.18**	**357.20**
Material	**Tons/CY**	**Tons/day**			
--	**1.25**	**109.4**			
		Activity Period (days) =		6.0	
		Haul Truck capacity (CY) =		14.0	

1. Assumes 10% of VMT occur on unpaved roads, 90% of VMT occurs during material transport to and from commercial location.

*Assumes haul load=14 yd³

*Assumes 50% of material used in No. 2 and 50% used in No. 4

**Aggregate material would come from commercial source up to 30 miles away

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
			0.18	10.80	0.90
		Activity Period (days) =		60.0	

*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes

Table 11: Natomas Cross Canal (NCC) Bridge Cutoff Wall and Closure Structure Work - Phase 4b Improvements

Project Information															
Loader	1		0.43	3.33	0.19	0.18	307.16	lb/day	12.62	99.93	5.77	-	5.31	-	9,214.73	lb/yr
Backhoe	1		0.19	1.28	0.05	0.05	112.95	lb/day	5.01	38.31	1.64	-	1.51	-	3,385.31	lb/yr
Employee Trips	35	employees	0.02	0.03	0.00	0.00	39.28	lb/day/emp	34.16	30.45	4.20	-	4.05	-	41,217.75	lb/yr
Fugitive Sources															
Travel on unpaved roads	5	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	4.8	-	0.5	-	lb/yr
Travel on paved roads	5	VMT/yr	-	-	0.26	0.04	-	lb/VMT	-	-	-	1.5	-	0.2	-	lb/yr
								Total Emissions (lb/year) =	**280.62**	**1,125.27**	**92.38**	**6.37**	**85.19**	**0.88**	**132,819.45**	**lb/yr**
								Total Emissions (lb/day) =	**0.69**	**37.51**	**3.08**	**0.21**	**2.84**	**0.02**	**4,427.32**	**lb/day**

Summary - Natomas Cross Canal Bridge Cutoff Wall	**ROG**	**NOX**	**PM10**		**PM2.5**		**CO2**
			COMB	**EM**	**COMB**	**EM**	
2012 Total from NCC Bridge Cutoff Wall (tons/year) =	**0.2**	**0.9**	**0.1**	**0.7**	**0.1**	**0.1**	**114.2**
2012 Total from NCC Bridge Cutoff Wall (lb/day) - Worst Case =	**6.7**	**37.5**	**3.1**	**123.6**	**2.8**	**16.4**	**4427.3**

These calculations represent worst-case emissions from construction activities associated with NCC Bridge Cutoff Wall work.

		Emissions (lb/day)						
				PM10		**PM2.5**		
Year	**Phase**	**ROG**	**NOx**	**COMB**	**EM**	**COMB**	**EM**	**CO2**
2012	1	2.2	13.8	1.0	0.2	0.9	0.0	1837.8
	2	5.1	32.0	2.3	123.4	2.1	16.4	4326.1
	3	2.9	17.5	1.8	0.6	1.1	0.1	2622.7
	4	5.1	32.0	2.3	123.6	2.1	16.4	4326.1
	5	6.7	37.5	3.1	0.2	2.8	0.0	4427.3
Worst-case lb/day =		**6.7**	**37.5**	**3.1**	**123.6**	**2.8**	**16.4**	**4427.3**

Table 12: Natomas Cross Canal (NCC) South Levee Ditch Relocations - Phase 4b Improvements

Project Information:
Phase 4b NCC South Levee Ditch Relocations includes relocation of Vestal Drainage Ditch and Morrison Irrigation Canal
Work Schedule: May - Nov, 2012 (1 through 3)

Total NCC South Levee Ditch Relocation length in Phase 4b =	4.0	mi			
	21120.0	ft			
NCC South Levee Ditch Relocation length in Sutter County =	21120.0	ft	100.0%	of the total length	

Conversion	
0.002204623	lb/gram
2000	lb/ton

	Qty	Unit	Emission Factor						Emissions (lb/yr)							
			ROG	NOX	PM10	PM2.5	CO2	Unit	ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	CO2	Unit
[1] Clearing and grubbing/stripping																
Mobile Sources																
Elevating Scraper(s)	4		0.46	4.36	0.18	0.16	409.54	lb/day	27.87	261.67	10.57	-	9.73	-	24,572.63	lb/yr
Water Truck(s)	2		0.10	1.27	0.05	0.05	163.47	lb/day	3.00	38.10	1.50	-	1.38	-	4,904.10	lb/yr
Front-end Loader(s)	4		0.43	3.33	0.19	0.18	307.16	lb/day	25.64	199.95	11.54	-	10.62	-	18,429.46	lb/yr
Pickup Truck	5		0.02	0.03	0.00	0.00	39.26	lb/day	1.73	2.18	0.30	-	0.29	-	2,944.13	lb/yr
Employee Trips	25	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	8.83	10.88	1.50	-	1.45	-	14,720.65	lb/yr
Fugitive Sources																
Travel on unpaved roads	2976	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	2,671.72	-	250.24	-	lb/yr
Travel on paved roads	2976	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	840.39	-	123.47	-	lb/yr
Material Handling																
Scraper Unloading			-	-	0.03	0.00	-	lb/ton	-	-	-	1,562.48	-	218.75	-	
								Total Emissions (lb/year) =	**66.86**	**512.67**	**25.42**	**5,074.59**	**23.46**	**592.45**	**65,570.94**	**lb/yr**
								Total Emissions (lb/day) =	**4.46**	**34.18**	**1.69**	**338.31**	**1.56**	**39.50**	**4,371.40**	**lb/day**
[2] Channel Excavation and Backfill (follows no. 1) - Work conducted in 10-hr shifts, 6 days per week																
Mobile Sources																
Elevating Scraper(s)	8		0.58	5.45	0.22	0.20	511.93	lb/day	139.35	1,306.33	52.87	-	48.64	-	122,863.14	lb/yr
Excavator(s)	2		0.53	4.08	0.24	0.22	405.28	lb/day	31.83	241.85	14.40	-	13.25	-	24,316.64	lb/yr
Water Truck[1]	1		0.10	1.27	0.05	0.05	163.47	lb/day	3.00	38.10	1.50	-	1.38	-	4,904.10	lb/yr
Employee Trips	35	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	24.15	30.45	4.20	-	4.05	-	41,217.75	lb/yr
Fugitive Sources																
Travel on unpaved roads	5952.4	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	5343.5	-	500.5	-	lb/yr
Travel on paved roads	5952.4	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	1680.8	-	246.9	-	lb/yr
Material Handling																
Scraper Unloading			-	-	0.03	0.00	-	lb/ton	-	-	-	3,125.0	-	437.5	-	
								Total Emissions (lb/year) =	**198.32**	**1,618.73**	**72.97**	**10,149.42**	**67.31**	**1,184.94**	**193,301.83**	**lb/yr**
								Total Emissions (lb/day) =	**6.61**	**53.96**	**2.43**	**338.31**	**2.24**	**39.50**	**6,443.39**	**lb/day**
[3] Demobilization/cleanup (follows no. 2)																
Mobile Sources																
Water Truck(s)	2		0.10	1.27	0.05	0.05	163.47	lb/day	2.40	30.48	1.20	-	1.10	-	3,923.28	lb/yr
Hydroseeding Truck(s)	2		0.30	2.76	0.10	0.10	324.22	lb/day	7.12	66.28	2.49	-	2.29	-	7,781.33	lb/yr
Front-end Loader	1		0.43	3.33	0.19	0.18	307.16	lb/day	5.13	39.97	2.31	-	2.12	-	3,685.89	lb/yr
Haul Truck(s)	2		1.19	15.82	0.62	0.57	1,847.96	lb/day	28.63	379.73	14.88	-	13.69	-	44,351.04	lb/yr
Employee Trips	25	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	6.90	9.70	1.20	-	1.16	-	11,776.50	lb/yr
Fugitive Sources																
Travel on unpaved roads	24	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	21.55	-	2.02	-	lb/yr
Travel on paved roads	24	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	6.78	-	1.00	-	lb/yr
								Total Emissions (lb/year) =	**50.18**	**525.16**	**22.08**	**28.32**	**20.36**	**3.01**	**71,518.04**	**lb/yr**
								Total Emissions (lb/day) =	**4.18**	**43.76**	**1.84**	**2.36**	**1.70**	**0.25**	**5,959.84**	**lb/day**

Input Data

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
Excavated Material	41,666.00	2,976.14	2.00	5,952.29	396.82
Material	Tons/CY	Tons/day			
--	1.25	3472.2			
			Activity Period (days) =	15.0	
			Haul Truck capacity (CY) =	14.0	

*Assumes haul load=14 yd^3

*Assumes that material hauling is along 50% paved and 50% unpaved haul routes

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
Excavated Material	83,334.00	5,952.43	2.00	11,904.86	396.83
Material	Tons/CY	Tons/day			
--	1.25	3472.3			
			Activity Period (days) =	30.0	
			Haul Truck capacity (CY) =	14.0	

*Assumes haul load=14 yd^3

*Assumes that material hauling occurs on 50% paved and 50% unpaved haul routes

1. Water trucks are assumed to operate for 8 hours per shift

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
-	-	-	2.00	48.00	4.00
			Activity Period (days) =	12.0	

*Assumes that material hauling is along 50% paved and 50% unpaved haul routes

Summary - Natomas Cross Canal South Levee Ditch Relocations	ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	CO2
2012 Total from NCC South Levee Ditch Relocations (tons/year) =	0.2	1.3	0.1	7.6	0.1	0.9	165.2
2012 Total from NCC South Levee Ditch Relocations (lb/day) - Worst Case =	6.6	54.0	2.4	338.3	2.2	39.5	6443.4

*These calculations represent worst-case emissions from construction activities associated with NCC South Levee Ditch Relocations work

Year	Phase	Emissions (lb/day) ROG	NOx	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	CO2
2012	1	4.5	34.2	1.7	338.3	1.6	39.5	4371.4
	2	6.6	54.0	2.4	338.3	2.2	39.5	6443.4
	3	4.2	43.8	1.8	2.4	1.7	0.3	5959.8
Worst-case lb/day =		**6.6**	**54.0**	**2.4**	**338.3**	**2.2**	**39.5**	**6443.4**

Table 13: Reclamation District 1000 Pumping Plants - Phase 4b Improvements

Project Information

Phase 4b Reclamation District 1000 Pumping Plants includes raising and replacement of discharge pipes

Work Schedule: May - Nov, 2015 (1 through 4)

Total Reclamation District 1000 Pumping Plant work length in Phase 4b =	0.5	mi	
	2640.0	ft	
Pumping Plant length in Sacramento County =	2640.0	ft	100.0% of the total length

Conversion		
0.002204623	lb/gram	
2000	lb/ton	

	Qty	Unit	Emission Factor						Emissions (lb/yr)								Input Data					
											PM10		PM2.5									
			ROG	NOX	PM10	PM2.5	CO2	Unit	ROG	NOX	COMB	EM	COMB	EM	CO2	Unit	Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
[1] Pumping Plant 1A - Pipeline Relocation, Pumping House Relocation, Channel Realignment																						
Mobile Sources																						
Grader(s)	5		0.49	3.79	0.22	0.20	346.97	lb/day	97.87	759.88	43.94	-	40.43	-	69,394.87	lb/yr				1.00	120.00	3.00
Water Truck(s)	9		0.10	1.27	0.05	0.05	163.47	lb/day	32.05	406.40	16.00	-	14.72	-	52,310.40	lb/yr			Activity Period (days) =		40.0	
Excavator(s)	10		0.42	3.22	0.19	0.18	324.22	lb/day	169.74	1,289.88	76.80	-	70.65	-	129,688.77	lb/yr	*Assumes haul load is approximately 1 mile roundtrip					
Off-Highway Truck(s)	3		0.30	2.76	0.10	0.10	324.22	lb/day	35.80	331.39	12.44	-	11.45	-	38,906.66	lb/yr	*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes					
Loader(s)	2		0.43	3.33	0.19	0.18	307.16	lb/day	34.19	266.47	15.39	-	14.16	-	24,572.61	lb/yr						
Compactor(s)	2		0.29	1.80	0.09	0.08	244.59	lb/day	22.90	143.66	6.85	-	6.30	-	19,567.08	lb/yr						
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	13.90	17.40	2.40	-	2.21	-	23,553.00	lb/yr						
Fugitive Sources																						
Travel on unpaved roads	60	VMT/yr	-	-	0.90	0.09	-	lb/VMT	-	-	-	53.99	-	5.04	-	lb/yr						
Travel on paved roads	60	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	16.94	-	2.49	-	lb/yr						
								Total Emissions (lb/year) =	406.09	3,214.28	173.82	70.81	160.02	7.53	357,993.40	lb/yr						
								Total Emissions (lb/day) =	10.15	80.36	4.35	1.77	4.00	0.19	8,949.83	lb/day						
[2] Pumping Plant 1B - Pipeline Relocation, Pumping House Relocation, Channel Realignment																						
Mobile Sources																						
Grader(s)	5		0.49	3.79	0.22	0.20	346.97	lb/day	97.87	759.88	43.94	-	40.43	-	69,394.87	lb/yr				1.00	120.00	3.00
Water Truck(s)	9		0.10	1.27	0.05	0.05	163.47	lb/day	32.05	406.40	16.00	-	14.72	-	52,310.40	lb/yr			Activity Period (days) =		40.0	
Excavator(s)	10		0.42	3.22	0.19	0.18	324.22	lb/day	169.74	1,289.88	76.80	-	70.65	-	129,688.77	lb/yr	*Assumes haul load is approximately 1 mile roundtrip					
Off-Highway Truck(s)	3		0.30	2.76	0.10	0.10	324.22	lb/day	35.80	331.39	12.44	-	11.45	-	38,906.66	lb/yr	*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes					
Loader(s)	2		0.43	3.33	0.19	0.18	307.16	lb/day	34.19	266.47	15.39	-	14.16	-	24,572.61	lb/yr						
Compactor(s)	2		0.29	1.80	0.09	0.08	244.59	lb/day	22.90	143.66	6.85	-	6.30	-	19,567.08	lb/yr						
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	13.90	17.40	2.40	-	2.21	-	23,553.00	lb/yr						
Fugitive Sources																						
Travel on unpaved roads	60	VMT/yr	-	-	0.90	0.09	-	lb/VMT	-	-	-	53.99	-	5.04	-	lb/yr						
Travel on paved roads	60	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	16.94	-	2.49	-	lb/yr						
								Total Emissions (lb/year) =	406.09	3,214.28	173.82	70.81	160.02	7.53	357,993.40	lb/yr						
								Total Emissions (lb/day) =	10.15	80.36	4.35	1.77	4.00	0.19	8,949.83	lb/day						
[3] Pumping Plant No. 6 - Pipeline Relocation, Pumping House Relocation, Channel Realignment																						
Mobile Sources																						
Grader(s)	5		0.49	3.79	0.22	0.20	346.97	lb/day	97.87	759.88	43.94	-	40.43	-	69,394.87	lb/yr				1.00	120.00	3.00
Water Truck(s)	9		0.10	1.27	0.05	0.05	163.47	lb/day	32.05	406.40	16.00	-	14.72	-	52,310.40	lb/yr			Activity Period (days) =		40.0	
Excavator(s)	10		0.42	3.22	0.19	0.18	324.22	lb/day	169.74	1,289.88	76.80	-	70.65	-	129,688.77	lb/yr	*Assumes haul load is approximately 1 mile roundtrip					
Off-Highway Truck(s)	3		0.30	2.76	0.10	0.10	324.22	lb/day	35.80	331.39	12.44	-	11.45	-	38,906.66	lb/yr	*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes					
Loader(s)	2		0.43	3.33	0.19	0.18	307.16	lb/day	34.19	266.47	15.39	-	14.16	-	24,572.61	lb/yr						
Compactor(s)	2		0.29	1.80	0.09	0.08	244.59	lb/day	22.90	143.66	6.85	-	6.30	-	19,567.08	lb/yr						
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	13.90	17.40	2.40	-	2.21	-	23,553.00	lb/yr						
Fugitive Sources																						
Travel on unpaved roads	60	VMT/yr	-	-	0.90	0.09	-	lb/VMT	-	-	-	53.99	-	5.04	-	lb/yr						
Travel on paved roads	60	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	16.94	-	2.49	-	lb/yr						
								Total Emissions (lb/year) =	406.09	3,214.28	173.82	70.81	160.02	7.53	357,993.40	lb/yr						
								Total Emissions (lb/day) =	10.15	80.36	4.35	1.77	4.00	0.19	8,949.83	lb/day						
[4] Pumping Plant No. 8 - Pipeline Relocation, Pumping House Relocation, Channel Realignment																						
Mobile Sources																						
Grader(s)	5		0.49	3.79	0.22	0.20	346.97	lb/day	97.87	759.88	43.94	-	40.43	-	69,394.87	lb/yr				1.00	120.00	3.00
Water Truck(s)	9		0.10	1.27	0.05	0.05	163.47	lb/day	32.05	406.40	16.00	-	14.72	-	52,310.40	lb/yr			Activity Period (days) =		40.0	
Excavator(s)	10		0.42	3.22	0.19	0.18	324.22	lb/day	169.74	1,289.88	76.80	-	70.65	-	129,688.77	lb/yr	*Assumes haul load is approximately 1 mile roundtrip					
Off-Highway Truck(s)	3		0.30	2.76	0.10	0.10	324.22	lb/day	35.80	331.39	12.44	-	11.45	-	38,906.66	lb/yr	*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes					
Loader(s)	2		0.43	3.33	0.19	0.18	307.16	lb/day	34.19	266.47	15.39	-	14.16	-	24,572.61	lb/yr						
Compactor(s)	2		0.29	1.80	0.09	0.08	244.59	lb/day	22.90	143.66	6.85	-	6.30	-	19,567.08	lb/yr						
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	13.90	17.40	2.40	-	2.21	-	23,553.00	lb/yr						
Fugitive Sources																						
Travel on unpaved roads	60	VMT/yr	-	-	0.90	0.09	-	lb/VMT	-	-	-	53.99	-	5.04	-	lb/yr						
Travel on paved roads	60	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	16.94	-	2.49	-	lb/yr						
								Total Emissions (lb/year) =	406.09	3,214.28	173.82	70.81	160.02	7.53	357,993.40	lb/yr						
								Total Emissions (lb/day) =	10.15	80.36	4.35	1.77	4.00	0.19	8,949.83	lb/day						

Summary - Reclamation District 1000 Pumping Plants	ROG	NOX	PM10		PM2.5		CO2
			COMB	EM	COMB	EM	
2015 Total from Reclamation District 1000 Pumping Plants (tons/year) =	0.8	6.4	0.3	0.1	0.3	0.0	715.0
2015 Total from Reclamation District 1000 Pumping Plants (lb/day) - Worst Case =	10.2	80.4	4.3	1.8	4.0	0.2	8949.8

*These calculations represent worst-case emissions from construction activities associated with Reclamation District 1000 Pumping Plant work

Year	Pumping Plant	Emissions (lb/day)						
		ROG	NOx	PM10		PM2.5		CO2
				COMB	EM	COMB	EM	
	1A	10.2	80.4	4.3	1.8	4.0	0.2	8949.8

Table 13: Reclamation District 1000 Pumping Plants - Phase 4b Improvements

Project Information

2015	1/8	10.2	80.4	4.3	1.8	4.0	0.2	8949.8
	No. 6	10.2	80.4	4.3	1.8	4.0	0.2	8949.8
	No. 9	10.2	80.4	4.3	1.8	4.0	0.2	8949.8
Worst-case tbiday =		10.2	80.4	4.3	1.8	4.0	0.2	8949.8

Table 14: City of Sacramento Pumping Plants - Phase 4b Improvements

Project Information

Phase 4b City of Sacramento Pumping Plants includes raising and replacement of discharge pipes

Work Schedule: May - Nov, 2013 (1 through 3)

Total City of Sacramento Pumping Plant work length in Phase 4b =	0.5	mi
	2640.0	ft
Pumping Plant length in Sacramento County =	2640.0	ft 100.0% of the total length

Conversion	
0.002204623	lb/gram
2000	lb/ton

	Qty	Unit	Emission Factor ROG	NOX	PM10	PM2.5	CO2	Unit	Emissions (lb/yr) ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	CO2	Unit
[1] City Sump 160 - Pipeline Relocation, Pumping House Relocation, Channel Realignment																
Mobile Sources																
Grader(s)	5		0.49	3.79	0.22	0.20	346.97	lb/day	97.97	758.88	43.94	-	40.48	-	69,394.87	lb/yr
Water Truck(s)	8		0.10	1.27	0.05	0.05	163.47	lb/day	32.00	406.40	16.00	-	14.72	-	52,310.40	lb/yr
Excavator(s)	10		0.42	3.22	0.19	0.18	324.22	lb/day	169.74	1,289.88	76.80	-	70.65	-	129,688.77	lb/yr
Off-Highway Truck(s)	3		0.30	2.76	0.10	0.10	324.22	lb/day	35.60	331.39	12.44	-	11.45	-	38,906.66	lb/yr
Loader(s)	2		0.43	3.33	0.19	0.18	307.16	lb/day	34.19	266.47	15.39	-	14.16	-	24,572.61	lb/yr
Compactor(s)	2		0.29	1.80	0.09	0.08	344.59	lb/day	22.90	143.86	6.85	-	6.30	-	19,567.08	lb/yr
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	13.80	17.40	2.40	-	2.31	-	23,553.00	lb/yr
Fugitive Sources																
Travel on unpaved roads	60	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	53.86	-	5.04	-	lb/yr
Travel on paved roads	60	VMT/yr	-	-	0.26	0.04	-	lb/VMT	-	-	-	16.94	-	2.49	-	lb/yr
								Total Emissions (lb/year) =	**406.09**	**3,214.28**	**173.82**	**70.81**	**160.02**	**7.53**	**357,993.40**	**lb/yr**
								Total Emissions (lb/day) =	**10.15**	**80.36**	**4.35**	**1.77**	**4.00**	**0.19**	**8,949.83**	**lb/day**
[2] City Sump 58 - Pipeline Relocation, Pumping House Relocation, Channel Realignment																
Mobile Sources																
Grader(s)	5		0.49	3.79	0.22	0.20	346.97	lb/day	97.97	758.88	43.94	-	40.48	-	69,394.87	lb/yr
Water Truck(s)	8		0.10	1.27	0.05	0.05	163.47	lb/day	32.00	406.40	16.00	-	14.72	-	52,310.40	lb/yr
Excavator(s)	10		0.42	3.22	0.19	0.18	324.22	lb/day	169.74	1,289.88	76.80	-	70.65	-	129,688.77	lb/yr
Off-Highway Truck(s)	3		0.30	2.76	0.10	0.10	324.22	lb/day	35.60	331.39	12.44	-	11.45	-	38,906.66	lb/yr
Loader(s)	2		0.43	3.33	0.19	0.18	307.16	lb/day	34.19	266.47	15.39	-	14.16	-	24,572.61	lb/yr
Compactor(s)	2		0.29	1.80	0.09	0.08	344.59	lb/day	22.90	143.86	6.85	-	6.30	-	19,567.08	lb/yr
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	13.80	17.40	2.40	-	2.31	-	23,553.00	lb/yr
Fugitive Sources																
Travel on unpaved roads	60	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	53.86	-	5.04	-	lb/yr
Travel on paved roads	60	VMT/yr	-	-	0.26	0.04	-	lb/VMT	-	-	-	16.94	-	2.49	-	lb/yr
								Total Emissions (lb/year) =	**406.09**	**3,214.28**	**173.82**	**70.81**	**160.02**	**7.53**	**357,993.40**	**lb/yr**
								Total Emissions (lb/day) =	**10.15**	**80.36**	**4.35**	**1.77**	**4.00**	**0.19**	**8,949.83**	**lb/day**
[3] City Sump 102 - Pipeline Relocation, Pumping House Relocation, Channel Realignment																
Mobile Sources																
Grader(s)	5		0.49	3.79	0.22	0.20	346.97	lb/day	97.97	758.88	43.94	-	40.48	-	69,394.87	lb/yr
Water Truck(s)	8		0.10	1.27	0.05	0.05	163.47	lb/day	32.00	406.40	16.00	-	14.72	-	52,310.40	lb/yr
Excavator(s)	10		0.42	3.22	0.19	0.18	324.22	lb/day	169.74	1,289.88	76.80	-	70.65	-	129,688.77	lb/yr
Off-Highway Truck(s)	3		0.30	2.76	0.10	0.10	324.22	lb/day	35.60	331.39	12.44	-	11.45	-	38,906.66	lb/yr
Loader(s)	2		0.43	3.33	0.19	0.18	307.16	lb/day	34.19	266.47	15.39	-	14.16	-	24,572.61	lb/yr
Compactor(s)	2		0.29	1.80	0.09	0.08	344.59	lb/day	22.90	143.86	6.85	-	6.30	-	19,567.08	lb/yr
Employee Trips	15	employees	0.02	0.03	0.00	0.00	39.26	lb/day/empl	13.80	17.40	2.40	-	2.31	-	23,553.00	lb/yr
Fugitive Sources																
Travel on unpaved roads	60	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	53.86	-	5.04	-	lb/yr
Travel on paved roads	60	VMT/yr	-	-	0.26	0.04	-	lb/VMT	-	-	-	16.94	-	2.49	-	lb/yr
								Total Emissions (lb/year) =	**406.09**	**3,214.28**	**173.82**	**70.81**	**160.02**	**7.53**	**357,993.40**	**lb/yr**
								Total Emissions (lb/day) =	**10.15**	**80.36**	**4.35**	**1.77**	**4.00**	**0.19**	**8,949.83**	**lb/day**

Input Data

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
-	-	-	1.00	120.00	3.00
		Activity Period (days) =		40.0	

*Assumes haul load is approximately 1 mile round trip

*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes

Summary - City of Sacramento Pumping Plants	ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	CO2
2013 Total from City of Sacramento Pumping Plants (tons/year) =	**0.6**	**4.8**	**0.3**	**0.1**	**0.2**	**0.0**	**537.0**
2013 Total from City of Sacramento Pumping Plants (lb/day) - Worst Case =	**10.2**	**80.4**	**4.3**	**1.8**	**4.0**	**0.2**	**8949.8**

*These calculations represent worst-case emissions from construction activities associated with City of Sacramento Pumping Plant work.

Year	Pumping Plant	Emissions (lb/day) ROG	NOx	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	CO2
2013	**City Sump 160**	10.2	80.4	4.3	1.8	4.0	0.2	8949.8
	City Sump 58	10.2	80.4	4.3	1.8	4.0	0.2	8949.8
	City Sump 102	10.2	80.4	4.3	1.8	4.0	0.2	8949.8
Worst-case lb/day =		**10.2**	**80.4**	**4.3**	**1.8**	**4.0**	**0.2**	**8949.8**

Table 15: Triangle Borrow Site Excavation (PGCC/NEMDC) - Phase 4b Improvements

Project Information

Phase 4b Triangle Borrow Site Excavation includes excavation and rehabilitation of Triangle Area Borrow Site

Work Schedule: May - Nov, 2014

Total Triangle Area Borrow Site work length in Phase 4b =	5.0	mi	
	26400.0	ft	
Triangle Borrow Site length in Sutter County =	26400.0	ft	100.0 %of the total length

Conversion	
0.002204623	lb/gram
2000	lb/ton

	Qty	Unit	Emission Factor						Emissions (lb/yr)							
			ROG	NOX	PM10	PM2.5	CO2	Unit	ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	CO2	Unit
[1] Triangle Area Borrow Site Excavation																
Mobile Sources																
Water Truck(s)	9		0.16	1.27	0.05	0.05	163.47	lb/day	112.00	1,422.46	56.00	-	51.52	-	183,086.40	lb/yr
Loader(s)	2		0.43	3.33	0.16	0.15	307.16	lb/day	118.67	920.85	53.87	-	49.59	-	85,094.15	lb/yr
Bulldozer(s)	2		0.46	4.05	0.17	0.16	335.80	lb/day	128.21	1,130.42	48.46	-	44.59	-	93,982.39	lb/yr
Excavator(s)	3		0.42	3.22	0.18	0.18	324.22	lb/day	119.62	902.81	53.79	-	49.46	-	90,782.14	lb/yr
Employee Trips	20	employees	0.02	0.03	0.00	0.00	49.26	lb/day/empl	64.40	81.20	11.20	-	10.00	-	109,914.00	lb/yr
Fugitive Sources																
Disturbed Acreage	200	lb/day	-	-	10.05	-	-	lb/acre/day	-	-	-	2,893.00	-	-	-	lb/yr
Material Handling																
Bulldozing	8	hr/day	-	-	0.25	0.11	-	lb/hr	-	-	-	543.03	-	118.03	-	lb/yr
								Total Emissions (lb/year) =	543.10	4,475.58	223.30	3,743.09	205.93	118.03	563,754.08	lb/yr
								Total Emissions (lb/day) =	3.88	31.97	1.59	26.74	1.47	0.84	4,026.81	lb/day
[2] Habitat Conservation, Borrow Site Restoration																
Mobile Sources																
Bulldozer	1		0.46	4.05	0.17	0.15	335.80	lb/day	12.89	169.74	4.36	-	3.96	-	9,082.94	lb/yr
Water Truck(s)	1		0.16	1.27	0.05	0.05	163.47	lb/day	3.66	35.10	1.50	-	1.38	-	4,694.10	lb/yr
Excavator(s)	1		0.85	2.59	0.15	0.14	324.22	lb/day	19.55	77.58	4.46	-	4.10	-	9,726.66	lb/yr
Off-Highway Truck(s)	1		0.26	2.13	0.08	0.07	324.22	lb/day	7.75	63.88	2.36	-	2.08	-	9,726.66	lb/yr
Employee Trips	10	employees	0.02	0.03	0.00	0.00	49.26	lb/day/empl	0.90	1.70	1.00	-	1.16	-	1,778.50	lb/yr
								Total Emissions (lb/year) =	40.34	282.00	13.72	-	12.57	-	46,201.85	lb/yr
								Total Emissions (lb/day) =	1.34	9.73	0.46	-	0.42	-	1,540.06	lb/day

Input Data

Amount Available for Excavation (acres) =	200.0
Activity Period (days) =	140.0
Activity Period (days) =	30.0

Summary - Triangle Properties Borrow Area Excavation	ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	CO2
2014 Total from Triangle Properties Borrow Area Excavation (tons/year) =	0.3	2.4	0.1	1.9	0.1	0.1	305.9
2014 Total from Triangle Properties Borrow Area Excavation (lb/day) - Worst Case =	3.9	32.0	1.6	26.7	1.5	0.8	4026.8

*Those calculations represent worst-case emissions from construction activities associated with Triangle Properties Borrow Area Excavation work.

Year	Phase	Emissions (lb/day) ROG	NOx	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	CO2
2014	1	3.88	31.97	1.59	26.74	1.47	0.84	4,026.81
	2	1.34	9.73	0.46	-	0.42	-	1,540.06
Worst-case lb/day =		3.88	31.97	1.59	26.74	1.47	0.84	4,026.81

Table 16: South Fisherman's Lake Borrow Area and West Lakeside School Site (ARNL/SREL) - Phase 4b Improvements

Project Information

Phase 4b South Fisherman's Lake Borrow Area and West Lakeside School Site includes excavation and rehabilitation of sites

Work Schedule: May - Nov, 2014

Total Borrow Site work length in Phase 4b =	1.0	mi			
	5280.0	ft			
Borrow Site length in Sacramento County =	5280.0	ft	100.0%	of the total length	

Conversion	
0.002204623	lb/gram
2000	lb/ton

	Qty	Unit	Emission Factor						Emissions (lb/yr)							Input Data	
			ROG	NOX	PM10	PM2.5	CO2	Unit	ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	CO2	Unit	
[1] South Fisherman's Lake Borrow Site Excavation																	
Mobile Sources																	Amount Available for Excavation (acres) - 610 South Main = 119.0
Water Truck(s)	8		0.10	1.27	0.05	0.05	163.47	lb/day	112.00	1,422.40	56.00	-	51.52	-	183,088.40	lb/yr	Amount Available for Excavation (acres) - Los Rios Community College = 95.0
Loader(s)	2		0.38	2.93	0.17	0.16	307.16	lb/day	106.46	821.35	47.32	-	43.53	-	86,004.13	lb/yr	Activity Period (days) = 140.0
Bulldozer(s)	2		0.42	3.65	0.15	0.14	335.60	lb/day	118.47	1,021.78	42.84	-	39.41	-	93,967.50	lb/yr	
Excavator(s)	2		0.37	2.78	0.16	0.15	324.22	lb/day	104.52	779.34	46.14	-	42.45	-	90,782.13	lb/yr	
Employee Trips	20	employees	0.02	0.03	0.00	0.00	39.26	lb/day/emplo	64.40	81.20	11.20	-	10.80	-	109,914.00	lb/yr	
Fugitive Sources																	
Disturbed Acreage	214	acres	-	-	10.00	-	-	lb/acre/day	-	-	-	2,140.00	-	-	-	lb/yr	
Material Handling																	
Bulldozing	8	hr/day	-	-	0.75	0.11	-	lb/hr				843.09		118.03		lb/yr	
								Total Emissions (lb/year) =	**505.85**	**4,125.97**	**203.50**	**2,983.09**	**187.72**	**118.03**	**563,754.16**	**lb/yr**	
								Total Emissions (lb/day) =	**3.61**	**29.47**	**1.45**	**21.31**	**1.34**	**0.84**	**4,026.82**	**lb/day**	
[2] Habitat Conservation, Borrow Site Restoration																	
Mobile Sources																	Activity Period (days) = 30.0
Bulldozer	1		0.41	3.46	0.14	0.13	335.60	lb/day	12.19	103.74	4.30	-	3.96	-	10,067.94	lb/yr	
Water Truck(s)	1		0.10	1.27	0.05	0.05	163.47	lb/day	3.00	38.10	1.50	-	1.38	-	4,904.10	lb/yr	
Excavator(s)	1		0.35	2.59	0.15	0.14	324.22	lb/day	10.50	77.58	4.46	-	4.10	-	9,726.66	lb/yr	
Off-Highway Trucks	1		0.26	2.13	0.08	0.07	324.22	lb/day	7.75	63.89	2.26	-	2.08	-	9,726.66	lb/yr	
Employee Trips	10	employees	0.02	0.03	0.00	0.00	39.26	lb/day/emplo	6.90	8.70	1.20	-	1.16	-	11,776.50	lb/yr	
								Total Emissions (lb/year) =	**40.34**	**292.00**	**13.72**	**-**	**12.67**	**-**	**46,201.85**	**lb/yr**	
								Total Emissions (lb/day) =	**1.34**	**9.73**	**0.46**	**-**	**0.42**	**-**	**1,540.06**	**lb/day**	
[3] West Lakefield School Borrow Site Excavation																	
Mobile Sources																	Amount Available for Excavation (acres) = 20.0
Water Truck(s)	8		0.10	1.27	0.05	0.05	163.47	lb/day	56.00	711.20	26.00	-	25.76	-	91,543.20	lb/yr	Activity Period (days) = 70.0
Loader(s)	2		0.38	2.93	0.17	0.16	307.16	lb/day	53.23	410.68	23.66	-	21.77	-	43,002.06	lb/yr	
Bulldozer(s)	2		0.42	3.65	0.15	0.14	335.60	lb/day	59.23	510.89	21.42	-	19.71	-	46,983.75	lb/yr	
Excavator(s)	2		0.37	2.78	0.16	0.15	324.22	lb/day	52.26	389.67	23.07	-	21.23	-	45,391.07	lb/yr	
Employee Trips	20	employees	0.02	0.03	0.00	0.00	39.26	lb/day/emplo	32.20	40.60	5.60	-	5.40	-	54,957.00	lb/yr	
Fugitive Sources																	
Disturbed Acreage	20	lb/day	-	-	10.00	-	-	lb/acre/day	-	-	-	200.00	-	-	-	lb/yr	
Material Handling																	
Bulldozing	8	hr/day	-	-	0.75	0.11	-	lb/hr				421.55		59.02		lb/yr	
								Total Emissions (lb/year) =	**252.92**	**2,062.98**	**101.75**	**621.55**	**93.86**	**59.02**	**281,877.08**	**lb/yr**	
								Total Emissions (lb/day) =	**3.61**	**29.47**	**1.45**	**8.88**	**1.34**	**0.84**	**4,026.82**	**lb/day**	
[4] Habitat Conservation, Borrow Site Restoration																	
Mobile Sources																	Activity Period (days) = 30.0
Bulldozer	1		0.41	3.46	0.14	0.13	335.60	lb/day	12.19	103.74	4.30	-	3.96	-	10,067.94	lb/yr	
Water Truck(s)	1		0.10	1.27	0.05	0.05	163.47	lb/day	3.00	38.10	1.50	-	1.38	-	4,904.10	lb/yr	
Excavator(s)	1		0.35	2.59	0.15	0.14	324.22	lb/day	10.50	77.58	4.46	-	4.10	-	9,726.66	lb/yr	
Off-Highway Trucks	1		0.26	2.13	0.08	0.07	324.22	lb/day	7.75	63.89	2.26	-	2.08	-	9,726.66	lb/yr	
Employee Trips	10	employees	0.02	0.03	0.00	0.00	39.26	lb/day/emplo	6.90	8.70	1.20	-	1.16	-	11,776.50	lb/yr	
								Total Emissions (lb/year) =	**40.34**	**292.00**	**13.72**	**-**	**12.67**	**-**	**46,201.85**	**lb/yr**	
								Total Emissions (lb/day) =	**1.34**	**9.73**	**0.46**	**-**	**0.42**	**-**	**1,540.06**	**lb/day**	

Summary - South Fisherman's Borrow Area and West Lakeside School Site Excavation	ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	CO2
2014 Total from Borrow Site Excavation (tons/year) =	**0.4**	**3.4**	**0.2**	**1.8**	**0.2**	**0.1**	**468.0**
2014 Total from Borrow Site Excavation (lb/day) - Worst Case =	**3.6**	**29.5**	**1.5**	**21.3**	**1.3**	**0.8**	**4026.8**

*These calculations represent worst-case emissions from construction activities associated with South Fisherman's Borrow Area and West Lakeside School Site excavation work.

Year	Phase	Emissions (lb/day) ROG	NOx	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	CO2
2014	1	3.61	29.47	1.45	21.31	1.34	0.84	4,026.82
	2	1.34	9.73	0.46	-	0.42	-	1,540.06
	3	3.61	29.47	1.45	8.88	1.34	0.84	4,026.82
	4	1.34	9.73	0.46	-	0.42	-	1,540.06
Worst-case lb/day =		**3.61**	**29.47**	**1.45**	**21.31**	**1.34**	**0.84**	**4,026.82**

Table 17a: Sutter County NLIP Phase 4b Emissions

Unmitigated 2012 Emissions

Project Element	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
NCC Bridge	6.69	37.51	3.08	123.55	2.84	16.36	0.16	0.91	0.07	0.75	0.07	0.10	114.17
NCC South Levee	6.61	53.96	2.43	338.31	2.24	39.50	0.16	1.33	0.06	7.63	0.06	0.89	165.20
TOTAL =	13.30	91.47	5.51	461.87	5.08	55.86	0.31	2.24	0.13	8.37	0.12	0.99	279.36

Mitigated 2012 Emissions

	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
% Reduction			45%	85%	45%	85%			45%	85%	45%	85%	-
	5%	40%	3.0	69.3	2.8	6.4	5%	40%	0.1	1.3	0.1	0.1	-
TOTAL	12.6	54.9	72.3		11.2		0.3	1.3	1.3		0.2		
Threshold	25	25	80		80		4.5	4.5	-		-		-
Significant "before offset payment ?	No	Yes	No		-		No	No	-		-		-

Sutter County NLIP Phase 4b Emissions

Unmitigated 2013 Emissions

Project Element	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
No Activity	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL =	-	-	-	-	-	-	-	-	-	-	-	-	-

Mitigated 2013 Emissions

	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
% Reduction	5%	40%	45%	85%	45%	85%	5%	40%	45%	85%	45%	85%	-
TOTAL	-	-	-	-	-	-	-	-	-	-	-	-	-
Threshold	25	25	80		80		4.5	4.5	-		-		-
Significant "before offset payment ?	-	-	-	-	-	-	-	-	-	-	-	-	-

Sutter County NLIP Phase 4b Emissions

Unmitigated 2014 Emissions

Project Element	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
PGCC Culvert	11.86	97.30	17.61	59.71	5.55	6.35	0.22	1.72	0.28	0.97	0.10	0.10	218.87
Riego Road	1.73	13.08	0.59	108.47	0.54	13.88	0.06	0.43	0.02	1.32	0.02	0.14	61.11
Triangle Properties	3.88	31.97	1.59	26.74	1.47	0.64	0.29	2.38	0.12	1.87	0.11	0.06	304.98
TOTAL =	17.46	142.35	19.80	194.92	7.87	20.86	0.57	4.54	0.42	4.16	0.23	0.31	584.96

Mitigated 2014 Emissions

	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
% Reduction	5%	40%	45%	85%	45%	85%	5%	40%	45%	85%	45%	85%	-
			10.9	29.2	4.3	3.1			0.2	0.6	0.1	0.0	595.0
TOTAL	16.6	85.4	40.1		7.5		0.5	2.7	0.9		0.2		595.0
Threshold	25	25	80		80		4.5	4.5	-		-		-
Significant "before offset payment ?	No	Yes	No		No		No	No	-		-		-

Sutter County NLIP Phase 4b Emissions

Unmitigated 2015 Emissions

Project Element	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
PGCC - Levee Raise	3.55	27.04	1.40	36.29	1.29	4.17	0.14	0.93	0.04	1.46	0.04	0.17	113.89
PGCC - Waterside	1.18	8.15	0.46	11.30	0.42	1.20	0.05	0.36	0.02	0.15	0.02	0.02	53.63
TOTAL =	4.74	35.19	1.86	47.59	1.71	5.37	0.19	1.29	0.06	1.60	0.06	0.18	167.52

Mitigated 2015 Emissions

	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
% Reduction	5%	40%	45%	85%	45%	85%	5%	40%	45%	85%	45%	85%	-
			1.0	7.1	0.9	0.8			0.0	0.2	0.0	0.0	167.52
TOTAL	4.5	21.1	8.2		1.7		0.2	0.8	0.3		0.1		167.52
Threshold	25	25	80		80		4.5	4.5	-		-		-
Significant "before offset payment ?	No	No	No		No		No	No	-		-		-

Sutter County NLIP Phase 4b Emissions

Unmitigated 2016 Emissions

Project Element	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
NEMDC North	22.39	129.15	6.41	715.70	33.30	72.55	1.90	10.84	0.51	55.45	1.78	6.10	1223.50
TOTAL =	22.39	129.15	6.41	715.70	33.30	72.55	1.90	10.84	0.51	55.45	1.78	6.10	1223.50

Mitigated 2016 Emissions

	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM[1]	Comb.	EM[1]			Comb.	EM[1]	Comb.	EM[1]	
% Reduction	5%	40%	45%	90%	45%	90%	5%	40%	45%	90%	45%	90%	-
			3.5	71.6	18.3	7.3			0.3	5.5	1.0	0.6	1223.50
TOTAL	21.3	77.5	75.1		25.6		1.8	6.5	5.8		1.6		1223.50
Threshold	25	25	80		80		4.5	4.5	-		-		-

Table 17b: Sacramento County NLIP Phase 4b Emissions

Unmitigated 2012 Emissions

Project Element	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
ARNL Reach I: 1-4	14.02	144.01	6.71	450.65	6.18	49.20	0.87	6.22	0.29	31.96	0.27	3.49	718.03
TOTAL =	14.02	144.01	6.71	450.65	6.18	49.20	0.87	6.22	0.29	31.96	0.27	3.49	718.03

Mitigated 2012 Emissions

	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
% Reduction	5%	40%	45%	85%	45%	85%	5%	40%	45%	85%	45%	85%	-
			3.7	67.6	3.4	7.4			0.2	4.8	0.1	0.6	718.03
TOTAL	13.3	86.4	71.3		10.8		0.8	3.7	5.0		0.7		
Threshold	-	85	-		-		25	25	100		100		-
Significant "before offset payment ?	-	Yes	-		-		No	No	No		No		-

Sacramento County NLIP Phase 4b Emissions

Unmitigated 2013 Emissions

Project Element	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
ARNL Reach I: 1-4	23.40	169.34	9.91	28.32	9.14	3.01	0.80	5.71	0.33	0.82	0.30	0.09	738.24
West Drainage Canal	4.26	37.85	1.57	439.65	1.45	55.85	0.16	1.31	0.06	21.84	0.05	2.43	179.08
City of Sacramento Pumps	10.15	80.36	4.35	1.77	4.00	0.19	0.61	4.82	0.26	0.11	0.24	0.01	536.99
SREL Reaches 16-20 - First 50%	44.12	374.91	21.28	964.35	19.59	105.79	2.51	17.95	0.94	68.65	0.87	7.54	2216.89
TOTAL =	81.93	662.47	37.11	1434.10	34.18	164.84	4.08	29.80	1.59	91.42	1.46	10.07	3671.20

Mitigated 2013 Emissions

	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
% Reduction	5%	40%	45%	85%	45%	85%	5%	40%	45%	85%	45%	85%	-
			20.4	215.1	18.8	24.7			0.9	13.7	0.8	1.5	3671.2
TOTAL	77.8	397.5	236.5		43.5		3.9	17.9	14.6		2.3		3671.2
Threshold	-	85	-		-		25	25	100		100		-
Significant "before offset payment ?	-	Yes	-		-		No	No	No		No		-

Sacramento County NLIP Phase 4b Emissions

Unmitigated 2014 Emissions

Project Element	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
SREL Reaches 16-20 - Last 50%	44.12	374.91	21.28	964.35	19.59	105.79	2.51	17.95	0.94	68.65	0.87	7.54	2216.89
Lakeside School Borrow Site	3.61	29.47	1.45	21.31	1.34	0.84	0.42	3.39	0.17	1.80	0.15	0.09	469.02
TOTAL =	47.73	404.38	22.74	985.66	20.93	106.63	2.93	21.33	1.11	70.46	1.02	7.62	2685.90

Mitigated 2014 Emissions

	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
% Reduction	5%	40%	45%	85%	45%	85%	5%	40%	45%	85%	45%	85%	-
			12.5	147.8	11.5	16.0			0.6	10.6	0.6	1.1	2685.90
TOTAL	46.3	242.6	160.4		27.5		2.8	12.8	11.2		1.7		2685.90
Threshold	-	85	-		-		25	25	100		100		-
Significant "before offset payment ?	-	Yes	-		-		No	No	No		No		-

Sacramento County NLIP Phase 4b Emissions

Unmitigated 2015 Emissions

Project Element	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
District 1000 Pumping Plants	10.15	80.36	4.35	1.77	4.00	0.19	0.81	6.43	0.35	0.14	0.32	0.02	715.99
NEMDC South - Levee Raise	63.43	462.84	25.08	647.99	23.08	74.42	2.55	16.57	0.78	25.99	0.72	2.98	2033.80
NEMDC South - Waterside	2.85	19.69	1.10	27.30	1.02	2.91	0.13	0.87	0.05	0.36	0.04	0.04	129.61
TOTAL =	76.44	582.89	30.53	677.06	28.10	77.51	3.49	23.87	1.17	26.49	1.08	3.04	2879.39

Mitigated 2015 Emissions

	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
% Reduction	5%	40%	45%	85%	45%	85%	5%	40%	45%	85%	45%	85%	-
			16.8	101.6	15.5	11.6			0.6	4.0	0.6	0.5	2879.39
TOTAL	72.6	349.7	116.4		27.1		3.3	14.3	4.6		1.1		-
Threshold	-	85	-		-		25	25	100		100		-
Significant "before offset payment ?	-	Yes	-		-		No	No	No		No		-

Sacramento County NLIP Phase 4b Emissions

Unmitigated 2016 Emissions

Project Element	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
NEMDC North	23.67	136.58	6.78	756.84	35.21	76.72	2.01	11.46	0.54	58.64	1.88	6.45	1293.83
TOTAL =	23.67	136.58	6.78	756.84	35.21	76.72	2.01	11.46	0.54	58.64	1.88	6.45	1293.83

Mitigated 2016 Emissions

	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM[1]	Comb.	EM[1]			Comb.	EM[1]	Comb.	EM[1]	

Table 17a. Sutter County NLIP Phase 4b Emissions

	Unmitigated 2012 Emissions								
Significant ↑before offset payment?	No	Yes	No	No	No	Yes	-	-	-

1. Implementation of a PM4CMO-approved Fugitive Dust Plan will reduce emissions of PM10 and PM2.5 by 85-90%, enhanced fugitive dust control measures including use of chemical stabilizers will be used during activities with high levels of earthmoving activities.

Table 17b. Sacramento County NLIP Phase 4b Emissions

	Unmitigated 2012 Emissions												
% Reduction	5%	40%	45%	90%	45%	90%	5%	40%	45%	90%	45%	90%	-
			3.7	76.7	19.4	7.7			0.3	6.5	1.0	0.6	
TOTAL	22.5	81.9	79.4		27.0		1.9	6.9	6.7		1.7		-
Threshold	-	85	-		-		25	25	100		100		-
Significant ↑before offset payment?	-	No	-		-		No	No	No		No		-

1. Implementation of a PM4CMO-approved Fugitive Dust Plan will reduce emissions of PM10 and PM2.5 by 85-90%, enhanced fugitive dust control measures including use of chemical stabilizers will be used during activities with high levels of earthmoving activities

Table 18: Fix-In-Place Alternative - Phase 4b Improvements

Phase 4b Fix-In-Place Alternative includes levee widening, rehabilitation, and seepage remediation
Fix-In-Place Alternative Reaches 16-20 Work Schedule: May - Nov. 2013 (50%)
Fix-In-Place Alternative Reaches 16-20 Work Schedule: May - Nov. 2014 (50%)

Total SREL Reaches 16-20 length in Phase 4b =	3.4	mi	
	17952.0	ft	
SREL Reaches 16-20 length in 1013 =	8976.0	ft	50.0% of the total length
SREL Reaches 16-20 length in 2014 =	8976.0	ft	50.0% of the total length

Conversion	
0.002204623	lb/gram
2000	lb/ton

	Qty	Unit	Emission Factor ROG	NOX	PM10	PM2.5	CO2	Unit	Emissions (lb/yr) ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	CO2	Unit
[1] Site Preparation (concurrent with 2)																
Mobile Sources																
Haul Truck(s)	10	trucks	1.19	15.82	0.62	0.57	1,847.96	g/mile[1]	28.41	376.72	14.76	-	13.58	-	43,998.80	lb/yr
Haul Truck(s)	270	trips	10.74	-	0.02	0.01	209.04	g/trip[2]	6.39	-	0.01	-	0.01	-	124.43	lb/yr
Water Truck(s)	2		0.10	1.27	0.05	0.05	163.47	lb/day	5.40	68.58	2.70	-	2.48	-	8,827.38	lb/yr
Scraper(s)	6		0.42	3.84	0.15	0.14	409.54	lb/day	68.75	622.50	24.54	-	22.58	-	66,348.10	lb/yr
Loader(s)	2		0.38	2.93	0.17	0.16	307.16	lb/day	20.53	158.40	9.13	-	8.40	-	16,586.51	lb/yr
Grader(s)	2		0.44	3.35	0.19	0.18	346.97	lb/day	23.57	180.74	10.42	-	9.59	-	18,736.52	lb/yr
Chipper(s)	4		0.56	4.34	0.25	0.23	443.67	lb/day	59.95	468.91	27.16	-	24.99	-	47,916.60	lb/yr
Crawler Tractor(s)	2		0.18	1.19	0.05	0.04	312.85	lb/day	9.94	64.45	2.49	-	2.30	-	16,893.67	lb/yr
Employee Trips	30	employees	0.02	0.03	0.00	0.00	39.26	lb/day/emp	18.63	23.49	3.24	-	3.12	-	31,796.55	lb/yr
Fugitive Sources																
Travel on unpaved road	540	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	484.76	-	45.40	-	lb/yr
Travel on paved road	540	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	152.46	-	22.40	-	lb/yr
								Total Emissions (lb/year) =	241.57	1,863.80	94.46	637.25	87.05	67.81	251,227.66	lb/yr
								Total Emissions (lb/day) =	8.95	72.73	3.50	23.60	3.22	2.51	9,304.73	lb/day
[2] Removal of Landside Structures and Other Facilities (concurrent with 1)																
Mobile Sources																
Haul Truck(s)	24	trucks	1.19	15.82	0.62	0.57	1,847.96	g/mile[1]	145.43	1,928.81	75.58	-	69.54	-	225,278.95	lb/yr
Haul Truck(s)	576	trips	10.74	-	0.02	0.01	209.04	g/trip[2]	13.63	-	0.02	-	0.02	-	265.45	lb/yr
Excavator(s)	2		0.37	2.78	0.16	0.15	324.22	lb/day	17.92	133.58	7.91	-	7.28	-	15,562.65	lb/yr
Loader(s)	1		0.38	2.93	0.17	0.16	307.16	lb/day	9.12	70.40	4.06	-	3.73	-	7,371.78	lb/yr
Employee Trips	30	employees	0.02	0.03	0.00	0.00	39.26	lb/day/emp	16.56	20.88	2.88	-	2.78	-	28,263.60	lb/yr
Fugitive Sources																
Travel on unpaved road	1152	VMT/year	-	-	0.90	0.08	-	lb/VMT	-	-	-	1,034.17	-	96.86	-	lb/yr
Travel on paved road	1152	VMT/year	-	-	0.28	0.04	-	lb/VMT	-	-	-	325.30	-	47.79	-	lb/yr
								Total Emissions (lb/year) =	202.7	2153.7	90.4	1359.5	83.3	144.7	276742.4	lb/yr
								Total Emissions (lb/day) =	8.4	89.7	3.8	56.6	3.5	6.0	11530.9	########
[3] Construction of Adjacent Levee Raise & Seepage Berms - Reaches 16-20																
Mobile Sources																
Haul Truck(s)	10	trucks	1.19	15.82	0.62	0.57	1,847.96	g/mile[1]	1,246.49	16,531.36	647.80	-	595.97	-	1,930,811.12	lb/yr
Haul Truck(s)	71400	trips	10.74	-	0.02	0.01	209.04	g/trip[2]	1,689.95	-	2.36	-	2.30	-	32,905.00	lb/yr
Water Truck(s)	2		0.10	1.27	0.05	0.05	163.47	lb/day	28.00	355.60	14.00	-	12.88	-	45,771.60	lb/yr
Crawler Tractor(s)	2		0.18	1.19	0.05	0.04	312.85	lb/day	51.55	334.21	12.94	-	11.90	-	87,596.82	lb/yr
Chipper(s)	4		0.56	4.34	0.25	0.23	443.67	lb/day	310.86	2,431.41	140.84	-	129.57	-	248,456.43	lb/yr
Scraper(s)	6		0.42	3.84	0.15	0.14	409.54	lb/day	356.50	3,227.78	127.26	-	117.08	-	344,016.79	lb/yr
Loader(s)	2		0.38	2.93	0.17	0.16	307.16	lb/day	106.46	821.35	47.32	-	43.53	-	86,004.13	lb/yr
Bulldozer(s)	5		0.42	3.65	0.15	0.14	335.60	lb/day	296.17	2,554.44	107.10	-	98.53	-	234,918.74	lb/yr
Compactor(s)	2		0.28	1.78	0.07	0.07	244.59	lb/day	79.72	499.24	19.94	-	18.34	-	68,484.61	lb/yr
Grader(s)	2		0.44	3.35	0.19	0.18	346.97	lb/day	122.19	937.16	54.07	-	49.74	-	97,152.86	lb/yr
Excavator(s)	5		0.37	2.78	0.16	0.15	324.22	lb/day	261.31	1,946.10	115.36	-	106.13	-	226,955.33	lb/yr
Employee Trips	60	employees	0.02	0.03	0.00	0.00	39.26	lb/day/emp	193.20	243.60	33.60	-	32.39	-	329,742.00	lb/yr
Fugitive Sources																
Travel on unpaved road	96179	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	86,340.73	-	8,086.95	-	lb/yr
Travel on paved road	96179	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	27,158.48	-	3,989.96	-	lb/yr
Material Handling																
Scraper Unloading			-	-	0.03	0.00	-	lb/ton	-	-	-	43,946.25	-	6,152.48	-	lb/yr
Truck Unloading			-	-	0.01	0.00	-	lb/ton	-	-	-	7,690.59	-	194.93	-	lb/yr
Bulldozing	8	hrs/day	-	-	0.75	0.11		lb/hr	-	-	-	843.09	-	116.03	-	lb/yr
								Total Emissions (lb/year) =	4,742.4	29,884.3	1,322.6	165,979.1	1,218.4	18,542.2	3,732,815.6	lb/yr
								Total Emissions (lb/day) =	33.9	213.5	9.4	1,185.6	8.7	132.4	26,663.0	lb/day
[4] Cutoff Wall Construction (24 hours per day day, 7 days per week)																
Mobile Sources																
Haul Truck(s)	8	trucks	1.19	15.82	0.62	0.57	1,847.96	g/mile[1]	5.05	66.97	2.62	-	2.41	-	7,822.19	lb/yr
Haul Truck(s)	480	trips	10.74	-	0.02	0.01	209.04	g/trip[2]	11.38	-	0.02	-	0.02	-	221.21	lb/yr
Loader(s)	10		1.14	8.80	0.51	0.47	921.47	lb/day	684.36	5,280.12	304.20	-	279.86	-	552,883.68	lb/yr
Bulldozer(s)	20		1.27	10.95	0.46	0.42	1,006.79	lb/day	1,523.16	13,137.12	550.80	-	506.74	-	1,208,153.52	lb/yr

Input Data

[1] Site Preparation

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
-	--	-	4.0	1,080.00	40.00
			Activity Period (days) =	27.0	

*Assumes haul load is approximately 4 miles roundtrip
*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes
Notes:
1. Emission factor represents running exhaust (grams/mile)
2. Emission factor represents start emission rate @ 480 minutes (grams/trip)

[2] Removal of Landside Structures and Other Facilities

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
--	--	--	4.0	2,304.00	96.00
			Activity Period (days) =	24.0	

*Assumes haul load is approximately 4 miles roundtrip
*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes
Notes
1. Emission factor represents running exhaust (grams/mile)
2. Emission factor represents start emission rate @ 480 minutes (grams/trip)

[3] Construction of Adjacent Levee Raise & Seepage Berms - Reaches 16-20

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
Levee Fill	424000	31000	4.0	124000	886
Seepage Berm Fill	663000	47357	4	189429	1353
Aggregate Base	63800	4557	30.0	136714	977
Asphalt Concrete	11100	793	30	23786	170
Material	**Tons/CY**	**R16-20 Tons/day**		**473929**	**3,385.20**
Aggregate	1.25	10463.4			

Reaches 16-20*	
Activity Period (days)* =	140.0
Haul Truck capacity (CY) =	14.0
Truck Trips (trips/day)* =	510

*Assumes quantity of material is based on given # of trips per day times haul capacity times activity period (510 trips/day*14 cy*140 days); total fill material for Reaches 16-20 = 1,097,000 cy
*Assumes haul load is approximately 4 miles roundtrip
*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes
*Date provided by HDR One Company, Inc
**Commercial Source; approximately 60 miles round trip
Notes:
1. Emission factor represents running exhaust (grams/mile)
2. Emission factor represents start emission rate @ 480 minutes (grams/trip)

[4] Cutoff Wall Construction

Import/ Export	Qty (CY)	# of Haul Loads	Round-trip (miles)	Total Miles	Total Miles/day
-	-	-	4.0	1,920.00	32.00
			Activity Period (days) =	60.0	
			Haul Truck capacity (CY) =	14.0	

*Assumes haul load is approximately 4 miles roundtrip

Table 18: Fix-In-Place Alternative - Phase 4b Improvements

Phase 4b Fix-In-Place Alternative includes levee widening, rehabilitation, and seepage remediation

Pallet Loader(s) (Forklift)	10		1.71	10.52	0.56	0.89	1,022.88	lb/day	1,022.94	6,327.72	577.26	-	531.06	-	614,315.16	lb/yr
Generator(s)	10		0.73	0.76	0.26	0.26	1,262.76	lb/day	439.56	5,853.60	167.76	-	154.34	-	757,655.28	lb/yr
Pump(s)	10		1.97	13.08	1.06	0.97	1,262.76	lb/day	1,179.36	7,847.82	634.22	-	583.57	-	757,655.48	lb/yr
Pickup(s)[7]	8		0.03	0.04	0.01	0.01	59.88	lb/day	16.56	20.88	2.88	-	2.78	-	28,263.60	lb/yr
Excavator(s)	6		0.37	8.35	0.49	0.45	972.67	lb/day	134.39	3,005.64	177.96	-	163.75	-	350,159.65	lb/yr
Deep Soil Mix Rigs	10		0.19	5.40	0.18	0.16	1,278.82	lb/day	111.18	3,240.36	107.46	-	98.86	-	767,894.22	lb/yr
Employee Trips	120	employees	0.02	0.03	0.00	0.00	39.26	lb/day/emp	165.60	208.80	26.80	-	27.76	-	282,638.00	lb/yr
Fugitive Sources																
Travel on unpaved roads	960	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	861.85	-	80.72	-	lb/yr
Travel on paved roads	960	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	271.06	-	39.83	-	lb/yr
Material Handling																
Bulldozing	24	hrs/day	-	-	0.75	0.11	-	lb/day	-	-	-	1,983.96	-	153.76	-	lb/yr
								Total Emissions (lb/year) =	**5,294.4**	**44,989.0**	**2,554.1**	**2,216.9**	**2,351.2**	**272.3**	**5,327,660.0**	**lb/yr**
								Total Emissions (lb/day) =	**88.2**	**749.8**	**42.6**	**36.9**	**39.2**	**4.5**	**88,794.3**	**lb/day**

*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes

Notes:

1. Emission factor represents running exhaust (grams/mile)
2. Emission factor represents start emission rate @480 minutes (grams/trip)
3. Pickup truck use is assumed to be half of the work day (~12 hours of use); emission factor times 1.5 to represent 12 hours of operation/day

[5] Reconstruct Garden Hwy at one intersection (concurrent with 5 and 6)

Mobile Sources																	**Import/ Export**	**Qty (CY)**	**# of Haul Loads**	**Round-trip (miles)**	**Total Miles**	**Total Miles/day**
Haul Truck(s)	2	trucks	1.19	15.82	0.62	0.57	1847.96	g/mile	0.2	1.3	0.4	-	0.4	-	1320.0	lb/yr	-		-	4.0	324.00	12.00
Haul Truck(s)	81	trips	10.74	0.00	0.02	0.01	209.04	g/trip	1.9	0.0	0.0	-	0.0	-	37.3	lb/yr			Activity Period (days) =		27.0	
Backhoe(s)	1		0.18	1.19	0.05	0.04	312.85	lb/day	5.0	32.2	1.2	-	1.1	-	8446.8	lb/yr	*Assumes haul load is approximately 4 miles roundtrip					
Smooth Drum Compactor(s)	1		0.28	1.78	0.07	0.07	244.59	lb/day	7.7	48.1	1.9	-	1.8	-	6603.9	lb/yr	*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes					
Off-Highway Truck(s)	1		0.27	2.32	0.08	0.08	324.22	g/mile	0.2	1.7	0.1	-	0.1	-	231.6	lb/yr	Notes:					
Truck Mounter Augers	1		0.27	2.32	0.08	0.08	324.22	lb/day	7.3	52.6	2.3	-	2.1	-	8754.0	lb/yr	1. Emission factor represents running exhaust (grams/mile)					
Pavers	1		0.75	4.48	0.40	0.36	352.66	lb/day	20.2	121.0	10.7	-	9.8	-	9521.9	lb/yr	2. Emission factor represents start emission rate @480 minutes (grams/trip)					
Employee Trips	60	employees	0.02	0.03	0.00	0.00	39.26	lb/day/emp	37.3	47.0	6.5	-	6.2	-	63593.1	lb/yr						
Fugitive Sources																						
Travel on unpaved roads	162	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	145.4	-	13.6	-	lb/yr						
Travel on paved roads	162	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	45.7	-	6.7	-	lb/yr						
								Total Emissions (lb/year) =	**80.4**	**323.9**	**23.1**	**191.2**	**21.6**	**20.3**	**98,508.6**	**lb/yr**						
								Total Emissions (lb/day) =	**3.0**	**12.0**	**0.9**	**7.1**	**0.8**	**0.8**	**3,648.5**	**lb/day**						

[6] Site Restoration/Demobilization

Mobile Sources																	**Import/ Export**	**Qty (CY)**	**# of Haul Loads**	**Round-trip (miles)**	**Total Miles**	**Total Miles/day**
Haul Truck(s)	2	trucks	1.19	15.82	0.62	0.57	1847.96	g/mile	0.22	3.49	0.37	-	0.34	-	1,108.14	lb/yr	-	-	-	4.0	272.00	8.00
Haul Truck(s)	68	trips	10.74	-	0.02	0.01	209.04	g/trip	1.61	-	0.09	-	0.08	-	31.34	lb/yr			Activity Period (days) =		34.0	
Off-Highway Truck(s)	3		0.27	2.32	0.08	0.08	324.22	lb/day	27.48	238.57	8.57	-	7.98	-	33,070.83	lb/yr	*Assumes haul load is approximately 4 miles roundtrip					
Water Truck(s)	3		0.10	1.27	0.05	0.05	163.47	lb/day	10.20	129.54	5.10	-	4.69	-	16,673.94	lb/yr	*Assumes that haul truck travel occurs on 50% paved and 50% unpaved haul routes					
Employee Trips	60	employees	0.02	0.03	0.00	0.00	39.26	lb/day/emp	46.92	59.16	8.16	-	7.87	-	80,080.20	lb/yr	Notes:					
Fugitive Sources																	1. Emission factor represents running exhaust (grams/mile)					
Travel on unpaved roads	126	VMT/yr	-	-	0.90	0.08	-	lb/VMT	-	-	-	122.09	-	11.44	-	lb/yr	2. Emission factor represents start emission rate @480 minutes (grams/trip)					
Travel on paved roads	126	VMT/yr	-	-	0.28	0.04	-	lb/VMT	-	-	-	38.40	-	5.64	-	lb/yr						
								Total Emissions (lb/year) =	**86.9**	**434.8**	**22.2**	**160.5**	**20.8**	**17.1**	**130,964.3**	**lb/yr**						
								Total Emissions (lb/day) =	**2.6**	**12.8**	**0.7**	**4.7**	**0.6**	**0.5**	**3,851.9**	**lb/day**						

Summary - Fix-In-Place SREL Reaches 16-20								
2013 Total from Fix-In-Place SREL Reaches 16-19A (tons/year) =	**50.0%**	**2.7**	**19.9**	**1.0**	**42.6**	**0.9**	**4.8**	**2454.5**
2013 Total from Fix-In-Place SREL Reaches 16-19A Worst-Case Day (lb/day) =	**50.0%**	**44.1**	**374.9**	**21.3**	**592.8**	**19.6**	**66.2**	**44397.2**
2014 Total from Fix-In-Place SREL Reaches 19B-20 (tons/year) =	**50.0%**	**2.7**	**19.9**	**1.0**	**42.6**	**0.9**	**4.8**	**2454.5**
2014 Total from Fix-In-Place SREL Reaches 19B-20 Worst-Case Day (lb/day) =	**50.0%**	**44.1**	**374.9**	**21.3**	**592.8**	**19.6**	**66.2**	**44397.2**

*These calculations represent worst-case emissions from construction activities associated with Fix-In-Place Alternative work

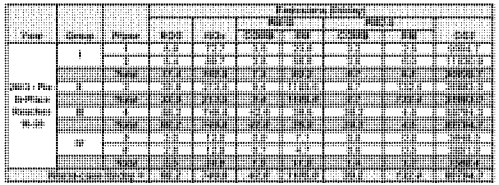

Table 19a: Sutter County NLIP Phase 4b Emissions

Unmitigated 2012 Emissions

Project Element	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
NCC Bridge	5.59	37.51	3.06	103.95	2.84	16.39	0.16	0.91	0.07	0.75	0.07	0.19	114.17
NCC South Levee	7.61	53.98	2.43	356.31	2.24	39.00	0.15	1.33	0.06	7.63	0.05	0.89	165.20
TOTAL =	13.20	91.47	5.51	461.87	5.08	55.96	0.31	2.24	0.13	8.37	0.12	0.99	279.36

Mitigated 2012 Emissions

	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
% Reduction	5%	40%	45%	95%	45%	95%	5%	40%	45%	95%	45%	95%	-
	5%	40%	3.0	68.3	2.8	8.4	5%	40%	0.1	1.3	0.1	0.1	-
TOTAL	12.6	54.9	72.3		11.2		0.3	1.3	1.3		0.2		279.36
Threshold	25	25	80		80		4.5	4.5	-		-		-
Significant ?before offset payment?	No	Yes	No		-		No	No	-		-		-

Table 19b: Sacramento County NLIP Phase 4b Emissions

Unmitigated 2012 Emissions

Project Element	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
ARNL Reach I: 1-4	14.02	144.01	6.71	350.65	6.18	49.20	0.87	6.22	0.29	31.96	0.27	3.49	718.03
TOTAL =	14.02	144.01	6.71	350.65	6.18	49.20	0.87	6.22	0.29	31.96	0.27	3.49	718.03

Mitigated 2012 Emissions

	Worst-Case lb/day						Tons/year						
	RGG	NOx	PM10		PM2.5		RGG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
% Reduction	5%	40%	45%	95%	45%	95%	5%	40%	45%	95%	45%	95%	-
			3.7	67.6	3.4	7.4			0.2	4.9	0.1	0.6	718.03
TOTAL	13.3	86.4	71.3		10.8		0.8	3.7	5.0		0.7		
Threshold	-	85	-		-		25	25	100		100		-
Significant ?before offset payment?	-	Yes	-		-		No	No	No		No		-

Table 19a: Sutter County NLIP Phase 4b Emissions

Unmitigated 2013 Emissions

Project Element	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
No Activity	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL =													-

Mitigated 2013 Emissions

	Worst-Case lb/day						Tons/year						
	RGG	NOx	PM10		PM2.5		RGG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
% Reduction	5%	40%	45%	95%	45%	95%	5%	40%	45%	95%	45%	95%	-
TOTAL													-
Threshold	25	25	80		80		4.5	4.5	-		-		-
Significant ?before offset payment?	-												-

Table 19b: Sacramento County NLIP Phase 4b Emissions

Unmitigated 2013 Emissions

Project Element	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
ARNL Reach I: 1-4	23.46	169.24	9.91	28.32	9.14	3.01	0.89	5.71	0.33	0.82	0.30	0.09	738.24
West Drainage Canal	4.28	37.86	1.57	439.65	1.45	55.85	0.16	1.31	0.05	21.64	0.05	2.42	179.08
City of Sacramento Pumps	10.15	88.36	4.35	1.77	4.00	0.19	0.61	4.82	0.26	0.11	0.24	0.01	596.99
Fic-In-Place SRBL Reaches 18-20 - First 50%	44.12	374.91	21.28	592.76	19.59	66.22	2.66	19.94	1.03	42.64	0.95	4.77	2454.48
TOTAL =	81.93	662.47	37.11	1062.53	34.18	125.27	4.23	31.79	1.67	65.41	1.54	7.30	3968.79

Mitigated 2013 Emissions

	Worst-Case lb/day						Tons/year						
	RGG	NOx	PM10		PM2.5		RGG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
% Reduction	5%	40%	45%	95%	45%	95%	5%	40%	45%	95%	45%	95%	-
			20.4	168.4	18.8	16.9			0.9	9.8	0.9	1.1	3968.8
TOTAL	77.8	397.5	179.8		37.8		4.0	19.1	10.7		1.9		3968.8
Threshold	-	85	-		-		25	25	100		100		-
Significant ?before offset payment?	-	Yes	-		-		No	No	No		No		-

Table 19a: Sutter County NLIP Phase 4b Emissions

Unmitigated 2014 Emissions

Project Element	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
PGCC Culvert	11.66	97.33	17.61	59.71	5.85	6.35	0.22	1.72	0.36	0.97	0.10	0.10	218.87
Ridge Road	1.73	13.08	9.59	108.47	0.54	13.68	0.06	0.43	0.02	1.32	0.02	0.14	61.11
Triangle Properties	3.99	31.97	1.59	54.74	1.47	0.94	0.29	2.29	0.12	1.87	0.11	0.06	304.99
TOTAL =	17.48	142.35	19.90	194.92	7.87	20.96	0.57	4.54	0.42	4.16	0.23	0.31	584.96

Mitigated 2014 Emissions

	Worst-Case lb/day						Tons/year						
	RGG	NOx	PM10		PM2.5		RGG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
% Reduction	5%	40%	45%	95%	45%	95%	5%	40%	45%	95%	45%	95%	-
			10.9	29.2	4.3	3.1			0.2	0.6	0.1	0.0	585.0
TOTAL	16.6	85.4	40.1		7.5		0.5	2.7	0.9		0.2		585.0
Threshold	25	25	80		80		4.5	4.5	-		-		-
Significant ?before offset payment?	No	Yes	No		No		No	No	-		-		-

Table 19b: Sacramento County NLIP Phase 4b Emissions

Unmitigated 2014 Emissions

Project Element	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
Fic-In-Place SRBL Reaches 18-20 - Last 50%	44.12	374.91	21.28	592.76	19.59	66.22	2.66	19.94	1.03	42.64	0.95	4.77	2454.48
Lakeside School Borrow Site	3.61	29.47	1.45	21.31	1.34	0.94	0.42	3.39	0.17	1.50	0.15	0.09	469.02
TOTAL =	47.73	404.38	22.74	614.09	20.93	67.07	3.08	23.32	1.19	44.44	1.10	4.85	2923.50

Mitigated 2014 Emissions

	Worst-Case lb/day						Tons/year						
	RGG	NOx	PM10		PM2.5		RGG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
% Reduction	5%	40%	45%	95%	45%	95%	5%	40%	45%	95%	45%	95%	-
			12.5	92.1	11.5	10.1			0.7	6.7	0.6	0.7	2923.50
TOTAL	45.3	242.6	104.6		21.8		2.9	14.0	7.3		1.3		2923.50
Threshold	-	85	-		-		25	25	100		100		-
Significant ?before offset payment?	-	Yes	-		-		No	No	No		No		-

Table 19a: Sutter County NLIP Phase 4b Emissions

Unmitigated 2015 Emissions

Project Element	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
PGCC - Levee Raise	3.55	27.04	1.40	56.29	1.29	4.17	0.14	0.93	0.04	1.48	0.04	0.17	113.99
PGCC - Waterside	1.18	8.15	0.46	11.30	0.42	1.35	0.05	0.36	0.02	0.15	0.02	0.02	53.63
TOTAL =	4.74	35.19	1.86	67.59	1.71	5.37	0.19	1.29	0.06	1.60	0.06	0.18	167.62

Mitigated 2015 Emissions

	Worst-Case lb/day						Tons/year						
	RGG	NOx	PM10		PM2.5		RGG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
% Reduction	5%	40%	45%	95%	45%	95%	5%	40%	45%	95%	45%	95%	-
			1.0	7.1	0.9	0.9			0.0	0.2	0.0	0.0	167.62
TOTAL	4.5	21.1	8.2		1.7		0.2	0.8	0.3		0.1		167.62
Threshold	25	25	80		80		4.5	4.5	-		-		-
Significant ?before offset payment?	No	No	No		No		No	No	-		-		-

Table 19b: Sacramento County NLIP Phase 4b Emissions

Unmitigated 2015 Emissions

Project Element	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
District 1000 Pumping Plants	10.15	88.36	4.35	1.77	4.00	0.19	0.61	5.42	0.26	0.11	0.24	0.01	715.99
NEMDC South - Levee Raise	63.43	482.94	25.06	647.99	23.06	74.42	2.55	16.57	0.78	25.99	0.72	2.98	2023.80
NEMDC South - Waterside	3.68	19.60	1.65	27.50	1.52	2.91	0.13	0.87	0.05	0.36	0.04	0.04	129.61
TOTAL =	76.44	592.89	30.53	677.06	28.10	77.51	3.49	23.87	1.17	26.49	1.06	3.04	2979.39

Mitigated 2015 Emissions

	Worst-Case lb/day						Tons/year						
	RGG	NOx	PM10		PM2.5		RGG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
% Reduction	5%	40%	45%	95%	45%	95%	5%	40%	45%	95%	45%	95%	-
			16.8	101.6	16.5	11.6			0.6	4.0	0.6	0.5	
TOTAL	72.6	349.7	183.4		27.1		3.3	14.3	4.6		1.1		2979.39
Threshold	-	85	-		-		25	25	100		100		-
Significant ?before offset payment?	-	Yes	-		-		No	No	No		No		-

Table 19a: Sutter County NLIP Phase 4b Emissions

Unmitigated 2016 Emissions

Project Element	Worst-Case lb/day						Tons/year						
	ROG	NOx	PM10		PM2.5		ROG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
NEMDC North	22.39	129.15	8.41	715.70	33.30	72.55	1.90	10.84	0.51	55.45	1.78	6.10	1223.50
TOTAL =	22.39	129.15	8.41	715.70	33.30	72.55	1.90	10.84	0.51	55.45	1.78	6.10	1223.50

Mitigated 2016 Emissions

	Worst-Case lb/day						Tons/year						
	RGG	NOx	PM10		PM2.5		RGG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
% Reduction	5%	40%	45%	95%	45%	95%	5%	40%	45%	95%	45%	95%	-
			3.5	71.6	16.3	7.3			0.3	9.5	1.0	0.6	1223.50
TOTAL	21.3	77.5	75.1		25.8		1.8	6.5	5.8		1.6		1223.50
Threshold	25	25	80		80		4.5	4.5	-		-		-

Table 19b: Sacramento County NLIP Phase 4b Emissions

Unmitigated 2016 Emissions

Project Element	Worst-Case lb/day						Tons/year						
	RGG	NOx	PM10		PM2.5		RGG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	
NEMDC North	23.67	136.58	6.79	756.86	35.21	76.72	2.01	11.46	0.54	58.64	1.88	6.45	1293.83
TOTAL =	23.67	136.58	6.79	756.84	35.21	76.72	2.01	11.46	0.54	58.64	1.88	6.45	1293.83

Mitigated 2016 Emissions

	Worst-Case lb/day						Tons/year						
	RGG	NOx	PM10		PM2.5		RGG	NOx	PM10		PM2.5		CO2
			Comb.	EM	Comb.	EM			Comb.	EM	Comb.	EM	

Table 18a: Sutter County NLIP Phase 4b Emissions

Unmitigated 2012 Emissions											
Significant *before offset payment?	No	Yes	No	No	No	Yes	-				-

1. Implementation of a PRAQMD-approved Fugitive Dust Plan will reduce emissions of PM10 and PM2.5 by 85-90%, enhanced fugitive dust control measures including use of chemical stabilizers will be used during activities with high levels of earthmoving activities.

Table 18b: Fix-In Place Summary, Unmitigated Emissions (includes activities within Sutter and Sacramento Counties)

	Worst-Case lb/day						Tons/year					
			PM10		PM2.5				PM10		PM2.5		
Year	ROG	NOx	Comb.	EM	Comb.	EM	ROG	NOx	Comb.	EM	Comb.	EM	CO2
2012	27.33	235.48	12.22	912.52	11.26	105.08	1.18	9.46	0.43	40.34	0.30	80.19	997.40
2013	61.93	662.47	37.11	1082.53	34.16	125.22	4.23	31.79	1.67	65.41	1.54	7.30	3806.79
2014	65.19	646.73	42.54	608.01	28.80	87.92	3.55	27.96	1.61	48.59	1.23	4.90	3500.48
2015	61.58	616.07	32.39	724.05	29.81	82.68	3.06	25.15	1.24	26.02	15.40	11.65	3046.91
2016	46.06	265.73	13.19	1472.54	68.51	149.27	3.91	22.30	1.05	114.08	3.66	12.54	2517.33

*Represents peak day/year

Table 18c: Fix-In Place Summary, Mitigated Emissions (inlucded activities within Sutter and Sacramento Counties)

	Worst-Case lb/day						Tons/year					
			PM10		PM2.5				PM10		PM2.5		
Year	ROG	NOx	Comb.	EM	Comb.	EM	ROG	NOx	Comb.	EM	Comb.	EM	CO2
2012	25.9	141.3	6.7	136.9	6.2	15.8	1.1	6.1	0.4	33.2	0.2	0.7	997.4
2013	22.8	337.5	20.4	159.4	18.8	16.6	4.0	16.0	0.9	9.5	0.6	1.1	3806.8
2014	61.9	326.0	23.4	171.4	15.8	13.2	3.5	16.7	0.2	0.0	0.7	0.8	3500.5
2015	27.1	370.8	17.8	168.7	33.6	16.9	3.5	15.1	4.9	0.0	0.6	0.5	3046.9
2016	43.8	159.4	7.3	147.3	37.7	14.9	3.7	13.4	12.9	0.0	2.0	1.3	2517.3

*Represents peak day/year

Table 18b: Sacramento County NLIP Phase 4b Emissions

Unmitigated 2012 Emissions													
% Reduction	5%	40%	45%	90%	45%	90%	5%	40%	45%	90%	45%	90%	-
			3.7	75.7	19.4	7.7			0.3	5.9	1.0	0.6	
TOTAL	22.5	61.9	79.4		27.0		1.9	6.9	6.2		1.7		1293.83
Threshold	-	85					25	25	100		100		-
Significant *before offset payment ?	-	No	-		-		No	No	No		No		-

1. Implementation of a SMAQMD-approved Fugitive Dust Plan will reduce emissions of PM10 and PM2.5 by 85-90%, enhanced fugitive dust control measures including use of chemical stabilizers will be used during activities with high levels of earthmoving activities.

Table 20: Phase 2 NLIP Emissions Summary															
Mitigated 2008 Emissions															
	Worst-Case lb/day			Tons/year				Sacramento	Worst-Case lb/day			Tons/year			
Sutter County	**ROG**	**NOX**	**PM10**	**ROG**	**NOX**	**PM10**	**CO2***	**County**	**ROG**	**NOX**	**PM10**	**ROG**	**NOX**	**PM10**	**CO2***
TOTAL	160.4	697.4	920.7	8.8	39.8	67.3	-	**TOTAL**	37.3	144.0	142.2	1.7	7.4	6.3	-
Mitigated 2010 Emissions															
	Worst-Case lb/day			Tons/year				Sacramento	Worst-Case lb/day			Tons/year			
Sutter County	**ROG**	**NOX**	**PM10**	**ROG**	**NOX**	**PM10**	**CO2***	**County**	**ROG**	**NOX**	**PM10**	**ROG**	**NOX**	**PM10**	**CO2***
TOTAL	15.7	66.6	131.2	0.7	3.3	7.1	-	**TOTAL**	5.6	21.6	21.3	0.2	1.1	0.9	-

*CO2 was not evaluated in Phase 2

Phase 3 NLIP Emissions Summary															
Mitigated 2009 Emissions (100% could occur in 2010)															
	Worst-Case lb/day			Tons/year				Sacramento	Worst-Case lb/day			Tons/year			
Sutter County	**ROG**	**NOX**	**PM10**	**ROG**	**NOX**	**PM10**	**CO2**	**County**	**ROG**	**NOX**	**PM10**	**ROG**	**NOX**	**PM10**	**CO2**
TOTAL	74.6	413.3	971.4	7.4	43.7	94.3	2740.9	**TOTAL**	93.3	498.7	1283.3	6.0	33.0	89.0	1876.8

"No Action Alternative" Emissions Summary (Phase 2 and 3 only)														
	Sutter County								Sacramento County					
	Worst-Case lb/day			Tons/yr					Worst-Case lb/day			Tons/yr		
	ROG	**NOX**	**PM10**	**ROG**	**NOX**	**PM10**	**CO2**		**ROG**	**NOX**	**PM10**	**ROG**	**NOX**	**PM10**	**CO2**
2008 Max Total	160.4	697.4	920.7	8.8	39.8	67.3	-	2008 Max Total	37.3	144.0	142.2	1.7	7.4	6.3	-
2009 Max Total	74.6	413.3	971.4	7.4	43.7	94.3	2740.9	2009 Max Total	93.3	498.7	1283.3	6.0	33.0	89.0	1876.8
2010 Max Total*	90.3	479.8	1102.6	8.1	47.1	101.4	2740.9	2010 Max Total*	98.9	520.3	1304.6	6.3	34.1	89.9	1876.8
*Assumes 100% of Phase 3 is conducted in 2010								*Assumes 100% of Phase 3 is conducted in 2010							

Table 21 (REVISED): Detailed Annual Emissions Summary During 2007-2016 Construction Seasons - Adjusted Schedule

Phase Components	Annual Emissions 2007 (TPY) ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	Annual Emissions 2008 (TPY) ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	Annual Emissions 2009 (TPY) ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM
Phase 1																		
NCC South Levee - westernmost 12,500 ft. through seepage and underseepage remediation	0.72	5.0	7.7	89.0	0.8	9.7	1.1	7.5	11.6	133.5	1.2	14.5	-	-	-	-	-	-
Phase 2																		
NCC South Levee - levee raising and seepage remediation	-	-	-	-	-	-	-	-	-	-	-	-	4.0	22.0	6.4	73.6	6.4	8.0
SREL Reaches 1-4B	-	-	-	-	-	-	-	-	-	-	-	-	1.2	6.4	3.4	38.6	0.3	42.0
Elkhorn/GGS Canal Relocation	-	-	-	-	-	-	-	-	-	-	-	-	0.8	4.6	0.3	2.9	0.0	0.3
Phase 3																		
PGCC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SREL Reaches 5A-9B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Elkhorn/GGS Canal Improvements	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NEMDC S. (Cutoff wall installation) to be constructed by ACOE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phase 4a																		
NCC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SREL Reaches 10-15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Riverside Canal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RD Pumping Plants No. 3 & 5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fisherman's Lake Excavation and Res	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phase 4b																		
Riego Road	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCC Bridge	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCC South Levee	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Triangle Properties Borrow Site Rehabilitation/Excavation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ARNL Reach I: 1-4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PGCC/NEMDC South - Waterside	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PGCC/NEMDC South - Levee Raise	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
West Drainage Canal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
District 1000 Pumping Plants	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
City of Sacramento Pumps	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PGCC Culvert	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NEMDC North	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SREL Reaches 16-20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
So. Fisherman & W. Lakeside Borrow Site Excavation/Rehabilitation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Annual Emissions Total, Uncontrolled =	0.7	5.0	7.7	89.0	0.8	9.7	1.1	7.5	11.6	133.5	1.2	14.5	6.0	33.7	10.0	115.2	6.8	56.3
Control Efficiency[1] =	5%	20%	45%	95%	45%	85%	5%	20%	45%	95%	45%	85%	5%	40%	45%	85%	45%	85%
Annual Emissions Total, Controlled	0.7	4.0	4.3	4.5	0.4	1.5	1.0	6.0	6.4	6.7	0.6	2.2	5.7	19.9	5.5	17.3	3.7	7.5
Annual Emissions Total, Controlled	0.7	4.0	8.7		1.9		1.0	6.0	13.1		2.8		5.7	19.9	22.8		11.3	
General Conformity Threshold	50	50	100		100		50	50	100		100		50	50	100		100	
De Minimus/Regional Significance	NO	NO	NO		NO		NO	NO	NO		NO		NO	NO	NO		NO	

Phase Components	Annual Emissions 2010 (TPY) ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	Annual Emissions 2011 (TPY) ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	Annual Emissions 2012 (TPY) ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM
Phase 1																		
NCC South Levee - westernmost 12,500 ft. through seepage and underseepage remediation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phase 2																		
NCC South Levee - levee raising and seepage remediation	-	-	-	-	-	-												
SREL Reaches 1-4B	4.8	25.6	13.4	154.6	1.4	168.0	-	-	-	-	-	-	-	-	-	-	-	-
Elkhorn/GGS Canal Relocation	0.2	1.2	0.1	0.7	0.0	0.1	-	-	-	-	-	-	-	-	-	-	-	-
Phase 3																		
PGCC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SREL Reaches 5A-9B	4.2	25.5	3.4	342.0	0.0	0.3	-	-	-	-	-	-	-	-	-	-	-	-
Elkhorn/GGS Canal Improvements	0.8	7.2	0.7	14.9	0.1	1.5	-	-	-	-	-	-	-	-	-	-	-	-
NEMDC S. (Cutoff wall installation) to be constructed by ACOE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phase 4a																		
NCC	-	-	-	-	-	-	0.3	1.4	0.1	4.1	0.1	0.5	-	-	-	-	-	-
SREL Reaches 10-15	-	-	-	-	-	-	5.4	31.4	1.3	443.5	1.2	48.1	4.4	25.7	1.1	362.9	1.0	39.3
Riverside Canal	-	-	-	-	-	-	-	-	-	-	-	-	1.1	5.5	0.3	52.0	0.2	5.2
RD Pumping Plants No. 3 & 5	-	-	-	-	-	-	0.6	4.8	0.3	0.0	0.2	0.0	-	-	-	-	-	-
Fisherman's Lake Excavation and Res	-	-	-	-	-	-	0.3	1.9	0.1	5.0	0.1	1.1	-	-	-	-	-	-
Phase 4b																		
Riego Road	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCC Bridge	-	-	-	-	-	-	-	-	-	-	-	-	0.2	0.9	0.1	0.7	0.1	0.1
NCC South Levee	-	-	-	-	-	-	-	-	-	-	-	-	0.2	1.3	0.1	7.6	0.1	0.9
Triangle Properties Borrow Site Rehabilitation/Excavation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ARNL Reach I: 1-4	-	-	-	-	-	-	-	-	-	-	-	-	0.9	6.2	0.3	32.0	0.3	3.5
PGCC/NEMDC South - Waterside	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PGCC/NEMDC South - Levee Raise	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
West Drainage Canal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
District 1000 Pumping Plants	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
City of Sacramento Pumps	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PGCC Culvert	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NEMDC North	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SREL Reaches 16-20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
So. Fisherman & W. Lakeside Borrow Site Excavation/Rehabilitation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Annual Emissions Total, Uncontrolled =	10.0	59.5	17.5	512.2	1.5	169.9	6.6	39.5	1.8	452.6	1.6	49.6	6.7	39.6	1.8	455.2	1.6	49.0
Control Efficiency[1] =	5%	40%	45%	85%	45%	85%	5%	40%	45%	85%	45%	85%	5%	40%	45%	85%	45%	85%
Annual Emissions Total, Controlled	9.5	35.7	9.7	76.8	0.8	25.5	6.3	23.7	1.0	67.9	0.9	7.4	6.4	23.8	1.0	68.3	0.9	7.4
Annual Emissions Total, Controlled	9.5	35.7	86.5		26.3		6.3	23.7	68.9		8.3		6.4	23.8	69.2		8.2	
General Conformity Threshold	50	50	100		100		25	25	100		100		25	25	100		100	
De Minimus/Regional Significance	NO	NO	NO		NO		NO	NO	NO		NO		NO	NO	NO		NO	

Phase Components	Annual Emissions 2013 (TPY) ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	Annual Emissions 2014 (TPY) ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	Annual Emissions 2015 (TPY) ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM	Annual Emissions 2016 (TPY) ROG	NOX	PM10 COMB	PM10 EM	PM2.5 COMB	PM2.5 EM
Phase 1																								
NCC South Levee - westernmost 12,500 ft. through seepage and underseepage remediation	-	-	-	-	-	-	-	-	-	-	-	-												
Phase 2																								
NCC South Levee - levee raising and seepage remediation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SREL Reaches 1-4B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Elkhorn/GGS Canal Relocation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phase 3																								
PGCC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SREL Reaches 5A-9B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Elkhorn/GGS Canal Improvements	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NEMDC S. (Cutoff wall installation) to be constructed by ACOE	-	-	-	-	-	-	-	-	-	-	-	-	1.3	8.4	0.6	12.8	0.2	0.1	-	-	-	-	-	-
Phase 4a																								
NCC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SREL Reaches 10-15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Riverside Canal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RD Pumping Plants No. 3 & 5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fisherman's Lake Excavation and Res	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phase 4b																								
Riego Road	-	-	-	-	-	-	0.1	0.4	0.0	1.3	0.0	0.1	-	-	-	-	-	-	-	-	-	-	-	-
NCC Bridge	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCC South Levee	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Triangle Properties Borrow Site Rehabilitation/Excavation	-	-	-	-	-	-	0.3	2.4	0.1	1.9	0.1	0.1	-	-	-	-	-	-						
ARNL Reach I: 1-4	0.6	5.7	0.3	0.8	0.3	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PGCC/NEMDC South - Waterside	-	-	-	-	-	-	-	-	-	-	-	-	0.2	1.2	0.1	0.5	0.1	0.1	-	-	-	-	-	-
PGCC/NEMDC South - Levee Raise	-	-	-	-	-	-	-	-	-	-	-	-	2.7	17.5	0.8	27.4	0.8	3.2	-	-	-	-	-	-
West Drainage Canal	0.2	1.3	0.1	21.8	0.1	2.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
District 1000 Pumping Plants	-	-	-	-	-	-	-	-	-	-	-	-	0.8	6.4	0.3	0.1	0.3	0.0	-	-	-	-	-	-
City of Sacramento Pumps	0.6	4.8	0.3	0.1	0.2	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PGCC Culvert	-	-	-	-	-	-	0.2	1.7	0.3	1.0	0.1	0.1	-	-	-	-	-	-	-	-	-	-	-	-
NEMDC North	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.9	22.3	1.1	114.1	3.7	12.5
SREL Reaches 16-20	2.5	17.9	0.9	69.6	0.9	7.5	2.5	17.9	0.9	69.6	0.9	7.5	-	-	-	-	-	-	-	-	-	-	-	-
So. Fisherman & W. Lakeside Borrow Site Excavation/Rehabilitation	-	-	-	-	-	-	0.4	3.4	0.2	1.6	0.2	0.1	-	-	-	-	-	-	-	-	-	-	-	-
Annual Emissions Total, Uncontrolled =	4.1	29.8	1.6	91.4	1.5	10.1	3.5	25.9	1.5	74.6	1.3	7.9	5.0	33.6	1.8	40.9	1.3	3.3	3.9	22.3	1.1	114.1	3.7	12.5
Control Efficiency[1] =	5%	40%	45%	85%	45%	85%	5%	40%	45%	85%	45%	85%	5%	40%	45%	85%	45%	85%	5%	40%	45%	85%	45%	85%
Annual Emissions Total, Controlled	3.9	17.9	0.9	13.7	0.8	1.5	3.3	15.5	0.8	11.2	0.7	1.2	4.7	20.1	1.0	6.1	0.7	0.5	3.7	13.4	0.6	17.1	2.0	1.9
Annual Emissions Total, Controlled	3.9	17.9	14.6		2.3		3.3	15.5	12.0		1.9		4.7	20.1	7.1		1.2		3.7	13.4	17.7		3.9	
General Conformity Threshold	25	25	100		100		25	25	100		100		25	25	100		100		25	25	100		100	
De Minimus/Regional Significance	NO	NO	NO		NO		NO	NO	NO		NO		NO	NO	NO		NO		NO	NO	NO		NO	

1. Control efficiencies are based on implemented control measures, per SMAQMD CEQA Guidance: control efficiency for NOx emissions is based on enhanced exhaust control measures per SMAQMD CEQA Guidance, including submittal of contracted construction fleet inventories for demonstration of 20% control compared to the ARB fleetwide average, with an additional 20% reduction imposed by the project to meet general conformity thresholds. A total NOx reduction of 40% from state-wide fleet averages will be required for years 2010 forward for all project phases. The control efficiency of 85-90% for PM10/PM2.5 is based on implementation of enhanced dust control measures through implementation of a developed Fugitive Dust Control Plan; control efficiency of ROG is based on compliance with SMAQMD Rule 442 Architectural Coatings.

2. Emissions from Phase 3 were included in the Phase 3 FEIS, and were approved through the authorization of the Record of Decisions (ROD), prior to the conformity limit change from 50 TPY top 25 TPY. Therefore, 50 TPY is the correct General Conformity Threshold applicable to Phase 3 emissions of VOCs and NOx.

Particulate Matter Emissions
COMB = Combustion Emissions
EM = Earthmoving

Table 22: Phase 4b - SMAQMD Offset Mitigation Fee Summary

1. For both residential and non-residential acreage entries EXCLUDE ONLY undisturbed (not graded) Open Space.
2. Append this calculation sheet to the environmental document.
3. Unmitigated NOx (lbs/day) and duration (days) should be consistent with URBEMIS results.

Construction Emissons Mitigation Fee Calculation

PART 1: PROJECT INFORMATION

Project Name: SAFCA - Phase 4b - 2011 NLIP Construction Emissions within SMAQMD's Jurisdiction

PART 2: EMISSIONS INFORMATION

Year	Activity Phase	NOx (lbs/day) unmitigated	NOx (lbs/day) mitigated*	NOx over threshold (lbs/day)	duration (days)	Total significant NOx (lbs)
2012	ARNL Reaches 1-4	144.01	86.41	1.41	27	38.04
	Total project Nox over threshold (lbs)		*38.04*			
	Total project Nox over threshold (tons)		*0.02*			

PART 3: MITIGATION FEE RESULTS

*TOTAL MITIGATION FEE ($16,400/TON)***	***$312***
Administrative Fee (5%)	***$16***
TOTAL MITIGATION FEE	***$328***

>>> *Fee is to be paid to the SMAQMD prior to any ground disturbance either in total or on a by acre basis.*

* Assumes a construction mitigation plan which achieves a 40% reduction in NOx from on-site, off-road equipment.
** Or the $/ton of NOx cost-effectiveness value in effect at the time the fee is collected.

PART 2: EMISSIONS INFORMATION

Year	Activity Phase	NOx (lbs/day) unmitigated	NOx (lbs/day) mitigated*	NOx over threshold (lbs/day)	duration (days)	Total significant NOx (lbs)
2013	ARNL Reaches 1-4	169.34	101.60	16.60	60	996.20
2013	West Drainage Canal	37.86	22.72	22.72	28	636.16
2013	City of Sacramento Pumps	80.36	48.21	48.21	40	1928.40
2013	SREL Reaches 16-20 - Initial 50%	374.91	224.95	224.95	30	6748.50
2013	**Total Activities =**					**10309.26**
	Total project Nox over threshold (lbs)		*10309.26*			
	Total project Nox over threshold (tons)		*5.15*			

PART 3: MITIGATION FEE RESULTS

*TOTAL MITIGATION FEE ($16,400/TON)***	***$84,536***
Administrative Fee (5%)	***$4,227***
TOTAL MITIGATION FEE	***$88,763***

>>> *Fee is to be paid to the SMAQMD prior to any ground disturbance either in total or on a by acre basis.*

* Assumes a construction mitigation plan which achieves a 40% reduction in NOx from on-site, off-road equipment.
** Or the $/ton of NOx cost-effectiveness value in effect at the time the fee is collected.

PART 2: EMISSIONS INFORMATION

Year	Activity Phase	NOx (lbs/day) unmitigated	NOx (lbs/day) mitigated*	NOx over threshold (lbs/day)	duration (days)	Total significant NOx (lbs)
2014	SREL Reaches 16-20 - Remaining 50%	374.91	224.95	139.95	30	4198.35
2014	Lakeside School Borrow Site	29.47	17.68	17.68	140	2475.58
2014	**Total Activities =**					**6673.94**
	Total project Nox over threshold (lbs)		*6673.94*			
	Total project Nox over threshold (tons)		*3.34*			

PART 3: MITIGATION FEE RESULTS

*TOTAL MITIGATION FEE ($16,400/TON)***	***$54,726***
Administrative Fee (5%)	***$2,736***
TOTAL MITIGATION FEE	***$57,463***

>>> *Fee is to be paid to the SMAQMD prior to any ground disturbance either in total or on a by acre basis.*

* Assumes a construction mitigation plan which achieves a 40% reduction in NOx from on-site, off-road equipment.
** Or the $/ton of NOx cost-effectiveness value in effect at the time the fee is collected.

PART 2: EMISSIONS INFORMATION

Year	Activity Phase	NOx (lbs/day) unmitigated	NOx (lbs/day) mitigated*	NOx over threshold (lbs/day)	duration (days)	Total significant NOx (lbs)
2015	District 1000 Pumping Plants	80.36	48.21	48.21	120	5785.70
2015	NEMDC South - Levee Raise	482.64	289.70	204.70	14	2917.04
2015	NEMDC South - Waterside	19.69	11.81	11.81	14	168.70
2015	**Total Activities =**					**8871.45**
	Total project Nox over threshold (lbs)		*8871.45*			
	Total project Nox over threshold (tons)		*4.44*			

PART 3: MITIGATION FEE RESULTS

*TOTAL MITIGATION FEE ($16,400/TON)***	***$72,746***

Table 22: Phase 4b - SMAQMD Offset Mitigation Fee Summary	
Administrative Fee (5%)	*$3,637*
TOTAL MITIGATION FEE	*$76,383*

>>> *Fee is to be paid to the SMAQMD prior to any ground disturbance either in total or on a by acre basis.*

* Assumes a construction mitigation plan which achieves a 40% reduction in NOx from on-site, off-road equipment.
** Or the $/ton of NOx cost-effectiveness value in effect at the time the fee is collected.

PART 2: EMISSIONS INFORMATION

Year	Activity Phase	NOx (lbs/day) unmitigated	NOx (lbs/day) mitigated*	NOx over threshold (lbs/day)	duration (days)	Total significant NOx (lbs)
2016	NEMDC North	136.58	81.95	0	85	0.00
	Total project Nox over threshold (lbs)		*0.00*			
	Total project Nox over threshold (tons)		*0.00*			

PART 3: MITIGATION FEE RESULTS

*TOTAL MITIGATION FEE ($16,400/TON)***	*$0*
Administrative Fee (5%)	*$0*
TOTAL MITIGATION FEE	*$0*

>>> *Fee is to be paid to the SMAQMD prior to any ground disturbance either in total or on a by acre basis.*

Mitigation Fee ($/acre)	-

* Assumes a construction mitigation plan which achieves a 40% reduction in NOx from on-site, off-road equipment.
** Or the $/ton of NOx cost-effectiveness value in effect at the time the fee is collected.

Phase 4b - SMAQMD Mitigation Fee Summary	
Year	Fee Total
2012	$328
2013	$88,763
2014	$57,463
2015	$76,383
2016	$0
TOTAL =	$222,936

Equipment Type	Emission Rates for Year 2010											
	ROG	NOX	PM10	PM2.5	CO2	Unit	ROG	NOX	PM10	PM2.5	CO2	Unit
Employee Light-Duty Trucks	0.023	0.029	0.004	0.004	39.255	lb/day/employee						
Haul Trucks	1.19	15.82	0.62	0.57	1847.96	g/mile	11.60	8.19	0.016	0.014	223.55	g/trip
Backhoes	0.2057	1.3752	0.0650	0.0598	312.8457	lb/day						
Bore/Drill Rigs	0.2041	2.3385	0.0841	0.0774	426.6076	lb/day						
Compactor	0.2862	1.7983	0.0856	0.0787	244.5886	lb/day						
Concrete/Industrial Saws	0.5051	3.2230	0.1580	0.1454	415.2317	lb/day						
Cranes	0.2472	2.4061	0.0929	0.0855	244.5885	lb/day						
Crawler Tractors	0.5212	4.8719	0.2034	0.1871	369.7268	lb/day						
Crushing/Proc. Equipment	0.6290	4.9396	0.2837	0.2610	443.6723	lb/day						
Dozer	0.4579	4.0586	0.1731	0.1592	335.5978	lb/day						
Excavator	0.4244	3.2247	0.1920	0.1766	324.2219	lb/day						
Forklifts, Rough Terrain	0.6643	4.0071	0.3701	0.3405	341.2864	lb/day						
Generator	0.2894	3.7816	0.1139	0.1048	420.9198	lb/day						
Grader	0.4893	3.7944	0.2197	0.2021	346.9744	lb/day						
Loaders, Rubber Tired	0.4274	3.3309	0.1924	0.1770	307.1577	lb/day						
Off-Highway Trucks	0.2966	2.7615	0.1037	0.0954	324.2222	lb/day						
Other Construction Equip.	0.5774	3.7753	0.3236	0.2977	352.6627	lb/day						
Pavers	0.8357	4.9393	0.4357	0.4008	352.6628	lb/day						
Paving Equipment	0.7097	4.2031	0.3702	0.3406	301.4698	lb/day						
Pump	0.7626	4.9115	0.3956	0.3639	420.9197	lb/day						
Rollers	0.6495	3.9873	0.3469	0.3191	318.5338	lb/day						
Scraper	0.4645	4.3611	0.1762	0.1621	409.5438	lb/day						
Signal Boards	1.8307	4.5214	0.4462	0.4105	443.6723	lb/day						
Skid Steer Loaders	0.9654	3.0209	0.2663	0.2450	312.8459	lb/day						
Surfacing Equipment	0.2142	2.3732	0.0856	0.0788	255.9648	lb/day						
Tractors	0.2057	1.3752	0.0650	0.0598	312.8457	lb/day						
Trenchers	0.9928	5.9689	0.5107	0.4698	426.6079	lb/day						
Water Trucks	0.10	1.27	0.05	0.0460	163.47	lb/day						
Fugitive Dust			10			lb/acre/day						
Assumptions: Emission factors from the Road Construction Emissions Model, Version 6.3.2 (SMAQMD 2009) for model year 2010 which assumes equipment operates 8hrs/day												

Equipment Type	Emission Rates for Year 2011											
	ROG	NOX	PM10	PM2.5	CO2	Unit	ROG	NOX	PM10	PM2.5	CO2	Unit
Employee Light-Duty Trucks	0.023	0.029	0.004	0.004	39.255	lb/day/employee						
Haul Trucks	1.19	15.82	0.62	0.57	1847.96	g/mile	11.23	8.015	0.015	0.015	271.220	g/trip
Backhoes	0.1936	1.2770	0.0547	0.05	312.8457	lb/day						
Bore/Drill Rigs	0.2041	2.3385	0.0841	0.08	426.6076	lb/day						
Compactor	0.2862	1.7983	0.0856	0.08	244.5886	lb/day						
Concrete/Industrial Saws	0.5051	3.2230	0.1580	0.15	415.2317	lb/day						
Cranes	0.2472	2.4061	0.0929	0.09	244.5885	lb/day						
Crawler Tractors	0.4819	4.4539	0.1858	0.17	369.7269	lb/day						
Crushing/Proc. Equipment	0.6290	4.9396	0.2837	0.26	443.6723	lb/day						
Dozer	0.4579	4.0586	0.1731	0.16	335.5978	lb/day						
Excavator	0.4244	3.2247	0.1920	0.18	324.2219	lb/day						
Forklifts, Rough Terrain	0.6643	4.0071	0.3701	0.34	341.2864	lb/day						
Generator	0.2894	3.7816	0.1139	0.10	420.9198	lb/day						

Equipment Type	Emission Rates for Year 2010											
	ROG	NOX	PM10	PM2.5	CO2	Unit	ROG	NOX	PM10	PM2.5	CO2	Unit
Grader	0.4893	3.7944	0.2197	0.20	346.9744	lb/day						
Loaders, Rubber Tired	0.4274	3.3309	0.1924	0.18	307.1577	lb/day						
Off-Highway Trucks	0.2966	2.7615	0.1037	0.10	324.2222	lb/day						
Other Construction Equip.	0.5774	3.7753	0.3236	0.30	352.6627	lb/day						
Pavers	0.8357	4.9393	0.4357	0.40	352.6628	lb/day						
Paving Equipment	0.7097	4.2031	0.3702	0.34	301.4698	lb/day						
Pump	0.7626	4.9115	0.3956	0.36	420.9197	lb/day						
Rollers	0.6495	3.9873	0.3469	0.32	318.5338	lb/day						
Scraper	0.4645	4.3611	0.1762	0.16	409.5438	lb/day						
Signal Boards	1.8307	4.5214	0.4462	0.41	443.6723	lb/day						
Skid Steer Loaders	0.9654	3.0209	0.2663	0.24	312.8459	lb/day						
Surfacing Equipment	0.2142	2.3732	0.0856	0.08	255.9648	lb/day						
Tractors	0.1936	1.2771	0.0547	0.05	312.8457	lb/day						
Trenchers	0.9928	5.9689	0.5107	0.47	426.6079	lb/day						
Water Trucks	0.10	1.27	0.05	0.05	163.47	lb/day						
Fugitive Dust			10			lb/acre/day						

Assumptions: Emission factors from the Road Construction Emissions Model, Version 6.3.2 (SMAQMD 2009) for model year 2011 which assumes equipment operates 8hrs/day

Travel on Unpaved Haul Roads (Heavy Duty Trucks):				Travel on Unpaved Haul R	
E(lbs/VMT)=(k)(s/12)^a (W/3)^b	*AP-42 12/03, 13.2.2-4 eq 1a			*E(lbs/VMT)=(k)(s/*	*AP-42 12/03, 13.2.2-4 eq 1a
Where:	PM10				PM2.5
k=Particle Size Multiplier:	1.5	*AP-42 12/03 Table 13.2.2-2; PM10 emissions; industrial roads	*k=Particle Size Multiplier:*	0.15	
s=Silt Content:	4.3	*AP-42 12/03 Table 13.2.2-1, service road	*s=Silt Content:*	4.30	
empirical constants			empirical constants		
a	0.9	*AP-42 12/03 Table 13.2.2-2; PM10 emissions; industrial roads	a	0.90	
b	0.45	*AP-42 12/03 Table 13.2.2-2; PM10 emissions; industrial roads	b	0.45	
W=Vehicle Weight:	11.375	((2+1.25 T/cy*15 cy truck capacity) + 2)/2 (average weight of loaded and unloaded	*W=Vehicle Weight:*	11.38	
	1.08	lbs/VMT	*E(ext)= E[(365-P)*	0.10	
E(ext)= E[(365-P)/365]	*AP-42 12/03 12.2.2-4 eq 2		*Where:*		
Where:			*P=# days/yr with >=0.01 in. precip*	63	
P=# days/yr with >=0.01 in. precip	63	*AP-42 12/03 Figure 13.2.2-1 for Sacramento Co/NOAA Technical Memorandum NWS WR-272; CLIMATE OF SACRAMENTO, CALIFORNIA (June 2005)			0.08
	0.90	lbs/VMT			

Travel on Paved Haul Roads (Heavy Duty Trucks):				Travel on Paved Haul Roa	
E(lbs/VMT)=(k) (sL/2)^.65 (W/3)^1.5 - (	*AP-42 12/03, 13.2.1-4 eq 1			*E(lbs/VMT)=(k) (sL/2)^.65 (W/3)^1.5 - C*	
Where:	PM10			*Where:*	PM2.5
k=Particle Size Multiplier (lb/VMT)	0.016	*AP-42 12/03 Table 13.2.1-1; PM10 emissions; industrial roads	*k=Particle Size Multiplier (lb/VMT)*	0.0024	
sL=road surface silt loading (g/m2)	8.2	*AP-42 12/03 Table 13.2.1-4; quarry roads	*sL=road surface silt loading (g/m2)*	8.20	
W=Vehicle Weight:	11.375	((2+1.25 T/cy*15 cy truck capacity) + 2)/2 (average weight of loaded and unloaded	*W=Vehicle Weight:*	11.38	
C=exhaust, break, tire wear (lb/VMT)	0.00047	*AP-42 12/03 Table 13.2.1-2; PM10 emissions	*C=exhaust, break, tire wear (lb/VMT)*	0.00036	
	0.30	lbs/VMT			0.04
E(ext)= E[1-(P/4N)]	*AP-42 12/03 13.2.1 eq 2		*E(ext)= E[1-(P/4N*	12/03 13.2.1 eq 2	
Where:			*Where:*		

Equipment Type	Emission Rates for Year 2010												
	ROG	NOX	PM10	PM2.5	CO2	Unit	ROG	NOX	PM10	PM2.5	CO2	Unit	
P=# days/yr with >=0.01 in. precip	63					*P=# days/yr with >=0.01 in. precip*	63						
N=number of days in averaging period	365	*AP-42 12/03 Figure 13.2.2-1 for Sacramento Co/NOAA Technical Memorandum NWS WR-272; CLIMATE OF SACRAMENTO, CALIFORNIA (June 2005)				*N=number of days in averaging period*	365						
	0.28	lbs/VMT					0.04						
Fugitive Dust Source Emissions													
	(lb/acre/day)												
Disturbance Area	60.71												
Assumptions: SMAQMD emission factor of 60.71 lbs/acre/day (SMAQMD 1994).													
Aggregate Storage Piles						**Aggregate Storage Piles**							
equipment traffic in storage area, 3. wind erosion of piles, 4. loadout of material through batch or drop operations (AP-42 12/03, chapt. 13.2.4).													
E(lb/ton)=(k)(0.0032)(U/5)^1.3 /(M/2)^1	*AP-42 12/03, 13.2.4-3 eq 1					*E(lb/ton)=(k)(0.0032)(U/5)^1.3 /(M/2)^1.4*							
Where:	**PM10**					*Where:*	**PM2.5**						
k=Particle Size Multiplier:	0.35	*AP-42 12/03 13.2.4-3; PM10 emissions				*k=Particle Size Multiplier:*	0.053						
U=mean wind speed (mph)	8	station, CA RAWS data from 1996-2006 (http://www.wrcc.dri.edu/htmlfiles/westwind.final.html#CALIFORNIA)				*wind speed (mph)*	8						
M=moisture content (%):	2.4	*AP-42 7/98 Table 11.9-3, haul truck				*M=moisture content (%):*	2.4						
	0.0016	lbs/ton					**0.00024**						
Batch Loading at Borrow Area						**Batch Loading at Borrow**							
E(TSP<15 um)=(.119/(M^0.9))	*AP-42 7/98, Table 11.9-1					*E(TSP<15 um)=(.119/(M^0.9))*							
Where:	**PM10**					*Where:*	**PM2.5**						
M=moisture content (%):	2.4	*AP-42 7/98 Table 11.9-3, haul truck				*M=moisture content (%):*	2.4						
	0.05	lb/ton					**0.05**						
*E(TSP<10um)=(E(TSP<15 um)*S)*	*AP-42 7/98, Table 11.9-1					*E(TSP<10um)=(E(TSP<15 um)*S)*							
S=scaling factor	0.75	*AP-42 7/98 Table 11.9-3, haul truck				*S=scaling factor*	0.019						
	0.04	lb/ton					**0.0010**						
Truck Unloading						**Truck Unloading**							
E(TSP<15 um)	**PM10**					*E(TSP<15 um)*	**PM2.5**						
Where:	**0.007**	lb/ton	*AP-42 7/98 Table 11.9-4, end dump truck unloading (batch drop			*Where:*	0.007						
*E(TSP<10um)=(E(TSP<15 um)*S)*	*AP-42 7/98, Table 11.9-1					*E(TSP<10um)=(E(TSP<15 um)*S)*							
S=scaling factor	0.75	*AP-42 7/98 Table 11.9-1, haul truck				*S=scaling factor*	0.019						
	0.005	lb/ton					**0.0001**						
Bulldozing	**PM10**					**Bulldozing**	**PM2.5**						
E(TSP<15 um)=(1(s)^1.5)/(M^1.4)	*AP-42 7/98, Table 11.9-1					*E(TSP<15 um)=(18.6(s)^1.5)/(M^1.4)*							
Where:						*Where:*							
M=moisture content (%):	7.9	*AP-42 7/98 Table 11.9-3, bulldozer				*M=moisture content (%):*	7.9						
s=silt content (%)	6.9	*AP-42 7/98 Table 11.9-3, bulldozer				*s=silt content (%)*	6.9						
	1.00	lb/hr					**1.00**						
*E(TSP<10um)=(E(TSP<15 um)*S)*	*AP-42 7/98, Table 11.9-1					*E(TSP<10um)=(E(TSP<15 um)*S)*							
S=scaling factor	0.75	*AP-42 7/98 Table 11.9-1, bulldozer				*S=scaling factor*	0.105						
	0.75	lb/hr					**0.11**						

Equipment Type	Emission Rates for Year 2010												
	ROG	NOX	PM10	PM2.5	CO2	Unit	ROG	NOX	PM10	PM2.5	CO2	Unit	
Scraper Unloading	PM10					Scraper Unloadi	PM2.5						
E(TSP<15 um)	0.04	lb/ton	*AP-42 7/98 Table 11.9-4, scraper unloading			E(TSP<15 um)	0.04						
*E(TSP<10um)=(E(TSP<15 um)*S)*	*AP-42 7/98, Table 11.9-1					*E(TSP<10um)=(E(TSP<15 um)*S)*							
S=scaling factor	0.75	*AP-42 7/98 Table 11.9-1, bulldozer/haul truck				*S=scaling factor*	0.105						
	0.03	lb/ton					0.0042						

Equipment Type	Emission Rates for Year 2012											
	ROG	NOX	PM10	PM2.5	CO2	Unit	ROG	NOX	PM10	PM2.5	CO2	Unit
Employee Light-Duty Tr	0.023	0.029	0.004	0.004	39.255	lb/day/employee						
Haul Trucks	1.19	15.82	0.62	0.57	1847.96	g/mile	10.736	7.788	0.015	0.01	209.04	g/trip
Backhoes	0.1841	1.1936	0.0462	0.04	312.8458	lb/day						
Bore/Drill Rigs	0.1853	1.8002	0.0597	0.05	426.6079	lb/day						
Compactor	0.2847	1.783	0.0712	0.07	244.5886	lb/day						
Concrete/Industrial Saw	0.5018	3.1773	0.1269	0.12	415.2319	lb/day						
Cranes	0.222	2.082	0.0775	0.07	244.5885	lb/day						
Crawler Tractors	0.4436	3.996	0.1637	0.15	369.7268	lb/day						
Crushing/Proc. Equipme	0.5551	4.3418	0.2515	0.23	443.6722	lb/day						
Dozer	0.4231	3.6492	0.153	0.14	335.5982	lb/day						
Excavator	0.3733	2.783	0.1648	0.15	324.2219	lb/day						
Forklifts, Rough Terrain	0.5688	3.5154	0.3207	0.30	341.2862	lb/day						
Generator	0.2442	3.252	0.0932	0.09	420.9196	lb/day						
Grader	0.4364	3.347	0.1931	0.18	346.9745	lb/day						
Loaders, Rubber Tired	0.3802	2.9334	0.169	0.16	307.1576	lb/day						
Off-Highway Trucks	0.2694	2.3193	0.084	0.08	324.2219	lb/day						
Other Construction Equ	0.4831	3.2926	0.277	0.25	352.6626	lb/day						
Pavers	0.7493	4.481	0.3964	0.36	352.6626	lb/day						
Paving Equipment	0.6371	3.8166	0.3379	0.31	301.4696	lb/day						
Pump	0.6552	4.3599	0.3524	0.32	420.9197	lb/day						
Rollers	0.5707	3.5769	0.3109	0.29	318.534	lb/day						
Scraper	0.4244	3.8426	0.1515	0.14	409.5438	lb/day						
Signal Boards	1.56	4.3699	0.3974	0.37	443.6722	lb/day						
Skid Steer Loaders	0.7338	2.9456	0.2217	0.20	312.8457	lb/day						
Surfacing Equipment	0.1886	2.0623	0.0719	0.07	255.9647	lb/day						
Tractors	0.1841	1.1936	0.0462	0.04	312.8458	lb/day						
Trenchers	0.8915	5.4295	0.467	0.43	426.6079	lb/day						
Water Trucks	0.10	1.27	0.05	0.05	163.47	lb/day						
Fugitive Dust			10			lb/acre/day						
Equipment Type	**Emission Rates for Year 2013**											
	ROG	NOX	PM10	PM2.5	CO2	Unit	ROG	NOX	PM10	PM2.5	CO2	Unit
Employee Light-Duty Tr	0.023	0.029	0.004	0.004	39.255	lb/day/employee						
Haul Trucks	1.19	15.82	0.62	0.57	1847.96	g/mile	10.181	7.568	0.014	0.01225	199.87	g/trip
Backhoes	0.1763	1.232	0.0392	0.04	312.8458	lb/day						
Bore/Drill Rigs	0.1773	1.6044	0.0494	0.05	426.6081	lb/day						
Compactor	0.2847	1.783	0.0698	0.06	244.5885	lb/day						
Concrete/Industrial Saw	0.5011	3.168	0.1228	0.11	415.2316	lb/day						

Equipment Type	Emission Rates for Year 2012											
	ROG	NOX	PM10	PM2.5	CO2	Unit	ROG	NOX	PM10	PM2.5	CO2	Unit
Cranes	0.2106	1.9335	0.0704	0.06	244.5885	lb/day						
Crawler Tractors	0.4257	3.7819	0.1532	0.14	369.7271	lb/day						
Crushing/Proc. Equipm	0.5165	4.0494	0.2299	0.21	443.6722	lb/day						
Dozer	0.4063	3.4579	0.1433	0.13	335.598	lb/day						
Excavator	0.35	2.5861	0.1485	0.14	324.2219	lb/day						
Forklifts, Rough Terrain	0.5237	3.281	0.2903	0.27	341.2864	lb/day						
Generator	0.2272	3.0057	0.0849	0.08	420.9196	lb/day						
Grader	0.412	3.1407	0.1774	0.16	346.9745	lb/day						
Loaders, Rubber Tired	0.3587	2.7506	0.1551	0.14	307.1578	lb/day						
Off-Highway Trucks	0.2583	2.1293	0.0754	0.07	324.2219	lb/day						
Other Construction Equ	0.4403	3.0686	0.2482	0.23	352.6625	lb/day						
Pavers	0.7085	4.262	0.3725	0.34	352.6626	lb/day						
Paving Equipment	0.6028	3.6317	0.3182	0.29	301.4695	lb/day						
Pump	0.6001	4.0782	0.3235	0.30	420.9198	lb/day						
Rollers	0.5339	3.3799	0.2889	0.27	318.5339	lb/day						
Scraper	0.4057	3.6048	0.1399	0.13	409.5436	lb/day						
Signal Boards	1.4148	4.1878	0.3637	0.33	443.6723	lb/day						
Skid Steer Loaders	0.6362	2.7943	0.1928	0.18	312.8458	lb/day						
Surfacing Equipment	0.1772	1.9215	0.0656	0.06	255.9648	lb/day						
Tractors	0.1763	1.232	0.0392	0.04	312.8458	lb/day						
Trenchers	0.8439	5.1713	0.4405	0.41	426.608	lb/day						
Water Trucks	0.10	1.27	0.05	0.05	163.47	lb/day						
Fugitive Dust			10			lb/acre/day						

Table 3.11-1
Summary of Annual Air Quality Data (2006—2008)

	2006	2007	2008
Sacramento–3801 Airport Road			
Ozone			
State standard (1-hour/8-hour average, 0.09/0.07 ppm)			
National standard (8-hour avg., 0.08 ppm)			
Maximum concentration (1-hour/8-hour average, ppm)	0.105/0.086	0.119/0.102	0.109/0.093
Number of days state standard exceeded	5/13	2/8	8/15
Number of days national 8-hour standard exceeded	5	4	9
Respirable Particulate Matter (PM_{10})			
State standard (24-hour average, 50 µg/m³)			
National standard (24-hour average, 150 µg/m³)			
Maximum concentration (µg/m³)	84.0	98.0	71.0
Number of days state standard exceeded	4	6	3
Number of days national standard exceeded	0	0	N/A
Nitrogen Dioxide (NO_2)			
State standard (1-hour average, 0.18 ppm)			
National standard (annual, 0.053 ppm)			
Maximum concentration (µg/m³) (1-hour average, ppm)	0.072	0.064	0.069
Number of days state standard exceeded	0	0	0
Carbon Monoxide (CO)			
State standard (1-hour/8-hour average, 20/9.1 ppm)			
National standard (1-hour/8-hour average, 35/9.5 ppm)			
Maximum concentration (1-hour/8-hour average, ppm)	4.70/3.15	6.30/5.58	N/A /1.83
Number of days state standard exceeded	0	0	0
Number of days national 1-hour/8-hour standard exceeded	0/0	0/0	N/A /0
Yuba City–Almond Street Monitoring Station			
Fine Particulate Matter ($PM_{2.5}$)			
~~*No separate state standard*~~ *State standard (annual, 12 µg/m³)*			
National standard (24-hour average/annual, 35 µg/m³/15 µg/m³)			
Maximum concentration (µg/m³)	51.6	55.8	147.1
Number of days national standard exceeded	3	6	8

Notes: µg/m³ = micrograms per cubic meter; NA = not available; ppm = parts per million by volume
Sources: ARB 2009a, EPA 2009

Table 3.11-2
Ambient Air Quality Standards and Attainment Status Designations for Sutter and Sacramento Counties

Pollutant	Averaging Time	California		National Standards [1]		
		Standards [2,3]	Attainment Status [4]	Primary [3,5]	Secondary [3,6]	Attainment Status [7]
Ozone	1-hour	0.09 ppm (180 µg/m^3)	N (Serious)	–	–	–
	8-hour	0.07 ppm[8] (137 µg/m^3)	Sutter: N Sacramento: N (Serious)	0.075 ppm (157 µg/m^3)	Same as Primary Standard	Sutter: N (Severe -15) Sacramento: N (~~Serious~~ Severe -15)
Carbon Monoxide (CO)	1-hour	20 ppm (23 mg/m^3)	A	35 ppm (40 mg/m^3)	–	U/A
	8-hour	9 ppm (10 mg/m^3)		9 ppm (10 mg/m^3)		
Nitrogen Dioxide (NO_2)[9]	Annual Arithmetic Mean	0.030 ppm (56 µg/m^3)	A	0.053 ppm (100 µg/m^3)	Same as Primary Standard	U/A
	1-hour	0.18 ppm (338 µg/m^3)		–0.100 ppm		
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	–	–	0.030 ppm (80 µg/m^3)	–	U
	24-hour	0.04 ppm (105 µg/m^3)	A	0.14 ppm (365 µg/m^3)	–	
	3-hour	–	–	–	0.5 ppm (1300 µg/m^3)	
	1-hour	0.25 ppm (655 µg/m^3)	A	–	–	–
Respirable Particulate Matter (PM_{10})	Annual Arithmetic Mean	20 µg/m^3	N	–[10]	Same as Primary Standard	Sutter: U Sacramento: N (Moderate)
	24-hour	50 µg/m^3		150 µg/m^3		
Fine Particulate Matter ($PM_{2.5}$)	Annual Arithmetic Mean	12 µg/m^3	Sutter: U Sacramento: N	15 µg/m^3	Same as Primary Standard	Sutter: N (Proposed) Sacramento: U/A
	24-hour	–		35 µg/m^3		
Lead	30-day Average	1.5 µg/m^3	A	–	–	A
	Calendar Quarter	–	–	1.5 µg/m^3	Same as Primary Standard	

Table 3.11-2
Ambient Air Quality Standards and Attainment Status Designations for Sutter and Sacramento Counties

Pollutant	Averaging Time	California		National Standards [1]		
		Standards [2,3]	Attainment Status [4]	Primary [3,5]	Secondary [3,6]	Attainment Status [7]
Sulfates	24-hour	25 µg/m^3	A	**No National Standards**		
Hydrogen Sulfide	1-hour	0.03 ppm (42 µg/m^3)	U			
Visibility-Reducing Particle Matter	8-hour	Extinction coefficient of 0.23 per kilometer—visibility of 10 miles or more (0.07—30 miles or more for Lake Tahoe) because of particles when the relative humidity is less than 70%.	U			

[1] National standards (other than ozone, PM, and those based on annual averages or annual arithmetic means) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration in a year, averaged over 3 years, is equal to or less than the standard. The PM_{10} 24-hour standard is attained when 99% of the daily concentrations, averaged over 3 years, are equal to or less than the standard. The $PM_{2.5}$ 24-hour standard is attained when 98% of the daily concentrations, averaged over 3 years, are equal to or less than the standard. Contact the EPA for further clarification and current Federal policies.

[2] California standards for ozone, CO (except Lake Tahoe), SO_2 (1- and 24-hour), NO_2, PM, and visibility-reducing particles are values that are not to be exceeded. All others are not to be equaled or exceeded. California Ambient Air Quality Standards (CAAQS) are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

[3] Concentration expressed first in units in which it was promulgated (i.e., parts per million [ppm] or micrograms per cubic meter [µg/m^3]). Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

[4] Unclassified (U): a pollutant is designated unclassified if the data are incomplete and do not support a designation of attainment or nonattainment.
Attainment (A): a pollutant is designated attainment if the state standard for that pollutant was not violated at any site in the area during a 3-year period.
Nonattainment (N): a pollutant is designated nonattainment if there was a least one violation of a state standard for that pollutant in the area.
Nonattainment/Transitional (NT): is a subcategory of the nonattainment designation. An area is designated nonattainment/transitional to signify that the area is close to attaining the standard for that pollutant.

[5] National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health.

[6] National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

[7] Nonattainment (N): any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for the pollutant.
Attainment (A): any area that meets the national primary or secondary ambient air quality standard for the pollutant.
Unclassifiable (U): any area that cannot be classified on the basis of available information as meeting or not meeting the national primary or secondary ambient air quality standard for the pollutant.

[8] This concentration effective May 17, 2006.

[9] The CAAQS were amended on February 22, 2007, to lower the 1-hour standard to 0.18 ppm and establish a new annual standard of 0.03 ppm. These changes become effective after regulatory changes are submitted and approved by the Office of Administrative Law, expected later this year.

[10] Because of a lack of evidence linking health problems to long-term exposure to coarse particle pollution, EPA revoked the annual PM_{10} standard on September 21, 2006.

Source: ARB 2009b

Table 4.11-1
Construction Schedule for the Adjacent Levee Alternative's (Proposed Action's) Major Project Components

Major Project Component	Construction Season (May–November)				
	2012 (%)	2013 (%)	2014 (%)	2015 (%)	2016 (%)
Phase 3 Project – Overlapping Components					
NEMDC South – Cutoff Wall	-	-	-	100	-
Phase 4a Project – Overlapping Components					
Sacramento River east levee Reach A:13–15	100	-	-	-	-
Riverside Canal	100	-	-	-	-
Phase 4b Project – All Components					
Sacramento River east levee Reach A:16–20	-	50	50	-	-
American River north levee Reach I:1–4	50	50	-	-	-
NEMDC North (Reaches F–G) levee raising	-	-	-	-	100
PGCC and NEMDC South (Reaches E and H) levee raising	-	-	-	100	-
PGCC and NEMDC South (Reaches E and H) waterside improvements	-	-	-	100	-
PGCC culvert remediation	-	-	100	-	-
SR 99 NCC Bridge remediation	100	-	-	-	-
West Drainage Canal	-	100	-	-	-
Riego Road Canal relocation	-	-	100	-	-
NCC south levee ditch relocations	100	-	-	-	-
RD 1000 Pumping Plant modifications	-	-	-	100	-
City of Sacramento Pumping Plant modifications	-	100	-	-	-
South Fisherman's Lake Borrow Area and West Lakeside School Site excavation and reclamation	-	-	100	-	-
Triangle Properties Borrow Site excavation and reclamation	-	-	100	-	-

Notes: NCC = Natomas Cross Canal; NEMDC = Natomas East Main Drainage Canal; PGCC = Pleasant Grove Creek Canal; RD = Reclamation District; SR = State Route
Source: Data compiled by AECOM in 2010

Table 4.11-2a
Summary of Maximum Daily Emissions within Sutter County During 2012–2016
for the Adjacent Levee Alternative (Proposed Action)

Year	2012						2013						2014						2015						2016					
Pollutant	ROG	NO_X	PM_{10}		$PM_{2.5}$		ROG	NO_X	PM_{10}		$PM_{2.5}$		ROG	NO_X	PM_{10}		$PM_{2.5}$		ROG	NO_X	PM_{10}		$PM_{2.5}$		ROG	NO_X	PM_{10}		$PM_{2.5}$	
			C	EM	C	EM			C	EM	C	EM			C	EM	C	EM			C	EM	C	EM			C	EM	C	EM
SR 99 NCC Bridge remediation	6.7	37.5	3.0	~~211.4~~124.0	2.8	~~22.4~~16.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCC south levee ditch relocations	6.6	53.9	2.4	338.3	2.2	39.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PGCC culvert remediation	-	-	-	-	-	-	-	-	-	-	-	-	11.9	97.3	17.6	59.7	5.9	6.4	-	-	-	-	-	-	-	-	-	-	-	-
Riego Road Canal relocation	-	-	-	-	-	-	-	-	-	-	-	-	1.7	13.1	0.6	108.5	0.5	13.7	-	-	-	-	-	-	-	-	-	-	-	-
Triangle Properties Borrow Site excavation and reclamation	-	-	-	-	-	-	-	-	-	-	-	-	3.9	32.0	1.6	~~132.7~~26.7	1.5	~~15.7~~0.8	-	-	-	-	-	-	-	-	-	-	-	-
PGCC (Reaches E and H) levee raising	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.6	27.0	1.4	36.3	1.3	4.2	-	-	-	-	-	-
PGCC (Reaches E and H) waterside improvements	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.2	8.2	0.5	11.3	0.4	1.2	-	-	-	-	-	-
NEMDC North (Reaches F–G) levee raising	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22.4	129.2	6.4	~~113.9.7~~15.7	33.3	~~99.6~~72.6
Total unmitigated emissions (lb/day)	13.3	**~~91.4~~91.5**	5.5	~~519.7~~461.9	~~5.8~~5.1	~~61.9~~55.9	-	-	-	-	-	-	17.5	**142.4**	19.8	~~300.9~~195.0	7.9	~~35.7~~20.9	4.7	**35.2**	1.9	47.6	1.7	5.4	22.4	**129.2**	6.4	~~113.9.7~~15.7	33.3	~~99.6~~72.6
			~~551.2~~467.4		~~67.7~~61.0				-		-				**~~320.7~~214.7**		43.6				**49.5**		7.1				**~~114~~6.1~~22.1~~**		~~13~~2.8105.9	
FRAQMD Threshold (lb/day)	25	25	80		-[1]		25	25	80		-[1]		25	25	80		-[1]		25	25	80		-[1]		25	25	80		-[1]	
Significant?	No	**Yes**	**Yes**		-		No	No	No		No		No	**Yes**	**Yes**		-		No	**Yes**	**Yes**		-		No	**Yes**	**Yes**		-	
Total mitigated emissions (lb/day)[2]	12.6	~~73.2~~54.9	~~30.5~~22.3		~~5.9~~11.2		-	-	-		-		16.6	**~~113.9~~85.4**	~~25.9~~40.1		~~6.1~~7.5		4.5	**~~28.1~~21.1**	~~3.~~18.2		~~1.2~~1.7		21.3	**~~103.3~~77.5**	~~60.5~~75.1		~~23.3~~25.6	
Significant with Mitigation Incorporated?	No	No[3]	No		-		No	No[3]	No		-		No	No[3]	No		-		No	No[3]	No		-		No	No[3]	No		-	

Notes: Table entries in bold exceed thresholds.

C = combustion sources (construction equipment); EM = earthmoving activities; EPA = Environmental Protection Agency; FRAQMD = Feather River Air Quality Management District; lb/day = pounds per day; $\mu g/m^3$ = micrograms per cubic meter; NEMDC = Natomas East Main Drainage Canal; NCC = Natomas Cross Canal; NO_X = oxides of nitrogen; PM_{10} = respirable particulate matter with an aerodynamic diameter of 10 micrometers or less; PGCC = Pleasant Grove Creek Canal; ROG = reactive organic gases; SMAQMD = Sacramento Metropolitan Air Quality Management District

[1] FRAQMD does not have an adopted mass emission-based threshold for $PM_{2.5}$; implementation of the District-recommended Fugitive Dust Control Plan and additional control measures are presumed to assure compliance with the applicable SIP attainment goals.

[2] Implementation of all recommended standard mitigation measures listed under Mitigation Measure 4.11-a would reduce ROG, NO_X, and PM_{10} emissions by approximately 5%, ~~20~~40%, ~~75~~85%–~~85~~90% for fugitive PM_{10} emissions from earthmoving activities, and 45% for mobile-source PM_{10} emissions, respectively.

[3] Coordination of an emissions reduction agreement with the FRAQMD for calculation and fee payment by the project proponent(s) to FRAQMD prior to project approval would be used to offset emissions in excess of FRAQMD's significance thresholds for daily NO_X emission resulting in a less-than-significant impact.

See **Appendix F** for assumptions and modeling results for each activity and subphase (i.e., site preparation, cutoff wall installation, levee construction).

Source: Calculations performed by AECOM based on data provided by HDR, Wood Rodgers, and Mead & Hunt in 2010

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Table 4.11-2b
Summary of Maximum Daily Emissions within Sacramento County During 2012–2016
(Combined Portions of Phase 4a and 4b Projects) for the Adjacent Levee Alternative (Proposed Action)

Year	2012						2013						2014						2015						2016					
Pollutant	ROG	NO_X	PM_{10}		$PM_{2.5}$		ROG	NO_X	PM_{10}		$PM_{2.5}$		ROG	NO_X	PM_{10}		$PM_{2.5}$		ROG	NO_X	PM_{10}		$PM_{2.5}$		ROG	NO_X	PM_{10}		$PM_{2.5}$	
			C	EM	C	EM			C	EM	C	EM			C	EM	C	EM			C	EM	C	EM			C	EM	C	EM
Phase 4a Project – Overlapping Components																														
Sacramento River east levee Reach A:13–15[1]	~~45.9~~ 69.0	~~272.7~~ 409.3	~~12.3~~ 100.0	~~2,438.5~~ 3,395.1	~~11.3~~ 8.7	~~213.7~~ 295.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Riverside Canal[2]	21.7	101.0	~~4.7~~ 280.2	~~1,428.1~~ 1,233.9	~~4.3~~ 24.4	~~132.5~~ 98.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phase 4b Project – All Components																														
American River north levee Reach F:1–4	14.0	144.0	6.7	~~556.6~~ 450.7	6.2	~~64.0~~ 49.2	23.4	169.3	9.9	~~116.7~~ 28.3	9.1	~~16.2~~ 3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
West Drainage Canal	-	-	-	-	-	-	4.3	37.9	1.6	439.7	1.5	55.9	-	-	-	-	-	-						-	-	-	-	-	-	-
City of Sacramento Pumping Plant modifications	-	-	-	-	-	-	10.2	80.4	4.4	1.8	4.0	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sacramento River east levee Reach A:16–20	-	-	-	-	-	-	44.1	374.9	21.3	~~1017.4~~ 964.4	19.6	~~113.2~~ 105.8	44.2	374.9	21.3	~~1017.4~~ 964.4	19.6	~~113.2~~ 105.8	-	-	-	-	-	-	-	-	-	-	-	-
South Fisherman's Lake Borrow Area and West Lakeside School Site excavation and reclamation	-	-	-	-	-	-	-	-	-	-	-	-	3.6	29.5	1.5	~~127.3~~ 21.3	1.3	~~15.7~~ 0.8	-	-	-	-	-	-	-	-	-	-	-	-
RD 1000 Pumping Plant modifications	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.2	80.4	4.4	1.8	4.0	0.2	-	-	-			-
NEDMC South (Reaches E and H) levee raising	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	~~64.1~~ 63.4	482.8	25.1	648.0	23.1	74.4	-	-	-	-	-	-
NEMDC South (Reaches E and H) waterside improvements	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.9	19.7	1.1	27.3	1.0	2.9	-	-	-	-	-	-
NEMDC North (Reaches F–G) levee raising	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23.7	136.6	6.8	~~1205.3~~ 756.8	35.2	~~105.3~~ 76.7
Total unmitigated emissions (lb/day)	~~81.6~~ 104.7	~~547.7~~ **654.3**	~~23.7~~ 386.9	~~4,423.2~~ 5,079.7	~~21.8~~ 39.3	~~410.2~~ 443.1	81.9	**662.5**	37.1	~~1,575.5~~ 1,434.1	34.2	~~183.4~~ 164.9	47.7	**404.4**	22.7	~~1,144.6~~ 985.7	20.9	~~128.9~~ 106.6	76.4	**582.9**	30.5	677.1	28.1	77.5	23.7	**136.6**	6.8	~~1205.3~~ 756.8	35.2	~~105.3~~ 76.7
SMAQMD Threshold	-	**85**	-		-		-	**85**	-		-		-	**85**	-		-		-	**85**	-		-		-	85	-		-	
Significant?	-	**Yes**	-	[4]	-		-	**Yes**	-	[4]	-		-	**Yes**	-	[4]	-		-	-	-	[4]	-		-	**Yes**	-	[4]		
Total mitigated emissions (lb/day)[3]	~~77.5~~ 99.5	~~411.2~~ 392.6	~~334.6~~ 974.8		– 88.1		77.8	~~530~~ 397.5	~~99.2~~ 235.5		~~28.1~~ 43.5		45.3	~~323.5~~ 242.6	~~69.7~~ 160.4		~~18~~ 27.5		72.6	~~466.3~~ 349.7	~~50.6~~ 118.4		~~19.3~~ 27.1		22.5	~~109.3~~ 82.0	~~64.0~~ 79.4		~~24.6~~ 27.0	
Significant with Mitigation Incorporated?	-	No[5]	No[4]		-		-	No[5]	No[4]		-		-	No[5]	No[4]		-		-	No[5]	No[4]		-		-	No[5]	No[4]		-	

Notes: Table entries in bold exceed thresholds.

C = combustion sources; EM = earthmoving activities; EPA = Environmental Protection Agency; FRAQMD = Feather River Air Quality Management District; lb/day = pounds per day; $\mu g/m^3$ = micrograms per cubic meter; NEMDC = Natomas East Main Drainage Canal; NCC = Natomas Cross Canal; NO_X = oxides of nitrogen; PM_{10} = respirable particulate matter with an aerodynamic diameter of 10 micrometers or less; PGCC = Pleasant Grove Creek Canal; ROG = reactive organic gases; SMAQMD = Sacramento Metropolitan Air Quality Management District

[1] Earthmoving activities during Sacramento River east levee Reaches 13–15 include excavation of borrow sites and movement of levee fill material totaling approximately 1.3 million cubic yards.

[2] Earthmoving activities during Riverside Canal relocation include excavation of borrow site material totaling approximately 410,000 cubic yards.

[3] Implementation of all recommended standard mitigation measures listed under Mitigation Measure 4.11-a would reduce ROG, NOX, and PM10 emissions by approximately 5%, ~~20~~40%, ~~75~~85%–~~95~~90% for fugitive PM10 emissions from earthmoving activities, and 45% for mobile-source PM10 emissions, respectively.

[4] SMAQMD does not have an adopted mass emission-based threshold for PM10. However, in absence of a localized threshold, emissions are compared against concentration based Ambient Air Quality Standards (AAQS); PM10 24-hr standard = 50 µg/m3; SMAQMD's CEQA Guide allows for enhanced PM10 Dust Control Practices to be proposed and implemented at the proposed project site for quantifiable emissions reductions. The proposed Phase 4b Project has developed a comprehensive Fugitive Dust Control Plan in compliance with the guidelines that will effectively reduce mass PM10 emissions below the concentration based thresholds.

[5] Payment into SMAQMD's Off-site Construction Mitigation Fee Program to offset NO_X emissions in excess of SMAQMD's significance threshold would reduce impacts for this pollutant in SMAQMD's jurisdiction to a less-than-significant level.

See **Appendix F** for assumptions and modeling results for each activity and subphase (i.e., site preparation, cutoff wall installation, levee construction, etc.).

Source: Calculations performed by AECOM based on data provided by HDR, Wood Rodgers, and Mead & Hunt in 2009

Table 4.11-3
Maximum Daily Emissions during the Peak (2013) Construction Season within Sacramento County for the Fix-in-Place Alternative[1]

Year	2013					
Pollutant	ROG	NO_X	PM_{10}		$PM_{2.5}$	
			Combustion	Earthmoving	Combustion	Earthmoving
Total unmitigated emissions (lb/day)	81.9	662.5	37.1	~~1203.9~~ 1,062.5	34.2	~~145.9~~ 125.3
SMAQMD Threshold[2]	–	**85**	-[3]		-[3]	
Significant?	–	**Yes**	-		-	
Total mitigated emissions (lb/day)[2]	77.8	~~530.0~~ 398.0	20.4	~~60.2~~ 159.3	18.8	~~7.3~~ 18.8
			~~80.6~~ 180.0		~~26.1~~ 37.6	
Significant with Mitigation Incorporated?	–	No[4]	-		-	

Notes: Table entries in bold exceed thresholds. EPA = Environmental Protection Agency; FRAQMD = Feather River Air Quality Management District; lb/day = pounds per day; $\mu g/m^3$ = micrograms per cubic meter; NCC = Natomas Cross Canal; NEMDC = Natomas East Main Drainage Canal; NO_X = oxides of nitrogen; PGCC = Pleasant Grove Creek Canal; PM_{10} = respirable particulate matter with an aerodynamic diameter of 10 micrometers or less; ROG = reactive organic gases; SMAQMD = Sacramento Metropolitan Air Quality Management District

[1] Peak daily emissions during the Fix-in-Place Alternative occur entirely within Sacramento County; no activities would occur in Sutter County during the 2013 construction season.

[2] Implementation of all recommended standard mitigation measures listed under Mitigation Measure 4.11-a would result in reductions of ROG, NO_X, and PM_{10} emissions by approximately 5% for ROG, ~~20~~40% for NO_X, ~~75~~85%–~~85~~90% for fugitive PM_{10} emissions, and 45% for mobile-source PM_{10} emissions.

[3] SMAQMD does not have an adopted mass emission-based threshold for PM_{10} or $PM_{2.5}$; the project proponent(s) have proposed Fugitive Dust Control Plan(s) and Enhanced Control Measures that will effectively reduce and maintain PM10 and PM2.5 emissions below the applied concentration based thresholds.

[4] Payment into SMAQMD's Off-site Construction Mitigation Fee Program to offset NO_X emissions in excess of SMAQMD's significance threshold would reduce impacts for this pollutant in SMAQMD's jurisdiction to a less-than-significant level.

See **Appendix F** for assumptions and modeling results for each activity and subphase (i.e., site preparation, cutoff wall installation, levee construction).

Source: Calculations performed by AECOM based on data provided by HDR, Wood Rodgers, and Mead & Hunt in 2010

Table 4.11-4
Summary of Maximum Annual Emissions During the 2012–2016 Construction Seasons
(Combined Portions of Phase 4a and 4b Projects) for the Adjacent Levee Alternative (Proposed Action)

Project Phase Components	Annual Emissions																											
	2012 (TPY)						2013 (TPY)						2014 (TPY)						2015 (TPY)						2016 (TPY)					
	ROG	NO_X	PM_{10}		$PM_{2.5}$		ROG	NO_X	PM_{10}		$PM_{2.5}$		ROG	NO_X	PM_{10}		$PM_{2.5}$		ROG	NO_X	PM_{10}		$PM_{2.5}$		ROG	NO_X	PM_{10}		$PM_{2.5}$	
			C	EM	C	EM			C	EM	C	EM			C	EM	C	EM			C	EM	C	EM			C	EM	C	EM
Phase 4a Project – Overlapping Portions	~~4.0~~ 5.5	~~22.6~~ 31.2	~~1~~ 1.3	~~293.9~~ 414.9	~~0.9~~ 1.2	~~31.4~~ 44.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phase 4b Project – All Components	~~1.7~~ 1.2	~~8.4~~ 8.5	~~0.5~~ 0.4	~~48.3~~ 40.3	~~0.5~~ 0.4	~~5.5~~ 4.5	4.1	29.8	1.6	~~105.2~~ 91.4	1.5	~~11.9~~ 10.1	3.5	25.9	1.5	~~102.8~~ 74.6	1.3	~~11.8~~ 7.9	~~3.7~~ 5.0	~~25.1~~ 33.6	~~1.3~~ 1.8	~~28~~ 40.9	~~1.3~~ 1.3	3.3	3.9	22.3	1.1	~~187.5~~ 114.1	3.7	~~17.6~~ 12.5
Annual Unmitigated Emissions Total	~~5.2~~ 6.7	~~31.1~~ 39.6	~~1.4~~ 1.8	~~342.2~~ 455.2	~~1.3~~ 1.6	~~37.0~~ 49.0	4.1	29.8	1.6	~~105.2~~ 91.4	1.5	~~12.0~~ 10.1	3.5	25.9	1.5	~~102.8~~ 74.6	1.3	~~11.9~~ 7.9	~~3.7~~ 5.0	~~25.2~~ 33.6	~~1.2~~ 1.8	~~28.1~~ 40.9	~~1.1~~ 1.3	~~3.2~~ 3.3	3.9	22.3	1.1	~~187.5~~ 114.1	3.7	~~17.6~~ 12.5
			~~0.8~~	~~51.3~~	~~0.7~~	~~5.5~~			~~0.9~~	~~15.8~~	~~0.8~~	~~1.8~~			~~0.8~~	~~15.4~~	~~0.7~~	~~1.8~~			~~0.7~~	~~4.2~~	~~0.6~~	~~0.5~~			~~0.6~~	~~28.1~~	~~2.0~~	~~2.6~~
Annual Mitigated Emissions Total[1]	~~5.0~~ 6.4	~~24.8~~ 24.0	~~52.1~~ 69.2		~~6.3~~ 8.2		3.9	~~23.9~~ 18.0	~~16.7~~ 14.6		~~2.6~~ 2.3		3.3	~~20.7~~ 15.5	~~16.3~~ 12.0		~~2.5~~ 1.9		~~3.5~~ 4.7	20.1	~~4.9~~ 7.1		~~1.1~~ 1.2		3.7	~~17.9~~ 13.4	~~28.7~~ 17.7		~~4.7~~ 3.9	
General Conformity Threshold	25	25	100		100		25	25	100		100		25	25	100		100		25	25	100		100		25	25	100		100	
Exceed *de minimus* Threshold?	No	No	No		No		No	No	No		No		No	No	No		No		No	No	No		No		No	No	No		No	

Notes: Table entries in bold exceed thresholds..C = Emissions from combustion (from construction equipment); EM = PM emissions from earthmoving activities; EPA = Environmental Protection Agency; FRAQMD = Feather River Air Quality Management District; lb/day = pounds per day; µg/m3 = micrograms per cubic meter; NCC = Natomas Cross Canal; NEMDC = Natomas East Main Drainage Canal; NO_X = oxides of nitrogen, PGCC = Pleasant Grove Creek Canal; PM_{10} = respirable particulate matter with an aerodynamic diameter of 10 micrometers or less, ROG = reactive organic gases; SMAQMD = Sacramento Metropolitan Air Quality Management District

[1] Implementation of all recommended standard mitigation measures listed under Mitigation Measure 4.11-a would result in reductions of ROG, NO_X, and PM_{10} emissions by approximately 5% for ROG, ~~30~~10% for NO_X, ~~75~~85%- ~~85~~90% for fugitive PM_{10} emissions, and 45% for mobile-source PM_{10} emissions.

See **Appendix F** for assumptions and modeling results for each project activity and subphase (i.e., site preparation, cutoff wall installation, levee construction).

Source: Calculations performed by AECOM based on data provided by HDR, Wood Rodgers, and Mead & Hunt in 2010

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Table 4.11-5
Maximum Annual Emissions during the Peak (2013) Construction Season for the Fix-in-Place Alternative[1]

Pollutant	ROG	NO_X	PM_{10}		$PM_{2.5}$	
			Combustion	Earthmoving	Combustion	Earthmoving
Total unmitigated emissions (tons/year)	4.2	31.8	1.7	~~79.2~~ 65.4	1.5	~~9.2~~ 7.3
SMAQMD Threshold[2]	**25**	**25**	**100**		**100**	
Significant?	–	**Yes**	No		No	
Total mitigated emissions (tons/year)[2]	4.0	~~25~~ 19.1	0.9	~~4.0~~ 9.8	0.8	~~0.5~~ 1.1
			~~80.6~~ 10.7		~~26.1~~ 1.9	
Significant with Mitigation Incorporated?	No	No	No		No	

Notes: Table entries in bold exceed thresholds.

EPA = Environmental Protection Agency; FRAQMD = Feather River Air Quality Management District; lb/day = pounds per day; $\mu g/m^3$ = micrograms per cubic meter; NCC = Natomas Cross Canal; NEMDC = Natomas East Main Drainage Canal; NO_X = oxides of nitrogen; PGCC = Pleasant Grove Creek Canal; PM_{10} = respirable particulate matter with an aerodynamic diameter of 10 micrometers or less; ROG = reactive organic gases; SMAQMD = Sacramento Metropolitan Air Quality Management District

[1] Peak daily emissions during the Fix-in-Place Alternative occur entirely within Sacramento County; no activities would occur in Sutter County during the 2013 construction season.

[2] Implementation of all recommended standard mitigation measures listed under Mitigation Measure 4.11-a would result in reductions of ROG, NO_X, and PM_{10} emissions by approximately 5% for ROG, ~~20~~40% for NO_X, ~~75~~85%–~~85~~90% for fugitive PM_{10} emissions, and 45% for mobile-source PM_{10} emissions.

See **Appendix F** for assumptions and modeling results for each activity and subphase (i.e., site preparation, cutoff wall installation, levee construction.).

Source: Calculations performed by AECOM based on data provided by HDR, Wood Rodgers, and Mead & Hunt in 2010

APPENDIX G

Noise Modeling Results

Appendix G

Project-Generated Construction Source Noise Prediction Model

Phase 4b Clearing and Grubbing/Stripping

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
	100	74.6
	200	66.7
	300	62.0
	400	58.7
	500	56.2
	600	54.1
	700	52.3
	800	50.8
	900	49.5
	1000	48.3
	1100	47.2
	1200	46.2

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Dozer	85	0.4
Front End Loader	80	0.4
Water Truck	75	0.4

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Dozer	81.0
Front End Loader	76.0
Water Truck	71.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
82.5

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log(U.F.) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix G

Project-Generated Construction Source Noise Prediction Model

Phase 4b Levee Degrading

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
	100	76.7
	200	68.8
	300	64.2
	400	60.9
	500	58.3
	600	56.2
	700	54.5
	800	53.0
	900	51.6
	1000	50.4
	1100	49.3
	1200	48.3

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Scraper	85	0.4
Front End Loader	80	0.4
Dozer	85	0.4

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Scraper	81.0
Front End Loader	76.0
Dozer	81.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
84.7

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log(U.F.) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix G

Project-Generated Construction Source Noise Prediction Model

Phase 4b Demolish Canal and Tree Removal

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
	100	76.3
	200	68.4
	300	63.8
	400	60.5
	500	57.9
	600	55.8
	700	54.1
	800	52.5
	900	51.2
	1000	50.0
	1100	48.9
	1200	47.9

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Excavator	85	0.4
Front End Loader	80	0.4
Dump Truck	84	0.4

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Excavator	81.0
Front End Loader	76.0
Dump Truck	80.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
84.3

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log(U.F.) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix G

Project-Generated Construction Source Noise Prediction Model

Phase 4b Cutoff Wall Construction

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
	100	76.1
	200	68.2
	300	63.6
	400	60.3
	500	57.7
	600	55.7
	700	53.9
	800	52.4
	900	51.0
	1000	49.8
	1100	48.7
	1200	47.7

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Generator	82	0.5
Excavator	85	0.4
Soil Mix Drill Rig	80	0.5

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Generator	79.0
Excavator	81.0
Soil Mix Drill Rig	77.0

Combined Predieted Noise Level (L_{eq} dBA at 50 feet)
84.1

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log(U.F.) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix G

Project-Generated Construction Source Noise Prediction Model

Phase 4b Borrow Site Excavation

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
	100	76.3
	200	68.4
	300	63.8
	400	60.5
	500	57.9
	600	55.8
	700	54.1
	800	52.5
	900	51.2
	1000	50.0
	1100	48.9
	1200	47.9

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Excavator	85	0.4
Front End Loader	80	0.4
Dump Truck	84	0.4

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Excavator	81.0
Front End Loader	76.0
Dump Truck	80.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
84.3

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log(U.F.) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix G

Project-Generated Construction Source Noise Prediction Model

Phase 4b Levee Raising

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
	100	75.7
	200	67.8
	300	63.1
	400	59.8
	500	57.3
	600	55.2
	700	53.4
	800	51.9
	900	50.5
	1000	49.3
	1100	48.3
	1200	47.3

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Front End Loader	80	0.4
Roller	85	0.2
Dozer	85	0.4

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Front End Loader	76.0
Roller	78.0
Dozer	81.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
83.6

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log(U.F.) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix G

Project-Generated Construction Source Noise Prediction Model

Phase 4b Surface Drainage Outlets

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
	100	75.7
	200	67.8
	300	63.1
	400	59.8
	500	57.3
	600	55.2
	700	53.4
	800	51.9
	900	50.6
	1000	49.3
	1100	48.3
	1200	47.3

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Backhoe	80	0.4
Paver	85	0.5
Concrete Pump Truck	82	0.2

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Backhoe	76.0
Paver	82.0
Concrete Pump Truck	75.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
83.6

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log(U.F.) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix G

Project-Generated Construction Source Noise Prediction Model

Phase 4b Construct Relief Wells and Drainage Canals

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold*	100	73.7
	200	65.8
	300	61.1
	400	57.8
	500	55.3
	600	53.2
	700	51.4
	800	49.9
	900	48.6
	1000	47.4
	1100	46.3
	1200	45.3

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Drill Rig Truck	84	0.2
Roller	85	0.2
Concrete Pump Truck	82	0.2

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Drill Rig Truck	77.0
Roller	78.0
Concrete Pump Truck	75.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
81.6

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log(U.F.) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix G

Project-Generated Construction Source Noise Prediction Model

Pbase 4b Site Restoration and Demobilization

EDAW | AECOM

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
	100	75.9
	200	68.0
	300	63.3
	400	60.0
	500	57.5
	600	55.4
	700	53.6
	800	52.1
	900	50.8
	1000	49.6
	1100	48.5
	1200	47.5

Assumptions:	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Dump Truck	84	0.4
Flat Bed Truck	84	0.4
Hydroseed Truck	80	0.4

Ground Type	Soft
Source Height	5
Receiver Height	8
Ground Factor	0.63

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Dump Truck	80.0
Flat Bed Truck	80.0
Hydroseed Truck	76.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
83.8

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006.

[2] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

$L_{eq}(equip) = E.L.+10*\log(U.F.) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

Appendix F

Phase 4b Levee Improvement Project
Levee Work
Summary of Predicted Action Noise Levels

		Distance to Noise Contours in feet	
Action	**Leq**	**50 dBA Contour**	**45 dBA Contour**
Phase 4b Clearing and Grubbing/Stripping	74.6	1698.8	3021.0
Phase 4b Levee Degrading	76.7	2172.6	3863.4
Phase 4b Demolish Canal and Tree Removal	76.3	2073.9	3687.9
Phase 4b Cutoff Wall Construction	76.1	2029.8	3609.5
Phase 4b Borrow Site Excavation	76.3	2073.9	3687.9
Phase 4b Levee Raising	75.7	1923.8	3421.1
Phase 4b Surface Drainage Outlets	75.7	1924.2	3421.7
Phase 4b Construct Relief Wells and Drainage Canals	73.7	1529.4	2719.6
Phase 4b Site Restoration and Demobilization	75.9	1970.2	3503.6

Appendix G
Haul Truck Trips
Sarcamento East Levee Reach A: 16-19A

Assumptions:

Mean SEL Reference Level at 50 feet	84.0
Assumed Haul Truck Speed (mph)	35.0
Number of Hours for Hauling per Day	10.0
Haul Truck Size in Cubic Yards	14.0
Amount of Haul Material	1,058,400
Number of Haul Days	140.0
Amount of Daily Haul Material	7,560.0
Amount of Hourly Haul Material	756.0
Number of Trips per Hour-one way	108.0
Leq for Haul Trips at 50 feet	66.4

Appendix G
Haul Truck Trips
Sacramento East Levee Reach A: 19B-20

Assumptions:

Mean SEL Reference Level at 50 feet	84.0
Assumed Haul Truck Speed (mph)	35.0
Number of Hours for Hauling per Day	10.0
Haul Truck Size in Cubic Yards	12.0
Amount of Haul Material	194,400.0
Number of Haul Days	45.0
Amount of Daily Haul Material	4,320.0
Amount of Hourly Haul Material	432.0
Number of Trips per Hour-one way	72.0
Leq for Haul Trips at 50 feet	64.6

Appendix G
Haul Truck Trips
American River North Levee Reach I: 1-4

Assumptions:

Mean SEL Reference Level at 50 feet	84.0
Assumed Haul Truck Speed (mph)	35.0
Number of Hours for Hauling per Day	10.0
Haul Truck Size in Cubic Yards	12.0
Amount of Haul Material	167,000.0
Number of Haul Days	140.0
Amount of Daily Haul Material	1,192.9
Amount of Hourly Haul Material	119.3
Number of Trips per Hour-one way	19.9
Leq for Haul Trips at 50 feet	59.1

Appendix G
Haul Truck Trips
West Levee of NEMDC Reaches F-G

Assumptions:

Mean SEL Reference Level at 50 feet	84.0
Assumed Haul Truck Speed (mph)	35.0
Number of Hours for Hauling per Day	10.0
Haul Truck Size in Cubic Yards	14.0
Amount of Haul Material	965,000.0
Number of Haul Days	140.0
Amount of Daily Haul Material	6,892.9
Amount of Hourly Haul Material	689.3
Number of Trips per Hour-one way	98.5
Leq for Haul Trips at 50 feet	66.0

Appendix G
Haul Truck Trips
West Levee of PGCC Reach E

Assumptions:

Mean SEL Reference Level at 50 feet	84.0
Assumed Haul Truck Speed (mph)	35.0
Number of Hours for Hauling per Day	10.0
Haul Truck Size in Cubic Yards	14.0
Amount of Haul Material	345,500.0
Number of Haul Days	140.0
Amount of Daily Haul Material	2,467.9
Amount of Hourly Haul Material	246.8
Number of Trips per Hour-one way	35.3
Leq for Haul Trips at 50 feet	61.5

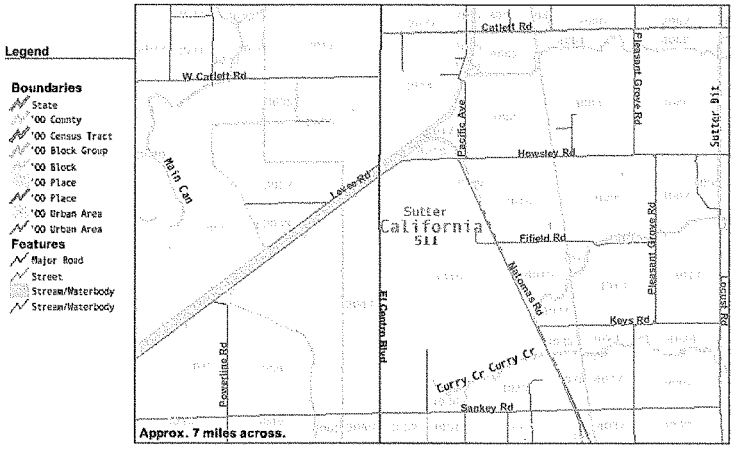
APPENDIX H

United States Census Block Groups Data

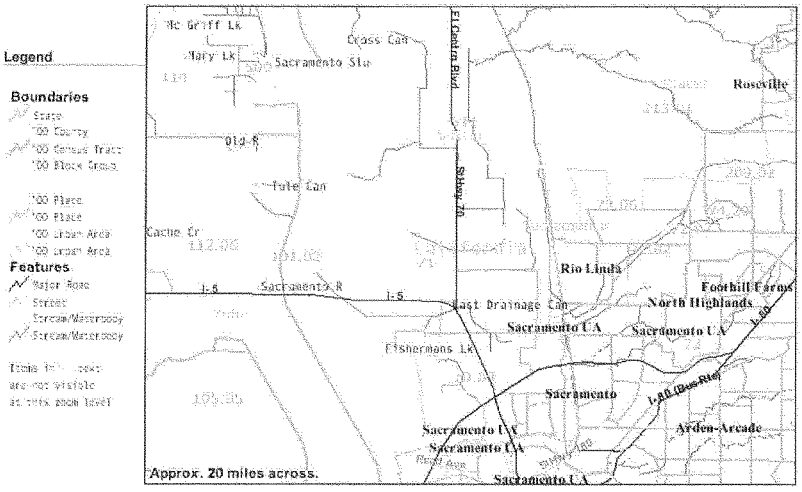
APPENDIX H

United States Census Block Groups Data

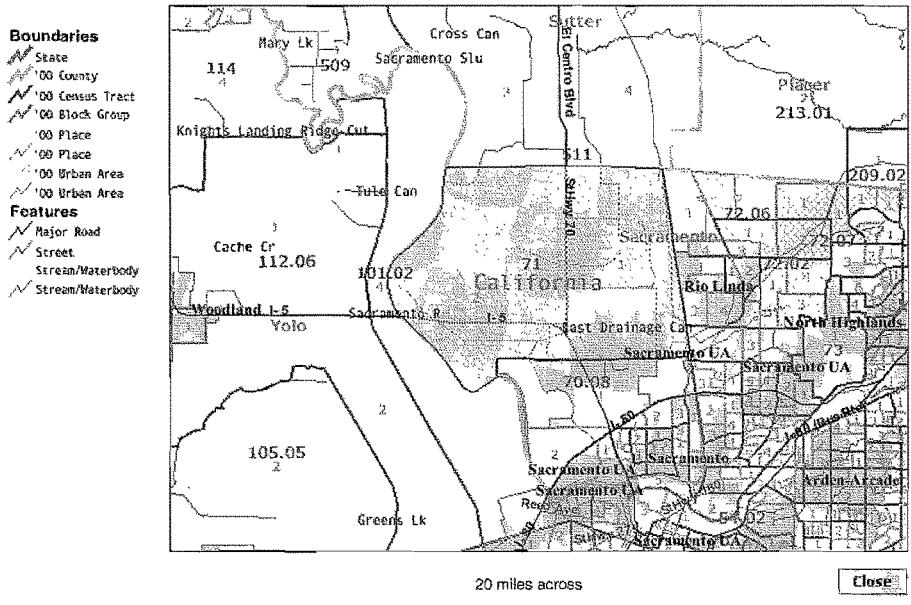
U.S. Census Bureau
American FactFinder



U.S. Census Bureau
American FactFinder



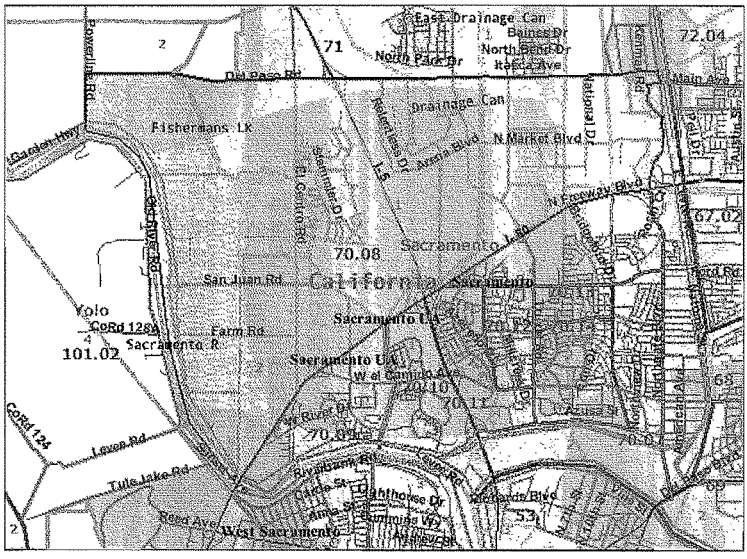
Census Tract 71, Sacramento County, California



Census Tract 70.08, Sacramento County, California

Boundaries
- State
- '00 County
- '00 Census Tract
- '00 Block Group
- '00 Block
- '00 Place
- '00 Place
- '00 Urban Area
- '00 Urban Area

Features
- Major Road
- Street
- Stream/Waterbody
- Stream/Waterbody



7 miles across

Close

QT-P3. **Race and Hispanic or Latino: 2000**
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data
Geographic Area: **Sacramento County, California**

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

Subject	Number	Percent
RACE		
Total population	**1,223,499**	**100.0**
One race	1,152,107	94.2
White	783,240	64.0
Black or African American	121,804	10.0
American Indian and Alaska Native	13,359	1.1
American Indian	9,770	0.8
Alaska Native	159	0.0
Both American Indian and Alaska Native	14	0.0
American Indian or Alaska Native, not specified	3,416	0.3
Asian	134,899	11.0
Asian Indian	13,227	1.1
Chinese	30,455	2.5
Filipino	24,516	2.0
Japanese	11,908	1.0
Korean	4,955	0.4
Vietnamese	16,372	1.3
Other Asian category	30,066	2.5
Two or more Asian categories	3,400	0.3
Native Hawaiian and Other Pacific Islander	7,264	0.6
Native Hawaiian	910	0.1
Samoan	1,270	0.1
Guamanian or Chamorro	936	0.1
Other Pacific Islander category	3,988	0.3
Two or more Native Hawaiian or Other Pacific Islander categories	160	0.0
Some other race	91,541	7.5
Two or more races	71,392	5.8
Two races including Some other race	26,322	2.2
Two races excluding Some other race, and three or more races	45,070	3.7
Two races excluding Some other race	39,341	3.2
Three or more races	5,729	0.5
HISPANIC OR LATINO		
Total population	**1,223,499**	**100.0**
Hispanic or Latino (of any race)	195,890	16.0
Mexican	150,909	12.3
Puerto Rican	5,746	0.5
Cuban	1,238	0.1
Other Hispanic or Latino	37,997	3.1
Not Hispanic or Latino	1,027,609	84.0
RACE AND HISPANIC OR LATINO		
Total population	**1,223,499**	**100.0**
One race	1,152,107	94.2
Hispanic or Latino	175,514	14.3
Not Hispanic or Latino	976,593	79.8
Two or more races	71,392	5.8
Hispanic or Latino	20,376	1.7
Not Hispanic or Latino	51,016	4.2

(X) Not applicable.
Source: U.S. Census Bureau, Census 2000 Summary File 1, Matrices P3, P4, PCT4, PCT5, PCT8, and PCT11.

QT-P3. **Race and Hispanic or Latino: 2000**

Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data
Geographic Area: **Sutter County, California**

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

Subject	Number	Percent
RACE		
Total population	**78,930**	**100.0**
One race	75,302	95.4
White	53,291	67.5
Black or African American	1,509	1.9
American Indian and Alaska Native	1,225	1.6
American Indian	875	1.1
Alaska Native	5	0.0
Both American Indian and Alaska Native	0	0.0
American Indian or Alaska Native, not specified	345	0.4
Asian	8,884	11.3
Asian Indian	6,989	8.9
Chinese	275	0.3
Filipino	426	0.5
Japanese	439	0.6
Korean	135	0.2
Vietnamese	78	0.1
Other Asian category	495	0.6
Two or more Asian categories	47	0.1
Native Hawaiian and Other Pacific Islander	161	0.2
Native Hawaiian	35	0.0
Samoan	15	0.0
Guamanian or Chamorro	74	0.1
Other Pacific Islander category	35	0.0
Two or more Native Hawaiian or Other Pacific Islander categories	2	0.0
Some other race	10,232	13.0
Two or more races	3,628	4.6
Two races including Some other race	1,660	2.1
Two races excluding Some other race, and three or more races	1,968	2.5
Two races excluding Some other race	1,760	2.2
Three or more races	208	0.3
HISPANIC OR LATINO		
Total population	**78,930**	**100.0**
Hispanic or Latino (of any race)	17,529	22.2
Mexican	15,138	19.2
Puerto Rican	193	0.2
Cuban	33	0.0
Other Hispanic or Latino	2,165	2.7
Not Hispanic or Latino	61,401	77.8
RACE AND HISPANIC OR LATINO		
Total population	**78,930**	**100.0**
One race	75,302	95.4
Hispanic or Latino	16,309	20.7
Not Hispanic or Latino	58,993	74.7
Two or more races	3,628	4.6
Hispanic or Latino	1,220	1.5
Not Hispanic or Latino	2,408	3.1

(X) Not applicable.
Source: U.S. Census Bureau, Census 2000 Summary File 1, Matrices P3, P4, PCT4, PCT5, PCT8, and PCT11.

U.S. Census Bureau
American FactFinder

CT 70.08

P4. HISPANIC OR LATINO, AND NOT HISPANIC OR LATINO BY RACE [73] - Universe: Total population
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

	Block Group 1, Census Tract 70.08, Sacramento County, California	Block Group 2, Census Tract 70.08, Sacramento County, California
Total:	969	202
Hispanic or Latino	85	9
Not Hispanic or Latino:	884	193
Population of one race:	854	179
White alone	708	160
Black or African American alone	37	4
American Indian and Alaska Native alone	10	1
Asian alone	97	11
Native Hawaiian and Other Pacific Islander alone	0	0
Some other race alone	2	3
Population of two or more races:	30	14
Population of two races:	28	11
White; Black or African American	0	0
White; American Indian and Alaska Native	7	2
White; Asian	16	4
White; Native Hawaiian and Other Pacific Islander	1	1
White; Some other race	2	4
Black or African American; American Indian and Alaska Native	1	0
Black or African American; Asian	0	0
Black or African American; Native Hawaiian and Other Pacific Islander	0	0
Black or African American; Some other race	0	0
American Indian and Alaska Native; Asian	0	0
American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0
American Indian and Alaska Native; Some other race	0	0
Asian; Native Hawaiian and Other Pacific Islander	1	0
Asian; Some other race	0	0
Native Hawaiian and Other Pacific Islander; Some other race	0	0
Population of three races:	1	3
White; Black or African American; American Indian and Alaska Native	0	0
White; Black or African American; Asian	0	0
White; Black or African American; Native Hawaiian and Other Pacific Islander	0	0
White; Black or African American; Some other race	0	3
White; American Indian and Alaska Native; Asian	1	0
White; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0
White; American Indian and Alaska Native; Some other race	0	0
White; Asian; Native Hawaiian and Other Pacific Islander	0	0
White; Asian; Some other race	0	0
White; Native Hawaiian and Other Pacific Islander; Some other race	0	0
Black or African American; American Indian and Alaska Native; Asian	0	0
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0
Black or African American; American Indian and Alaska Native; Some other race	0	0
Black or African American; Asian; Native Hawaiian and Other Pacific Islander	0	0
Black or African American; Asian;Some other race	0	0
Black or African American; Native Hawaiian and Other Pacific Islander; Some other race	0	0
American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0
American Indian and Alaska Native; Asian; Some other race	0	0
American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0
Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0
Population of four races:	1	0
White; Black or African American; American Indian and Alaska Native; Asian	1	0

White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0
White; Black or African American; American Indian and Alaska Native; Some other race	0	0
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander	0	0
White; Black or African American; Asian; Some other race	0	0
White; Black or African American; Native Hawaiian and Other Pacific Islander; Some other race	0	0
White; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0
White; American Indian and Alaska Native; Asian; Some other race	0	0
White; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0
White; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0
Black or African American; American Indian and Alaska Native; Asian; Some other race	0	0
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0
Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0
American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0
Population of five races:	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Some other race	0	0
White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0
White; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0
Population of six races:	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0

U.S. Census Bureau
Census 2000

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 1 (SF 1) 100-Percent Data (PDF 44KB)

U.S. Census Bureau
American FactFinder

CT 70.08

DP-3. **Profile of Selected Economic Characteristics: 2000**
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data
Geographic Area: **Census Tract 70.08, Sacramento County, California**

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

Subject	Number	Percent
EMPLOYMENT STATUS		
Population 16 years and over	**1,061**	**100.0**
In labor force	593	55.9
Civilian labor force	593	55.9
Employed	538	50.7
Unemployed	55	5.2
Percent of civilian labor force	9.3	(X)
Armed Forces	0	0.0
Not in labor force	468	44.1
Females 16 years and over	**562**	**100.0**
In labor force	295	52.5
Civilian labor force	295	52.5
Employed	248	44.1
Own children under 6 years	**62**	**100.0**
All parents in family in labor force	23	37.1
COMMUTING TO WORK		
Workers 16 years and over	**538**	**100.0**
Car, truck, or van -- drove alone	443	82.3
Car, truck, or van -- carpooled	41	7.6
Public transportation (including taxicab)	7	1.3
Walked	8	1.5
Other means	0	0.0
Worked at home	39	7.2
Mean travel time to work (minutes)	24.8	(X)
Employed civilian population 16 years and over	**538**	**100.0**
OCCUPATION		
Management, professional, and related occupations	204	37.9
Service occupations	86	16.0
Sales and office occupations	146	27.1
Farming, fishing, and forestry occupations	0	0.0
Construction, extraction, and maintenance occupations	49	9.1
Production, transportation, and material moving occupations	53	9.9
INDUSTRY		
Agriculture, forestry, fishing and hunting, and mining	0	0.0
Construction	65	12.1
Manufacturing	57	10.6
Wholesale trade	25	4.6
Retail trade	29	5.4
Transportation and warehousing, and utilities	8	1.5
Information	26	4.8
Finance, insurance, real estate, and rental and leasing	39	7.2
Professional, scientific, management, administrative, and waste management services	75	13.9
Educational, health and social services	137	25.5
Arts, entertainment, recreation, accommodation and food services	41	7.6
Other services (except public administration)	18	3.3
Public administration	18	3.3
CLASS OF WORKER		
Private wage and salary workers	442	82.2
Government workers	61	11.3
Self-employed workers in own not incorporated business	35	6.5

Subject	Number	Percent
Unpaid family workers	0	0.0
INCOME IN 1999		
Households	**521**	**100.0**
Less than $10,000	27	5.2
$10,000 to $14,999	11	2.1
$15,000 to $24,999	15	2.9
$25,000 to $34,999	78	15.0
$35,000 to $49,999	122	23.4
$50,000 to $74,999	116	22.3
$75,000 to $99,999	93	17.9
$100,000 to $149,999	24	4.6
$150,000 to $199,999	17	3.3
$200,000 or more	18	3.5
Median household income (dollars)	51,103	(X)
With earnings	391	75.0
Mean earnings (dollars)	77,502	(X)
With Social Security income	198	38.0
Mean Social Security income (dollars)	10,517	(X)
With Supplemental Security Income	8	1.5
Mean Supplemental Security Income (dollars)	10,000	(X)
With public assistance income	14	2.7
Mean public assistance income (dollars)	6,850	(X)
With retirement income	114	21.9
Mean retirement income (dollars)	23,393	(X)
Families	**380**	**100.0**
Less than $10,000	10	2.6
$10,000 to $14,999	0	0.0
$15,000 to $24,999	12	3.2
$25,000 to $34,999	55	14.5
$35,000 to $49,999	87	22.9
$50,000 to $74,999	72	18.9
$75,000 to $99,999	85	22.4
$100,000 to $149,999	24	6.3
$150,000 to $199,999	17	4.5
$200,000 or more	18	4.7
Median family income (dollars)	59,750	(X)
Per capita income (dollars)	31,427	(X)
Median earnings (dollars):		
Male full-time, year-round workers	41,500	(X)
Female full-time, year-round workers	34,875	(X)
POVERTY STATUS IN 1999 (below poverty level)		
Families	**10**	**(X)**
Percent below poverty level	(X)	2.6
With related children under 18 years	0	(X)
Percent below poverty level	(X)	0.0
With related children under 5 years	0	(X)
Percent below poverty level	(X)	0.0
Families with female householder, no husband present	**0**	**(X)**
Percent below poverty level	(X)	0.0
With related children under 18 years	0	(X)
Percent below poverty level	(X)	0.0
With related children under 5 years	0	(X)
Percent below poverty level	(X)	(X)
Individuals	**47**	**(X)**
Percent below poverty level	(X)	4.0
18 years and over	47	(X)
Percent below poverty level	(X)	4.6
65 years and over	0	(X)
Percent below poverty level	(X)	0.0
Related children under 18 years	0	(X)
Percent below poverty level	(X)	0.0
Related children 5 to 17 years	0	(X)
Percent below poverty level	(X)	0.0
Unrelated individuals 15 years and over	29	(X)

Subject	Number	Percent
Percent below poverty level	(X)	13.5

(X) Not applicable.
Detailed Occupation Code List (PDF 42KB)
Detailed Industry Code List (PDF 44KB)
User note on employment status data (PDF 63KB)
Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices P30, P32, P33, P43, P46, P49, P50, P51, P52, P53, P58, P62, P63, P64, P65, P67, P71, P72, P73, P74, P76, P77, P82, P87, P90, PCT47, PCT52, and PCT53

QT-P32. **Income Distribution in 1999 of Households and Families: 2000**
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data
Geographic Area: **Census Tract 70.08, Sacramento County, California**

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

Subject	Households	Families			Nonfamily households
		Total	Married-couple families	Female householder, no husband present	
NUMBER					
Total	**521**	**380**	**308**	**52**	**141**
Less than $10,000	27	10	10	0	17
$10,000 to $14,999	11	0	0	0	11
$15,000 to $19,999	15	12	0	12	15
$20,000 to $24,999	0	0	0	0	0
$25,000 to $29,999	30	23	15	8	7
$30,000 to $34,999	46	32	24	8	4
$35,000 to $39,999	42	31	31	0	11
$40,000 to $44,999	44	26	7	8	24
$45,000 to $49,999	36	30	22	8	0
$50,000 to $59,999	63	28	20	8	35
$60,000 to $74,999	53	44	35	0	9
$75,000 to $99,999	93	85	85	0	8
$100,000 to $124,999	17	17	17	0	0
$125,000 to $149,999	7	7	7	0	0
$150,000 to $199,999	17	17	17	0	0
$200,000 or more	18	18	18	0	0
Median income (dollars)	51,103	59,750	67,344	34,375	42,292
Mean income (dollars)	72,767	85,343	96,042	35,427	37,618
PERCENT DISTRIBUTION					
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Less than $10,000	5.2	2.6	3.2	0.0	12.1
$10,000 to $14,999	2.1	0.0	0.0	0.0	7.8
$15,000 to $19,999	2.9	3.2	0.0	23.1	10.6
$20,000 to $24,999	0.0	0.0	0.0	0.0	0.0
$25,000 to $29,999	5.8	6.1	4.9	15.4	5.0
$30,000 to $34,999	9.2	8.4	7.8	15.4	2.8
$35,000 to $39,999	8.1	8.2	10.1	0.0	7.8
$40,000 to $44,999	8.4	6.8	2.3	15.4	17.0
$45,000 to $49,999	6.9	7.9	7.1	15.4	0.0
$50,000 to $59,999	12.1	7.4	6.5	15.4	24.8
$60,000 to $74,999	10.2	11.6	11.4	0.0	6.4
$75,000 to $99,999	17.9	22.4	27.6	0.0	5.7
$100,000 to $124,999	3.3	4.5	5.5	0.0	0.0
$125,000 to $149,999	1.3	1.8	2.3	0.0	0.0
$150,000 to $199,999	3.3	4.5	5.5	0.0	0.0
$200,000 or more	3.5	4.7	5.8	0.0	0.0

(X) Not applicable.
Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices P52, P53, P54, P79, P80, P81, PCT38, PCT40, and PCT41.

U.S. Census Bureau
American FactFinder

CT 71

P4. HISPANIC OR LATINO, AND NOT HISPANIC OR LATINO BY RACE [73] - Universe: Total population
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

	Block Group 1, Census Tract 71, Sacramento County, California	Block Group 2, Census Tract 71, Sacramento County, California
Total:	896	254
Hispanic or Latino	173	27
Not Hispanic or Latino:	723	227
Population of one race:	699	222
White alone	562	206
Black or African American alone	44	3
American Indian and Alaska Native alone	10	0
Asian alone	79	11
Native Hawaiian and Other Pacific Islander alone	0	0
Some other race alone	4	2
Population of two or more races:	24	5
Population of two races:	24	5
White; Black or African American	0	0
White; American Indian and Alaska Native	6	1
White; Asian	11	1
White; Native Hawaiian and Other Pacific Islander	0	0
White; Some other race	3	2
Black or African American; American Indian and Alaska Native	0	0
Black or African American; Asian	1	0
Black or African American; Native Hawaiian and Other Pacific Islander	0	0
Black or African American; Some other race	0	0
American Indian and Alaska Native; Asian	0	0
American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0
American Indian and Alaska Native; Some other race	0	0
Asian; Native Hawaiian and Other Pacific Islander	0	0
Asian; Some other race	3	1
Native Hawaiian and Other Pacific Islander; Some other race	0	0
Population of three races:	0	0
White; Black or African American; American Indian and Alaska Native	0	0
White; Black or African American; Asian	0	0
White; Black or African American; Native Hawaiian and Other Pacific Islander	0	0
White; Black or African American; Some other race	0	0
White; American Indian and Alaska Native; Asian	0	0
White; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0
White; American Indian and Alaska Native; Some other race	0	0
White; Asian; Native Hawaiian and Other Pacific Islander	0	0
White; Asian; Some other race	0	0
White; Native Hawaiian and Other Pacific Islander; Some other race	0	0
Black or African American; American Indian and Alaska Native; Asian	0	0
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0
Black or African American; American Indian and Alaska Native; Some other race	0	0
Black or African American; Asian; Native Hawaiian and Other Pacific Islander	0	0
Black or African American; Asian;Some other race	0	0
Black or African American; Native Hawaiian and Other Pacific Islander; Some other race	0	0
American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0
American Indian and Alaska Native; Asian; Some other race	0	0
American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0
Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0
Population of four races:	0	0
White; Black or African American; American Indian and Alaska Native, Asian	0	0

White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0
White; Black or African American; American Indian and Alaska Native; Some other race	0	0
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander	0	0
White; Black or African American; Asian; Some other race	0	0
White; Black or African American; Native Hawaiian and Other Pacific Islander; Some other race	0	0
White; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0
White; American Indian and Alaska Native; Asian; Some other race	0	0
White; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0
White; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0
Black or African American; American Indian and Alaska Native; Asian; Some other race	0	0
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0
Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0
American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0
Population of five races:	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Some other race	0	0
White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0
White, Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0
White; American Indian and Alaska Native, Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0
Population of six races:	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0

U.S. Census Bureau
Census 2000

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 1 (SF 1) 100-Percent Data (PDF 44KB)

CT 71

U.S. Census Bureau
American FactFinder

QT-P32. **Income Distribution in 1999 of Households and Families: 2000**
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data
Geographic Area: **Census Tract 71, Sacramento County, California**

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

Subject	Households	Families			Nonfamily households
		Total	Married-couple families	Female householder, no husband present	
NUMBER					
Total	412	293	271	16	119
Less than $10,000	4	4	0	4	4
$10,000 to $14,999	6	6	6	0	0
$15,000 to $19,999	15	0	0	0	15
$20,000 to $24,999	32	25	25	0	7
$25,000 to $29,999	12	6	6	0	6
$30,000 to $34,999	22	8	8	0	14
$35,000 to $39,999	6	6	0	6	0
$40,000 to $44,999	18	18	18	0	0
$45,000 to $49,999	26	18	18	0	8
$50,000 to $59,999	31	16	10	6	11
$60,000 to $74,999	59	59	59	0	12
$75,000 to $99,999	74	39	39	0	23
$100,000 to $124,999	55	55	49	0	0
$125,000 to $149,999	30	17	17	0	13
$150,000 to $199,999	16	16	16	0	0
$200,000 or more	6	0	0	0	6
Median income (dollars)	65,000	66,146	67,188	39,167	55,208
Mean income (dollars)	75,987	75,574	77,159	35,344	71,568
PERCENT DISTRIBUTION					
Total	100.0	100.0	100.0	100.0	100.0
Less than $10,000	1.0	1.4	0.0	25.0	3.4
$10,000 to $14,999	1.5	2.0	2.2	0.0	0.0
$15,000 to $19,999	3.6	0.0	0.0	0.0	12.6
$20,000 to $24,999	7.8	8.5	9.2	0.0	5.9
$25,000 to $29,999	2.9	2.0	2.2	0.0	5.0
$30,000 to $34,999	5.3	2.7	3.0	0.0	11.8
$35,000 to $39,999	1.5	2.0	0.0	37.5	0.0
$40,000 to $44,999	4.4	6.1	6.6	0.0	0.0
$45,000 to $49,999	6.3	6.1	6.6	0.0	6.7
$50,000 to $59,999	7.5	5.5	3.7	37.5	9.2
$60,000 to $74,999	14.3	20.1	21.8	0.0	10.1
$75,000 to $99,999	18.0	13.3	14.4	0.0	19.3
$100,000 to $124,999	13.3	18.8	18.1	0.0	0.0
$125,000 to $149,999	7.3	5.8	6.3	0.0	10.9
$150,000 to $199,999	3.9	5.5	5.9	0.0	0.0
$200,000 or more	1.5	0.0	0.0	0.0	5.0

(X) Not applicable.
Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices P52, P53, P54, P79, P80, P81, PCT38, PCT40, and PCT41.

U.S. Census Bureau
American FactFinder

CT 71

DP-3. **Profile of Selected Economic Characteristics: 2000**
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data
Geographic Area: **Census Tract 71, Sacramento County, California**

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

Subject	Number	Percent
EMPLOYMENT STATUS		
Population 16 years and over	**836**	**100.0**
In labor force	530	63.4
Civilian labor force	530	63.4
Employed	511	61.1
Unemployed	19	2.3
Percent of civilian labor force	3.6	(X)
Armed Forces	0	0.0
Not in labor force	306	36.6
Females 16 years and over	**450**	**100.0**
In labor force	257	57.1
Civilian labor force	257	57.1
Employed	248	55.1
Own children under 6 years	**90**	**100.0**
All parents in family in labor force	14	15.6
COMMUTING TO WORK		
Workers 16 years and over	**501**	**100.0**
Car, truck, or van -- drove alone	415	82.8
Car, truck, or van -- carpooled	74	14.8
Public transportation (including taxicab)	7	1.4
Walked	0	0.0
Other means	0	0.0
Worked at home	5	1.0
Mean travel time to work (minutes)	25.1	(X)
Employed civilian population 16 years and over	**511**	**100.0**
OCCUPATION		
Management, professional, and related occupations	207	40.5
Service occupations	64	12.5
Sales and office occupations	135	26.4
Farming, fishing, and forestry occupations	0	0.0
Construction, extraction, and maintenance occupations	43	8.4
Production, transportation, and material moving occupations	62	12.1
INDUSTRY		
Agriculture, forestry, fishing and hunting, and mining	5	1.0
Construction	33	6.5
Manufacturing	60	11.7
Wholesale trade	35	6.8
Retail trade	25	4.9
Transportation and warehousing, and utilities	25	4.9
Information	12	2.3
Finance, insurance, real estate, and rental and leasing	31	6.1
Professional, scientific, management, administrative, and waste management services	56	11.0
Educational, health and social services	86	16.8
Arts, entertainment, recreation, accommodation and food services	10	2.0
Other services (except public administration)	44	8.6
Public administration	89	17.4
CLASS OF WORKER		
Private wage and salary workers	326	63.8
Government workers	153	29.9
Self-employed workers in own not incorporated business	32	6.3

Subject	Number	Percent
Unpaid family workers	0	0.0
INCOME IN 1999		
Households	**412**	**100.0**
Less than $10,000	4	1.0
$10,000 to $14,999	6	1.5
$15,000 to $24,999	47	11.4
$25,000 to $34,999	34	8.3
$35,000 to $49,999	50	12.1
$50,000 to $74,999	90	21.8
$75,000 to $99,999	74	18.0
$100,000 to $149,999	85	20.6
$150,000 to $199,999	16	3.9
$200,000 or more	6	1.5
Median household income (dollars)	65,000	(X)
With earnings	357	86.7
Mean earnings (dollars)	70,757	(X)
With Social Security income	101	24.5
Mean Social Security income (dollars)	13,533	(X)
With Supplemental Security Income	10	2.4
Mean Supplemental Security Income (dollars)	5,970	(X)
With public assistance income	29	7.0
Mean public assistance income (dollars)	2,786	(X)
With retirement income	70	17.0
Mean retirement income (dollars)	19,540	(X)
Families	**293**	**100.0**
Less than $10,000	4	1.4
$10,000 to $14,999	6	2.0
$15,000 to $24,999	25	8.5
$25,000 to $34,999	14	4.8
$35,000 to $49,999	42	14.3
$50,000 to $74,999	75	25.6
$75,000 to $99,999	39	13.3
$100,000 to $149,999	72	24.6
$150,000 to $199,999	16	5.5
$200,000 or more	0	0.0
Median family income (dollars)	66,146	(X)
Per capita income (dollars)	27,589	(X)
Median earnings (dollars):		
Male full-time, year-round workers	46,538	(X)
Female full-time, year-round workers	34,154	(X)
POVERTY STATUS IN 1999 (below poverty level)		
Families	**17**	**(X)**
Percent below poverty level	(X)	5.8
With related children under 18 years	17	(X)
Percent below poverty level	(X)	13.7
With related children under 5 years	13	(X)
Percent below poverty level	(X)	26.0
Families with female householder, no husband present	**4**	**(X)**
Percent below poverty level	(X)	25.0
With related children under 18 years	4	(X)
Percent below poverty level	(X)	40.0
With related children under 5 years	0	(X)
Percent below poverty level	(X)	(X)
Individuals	**133**	**(X)**
Percent below poverty level	(X)	12.0
18 years and over	72	(X)
Percent below poverty level	(X)	8.7
65 years and over	0	(X)
Percent below poverty level	(X)	0.0
Related children under 18 years	61	(X)
Percent below poverty level	(X)	21.9
Related children 5 to 17 years	52	(X)
Percent below poverty level	(X)	25.7
Unrelated individuals 15 years and over	26	(X)

Subject	Number	Percent
Percent below poverty level	(X)	14.6

(X) Not applicable.
Detailed Occupation Code List (PDF 42KB)
Detailed Industry Code List (PDF 44KB)
User note on employment status data (PDF 63KB)
Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices P30, P32, P33, P43, P46, P49, P50, P51, P52, P53, P58, P62, P63, P64, P65, P67, P71, P72, P73, P74, P76, P77, P82, P87, P90, PCT47, PCT52, and PCT53

U.S. Census Bureau
State & County QuickFacts

Sacramento (city), California

People QuickFacts	Sacramento	California
Population, 2003 estimate	445,335	35,484,453
Population, percent change, April 1, 2000 to July 1, 2003	9.4%	4.8%
Population, 2000	407,018	33,871,648
Population, percent change, 1990 to 2000	3.0%	13.6%
Persons under 5 years old, percent, 2000	7.1%	7.3%
Persons under 18 years old, percent, 2000	27.3%	27.3%
Persons 65 years old and over, percent, 2000	11.4%	10.6%
Female persons, percent, 2000	51.4%	50.2%
White persons, percent, 2000 (a)	48.3%	59.5%
Black or African American persons, percent, 2000 (a)	15.5%	6.7%
American Indian and Alaska Native persons, percent, 2000 (a)	1.3%	1.0%
Asian persons, percent, 2000 (a)	16.6%	10.9%
Native Hawaiian and Other Pacific Islander, percent, 2000 (a)	0.9%	0.3%
Persons reporting some other race, percent, 2000 (a)	11.0%	16.8%
Persons reporting two or more races, percent, 2000	6.4%	4.7%
Persons of Hispanic or Latino origin, percent, 2000	21.6%	32.4%
Living in same house in 1995 and 2000, pct 5 yrs old & over	48.6%	50.2%
Foreign born persons, percent, 2000	20.3%	26.2%
Language other than English spoken at home, pct age 5+, 2000	32.6%	39.5%
High school graduates, percent of persons age 25+, 2000	77.3%	76.8%
Bachelor's degree or higher, pct of persons age 25+, 2000	23.9%	26.6%
Mean travel time to work (minutes), workers age 16+, 2000	23.4	27.7
Housing units, 2000	163,957	12,214,549
Homeownership rate, 2000	50.1%	56.9%
Median value of owner-occupied housing units, 2000	$128,800	$211,500
Households, 2000	154,581	11,502,870
Persons per household, 2000	2.57	2.87
Median household income, 1999	$37,049	$47,493
Per capita money income, 1999	$18,721	$22,711
Persons below poverty, percent, 1999	20.0%	14.2%

Business QuickFacts	Sacramento	California
Wholesale trade sales, 1997 ($1000)	5,538,197	548,864,451
Retail sales, 1997 ($1000)	3,039,615	263,118,346
Retail sales per capita, 1997	$7,555	$8,167
Accommodation and foodservices sales, 1997 ($1000)	531,078	42,312,641
Total number of firms, 1997	25,562	2,565,734

Minority-owned firms, percent of total, 1997	34.2%	28.8%
Women-owned firms, percent of total, 1997	32.4%	27.3%

Geography QuickFacts	Sacramento	California
Land area, 2000 (square miles)	97	155,959
Persons per square mile, 2000	4,189.2	217.2
FIPS Code	64000	06
Counties		

(a) Includes persons reporting only one race.
(b) Hispanics may be of any race, so also are included in applicable race categories.

FN: Footnote on this item for this area in place of data
NA: Not available
D: Suppressed to avoid disclosure of confidential information
X: Not applicable
S: Suppressed; does not meet publication standards
Z: Value greater than zero but less than half unit of measure shown
F: Fewer than 100 firms

Source U.S. Census Bureau: State and County QuickFacts. Data derived from Population Estimates, 2000 Census of Population and Housing, 1990 Census of Population and Housing, Small Area Income and Poverty Estimates, County Business Patterns, 1997 Economic Census, Minority- and Women-Owned Business, Building Permits, Consolidated Federal Funds Report, Census of Governments
Last Revised: Wednesday, 02-Jan-2008 15:09:08 EST

Subject	Number	Percent
Percent below poverty level	(X)	46.5

(X) Not applicable.
Detailed Occupation Code List (PDF 42KB)
Detailed Industry Code List (PDF 44KB)
User note on employment status data (PDF 63KB)
Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices P30, P32, P33, P43, P46, P49, P50, P51, P52, P53, P58, P62, P63, P64, P65, P67, P71, P72, P73, P74, P76, P77, P82, P87, P90, PCT47, PCT52, and PCT53

City

DP-3. **Profile of Selected Economic Characteristics: 2000**
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data
Geographic Area: **Sacramento city, California**

NOTE: Data based on a sample except in P8, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

Subject	Number	Percent
EMPLOYMENT STATUS		
Population 16 years and over	**307,682**	**100.0**
In labor force	184,829	60.1
Civilian labor force	184,330	59.9
Employed	169,787	55.2
Unemployed	14,543	4.7
Percent of civilian labor force	7.9	(X)
Armed Forces	499	0.2
Not in labor force	122,853	39.9
Females 16 years and over	**160,853**	**100.0**
In labor force	89,700	55.8
Civilian labor force	89,501	55.6
Employed	83,333	51.8
Own children under 6 years	**32,228**	**100.0**
All parents in family in labor force	16,708	51.8
COMMUTING TO WORK		
Workers 16 years and over	**166,419**	**100.0**
Car, truck, or van -- drove alone	118,182	71.0
Car, truck, or van -- carpooled	27,126	16.3
Public transportation (including taxicab)	7,681	4.6
Walked	4,602	2.8
Other means	3,953	2.4
Worked at home	4,875	2.9
Mean travel time to work (minutes)	23.4	(X)
Employed civilian population 16 years and over	**169,787**	**100.0**
OCCUPATION		
Management, professional, and related occupations	61,498	36.2
Service occupations	27,432	16.2
Sales and office occupations	48,567	28.6
Farming, fishing, and forestry occupations	634	0.4
Construction, extraction, and maintenance occupations	12,980	7.6
Production, transportation, and material moving occupations	18,676	11.0
INDUSTRY		
Agriculture, forestry, fishing and hunting, and mining	954	0.6
Construction	9,804	5.8
Manufacturing	11,237	6.6
Wholesale trade	5,099	3.0
Retail trade	17,305	10.2
Transportation and warehousing, and utilities	7,951	4.7
Information	7,119	4.2
Finance, insurance, real estate, and rental and leasing	12,345	7.3
Professional, scientific, management, administrative, and waste management services	17,913	10.6
Educational, health and social services	32,346	19.1
Arts, entertainment, recreation, accommodation and food services	13,675	8.1

Subject	Number	Percent
Other services (except public administration)	8,972	5.3
Public administration	25,067	14.8
CLASS OF WORKER		
Private wage and salary workers	113,234	66.7
Government workers	45,879	27.0
Self-employed workers in own not incorporated business	10,286	6.0
Unpaid family workers	438	0.3
INCOME IN 1999		
Households	**154,893**	**100.0**
Less than $10,000	18,437	11.9
$10,000 to $14,999	11,745	7.6
$15,000 to $24,999	21,372	13.8
$25,000 to $34,999	21,285	13.7
$35,000 to $49,999	26,118	16.9
$50,000 to $74,999	28,775	18.6
$75,000 to $99,999	12,605	8.1
$100,000 to $149,999	10,170	6.6
$150,000 to $199,999	2,374	1.5
$200,000 or more	2,012	1.3
Median household income (dollars)	37,049	(X)
With earnings	121,287	78.3
Mean earnings (dollars)	47,960	(X)
With Social Security income	34,984	22.6
Mean Social Security income (dollars)	10,312	(X)
With Supplemental Security Income	13,001	8.4
Mean Supplemental Security Income (dollars)	7,187	(X)
With public assistance income	13,201	8.5
Mean public assistance income (dollars)	5,259	(X)
With retirement income	25,965	16.8
Mean retirement income (dollars)	19,082	(X)
Families	**92,213**	**100.0**
Less than $10,000	7,644	8.3
$10,000 to $14,999	6,027	6.5
$15,000 to $24,999	11,637	12.6
$25,000 to $34,999	12,479	13.5
$35,000 to $49,999	15,713	17.0
$50,000 to $74,999	18,631	20.2
$75,000 to $99,999	9,063	9.8
$100,000 to $149,999	7,745	8.4
$150,000 to $199,999	1,690	1.8
$200,000 or more	1,584	1.7
Median family income (dollars)	42,051	(X)
Per capita income (dollars)	18,721	(X)
Median earnings (dollars):		
Male full-time, year-round workers	35,946	(X)
Female full-time, year-round workers	31,318	(X)
POVERTY STATUS IN 1999 (below poverty level)		
Families	**14,082**	**(X)**
Percent below poverty level	(X)	15.3
With related children under 18 years	11,953	(X)
Percent below poverty level	(X)	22.5
With related children under 5 years	6,000	(X)
Percent below poverty level	(X)	27.0
Families with female householder, no husband present	**6,619**	**(X)**
Percent below poverty level	(X)	28.4
With related children under 18 years	5,999	(X)
Percent below poverty level	(X)	35.0
With related children under 5 years	2,945	(X)
Percent below poverty level	(X)	46.7
Individuals	**79,737**	**(X)**
Percent below poverty level	(X)	20.0
18 years and over	47,395	(X)
Percent below poverty level	(X)	16.3

Subject	Number	Percent
65 years and over	4,037	(X)
Percent below poverty level	(X)	9.0
Related children under 18 years	31,732	(X)
Percent below poverty level	(X)	29.5
Related children 5 to 17 years	23,377	(X)
Percent below poverty level	(X)	29.3
Unrelated individuals 15 years and over	21,063	(X)
Percent below poverty level	(X)	23.3

(X) Not applicable.
Detailed Occupation Code List (PDF 42KB)
Detailed Industry Code List (PDF 44KB)
User note on employment status data (PDF 63KB)
Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices P30, P32, P33, P43, P46, P49, P50, P51, P52, P53, P58, P62, P63, P64, P65, P67, P71, P72, P73, P74, P76, P77, P82, P87, P90, PCT47, PCT52, and PCT53

U.S. Census Bureau
State & County QuickFacts

Sacramento County, California

People QuickFacts	Sacramento County	California
Population, 2007 estimate	1,386,667	36,553,215
Population, percent change, April 1, 2000 to July 1, 2007	13.3%	7.9%
Population, 2000	1,223,499	33,871,648
Persons under 5 years old, percent, 2007	7.4%	7.3%
Persons under 18 years old, percent, 2007	26.2%	25.7%
Persons 65 years old and over, percent, 2007	11.1%	11.0%
Female persons, percent, 2007	50.9%	50.0%
White persons, percent, 2007 (a)	70.0%	76.8%
Black persons, percent, 2007 (a)	10.5%	6.7%
American Indian and Alaska Native persons, percent, 2007 (a)	1.2%	1.2%
Asian persons, percent, 2007 (a)	13.3%	12.4%
Native Hawaiian and Other Pacific Islander, percent, 2007 (a)	0.8%	0.4%
Persons reporting two or more races, percent, 2007	4.2%	2.5%
Persons of Hispanic or Latino origin, percent, 2007 (b)	19.6%	36.2%
White persons not Hispanic, percent, 2007	52.6%	42.7%
Living in same house in 1995 and 2000, pct 5 yrs old & over	47.5%	50.2%
Foreign born persons, percent, 2000	16.1%	26.2%
Language other than English spoken at home, pct age 5+, 2000	24.4%	39.5%
High school graduates, percent of persons age 25+, 2000	83.3%	76.8%
Bachelor's degree or higher, pct of persons age 25+, 2000	24.8%	26.6%
Persons with a disability, age 5+, 2000	224,148	5,923,361
Mean travel time to work (minutes), workers age 16+, 2000	25.4	27.7
Housing units, 2007	547,968	13,308,346
Homeownership rate, 2000	58.2%	56.9%
Housing units in multi-unit structures, percent, 2000	27.4%	31.4%
Median value of owner-occupied housing units, 2000	$144,200	$211,500
Households, 2000	453,602	11,502,870
Persons per household, 2000	2.64	2.87
Median household income, 2007	$56,823	$59,928
Per capita money income, 1999	$21,142	$22,711
Persons below poverty, percent, 2007	12.2%	12.4%

Business QuickFacts	Sacramento County	California
Private nonfarm establishments, 2006	28,823	878,128[1]
Private nonfarm employment, 2006	480,346	13,834,264[1]
Private nonfarm employment, percent change 2000-2006		

	13.3%	7.4%[1]
Nonemployer establishments, 2006	85,458	2,645,256
Total number of firms, 2002	90,876	2,908,758
Black-owned firms, percent, 2002	4.8%	3.9%
American Indian and Alaska Native owned firms, percent, 2002	1.2%	1.3%
Asian-owned firms, percent, 2002	11.9%	12.8%
Native Hawaiian and Other Pacific Islander owned firms, percent, 2002	S	0.2%
Hispanic-owned firms, percent, 2002	8.7%	14.7%
Women-owned firms, percent, 2002	31.7%	29.9%
Manufacturers shipments, 2002 ($1000)	6,459,839	378,661,414
Wholesale trade sales, 2002 ($1000)	12,852,250	655,954,708
Retail sales, 2002 ($1000)	13,730,077	359,120,365
Retail sales per capita, 2002	$10,548	$10,264
Accommodation and foodservices sales, 2002 ($1000)	1,665,556	55,559,669
Building permits, 2007	4,112	110,073
Federal spending, 2007 ($1000)	15,718,541	260,421,921[1]

Geography QuickFacts	**Sacramento County**	**California**
Land area, 2000 (square miles)	965.65	155,959.34
Persons per square mile, 2000	1,266.6	217.2
FIPS Code	067	06
Metropolitan or Micropolitan Statistical Area	Sacramento--Arden-Arcade--Roseville, CA Metro Area	

1: Includes data not distributed by county.

(a) Includes persons reporting only one race.
(b) Hispanics may be of any race, so also are included in applicable race categories.

D: Suppressed to avoid disclosure of confidential information
F: Fewer than 100 firms
FN: Footnote on this item for this area in place of data
NA: Not available
S: Suppressed; does not meet publication standards
X: Not applicable
Z: Value greater than zero but less than half unit of measure shown

Source U.S. Census Bureau: State and County QuickFacts. Data derived from Population Estimates, Census of Population and Housing, Small Area Income and Poverty Estimates, State and County Housing Unit Estimates, County Business Patterns, Nonemployer Statistics, Economic Census, Survey of Business Owners, Building Permits, Consolidated Federal Funds Report
Last Revised: Friday, 20-Feb-2009 09:28:03 EST

U.S. Census Bureau
American FactFinder

County

DP-3. **Profile of Selected Economic Characteristics: 2000**
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data
Geographic Area: **Sacramento County, California**

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

Subject	Number	Percent
EMPLOYMENT STATUS		
Population 16 years and over	**921,897**	**100.0**
In labor force	587,086	63.7
Civilian labor force	584,886	63.4
Employed	545,925	59.2
Unemployed	38,961	4.2
Percent of civilian labor force	6.7	(X)
Armed Forces	2,200	0.2
Not in labor force	334,811	36.3
Females 16 years and over	**478,693**	**100.0**
In labor force	280,577	58.6
Civilian labor force	280,054	58.5
Employed	263,221	55.0
Own children under 6 years	**100,671**	**100.0**
All parents in family in labor force	56,043	55.7
COMMUTING TO WORK		
Workers 16 years and over	**536,310**	**100.0**
Car, truck, or van -- drove alone	404,130	75.4
Car, truck, or van -- carpooled	77,021	14.4
Public transportation (including taxicab)	16,502	3.1
Walked	10,999	2.1
Other means	9,368	1.7
Worked at home	18,290	3.4
Mean travel time to work (minutes)	25.4	(X)
Employed civilian population 16 years and over	**545,925**	**100.0**
OCCUPATION		
Management, professional, and related occupations	198,004	36.3
Service occupations	79,285	14.5
Sales and office occupations	163,268	29.9
Farming, fishing, and forestry occupations	2,205	0.4
Construction, extraction, and maintenance occupations	47,691	8.7
Production, transportation, and material moving occupations	55,472	10.2
INDUSTRY		
Agriculture, forestry, fishing and hunting, and mining	3,990	0.7
Construction	37,223	6.8
Manufacturing	39,115	7.2
Wholesale trade	18,741	3.4
Retail trade	62,702	11.5
Transportation and warehousing, and utilities	25,280	4.6
Information	20,910	3.8
Finance, insurance, real estate, and rental and leasing	46,715	8.6
Professional, scientific, management, administrative, and waste management services	56,352	10.3
Educational, health and social services	100,629	18.4
Arts, entertainment, recreation, accommodation and food services	38,835	7.1
Other services (except public administration)	28,273	5.2
Public administration	67,260	12.3
CLASS OF WORKER		
Private wage and salary workers	381,308	69.8
Government workers	125,669	23.0
Self-employed workers in own not incorporated business	37,643	6.9

Subject	Number	Percent
Unpaid family workers	1,305	0.2
INCOME IN 1999		
Households	**453,841**	**100.0**
Less than $10,000	37,684	8.3
$10,000 to $14,999	26,880	5.9
$15,000 to $24,999	54,323	12.0
$25,000 to $34,999	58,693	12.9
$35,000 to $49,999	77,438	17.1
$50,000 to $74,999	93,034	20.5
$75,000 to $99,999	49,765	11.0
$100,000 to $149,999	39,064	8.6
$150,000 to $199,999	9,421	2.1
$200,000 or more	7,539	1.7
Median household income (dollars)	43,816	(X)
With earnings	369,790	81.5
Mean earnings (dollars)	54,822	(X)
With Social Security income	101,678	22.4
Mean Social Security income (dollars)	10,791	(X)
With Supplemental Security Income	28,935	6.4
Mean Supplemental Security Income (dollars)	7,379	(X)
With public assistance income	29,896	6.6
Mean public assistance income (dollars)	5,143	(X)
With retirement income	83,660	18.4
Mean retirement income (dollars)	19,801	(X)
Families	**299,738**	**100.0**
Less than $10,000	16,942	5.7
$10,000 to $14,999	13,815	4.6
$15,000 to $24,999	30,562	10.2
$25,000 to $34,999	35,495	11.8
$35,000 to $49,999	50,494	16.8
$50,000 to $74,999	66,216	22.1
$75,000 to $99,999	39,928	13.3
$100,000 to $149,999	32,442	10.8
$150,000 to $199,999	7,636	2.5
$200,000 or more	6,208	2.1
Median family income (dollars)	50,717	(X)
Per capita income (dollars)	21,142	(X)
Median earnings (dollars):		
Male full-time, year-round workers	39,482	(X)
Female full-time, year-round workers	31,569	(X)
POVERTY STATUS IN 1999 (below poverty level)		
Families	**30,774**	**(X)**
Percent below poverty level	(X)	10.3
With related children under 18 years	26,079	(X)
Percent below poverty level	(X)	15.4
With related children under 5 years	13,449	(X)
Percent below poverty level	(X)	19.3
Families with female householder, no husband present	**14,580**	**(X)**
Percent below poverty level	(X)	23.4
With related children under 18 years	13,311	(X)
Percent below poverty level	(X)	29.9
With related children under 5 years	6,527	(X)
Percent below poverty level	(X)	42.9
Individuals	**169,784**	**(X)**
Percent below poverty level	(X)	14.1
18 years and over	102,056	(X)
Percent below poverty level	(X)	11.7
65 years and over	8,628	(X)
Percent below poverty level	(X)	6.6
Related children under 18 years	65,901	(X)
Percent below poverty level	(X)	20.2
Related children 5 to 17 years	47,967	(X)
Percent below poverty level	(X)	19.9
Unrelated individuals 15 years and over	48,043	(X)

Subject	Number	Percent
Percent below poverty level	(X)	20.8

(X) Not applicable.
Detailed Occupation Code List (PDF 42KB)
Detailed Industry Code List (PDF 44KB)
User note on employment status data (PDF 93KB)
Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices P30, P32, P33, P43, P46, P49, P50, P51, P52, P53, P58, P62, P63, P64, P65, P67, P71, P72, P73, P74, P76, P77, P82, P87, P90, PCT47, PCT52, and PCT53

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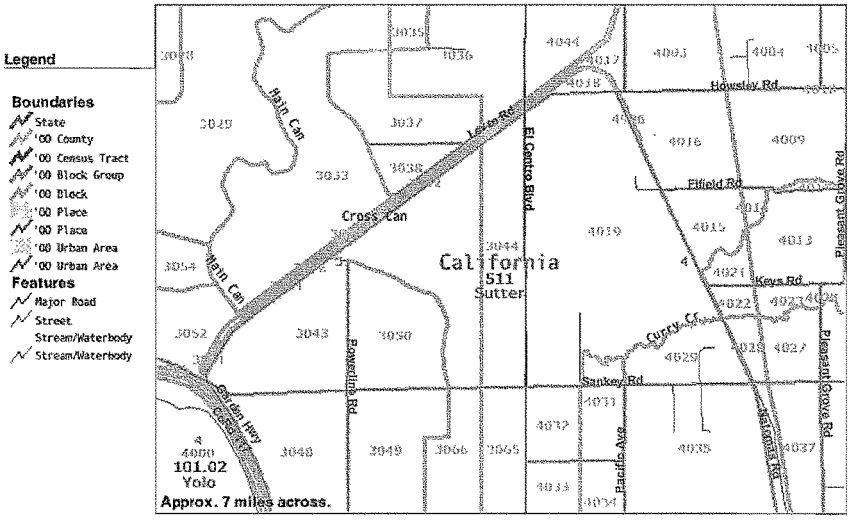


U.S. Census Bureau
American FactFinder

DP-3. **Profile of Selected Economic Characteristics: 2000**
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data
Geographic Area: **Sutter County, California**

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

Subject	Number	Percent
EMPLOYMENT STATUS		
Population 16 years and over	**58,728**	**100.0**
In labor force	35,470	60.4
Civilian labor force	35,107	59.8
Employed	30,980	52.8
Unemployed	4,127	7.0
Percent of civilian labor force	11.8	(X)
Armed Forces	363	0.6
Not in labor force	23,258	39.6
Females 16 years and over	**30,139**	**100.0**
In labor force	15,698	52.1
Civilian labor force	15,591	51.7
Employed	13,617	45.2
Own children under 6 years	**6,654**	**100.0**
All parents in family in labor force	3,708	55.7
COMMUTING TO WORK		
Workers 16 years and over	**30,383**	**100.0**
Car, truck, or van -- drove alone	23,756	78.2
Car, truck, or van -- carpooled	4,492	14.8
Public transportation (including taxicab)	193	0.6
Walked	571	1.9
Other means	458	1.5
Worked at home	913	3.0
Mean travel time to work (minutes)	25.4	(X)
Employed civilian population 16 years and over	**30,980**	**100.0**
OCCUPATION		
Management, professional, and related occupations	8,825	28.5
Service occupations	4,585	14.8
Sales and office occupations	7,575	24.5
Farming, fishing, and forestry occupations	1,791	5.8
Construction, extraction, and maintenance occupations	3,412	11.0
Production, transportation, and material moving occupations	4,792	15.5
INDUSTRY		
Agriculture, forestry, fishing and hunting, and mining	2,913	9.4
Construction	2,595	8.4
Manufacturing	3,073	9.9
Wholesale trade	1,177	3.8
Retail trade	3,916	12.6
Transportation and warehousing, and utilities	1,576	5.1
Information	579	1.9
Finance, insurance, real estate, and rental and leasing	1,595	5.1
Professional, scientific, management, administrative, and waste management services	2,121	6.8
Educational, health and social services	6,234	20.1
Arts, entertainment, recreation, accommodation and food services	1,928	6.2
Other services (except public administration)	1,451	4.7
Public administration	1,822	5.9
CLASS OF WORKER		
Private wage and salary workers	22,329	72.1
Government workers	5,630	18.2
Self-employed workers in own not incorporated business	2,846	9.2

Subject	Number	Percent
Unpaid family workers	175	0.6
INCOME IN 1999		
Households	**27,098**	**100.0**
Less than $10,000	2,734	10.1
$10,000 to $14,999	1,975	7.3
$15,000 to $24,999	4,097	15.1
$25,000 to $34,999	3,588	13.2
$35,000 to $49,999	4,512	16.7
$50,000 to $74,999	5,133	18.9
$75,000 to $99,999	2,619	9.7
$100,000 to $149,999	1,713	6.3
$150,000 to $199,999	412	1.5
$200,000 or more	335	1.2
Median household income (dollars)	38,375	(X)
With earnings	21,865	80.7
Mean earnings (dollars)	47,914	(X)
With Social Security income	7,204	26.6
Mean Social Security income (dollars)	10,584	(X)
With Supplemental Security Income	1,603	5.9
Mean Supplemental Security Income (dollars)	6,732	(X)
With public assistance income	1,383	5.1
Mean public assistance income (dollars)	4,978	(X)
With retirement income	5,313	19.6
Mean retirement income (dollars)	18,690	(X)
Families	**20,251**	**100.0**
Less than $10,000	1,309	6.5
$10,000 to $14,999	1,208	6.0
$15,000 to $24,999	2,800	13.8
$25,000 to $34,999	2,404	11.9
$35,000 to $49,999	3,547	17.5
$50,000 to $74,999	4,483	22.1
$75,000 to $99,999	2,315	11.4
$100,000 to $149,999	1,534	7.6
$150,000 to $199,999	371	1.8
$200,000 or more	280	1.4
Median family income (dollars)	44,330	(X)
Per capita income (dollars)	17,428	(X)
Median earnings (dollars):		
Male full-time, year-round workers	35,723	(X)
Female full-time, year-round workers	25,778	(X)
POVERTY STATUS IN 1999 (below poverty level)		
Families	**2,446**	**(X)**
Percent below poverty level	(X)	12.1
With related children under 18 years	2,058	(X)
Percent below poverty level	(X)	17.9
With related children under 5 years	1,009	(X)
Percent below poverty level	(X)	22.0
Families with female householder, no husband present	**897**	**(X)**
Percent below poverty level	(X)	29.9
With related children under 18 years	788	(X)
Percent below poverty level	(X)	37.0
With related children under 5 years	366	(X)
Percent below poverty level	(X)	46.9
Individuals	**12,031**	**(X)**
Percent below poverty level	(X)	15.5
18 years and over	7,213	(X)
Percent below poverty level	(X)	13.1
65 years and over	699	(X)
Percent below poverty level	(X)	7.7
Related children under 18 years	4,733	(X)
Percent below poverty level	(X)	21.3
Related children 5 to 17 years	3,399	(X)
Percent below poverty level	(X)	20.4
Unrelated individuals 15 years and over	2,498	(X)

Subject	Number	Percent
Percent below poverty level	(X)	24.9

(X) Not applicable.
Detailed Occupation Code List (PDF 42KB)
Detailed Industry Code List (PDF 44KB)
User note on employment status data (PDF 63KB)
Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices P30, P32, P33, P43, P46, P49, P50, P51, P52, P53, P58, P62, P63, P64, P65, P67, P71, P72, P73, P74, P76, P77, P82, P87, P90, PCT47, PCT52, and PCT53

DP-3. **Profile of Selected Economic Characteristics: 2000**
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data
Geographic Area: **Census Tract 511, Sutter County, California**

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

Subject	Number	Percent
EMPLOYMENT STATUS		
Population 16 years and over	**2,091**	**100.0**
In labor force	1,252	59.9
Civilian labor force	1,252	59.9
Employed	1,153	55.1
Unemployed	99	4.7
Percent of civilian labor force	7.9	(X)
Armed Forces	0	0.0
Not in labor force	839	40.1
Females 16 years and over	**999**	**100.0**
In labor force	506	50.7
Civilian labor force	506	50.7
Employed	454	45.4
Own children under 6 years	**150**	**100.0**
All parents in family in labor force	78	52.0
COMMUTING TO WORK		
Workers 16 years and over	**1,115**	**100.0**
Car, truck, or van -- drove alone	860	77.1
Car, truck, or van -- carpooled	84	7.5
Public transportation (including taxicab)	5	0.4
Walked	26	2.3
Other means	10	0.9
Worked at home	130	11.7
Mean travel time to work (minutes)	26.2	(X)
Employed civilian population 16 years and over	**1,153**	**100.0**
OCCUPATION		
Management, professional, and related occupations	366	31.7
Service occupations	115	10.0
Sales and office occupations	267	23.2
Farming, fishing, and forestry occupations	83	7.2
Construction, extraction, and maintenance occupations	162	14.1
Production, transportation, and material moving occupations	160	13.9
INDUSTRY		
Agriculture, forestry, fishing and hunting, and mining	229	19.9
Construction	130	11.3
Manufacturing	61	5.3
Wholesale trade	56	4.9
Retail trade	139	12.1
Transportation and warehousing, and utilities	56	4.9
Information	23	2.0
Finance, insurance, real estate, and rental and leasing	42	3.6
Professional, scientific, management, administrative, and waste management services	76	6.6
Educational, health and social services	171	14.8
Arts, entertainment, recreation, accommodation and food services	31	2.7

Subject	Number	Percent
Other services (except public administration)	57	4.9
Public administration	82	7.1
CLASS OF WORKER		
Private wage and salary workers	677	58.7
Government workers	254	22.0
Self-employed workers in own not incorporated business	213	18.5
Unpaid family workers	9	0.8
INCOME IN 1999		
Households	**956**	**100.0**
Less than $10,000	87	9.1
$10,000 to $14,999	59	6.2
$15,000 to $24,999	108	11.3
$25,000 to $34,999	148	15.5
$35,000 to $49,999	137	14.3
$50,000 to $74,999	174	18.2
$75,000 to $99,999	135	14.1
$100,000 to $149,999	67	7.0
$150,000 to $199,999	31	3.2
$200,000 or more	10	1.0
Median household income (dollars)	42,841	(X)
With earnings	760	79.5
Mean earnings (dollars)	54,902	(X)
With Social Security income	297	31.1
Mean Social Security income (dollars)	11,494	(X)
With Supplemental Security Income	41	4.3
Mean Supplemental Security Income (dollars)	6,298	(X)
With public assistance income	36	3.8
Mean public assistance income (dollars)	3,650	(X)
With retirement income	181	18.9
Mean retirement income (dollars)	15,697	(X)
Families	**716**	**100.0**
Less than $10,000	37	5.2
$10,000 to $14,999	38	5.3
$15,000 to $24,999	74	10.3
$25,000 to $34,999	104	14.5
$35,000 to $49,999	105	14.7
$50,000 to $74,999	158	22.1
$75,000 to $99,999	110	15.4
$100,000 to $149,999	55	7.7
$150,000 to $199,999	25	3.5
$200,000 or more	10	1.4
Median family income (dollars)	50,000	(X)
Per capita income (dollars)	19,490	(X)
Median earnings (dollars):		
Male full-time, year-round workers	36,628	(X)
Female full-time, year-round workers	32,042	(X)
POVERTY STATUS IN 1999 (below poverty level)		
Families	**78**	**(X)**
Percent below poverty level	(X)	10.9
With related children under 18 years	62	(X)
Percent below poverty level	(X)	17.2
With related children under 5 years	20	(X)
Percent below poverty level	(X)	19.6
Families with female householder, no husband present	**10**	**(X)**
Percent below poverty level	(X)	14.9
With related children under 18 years	8	(X)
Percent below poverty level	(X)	20.5
With related children under 5 years	0	(X)
Percent below poverty level	(X)	0.0
Individuals	**390**	**(X)**
Percent below poverty level	(X)	14.4
18 years and over	249	(X)
Percent below poverty level	(X)	12.5

Subject	Number	Percent
65 years and over	43	(X)
Percent below poverty level	(X)	10.7
Related children under 18 years	141	(X)
Percent below poverty level	(X)	20.1
Related children 5 to 17 years	114	(X)
Percent below poverty level	(X)	19.5
Unrelated individuals 15 years and over	99	(X)
Percent below poverty level	(X)	20.8

(X) Not applicable.
Detailed Occupation Code List (PDF 42KB)
Detailed Industry Code List (PDF 44KB)
User note on employment status data (PDF 63KB)
Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices P30, P32, P33, P43, P46, P49, P50, P51, P52, P53, P58, P62, P63, P64, P65, P67, P71, P72, P73, P74, P76, P77, P82, P87, P90, PCT47, PCT52, and PCT53

U.S. Census Bureau
American FactFinder

P4. HISPANIC OR LATINO, AND NOT HISPANIC OR LATINO BY RACE [73] - Universe: Total population
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

	Sutter County, California	Block Group 3, Census Tract 511, Sutter County, California	Block Group 4, Census Tract 511, Sutter County, California
Total:	78,930	364	822
Hispanic or Latino	17,529	83	103
Not Hispanic or Latino:	61,401	281	719
Population of one race:	58,993	273	683
White alone	47,532	259	649
Black or African American alone	1,418	1	12
American Indian and Alaska Native alone	940	2	11
Asian alone	8,771	8	11
Native Hawaiian and Other Pacific Islander alone	142	1	0
Some other race alone	190	2	0
Population of two or more races:	2,408	8	36
Population of two races:	2,268	7	31
White; Black or African American	126	0	1
White; American Indian and Alaska Native	711	7	7
White; Asian	437	0	6
White; Native Hawaiian and Other Pacific Islander	50	0	1
White; Some other race	210	0	2
Black or African American; American Indian and Alaska Native	24	0	0
Black or African American; Asian	57	0	1
Black or African American; Native Hawaiian and Other Pacific Islander	8	0	0
Black or African American; Some other race	5	0	0
American Indian and Alaska Native; Asian	88	0	0
American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	4	0	0
American Indian and Alaska Native; Some other race	12	0	3
Asian; Native Hawaiian and Other Pacific Islander	46	0	10
Asian; Some other race	489	0	0
Native Hawaiian and Other Pacific Islander; Some other race	1	0	0
Population of three races:	122	1	5
White; Black or African American; American Indian and Alaska Native	31	0	1
White; Black or African American; Asian	8	0	0
White; Black or African American; Native Hawaiian and Other Pacific Islander	0	0	0
White; Black or African American; Some other race	5	0	0
White; American Indian and Alaska Native; Asian	19	0	0
White; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	10	0	0
White; American Indian and Alaska Native; Some other race	7	0	0
White; Asian; Native Hawaiian and Other Pacific Islander	19	0	4
White; Asian; Some other race	12	1	0
White; Native Hawaiian and Other Pacific Islander; Some other race	1	0	0
Black or African American; American Indian and Alaska Native; Asian	2	0	0
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0	0
Black or African American; American Indian and Alaska Native; Some other race	1	0	0
Black or African American; Asian; Native Hawaiian and Other Pacific Islander	0	0	0
Black or African American; Asian;Some other race	1	0	0
Black or African American; Native Hawaiian and Other Pacific Islander; Some other race	2	0	0
American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0	0
American Indian and Alaska Native; Asian; Some other race	0	0	0
American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	2	0	0
Asian; Native Hawaiian and Other Pacific Islander; Some other race	2	0	0
Population of four races:	14	0	0
White; Black or African American; American Indian and Alaska Native;			

Asian	9	0	0
White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0	0
White; Black or African American; American Indian and Alaska Native; Some other race	0	0	0
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander	0	0	0
White; Black or African American; Asian; Some other race	0	0	0
White; Black or African American; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0
White; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	5	0	0
White; American Indian and Alaska Native; Asian; Some other race	0	0	0
White; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0
White; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0	0
Black or African American; American Indian and Alaska Native; Asian; Some other race	0	0	0
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0
Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0
American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0
Population of five races:	4	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	4	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Some other race	0	0	0
White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0
White; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0
Population of six races:	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0

U.S. Census Bureau
Census 2000

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 1 (SF 1) 100-Percent Data (PDF 44KB)

U.S. Census Bureau
American FactFinder

P1. TOTAL POPULATION [1] - Universe: Total population
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

	Census Tract 71, Sacramento County, California	Census Tract 511, Sutter County, California
Total	1,150	2,703

U.S. Census Bureau
Census 2000

Census count corrections for American Indian and Alaska Native Areas (AIANAs), states, counties, places, county subdivisions, census tracts, and blocks may have been released as a result of an external challenge through the Count Question Resolution Program.

P4. HISPANIC OR LATINO, AND NOT HISPANIC OR LATINO BY RACE [73] - Universe: Total population
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

	Census Tract 71, Sacramento County, California	Census Tract 511, Sutter County, California
Total:	1,150	2,703
Hispanic or Latino	200	432
Not Hispanic or Latino:	950	2,271
Population of one race:	921	2,201
White alone	768	2,087
Black or African American alone	47	14
American Indian and Alaska Native alone	10	38
Asian alone	90	58
Native Hawaiian and Other Pacific Islander alone	0	2
Some other race alone	6	2
Population of two or more races:	29	70
Population of two races:	29	63
White; Black or African American	0	1
White; American Indian and Alaska Native	7	24
White; Asian	12	9
White; Native Hawaiian and Other Pacific Islander	0	1
White; Some other race	5	11
Black or African American; American Indian and Alaska Native	0	0
Black or African American; Asian	1	3
Black or African American; Native Hawaiian and Other Pacific Islander	0	0
Black or African American; Some other race	0	0
American Indian and Alaska Native; Asian	0	0
American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0
American Indian and Alaska Native; Some other race	0	3
Asian; Native Hawaiian and Other Pacific Islander	0	10
Asian; Some other race	4	1
Native Hawaiian and Other Pacific Islander; Some other race	0	0
Population of three races:	0	7
White; Black or African American; American Indian and Alaska Native	0	1
White; Black or African American; Asian	0	0
White; Black or African American; Native Hawaiian and Other Pacific Islander	0	0
White; Black or African American; Some other race	0	0
White; American Indian and Alaska Native; Asian	0	0
White; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0
White; American Indian and Alaska Native; Some other race	0	0
White; Asian; Native Hawaiian and Other Pacific Islander	0	5
White; Asian; Some other race	0	1
White; Native Hawaiian and Other Pacific Islander; Some other race	0	0

Black or African American; American Indian and Alaska Native; Asian	0	0
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0
Black or African American; American Indian and Alaska Native; Some other race	0	0
Black or African American; Asian; Native Hawaiian and Other Pacific Islander	0	0
Black or African American; Asian;Some other race	0	0
Black or African American; Native Hawaiian and Other Pacific Islander; Some other race	0	0
American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0
American Indian and Alaska Native; Asian; Some other race	0	0
American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0
Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0
Population of four races:	0	0
White; Black or African American; American Indian and Alaska Native; Asian	0	0
White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0
White; Black or African American; American Indian and Alaska Native; Some other race	0	0
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander	0	0
White; Black or African American; Asian; Some other race	0	0
White; Black or African American; Native Hawaiian and Other Pacific Islander; Some other race	0	0
White; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0
White; American Indian and Alaska Native; Asian; Some other race	0	0
White; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0
White; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0
Black or African American; American Indian and Alaska Native; Asian; Some other race	0	0
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0
Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0
American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0
Population of five races:	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Some other race	0	0
White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0
White; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0
Population of six races:	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0

U.S. Census Bureau
Census 2000

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 1 (SF 1) 100-Percent Data (PDF 44KB)

U.S. Census Bureau
American FactFinder

P1. TOTAL POPULATION [1] - Universe: Total population
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

	Block 3043, Block Group 3, Census Tract 511, Sutter County, California	Block 3044, Block Group 3, Census Tract 511, Sutter County, California	Block 3048, Block Group 3, Census Tract 511, Sutter County, California	Block 3049, Block Group 3, Census Tract 511, Sutter County, California	Block 3050, Block Group 3, Census Tract 511, Sutter County, California	Block 3065, Block Group 3, Census Tract 511, Sutter County, California	Block 3066, Block Group 3, Census Tract 511, Sutter County, California	Block 4019, Block Group 4, Census Tract 511, Sutter County, California	Block 4029, Block Group 4, Census Tract 511, Sutter County, California	Block 4031, Block Group 4, Census Tract 511, Sutter County, California
Total	0	0	10	4	11	0	0	33	6	3

U.S. Census Bureau
Census 2000

Census count corrections for American Indian and Alaska Native Areas (AIANAs), states, counties, places, county subdivisions, census tracts, and blocks may have been released as a result of an external challenge through the Count Question Resolution Program.

P4. HISPANIC OR LATINO, AND NOT HISPANIC OR LATINO BY RACE [73] - Universe: Total population
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

	Block 3043, Block Group 3, Census Tract 511, Sutter County, California	Block 3044, Block Group 3, Census Tract 511, Sutter County, California	Block 3048, Block Group 3, Census Tract 511, Sutter County, California	Block 3049, Block Group 3, Census Tract 511, Sutter County, California	Block 3050, Block Group 3, Census Tract 511, Sutter County, California	Block 3065, Block Group 3, Census Tract 511, Sutter County, California	Block 3066, Block Group 3, Census Tract 511, Sutter County, California	Block 4019, Block Group 4, Census Tract 511, Sutter County, California	Block 4029, Block Group 4, Census Tract 511, Sutter County, California	Block 4031, Block Group 4, Census Tract 511, Sutter County, California
Total:	0	0	10	4	11	0	0	33	6	3
Hispanic or Latino	0	0	4	0	2	0	0	19	0	0
Not Hispanic or Latino:	0	0	6	4	9	0	0	14	6	3
Population of one race:	0	0	6	4	9	0	0	14	4	3
White alone	0	0	4	4	9	0	0	14	4	3
Black or African American alone	0	0	0	0	0	0	0	0	0	0
American Indian and Alaska Native alone	0	0	0	0	0	0	0	0	0	0
Asian alone	0	0	1	0	0	0	0	0	0	0
Native Hawaiian and Other Pacific Islander alone	0	0	1	0	0	0	0	0	0	0
Some other race alone	0	0	0	0	0	0	0	0	0	0
Population of two or more races:	0	0	0	0	0	0	0	0	2	0
Population of two races:	0	0	0	0	0	0	0	0	2	0
White; Black or African American	0	0	0	0	0	0	0	0	0	0
White; American Indian and Alaska Native	0	0	0	0	0	0	0	0	1	0
White; Asian	0	0	0	0	0	0	0	0	1	0
White; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
White; Some other race	0	0	0	0	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native	0	0	0	0	0	0	0	0	0	0
Black or African American; Asian	0	0	0	0	0	0	0	0	0	0
Black or African American; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
Black or African American; Some other race	0	0	0	0	0	0	0	0	0	0
American Indian and Alaska Native; Asian	0	0	0	0	0	0	0	0	0	0
American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
American Indian and Alaska Native; Some other race	0	0	0	0	0	0	0	0	0	0
Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
Asian; Some other race	0	0	0	0	0	0	0	0	0	0
Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
Population of three races:	0	0	0	0	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native	0	0	0	0	0	0	0	0	0	0
White; Black or African American; Asian	0	0	0	0	0	0	0	0	0	0
White; Black or African American; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
White; Black or African American; Some other race	0	0	0	0	0	0	0	0	0	0
White; American Indian and Alaska Native; Asian	0	0	0	0	0	0	0	0	0	0
White; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
White; American Indian and Alaska Native; Some other race	0	0	0	0	0	0	0	0	0	0
White; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
White; Asian; Some other race	0	0	0	0	0	0	0	0	0	0
White; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Asian	0	0	0	0	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Some other race	0	0	0	0	0	0	0	0	0	0
Black or African American; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
Black or African American; Asian;Some other race	0	0	0	0	0	0	0	0	0	0

Black or African American; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
American Indian and Alaska Native; Asian; Some other race	0	0	0	0	0	0	0	0	0	0
American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
Population of four races:	0	0	0	0	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian	0	0	0	0	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Some other race	0	0	0	0	0	0	0	0	0	0
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
White; Black or African American; Asian; Some other race	0	0	0	0	0	0	0	0	0	0
White; Black or African American; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
White; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
White; American Indian and Alaska Native; Asian; Some other race	0	0	0	0	0	0	0	0	0	0
White; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
White; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Asian; Some other race	0	0	0	0	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
Population of five races:	0	0	0	0	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Some other race	0	0	0	0	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
White; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
Population of six races:	0	0	0	0	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0

U.S. Census Bureau
Census 2000

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 1 (SF 1) 100-Percent Data (PDF 44KB)

P1. TOTAL POPULATION [1] - Universe: Total population
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

	Block 3057, Block Group 3, Census Tract 511, Sutter County, California	Block 3059, Block Group 3, Census Tract 511, Sutter County, California	Block 3060, Block Group 3, Census Tract 511, Sutter County, California	Block 3061, Block Group 3, Census Tract 511, Sutter County, California	Block 3062, Block Group 3, Census Tract 511, Sutter County, California	Block 3063, Block Group 3, Census Tract 511, Sutter County, California	Block 3064, Block Group 3, Census Tract 511, Sutter County, California	Block 4041, Block Group 4, Census Tract 511, Sutter County, California	Block 4042, Block Group 4, Census Tract 511, Sutter County, California	Block 4043, Block Group 4, Census Tract 511, Sutter County, California
Total	0	5	0	0	10	0	0	4	0	0

U.S. Census Bureau
Census 2000

Census count corrections for American Indian and Alaska Native Areas (AIANAs), states, counties, places, county subdivisions, census tracts, and blocks may have been released as a result of an external challenge through the Count Question Resolution Program.

P4. HISPANIC OR LATINO, AND NOT HISPANIC OR LATINO BY RACE [73] - Universe: Total population
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

	Block 3057, Block Group 3, Census Tract 511, Sutter County, California	Block 3059, Block Group 3, Census Tract 511, Sutter County, California	Block 3060, Block Group 3, Census Tract 511, Sutter County, California	Block 3061, Block Group 3, Census Tract 511, Sutter County, California	Block 3062, Block Group 3, Census Tract 511, Sutter County, California	Block 3063, Block Group 3, Census Tract 511, Sutter County, California	Block 3064, Block Group 3, Census Tract 511, Sutter County, California	Block 4041, Block Group 4, Census Tract 511, Sutter County, California	Block 4042, Block Group 4, Census Tract 511, Sutter County, California	Block 4043, Block Group 4, Census Tract 511, Sutter County, California
Total:	0	5	0	0	10	0	0	4	0	0
Hispanic or Latino	0	0	0	0	0	0	0	0	0	0
Not Hispanic or Latino:	0	5	0	0	10	0	0	4	0	0
Population of one race:	0	5	0	0	10	0	0	4	0	0
White alone	0	5	0	0	9	0	0	3	0	0
Black or African American alone	0	0	0	0	0	0	0	0	0	0
American Indian and Alaska Native alone	0	0	0	0	0	0	0	1	0	0
Asian alone	0	0	0	0	1	0	0	0	0	0
Native Hawaiian and Other Pacific Islander alone	0	0	0	0	0	0	0	0	0	0
Some other race alone	0	0	0	0	0	0	0	0	0	0
Population of two or more races:	0	0	0	0	0	0	0	0	0	0
Population of two races:	0	0	0	0	0	0	0	0	0	0
White; Black or African American	0	0	0	0	0	0	0	0	0	0
White; American Indian and Alaska Native	0	0	0	0	0	0	0	0	0	0
White; Asian	0	0	0	0	0	0	0	0	0	0
White; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
White; Some other race	0	0	0	0	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native	0	0	0	0	0	0	0	0	0	0
Black or African American; Asian	0	0	0	0	0	0	0	0	0	0
Black or African American; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
Black or African American; Some other race	0	0	0	0	0	0	0	0	0	0
American Indian and Alaska Native; Asian	0	0	0	0	0	0	0	0	0	0
American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
American Indian and Alaska Native; Some other race	0	0	0	0	0	0	0	0	0	0
Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
Asian; Some other race	0	0	0	0	0	0	0	0	0	0
Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
Population of three races:	0	0	0	0	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native	0	0	0	0	0	0	0	0	0	0
White; Black or African American; Asian	0	0	0	0	0	0	0	0	0	0
White; Black or African American; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
White; Black or African American; Some other race	0	0	0	0	0	0	0	0	0	0
White; American Indian and Alaska Native; Asian	0	0	0	0	0	0	0	0	0	0
White; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
White; American Indian and Alaska Native; Some other race	0	0	0	0	0	0	0	0	0	0
White; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
White; Asian; Some other race	0	0	0	0	0	0	0	0	0	0
White; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Asian	0	0	0	0	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Some other race	0	0	0	0	0	0	0	0	0	0
Black or African American; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
Black or African American; Asian;Some other race	0	0	0	0	0	0	0	0	0	0

Black or African American; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
American Indian and Alaska Native; Asian; Some other race	0	0	0	0	0	0	0	0	0	0
American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
Population of four races:	0	0	0	0	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian	0	0	0	0	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Some other race	0	0	0	0	0	0	0	0	0	0
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
White; Black or African American; Asian; Some other race	0	0	0	0	0	0	0	0	0	0
White; Black or African American; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
White; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
White; American Indian and Alaska Native; Asian; Some other race	0	0	0	0	0	0	0	0	0	0
White; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
White; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Asian; Some other race	0	0	0	0	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
Population of five races:	0	0	0	0	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Some other race	0	0	0	0	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
White; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0
Population of six races:	0	0	0	0	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0	0	0	0	0

U.S. Census Bureau
Census 2000

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 1 (SF 1) 100-Percent Data (PDF 44KB)

U.S. Census Bureau
American FactFinder

P1. TOTAL POPULATION [1] - Universe: Total population
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

	Census Tract 71, Sacramento County, California	Census Tract 511, Sutter County, California	Block Group 1, Census Tract 71, Sacramento County, California	Block Group 2, Census Tract 71, Sacramento County, California	Block Group 3, Census Tract 511, Sutter County, California	Block Group 4, Census Tract 511, Sutter County, California
Total	1,150	2,703	896	254	364	822

U.S. Census Bureau
Census 2000

Census count corrections for American Indian and Alaska Native Areas (AIANAs), states, counties, places, county subdivisions, census tracts, and blocks may have been released as a result of an external challenge through the Count Question Resolution Program.

P4. HISPANIC OR LATINO, AND NOT HISPANIC OR LATINO BY RACE [73] - Universe: Total population
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

	Census Tract 71, Sacramento County, California	Census Tract 511, Sutter County, California	Block Group 1, Census Tract 71, Sacramento County, California	Block Group 2, Census Tract 71, Sacramento County, California	Block Group 3, Census Tract 511, Sutter County, California	Block Group 4, Census Tract 511, Sutter County, California
Total:	1,150	2,703	896	254	364	822
Hispanic or Latino	200	432	173	27	83	103
Not Hispanic or Latino:	950	2,271	723	227	281	719
Population of one race:	921	2,201	699	222	273	683
White alone	768	2,087	562	206	259	649
Black or African American alone	47	14	44	3	1	12
American Indian and Alaska Native alone	10	38	10	0	2	11
Asian alone	90	58	79	11	8	11
Native Hawaiian and Other Pacific Islander alone	0	2	0	0	1	0
Some other race alone	6	2	4	2	2	0
Population of two or more races:	29	70	24	5	8	36
Population of two races:	29	63	24	5	7	31
White; Black or African American	0	1	0	0	0	1
White; American Indian and Alaska Native	7	24	6	1	7	7
White; Asian	12	9	11	1	0	6
White; Native Hawaiian and Other Pacific Islander	0	1	0	0	0	1
White; Some other race	5	11	3	2	0	2
Black or African American; American Indian and Alaska Native	0	0	0	0	0	0
Black or African American; Asian	1	3	1	0	0	1
Black or African American; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0
Black or African American; Some other race	0	0	0	0	0	0
American Indian and Alaska Native; Asian	0	0	0	0	0	0
American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0
American Indian and Alaska Native; Some other race	0	3	0	0	0	3
Asian; Native Hawaiian and Other Pacific Islander	0	10	0	0	0	10
Asian; Some other race	4	1	3	1	0	0
Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0
Population of three races:	0	7	0	0	1	5
White; Black or African American; American Indian and Alaska Native	0	1	0	0	0	1
White; Black or African American; Asian	0	0	0	0	0	0
White; Black or African American; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0
White; Black or African American; Some other race	0	0	0	0	0	0

White; American Indian and Alaska Native; Asian	0	0	0	0	0	0
White; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0
White; American Indian and Alaska Native; Some other race	0	0	0	0	0	0
White; Asian; Native Hawaiian and Other Pacific Islander	0	5	0	0	0	4
White; Asian; Some other race	0	1	0	0	1	0
White; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Asian	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Some other race	0	0	0	0	0	0
Black or African American; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0
Black or African American; Asian;Some other race	0	0	0	0	0	0
Black or African American; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0
American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0
American Indian and Alaska Native; Asian; Some other race	0	0	0	0	0	0
American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0
Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0
Population of four races:	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Some other race	0	0	0	0	0	0
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0
White; Black or African American; Asian; Some other race	0	0	0	0	0	0
White; Black or African American; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0
White; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0
White; American Indian and Alaska Native; Asian; Some other race	0	0	0	0	0	0
White; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0
White; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Asian; Some other race	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0
Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0
American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0
Population of five races:	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Some other race	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0
White; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0
Population of six races:	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0

U.S. Census Bureau
Census 2000

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 1 (SF 1) 100-Percent Data (PDF 44KB)

U.S. Census Bureau
American FactFinder

P4. HISPANIC OR LATINO, AND NOT HISPANIC OR LATINO BY RACE [73] - Universe: Total population
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data

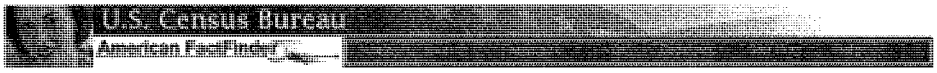
NOTE: For information on confidentiality protection, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

	Census Tract 70.01, Sacramento County, California	Census Tract 70.07, Sacramento County, California	Census Tract 70.08, Sacramento County, California	Census Tract 70.09, Sacramento County, California	Census Tract 70.10, Sacramento County, California	Census Tract 70.11, Sacramento County, California
Total:	3,097	5,561	1,171	1,194	2,653	5,978
Hispanic or Latino	1,565	2,361	94	140	403	1,561
Not Hispanic or Latino:	1,532	3,200	1,077	1,054	2,250	4,417
Population of one race:	1,424	2,983	1,033	999	2,123	4,091
White alone	1,127	1,864	868	848	1,596	2,295
Black or African American alone	138	699	41	51	267	908
American Indian and Alaska Native alone	54	35	11	7	18	23
Asian alone	68	316	108	82	209	809
Native Hawaiian and Other Pacific Islander alone	31	49	0	5	19	41
Some other race alone	6	20	5	6	14	15
Population of two or more races:	108	217	44	55	127	326
Population of two races:	104	195	39	49	109	298
White; Black or African American	16	36	0	2	13	59
White; American Indian and Alaska Native	24	36	9	8	12	26
White; Asian	14	21	20	9	31	76
White; Native Hawaiian and Other Pacific Islander	4	5	2	0	2	5
White; Some other race	22	28	6	24	20	42
Black or African American; American Indian and Alaska Native	3	7	1	2	5	14
Black or African American; Asian	2	10	0	2	7	4
Black or African American; Native Hawaiian and Other Pacific Islander	0	0	0	0	1	4
Black or African American; Some other race	0	7	0	0	6	5
American Indian and Alaska Native; Asian	3	3	0	0	0	3
American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	1
American Indian and Alaska Native; Some other race	0	1	0	0	1	0
Asian; Native Hawaiian and Other Pacific Islander	7	14	1	2	1	19
Asian; Some other race	9	25	0	0	10	40
Native Hawaiian and Other Pacific Islander; Some other race	0	2	0	0	0	0
Population of three races:	4	22	4	6	16	26
White; Black or African American; American Indian and Alaska Native	0	6	0	4	3	15
White; Black or African American; Asian	0	0	0	0	0	1
White; Black or African American; Native Hawaiian and Other Pacific Islander	0	3	0	0	0	0
White; Black or African American; Some other race	0	4	3	0	9	2
White; American Indian and Alaska Native; Asian	0	1	1	0	0	2
White; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0
White; American Indian and Alaska Native; Some other race	3	0	0	0	0	2
White; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	1	1	2
White; Asian; Some other race	0	0	0	0	1	1
White; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	1
Black or African American; American Indian and Alaska Native; Asian	1	7	0	0	0	0
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Some other race	0	0	0	1	0	0
Black or African American; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0
Black or African American; Asian;Some other race	0	0	0	0	2	0
Black or African American; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0
American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0
American Indian and Alaska Native; Asian; Some other race	0	0	0	0	0	0
American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0
Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	1	0	0	0	0
Population of four races:	0	0	1	0	2	2
White; Black or African American; American Indian and Alaska Native; Asian	0	0	1	0	0	1

White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Some other race	0	0	0	0	0	0
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	1	0
White; Black or African American; Asian; Some other race	0	0	0	0	0	0
White; Black or African American; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0
White; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	1
White; American Indian and Alaska Native; Asian; Some other race	0	0	0	0	0	0
White; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0
White; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	1	0
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Asian; Some other race	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0
Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0
American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0
Population of five races:	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Some other race	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0
White; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0
Population of six races:	0	0	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0	0	0

U.S. Census Bureau
Census 2000

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 1 (SF 1) 100-Percent Data (PDF 44KB)



H6. OCCUPANCY STATUS [3] - Universe: Housing units
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

	Census Tract 511, Sutter County, California
Total:	1,042
Occupied	963
Vacant	79

U.S. Census Bureau
Census 2000

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 3 (SF 3) - Sample Data (PDF 141.5KB)

U.S. Census Bureau
American FactFinder

H1. HOUSING UNITS [1] - Universe: Housing units
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

	Census Tract 70.01, Sacramento County, California	Census Tract 70.04, Sacramento County, California	Census Tract 70.08, Sacramento County, California	Census Tract 70.09, Sacramento County, California	Census Tract 70.10, Sacramento County, California	Census Tract 70.11, Sacramento County, California	Census Tract 70.12, Sacramento County, California	Census Tract 70.13, Sacramento County, California	Census Tract 70.14, Sacramento County, California	Census Tract 71, Sacramento County, California
Total	1,109	2,621	597	741	1,872	2,537	1,450	1,036	2,811	505

U.S. Census Bureau
Census 2000

H6. OCCUPANCY STATUS [3] - Universe: Housing units
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

	Census Tract 70.01, Sacramento County, California	Census Tract 70.04, Sacramento County, California	Census Tract 70.08, Sacramento County, California	Census Tract 70.09, Sacramento County, California	Census Tract 70.10, Sacramento County, California	Census Tract 70.11, Sacramento County, California	Census Tract 70.12, Sacramento County, California	Census Tract 70.13, Sacramento County, California	Census Tract 70.14, Sacramento County, California	Census Tract 71, Sacramento County, California
Total:	1,109	2,621	597	741	1,872	2,537	1,450	1,036	2,811	505
Occupied	1,037	2,544	554	618	1,519	2,452	1,393	1,036	2,712	418
Vacant	72	77	43	123	353	85	57	0	99	87

U.S. Census Bureau
Census 2000

H7. TENURE [3] - Universe: Occupied housing units
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

	Census Tract 70.01, Sacramento County, California	Census Tract 70.04, Sacramento County, California	Census Tract 70.08, Sacramento County, California	Census Tract 70.09, Sacramento County, California	Census Tract 70.10, Sacramento County, California	Census Tract 70.11, Sacramento County, California	Census Tract 70.12, Sacramento County, California	Census Tract 70.13, Sacramento County, California	Census Tract 70.14, Sacramento County, California	Census Tract 71, Sacramento County, California
Total:	1,037	2,544	554	618	1,519	2,452	1,393	1,036	2,712	418
Owner occupied	521	1,020	498	313	170	727	929	581	1,327	345
Renter occupied	516	1,524	56	305	1,349	1,725	464	455	1,385	73

U.S. Census Bureau
Census 2000

H8. VACANCY STATUS [7] - Universe: Vacant housing units
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

	Census Tract 70.01, Sacramento County, California	Census Tract 70.04, Sacramento County, California	Census Tract 70.08, Sacramento County, California	Census Tract 70.09, Sacramento County, California	Census Tract 70.10, Sacramento County, California	Census Tract 70.11, Sacramento County, California	Census Tract 70.12, Sacramento County, California	Census Tract 70.13, Sacramento County, California	Census Tract 70.14, Sacramento County, California	Census Tract 71, Sacramento County, California
Total:	72	77	43	123	353	85	57	0	99	87
For rent	31	46	0	30	143	74	29	0	60	6
For sale only	6	12	43	61	44	0	10	0	39	45
Rented or sold, not occupied	7	0	0	21	19	0	0	0	0	36
For seasonal, recreational, or occasional use	7	9	0	11	147	11	18	0	0	0
For migrant workers	0	0	0	0	0	0	0	0	0	0
Other vacant	21	10	0	0	0	0	0	0	0	0

U.S. Census Bureau
Census 2000

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 3 (SF 3) - Sample Data (PDF 141.5KB)

U.S. Census Bureau
American FactFinder

H6. OCCUPANCY STATUS [3] - Universe: Housing units
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

	Census Tract 70.01, Sacramento County, California	Census Tract 70.04, Sacramento County, California	Census Tract 70.08, Sacramento County, California	Census Tract 70.09, Sacramento County, California	Census Tract 70.10, Sacramento County, California	Census Tract 70.11, Sacramento County, California	Census Tract 70.12, Sacramento County, California	Census Tract 70.13, Sacramento County, California	Census Tract 70.14, Sacramento County, California	Census Tract 71, Sacramento County, California
Total:	1,109	2,621	597	741	1,872	2,537	1,450	1,036	2,811	505
Occupied	1,037	2,544	554	618	1,519	2,452	1,393	1,036	2,712	418
Vacant	72	77	43	123	353	85	57	0	99	87

U.S. Census Bureau
Census 2000

H76. MEDIAN VALUE (DOLLARS) FOR SPECIFIED OWNER-OCCUPIED HOUSING UNITS [1] - Universe: Specified owner-occupied housing units
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

	Census Tract 70.01, Sacramento County, California	Census Tract 70.04, Sacramento County, California	Census Tract 70.08, Sacramento County, California	Census Tract 70.09, Sacramento County, California	Census Tract 70.10, Sacramento County, California	Census Tract 70.11, Sacramento County, California	Census Tract 70.12, Sacramento County, California	Census Tract 70.13, Sacramento County, California	Census Tract 70.14, Sacramento County, California	Census Tract 71, Sacramento County, California
Median value	84,600	120,000	169,100	218,400	220,100	131,600	116,300	120,300	118,300	198,700

U.S. Census Bureau
Census 2000

H85. MEDIAN VALUE (DOLLARS) FOR ALL OWNER-OCCUPIED HOUSING UNITS [1] - Universe: Owner-occupied housing units
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

	Census Tract 70.01, Sacramento County, California	Census Tract 70.04, Sacramento County, California	Census Tract 70.08, Sacramento County, California	Census Tract 70.09, Sacramento County, California	Census Tract 70.10, Sacramento County, California	Census Tract 70.11, Sacramento County, California	Census Tract 70.12, Sacramento County, California	Census Tract 70.13, Sacramento County, California	Census Tract 70.14, Sacramento County, California	Census Tract 71, Sacramento County, California
Median value	79,800	117,800	154,100	220,100	217,600	131,900	113,000	119,200	118,100	199,100

U.S. Census Bureau
Census 2000

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 3 (SF 3) - Sample Data (PDF 141.5KB)

U.S. Census Bureau
American FactFinder

H6. OCCUPANCY STATUS [3] - Universe: Housing units
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

	Sacramento city, California
Total:	163,914
Occupied	154,565
Vacant	9,349

U.S. Census Bureau
Census 2000

Standard Error/Variance documentation for this dataset:
Accuracy of the Data: Census 2000 Summary File 3 (SF 3) - Sample Data (PDF 141.5KB)

U.S. Census Bureau
American FactFinder

DP-3. **Profile of Selected Economic Characteristics: 2000**
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data
Geographic Area: **Sutter County, California**

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

Subject	Number	Percent
EMPLOYMENT STATUS		
Population 16 years and over	**58,728**	**100.0**
In labor force	35,470	60.4
Civilian labor force	35,107	59.8
Employed	30,980	52.8
Unemployed	4,127	7.0
Percent of civilian labor force	11.8	(X)
Armed Forces	363	0.6
Not in labor force	23,258	39.6
Females 16 years and over	**30,139**	**100.0**
In labor force	15,698	52.1
Civilian labor force	15,591	51.7
Employed	13,617	45.2
Own children under 6 years	**6,654**	**100.0**
All parents in family in labor force	3,708	55.7
COMMUTING TO WORK		
Workers 16 years and over	**30,383**	**100.0**
Car, truck, or van -- drove alone	23,756	78.2
Car, truck, or van -- carpooled	4,492	14.8
Public transportation (including taxicab)	193	0.6
Walked	571	1.9
Other means	458	1.5
Worked at home	913	3.0
Mean travel time to work (minutes)	25.4	(X)
Employed civilian population 16 years and over	**30,980**	**100.0**
OCCUPATION		
Management, professional, and related occupations	8,825	28.5
Service occupations	4,585	14.8
Sales and office occupations	7,575	24.5
Farming, fishing, and forestry occupations	1,791	5.8
Construction, extraction, and maintenance occupations	3,412	11.0
Production, transportation, and material moving occupations	4,792	15.5
INDUSTRY		
Agriculture, forestry, fishing and hunting, and mining	2,913	9.4
Construction	2,595	8.4
Manufacturing	3,073	9.9
Wholesale trade	1,177	3.8
Retail trade	3,916	12.6
Transportation and warehousing, and utilities	1,576	5.1
Information	579	1.9
Finance, insurance, real estate, and rental and leasing	1,595	5.1
Professional, scientific, management, administrative, and waste management services	2,121	6.8
Educational, health and social services	6,234	20.1
Arts, entertainment, recreation, accommodation and food services	1,928	6.2
Other services (except public administration)	1,451	4.7
Public administration	1,822	5.9
CLASS OF WORKER		
Private wage and salary workers	22,329	72.1
Government workers	5,630	18.2
Self-employed workers in own not incorporated business	2,846	9.2

Subject	Number	Percent
Unpaid family workers	175	0.6
INCOME IN 1999		
Households	**27,098**	**100.0**
Less than $10,000	2,734	10.1
$10,000 to $14,999	1,975	7.3
$15,000 to $24,999	4,097	15.1
$25,000 to $34,999	3,568	13.2
$35,000 to $49,999	4,512	16.7
$50,000 to $74,999	5,133	18.9
$75,000 to $99,999	2,619	9.7
$100,000 to $149,999	1,713	6.3
$150,000 to $199,999	412	1.5
$200,000 or more	335	1.2
Median household income (dollars)	38,375	(X)
With earnings	21,865	80.7
Mean earnings (dollars)	47,914	(X)
With Social Security income	7,204	26.6
Mean Social Security income (dollars)	10,584	(X)
With Supplemental Security Income	1,603	5.9
Mean Supplemental Security Income (dollars)	6,732	(X)
With public assistance income	1,383	5.1
Mean public assistance income (dollars)	4,978	(X)
With retirement income	5,313	19.6
Mean retirement income (dollars)	18,690	(X)
Families	**20,251**	**100.0**
Less than $10,000	1,309	6.5
$10,000 to $14,999	1,208	6.0
$15,000 to $24,999	2,800	13.8
$25,000 to $34,999	2,404	11.9
$35,000 to $49,999	3,547	17.5
$50,000 to $74,999	4,483	22.1
$75,000 to $99,999	2,315	11.4
$100,000 to $149,999	1,534	7.6
$150,000 to $199,999	371	1.8
$200,000 or more	280	1.4
Median family income (dollars)	44,330	(X)
Per capita income (dollars)	17,428	(X)
Median earnings (dollars):		
Male full-time, year-round workers	35,723	(X)
Female full-time, year-round workers	25,778	(X)
POVERTY STATUS IN 1999 (below poverty level)		
Families	**2,446**	**(X)**
Percent below poverty level	(X)	12.1
With related children under 18 years	2,058	(X)
Percent below poverty level	(X)	17.9
With related children under 5 years	1,009	(X)
Percent below poverty level	(X)	22.0
Families with female householder, no husband present	**897**	**(X)**
Percent below poverty level	(X)	29.9
With related children under 18 years	788	(X)
Percent below poverty level	(X)	37.0
With related children under 5 years	366	(X)
Percent below poverty level	(X)	46.9
Individuals	**12,031**	**(X)**
Percent below poverty level	(X)	15.5
18 years and over	7,213	(X)
Percent below poverty level	(X)	13.1
65 years and over	699	(X)
Percent below poverty level	(X)	7.7
Related children under 18 years	4,733	(X)
Percent below poverty level	(X)	21.3
Related children 5 to 17 years	3,399	(X)
Percent below poverty level	(X)	20.4
Unrelated individuals 15 years and over	2,498	(X)

Subject	Number	Percent
Percent below poverty level	(X)	24.9

(X) Not applicable.
Detailed Occupation Code List (PDF 42KB)
Detailed Industry Code List (PDF 44KB)
User note on employment status data (PDF 63KB)
Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices P30, P32, P33, P43, P46, P49, P50, P51, P52, P53, P58, P62, P63, P64, P65, P67, P71, P72, P73, P74, P76, P77, P82, P87, P90, PCT47, PCT52, and PCT53

DP-3. **Profile of Selected Economic Characteristics: 2000**
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data
Geographic Area: **Census Tract 511, Sutter County, California**

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

Subject	Number	Percent
EMPLOYMENT STATUS		
Population 16 years and over	**2,091**	**100.0**
In labor force	1,252	59.9
Civilian labor force	1,252	59.9
Employed	1,153	55.1
Unemployed	99	4.7
Percent of civilian labor force	7.9	(X)
Armed Forces	0	0.0
Not in labor force	839	40.1
Females 16 years and over	**999**	**100.0**
In labor force	506	50.7
Civilian labor force	506	50.7
Employed	454	45.4
Own children under 6 years	**150**	**100.0**
All parents in family in labor force	78	52.0
COMMUTING TO WORK		
Workers 16 years and over	**1,115**	**100.0**
Car, truck, or van -- drove alone	860	77.1
Car, truck, or van -- carpooled	84	7.5
Public transportation (including taxicab)	5	0.4
Walked	26	2.3
Other means	10	0.9
Worked at home	130	11.7
Mean travel time to work (minutes)	26.2	(X)
Employed civilian population 16 years and over	**1,153**	**100.0**
OCCUPATION		
Management, professional, and related occupations	366	31.7
Service occupations	115	10.0
Sales and office occupations	267	23.2
Farming, fishing, and forestry occupations	83	7.2
Construction, extraction, and maintenance occupations	162	14.1
Production, transportation, and material moving occupations	160	13.9
INDUSTRY		
Agriculture, forestry, fishing and hunting, and mining	229	19.9
Construction	130	11.3
Manufacturing	61	5.3
Wholesale trade	56	4.9
Retail trade	139	12.1
Transportation and warehousing, and utilities	56	4.9
Information	23	2.0
Finance, insurance, real estate, and rental and leasing	42	3.6
Professional, scientific, management, administrative, and waste management services	76	6.6
Educational, health and social services	171	14.8
Arts, entertainment, recreation, accommodation and food services	31	2.7

Subject	Number	Percent
Other services (except public administration)	57	4.9
Public administration	82	7.1
CLASS OF WORKER		
Private wage and salary workers	677	58.7
Government workers	254	22.0
Self-employed workers in own not incorporated business	213	18.5
Unpaid family workers	9	0.8
INCOME IN 1999		
Households	**956**	**100.0**
Less than $10,000	87	9.1
$10,000 to $14,999	59	6.2
$15,000 to $24,999	108	11.3
$25,000 to $34,999	148	15.5
$35,000 to $49,999	137	14.3
$50,000 to $74,999	174	18.2
$75,000 to $99,999	135	14.1
$100,000 to $149,999	67	7.0
$150,000 to $199,999	31	3.2
$200,000 or more	10	1.0
Median household income (dollars)	42,841	(X)
With earnings	760	79.5
Mean earnings (dollars)	54,902	(X)
With Social Security income	297	31.1
Mean Social Security income (dollars)	11,494	(X)
With Supplemental Security Income	41	4.3
Mean Supplemental Security Income (dollars)	6,298	(X)
With public assistance income	36	3.8
Mean public assistance income (dollars)	3,650	(X)
With retirement income	181	18.9
Mean retirement income (dollars)	15,697	(X)
Families	**716**	**100.0**
Less than $10,000	37	5.2
$10,000 to $14,999	38	5.3
$15,000 to $24,999	74	10.3
$25,000 to $34,999	104	14.5
$35,000 to $49,999	105	14.7
$50,000 to $74,999	158	22.1
$75,000 to $99,999	110	15.4
$100,000 to $149,999	55	7.7
$150,000 to $199,999	25	3.5
$200,000 or more	10	1.4
Median family income (dollars)	50,000	(X)
Per capita income (dollars)	19,490	(X)
Median earnings (dollars):		
Male full-time, year-round workers	36,628	(X)
Female full-time, year-round workers	32,042	(X)
POVERTY STATUS IN 1999 (below poverty level)		
Families	**78**	**(X)**
Percent below poverty level	(X)	10.9
With related children under 18 years	62	(X)
Percent below poverty level	(X)	17.2
With related children under 5 years	20	(X)
Percent below poverty level	(X)	19.6
Families with female householder, no husband present	**10**	**(X)**
Percent below poverty level	(X)	14.9
With related children under 18 years	8	(X)
Percent below poverty level	(X)	20.5
With related children under 5 years	0	(X)
Percent below poverty level	(X)	0.0
Individuals	**390**	**(X)**
Percent below poverty level	(X)	14.4
18 years and over	249	(X)
Percent below poverty level	(X)	12.5

Subject	Number	Percent
65 years and over	43	(X)
Percent below poverty level	(X)	10.7
Related children under 18 years	141	(X)
Percent below poverty level	(X)	20.1
Related children 5 to 17 years	114	(X)
Percent below poverty level	(X)	19.5
Unrelated individuals 15 years and over	69	(X)
Percent below poverty level	(X)	20.8

(X) Not applicable.
Detailed Occupation Code List (PDF 42KB)
Detailed Industry Code List (PDF 44KB)
User note on employment status data (PDF 63KB)
Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices P30, P32, P33, P43, P46, P49, P50, P51, P52, P53, P58, P62, P63, P64, P65, P67, P71, P72, P73, P74, P76, P77, P82, P87, P90, PCT47, PCT52, and PCT53

4b Economic

U.S. Census Bureau
American FactFinder

DP-3. **Profile of Selected Economic Characteristics: 2000**
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data
Geographic Area: **Census Tract 70.01, Sacramento County, California**

NEMDC South

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

Subject	Number	Percent
EMPLOYMENT STATUS		
Population 16 years and over	**2,232**	**100.0**
In labor force	1,117	50.0
Civilian labor force	1,117	50.0
Employed	982	44.0
Unemployed	135	6.0
Percent of civilian labor force	12.1	(X)
Armed Forces	0	0.0
Not in labor force	1,115	50.0
Females 16 years and over	**1,105**	**100.0**
In labor force	480	43.4
Civilian labor force	480	43.4
Employed	433	39.2
Own children under 6 years	**278**	**100.0**
All parents in family in labor force	151	54.3
COMMUTING TO WORK		
Workers 16 years and over	**927**	**100.0**
Car, truck, or van -- drove alone	617	66.6
Car, truck, or van -- carpooled	207	22.3
Public transportation (including taxicab)	14	1.5
Walked	34	3.7
Other means	22	2.4
Worked at home	33	3.6
Mean travel time to work (minutes)	28.5	(X)
Employed civilian population 16 years and over	**982**	**100.0**
OCCUPATION		
Management, professional, and related occupations	123	12.5
Service occupations	243	24.7
Sales and office occupations	222	22.6
Farming, fishing, and forestry occupations	26	2.6
Construction, extraction, and maintenance occupations	156	15.9
Production, transportation, and material moving occupations	212	21.6
INDUSTRY		
Agriculture, forestry, fishing and hunting, and mining	40	4.1
Construction	114	11.6
Manufacturing	122	12.4
Wholesale trade	32	3.3
Retail trade	67	6.8
Transportation and warehousing, and utilities	43	4.4
Information	8	0.8
Finance, insurance, real estate, and rental and leasing	45	4.6
Professional, scientific, management, administrative, and waste management services	59	6.0
Educational, health and social services	131	13.3
Arts, entertainment, recreation, accommodation and food services	146	14.9
Other services (except public administration)	78	7.9
Public administration	97	9.9
CLASS OF WORKER		
Private wage and salary workers	764	77.8
Government workers	148	15.1
Self-employed workers in own not incorporated business	62	6.3

Subject	Number	Percent
Unpaid family workers	8	0.8
INCOME IN 1999		
Households	**1,035**	**100.0**
Less than $10,000	238	23.0
$10,000 to $14,999	134	12.9
$15,000 to $24,999	209	20.2
$25,000 to $34,999	100	9.7
$35,000 to $49,999	124	12.0
$50,000 to $74,999	133	12.9
$75,000 to $99,999	51	4.9
$100,000 to $149,999	23	2.2
$150,000 to $199,999	12	1.2
$200,000 or more	11	1.1
Median household income (dollars)	21,302	(X)
With earnings	702	67.8
Mean earnings (dollars)	37,812	(X)
With Social Security income	329	31.8
Mean Social Security income (dollars)	9,858	(X)
With Supplemental Security Income	154	14.9
Mean Supplemental Security Income (dollars)	7,790	(X)
With public assistance income	120	11.6
Mean public assistance income (dollars)	5,017	(X)
With retirement income	123	11.9
Mean retirement income (dollars)	13,693	(X)
Families	**691**	**100.0**
Less than $10,000	107	15.5
$10,000 to $14,999	75	10.9
$15,000 to $24,999	133	19.2
$25,000 to $34,999	95	13.7
$35,000 to $49,999	102	14.8
$50,000 to $74,999	101	14.6
$75,000 to $99,999	38	5.5
$100,000 to $149,999	23	3.3
$150,000 to $199,999	12	1.7
$200,000 or more	5	0.7
Median family income (dollars)	27,460	(X)
Per capita income (dollars)	11,401	(X)
Median earnings (dollars):		
Male full-time, year-round workers	28,889	(X)
Female full-time, year-round workers	25,446	(X)
POVERTY STATUS IN 1999 (below poverty level)		
Families	**188**	**(X)**
Percent below poverty level	(X)	27.2
With related children under 18 years	137	(X)
Percent below poverty level	(X)	34.5
With related children under 5 years	58	(X)
Percent below poverty level	(X)	30.1
Families with female householder, no husband present	**87**	**(X)**
Percent below poverty level	(X)	42.9
With related children under 18 years	83	(X)
Percent below poverty level	(X)	49.7
With related children under 5 years	34	(X)
Percent below poverty level	(X)	44.2
Individuals	**1,032**	**(X)**
Percent below poverty level	(X)	34.0
18 years and over	650	(X)
Percent below poverty level	(X)	30.3
65 years and over	82	(X)
Percent below poverty level	(X)	20.9
Related children under 18 years	371	(X)
Percent below poverty level	(X)	42.3
Related children 5 to 17 years	281	(X)
Percent below poverty level	(X)	43.7
Unrelated individuals 15 years and over	264	(X)

Subject	Number	Percent
Percent below poverty level	(X)	46.5

(X) Not applicable.
Detailed Occupation Code List (PDF 42KB)
Detailed Industry Code List (PDF 44KB)
User note on employment status data (PDF 63KB)
Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices P30, P32, P33, P43, P45, P49, P50, P51, P52, P53, P58, P62, P63, P64, P65, P67, P71, P72, P73, P74, P76, P77, P82, P87, P90, PCT47, PCT52, and PCT53

DP-3. **Profile of Selected Economic Characteristics: 2000**
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data
Geographic Area: **Census Tract 70.07, Sacramento County, California**

American River

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

Subject	Number	Percent
EMPLOYMENT STATUS		
Population 16 years and over	**3,867**	**100.0**
In labor force	2,236	57.8
Civilian labor force	2,236	57.8
Employed	1,972	51.0
Unemployed	264	6.8
Percent of civilian labor force	11.8	(X)
Armed Forces	0	0.0
Not in labor force	1,631	42.2
Females 16 years and over	**1,920**	**100.0**
In labor force	1,095	57.0
Civilian labor force	1,095	57.0
Employed	985	51.3
Own children under 6 years	**425**	**100.0**
All parents in family in labor force	181	42.6
COMMUTING TO WORK		
Workers 16 years and over	**1,912**	**100.0**
Car, truck, or van -- drove alone	1,368	71.5
Car, truck, or van -- carpooled	365	19.1
Public transportation (including taxicab)	96	5.0
Walked	17	0.9
Other means	17	0.9
Worked at home	49	2.6
Mean travel time to work (minutes)	23.7	(X)
Employed civilian population 16 years and over	**1,972**	**100.0**
OCCUPATION		
Management, professional, and related occupations	489	24.8
Service occupations	294	14.9
Sales and office occupations	627	31.8
Farming, fishing, and forestry occupations	12	0.6
Construction, extraction, and maintenance occupations	179	9.1
Production, transportation, and material moving occupations	371	18.8
INDUSTRY		
Agriculture, forestry, fishing and hunting, and mining	5	0.3
Construction	141	7.2
Manufacturing	175	8.9
Wholesale trade	108	5.5
Retail trade	238	12.1
Transportation and warehousing, and utilities	100	5.1
Information	51	2.6
Finance, insurance, real estate, and rental and leasing	182	9.2
Professional, scientific, management, administrative, and waste management services	146	7.4
Educational, health and social services	260	13.2
Arts, entertainment, recreation, accommodation and food services	168	8.5

Subject	Number	Percent
Other services (except public administration)	143	7.3
Public administration	255	12.9
CLASS OF WORKER		
Private wage and salary workers	1,424	72.2
Government workers	449	22.8
Self-employed workers in own not incorporated business	95	4.8
Unpaid family workers	4	0.2
INCOME IN 1999		
Households	**1,544**	**100.0**
Less than $10,000	97	6.3
$10,000 to $14,999	132	8.5
$15,000 to $24,999	129	8.4
$25,000 to $34,999	295	19.1
$35,000 to $49,999	216	14.0
$50,000 to $74,999	432	28.0
$75,000 to $99,999	136	8.8
$100,000 to $149,999	101	6.5
$150,000 to $199,999	0	0.0
$200,000 or more	6	0.4
Median household income (dollars)	45,297	(X)
With earnings	1,288	83.4
Mean earnings (dollars)	48,466	(X)
With Social Security income	434	28.1
Mean Social Security income (dollars)	9,151	(X)
With Supplemental Security Income	105	6.8
Mean Supplemental Security Income (dollars)	8,959	(X)
With public assistance income	184	11.9
Mean public assistance income (dollars)	6,531	(X)
With retirement income	360	23.3
Mean retirement income (dollars)	13,655	(X)
Families	**1,279**	**100.0**
Less than $10,000	61	4.8
$10,000 to $14,999	97	7.6
$15,000 to $24,999	109	8.5
$25,000 to $34,999	254	19.9
$35,000 to $49,999	206	16.1
$50,000 to $74,999	346	27.1
$75,000 to $99,999	124	9.7
$100,000 to $149,999	76	5.9
$150,000 to $199,999	0	0.0
$200,000 or more	6	0.5
Median family income (dollars)	45,659	(X)
Per capita income (dollars)	13,912	(X)
Median earnings (dollars):		
Male full-time, year-round workers	29,841	(X)
Female full-time, year-round workers	30,073	(X)
POVERTY STATUS IN 1999 (below poverty level)		
Families	**201**	**(X)**
Percent below poverty level	(X)	15.7
With related children under 18 years	174	(X)
Percent below poverty level	(X)	22.1
With related children under 5 years	88	(X)
Percent below poverty level	(X)	27.9
Families with female householder, no husband present	**67**	**(X)**
Percent below poverty level	(X)	23.3
With related children under 18 years	62	(X)
Percent below poverty level	(X)	27.1
With related children under 5 years	10	(X)
Percent below poverty level	(X)	11.2
Individuals	**1,151**	**(X)**
Percent below poverty level	(X)	20.9
18 years and over	548	(X)
Percent below poverty level	(X)	14.9

Subject	Number	Percent
65 years and over	46	(X)
Percent below poverty level	(X)	9.9
Related children under 18 years	586	(X)
Percent below poverty level	(X)	32.2
Related children 5 to 17 years	457	(X)
Percent below poverty level	(X)	32.1
Unrelated individuals 15 years and over	126	(X)
Percent below poverty level	(X)	20.6

(X) Not applicable.
Detailed Occupation Code List (PDF 42KB)
Detailed Industry Code List (PDF 44KB)
User note on employment status data (PDF 63KB)
Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices P30, P32, P33, P43, P46, P49, P50, P51, P52, P53, P58, P62, P63, P64, P65, P67, P71, P72, P73, P74, P76, P77, P82, P87, P90, PCT47, PCT52, and PCT53

DP-3. **Profile of Selected Economic Characteristics: 2000**
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data
Geographic Area: **Census Tract 70.08, Sacramento County, California**

SREL Reach 16-18

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

Subject	Number	Percent
EMPLOYMENT STATUS		
Population 16 years and over	**1,061**	**100.0**
In labor force	593	55.9
Civilian labor force	593	55.9
Employed	538	50.7
Unemployed	55	5.2
Percent of civilian labor force	9.3	(X)
Armed Forces	0	0.0
Not in labor force	468	44.1
Females 16 years and over	**562**	**100.0**
In labor force	295	52.5
Civilian labor force	295	52.5
Employed	248	44.1
Own children under 6 years	**62**	**100.0**
All parents in family in labor force	23	37.1
COMMUTING TO WORK		
Workers 16 years and over	**538**	**100.0**
Car, truck, or van -- drove alone	443	82.3
Car, truck, or van -- carpooled	41	7.6
Public transportation (including taxicab)	7	1.3
Walked	8	1.5
Other means	0	0.0
Worked at home	39	7.2
Mean travel time to work (minutes)	24.8	(X)
Employed civilian population 16 years and over	**538**	**100.0**
OCCUPATION		
Management, professional, and related occupations	204	37.9
Service occupations	86	16.0
Sales and office occupations	146	27.1
Farming, fishing, and forestry occupations	0	0.0
Construction, extraction, and maintenance occupations	49	9.1
Production, transportation, and material moving occupations	53	9.9
INDUSTRY		
Agriculture, forestry, fishing and hunting, and mining	0	0.0
Construction	65	12.1
Manufacturing	57	10.6
Wholesale trade	25	4.6
Retail trade	29	5.4

Subject	Number	Percent
Transportation and warehousing, and utilities	8	1.5
Information	26	4.8
Finance, insurance, real estate, and rental and leasing	39	7.2
Professional, scientific, management, administrative, and waste management services	75	13.9
Educational, health and social services	137	25.5
Arts, entertainment, recreation, accommodation and food services	41	7.6
Other services (except public administration)	18	3.3
Public administration	18	3.3
CLASS OF WORKER		
Private wage and salary workers	442	82.2
Government workers	61	11.3
Self-employed workers in own not incorporated business	35	6.5
Unpaid family workers	0	0.0
INCOME IN 1999		
Households	**521**	**100.0**
Less than $10,000	27	5.2
$10,000 to $14,999	11	2.1
$15,000 to $24,999	15	2.9
$25,000 to $34,999	78	15.0
$35,000 to $49,999	122	23.4
$50,000 to $74,999	116	22.3
$75,000 to $99,999	93	17.9
$100,000 to $149,999	24	4.6
$150,000 to $199,999	17	3.3
$200,000 or more	18	3.5
Median household income (dollars)	51,103	(X)
With earnings	391	75.0
Mean earnings (dollars)	77,502	(X)
With Social Security income	198	38.0
Mean Social Security income (dollars)	10,517	(X)
With Supplemental Security Income	8	1.5
Mean Supplemental Security Income (dollars)	10,000	(X)
With public assistance income	14	2.7
Mean public assistance income (dollars)	6,850	(X)
With retirement income	114	21.9
Mean retirement income (dollars)	23,393	(X)
Families	**380**	**100.0**
Less than $10,000	10	2.6
$10,000 to $14,999	0	0.0
$15,000 to $24,999	12	3.2
$25,000 to $34,999	55	14.5
$35,000 to $49,999	87	22.9
$50,000 to $74,999	72	18.9
$75,000 to $99,999	85	22.4
$100,000 to $149,999	24	6.3
$150,000 to $199,999	17	4.5
$200,000 or more	18	4.7
Median family income (dollars)	59,750	(X)
Per capita income (dollars)	31,427	(X)
Median earnings (dollars):		
Male full-time, year-round workers	41,500	(X)
Female full-time, year-round workers	34,875	(X)
POVERTY STATUS IN 1999 (below poverty level)		
Families	**10**	**(X)**
Percent below poverty level	(X)	2.6
With related children under 18 years	0	(X)
Percent below poverty level	(X)	0.0
With related children under 5 years	0	(X)
Percent below poverty level	(X)	0.0
Families with female householder, no husband present	**0**	**(X)**
Percent below poverty level	(X)	0.0
With related children under 18 years	0	(X)
Percent below poverty level	(X)	0.0

Subject	Number	Percent
With related children under 5 years	0	(X)
Percent below poverty level	(X)	(X)
Individuals	**47**	**(X)**
Percent below poverty level	(X)	4.0
18 years and over	47	(X)
Percent below poverty level	(X)	4.6
65 years and over	0	(X)
Percent below poverty level	(X)	0.0
Related children under 18 years	0	(X)
Percent below poverty level	(X)	0.0
Related children 5 to 17 years	0	(X)
Percent below poverty level	(X)	0.0
Unrelated individuals 15 years and over	29	(X)
Percent below poverty level	(X)	13.5

(X) Not applicable.
Detailed Occupation Code List (PDF 42KB)
Detailed Industry Code List (PDF 44KB)
User note on employment status data (PDF 63KB)
Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices P30, P32, P33, P43, P46, P49, P50, P51, P52, P53, P56, P62, P63, P64, P65, P67, P71, P72, P73, P74, P76, P77, P82, P87, P90, PCT47, PCT52, and PCT53

DP-3. **Profile of Selected Economic Characteristics: 2000**
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data
Geographic Area: **Census Tract 70.09, Sacramento County, California**

SREL Reaches 19

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

Subject	Number	Percent
EMPLOYMENT STATUS		
Population 16 years and over	**1,002**	**100.0**
In labor force	831	82.9
Civilian labor force	831	82.9
Employed	808	80.6
Unemployed	23	2.3
Percent of civilian labor force	2.8	(X)
Armed Forces	0	0.0
Not in labor force	171	17.1
Females 16 years and over	**513**	**100.0**
In labor force	394	76.8
Civilian labor force	394	76.8
Employed	386	75.2
Own children under 6 years	**50**	**100.0**
All parents in family in labor force	50	100.0
COMMUTING TO WORK		
Workers 16 years and over	**802**	**100.0**
Car, truck, or van -- drove alone	650	81.0
Car, truck, or van -- carpooled	87	10.8
Public transportation (including taxicab)	0	0.0
Walked	0	0.0
Other means	37	4.6
Worked at home	28	3.5
Mean travel time to work (minutes)	25.8	(X)
Employed civilian population 16 years and over	**808**	**100.0**
OCCUPATION		
Management, professional, and related occupations	425	52.6
Service occupations	161	19.9
Sales and office occupations	178	22.0
Farming, fishing, and forestry occupations	0	0.0
Construction, extraction, and maintenance occupations	36	4.5
Production, transportation, and material moving occupations	8	1.0

Subject	Number	Percent
INDUSTRY		
Agriculture, forestry, fishing and hunting, and mining	0	0.0
Construction	17	2.1
Manufacturing	46	5.7
Wholesale trade	39	4.8
Retail trade	37	4.6
Transportation and warehousing, and utilities	36	4.5
Information	48	5.9
Finance, insurance, real estate, and rental and leasing	80	9.9
Professional, scientific, management, administrative, and waste management services	113	14.0
Educational, health and social services	164	20.3
Arts, entertainment, recreation, accommodation and food services	34	4.2
Other services (except public administration)	27	3.3
Public administration	167	20.7
CLASS OF WORKER		
Private wage and salary workers	499	61.8
Government workers	265	32.8
Self-employed workers in own not incorporated business	44	5.4
Unpaid family workers	0	0.0
INCOME IN 1999		
Households	**657**	**100.0**
Less than $10,000	27	4.1
$10,000 to $14,999	17	2.6
$15,000 to $24,999	50	7.6
$25,000 to $34,999	84	12.8
$35,000 to $49,999	79	12.0
$50,000 to $74,999	166	25.3
$75,000 to $99,999	113	17.2
$100,000 to $149,999	103	15.7
$150,000 to $199,999	0	0.0
$200,000 or more	18	2.7
Median household income (dollars)	57,938	(X)
With earnings	605	92.1
Mean earnings (dollars)	64,709	(X)
With Social Security income	102	15.5
Mean Social Security income (dollars)	9,991	(X)
With Supplemental Security Income	0	0.0
Mean Supplemental Security Income (dollars)	(X)	(X)
With public assistance income	0	0.0
Mean public assistance income (dollars)	(X)	(X)
With retirement income	66	10.0
Mean retirement income (dollars)	14,992	(X)
Families	**264**	**100.0**
Less than $10,000	0	0.0
$10,000 to $14,999	0	0.0
$15,000 to $24,999	0	0.0
$25,000 to $34,999	28	10.6
$35,000 to $49,999	17	6.4
$50,000 to $74,999	74	28.0
$75,000 to $99,999	56	21.2
$100,000 to $149,999	71	26.9
$150,000 to $199,999	0	0.0
$200,000 or more	18	6.8
Median family income (dollars)	79,614	(X)
Per capita income (dollars)	38,283	(X)
Median earnings (dollars):		
Male full-time, year-round workers	52,344	(X)
Female full-time, year-round workers	41,987	(X)
POVERTY STATUS IN 1999 (below poverty level)		
Families	**0**	**(X)**
Percent below poverty level	(X)	0.0
With related children under 18 years	0	(X)
Percent below poverty level	(X)	0.0

Subject	Number	Percent
With related children under 5 years	0	(X)
Percent below poverty level	(X)	0.0
Families with female householder, no husband present	**0**	**(X)**
Percent below poverty level	(X)	0.0
With related children under 18 years	0	(X)
Percent below poverty level	(X)	0.0
With related children under 5 years	0	(X)
Percent below poverty level	(X)	0.0
Individuals	**27**	**(X)**
Percent below poverty level	(X)	2.3
18 years and over	27	(X)
Percent below poverty level	(X)	2.7
65 years and over	17	(X)
Percent below poverty level	(X)	13.8
Related children under 18 years	0	(X)
Percent below poverty level	(X)	0.0
Related children 5 to 17 years	0	(X)
Percent below poverty level	(X)	0.0
Unrelated individuals 15 years and over	27	(X)
Percent below poverty level	(X)	5.7

(X) Not applicable.
Detailed Occupation Code List (PDF 42KB)
Detailed Industry Code List (PDF 44KB)
User note on employment status data (PDF 63KB)
Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices P30, P32, P33, P43, P46, P49, P50, P51, P52, P53, P58, P62, P63, P64, P65, P67, P71, P72, P73, P74, P76, P77, P82, P87, P90, PCT47, PCT52, and PCT53

SREL Reach 20

DP-3. **Profile of Selected Economic Characteristics: 2000**
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data
Geographic Area: **Census Tract 70.10, Sacramento County, California**

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

Subject	Number	Percent
EMPLOYMENT STATUS		
Population 16 years and over	**2,293**	**100.0**
In labor force	1,971	86.0
Civilian labor force	1,932	84.3
Employed	1,885	82.2
Unemployed	47	2.0
Percent of civilian labor force	2.4	(X)
Armed Forces	39	1.7
Not in labor force	322	14.0
Females 16 years and over	**1,152**	**100.0**
In labor force	928	80.6
Civilian labor force	928	80.6
Employed	897	77.9
Own children under 6 years	**217**	**100.0**
All parents in family in labor force	136	62.7
COMMUTING TO WORK		
Workers 16 years and over	**1,857**	**100.0**
Car, truck, or van -- drove alone	1,499	80.7
Car, truck, or van -- carpooled	211	11.4
Public transportation (including taxicab)	50	2.7
Walked	33	1.8
Other means	0	0.0
Worked at home	64	3.4
Mean travel time to work (minutes)	19.9	(X)
Employed civilian population 16 years and over	**1,885**	**100.0**

Subject	Number	Percent
OCCUPATION		
Management, professional, and related occupations	1,133	60.1
Service occupations	142	7.5
Sales and office occupations	491	26.0
Farming, fishing, and forestry occupations	0	0.0
Construction, extraction, and maintenance occupations	56	3.0
Production, transportation, and material moving occupations	63	3.3
INDUSTRY		
Agriculture, forestry, fishing and hunting, and mining	10	0.5
Construction	97	5.1
Manufacturing	74	3.9
Wholesale trade	115	6.1
Retail trade	95	5.0
Transportation and warehousing, and utilities	123	6.5
Information	160	8.5
Finance, insurance, real estate, and rental and leasing	176	9.3
Professional, scientific, management, administrative, and waste management services	375	19.9
Educational, health and social services	275	14.6
Arts, entertainment, recreation, accommodation and food services	73	3.9
Other services (except public administration)	46	2.4
Public administration	266	14.1
CLASS OF WORKER		
Private wage and salary workers	1,414	75.0
Government workers	394	20.9
Self-employed workers in own not incorporated business	77	4.1
Unpaid family workers	0	0.0
INCOME IN 1999		
Households	**1,488**	**100.0**
Less than $10,000	48	3.2
$10,000 to $14,999	24	1.6
$15,000 to $24,999	154	10.3
$25,000 to $34,999	256	17.2
$35,000 to $49,999	249	16.7
$50,000 to $74,999	366	24.6
$75,000 to $99,999	191	12.8
$100,000 to $149,999	137	9.2
$150,000 to $199,999	30	2.0
$200,000 or more	33	2.2
Median household income (dollars)	50,365	(X)
With earnings	1,425	95.8
Mean earnings (dollars)	59,094	(X)
With Social Security income	85	5.7
Mean Social Security income (dollars)	13,001	(X)
With Supplemental Security Income	66	4.4
Mean Supplemental Security Income (dollars)	8,006	(X)
With public assistance income	8	0.5
Mean public assistance income (dollars)	800	(X)
With retirement income	120	8.1
Mean retirement income (dollars)	15,445	(X)
Families	**578**	**100.0**
Less than $10,000	17	2.9
$10,000 to $14,999	8	1.4
$15,000 to $24,999	88	15.2
$25,000 to $34,999	109	18.9
$35,000 to $49,999	102	17.6
$50,000 to $74,999	90	15.6
$75,000 to $99,999	60	10.4
$100,000 to $149,999	59	10.2
$150,000 to $199,999	12	2.1
$200,000 or more	33	5.7
Median family income (dollars)	44,028	(X)
Per capita income (dollars)	33,488	(X)
Median earnings (dollars):		
Male full-time, year-round workers	46,466	(X)

Subject	Number	Percent
Female full-time, year-round workers	33,451	(X)
POVERTY STATUS IN 1999 (below poverty level)		
Families	**25**	**(X)**
Percent below poverty level	(X)	4.3
With related children under 18 years	25	(X)
Percent below poverty level	(X)	7.9
With related children under 5 years	9	(X)
Percent below poverty level	(X)	4.4
Families with female householder, no husband present	**9**	**(X)**
Percent below poverty level	(X)	4.8
With related children under 18 years	9	(X)
Percent below poverty level	(X)	6.5
With related children under 5 years	9	(X)
Percent below poverty level	(X)	9.8
Individuals	**167**	**(X)**
Percent below poverty level	(X)	6.2
18 years and over	111	(X)
Percent below poverty level	(X)	4.9
65 years and over	0	(X)
Percent below poverty level	(X)	0.0
Related children under 18 years	56	(X)
Percent below poverty level	(X)	13.7
Related children 5 to 17 years	39	(X)
Percent below poverty level	(X)	20.3
Unrelated individuals 15 years and over	55	(X)
Percent below poverty level	(X)	4.7

(X) Not applicable.
Detailed Occupation Code List (PDF 42KB)
Detailed Industry Code List (PDF 44KB)
User note on employment status data (PDF 63KB)
Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices P30, P32, P33, P43, P46, P49, P50, P51, P52, P53, P58, P62, P63, P64, P65, P67, P71, P72, P73, P74, P76, P77, P82, P87, P90, PCT47, PCT52, and PCT53

American River Reaches 1-3

DP-3. **Profile of Selected Economic Characteristics: 2000**
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data
Geographic Area: **Census Tract 70.11, Sacramento County, California**

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

Subject	Number	Percent
EMPLOYMENT STATUS		
Population 16 years and over	**4,390**	**100.0**
In labor force	3,416	77.8
Civilian labor force	3,416	77.8
Employed	3,215	73.2
Unemployed	201	4.6
Percent of civilian labor force	5.9	(X)
Armed Forces	0	0.0
Not in labor force	974	22.2
Females 16 years and over	**2,192**	**100.0**
In labor force	1,492	68.1
Civilian labor force	1,492	68.1
Employed	1,417	64.6
Own children under 6 years	**607**	**100.0**
All parents in family in labor force	421	69.4
COMMUTING TO WORK		
Workers 16 years and over	**3,130**	**100.0**
Car, truck, or van -- drove alone	2,299	73.5
Car, truck, or van -- carpooled	524	16.7

Subject	Number	Percent
Public transportation (including taxicab)	103	3.3
Walked	75	2.4
Other means	62	2.0
Worked at home	67	2.1
Mean travel time to work (minutes)	18.9	(X)
Employed civilian population 16 years and over	**3,215**	**100.0**
OCCUPATION		
Management, professional, and related occupations	1,116	34.7
Service occupations	388	12.1
Sales and office occupations	1,223	38.0
Farming, fishing, and forestry occupations	7	0.2
Construction, extraction, and maintenance occupations	184	5.7
Production, transportation, and material moving occupations	297	9.2
INDUSTRY		
Agriculture, forestry, fishing and hunting, and mining	13	0.4
Construction	146	4.5
Manufacturing	116	3.6
Wholesale trade	130	4.0
Retail trade	289	9.0
Transportation and warehousing, and utilities	250	7.8
Information	312	9.7
Finance, insurance, real estate, and rental and leasing	291	9.1
Professional, scientific, management, administrative, and waste management services	419	13.0
Educational, health and social services	460	14.3
Arts, entertainment, recreation, accommodation and food services	238	7.4
Other services (except public administration)	198	6.2
Public administration	353	11.0
CLASS OF WORKER		
Private wage and salary workers	2,342	72.8
Government workers	714	22.2
Self-employed workers in own not incorporated business	145	4.5
Unpaid family workers	14	0.4
INCOME IN 1999		
Households	**2,457**	**100.0**
Less than $10,000	158	6.4
$10,000 to $14,999	181	7.4
$15,000 to $24,999	272	11.1
$25,000 to $34,999	457	18.6
$35,000 to $49,999	460	18.7
$50,000 to $74,999	554	22.5
$75,000 to $99,999	168	6.8
$100,000 to $149,999	153	6.2
$150,000 to $199,999	44	1.8
$200,000 or more	10	0.4
Median household income (dollars)	38,397	(X)
With earnings	2,302	93.7
Mean earnings (dollars)	46,214	(X)
With Social Security income	188	7.7
Mean Social Security income (dollars)	7,681	(X)
With Supplemental Security Income	140	5.7
Mean Supplemental Security Income (dollars)	6,852	(X)
With public assistance income	66	2.7
Mean public assistance income (dollars)	3,753	(X)
With retirement income	229	9.3
Mean retirement income (dollars)	10,421	(X)
Families	**1,391**	**100.0**
Less than $10,000	40	2.9
$10,000 to $14,999	93	6.7
$15,000 to $24,999	144	10.4
$25,000 to $34,999	231	16.6
$35,000 to $49,999	201	14.5
$50,000 to $74,999	383	27.5
$75,000 to $99,999	117	8.4
$100,000 to $149,999	150	10.8

Subject	Number	Percent
$150,000 to $199,999	22	1.6
$200,000 or more	10	0.7
Median family income (dollars)	48,650	(X)
Per capita income (dollars)	19,221	(X)
Median earnings (dollars):		
Male full-time, year-round workers	35,224	(X)
Female full-time, year-round workers	31,124	(X)
POVERTY STATUS IN 1999 (below poverty level)		
Families	**102**	**(X)**
Percent below poverty level	(X)	7.3
With related children under 18 years	93	(X)
Percent below poverty level	(X)	10.4
With related children under 5 years	62	(X)
Percent below poverty level	(X)	13.7
Families with female householder, no husband present	**54**	**(X)**
Percent below poverty level	(X)	13.8
With related children under 18 years	45	(X)
Percent below poverty level	(X)	14.8
With related children under 5 years	35	(X)
Percent below poverty level	(X)	25.7
Individuals	**598**	**(X)**
Percent below poverty level	(X)	10.0
18 years and over	444	(X)
Percent below poverty level	(X)	10.4
65 years and over	16	(X)
Percent below poverty level	(X)	7.7
Related children under 18 years	141	(X)
Percent below poverty level	(X)	8.3
Related children 5 to 17 years	74	(X)
Percent below poverty level	(X)	6.2
Unrelated individuals 15 years and over	253	(X)
Percent below poverty level	(X)	17.1

(X) Not applicable.
Detailed Occupation Code List (PDF 42KB)
Detailed Industry Code List (PDF 44KB)
User note on employment status data (PDF 63KB)
Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices P30, P32, P33, P43, P46, P49, P50, P51, P52, P53, P58, P62, P63, P64, P65, P67, P71, P72, P73, P74, P76, P77, P82, P87, P90, PCT47, PCT52, and PCT53

DP-4. **Profile of Selected Housing Characteristics: 2000**
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data
Geographic Area: **Census Tract 70.01, Sacramento County, California**

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

Subject	Number	Percent
Total housing units	**1,109**	**100.0**
UNITS IN STRUCTURE		
1-unit, detached	719	64.8
1-unit, attached	44	4.0
2 units	21	1.9
3 or 4 units	78	7.0
5 to 9 units	35	3.2
10 to 19 units	13	1.2
20 or more units	24	2.2
Mobile home	172	15.5
Boat, RV, van, etc.	3	0.3
YEAR STRUCTURE BUILT		
1999 to March 2000	3	0.3
1995 to 1998	8	0.7

Subject	Number	Percent
1990 to 1994	80	7.2
1980 to 1989	181	16.3
1970 to 1979	124	11.2
1960 to 1969	171	15.4
1940 to 1959	442	39.9
1939 or earlier	100	9.0
ROOMS		
1 room	47	4.2
2 rooms	113	10.2
3 rooms	201	18.1
4 rooms	265	23.9
5 rooms	317	28.6
6 rooms	135	12.2
7 rooms	25	2.3
8 rooms	0	0.0
9 or more rooms	6	0.5
Median (rooms)	4.2	(X)
Occupied Housing Units	**1,037**	**100.0**
YEAR HOUSEHOLDER MOVED INTO UNIT		
1999 to March 2000	254	24.5
1995 to 1998	274	26.4
1990 to 1994	140	13.5
1980 to 1989	133	12.8
1970 to 1979	67	6.5
1969 or earlier	169	16.3
VEHICLES AVAILABLE		
None	217	20.9
1	376	36.3
2	294	28.4
3 or more	150	14.5
HOUSE HEATING FUEL		
Utility gas	724	69.8
Bottled, tank, or LP gas	22	2.1
Electricity	291	28.1
Fuel oil, kerosene, etc.	0	0.0
Coal or coke	0	0.0
Wood	0	0.0
Solar energy	0	0.0
Other fuel	0	0.0
No fuel used	0	0.0
SELECTED CHARACTERISTICS		
Lacking complete plumbing facilities	6	0.6
Lacking complete kitchen facilities	7	0.7
No telephone service	53	5.1
OCCUPANTS PER ROOM		
Occupied housing units	**1,037**	**100.0**
1.00 or less	835	80.5
1.01 to 1.50	88	8.5
1.51 or more	114	11.0
Specified owner-occupied units	**406**	**100.0**
VALUE		
Less than $50,000	35	8.6
$50,000 to $99,999	298	73.4
$100,000 to $149,999	56	13.8
$150,000 to $199,999	10	2.5
$200,000 to $299,999	0	0.0
$300,000 to $499,999	7	1.7
$500,000 to $999,999	0	0.0
$1,000,000 or more	0	0.0
Median (dollars)	84,600	(X)
MORTGAGE STATUS AND SELECTED MONTHLY OWNER COSTS		
With a mortgage	247	60.8
Less than $300	0	0.0

Subject	Number	Percent
$300 to $499	6	1.5
$500 to $699	74	18.2
$700 to $999	95	23.4
$1,000 to $1,499	56	13.8
$1,500 to $1,999	10	2.5
$2,000 or more	6	1.5
Median (dollars)	901	(X)
Not mortgaged	159	39.2
Median (dollars)	220	(X)
SELECTED MONTHLY OWNER COSTS AS A PERCENTAGE OF HOUSEHOLD INCOME IN 1999		
Less than 15 percent	118	29.1
15 to 19 percent	57	14.0
20 to 24 percent	51	12.6
25 to 29 percent	22	5.4
30 to 34 percent	24	5.9
35 percent or more	120	29.6
Not computed	14	3.4
Specified renter-occupied units	**516**	**100.0**
GROSS RENT		
Less than $200	23	4.5
$200 to $299	58	11.2
$300 to $499	235	45.5
$500 to $749	129	25.0
$750 to $999	41	7.9
$1,000 to $1,499	0	0.0
$1,500 or more	6	1.2
No cash rent	24	4.7
Median (dollars)	452	(X)
GROSS RENT AS A PERCENTAGE OF HOUSEHOLD INCOME IN 1999		
Less than 15 percent	74	14.3
15 to 19 percent	53	10.3
20 to 24 percent	57	11.0
25 to 29 percent	35	6.8
30 to 34 percent	35	6.8
35 percent or more	208	40.3
Not computed	54	10.5

(X) Not applicable.
Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices H1, H7, H20, H23, H24, H30, H34, H38, H40, H43, H44, H48, H51, H62, H63, H69, H74, H76, H90, H91, and H94

DP-4. **Profile of Selected Housing Characteristics: 2000**
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data
Geographic Area: **Census Tract 70.07, Sacramento County, California**

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

Subject	Number	Percent
Total housing units	**1,607**	**100.0**
UNITS IN STRUCTURE		
1-unit, detached	1,288	80.1
1-unit, attached	16	1.0
2 units	0	0.0
3 or 4 units	63	3.9
5 to 9 units	94	5.8
10 to 19 units	19	1.2
20 or more units	47	2.9
Mobile home	80	5.0
Boat, RV, van, etc.	0	0.0
YEAR STRUCTURE BUILT		
1999 to March 2000	6	0.4

Subject	Number	Percent
1995 to 1998	27	1.7
1990 to 1994	32	2.0
1980 to 1989	246	15.3
1970 to 1979	515	32.0
1960 to 1969	286	17.8
1940 to 1959	476	29.6
1939 or earlier	19	1.2
ROOMS		
1 room	0	0.0
2 rooms	35	2.2
3 rooms	226	14.1
4 rooms	79	4.9
5 rooms	443	27.6
6 rooms	461	28.7
7 rooms	219	13.6
8 rooms	90	5.6
9 or more rooms	54	3.4
Median (rooms)	5.5	(X)
Occupied Housing Units	**1,525**	**100.0**
YEAR HOUSEHOLDER MOVED INTO UNIT		
1999 to March 2000	343	22.5
1995 to 1998	349	22.9
1990 to 1994	176	11.5
1980 to 1989	278	18.2
1970 to 1979	195	12.8
1969 or earlier	184	12.1
VEHICLES AVAILABLE		
None	92	6.0
1	506	33.2
2	649	42.6
3 or more	278	18.2
HOUSE HEATING FUEL		
Utility gas	1,164	76.3
Bottled, tank, or LP gas	7	0.5
Electricity	340	22.3
Fuel oil, kerosene, etc.	0	0.0
Coal or coke	0	0.0
Wood	14	0.9
Solar energy	0	0.0
Other fuel	0	0.0
No fuel used	0	0.0
SELECTED CHARACTERISTICS		
Lacking complete plumbing facilities	0	0.0
Lacking complete kitchen facilities	0	0.0
No telephone service	12	0.8
OCCUPANTS PER ROOM		
Occupied housing units	**1,525**	**100.0**
1.00 or less	1,283	82.8
1.01 to 1.50	142	9.3
1.51 or more	120	7.9
Specified owner-occupied units	**992**	**100.0**
VALUE		
Less than $50,000	0	0.0
$50,000 to $99,999	431	43.4
$100,000 to $149,999	482	48.6
$150,000 to $199,999	71	7.2
$200,000 to $299,999	8	0.8
$300,000 to $499,999	0	0.0
$500,000 to $999,999	0	0.0
$1,000,000 or more	0	0.0
Median (dollars)	105,700	(X)
MORTGAGE STATUS AND SELECTED MONTHLY OWNER COSTS		
With a mortgage	775	78.1

Subject	Number	Percent
Less than $300	8	0.8
$300 to $499	26	2.6
$500 to $699	92	9.3
$700 to $999	240	24.2
$1,000 to $1,499	341	34.4
$1,500 to $1,999	43	4.3
$2,000 or more	25	2.5
Median (dollars)	1,023	(X)
Not mortgaged	217	21.9
Median (dollars)	264	(X)
SELECTED MONTHLY OWNER COSTS AS A PERCENTAGE OF HOUSEHOLD INCOME IN 1999		
Less than 15 percent	281	28.3
15 to 19 percent	189	19.1
20 to 24 percent	121	12.2
25 to 29 percent	117	11.8
30 to 34 percent	62	6.3
35 percent or more	216	21.8
Not computed	6	0.6
Specified renter-occupied units	**431**	**100.0**
GROSS RENT		
Less than $200	0	0.0
$200 to $299	6	1.4
$300 to $499	32	7.4
$500 to $749	209	48.5
$750 to $999	112	26.0
$1,000 to $1,499	55	12.8
$1,500 or more	13	3.0
No cash rent	4	0.9
Median (dollars)	713	(X)
GROSS RENT AS A PERCENTAGE OF HOUSEHOLD INCOME IN 1999		
Less than 15 percent	64	14.8
15 to 19 percent	49	11.4
20 to 24 percent	60	13.9
25 to 29 percent	75	17.4
30 to 34 percent	34	7.9
35 percent or more	145	33.6
Not computed	4	0.9

(X) Not applicable.
Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices H1, H7, H20, H23, H24, H30, H34, H38, H40, H43, H44, H48, H51, H62, H63, H69, H74, H76, H90, H91, and H94

DP-4. **Profile of Selected Housing Characteristics: 2000**
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data
Geographic Area: **Census Tract 70.08, Sacramento County, California**

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

Subject	Number	Percent
Total housing units	**597**	**100.0**
UNITS IN STRUCTURE		
1-unit, detached	382	64.0
1-unit, attached	0	0.0
2 units	0	0.0
3 or 4 units	0	0.0
5 to 9 units	13	2.2
10 to 19 units	0	0.0
20 or more units	0	0.0
Mobile home	202	33.8
Boat, RV, van, etc.	0	0.0
YEAR STRUCTURE BUILT		

Subject	Number	Percent
1999 to March 2000	225	37.7
1995 to 1998	11	1.8
1990 to 1994	40	6.7
1980 to 1989	51	8.5
1970 to 1979	178	29.8
1960 to 1969	75	12.6
1940 to 1959	17	2.8
1939 or earlier	0	0.0
ROOMS		
1 room	0	0.0
2 rooms	8	1.3
3 rooms	40	6.7
4 rooms	58	9.7
5 rooms	132	22.1
6 rooms	122	20.4
7 rooms	139	23.3
8 rooms	65	10.9
9 or more rooms	33	5.5
Median (rooms)	6.0	(X)
Occupied Housing Units	**554**	**100.0**
YEAR HOUSEHOLDER MOVED INTO UNIT		
1999 to March 2000	223	40.3
1995 to 1998	68	12.3
1990 to 1994	74	13.4
1980 to 1989	59	10.6
1970 to 1979	114	20.6
1969 or earlier	16	2.9
VEHICLES AVAILABLE		
None	39	7.0
1	187	33.8
2	209	37.7
3 or more	119	21.5
HOUSE HEATING FUEL		
Utility gas	328	59.2
Bottled, tank, or LP gas	31	5.6
Electricity	178	32.1
Fuel oil, kerosene, etc.	0	0.0
Coal or coke	0	0.0
Wood	17	3.1
Solar energy	0	0.0
Other fuel	0	0.0
No fuel used	0	0.0
SELECTED CHARACTERISTICS		
Lacking complete plumbing facilities	0	0.0
Lacking complete kitchen facilities	0	0.0
No telephone service	9	1.6
OCCUPANTS PER ROOM		
Occupied housing units	**554**	**100.0**
1.00 or less	546	98.6
1.01 to 1.50	8	1.4
1.51 or more	0	0.0
Specified owner-occupied units	**316**	**100.0**
VALUE		
Less than $50,000	0	0.0
$50,000 to $99,999	13	4.1
$100,000 to $149,999	48	15.2
$150,000 to $199,999	151	47.8
$200,000 to $299,999	50	15.8
$300,000 to $499,999	21	6.6
$500,000 to $999,999	9	2.8
$1,000,000 or more	24	7.6
Median (dollars)	169,100	(X)
MORTGAGE STATUS AND SELECTED MONTHLY OWNER COSTS		

Subject	Number	Percent
With a mortgage	254	80.4
Less than $300	0	0.0
$300 to $499	0	0.0
$500 to $699	22	7.0
$700 to $999	34	10.8
$1,000 to $1,499	64	20.3
$1,500 to $1,999	92	29.1
$2,000 or more	42	13.3
Median (dollars)	1,537	(X)
Not mortgaged	62	19.6
Median (dollars)	318	(X)
SELECTED MONTHLY OWNER COSTS AS A PERCENTAGE OF HOUSEHOLD INCOME IN 1999		
Less than 15 percent	107	33.9
15 to 19 percent	28	8.9
20 to 24 percent	15	4.7
25 to 29 percent	53	16.8
30 to 34 percent	25	7.9
35 percent or more	79	25.0
Not computed	9	2.8
Specified renter-occupied units	**48**	**100.0**
GROSS RENT		
Less than $200	0	0.0
$200 to $299	0	0.0
$300 to $499	18	37.5
$500 to $749	8	16.7
$750 to $999	22	45.8
$1,000 to $1,499	0	0.0
$1,500 or more	0	0.0
No cash rent	0	0.0
Median (dollars)	538	(X)
GROSS RENT AS A PERCENTAGE OF HOUSEHOLD INCOME IN 1999		
Less than 15 percent	9	18.8
15 to 19 percent	9	18.8
20 to 24 percent	0	0.0
25 to 29 percent	0	0.0
30 to 34 percent	0	0.0
35 percent or more	30	62.5
Not computed	0	0.0

(X) Not applicable.
Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices H1, H7, H20, H23, H24, H30, H34, H38, H40, H43, H44, H48, H51, H62, H63, H69, H74, H76, H90, H91, and H94

DP-4. **Profile of Selected Housing Characteristics: 2000**
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data
Geographic Area: **Census Tract 70.09, Sacramento County, California**

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

Subject	Number	Percent
Total housing units	**741**	**100.0**
UNITS IN STRUCTURE		
1-unit, detached	307	41.4
1-unit, attached	132	17.8
2 units	0	0.0
3 or 4 units	75	10.1
5 to 9 units	130	17.5
10 to 19 units	33	4.5
20 or more units	64	8.6
Mobile home	0	0.0
Boat, RV, van, etc.	0	0.0

Subject	Number	Percent
YEAR STRUCTURE BUILT		
1999 to March 2000	137	18.5
1995 to 1998	33	4.5
1990 to 1994	69	9.3
1980 to 1989	381	51.4
1970 to 1979	87	11.7
1960 to 1969	16	2.2
1940 to 1959	18	2.4
1939 or earlier	0	0.0
ROOMS		
1 room	18	2.4
2 rooms	18	2.4
3 rooms	99	13.4
4 rooms	174	23.5
5 rooms	182	24.6
6 rooms	74	10.0
7 rooms	97	13.1
8 rooms	36	4.9
9 or more rooms	43	5.8
Median (rooms)	4.8	(X)
Occupied Housing Units	**618**	**100.0**
YEAR HOUSEHOLDER MOVED INTO UNIT		
1999 to March 2000	316	51.1
1995 to 1998	155	25.1
1990 to 1994	34	5.5
1980 to 1989	96	15.5
1970 to 1979	8	1.3
1969 or earlier	9	1.5
VEHICLES AVAILABLE		
None	0	0.0
1	373	60.4
2	188	30.4
3 or more	57	9.2
HOUSE HEATING FUEL		
Utility gas	289	46.8
Bottled, tank, or LP gas	18	2.9
Electricity	311	50.3
Fuel oil, kerosene, etc.	0	0.0
Coal or coke	0	0.0
Wood	0	0.0
Solar energy	0	0.0
Other fuel	0	0.0
No fuel used	0	0.0
SELECTED CHARACTERISTICS		
Lacking complete plumbing facilities	0	0.0
Lacking complete kitchen facilities	0	0.0
No telephone service	0	0.0
OCCUPANTS PER ROOM		
Occupied housing units	**618**	**100.0**
1.00 or less	600	97.1
1.01 to 1.50	18	2.9
1.51 or more	0	0.0
Specified owner-occupied units	**278**	**100.0**
VALUE		
Less than $50,000	0	0.0
$50,000 to $99,999	7	2.5
$100,000 to $149,999	27	9.7
$150,000 to $199,999	52	18.7
$200,000 to $299,999	166	59.7
$300,000 to $499,999	17	6.1
$500,000 to $999,999	9	3.2
$1,000,000 or more	0	0.0
Median (dollars)	218,400	(X)

Subject	Number	Percent
MORTGAGE STATUS AND SELECTED MONTHLY OWNER COSTS		
With a mortgage	235	84.5
Less than $300	0	0.0
$300 to $499	0	0.0
$500 to $699	7	2.5
$700 to $999	0	0.0
$1,000 to $1,499	94	33.8
$1,500 to $1,999	100	36.0
$2,000 or more	34	12.2
Median (dollars)	1,571	(X)
Not mortgaged	43	15.5
Median (dollars)	516	(X)
SELECTED MONTHLY OWNER COSTS AS A PERCENTAGE OF HOUSEHOLD INCOME IN 1999		
Less than 15 percent	56	20.1
15 to 19 percent	38	13.7
20 to 24 percent	36	12.9
25 to 29 percent	60	21.6
30 to 34 percent	0	0.0
35 percent or more	88	31.7
Not computed	0	0.0
Specified renter-occupied units	**305**	**100.0**
GROSS RENT		
Less than $200	0	0.0
$200 to $299	0	0.0
$300 to $499	0	0.0
$500 to $749	26	8.5
$750 to $999	168	55.1
$1,000 to $1,499	111	36.4
$1,500 or more	0	0.0
No cash rent	0	0.0
Median (dollars)	951	(X)
GROSS RENT AS A PERCENTAGE OF HOUSEHOLD INCOME IN 1999		
Less than 15 percent	56	18.4
15 to 19 percent	41	13.4
20 to 24 percent	44	14.4
25 to 29 percent	18	5.9
30 to 34 percent	25	8.2
35 percent or more	121	39.7
Not computed	0	0.0

(X) Not applicable.
Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices H1, H7, H20, H23, H24, H30, H34, H38, H40, H43, H44, H48, H51, H52, H63, H69, H74, H76, H90, H91, and H94

DP-4. **Profile of Selected Housing Characteristics: 2000**
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data
Geographic Area: **Census Tract 70.10, Sacramento County, California**

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

Subject	Number	Percent
Total housing units	**1,872**	**100.0**
UNITS IN STRUCTURE		
1-unit, detached	244	13.0
1-unit, attached	8	0.4
2 units	14	0.7
3 or 4 units	300	16.0
5 to 9 units	651	34.8
10 to 19 units	133	7.1
20 or more units	522	27.9
Mobile home	0	0.0
Boat, RV, van, etc.	0	0.0

Subject	Number	Percent
YEAR STRUCTURE BUILT		
1999 to March 2000	238	12.7
1995 to 1998	243	13.0
1990 to 1994	592	31.6
1980 to 1989	617	33.0
1970 to 1979	182	9.7
1960 to 1969	0	0.0
1940 to 1959	0	0.0
1939 or earlier	0	0.0
ROOMS		
1 room	53	2.8
2 rooms	146	7.8
3 rooms	352	18.8
4 rooms	819	43.8
5 rooms	276	14.7
6 rooms	54	2.9
7 rooms	88	4.7
8 rooms	50	2.7
9 or more rooms	34	1.8
Median (rooms)	4.0	(X)
Occupied Housing Units	**1,519**	**100.0**
YEAR HOUSEHOLDER MOVED INTO UNIT		
1999 to March 2000	1,061	69.8
1995 to 1998	354	23.3
1990 to 1994	70	4.6
1980 to 1989	34	2.2
1970 to 1979	0	0.0
1969 or earlier	0	0.0
VEHICLES AVAILABLE		
None	45	3.0
1	779	51.2
2	612	40.3
3 or more	84	5.5
HOUSE HEATING FUEL		
Utility gas	503	33.1
Bottled, tank, or LP gas	17	1.1
Electricity	981	64.6
Fuel oil, kerosene, etc.	9	0.6
Coal or coke	0	0.0
Wood	0	0.0
Solar energy	0	0.0
Other fuel	0	0.0
No fuel used	9	0.6
SELECTED CHARACTERISTICS		
Lacking complete plumbing facilities	0	0.0
Lacking complete kitchen facilities	0	0.0
No telephone service	0	0.0
OCCUPANTS PER ROOM		
Occupied housing units	**1,519**	**100.0**
1.00 or less	1,453	95.7
1.01 to 1.50	39	2.6
1.51 or more	27	1.8
Specified owner-occupied units	**163**	**100.0**
VALUE		
Less than $50,000	0	0.0
$50,000 to $99,999	0	0.0
$100,000 to $149,999	0	0.0
$150,000 to $199,999	53	32.5
$200,000 to $299,999	94	57.7
$300,000 to $499,999	16	9.8
$500,000 to $999,999	0	0.0
$1,000,000 or more	0	0.0
Median (dollars)	220,100	(X)

Subject	Number	Percent
MORTGAGE STATUS AND SELECTED MONTHLY OWNER COSTS		
With a mortgage	156	95.7
Less than $300	0	0.0
$300 to $499	0	0.0
$500 to $699	0	0.0
$700 to $999	0	0.0
$1,000 to $1,499	98	23.3
$1,500 to $1,999	63	38.7
$2,000 or more	55	33.7
Median (dollars)	1,836	(X)
Not mortgaged	7	4.3
Median (dollars)	325	(X)
SELECTED MONTHLY OWNER COSTS AS A PERCENTAGE OF HOUSEHOLD INCOME IN 1999		
Less than 15 percent	43	26.4
15 to 19 percent	56	34.4
20 to 24 percent	7	4.3
25 to 29 percent	16	9.8
30 to 34 percent	17	10.4
35 percent or more	24	14.7
Not computed	0	0.0
Specified renter-occupied units	**1,349**	**100.0**
GROSS RENT		
Less than $200	8	0.6
$200 to $299	0	0.0
$300 to $499	8	0.6
$500 to $749	443	32.8
$750 to $999	467	34.6
$1,000 to $1,499	403	29.9
$1,500 or more	12	0.9
No cash rent	8	0.6
Median (dollars)	827	(X)
GROSS RENT AS A PERCENTAGE OF HOUSEHOLD INCOME IN 1999		
Less than 15 percent	197	14.6
15 to 19 percent	355	26.3
20 to 24 percent	197	14.6
25 to 29 percent	214	15.9
30 to 34 percent	100	7.4
35 percent or more	268	19.9
Not computed	18	1.3

(X) Not applicable.
Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices H1, H7, H20, H23, H24, H30, H34, H38, H40, H43, H44, H48, H51, H62, H63, H69, H74, H76, H90, H91, and H94

DP-4. **Profile of Selected Housing Characteristics: 2000**
Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data
Geographic Area: **Census Tract 70.11, Sacramento County, California**

NOTE: Data based on a sample except in P3, P4, H3, and H4. For information on confidentiality protection, sampling error, nonsampling error, definitions, and count corrections see http://factfinder.census.gov/home/en/datanotes/expsf3.htm.

Subject	Number	Percent
Total housing units	**2,537**	**100.0**
UNITS IN STRUCTURE		
1-unit, detached	817	32.2
1-unit, attached	132	5.2
2 units	0	0.0
3 or 4 units	197	7.8
5 to 9 units	286	11.3
10 to 19 units	479	18.9
20 or more units	626	24.7
Mobile home	0	0.0

Subject	Number	Percent
Boat, RV, van, etc.	0	0.0
YEAR STRUCTURE BUILT		
1999 to March 2000	0	0.0
1995 to 1998	101	4.0
1990 to 1994	274	10.8
1980 to 1989	1,675	66.0
1970 to 1979	420	16.6
1960 to 1969	30	1.2
1940 to 1959	29	1.1
1939 or earlier	8	0.3
ROOMS		
1 room	159	6.3
2 rooms	241	9.5
3 rooms	501	19.7
4 rooms	656	25.9
5 rooms	357	14.1
6 rooms	279	11.0
7 rooms	230	9.1
8 rooms	109	4.3
9 or more rooms	5	0.2
Median (rooms)	4.1	(X)
Occupied Housing Units	**2,452**	**100.0**
YEAR HOUSEHOLDER MOVED INTO UNIT		
1999 to March 2000	1,181	48.2
1995 to 1998	596	24.3
1990 to 1994	277	11.3
1980 to 1989	391	15.9
1970 to 1979	7	0.3
1969 or earlier	0	0.0
VEHICLES AVAILABLE		
None	177	7.2
1	1,147	46.8
2	859	35.0
3 or more	269	11.0
HOUSE HEATING FUEL		
Utility gas	564	23.0
Bottled, tank, or LP gas	0	0.0
Electricity	1,871	76.3
Fuel oil, kerosene, etc.	0	0.0
Coal or coke	0	0.0
Wood	8	0.3
Solar energy	9	0.4
Other fuel	0	0.0
No fuel used	0	0.0
SELECTED CHARACTERISTICS		
Lacking complete plumbing facilities	11	0.4
Lacking complete kitchen facilities	0	0.0
No telephone service	8	0.3
OCCUPANTS PER ROOM		
Occupied housing units	**2,452**	**100.0**
1.00 or less	2,190	89.3
1.01 to 1.50	62	2.5
1.51 or more	200	8.2
Specified owner-occupied units	**676**	**100.0**
VALUE		
Less than $50,000	12	1.8
$50,000 to $99,999	73	10.8
$100,000 to $149,999	411	60.8
$150,000 to $199,999	180	26.6
$200,000 to $299,999	0	0.0
$300,000 to $499,999	0	0.0
$500,000 to $999,999	0	0.0
$1,000,000 or more	0	0.0

Subject	Number	Percent
Median (dollars)	131,600	(X)
MORTGAGE STATUS AND SELECTED MONTHLY OWNER COSTS		
With a mortgage	618	91.4
Less than $300	0	0.0
$300 to $499	10	1.5
$500 to $699	21	3.1
$700 to $999	102	15.1
$1,000 to $1,499	372	55.0
$1,500 to $1,999	95	14.1
$2,000 or more	18	2.7
Median (dollars)	1,228	(X)
Not mortgaged	58	8.6
Median (dollars)	297	(X)
SELECTED MONTHLY OWNER COSTS AS A PERCENTAGE OF HOUSEHOLD INCOME IN 1999		
Less than 15 percent	167	24.7
15 to 19 percent	97	14.3
20 to 24 percent	134	19.8
25 to 29 percent	100	14.8
30 to 34 percent	60	8.9
35 percent or more	118	17.5
Not computed	0	0.0
Specified renter-occupied units	**1,725**	**100.0**
GROSS RENT		
Less than $200	0	0.0
$200 to $299	6	0.3
$300 to $499	36	2.1
$500 to $749	1,414	82.0
$750 to $999	218	12.6
$1,000 to $1,499	51	3.0
$1,500 or more	0	0.0
No cash rent	0	0.0
Median (dollars)	675	(X)
GROSS RENT AS A PERCENTAGE OF HOUSEHOLD INCOME IN 1999		
Less than 15 percent	208	12.1
15 to 19 percent	330	19.1
20 to 24 percent	275	15.9
25 to 29 percent	300	17.4
30 to 34 percent	101	5.9
35 percent or more	461	26.7
Not computed	50	2.9

(X) Not applicable.
Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices H1, H7, H20, H23, H24, H30, H34, H38, H40, H43, H44, H48, H51, H62, H63, H69, H74, H76, H90, H91, and H94

ORGANIZATIONS

O1

Sacramento Area Bicycle Advocates
SABA
Making Sacramento a cycling capital
909 12th Street Ste 116 Sacramento CA 95814 (916) 444-6600 www.sacbike.org

August 13, 2010

John Bassett, P.E., Director of Engineering
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814

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Jim Strong
Partner
Streng Brothers Rentals

RE: Draft EIS/EIR on Phase 4b of the Natomas Levee Improvement Program

Dear Mr. Bassett:

Thank you for the opportunity to comment on the subject Draft EIR/EIS. We continue to be very pleased that the Phase 4b Project DEIR/EIS provides for the possible construction of the Natomas Levee Recreational Trail Project, a 42-mile bicycle and pedestrian Class I facility. However, we fear that many years may pass before actual construction of this trail may even start, let alone be completed and usable for either recreation or commuting. O1-1

The Draft EIR/EIS properly acknowledges that construction of the project will cause temporary (up-to-6-month) disruptions of roadways and trails used by bicyclists and commits to preparation and implementation of Bicycle Detour Plans for each such disruption.

The Draft EIR/EIS fails to identify possible significant adverse impacts of long-term or indefinite interruption of bicycle facilities. Such long-term impacts may occur if the NLIP does not commit to completely reconstruct existing bicycle facilities that are destroyed by construction excavation or filling. These significant adverse impacts may occur at the following locations of existing bicycle facilities (see City of Sacramento Bikeway Master Plan map dated April 2010): O1-2

1. Garden Highway along the American River levee and the lower portion of the Sacramento River levee (to Orchard Lane) where it currently has Class II bicycle lanes,

2. Class I Bike Trail at foot of Sacramento River levee westward from Natomas Oaks Park to the Main Drainage Canal Class I bike trail (this trail is currently an important commuter route from South Natomas towards downtown and will become much more important when the bike bridge over I80 to North Natomas at the junction of the Main Drainage Canal and the East and West Drainage Canals and their Class I bike trails is completed in 2011),

3. Class I Bike Trail at foot of Sacramento River levee westward from Shorebird Park to Marina Glen Way with connections up the slope of

SAFCA '10 AUG 16 PM2:56

American Lung Association Clean Air Award, Sacramento Environmental Commission Environmental Recognition Award, League of Women Voters Civic Contribution Award, League of American Bicyclists Club of the Year

the levee to Garden Highway (an important route for commuters from the western portion of South Natomas), and

4. Ueda Parkway Class I bike trail along the top of the Natomas East Main Drainage Canal west levee (an important commuter and recreational bicycle route between North Sacramento, North and South Natomas, and downtown).

O1-2 (Con't.)

These significant adverse impacts can be reduced to less than significant levels by the commitment of the NLIP 4b project to fully reconstruct and reestablish these important bicycle facilities and connections.

To fully mitigate temporary construction disruptions to bicycle routes, the Bicycle Detour Plans must include (in addition to what is stated in the DEIR/EIS) the following measures:

- Noticing of alternate routes for bicyclists to local bicycle organizations for distribution through their information channels, and
- 25 mph speed limits through the detours.

The Ueda Parkway bike trail currently has limited connections with surface streets in the neighborhoods near which it passes. Reconstruction of the Ueda Parkway bike trail after completion of the levee project should include establishing connections (possibly by paving construction-access ramps) to the following surface streets:

O1-3

- Indiana Ave
- Senator Ave
- Rosin Court
- Tandy Court
- North Market Blvd

SABA is an award-winning nonprofit organization with more than 1400 members. We represent bicyclists. Our aim is more and safer trips by bike. We are working for a future in which bicycling for everyday transportation is common because it is safe, convenient, and desirable. Bicycling is the healthiest, cleanest, cheapest, quietest, most energy efficient, and least congesting form of transportation.

Thank you for considering our comments.

Yours truly,

Matt Seiler for

Jordan Lang
Project Assistant

Cc Ed Cox, City of Sacramento Alternate-Modes Coordinator
Dan Klinker, Sacramento County Bicycle Coordinator

Letter	Sacramento Area Bicycle Advocates
O1	Jordan Lang, Project Assistant
Response	August 13, 2010

O1-1 Comment noted.

O1-2 Table 3.13-1 is revised as follows:

Table 3.13-1
Recreational Facilities and Park Lands in the Natomas Basin, including the Phase 4b Project Area

Facility (Owner/Operator)	Location	Features
Garden Highway Bikeway	Reach I:1–2 of the American River north levee and Reach A:19B and 20 of the Sacramento River east levee. The Class I bikeway is adjacent to Garden Highway, on the waterside of the levees between Natomas Park Drive and Gateway Oaks Drive. The trail crosses Garden Highway, enters the Natomas Oaks Park, and continues parallel to the levee on the landside to the NEMDC. The bikeway turns north at this point and follows the NEMDC. See **Plate 2-21**, "Bike Trail Concepts"	1.25-mile trail from Natomas Park Drive to Natomas Main Drainage Canal
Ueda Parkway (City of Sacramento Department of Parks and Recreation)	On the crown of NEMDC west levee between Arden Garden Connector and Elkhorn Boulevard, Dry Creek, and Robla Creek	12.5 miles of paved recreation trails primarily on levee crowns, providing access to the natural habitat of Steelhead, Arcade, Dry, and Robla Creeks. The parkway also has approximately 3.5 miles of equestrian trail in the Hansen Ranch area, which includes Dry Creek, Robla Creek, wetlands, and oak woodlands. Provides a connection to American River Parkway and downtown Sacramento, with neighborhood access points at various locations; facilities include a Class I bike trail along the crown of the NEMDC

Table 4.14-1 is revised as follows:

Table 4.13-1
Impacts to Recreational Facilities and Park Lands In or Near the Phase 4b Project Area

Facility (Owner/Operator)	Location	Park Amenities	Temporary and Short-term Impacts	Permanent Impacts
Ueda Parkway (City of Sacramento)	On the crown of the NEMDC west levee between Arden-Garden Connector and Elkhorn Boulevard, along Dry Creek, and Robla Creek east of the NEMDC	12.5 miles of paved recreation trails primarily on the levee crowns; connection to American River Parkway and downtown Sacramento; neighborhood access points at various locations; facilities include a Class I bike trail along the crown of the NEMDC	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative: Erosion repair, waterside repairs, and repairs at City of Sacramento Sump Pump 102 would require temporary closures of the bike trail on the NEMDC levee crown. The bike trail would be demolished at the construction locations and reconstructed.	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative: Vegetation removal (including potential removal of Heritage oak trees) on the waterside of the west levee of NEMDC south would adversely affect the recreational experiences for passive users (birdwatchers, fisherman, and hikers) of the Parkway.
Garden Highway Bikeway	Waterside of the American River north levee in Reaches I:1 and I:2 and on the waterside and landside of the Sacramento River east levee in Reach A:20	1.25-mile trail from Natomas Park Drive to Natomas Main Drainage Canal; the trail follows the Natomas Main Drainage Canal north from the Sacramento River east levee Reach A:19B and 20	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative: Portions of the Bikeway located on the levee crown on the south side of Garden Highway on the American River north levee Reach I:1–2 and Sacramento River east levee Reach A:20 would be temporarily affected by construction closures and may need to be reconstructed upon completion of construction.	Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative: In Reach A:20 on the landside of the levee between Natomas Oaks Park and the NEMDC, the Adjacent Levee Alternative (Proposed Action) and the Fix-in-Place Alternative (O&M corridor) would encroach on the Bikeway. Following construction of the Fix-in-Place Alternative, the Bikeway could be replaced in the O&M corridor. Fix-in-Place Alternative: Removal of riparian vegetation and woodlands on the waterside of the Sacramento River east levee in Reach A:20 and American River north levee in Reach I:1–2 would diminish the quality of the recreational experience for users of the Bikeway in these areas.

Mitigation Measure 4.13-c(1), "Prepare and Implement a Bicycle Detour Plan for All Bicycle Trails and On-Street Bicycle Routes, Provide Detours for Bicycle Facilities, and Coordinate with City and/or County Departments of Parks and Recreation to Repair Damage to Recreational Facilities," of the DEIS/DEIR will reduce temporary impacts to bicycle routes to a less than significant level because construction-related damage will be repaired or reconstructed; access restored; and detour routes, roadway markings to designate temporary bike lanes, and informational signs will be provided. Specific details and coordination efforts related to reconstruction of bicycle routes will be determined during final planning, engineering, and design.

To the extent feasible, the reconstructed roadway and any associated bicycle facilities would meet City of Sacramento or Sacramento County roadway design criteria, depending on the jurisdiction.

O1-3 As described above in response to comment O1-2, implementation of Mitigation Measure 4.13-c(1), "Prepare and Implement a Bicycle Detour Plan for All Bicycle Trails and On-Street Bicycle Routes, Provide Detours for Bicycle Facilities, and Coordinate with City and/or County Departments of Parks and Recreation to Repair Damage to Recreational Facilities," in the DEIS/DEIR would reduce temporary impacts to bicycle routes to a less than significant level because construction-related damage would be repaired or reconstructed; access would be restored; and detour routes, roadway markings to designate temporary bike lanes, and informational signs would be provided. Because consultation with the County and/or City of Sacramento Bicycle and Pedestrian Coordinator, as applicable, is included as part of this mitigation measure, noticing requirements and speed limits of detours will be based upon guidance from the relevant local agency.

USACE and SAFCA are not responsible for construction of bikeways or the establishment of connections from existing bikeways to surface streets. Although the Natomas Levee Recreational Trail Project is included as part of the Phase 4b Project description, further environmental review (i.e., CEQA) is likely to be required as design plans and specifications are developed.

O2

Henningsen, Sarah

From: Bassett. John (MSA) [bassettj@SacCounty.NET]
Sent: Monday, August 16, 2010 2:36 PM
To: Dunn, Francine; Henningsen, Sarah
Subject: FW: DEIS/DEIR Comments due 8/16/10

-----Original Message-----
From: Frederick Weiland [mailto:flweiland@yahoo.com]
Sent: Monday, August 16, 2010 1:57 PM
To: Elizabeth.g.holland@usace.army.mil; Bassett. John (MSA)
Cc: Baker. Janet (MSA); rstork@friendsoftheriver.org; Warren V. Truitt
Subject: DEIS/DEIR Comments due 8/16/10

Dear Ms. Holland,

Save The American River Association (SARA) was founded in 1961 to establish The American River Parkway and remains today as the guardian of and advocate for its lands and waters.

Since we are already on record in a letter dated June 3, 2010, as opposing the U.S. Army Corps of Engineers' nationwide policy to require state and local flood control agencies to remove trees, shrubs, and woody vegetation from flood protection levees and adjacent areas, SARA will confine its comments here to the DEIS/DEIR evaluating the potentially significant environmental impacts of the Phase 4b Project, Reach I: 1-4. O2-1

1. Please confirm our understanding that Reach I: 1-4 is included in the conditional variance granted SAFCA thereby avoiding the removal of significant waterside riparian vegetation that would have resulted in severe impacts to the environment and on users of the American River Parkway. In fact, only the landside vegetation of Reach I: 1-4 is slated for removal except as noted in 2. O2-2

2. It is our understanding that the removal of no more than 28 trees on the NEMDC at the Arden Garden/Northgate Boulevard location (between Jefferson and Harding Avenues to be exact), in an area of the Parkway designated Protected Area, will be mitigated at a ratio of 3 to 1. This mitigation will be installed at least one to two years before the loss of the 28 trees, and the mitigation will be fully monitored to insure its success as replacement SRA. The mitigation site is located on the NEMDC between Rimmer and Tanaya Avenues. Please note that this mitigation does not compensate the Public for the loss of habitat and natural amenities within The American River Parkway. The DEIS/DEIR should address some form of compensation for degradation occuring within a Federal, State and County protected Park and River. O2-3

3. The DEIS/DEIR lists Discovery Park as a potential staging area for the levee improvements. Since the exact location within Discovery Park is not specified in the environmental document, please note that we will request further environmental analysis if a site location is chosen that may have impacts on the plants, animals and birds who rely on the River and Parkway lands. O2-4

Thank you for the opportunity to comment regarding potential impacts of the Phase 4b Project, Reach I: 1-4, on The American River Parkway. For our records, please confirm that you received these comments by the DEIS/DEIR deadline of August 16th, 5:00 p.m. SARA looks forward to the courtesy of your response.

Sincerely,

1

Betsy Weiland, Co-Chairman
Land Use Committee
Save The American River Association
4950 Keane Drive
Carmichael, California 95608

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2

Letter O2 Response	Save the American River Association Betsy Weiland, Co-Chariman, Land Use Committee August 16, 2010

O2-1 Comment noted.

O2-2 See response to comment F2-2. All but a 0.4-mile stretch of the NEMDC was approved under the vegetation variance approval granted on June 16, 2010. Reach I:1–4 of the American River north levee is included in the USACE-granted variance (see Appendix I of the Natomas PACR).

O2-3 The exact number and location of trees to be removed will be based upon final detailed plans and specifications, which will be developed if and when the Phase 4b Project is approved.

Mitigation Measure 4.7-a, "Minimize Effects on Woodland Habitat; Implement Woodland Habitat Improvements and Management Agreements; Compensate for Loss of Habitat; and Comply with Section 7 of the ESA, Section 2081 of the CESA, and Section 1602 of the California Fish and Game Code," of the DEIS/DEIR provides replacement ratios to reduce Impact 4.7-a, "Loss of Landside and Waterside Woodland and Shaded Riverine Aquatic Habitats," of the DEIS/DEIR. The habitat improvements from mitigation implementation would reduce long-term impacts to landside woodland habitats loss to a less-than-significant level. However, this impact would remain significant and unavoidable for many years before reaching a less-than-significant level because replacement plantings would require a minimum of 10–15 years before providing important habitat components such as shade and structure and decades to replace old growth trees, such as Heritage oaks.

Timing of replacement will be determined in coordination with DFG, NMFS, and the U.S. Fish and Wildlife Service (USFWS).

Impact 4.3-c, "Inconsistency with the American River Parkway Plan and Wild and Scenic Rivers Act," in the DEIS/DEIR addresses the impact to the American River Parkway from removal of vegetation.

O2-4 Comment noted. In the case that new environmental impacts or substantially greater environmental impacts are identified, due to project changes or new information, USACE and/or SAFCA would prepare further environmental analysis as required by State CEQA Guidelines, CCR Section 15162 and National Environmental Policy Act (NEPA) CEQ Regulation 1502.9.

O3

SACRAMENTO TREE FOUNDATION

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August 16, 2010

Elizabeth Holland, Planning Division
U.S. Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814

Re: Public Comment on the Draft Environmental Impact Statement/Draft Environmental Impact Report on the American River Watershed Common Features Project/Natomas Post-authorization Change Report/Natomas Levee Improvement Program, Phase 4b Landside Improvements Project

Dear Ms. Holland,

Thank you for the opportunity to comment on the Draft Environmental Impact Statement/Draft Environmental Impact Report (DEIS/DEIR) for the Natomas Levee Improvement Program, Phase 4b.

The Sacramento Tree Foundation appreciates the analysis made in the DEIS/DEIR addressing the preservation of as much waterside woodland as possible, thus reducing the impact to shaded riverine aquatic habitats. We understand the concept that the adjacent levee provides extra levee integrity with a redundant solution if the original levee should fail. This solution is a response to the Army Corps of Engineers' (Corps) perspective and policy that waterside and landside vegetation threatens the stability of levees.

While we appreciate the efforts made to preserve the waterside vegetation and trees, the basic premise of this approach – that trees on levees threaten the stability of levees – is flawed. It has not been proven that vegetation or trees weaken levee integrity. On the contrary, a 2001 report from the Engineer Research and Development Center (ERDC), which is the US Army Corps of Engineers' distributed research and development command, states: O3-1

"…Riparian vegetation helps stabilize banks, which is valuable because otherwise expensive structures would have to be built to stabilize the bank." [1]

The same report further states:

"The stabilizing benefits of vegetation can be a strong inducement for their incorporation into flood control projects. Leaves and stems of plants intercept rainfall and reduce surface erosion both from runoff and from overbank flooding. Vegetation, primarily woody plants, also helps to prevent mass movement, particularly shallow sliding in slopes." [2]

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"..healthy riparian vegetation also stabilizes streambanks, provides shade that prevents excessive water temperature fluctuations, performs a vital role in nutrient cycling and water quality, improves aesthetic and recreational benefits of a site, and is immensely productive as wildlife habitat. For these reasons, the incorporation of vegetation in stream restoration and flood control projects is often desirable.." [3]

"Flood attenuation is increased in vegetated riparian systems. As is the case for maintenance of stream morphology, the resistance of vegetation to flow is an important attribute for flood attenuation. The area that vegetation presents to flow is proportional to resistance (measured as Manning's n) and effectiveness at reducing flow velocity. This presented vegetational area of vegetation increases directly with increased stem size and density. Trees are most effective at resisting flow." [4]

Furthermore, on page 2-8 in the DEIS/DEIR, it is shown that in the past the Corps allowed vegetation to remain on levees and that during two subsequent floods, there was no evidence of instability or threat to safety:

"However, with the concurrence of USACE and the State, to minimize the project's environmental effects, trees were allowed to remain in the maintenance area along the landside toe of the improved levee and along the waterside slope of the levee and waterside berm. It was felt that these trees would not impair the performance of the improved levee because there was adequate visibility of and access to both sides of the levee to conduct routine maintenance and flood fighting activities. Nor was there any significant concern regarding the impact of the remaining trees on the safety or structural integrity of the improved levee. Although nearly overtopped and subjected to prolonged high flow during the flood of 1986, the old levee had performed well with few signs of stress. With its increased height, the new levee performed even better during the flood of 1997. However, this levee is no longer considered in compliance with USACE levee vegetation guidance, and avoidance of landside tree clearing in this maintenance area would require a variance from USACE.

O3-1 (Con't.)

The California Department of Water Resources, in their letter of April 15, 2010 regarding the Corps' vegetation variance policy:

"Whereas overtopping, underseepage, through-seepage, erosion and other high-risk modes of failure are well-documented in the Central Valley, we have not seen evidence that well-managed vegetations poses significant risks. We are not aware of any levee failures in the Central Valley that were caused by woody vegetation on levees, and interim studies suggest that woody vegetation has negligible detrimental effects on levee performance as well."

Bio-stabilization of levees is common practice in Europe and gaining ground in other parts of the world.[5] Given the scarcity of trees in California's Central Valley and the severe reduction in wildlife habitat already inflicted on the region, we believe a

policy of "clearing, grubbing, and stripping" levees is irresponsible and will cause irreparable, long-term harm to the environment as well as to our citizens given the air and water quality benefits of trees, -- to say nothing of the great economic cost to implement such a policy.

In the Corps' Engineering Technical Letter 1110-2-571, the benefits of landscape planting mentioned include dust and erosion prevention, water quality and wildlife habitat, and creating a pleasant environment for human use and recreation. But the benefits of trees with respect to our citizens go far beyond this list as shown below:

- Trees are a significant factor in reducing air pollution by means of nitrous oxide deposition, sulfur dioxide absorption, ozone interception, and particulate matter intereception. 100 trees can remove 1,000 pounds of pollutants per year, including 400 pounds of ozone and 300 pounds of particulates.[6] Recent research shows the increasing public health threats of ultrafine particulate matter from car exhaust.
- On an annual basis, 100 trees can remove 5 tons of carbon dioxide from the atmosphere.[6] Large trees are the most effective for long-term carbon storage.
- In semi-arid California, trees catch and hold rainfall, which delays stormwater runoff and reduces flooding. A large deciduous tree can intercept between 500 and 760 gallons of water per year. A mature evergreen can intercept more than 4,000 gallons per year, depending on species and rainfall characteristics.[7] Preventing stormwater runoff improves water quality and water availability at the local level. Tree canopies reduce soil erosion by diminishing the impact of rain on barren surfaces.
- Plants clean the soil and water by removing contaminants such as metals, pesticides, crude oil, polycyclic aromatic hydrocarbons and more through the process known as phytoremediation. Tree species commonly used for phytoremediation include willow, poplar (cottonwood hybrids), and mulberry, because they have deep root systems and are able to control the movement of pollutants by consuming large amounts of water. Willow and poplar are the typical species for riparian woodland in Sacramento. While pollutant removal rates vary greatly, one study estimated that one sugar maple growing along a roadway removed 60 mg of cadmium, 140 mg of chromium, 820 mg of nickel, and 5,200 mg of lead from the environment during a single growing season.[8]
- In urban areas, such as the Natomas Levee in Sacramento, an increase in tree canopy can reduce the urban heat island effect by reducing ambient temperatures by 3 – 5 degrees Fahrenheit.[9]

We urge the Corps to re-consider well-established alternative methods of bio-stabilization on levees in order to preserve our limited environmental resources. If current research and empirical data are somehow insufficient, we again urge the Corps to expedite the research needed to determine the impact of trees and

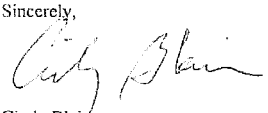
O3-1 (Con't.)

vegetation on levee stability. Please take the time to fully consider these alternatives before implementing a policy of clearing, grubbing, and stripping in the West.

O3-1 (Con't.)

The Sacramento Tree Foundation believes that we can reach a better solution by working with a broad range of agencies and concerned citizens – a solution that will address our urgent environmental, levee stability, and human health concerns. Thank you very much for your consideration.

Sincerely,



Cindy Blair
Operations Director
Sacramento Tree Foundation

1. Environmental considerations for vegetation in flood control channels. J. C.Fischenich, and R. R. Copeland. ERDC. TR-01-16, U.S. Army Engineer Research and Development Center, Vicksburg, MS. 2001. Page 3.
2. *Ibid.* Page 57-58.
3. *Ibid.* Page 3.
4. *Ibid.* Page 68-69.
5. *Ibid.* Page 57 and the article "**City to plant trees to help prevent dyke, bank erosion**" **Viet Nam News,** June, 16 2010. "During the 2011-15 period, the city will plant additional 810,000 trees along 112km of sea dykes, river and canal banks in the coastal district… City officials said the project was being undertaken because of the general ineffectiveness of various flood prevention programmes, on which the city had spent more than VND200 billion ($10.5 million) each year since 2008."
6. Tree Guidelines for San Joaquin Valley Community. E.G. McPherson et al, USDA Forest Service, Pacific Southwest Research Station, Center for Urban Forest Research. Davis, CA. 1999.
7. Benefits of the Urban Forest: Fact Sheet #1. USDA Forest Service, Pacific Southwest Research Station, Center for Urban Forest Research. Davis, CA. 2001.
8. Identified Benefits of Community Trees and Forests. K. Coder, University of Georgia. Athens, GA. 1996.
9. Energy Saving Calculations for Heat Island Reduction Strategies in Baton Rouge, Sacramento, and Salt Lake City. S. Konopacki and H. Akbari. 2000.

cc: John Bassett, Director of Engineering, Sacramento Area Flood Control Agency

Letter	Sacramento Tree Foundation
O3	Cindy Blain, Operations Director
Response	August 16, 2010

O3-1 On February 9, 2010, USACE posted a notice in the *Federal Register* (Vol. 75, No. 26) requesting comments on the Finding of No Significant Impact and draft Environmental Assessment on the *Process for Requesting a Variance From Vegetation Standards for Levees and Floodwall*. The comment period closed on April 25, 2010 (which was an extension from the original date of March 11, 2010). USACE is currently in the process of responding to comments and making a decision on the NEPA document.

O4

Henningsen, Sarah

From: Holland, Elizabeth G SPK [Elizabeth.G.Holland@usace.army.mil]
Sent: Wednesday, August 18, 2010 6:44 AM
To: Henningsen, Sarah; Dunn, Francine
Subject: FW: Phase 4b Draft EIR/EIS Comments
Attachments: GHCA NLIP Phase 4b NOP Comments.pdf

NOP comment attached.

Elizabeth Holland
U.S. Army Corps of Engineers
Senior Environmental Manager
(916) 557-6763 Cell (916) 524-8239
e-Mail Elizabeth.g.holland@usace.army.mil

-----Original Message-----
From: Gibson Howell [mailto:gib@mail.com]
Sent: Tuesday, August 17, 2010 6:22 PM
To: bassettj@saccounty.net; Holland, Elizabeth G SPK
Cc: Barbara Gualco; Buer. Stein (MSA); David Ingram
Subject: RE: Phase 4b Draft EIR/EIS Comments

Liz and John,

Could we please include our GHCA comments to the Phase 4b "NOP" to the Draft Phase 4b comments? As far as we can tell nothing has changed, so our comments remain the same. The only thing we would like to add is that we are very encouraged the USACE has granted the "Vegetation Variance" for the NLIP and that the USACE will abide by the "Settlement Agreements" between SAFCA and GHCA.

As unpaid volunteers for our community it is very difficult to decipher the 1000's of pages of EIR/EIS's that have been generated year after year by very well paid consultants. Trying to do this with hundreds of individually downloaded files that are not 'hyperlinked' makes this even more onerous. The paper documents are the only reasonable way to compare any changes between Phase 1, Phase 2, Phase 2 (supplemental), Phase 3, Phase 4a, and Phase 4b (each document more than 1000 pages long, not including appendixes).

O4-1

Both the USACE and SAFCA websites only offer the "Draft Phase 4b" document in 17 multiple megabyte files that are not easily cross-referencable or 'hyper-linked'. In previous EIR/EIS's the entire document could be downloaded and seen as 'one entire document'. Trying to understand the scope and impact on our community is all but impossible with this segmented approach.

We only obtained a 'paper copy' of the Draft Phase 4b document on Friday the 13th, the weekend before the deadline. It took many calls, but thanks to SAFCA, they loaned us the only copy they had.

We respectfully request you incorporate the GHCA Phase 4b "NOP" comments to the "Draft Phase 4b EIR/EIS" comments.

Thank You,

1

Gibson Howell
President, Garden Highway Community Association

-----Original Message-----
From: Holland, Elizabeth G SPK
[mailto:Elizabeth.G.Holland@usace.army.mil]
Sent: Monday, August 16, 2010 2:13 PM
To: gib@mail.com
Subject: RE: Phase 4b Draft EIR/EIS Comments

Gib - I was trying to call you but got tied up in other phone calls and meetings this morning.

We are not providing extensions on this Phase as we must get the responses to comments completed and out to meet a deadline for congressional authorization. Please provide your comments to us today as we are now working through the responses. Sorry but we have to meet these deadlines to get authorization and funding this year.

I am not attending the meeting today - that is our levee safety section that deals with encroachments.

Elizabeth Holland
U.S. Army Corps of Engineers
Senior Environmental Manager
(916) 557-6763 Cell (916) 524-8239
e-Mail Elizabeth.g.holland@usace.army.mil

-----Original Message-----
From: Gibson Howell [mailto:gib@mail.com]
Sent: Monday, August 16, 2010 12:56 PM
To: Holland, Elizabeth G SPK
Subject: Phase 4b Draft EIR/EIS Comments

Liz,

Hello and hope all is well!

The GHCA was trying to generate our comments on Phase 4b using the website documents, but there are so many different files and they are so large it was proving to be near impossible. We just obtained a paper copy of the 4b Draft EIR/EIS last Friday and have been working on the GHCA comments this weekend. Can we please get an extension to file comments until either tomorrow (17th) or Wednesday (18th)? Any extension would be greatly appreciated.

Thank You,

Gibson Howell
GHCA

p.s. Will we be seeing you at the GHCA/SAFCA/USACE/CVFPB/RD1000 meeting today?

2

Garden Highway Community Association
2701 Del Paso Road, #130-231
Sacramento, CA 95835

December 4, 2009

John Bassett, Director of Engineering
SAFCA
1007 7th Street, 7th Floor
Sacramento, CA 95814

AND

Elizabeth Holland, Planning Division
U.S. Army Corps of Engineers
1325 J Street, Room 1480
Sacramento, CA 95814

RE: Comments on Phase 4b "Notice of Preparation"

SAFCA and US Army Corps of Engineers:

The Garden Highway Community Association (GHCA) is an incorporated community association whose membership includes nearly all waterside and landside property owners along the Garden Highway in the area addressed in SAFCA's Natomas Levee Improvement Program (NLIP). The GHCA supports increased flood protection for the Natomas Basin, as long as it is done in a fiscally responsible, environmentally conscious, and scientifically sound manner. At the same time, as most GHCA members live on or next to the NLIP, they have an enormons interest and concern in how this project is implemented.

Below is a list of comments and concerns regarding the Phase 4b Notice of Preparation.

1. Failure to Adequately Consider Alternative Designs

SAFCA and the USACE have failed to conduct a legitimate, unbiased study to determine the most economically and environmentally sound project design to bring the Natomas Basin up to tbe USACE 100 year flood protection standard. SAFCA and the USACE have summarily dismissed feasible alternatives that would lead to region-wide solutious to the flooding potential in the Natomas Basin and surrounding communities. They have also failed to make a rationale, "good faith" effort at minimizing the height and footprint of the adjacent levee system, especially in light of the lower and inferior levee systems both upstream and adjacent to the NLIP. Therefore, the project is not in compliance of CEQA and NEPA requirements. O4-2

Pursuant to the applicable environmeutal laws, the agencies responsible for this Project must rigorously explore and objectively evaluate all reasonable alternatives and must devote substantial consideration to each alternative consideration.

Notably, during a recent SAFCA Board meeting which discussed the Project, it was repeated several times that the levee improvement design is a "work in progress" and that certification of ongoing EIS phases was a "worst case scenario" for the environment and property rights. Unfortunately, current environment destruction adjacent to Garden Highway does not correlate with these "work in progress" and "worst case scenario" portrayals. Rather, SAFCA and its contractors are in a race to remove highly sensitive habitat within the ENTIRE project footprint, despite the fact that alternative, less obtrusive levee improvement designs are gaining momentum and the fact that the Project is facing insurmountable fiscal problems.

The GHCA strongly encourages SAFCA and the USACE to look outside the Project's predestined box and not "clear a constrnction path" through sensitive habitats and rich farmland based upon "worst case" design scenarios. There are obviously countless alternative designs that would accomplish the flood protection our region needs at a fraction of the monetary, environmental and property-loss cost. For example, simply narrowing the footprint of the "seepage berms" would resnlt in mammoth savings in all three of these areas. These berms, designed to be 500 feet wide in some areas, are unprecedeuted in our region and seem highly unwarranted when compared to the existing 10-20 foot berms that previously handled several 100-year-floods (without the cut-off walls that will be added as a part of this project). More telling, as evidenced by design concessions to certain property owuers, SAFCA and the USACE have shown by their own actions that the footprint of the seepage berms can be substantially narrowed without losing the flood protection it seeks. O4-2 (Con't.)

CEQA also requires a realistic analysis of the existing physical environmental conditions affecting the Project. Several court decisions have determined that the impacts of a proposed project must be measured against the "real conditions on the ground." Save Our Peninsula Committee v. Monterey County Board of Supervisors (2001) 87 Cal.App.4th 99, 121. "An EIR must focus on impacts to the existing environment, not hypothetical sitnations." ibid. In deterunining whether a project's impacts may significantly affect the existing environment, there must be a "baseline" set of environmental conditions to use as a comparison to the anticipated project impacts. As the Court of Appeal has explained, "it is only against this baseline than any siguificant environmental effects can be determined." County of Arnador v. El Dorado County Water Agency (1999) 76 Cal.App.4th 99, 952. O4-3

Despite these requirements, the plans for this Project fail to describe the existing physical environmental conditions in order to determine the Project's significant adverse impacts on the existing environment. Conversely, the entire NLIP design relies upon a computer simulation that describes a hypothetical physical conditiou, but does not describe the actual physical couditions on the grouud, including the cnrrent condition of the west side levees along the Sacramento River and the north side levee along the Natomas Cross Canal. This comparison would answer the question of "levee parity" and whether any spots along the river side of the east levee improvements or west side of the Sacramento River in Yolo County, or north side of the Natomas Cross Canal in Sutter County, would be more vulnerable to flooding.

In other words, if the east side levee along the Sacramento River has sufficient freeboard to ensure safe containment of the "200-year" design water surface, then these improved levees will have a significant adverse effect on the existing lower levee, properties, and structures along the west side of the Sacramento River as well as the homes and residents along Garden Highway on the river side of the improved east side levees. O4-3 (Con't.)

The failure to evaluate the impact of a Project on the existing physical environmental conditions frustrates "the central function of the EIR, to inform decision makers about the impacts of the proposed project on the existing environment." Save Our Peninsula Committee, supra, 87 Cal.App.4th at p. 127.

The Project's plans further fail to consider the impacts of monnting environmental legislation and biological opinions which will significantly impact alternative flood protection plans, summarily dismissed by SAFCA as "impossible" or "inconceivable." One such edict recently issued by the The National Marine Fisheries Service unveiled a coruplex set of rules, a "biological opinion", which will likely have enormous impacts on local flood protection practices with the goal of increasing the populations of winter and spring-run salmon, Central Valley steelhead and green sturgeon. According to Kate Poole, attorney at the Natural Resources Defense Council, "There's no question any more about the fact that the Bay-Delta ecosystem is in dire need of significant changes and fixes. This is one big step to do that." O4-4

The new federal rules reqnire that reclamation districts find a way to flood the Yolo Bypass more often to improve salmon habitat, negating SAFCA's argument that the Yolo Bypass could not be used to divert more water from the Sacramento River than curreut rules permit. Moreover, SAFCA's concern that water diversion to the Yolo Bypass would be too costly to local water and flood agencies apparently did not negate the decision on the new rules. The ruling governs water operatious of the California Department of Water Resources, who will share the cost of the new orders. Clearly, flooding the Yolo Bypass "more frequently" will require a lowering of the Sacramento River weirs – a proposal made by the GHCA during 2007 as a more effective, long-term solution in lieu of an eternal levee battle in the narrow channels of the Sacramento River.

2. Failure to Adequately Consider and Protect Wildlife

The United States Environmental Protection Agency has previously commented on the NLIP, noting its continued concern over the temporary and permanent effects the Project is expected to have on the waters of the United States and recommended the continued "close consultation and collaboration" with the U. S. Fish and Wildlife Agency, California Department of Fish and Game and The Natomas Basin Conservancy to "ensure effects on woodlands, threatened and sensitive species habitat and waters of the US are avoided and minimized." Overall, this Agency has previously classified prior EIS drafts associated with the NLIP as "Insufficient Information (EC-2)". O4-5

The California Department of Fish and Game "DFG" has also expressed serious concern regarding the environmental impacts of the NLIP: O4-6

- The DFG believes pertinent mitigation measures are potentially unenforceable and may not bring the impacts to fisheries and aqnatic resonrces to below a level that is significant.

- The DFG has found transplantation of herbaceous plants is typically unsuccessful and should be considered experimental. Mitigation measures for any potentially unavoidable impacts to special-status plants should inclnde additional measures to increase the chances of survival for the population in question. Mitigation sites should be permanently protected and managed in perpetuity.

- The DFG is concerned with potential impacts to raptor nesting behavior not currently addressed in the DEIR, especially with regard to 24/7 construction and an estimated 900-1000 haul trips per day to deliver fill material. The DFG "believes that each of these activities could potentially result in significant impacts to nesting raptors including nest abandonment, starvation of young, and/or reduced health and vigor of eggs or nestlings that could result in death."

- In their current form, the DFG opines that the environmental documents do not explore the potential impacts of uighttiue construction activities on nesting raptors. Moreover, construction at night poses additional complications for the effectiveness of biological monitors in ensuring that appropriate buffer zones are in place around active nests and that birds do not abandon their nests.

- The DFG has noted that prior DEIRS do not provide a discussion of potential impacts to the Northern Harrier, a ground nesting raptor and does not consider avoidance or mitigation measures.

O4-6 (Con't.)

The GHCA further notes the NLIP purports to mitigate the loss of woodland habitat by the promise to create three acres of canopied woodlands for every one acre destroyed. This mitigation goal is fatally flawed in that there is no discussion, explanation and/or plan to address the environmental tragedy that will result from the 50 to 100 year period required for the "new" woodland habitat to be developed – assuming the planued mitigation goal is even reached.

O4-7

Despite the failure to mitigate the significant adverse impacts resulting from the destruction of woodland habitat, and the lack of necessary funding to effect the planned mitigation related thereto, SAFCA and its contractors are currently proceeding with the destruction of woodland habitat and the clear-cutting of heritage oaks and other trees.

Further, the NLIP also proposes to utilize lands purchased by the Natomas Basin Conservancy ("Conservancy") as borrow areas. These borrow areas will provide the base material for the landside levee improvements on the south side levee along the Natomas Cross Canal and the east side levee along the Sacramento River. Despite SAFCA's proposed use of these lands, the Conservancy acquired these properties to offset urban development's significant adverse impacts on protected wildlife species within the Natomas Basin. The Conservancy acquires and manages these properties consistent with the Natomas Basin Habitat Conservation Plan. The GHCA believes there still is no agreement between the Conservancy and SAFCA on the nse of Conservancy lands and how these lands will carry out their intended conservation purpose after the soil necessary for the construction of the levee improvements is removed. Thus, any claimed mitigation for the loss and disturbance of Conservancy land is impermissibly deferred to some future time after Project approval and implementation.

O4-8

Despite the fact that the Project's agencies have been afforded several bites at the apple in an attempt to come up with acceptable environmental mitigation, it continues to gloss over the devastating impact the

O4-9

Project will have on the sensitive habitat of protected species, including raptors, snakes and flora (see comments of the California Department of Fish and Game summarized above). O4-9 (Con't.)

3. Failure to Study Simultaneous Multi-Phase Construction

SAFCA, and now the USACE, are currently postulating that multiple phases of the NLIP could be constructed simultaneously. This directly contravenes the construction impact and mitigation advanced in the prior environmental documents and creates new issues not previously studied or addressed. For example, there would be compounded effects of CO2 emissions, noise, dust, vibration, and disruption to wildlife that has not been analyzed. Compared to the original Phase 3 EIR, for example, emissions in just Sacramento County would raise from ROG 75 lb/day to 287 lb/day, NOX 413 lb/day to 1,476 lb/day, and PM10 971 lb/day to 3,847 lb/day if these phases are to be done simultaneously. Moreover, on page ES-16, "Air Quality," the Phase 3 DEIR references the "nonattainment status of the Feather River Air Quality Management District aud the Sacramento Metropolitan Air Quality Management District for ozone and PM10." The GHCA contends the cumulative effect of simultaneous construction during multiple construction phases has not been sufficiently analyzed by the responsible agencies. O4-10

Fnrthermore, simultaneous construction could involve three or more phases of simultaneous, 24/7 construction. Given the grave impacts of just one 24/7 worksite, the GHCA believes SAFCA and the USACE certainly cannot justify multiple worksites operating in this manner. This impact would make the simultaneous Phases (2, 3, 4a, 4b) unreasonably harmful to wildlife, the environment, and Garden Highway residents. O4-11

4. Failure to Adequately Address Encroachments/Levee Prism

At page 7 of the NOP, Encroachment Management, the following proposed action appears: "Remove encroachments as required to meet the criteria of the USACE, CVFPB, and FEMA." Conversely, the Sacramento Division of USACE and SAFCA have repeatedly advised members of the GHCA that the "adjacent" levee adopted by the NLIP "should" remove the waterside trees, landscaping, feucing, and other vegetation and improvements from the "levee prism." In other words, these agencies believe implementation of the NLIP would spare these items from removal under even the most aggressive encroachment standards. Thus, the GHCA is concerned with the apparent unchanged position regarding encroachments as described in the current NOP. O4-12

Of utmost importance to property owners along Phase 4b, the USACE does not mention how they will treat vegetation and encroachments on either side of the levee where they decide not to build an "adjacent setback levee" and thus achieve a new levee prism. If a "one size fits all" approach of denuding levees is applied, it will completely contradict the long established local USACE procedures of planting trees to stabilize the levees, protect endangered wildlife and reduced wind-driven waves. We have also been told that many members of the scientific community believe trees and other vegetation improves the strength of a levee, especially in areas of the country that do not have to contend with hurricane strength winds. What are USACE's current views on this?

It also does not appear the USACE has identified what (if any) waterside encroachments will be subject to removal within the NLIP and what legal processes will be iuvolved in condemnation of associated property rights. These questions are of utmost importance to the GHCA aud its members. SAFCA has O4-13

also advised the GHCA it has maps of approximately 30,000 encroachments and all associated easements on the waterside of the levee. SAFCA recently revealed this database to the public, but there is no mention of the encroachments and/or vegetation that the involved flood agencies consider to be unacceptable. Research has revealed some vague, inadequately mapped easements dating back to the early 1900's which appear to show little or no support for any planned encroachment removal.

SAFCA has also stated "on the record" it is willing to help facilitate "post-facto" permits for encroachments that do not endanger the levee. Would the USACE also be willing to endorse this procedure? Unfortunately, because the property owners have no information as to what items SAFCA and the USACE feel are acceptable encroachments, Garden Highway properties are being left in the dark. O4-13 (Con't.)

Overall, the members of the GHCA are very concerned about which "encroachments" might require removal and with the various easements SAFCA and/or its partners will attempt to claim. SAFCA has promised to work with each property owner to discuss and resolve issues regarding alleged encroachments, but thus far has taken no such action. Does the USACE plan on doing the same for Phase 4b? Currently, construction Phase 2 of the Project is underway, yet the GHCA is aware of no affected property owners having been contacted regarding encroachment or easement plans. This not only impacts existing improvements, but future improvements. The uncertainty also creates resale problems and negatively affects property values.

5. <u>Failure to Justify 24/7 Construction</u>

As accurately noted by the California Department of Fish and Game, previous EIRS/NEPA documents do not adequately address the potential impacts to raptor nesting especially with regard to 24/7 construction and an estimated 900-1000 haul trips per day to deliver fill material. The DFG "believes that each of these activities could potentially result in significant impacts to nesting raptors including nest abandonment, starvation of young, and/or reduced health and vigor of eggs or nestlings that could result in death." Moreover, the NOP does not explore the potential impacts of nighttime construction activities on nesting raptors. Moreover, construction at night poses additional complications for the effectiveness of biological monitors in ensuring that appropriate buffer zones are in place around active nests and that birds do not abandon their nests. O4-14

The NOP contends Cutoff Walls, wells and perhaps additional aspects of the Project require a 24/7 construction schedule. The residents along Garden Highway and the sensitive environment that exists in the riparian, river habitat adjacent thereto cannot be subjected to 24/7 construction simply because SAFCA or the USACE is running behind schedule on what might be perceived as an overly ambitious project. It is anticipated 24/7 construction during subsequent phases of the NLIP would have an exponentially adverse impact on property owners spanning many miles in all directions. Moreover, the use of trucks to get to and from the actual "construction" sites will expand the location of the impact far beyond the limited construction sites addressed by SAFCA and this NOP. O4-15

The GHCA also feels the NOP ignores both city and county (Sacramento and Sutter) noise ordinances. As such, the GHCA seeks an explanation as how the USACE plans to deal with violations of local noise ordinances.

6. Damage to Businesses

The NOP fails to address the impact of the project on the businesses that exist along and upon Garden Highway which thrive only because individuals seek the tranquility and peace of a rural, river atmosphere that is easily accessible, peaceful and enjoyable. O4-16

7. Hydrology

The hydrology reports postulated by SAFCA and its engineers in previous Phases conclude the improved levee system contemplated by the NLIP will not increase the flood risk to the waterside property owners within the NLIP. These reports are explicitly based upon the assumption that other surrounding Reclamation Districts will NEVER improve their levees. This assumption is improper, flawed and not in concert with the current push by adjacent Districts to fortify their levees. The threat of increased flood risk cannot be summarily dismissed and a funding mechanism must be included to deal with the financial impact of this impact. O4-17

Equally troubling, SAFCA admits its "design event analysis is not the same as the analysis procedure used by USACE." As the primary advertised goal of the NLIP is to obtain USACE certification, why is SAFCA deviating from the USACE event analysis? The previons SAFCA EIRS/NEPA documents further note that the USACE analysis "includes consideration of system uncertainties." Does this mean the SAFCA analysis does not account for "system uncertainties" such as the other side of the levee overtopping or failing?

Waterside residents adjaceut to the NLIP are very concerned about increased flooding of their homes due to the levee being raised as much as three feet. SAFCA has systematically advised the GHCA not to worry, as levees will overtop or fail elsewhere. Unfortunately, it appears SAFCA's engineering analysis does not account for this or assumes the other levees will be raised and reinforced. If both sides of the levee are eventually raised, then the water capacity of the river will be increased. This would allow the upstream reservoirs to release more water during a flood event and subject residents to a much greater chance of flooding. The GHCA has been advised there is debate amongst USACE engineers as to which provides the better hydrological model, "perfect world" where you cannot take into account deficiencies in other parts of the levee, or "real world" where you can. What is USACE's view on this? O4-18

8. Property Values

The NOP, consistent with all prior SAFCA action related to the NLIP, wholly fails to address the impact of the Project on property values in the affected areas and has uo funding mechanism in place to deal with the destruction of property values in and around the project that will ripen into eminent domain and inverse condemnatiou lawsnits. This exposure includes, but is not limited to, irreparable damage to property values which began when this project was first publically announced (at a time when real estate values were significantly higher than today), and will continue indefinitely into the future. The Project has stalled and prevented sales, land improvements and retirement plans. This trend will increase exponentially when active construction begins. Due the lack of a funding mechanism, the taxpayers will be left to shoulder yet another wave of unanticipated and undisclosed cost overruns. O4-19

9. Failure to Consider Environmental Impact of Development

While SAFCA publicly justifies the massive NLIP as a necessary cure for the imminent, Hurricane Katrina type flooding that could occur in the Natomas Basin in the event of a 100-year-flood, in reality SAFCA is simply trying to lift the building moratorium affecting the builders who have imprudently chosen to pave over rice fields in a "basin". These are the same developers who have spent hundreds of thousands of dollars supporting our local officials and lobbying for the right to resume rapid development within the floodplain. Without more "urban sprawl", these developers and the County of Sacramento are unable to tap into the "quick cash" that has been created from destroying our evaporating farm lands.

The GHCA contends that rather than encouraging additional urban sprawl, local agencies should be focusing on creating more housing in urban areas, i.e. building up, not out. Moreover, the failure of local agencies to curb their appetite for our farmlands will only increase traffic congestion, gas and carbon emissions and regional pollution at a time when universal fears and concerns over global warming, water scarcity and energy depletion is gaining momentum. O4-20

The GHCA contends the urban sprawl into the Natomas Basin, quite ironically, increases the flood potential for Natomas and surrounding communities. Vast farmland that previously collected and stored water during heavy storms, before slowly releasing it through natural underground seepage, has now been paved and improved with storm drains. Accordingly, thousands of acre feet of rainwater that previously rested safely within area farmland is now immediately collected and pumped into the Sacramento River. Historical flow charts from the Sacramento River during times of heavy storms confirm the negative impact Natomas Basin development is having on regional flood protection.

10. Failure of the Notice of Preparation to abide by the Settlement Agreement between SAFCA and the GHCA.

The "Notice of Preparation" in no way mentions the previously agreed to settlement agreement between SAFCA and the GHCA. While the GHCA understands the USACE is not SAFCA, as the assignee of certain aspects of the Project, the USACE is legally required to comply with all legally enforceable agreements entered into by SAFCA, the assignor. To hold otherwise would render the settlement agreement between SAFCA and the GHCA illusory. O4-21

11. Rights of Entry/Eminent Domain.

It has recently come to the attention of the GHCA that SAFCA has pursued Right of Entry Agreements from Garden Highway property owners without advising those property owners of any authority for the desired access and without advising owners of their associated rights. By withholding this critical information, SAFCA has in essence coerced many Garden Highway residents into making uninformed decisions under the bold threat of imminent litigation should they resist. O4-22

In response to a recent complaint by the GHCA, counsel for SAFCA has confessed that entry onto the private property of Garden Highway residents is being sought pursuant to the Eminent Domain laws of the State of California. However, pursuant to California Code of Civil Procedure Section 1245.010, SAFCA and/or its contractors must be "**authorized to acquire property for a particular use**" **before**

they may enter private property in order to "take photographs, studies, surveys, examinations, tests, soundings, borings, samplings, or appraisals or to engage in similar activities reasonably related to acquisition or use of the property for that use." Apparently, SAFCA has repeatedly misinformed property owners that SAFCA possesses this authority when, in reality, no such authority had ever been obtained.

Based upon the foregoing, the GHCA hereby submits that all involved flood agencies seeking permission to enter private property must notify the affected property owners **of the legal authority upon which the agency relies, along with a full description of the associated rights afforded the property owners**.

O4-22 (Con't.)

Lastly, the GHCA hereby objects to the "taking" of private lands pursuant to the Eminent Domain laws under the guise that these lands are necessary for the development of the Project, when in fact the involved agency actually and surreptitiously plans to convey the condemned land to another private party, i.e. the airport.

12. Natomas Levee Recreational Trail Project.

The GHCA is pleased a recreational trail is finally being included as part of the NLIP. Unfortunately there is no funding mechanism in place other than waiting on the Department of Transportation, which has admitted could take years. As SAFCA and the USACE are already spending millions of dollars protectiug cultural resources of Native American Indians, the GHCA believes it would be practical to allocate a nominal sum of money to enhance the resources of the current living residents in the Natomas Basin. The simple modification of the design of the new levee crown from a gravel road to paved road would bear a meager cost and would streamline the bike path for the DOT.

O4-23

13. Incorporation.

The GHCA also hereby incorporates by reference all comments asserted by Garden Highway property owners and/or their representatives in response to this portion of the NLIP.

In sum, while the GHCA appreciates the daunting task this Project presents to the involved flood agencies, its members strongly feel that a more rational design approach would substantially reduce these challenges, save the taxpayers hundreds of millions of dollars, preserve sensitive habitat and rich farmland and ultimately expedite recertification of the Natomas levees. Moreover, the GHCA implores the involved flood agencies to continue to acknowledge and adhere to the rights of all Garden Highway residents, businesses and property owners.

O4-24

Respectfully submitted,

GARDEN HIGHWAY COMMUNITY ASSOCIATION

Letter	Garden Highway Community Association
O4	Gibson Howell, President
Response	August 17, 2010

O4-1 USACE and SAFCA will treat Garden Highway Community Association's (GHCA's) comment letter on the Phase 4b notice of preparation (NOP) as a comment letter on the DEIS/DEIR. See responses to comments O4-2 through O4-24.

USACE and SAFCA have prepared the NLIP environmental documents, including the DEIS/DEIR, in accordance with NEPA and CEQA, in particular the tiering provisions (see Section 1.5, "Environmental Regulatory Framework and Relationship of this EIS/EIR to Other Documents," of the DEIS/DEIR). USACE and SAFCA have strived to ensure that the NLIP environmental documents are understandable to decision makers and to the public, while still containing the level of detail necessary for a robust and technically adequate analysis aimed to withstand legal scrutiny. To help facilitate clarity, the NLIP environmental documents, including the DEIS/DEIR, include numerous plates, tables, and formatting considerations to highlight discussions pertaining to project alternatives, environmental impacts, and proposed mitigation measures.

The files on USACE's and SAFCA's Web sites are purposefully numerous to keep the files to manageable and easily downloadable sizes (less than 5 MB). It is not clear how the commenter proposes to hyperlink or cross-reference the files; however, the Table of Contents should serve as a guide the document as well as Chapter 10, "Index," of the DEIS/DEIR.

Regarding the late timing of the commenter receiving a paper copy of the DEIS/DEIR, a notice announcing the availability of the document was mailed to affected residents (including the commenter) on June 29–30, 2010 and printed in the *Sacramento Bee* on July 2, 2010. The notice indicated the electronic availability of the DEIS/DEIR on USACE's and SAFCA's Web sites, as well as where paper copies could be reviewed (at USACE's and SAFCA's office and at two local libraries). Additionally, CD or paper copies could have been requested from either USACE or SAFCA; several of these requests were received and materials were typically mailed within 48 hours of the request. The high cost of printing and the project's extensive mailing list have rendered paper copies of the NLIP documents mostly infeasible.

O4-2 Under NEPA and CEQA, the Federal and state lead agencies must consider a reasonable range of alternatives that would achieve most of the project objectives (project purpose, under NEPA) and reduce some of the environmental impacts of the project. The alternatives must also include a no-project (no action, under NEPA) alternative. Lead agencies are not required to consider every conceivable alternative, but are instead required to present a range of reasonable alternatives to foster informed decision-making (see CCR, Title 14, Section 15126.6 and 40 Code of Federal Regulations [CFR] 1502.14).

Section 2.1.5, "Alternatives Considered, but Eliminated from Further Consideration," of the DEIS/DEIS describes 11 alternatives that were considered but eliminated from further consideration in previously certified and approved NLIP environmental documents (and one additional alternative that was considered and eliminated by USACE as part of the Natomas PACR). This discussion illustrates the range of possible alternatives considered by USACE and SAFCA in relation to the NLIP as a whole. The DEIS/DEIR carries forward three alternatives to the Phase 4b Project for detailed analysis: the No-Action Alternative, the Adjacent Levee Alternative (Proposed Action), and the Fix-in-Place Alternative. The differences among these

alternatives are described in Table ES-1of the DEIS/DEIR, and the differences in associated environmental effects of the alternatives are described in Tables 2-28 and 2-29 of the DEIS/DEIR. Because the Phase 4b Project alternatives vary in the nature and severity of their potential environmental effects, USACE and SAFCA have presented a reasonable range of alternatives from which to select the Proposed Action.

The DEIS/DEIR attempts to describe the full range of potential adverse environmental effects, including and up to a worst-case scenario. As such, a range of 100–300 feet is provided for the likely width of the proposed seepage berms along the Sacramento River east levee Reach A:16–20 (see Table 2-2 of the DEIS/DEIR). As project design progresses, it is anticipated that the seepage berms may be more narrow in some locations depending, in part, on design considerations and property issues; however, the DEIS/DEIR takes a conservative approach in analyzing potential impacts and thus presents a worst-case scenario.

O4-3 Chapter 3, "Affected Environment," of the DEIS/DEIR provides detailed information related to the existing physical environment of the Phase 4b Project area. As discussed in Section 4.1.2.2, "Impact Mechanisms," of the DEIS/DEIR, the CEQA environmental analysis compares the action alternative and no-project alternative (No-Action Alternative) to the existing conditions at the time of release of the NOP (i.e., baseline for the purposes of CEQA), which was November 5, 2009 for the Phase 4b Project. NEPA considers the No-Action Alterative (i.e., expected future conditions without the project) to be the baseline to which the action alternatives are compared, and the No-Action Alterative is compared to existing conditions (including the Phase 2 Project). Each issue area discussed in Chapter 4, "Environmental Consequences and Mitigation Measures," of the DEIS/DEIR includes the section, "Methodology and Thresholds of Significance," where the impact mechanisms specific to the respective issue areas are discussed.

Section 4.5.1.1, "Methodology," of the DEIS/DEIR provides an overview of surface hydrology analysis, and states, specific to the NLIP analysis:

> The surface hydrology analysis evaluates the potential flood-related impacts of the action alternatives on water surface elevations in the stream and river channels in the project area and in the larger watershed within which the project is situated. Specifically, a UNET hydraulic computer model was used to compare existing conditions in the waterways surrounding the Natomas Basin and in the larger SRFCP both with and without the Adjacent Levee Alternative (Proposed Action) (with-project and without-project [i.e., No-Action Alternative], respectively) assuming no levee failure and other reasonably foreseeable improvements to Folsom Dam and the urban levees outside the Natomas Basin.

Following this discussion, Table 4.5-1 of the DEIS/DEIR summarizes the conditions and assumptions associated with each of the model runs. The modeling output generated by these conditions under the targeted flood scenarios is displayed in Tables 4.5-2 through 4.5-8 of the DEIS/DEIR. More detailed hydraulic modeling results are included in Appendix C of the DEIS/DEIR.

The use of a hydraulic computer model of the Sacramento River Flood Control Project (SRFCP) was reviewed and approved for use for this project in 2006 by the USACE Sacramento District to compare existing conditions in the waterways surrounding the Natomas Basin and in the larger SRFCP with and without the NLIP improvements and the other improvements comprising the 200-year flood protection program for the Sacramento area. See Appendix C of the DEIS/DEIR for more information regarding the hydrologic modeling approach.

O4-4 As discussed in Section 2.1.5, "Alternatives Considered, but Eliminated from Further Consideration," of the DEIS/DEIR, the Yolo Bypass Improvements alternative was eliminated from consideration because:

> (1) it would be too costly for SAFCA to implement; (2) levee height increases and substantial seepage and slope stability remediation would still be required for the Natomas perimeter levee system, adding to costs; (3) these improvements lie outside of SAFCA's jurisdiction and would require Federal, State, and local cooperation and funding; and (4) the project objectives of restoring 100-year (0.01 AEP) flood protection to the Natomas Basin could not be achieved as quickly as possible.

Implementation of the Phase 4b Project is contingent on issuance of numerous permits, authorizations, and approvals, including biological opinions from USFWS and NMFS; these agencies will consider applicable environmental legislation and biological opinions before issuance of permits. The project cannot proceed without the required permits.

O4-5 EPA's comment letter on the Phase 3 DEIS/DEIR and USACE's and SAFCA's responses in the Phase 3 FEIR are included as **Appendix J3** to this FEIS/FEIR. Comments on previous NLIP environmental documents, as well as any resulting project/document revisions made in response to those comments, were incorporated into subsequent NLIP environmental documents, including the Phase 4b DEIS/DEIR, as applicable. USACE and SAFCA have and will continue to work closely with EPA, USFWS, NMFS, DFG, and The Natomas Basin Conservancy (TNBC).

O4-6 DFG's comment letter on the Phase 3 DEIS/DEIR and USACE's and SAFCA's responses in the Phase 3 FEIR are included as **Appendix J4** to this FEIS/FEIR. Comments on previous NLIP environmental documents, as well as any resulting project/document revisions made in response to those comments, were incorporated into subsequent NLIP environmental documents, including the Phase 4b DEIS/DEIR, as applicable. See also response to comment O4-14.

O4-7 Impact 4.7-a, "Loss of Landside and Waterside Woodland and Shaded Riverine Aquatic Habitats" of the DEIS/DEIR addresses short-term (10–15 years) and long-term impacts due to loss of woodland habitat. SAFCA disagrees with the commenter's statement that it would take 50–100 years for new woodland habitat development. Based upon the expert professional judgment of SAFCA's biological consultants, habitat function would be expected to be restored within approximately 10–15 years, as described in Impact 4.7-a, "Loss of Landside and Waterside Woodland and Shaded Riverine Aquatic Habitats." Regardless of the length of time required to restore woodland habitat that would provide existing ecological function, the DEIS/DEIR concludes that short-term (10–15 years) impacts to woodland habitats would be a significant and unavoidable impact for 10–15 years before reaching a less-than-significant level because replacement plantings would require a minimum of 10–15 years before providing important habitat components such as shade and structure. SAFCA's previous projects involving woodland plantings and transplants within the project vicinity have been successful. Of 50 trees planted in the Rio Linda Creek Conservation Area, 94% have survived; similarly, of 14 oaks transplanted by SAFCA in 2004 as part of the Hagedorn Grove project, 12 survived (Buck, pers. comm., 2009).

At the time of submission of this comment letter on the Phase 4b Project (August 17, 2010), woodland plantings and transplants have not yet been completed; therefore, it is not yet possible to report on the success rate for these tree plantings and transplants for the Phase 3 and 4a Projects. However, pursuant to the woodland planting and maintenance contract, SAFCA's contractor for tree planting is required to attain performance standards (as approved by USACE, USFWS, and DFG through the Phase 2 Mitigation Monitoring Plan [MMP] approval process) during the initial maintenance period, which is the 3-year-period immediately following

acceptance of the installation portion of the woodland plantings by SAFCA. If the performance standards are not met, the project will not be accepted until the identified remedial actions are implemented by the contractor as directed by SAFCA. These remedial measures could include additional/replacement weed control or additional planting, using adaptive management to identify those plants best suited to the site. Performance standards included in the construction contract are listed below.

Performance Standards for Planting Survival During the Maintenance Period		
Year	**Survival of Container Plants by Area (%)**	**Survival of Native Seed by Area (%)**
1	95	50
2	95	50
3	90	50
Assessment Timing	Late Summer	Late Summer
Source: SAFCA 2009		

SAFCA will conduct field assessments of the plant survivorship once per year, at the timing noted in the above table. Healthy plants are considered to be robust, in good form, free of disease and insect infestation, and exhibit vigorous growth (foliage and wood); they must not be heat- or water-stressed (SAFCA 2009).

In addition to the 3-year initial maintenance period, the MMP requires that SAFCA monitor and maintain woodland plantings for an additional 5 years (for a total of 8 years). Monitoring and maintenance plans discussed above are based upon the Phase 2 MMP, which was approved by USACE, USFWS, and DFG. SAFCA anticipates that these agencies would approve the same monitoring and maintenance schedules, which would be applied to the Phase 4b Project woodland planting component in the Phase 4b MMP.

The commenter does not provide specifics with regard to a lack of mitigation for removal of vegetation as part of implementation of earlier phases. Woodland plantings have occurred on parcels in Reach C:1, 2, and 4a to compensate for vegetation removal that has occurred as part of the Phase 2 and Phase 3 Projects. USACE will comply with its policy that mitigation must be constructed prior to or concurrent with project construction. The Phase 4b Project will comply with California Fish and Game Code Section 2081 requirements.

O4-8 The commenter's assertion that the NLIP will use TNBC lands for borrow material is incorrect. Table 2-22 in the DEIS/DEIR lists the proposed borrow sources for the Phase 4b Project. Additionally, Table 4.1-1 in the DEIS/DEIR lists the proposed borrow sites for the Phase 2, 3, and 4a Projects. These tables indicate that one of the primary sources of soil borrow would the Fisherman's Lake Borrow Area. TNBC owns some lands adjacent to the Fisherman's Lake Borrow Area, including managed marsh and agricultural upland (field crop). These TNBC-owned conservation lands would not be used for borrow operations. Lands that are currently used for agricultural purposes would provide borrow material, and would then be reclaimed as a mosaic of managed marsh and uplands. These sites would thus create connectivity between existing TNCB parcels adjacent to the Phase 4b Project borrow sites (see Plates 2-22d through 2-22f in the DEIS/DEIR, which shows the location of TNBC lands in relation to the proposed Phase 4b Project borrow sites). The Long-Term Management Plan (LTMP), which has been approved by the resources agencies and USACE, states that SAFCA intends to enter into management agreements with TNBC to manage the borrow/mitigation sites at Fisherman's Lake. These

agreements will not be executed until SAFCA has more specific plans and specifications for these sites.

O4-9 The DEIS/DEIR provides a list of significant and unavoidable impacts that would result from implementation of the Phase 4b Project (see Sections ES.11.2, "Significant and Unavoidable Impacts of the Action Alternatives," and 5.4, "Significant and Unavoidable Environmental Impacts," of the DEIS/DEIR) because no feasible mitigation is available to reduce the significant impacts to a less-than-significant level, or identified mitigation would minimize the impacts but would not reduce the significant impacts to a less-than-significant level. Impacts to biological resources are included on this list and are discussed in detail in Chapter 4, "Environmental Consequences and Mitigation Measures," of the DEIS/DEIR. USACE and SAFCA are obligated to secure permits from the applicable resource/regulatory agencies before project construction that could affect agency-regulated habitat. Issuance of these permits indicates that proposed mitigation and compensation are considered to be acceptable according to applicable Federal, state, and local regulations. Project construction cannot commence in areas where such permits are required. Agency documents are legally binding, enforceable terms and conditions of the various agencies including: USACE, USFWS, NMFS, DFG, TNBC, Sacramento County, the Sacramento County Airport System, the Natomas Central Mutual Water Company, and RD 1000. See also response to comment O4-6.

O4-10 As discussed on pages 4.11-2 and 4.11-3 (especially Table 4.11-1) of the DEIS/DEIR, to ensure that worst-case air quality impacts were captured for both the Adjacent Levee Alternative (Proposed Action) and the Fix-in-Place Alternative as required under NEPA and CEQA, emissions were estimated assuming that a portion of the Phase 4a Project (specifically, improvements to the Sacramento River east levee Reach A:13–15 and the Riverside Canal) is constructed in 2012, concurrent with the beginning of Phase 4b Project construction. It should be noted that emissions are estimated within the air districts that regulate them using mass emission thresholds for regional impact analysis. The Phase 4a Project components that would overlap with the Phase 4b Project (in the 2012 construction season) are located within Sacramento County. See also response to comment F3-2.

O4-11 As stated in the DEIS/DEIR, residents in or near the affected cutoff wall work area would be afforded the opportunity, at the project proponent(s)'s expense, to temporarily relocate to a nearby hotel for as long as construction extends 24 hours per day, 7 days per week (24/7) within 500 feet of their residence (see Mitigation Measure 4.12-a, "Implement Noise-Reducing Construction Practices, Prepare and Implement a Noise Control Plan, and Monitor and Record Construction Noise Near Sensitive Receptors," of the DEIS/DEIR). Further, because 24/7 noise impacts are localized in nature, it is not clear how these impacts would be "compounded" by occurring in different locations at the same time or in different weeks, months, or years. Because 24/7 work would be conducted in discrete locations within the areas already identified for construction, and would only affect people locally for relatively short periods of time, there would not be any undisclosed compounding of effects that was not already analyzed in the DEIS/DEIR analysis of construction impacts. See also **Appendix J2** of this FEIS/FEIR, which includes the Phase 3 FEIR Master Response concerning 24/7 construction.

O4-12 See response to comment F3-1 regarding approval of the vegetation variance.

O4-13 See Section 2.3.4.11, "Structural Encroachments," of the DEIS/DEIR.

O4-14 See response to comment O4-6. Impact 4.7-f, "Impacts on Swainson's Hawk and Other Special Status Birds" in the DEIS/DEIR describes potential disturbance of special-status birds during project construction, which would occur during the daytime and nighttime. Mitigation Measure

Mitigation Measure 4.7-f, "Minimize Potential Impacts on Swainson's Hawk and Other Special-Status Birds Foraging and Nesting Habitat, Monitor Active Nests during Construction, Implement All Upland and Agricultural Habitat Improvements and Management Agreements to Compensate for Loss of Quantity and Quality of Foraging Habitat, Obtain Incidental Take Authorization; and Implement Mitigation Measure 4.7-a, 'Minimize Effects on Woodland Habitat, Implement all Woodland Habitat Improvements and Management Agreements, Compensate for Loss of Habitat, and Comply with Section 7 of the Federal Endangered Species Act, Section 2081 of the California Endangered Species Act, and Section 1602 of the California Fish and Game Code'" in the DEIS/DEIR would be implemented during both daytime and nighttime activities to help reduce this impact; however, the impact would remain significant and unavoidable for 10–15 years due to the short-term (10–15 years) loss of woodland habitat.

O4-15 The DEIS/DEIR describes those project components that could require 24/7 construction, and states that 24/7 construction would only occur in rural areas, not in urban areas. The noise standards and ordinances of the City of Sacramento and Sacramento and Sutter Counties are described in Section 3.12, "Noise," of the DEIS/DEIR.

As discussed in Section 2.3.3.2, "Adjacent Levee Alternative (Proposed Action)," under subheading "Sacramento River East Levee (Reach A:16–20)," of the DEIS/DEIR, cutoff wall construction in the urbanized area east of the Interstate 80 (I-80) overcrossing (within the limits of the City of Sacramento), where most residences are located, would be restricted to daytime hours. Therefore, the City of Sacramento noise ordinance would not be violated in terms of construction equipment operating near homes during the more noise-sensitive early morning and nighttime hours (i.e., during hours that are not exempted by the applicable local ordinances in the City of Sacramento).

Work in Sacramento County could occur during nighttime hours. However, Section 6.68.090 of the Sacramento County Code exempts nighttime noise activities when unavoidable conditions occur during a construction project and the nature of the project necessitates that work in process be continued until a specific phase is completed. This exemption allows work to continue after 8:00 p.m., including operation of machinery and equipment as necessary to bring the specific work in progress to completion under conditions that will not jeopardize inspection acceptance or create undue financial hardships for the contractor or owner.

As discussed in Impact 4.12-a, "Generation of Temporary and Short-Term Construction Noise," of the DEIS/DEIR, construction at sites within Sutter County, including the Pleasant Grove Creek Canal (PGCC), State Route 99 Natomas Cross Canal (NCC) (bridge remediation), Vestal Drain ditch (relocation), Brookfield borrow site (conversion to managed marsh), and Chappell Drain and Ditch, would not affect sensitive receptors, regardless of whether it occurs during nighttime hours, because no noise-sensitive land uses are within 1,000 feet of construction activities and/or because topographic features (such as a levee) would shield sensitive receptors from noise sources. Therefore, the Sutter County noise ordinance would not be violated.

See also response to comments O4-11, O4-14, and **Appendix J2** of this FEIS/FEIR, which includes the Phase 3 FEIR Master Response concerning 24/7 construction.

O4-16 Mitigation Measure 4.3-d, "Notify Residents and Businesses of Project Construction and Road Closure Schedules; and Implement Mitigation Measures 4.10-a, 'Prepare and Implement a Traffic Safety and Control Plan for Construction-Related Truck Trips,' and 4.10-c, 'Notify Emergency Service Providers about Project Construction and Maintain Emergency Access or Coordinate Detours with Providers'" in the DEIS/DEIR requires the project proponent(s) to provide business

owners with information pertaining to construction activities, complaint procedures, and construction timelines.

It should further be noted that effects analyzed under CEQA must be related to a physical change in the environment (State CEQA Guidelines CCR Section 15358[b]). Economic and social effects are not considered environmental effects under CEQA. These effects need to be considered in an EIR only if they would lead to a significant adverse effect on the physical environment.

NEPA does require consideration of economic effects (40 CFR 1508.8); however, this requirement is limited to effects that are reasonably foreseeable rather than speculative in nature (Mandelker 2007: 8-102, citing *City of Riverview v. Surface Transp. Bd.*, 398 F 3d 434 [6th Cir. 2005]). Here the commenter states that the project would have an effect on business along Garden Highway, but does not offer specific facts linking the project to a demonstrable effect on these businesses that can be clearly attributed to the project. Absent specific facts showing a clear effect on these businesses, this comment contains speculation that is beyond the required and practicable scope of analysis under NEPA.

O4-17 SAFCA's conclusion that the NLIP would not increase the flood risk to waterside property owners along Garden Highway is based on surveys that indicate that the Sacramento River east levee is currently higher than most of the Sacramento River west levee in the reach downstream of the NCC. Therefore, increasing this height differential would not alter the current balance of risks in this reach of the system. The increased height of the east levee would contribute cumulatively to an increase in flood risk to waterside property owners only if the west levee were raised to a height equal to or greater than the current height of the east levee. The protected basin on the west side of the Sacramento River is agricultural in nature; it contains very few damageable structures. As discussed in Section 3.2.2, "Environmental Setting," of the DEIS/DEIR, SAFCA recently entered into an arrangement with Yolo County, the California Department of Water Resources (DWR), the Yolo Land Trust, and the Sacramento Valley Conservancy that resulted in the recordation of agricultural conservation easements on 1,660 acres of land in this basin. Under these circumstances and in light of recently enacted revisions to the State's Planning and Subdivision laws restricting development in floodplain areas, it is highly unlikely that the Sacramento River west levee will ever be raised to a height exceeding the current height of the Sacramento River east levee.

Further, the commenter states that "these reports are explicitly based upon the assumption that other surrounding Reclamation Districts will never improve their levee." This statement is not correct. USACE and the CVFPB have set policies that grant all levee districts the opportunity to strengthen their levees. If a levee district chooses to raise a levee, then that district must demonstrate that it will not have an adverse impact. The Phase 4b Project's hydraulic impact analysis took this into consideration by assuming that other levees in the system would overtop, but not fail. If other levee districts choose to raise their levees then those districts will need to conduct a hydraulic impact analysis to demonstrate that there are not adverse impacts.

O4-18 Contrary to what the commenter states, SAFCA is not seeking certification of the levee system by USACE. SAFCA's methodology for developing a design water surface does differ from USACE's methodology; however, the method for determining hydraulic impacts is the same. The hydraulic impact analysis contained in the DEIS/DEIR evaluates hydraulics impacts based on upstream levees failing when overtopped along with the condition of allowing upstream levees to overtop without failing. Both of these conditions resulted in a conclusion that the impact was less than significant (see Section 4.5, "Hydrology and Hydraulics," in the DEIS/DEIR). Also, see response to comment O4-17.

O4-19 See response to comment O4-16 regarding NEPA and CEQA requirements to analyze economic effects.

O4-20 See response to comment F3-5.

O4-21 USACE is not legally required to comply with the Garden Highway Settlement Agreement, contrary to what the commenter states. However, USACE has agreed to implement many of its provisions, as indicated in the mitigation measures contained throughout the DEIS/DEIR.

It should be noted (and it was noted in response to GHCA's comment O1-23 on the Phase 4a FEIR and FEIS) that SAFCA is also not legally required to comply with the Garden Highway Settlement Agreement, which concerns only the Phase 2 Project, but which is being voluntarily implemented by SAFCA for the other NLIP project phases.

O4-22 This is not a comment on the DEIS/DEIR. SAFCA has been given legal authority by the Legislature "to coordinate a regional effort to finance, provide, and maintain facilities and works necessary to ensure a reasonable and prudent level of flood protection, as determined by the agency…" (California Water Code App., Section 130-20[c]), which includes entering into right of entry agreements. To the extent that property must be acquired to implement the Phase 4b Project, USACE and SAFCA would comply with all applicable legal requirements.

O4-23 As stated in Section 2.3.4.7, "Natomas Levee Class 1 Bike Trail Project," of the DEIS/DEIR, additional design and engineering work is required to determine the exact alignment of the bike trail in terms of its placement in relation to levees and roadways. Therefore, this element of the Phase 4b Project is analyzed at a program level of analysis in the DEIS/DEIR. Construction, operation, and maintenance of a recreation trail on the perimeter levee system would be funded locally, separate from the levee improvement elements of the Phase 4b Project. Site-specific environmental review will be conducted once detailed design is available.

O4-24 Comment noted. See responses to previous comments regarding environmental issues.

BUSINESSES

B1

Henningsen, Sarah

From: Greg Johnson [gjohnson@kvie.org]
Sent: Wednesday, July 14, 2010 2:33 PM
To: Holland, Elizabeth G SPK
Cc: Parker, Laurie S SPK; Henningsen, Sarah; Tibbitts, Dan P SPK; McDaniel, David P SPK
Subject: RE: NLIP Garden Highway Reach 16

Elizabeth;

Thanks, that gives me a better understanding of the purpose of the EIS/EIR which in part is to present the worst case scenarios.

Laurie has provided some detail depicting what is more likely to be actually constructed. From that information it appears the impact to our property is much more conservative and at this point does not seem to impact the tower or building.

Greg Johnson
Director of Engineering

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-----Original Message-----
From: Holland, Elizabeth G SPK [mailto:Elizabeth.G.Holland@usace.army.mil]
Sent: Wednesday, July 14, 2010 2:22 PM
To: Greg Johnson
Cc: Parker, Laurie S SPK; Henningsen, Sarah; Tibbitts, Dan P SPK; McDaniel, David P SPK
Subject: RE: NLIP Garden Highway Reach 16

Greg,

I understand you spoke with Laurie Parker from our real estate division. What you have reviewed is a draft EIS/EIR for the Natomas Study, we do not have authorization from Congress at this time for a project and so therefore, you have not been contacted about the location of the KVIE tower. If we receive congressional authorization for a project we will work to prepare design refinements. That is when we would coordinate with you on the tower. We will take your e-mail as a comment on the draft EIS/EIR and make sure that

1

it is considered in the final document. We will also work with you to look at alternatives in this area when we start to prepare plans and specifications. We will try and design to provide public safety and prevent impacts to the KVIE tower. At this time we are just not to a point that we can provide you with details of what will occur in that area - our EIS/EIR looks at the greatest potential impacts as required under NEPA.

If you have further questions please give me a call and if I cannot help you and will find someone who can.

Elizabeth Holland
U.S. Army Corps of Engineers
Senior Environmental Manager
(916) 557-6763 Cell (916) 524-8239
e-Mail Elizabeth.g.holland@usace.army.mil

-----Original Message-----
From: Greg Johnson [mailto:gjohnson@kvie.org]
Sent: Wednesday, July 14, 2010 10:15 AM
To: Holland, Elizabeth G SPK
Subject: NLIP Garden Highway Reach 16

John and Elizabeth;

KVIE owns property affected by the proposed levee improvements described in the just released DEIS/DEIR for the Natomas Levee Improvement Program. Our property is located on Garden Highway in the area described as Reach 16 in the document.

Located on our property, which is adjacent to the present levee, is a communications tower and associated building and equipment that is used to relay our broadcast programming from our studio to our transmitter site located in Walnut Grove, as well as an interconnection with our sister PBS station KQED in San Francisco.

In reading through the DEIS/DEIR it is clear that as part of this project major changes would take place on our property. Plate 2-8A (attached) shows that along with the widening of the levee itself, the finished grade of the 300 foot seepage berm would be substantially higher than the existing grade and extend through the present location of our tower and building. This is quite alarming especially as we were not informed earlier of the possibility that we would have to move or modify this vital tower, building and equipment.

B1-1

I need one of you to call me to further explain exactly what's planned and its impact on our facility and property on Garden Highway.

2

Greg Johnson

Director of Engineering

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Letter	KVIE
B1	Greg Johnson, Director of Engineering
Response	July 14, 2010

B1-1 The DEIS/DIER analyzes the worst-case scenario (i.e., the greatest potential impacts that could occur), which may include conflicts with existing KVIE facilities. If Congress authorizes the Phase 4b Project, USACE and SAFCA will begin detailed plans and specifications of project features. If possible, KVIE structures, including the communications tower, would be avoided. In the case that avoidance is not possible, USACE and SAFCA will coordinate with KVIE to ensure that impacts are minimized to the greatest degree possible.

INDIVIDUALS

I1

3934 El Centro Road
Sacramento, Ca 95834

July 7, 2010

John Bassett, Director of Engineering
SAFCA
1007 7th Street, 7th Floor
Sacramento, Ca 95814

Re: Comments on DEIS / DEIR and Natomas PACR

Dear Mr. Bassett:

This is to comment on deficiencies we perceive in the above materials. Although we support simultaneous efforts to improve flood protection and conservation in our neighborhood, we also believe it is critical to delineate all impacts of the proposed project, and to identify all viable mitigation efforts. I1-1

This comment letter is to point out two inter-related project aspects – to highlight possible ground water hydrology impacts due to aggregated factors, and to note the lack of specificity and comprehensive analysis of improvements to the West Drainage Canal. At the end of this comment letter we will link these two issues.

Regarding ground water hydrology impacts, we note that some elements are not analyzed, and others are analyzed in isolation, without consideration of their combined and possible multiplier impacts – for instance, due to changes in vegetation. For example, page 4.5-16, "Effects of Cutoff Walls on Existing Groundwater Wells," notes restrictions on movement of ground water. Elsewhere in the document, numerous mentions of additional wells are noted (for example, page 2-61 notes that irrigation wells may be needed to be established for woodland groves; page 4.7-2 discusses creating managed marsh for giant garter snake, again creating a demand on ground water hydrology.) Most significantly, missing from the discussion is the impact on near- I1-2

SAFCA '10 JUL 12 AM11:14

surface groundwater moisture from the creation of significant earth "borrow" depressions. Although hillside hydrology is complicated, it is our general understanding that such terracing has an impact: that "upper terraces" dry out more than "lower terraces." Because our approximately 3 acre ranchette – as well as our neighbors – are on the "upper terrace" near significant proposed "borrow areas" and are planted in home orchards, and depend on well water for our domestic use as well as irrigation, we have concerns about the cumulative impact of the various ground water hydrology elements, mentioned above, notably potential additional pumping required to maintain our private property or well failure.. We believe the draft needs to delineate these elements better, and to use a systems approach to look at these elements in combination. I1-2 (Con't.)

Regarding the lack of specificity and comprehensive analysis of improvements to the West Drainage Canal, we note several deficiencies. The part of that waterway east of El Centro Road, between Arena Blvd and Peregrine Park / I-5 seemingly is never mentioned. That omission is particularly troubling because that section of the waterway has the same habitat limitations mentioned elsewhere (for example, page 2-60 notes "...mostly barren, steep banks with little or no cover or foraging habitat...") Additionally, the report fails to note, for that same section of the waterway, the existence of several significant open public lands with potential for design integration for West Drainage Canal habitat improvements. Those existing public lands include 1) Witter Ranch State Historical Park / San Juan Reservoir park, 2) Red Tail Hawk Park, and 3) Peregine Park. The reports also fails to mention the recreational use of the entire West Drainage Canal, the levies of which are used for biking and strolling by many residents. Additionally, the report fails to note the impending completion of a crucial link in Sacramento bikeways, tying into the West Drainage Canal and Peregrine Park (see Sacramento Bee, June 6, 2010, "Groundbreaking held for Natomas bike bridge link" – ironically, that article mentions that construction will stop for several months to accommodate the hibernation season of the giant garter snake, one of the objectives of the NLIP). Design attention to this section of the West Drainage Canal is also important because the CH2MHill analysis of giant garter snake records, as part of their Revised Natomas Basin HCP (their Figure 12), charts existence of the species in this area. I1-3 I1-4 I1-5

As mentioned previously, we believe these two concerns are actually linked. We believe that an element in mitigating the ground water hydrology issues above are contained in improvements potentials to the West Drainage Canal. The very elements that improve habitat (see page 2-60 – "..sloped banks supporting native sedges and rushes at the shoreline..." and "...a variable width submerged bench located within the bank, which would support a band of tules...") would also improve ground water percolation recharge. The existence of public open spaces which could accommodate slight widening of the canal in spots to achieve this goal seems to be an opportunity that the NLIP should not overlook. For the very few significant, privately owned open space parcels contiguous with the West Drainage Canal (such as the parcel on Arena Blvd. that backs up to the canal), perhaps strategic land use design stipulations could accommodate such habitat improvements before they are precluded by development. I1-6 I1-7

We hope that these comments further improve the draft.

Sincerely,

Jorge Jimenez, Ph. D.
Ron Selge

Letter I1 Response	Jorge Jimenez, Ph.D and Ron Selge July 7, 2010

I1-1 See responses to comments I1-2 through I1-7.

I1-2 **Effects on groundwater from cutoff wall installation.** These potential impacts were addressed under Impact 4.5-c, "Effects on Groundwater," of the DEIS/DEIR and in a report prepared by Luhdorff & Scalmanini, Consulting Engineers (LSCE) (LSCE, May 4, 2009) entitled *Evaluation of Potential Groundwater Impacts Due to Proposed Construction for the Natomas Levee Improvement Project* included in Appendix C2 of the DEIS/DEIR. That report was updated in a technical memorandum entitled *Potential impacts of Slurry Cutoff Walls Proposed for Phase 4B of the Natomas Levee Improvement Program* (LSCE, January 28, 2010) included in Appendix C4 of the DEIS/DEIR. Both reports concluded that groundwater flow reductions due to proposed cutoff walls would be small and not have significant impacts on groundwater conditions anywhere in the Natomas Basin, including on the productive capacity of private wells.

Effects on groundwater from groundwater supply wells developed for created habitat. The Phase 4a EIS/EIR (Impact 4.5-c) addressed the potential impacts on groundwater from installation of groundwater wells to support both managed marsh in the Fisherman's Lake area as well as woodland corridors. The Phase 4b Project does not propose additional groundwater wells beyond those wells that were analyzed in the Phase 4a EIS/EIR. Details can be found in the technical memorandum, *Potential Impacts of Proposed Phase 4a Habitat Mitigation Wells* (LSCE, August 5, 2009), included in Appendix C5 of the Phase 4a EIS/EIR. That analysis was updated for the Fisherman's Lake area in a second technical memorandum, *Potential Impacts of Proposed Fisherman's Lake Marsh Wells* (LSCE, October 30, 2009), included in Appendix C6 of the Phase 4a EIS/EIR. Both reports concluded that the proposed habitat mitigation wells would not have significant impacts on nearby private wells in the Fisherman's Lake area.

Effects of borrow site excavation on groundwater levels beneath adjacent properties. For borrow sites that would not be converted to managed marsh, removal of borrow material would not affect groundwater levels because the final grade of the reclaimed borrow areas would still be above the water table. In the case of borrow sites that would be converted to managed marsh, removal of borrow material below the water table would also not result in lower groundwater levels because water levels would be managed by importing sufficient water to replace water lost to evapotranspiration from marsh vegetation and open water areas. Surface water levels in the managed marsh proposed for the Fisherman's Lake area would be maintained at elevations of 13–14 feet, which are several feet higher than the average underlying groundwater levels. As a result, infiltration from water in the managed marshes would actually result in a slight increase in underlying groundwater levels.

I1-3 Improvements to the West Drainage Canal east of Fishermans' Lake, including the urbanized section east of El Centro Road, are not part of the NLIP and were therefore not analyzed as part of the Phase 4b Project.

I1-4 Because no improvements would be constructed along the West Drainage Canal east of Fisherman's Lake, recreational uses along this section of the canal would not be affected and were not analyzed as part of the Phase 4b Project.

Temporary changes in recreational opportunities during project construction activities are addressed in Impact 4.13-c, "Temporary Changes in Recreational Opportunities during Project Construction Activities" of the DEIS/DEIR. The West Drainage Canal, which is shown on Plate 2-17 of the DEIS/DEIR, is owned and operated by RD 1000 and is not a designated public recreational facility (see Plate 3-7 of the DEIS/DEIR). Any incidental use of this canal for recreation (e.g., walking or bicycling) would only be affected during construction, and public recreational facilities in the vicinity of the West Drainage Canal, such as Fisherman's Lake Parkway and Open Space, would be available as substitutes.

I1-5 West Drainage Canal improvements designed to improve habitat for giant garter snake are described in Section 2.3.4.1, "West Drainage Canal Habitat Improvements," of the DEIS/DEIR. 4.7-e, "Giant Garter Snake Mortality, Injury, and/or Disturbance to Habitat" of the DEIS/DEIR addresses impacts to giant garter snake.

I1-6 Because Impact 4.5-c, "Effects on Groundwater," of the DEIS/DEIR concludes that no significant groundwater impacts would occur with implementation of the Phase 4b Project, no mitigation is necessary.

I1-7 See response to comment I1-3.

Jew, Deborah

I2

From: Holland, Elizabeth G SPK [Elizabeth.G.Holland@usace.army.mil]
Sent: Tuesday, August 17, 2010 8:22 AM
To: Henningsen, Sarah; Dunn, Francine
Cc: Ruhl, Jane C LRL; Muha, Andrew T SPK; Evoy-Mount, Matilda L SPK; Bassett. John (MSA)
Subject: FW: Natomas Levee project 4b

An additional comment from Mr. Perry.

Elizabeth Holland
U.S. Army Corps of Engineers
Senior Environmental Manager
(916) 557-6763 Cell (916) 524-8239
e-Mail Elizabeth.g.holland@usace.army.mil

-----Original Message-----
From: john P [mailto:john@pbbcpas.com]
Sent: Thursday, August 12, 2010 2:01 PM
To: Holland, Elizabeth G SPK
Cc: Parker, Laurie S SPK
Subject: Re: Natomas Levee project 4b

Dear: Ms. Holland: Thank you for your response. The inclusion of habitat mitigation adjacent to our agricultural property causes great concern because of past problems we have had farming adjacent non agricultural parcels. The affects of damages from insects, rodents and birds is unimaginable. In the case of certain corps, we have suffered total loss farming next to non farmed parcels. I2-1

Thank you;
John Perry

On 8/12/2010 12:36 PM, Holland, Elizabeth G SPK wrote:
> Mr. Perry,
>
> We will include these as official comments on the draft EIS/EIR and
> respond to them in the final document. The Corps has not begun plans
> and specifications for this reach of the project at this time.
> Construction of the reach you refer to is slated for 2013, depending
> on Congressional Funding. When we begin construction drawings we will
> be contacting concerned individuals to coordinate efforts of design
> and construction. In the mean time you will find responses to your
> comments in the final EIS/EIR which will be released in the October
timeframe.
>
> Elizabeth Holland
> U.S. Army Corps of Engineers
> Senior Environmental Manager
> (916) 557-6763 Cell (916) 524-8239
> e-Mail Elizabeth.g.holland@usace.army.mil

1

>
>
> -----Original Message-----
> From: john P [mailto:john@pbbcpas.com]
> Sent: Wednesday, July 28, 2010 2:51 PM
> To: Holland, Elizabeth G SPK
> Cc: BassettJ@saccounty.net
> Subject: Natomas Levee project 4b
>
> Dear Ms. Holland: At the recent work shop, I indicated that I would
> send you a list of questions related the project. Attached is a list
> of questions related to the project. I would like to meet with your
> staff or consultants to address some of our concerns. In several
> weeks our operation will be at peak activity and it would be
> appropriate for your staff or consultants to visit our operation, so
> they have an understanding of the affects of the project on our operations.
>
> Contact me at your convenience.
>
> Thank you;
> John Perry
>
>
>

2

PERRY FARMS
DIVERSIFIED FARMING
350 Court Street, Woodland, CA 95695
Telephone (530) 662-3251
Fax (530) 662-4600

MEMO LETTER

Date: July 23, 2010

To: USACE; Attention Elizabeth Holland

From: John Perry, Perry Farms

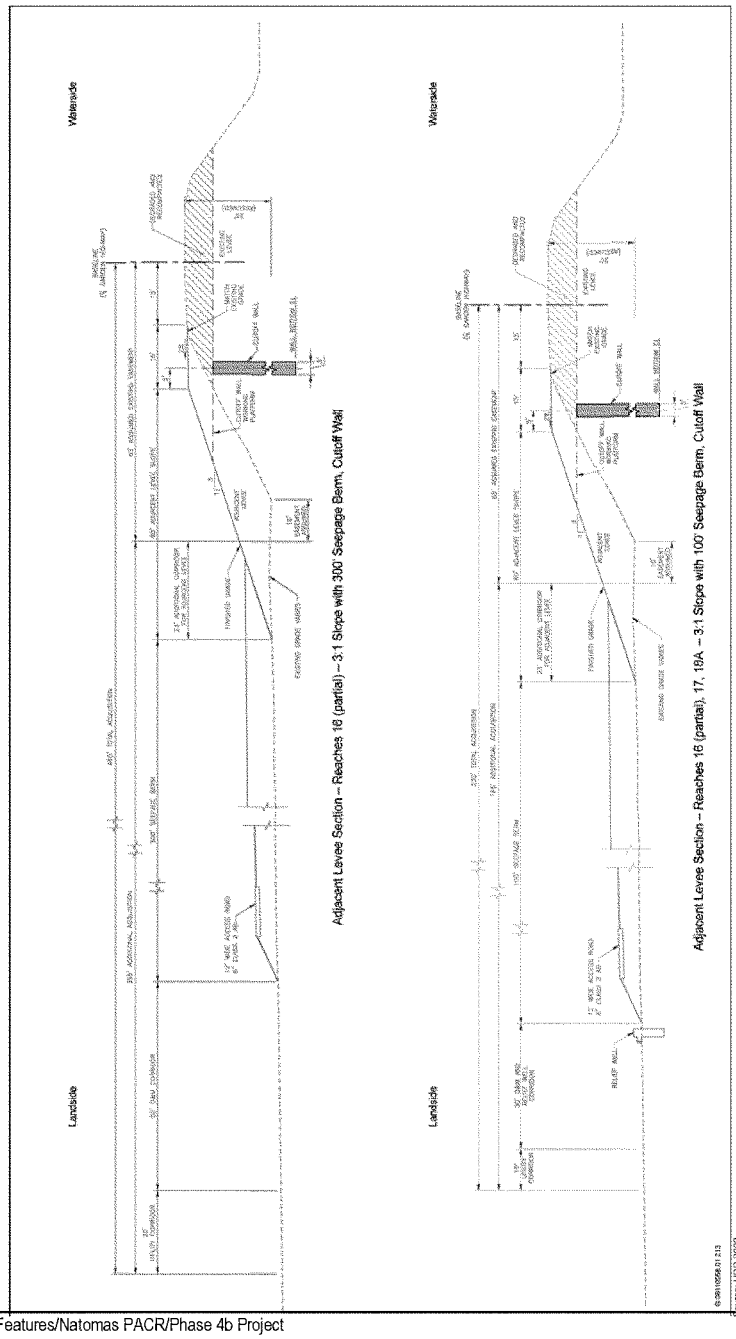
Re: Natomas Phase 4B project

Per out review of the DEIS/DEIR we have questions as to the physical and financial impact of the project on our farming operation. We will start with a description and physical location of our operation, in order for the CORP of Engineers has an understanding of the affects of this project on our operation.

The operation is located south of the Fisherman's Lake and farms approximately 1,000 acres. The operation has been in existence since the 1930s. The operation farms a variety of crops including wheat, corn, safflower, sunflower and fresh market vegetables. A substantial amount of the acreage farmed is located along the Garden Highway. A majority of the fresh market vegetables are grown on property along the Garden Highway. A large portion of irrigation water is serviced from the Riverside Canal. I2-2

In order to plan the future of the operation, we need some clarity as to the timing and foot print of the project. The following is a list of questions that we have in order to plan how to deal with the project:

1. What is the foot print of the project? I2-3
2. What are the dates anticipated for the initial physical occupation of the project foot print and the anticipated duration? I2-4
3. What are the dates and duration of the relocation of the Riverside Canal I2-5
4. What is the physical design and location of the River Canal? I2-6
5. How will irrigation water be serviced to the area while relocation and construction work occurs? I2-7
6. What are the location of the borrow sites? I2-8
7. Between the project's foot print and the barrow sites, there will be a substantial reduction in acreage being farmed by our operation; what provisions are being made to address the economic impact on our farming operation. I2-9
8. Substantial compaction of soils will occur as result of the construction activities and relocation of canals. What factors are being considered to address this long term affect on agricultural activities? I2-10
9. The relocation of the canals and levee construction will change the landscape of the area. What provisions are being made to eliminate the creation of habitat for rodents, noxious weeds and insects? I2-11
10. Farming requires the movement of farm equipment, between various parcels. Are provisions being made to address ingress and egress while construction is occurring? I2-12



Cross-Sections – Sacramento River East Levee Reach A:16–18A

Plate 2-8a

Letter I2 Response — **John Perry, Perry Farms Diversified Farming, July 28, 2010 and August 12, 2010**

I2-1 Because the commenter is not specific about the location of his agricultural property, it cannot be confirmed whether habitat would be located adjacent to it. However, comment I2-2 indicates that the property is located south of Fisherman's Lake. The construction of habitat in the Fisherman's Lake area, as part of reclamation of soil borrow sites, was addressed in the Phase 4a EIS/EIR (see Plate 2-12 of the Phase 4a EIS/EIR for the conceptual plan). All habitat established as part of this complex would be located north of Radio Road. Following excavation of borrow material, borrow sites within the Fisherman's Lake area would either be developed as managed marsh or returned to agricultural use, such as growing hay or alfalfa. Except for the marsh, which would be managed as habitat for giant garter snake, no parcels in the Fisherman's Lake area would be unfarmed.

I2-2 Comment noted.

I2-3 The Phase 4b Project components are shown in the following plates in the DEIS/DEIR:

- Plates 2-7a and 2-7b (Sacramento River east levee Reach A:16–20),
- Plate 2-9 (American River north levee Reach I:1–4),
- Plate 2-11 (NEMDC North),
- Plate 2-13 (PGCC),
- Plate 2-14 (NEMDC South),
- Plate 2-16 (NCC),
- Plate 2-17 (West Drainage Canal and West Lakeside School Site), and
- Plate 2-19 (Potential Woodland Planting Area in Lower Dry Creek).

While the above plates show the proposed locations of the Phase 4b Project components, the exact project footprint has not been finalized. The DEIS/DEIR discloses the worse-case effects (i.e., greatest potential impacts) of the Phase 4b Project, and thus evaluates a larger project footprint than would actually occur. USACE is in the process of awarding a contract to begin detail designs of the Phase 4b Project, and detailed designs and footprints should be available in 2011. USACE will work with landowners over the next year to configure the Phase 4b Project with the least potential impacts to the public. If impacts are determined to be significant beyond what has been disclosed in the EIS/EIR, a supplemental NEPA/CEQA document will be prepared.

I2-4 The Phase 4b Project is anticipated to begin construction in 2012 and be completed in 2016. All work by USACE will be based on Congressional authorization and funding.

I2-5 See response to comment I2-4 for overall construction schedule. Relocation of the Riverside Canal is planned to occur in 2012 (as shown in Table 4.11-1 of the DEIS/DEIR).

I2-6 A conceptual alignment of the relocated Riverside Canal is shown in Plate 2-7a of the DEIS/DEIR. Detailed design of the Riverside Canal has not been finalized. USACE will work with landowners over the next year to configure the Phase 4b Project with the least potential impacts to the public. If impacts are determined to be significant beyond what has been disclosed in the EIS/EIR, a supplemental NEPA/CEQA document will be prepared.

I2-7 Mitigation Measure 4.15-a, "Coordinate with Irrigation Water Supply Users Before and During all Irrigation Infrastructure Modifications and Implement Measures to Minimize Interruptions for Supply," of the DEIS/DEIR requires the project proponent(s) to coordinate with water supply providers and consumers to minimize interruptions, conduct work during the nonirrigation season whenever feasible, and ensure that essential water supply necessary during the irrigation season is provided by an alternative supply if an interruption is unavoidable.

I2-8 The borrow sites identified in the DEIS/DEIR are all potential borrow sites for the Phase 4b Project (see Section 2.3.3.4, "Borrow Sites," Tables 2-22 and 2-23, and Plate 2-6 in the DEIS/DEIR). However, USACE is still in the process of determining the exact amount of borrow material that would be required. If additional borrow sites are needed, supplement NEPA and/or CEQA documentation will be prepared.

I2-9 See response to comment I2-8. See also response to comment O4-16 regarding NEPA and CEQA requirements to analyze economic effects.

I2-10 The soil compacted by construction activities can be scarified such that the compaction densities match pre-construction densities.

I2-11 RD 1000 and SAFCA will be responsible for maintaining the new canals and levees after completion of the project. Common practice includes filling in rodent holes, mowing and spraying weeds, and providing vector control.

I2-12 Access routes for farming will be maintained during project construction, as they will be maintained for all landowners in this reach.

I3

July 28, 2010

Elizabeth Holland, Planning Division
USACE, Sacramento District
1325 J Street
Sacramento, CA 95814

RE: Natomas Levee Improvement Program
Construction Staging Area for Lease

Dear Ms. Holland,

My name is Imogene W. Amrine and I own a 10 acre parcel at 2520 Garden Highway (APN: 274-0250-040-0000). Physically my parcel is located 1 mile south of San Juan Road on Garden Highway.

This 10 acre parcel was leased from me in the past and used as a construction staging area during levee improvements. It has electricity, well water and a driveway (over the irrigation ditch) that was constructed for heavy loads. I3-1

The parcel is available for lease immediately and throughout the Natomas Levee Improvement Program. Please let me know who I should talk to with regards to the possibility of leasing out my parcel.

Enclosed is a parcel map with my parcel highlighted and an aerial photo of the parcel.

Sincerely,

Imogene W. Amrine

Imogene W. Amrine
5640 Angelina Ave.
Carmichael, CA 95608
916/487-2422

Cc: John Basset, Director of Engineering, SAFCA

Enc.

SAFCA '10 JUL 30 AM 11:46

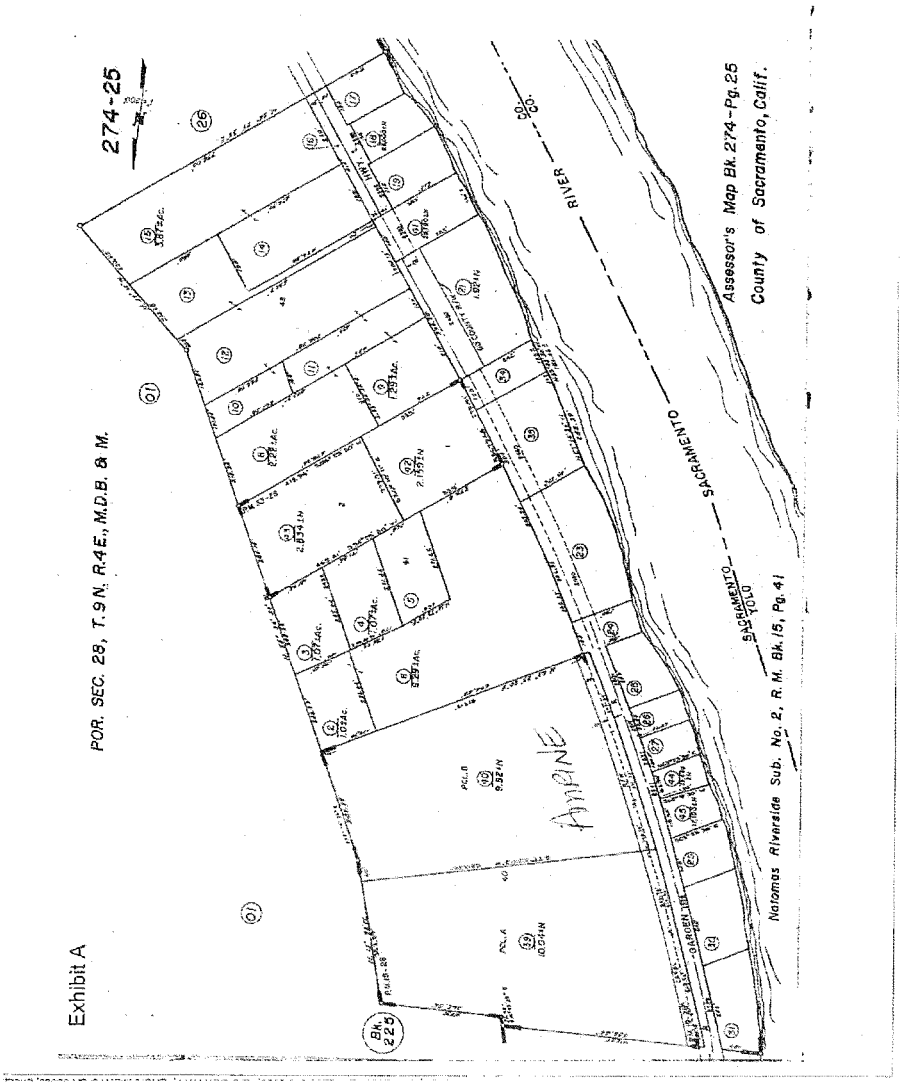
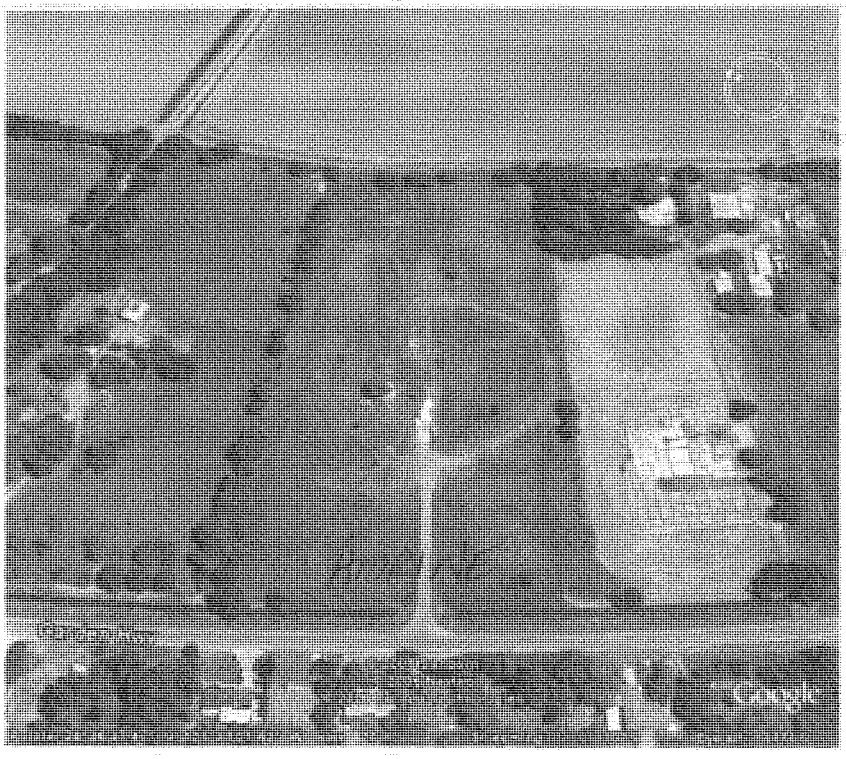


Exhibit A
274-25
POR. SEC. 28, T.9N, R.4E, M.D.B. & M.
Assessor's Map Bk. 274-Pg. 25
County of Sacramento, Calif.
SACRAMENTO RIVER
SACRAMENTO
YOLO
Natomas Riverside Sub. No. 2, R. M. Bk. 15, Pg. 41
OAKMONT DR.
Bk. 225



Letter	
I3	**Imogene W. Amrine**
Response	**July 28, 2010**

I3-1 The availability of APN 274-0250-040 for lease as a construction staging area will be considered by project engineers during preparation of detailed design and specifications of the Phase 4b Project.

I4

Phillip Day Perry
2346 La Lima Way
Sacramento, California 95833

August 4, 2010

Elizabeth Holland, Planning Division
USACE, Sacramento District
1325 J Street
Sacramento, CA 95814

RE: Comments related to the Phase 4b Project of the NLIP

Dear Ms. Holland,

Thank you for the opportunity to offer comments regarding the DEIS/DEIR for the above-referenced project.

My residence of the last 21 years abuts the RD1000 Main Drainage Canal and is located within one block of the project area described as Reach 19b. I4-1

During my tenure in Natomas, I have been subject to slurry wall construction, pumping plant improvements, and additional cutoff-wall construction that have created noise, dust, and traffic nightmares. I4-2

As currently presented, this project will unduly and negatively impact the quality of life for every resident who lives within a mile of this project's footprint, both during construction and for years after.

Schematics of the levee "improvements" indicate that in this heavily populated area, we will soon face slopes denuded of mature trees, new retaining walls, months-long road closures, and seemingly endless noise and dust. I4-3

This project also reeks of wasted tax dollars.

Dollars wasted on earlier levee work now deemed inadequate. Dollars wasted tearing-up recently completed cutoff-wall work at pumping plant #1 so outfall pipes can be reconfigured. Dollars wasted on over-building an already adequate levee system. I4-4

This project will simply destroy the existing visual character of the project area. I4-5

I am a minority voice to be sure as we can assume that ninety-nine percent of the population of Natomas cares only about not having to pay for flood insurance. What those of us who live in the actual construction area have to go through while this project is undertaken makes no difference. The fact is, those in charge will look at these and any other comments provided, shrug their shoulders, then do what *they* believe to be in the best interests of the community, contrary viewpoints be damned. I4-6

I just don't have that much faith that SAFCA, the USACE, or any other government agency involved in this project truly knows what they are doing except a desire to turn the Sacramento River into a drainage ditch, ala the Los Angeles River. There must be better ways to achieve the results being dictated to us by USACE. I4-7

Sincerely,

Phil Perry

Letter I4 Response	Phillip Day Perry August 4, 2010

I4-1 Comment noted. The commenter lives within the Phase 4b Project area.

I4-2 Comment noted. Construction projects may result in noise, air quality, and traffic impacts.

I4-3 The intent of EISs and EIRs is to provide information related to a proposed project, disclose potentially significant impacts and to propose mitigation measures to reduce potentially significant impacts. The DEIS/DEIR outlines the anticipated temporary and long-term impacts associated with the Phase 4b Project (for reference see Table ES-2, "Summary of Impacts and Mitigation Measures" of the DEIS/DEIR). Impacts resulting from vegetation removal (e.g., Section 4.7, "Biological Resources" and Section 4.14, "Visual Resources"), increased traffic (Section 4.10, "Traffic and Transportation), noise (Section 4.12, "Noise"), and dust (Section 4.11, "Air Quality") are discussed in detail in the DEIS/DEIR. Where feasible, mitigation measures are proposed that would reduce impacts to the maximum extent possible.

I4-4 See response to comment O4-16 regarding NEPA and CEQA requirements to analyze economic effects.

In general, because levee operation and maintenance is an on-going process, and engineering standards and flood zone designations change over time, levee systems will require upgrades and reconstruction. The adequacy of Federal levee systems is based upon guidance developed by USACE. The Phase 4b Project is proposed to meet those requirements. Section 1.4, "Project Purpose/Project Objectives and Need for Action," in the DEIS/DEIR provides information related to the project purpose and objectives, according to USACE and SAFCA (Section 1.4.1, "Project Purpose/Project Objectives"), background reports used in support of the need for levee reconstruction (Section 1.4.2, "Need for Action"), and deficiencies in the Natomas Basin levee system that contribute to the problems and needs related to project implementation (Section 1.4.2.1, "Flood Problems and Needs").

I4-5 In Section 4.14, "Visual Resources" of the DEIS/DIER, USACE and SAFCA acknowledge that implementation of the Adjacent Levee Alternative (Proposed Action) and the Fix-in-Place Alternative would result in adverse effects on scenic resources and the visual character of the Sacramento River east levee, American River north levee, and NEMDC South. This change in visual character would be attributed to the removal of a substantial number of trees, including large mature trees and Heritage oaks, from the landside and waterside of these levees. As stated in the DEIS/DEIR, Impact 4.14-a, "Alteration of Scenic Vistas, Scenic Resources, and Existing Visual Character of the Project Area," is considered to be significant. Although Mitigation Measure 4.14-a, "Implement Mitigation Measures 4.7-a, 'Minimize Effects on Woodland Habitat; Implement all Woodland Habitat Improvements and Management Agreements; Compensate for Loss of Habitat; and Comply with Section 7 of the Federal Endangered Species Act, Section 1602 of the California Fish and Game Code, and Section 2081 of the California Endangered Species Act Permit Conditions,' and 4.13-b, 'Compensate City of Sacramento Department of Parks and Recreation for Loss of Parkland and Park Amenities'," in the DEIS/DEIR would reduce adverse effects, it would not be to a less than significant level and this impact would be considered significant and unavoidable.

This FEIS/FEIR will be used by the SAFCA Board as a decision making document to, in part, determine if the significant and unavoidable environmental impacts out-weigh the economic, legal, social, technological, or other beneficial impacts of the project. If the SAFCA Board determines that the significant environmental impacts are considered to be "acceptable" when compared to the benefits of the project, a statement of overriding considerations will be prepared providing the substantial evidence that was used to reach this conclusion (State CEQA Guidelines CCR Section 15093).

I4-6 Comments received on the DEIS/DEIR are addressed in this FEIS/FEIR. Comments will be used for consideration of certification of the EIR and issuance of a Record of Decision by the SAFCA Board and USACE, respectively.

I4-7 See response to comment I4-4.

I5

Henningsen, Sarah

From: Holland, Elizabeth G SPK [Elizabeth.G.Holland@usace.army.mil]
Sent: Monday, August 16, 2010 8:44 AM
To: Dunn, Francine; Henningsen, Sarah
Cc: Ruhl, Jane C LRL; Muha, Andrew T SPK; Evoy-Mount, Matilda L SPK
Subject: FW: Phase 4b Landside Improvements Project

Comments for EIS/EIR

Elizabeth Holland
U.S. Army Corps of Engineers
Senior Environmental Manager
(916) 557-6763 Cell (916) 524-8239
e-Mail Elizabeth.g.holland@usace.army.mil

-----Original Message-----
From: Melvin Borgman [mailto:melvin.borgman@yahoo.com]
Sent: Sunday, August 15, 2010 5:19 PM
To: Holland, Elizabeth G SPK
Cc: bgualco@gualco.com
Subject: Phase 4b Landside Improvements Project

Ms. Holland:

What is the current design criteria for water elevations

in the Sacramento River at Verona,
in the Natomas Cross Canal,
in the Pleasant Grove Creek Canal?

I5-1

What was the original design criteria for water elevations

in the Sacramento River at Verona,

in the Natomas Cross Canal,

in the Pleasant Grove Creek Canal?

When the river elevation at Verona is higher than the elevation of the Western Pacific Railroad, water from the tributaries of the Natomas Cross Canal system are blocked and are forced to flow north and south along the east side of the Western Pacific Railroad, flooding the area from Coon Creek to Sankey Road. The winter of 2009-2010 brought significant storms to the east Valley and west slope of the Sierra region, yet no significant flooding occurred in the Pleasant Grove area. The river at Verona never reached a 30 foot elevation and the Natomas Cross Canal system worked.

I5-2

Various "improvements"in the river system in the past 100 years such as straightening levees and channels up stream brings water to Verona faster. Improvements down stream such as levees around "islands" in the Delta and building houses, docks, bridges, etc. in the water side of the river reduce flow capacity. The gradient from Verona to the Delta is nearly zero to begin with.

I5-3

1

How can the river elevation be reduced in heavy storm conditions?

* Increase Sacramento River flow capacity.
* Make the River wider and deeper.
* Remove levees from "islands" in the Sacramento River Delta.
* Increase upstream storage capacity.
* Curtail drainage pumping by reclamation and drainage districts during periods of high river flow conditions. These districts should have internal retention facilities.

I5-4

Please acknowledge receipt of this message.

Respectfully submitted,
Melvin Borgman
3559 Howsley Road
Pleasant Grove, CA 95668

Letter I5 Response **Melvin Borgman August 15, 2010**

I5-1 The NLIP is designed to the state of California standard as defined in Senate Bill 5 (SB 5). SB 5, signed by the Governor in October 2007, defines the State standard of the mean annual 200-year flood with at least 3 feet of freeboard between the water surface elevations and the top of the levees around the Natomas Basin. For purposes of modeling these water surface elevations, it was assumed that the levees protecting other areas in the system will not fail even if overtopped. As indicated in Table 4.5-4 of the DEIS/EIR, the 200-year no levee failure water surface elevation in the Sacramento River at Verona is 42.6 feet NGVD 29.[2] This water surface elevation rises very slightly (less than 0.1 foot) along the length of the NCC and in the PGCC due to the control exerted on water levels in these water bodies by conditions in the Sacramento River under this condition.

The original design criteria for the Sacramento River for the reach of the Sacramento River from the mouth of the NCC to the Sacramento Bypass is based upon a historical flow of 107,000 cubic feet per second (cfs). The flow was used to generate what is known as the "project floodplain," also known as the "1957 profiles." The profiles show that the "project floodplain" elevation at the mouth of the NCC is 41.2 feet C.E.[3] (or 38.2 feet NGVD 29).

The original design criteria for the NCC and PGCC are set forth in *Design Memorandum No.2, Sacramento River Flood Control Project California, Back Levees for Reclamation District No. 1000 and No. 1001 Levee Construction* dated August 1, 1957. This memorandum reflects USACE's consideration of two possible design conditions affecting flows and water surface elevations in the NCC and PGCC. "Condition A" was based on a combination of a 'moderate' stage 39.0 feet C.E. (or 36.0 feet NGVD 29) in the Sacramento River and an estimated 200-year flood flow from the creek group feeding into the NCC. Under Condition A, design flows on the NCC and PGCC equated to 27,000 cfs and 7,000 cfs, respectively. "Condition B" was based on the "project floodplain" elevation (41.2 feet C.E.) in the Sacramento River described above and an estimated 50-year flood flow from the creek group feeding into the NCC. Under Condition B, design flow on the NCC and PGCC equated to 22,000 cfs and 6,000 cfs, respectively. The Condition B flow line controlled in all cases and was therefore adopted as the project floodplain.

USACE noted in the memorandum:

> This project flood plane provides full protection of rapidly developing urban lands in Reclamation District No. 1000 from flood conditions of project flood magnitude (estimated frequency of once in 200 years). All other lands east and north of the project levees are agricultural lands that are not expected to become urban within the foreseeable future and therefore do not require such a degree of protection. The 3-foot freeboard[4] used for the design of the levees represents a considerable factor of safety for the following reasons. The adopted flood plane rises only about 1.5 feet from the Sacramento

[2] NGVD29 = National Geodetic Vertical Datum of 1929.

[3] C.E. = U.S. Corps of Engineers Datum, C.E. datum is 3 feet below mean sea level (MSL). MSL is roughly equivalent to NGVD29.

[4] The left bank of the Sacramento River at the mouth of the NCC had a top of levee elevation of 45.9 C.E. according to the 1957 profiles. The water surface at that location is 41.2 C.E., which equates to 4.7 feet of freeboard, much greater than the 3-foot design. The levees were built before the 1957 profile design and in general have greater than 3 feet of freeboard.

River to the head of the main canal and its elevation is dominated by the 41-foot starting elevation [C.E datum] in the Sacramento River. This starting elevation cannot increase significantly because any material increase in upstream Sacramento River flows would inevitably cause extensive upstream levee failures which would allow large volumes of water to escape from the channels and prevent further rise at the mouth of the Natomas Cross Canal.

I5-2 Comment noted.

I5-3 Comment noted. See Attachment 4 of the Appendix C to the Natomas PACR for discussion regarding sensitivity to downstream conditions.

I5-4 Hydraulic analyses of the river system conclude that dredging of the Sacramento River channel does not provide long-term peak flow capacity. SAFCA has previously considered this concept and concluded that it would not improve flood water conveyance or control during peak flood conditions.

Removing levees from islands in the Delta would not appreciably influence flood elevations in Natomas. See response to comment I5-3.

Section 2.1.5, "Alternatives Considered, But Eliminated from Further Consideration," of the DEIS/DEIR addresses expansion of the Yolo Bypass and use of upstream transitory storage to reduce water surface elevations.

Pumping capacity of drainage facilities are small compared to flood flows within the channel system and therefore flood elevations could not be appreciably reduced. Flow from interior drainage facilities were ignored in generating design channel water surface profiles.

I6

Henningsen, Sarah

From: Bassett. John (MSA) [bassettj@SacCounty.NET]
Sent: Monday, August 16, 2010 9:50 AM
To: Dunn, Francine; Henningsen, Sarah
Subject: FW: NLIP Phase 4b

From: Charlotte Borgman [mailto:cborgmom@yahoo.com]
Sent: Monday, August 16, 2010 8:52 AM
To: Elizabeth.G.Holland@usace.army.mil
Cc: Bassett. John (MSA); bgualco@gualco.net
Subject: NLIP Phase 4b

Ms. Holland:

I have concerns regarding the proposed relocation of the Morrison Canal.

As you are aware, that canal supplies irrigation water to the C. Morrison Ranch as part of the Natomas Mutual Water Company system. The proposed relocation of the canal will separate a large portion of our property on the west side of SR99 from the remaining portion of the "west side" property. The proposed relocation will create a small section of land to the north of the new canal that will be difficult to cultivate, irrigate and harvest compared to the current situation. It will also cut off access to the remaining property from a well that is located in the north east corner of our property on the west side of SR99.

The proposed relocation will also isolate the northwest corner of our property on the east side of SR99 making that portion of the ranch difficult if not impossible to farm. Our supply pump from the present location of the Morrison Canal is in that northwest corner and feeds an underground pipeline that runs from there almost to the eastern border of the ranch near the "fig tree". That is a relatively new system completed in 2005.

As pictured in Plate 2-16 the proposed relocation appears to also pass through our equipment shed and the house located near it. I6-1

It is my understanding that the proposed relocation is a seepage related issue. If the levee improvements in that area included seepage controls, why is it necessary to relocate a ditch that would "catch" seepage if any occurred?

A significant portion of our ranch was lost to the improvements to SR99, including the addition of the Howsley Road interchange, and the previous relocation of the Morrison Canal to it's current location. Additional loss of property and the inconvenience of farming around the relocated canal will create a financial burden.

Respectfully submitted,
Charlotte Borgman
C. Morrison Ranch
P.O. Box 771
Pleasant Grove, CA 95668

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Letter I6 Response	Charlotte Borgman, C. Morrison Ranch August 16, 2010

I6-1 Plate 2-16 in the DEIS/DEIR is schematic in nature. As detailed plans and specifications are developed for relocation of Morrison Canal, specific impacts will be evaluated and mitigated as necessary.

17

Henningsen, Sarah

From: Bassett. John (MSA) [bassettj@SacCounty.NET]
Sent: Monday, August 16, 2010 9:51 AM
To: Dunn, Francine; Henningsen, Sarah
Subject: FW: Levee Comments.doc
Attachments: Levee Comments.doc

From: CandeeR@saccourt.ca.gov [mailto:CandeeR@saccourt.ca.gov]
Sent: Monday, August 16, 2010 8:49 AM
To: Elizabeth.g.holland@usace.army.mil; Bassett. John (MSA)
Cc: tbarth@bttlawfirm.com
Subject: Levee Comments.doc

Ms. Holland and Mr. Bassett,

Attached are my comments on the DEIS/DEIR. I am also putting a hard copy in the mail today addressed to Ms. Holland.

Thanks for the opportunity to comment.

Roland L. Candee

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1

August 12, 2010

Elizabeth Holland, Planning Division
USACE, Sacramento District
1325 J Street
Sacramento, CA 95814

Subject: Comments on July 2, 2010 Draft EIS/EIR; American River Watershed Common Features Project/Natomas Post-Authorization Change Report/Natomas Levee Improvement Program, Phase 4b

Dear Ms. Holland,

My name is Roland L. Candee and I live on the Garden Highway in Sutter County. I object to the U.S. Corps of Engineers giving permission to SAFCA to proceed with the project, via previous authorization(s) or via any new authorization(s). It is obvious that the whole approach is flawed for reasons set out in detail in my previously submitted written comments, all of which are incorporated herein by reference. I7-1

For example, the project as it relates to the Natomas Levee has been pushed through in pieces under a claim that somehow each segment has "independent utility" – all this directly in the face of people such as myself pointing out that pieces of this project as it relates to the Natomas Levee raising have no more independent utility than one wall to a bathtub has independent utility. It now appears that the Natomas Levee raising project will not be completed anytime in the near future because of funding issues, leaving levee waterside land owners such as myself receiving all of the burdens without any complete flood protection flowing to the Natomas Basin. This approach makes a mockery of 40 C.F.R. Section 1508.25's requirement that an agency consider the effects of connected actions within a single EIS. Would the SAFCA board really have approved moving forward originally if they knew there was not enough money to complete the project? It seems perfectly realistic that the SAFCA board would have looked to expend resources on projects that could realistically be completed and not go after projects that couldn't realistically be completed. An obvious place to potentially spend less money to get to the same result would have been to lower the elevation of the Fremont Weir, taking pressure off the portion of the Sacramento River in issue with the Natomas Levee raising project. I7-2

For another example, pushing the project through in stages makes it effectively impossible for a member of the public (such as myself) to track all of the various issues and positions that a public agency such as SAFCA has taken. I went to SAFCA's offices and asked for a hard copy of this latest draft EIS/EIR so that I could try and compare what is currently written with three or four prior EIS/EIR documents and I was told the materials are only available on CD. While I appreciate the volume, I simply don't have the time or manpower available to personally print out everything and go through the comparison of the multiple voluminous documents. If the agencies had followed the legal requirement that all of the effects of connected actions be tracked within a single EIS, then I would not be left in an effectively impossible situation to accomplish a review. I could look at one document and see what, if anything, I needed to comment on. I7-3

For another example, what is the real target for how high the Natomas Levee must be raised? Prior environmental documents took the position that the needed levee height was up to three feet higher than the current Garden Highway levee elevation. I now read in your latest document that the "up to three feet higher" amount is not sufficient and the target has moved to a standard that is expressed as the 200 year flood elevation plus three feet of elevation plus an allowance for wave run-up plus an additional foot for climate change. While I do not believe that any judicial officer will have any trouble ultimately reaching the obvious conclusion that raising the levee shifts the risk of flooding from those inside the basin to those immediately outside the levee, the process of submitting this large project through in various pieces for review creates many legal issues. Would the SAFCA board really have approved moving forward originally if they knew the levee raising was going to need to immediately be followed with a subsequent project to raise the levee even higher? The obvious answer is that the SAFCA members are rational thinking, serious board members who would have been bothered by an approach that effectively damned waterside levee residents such as myself to multiple levee raising projects one after another. I7-4

Even past the consideration of inappropriately approaching this as multiple independently viable levee raising projects, the Attachment 5 to the Natomas Post-Authorization Change Report is very relevant in revealing the absurdity of taking the position, as the SAFCA board has done, that raising the levee doesn't transfer flood risk to the property of waterside land owners such as myself. If I have properly read the analysis (and I must concede that I7-5

it is confusing as written), then it appears that SAFCA is now taking the position that they (SAFCA) can legally proceed with post-authorization changes as long as there are not hydraulic impacts on the river beyond those previously authorized. Hence, despite the current admission that up to three feet of levee raise isn't going to be enough (i.e., the needed raise has gone to three feet above the 200 year flood level plus an allowance for wave run-up plus one foot for climate change), the post-authorization change report can go through and be approved because SAFCA is not technically asking for authority to raise the Natomas Levee beyond the "up to three feet" previously approved. Ironically, the reasoning as expressed in the position paper focuses on levee height as the obvious main criteria that triggers a transfer of risk and a requirement of mitigation/inverse condemnation acknowledgment. The specific language contained in the position paper notes that "(f)ix-in-place levee improvements that do not change the geometry of the hydraulic cross section, **including existing levee height** (emphasis added), would not effect the flood event hydrograph." Additional language notes that "there is no requirement for mitigation for improvements **that do not raise the height of the levee** (emphasis added)." The position paper admits that raising the levee would be "a transfer of risk of flooding from the project area to another area." How can SAFCA now admit that raising the levee is a fundamental transfer of risk yet when this levee raising was originally approved, no transfer of risk for the "up to three feet" of levee raise was ever acknowledged? The obviousness of this levee raising equals condemnation/transfer of risk tie is further revealed in the fact that this draft EIS/EIR justifies no condemnation/transfer of risk on the American River portion of the overall project specifically on the grounds that there is no raise in the height of the levee! I7-5 (Con't.)

The current draft EIS/EIR appears to continue to concede that the numbers show a rise in the river elevation level in the vicinity of my property as a result of the project, albeit a small amount and under flood conditions. I continue to object to SAFCA's choosing originally to use a .1 foot standard as an apparently claimed de minimis amount of rise in elevation when the true standard is that development must not cause any rise in base flood elevation levels. I continue to object to SAFCA apparently then changing the de minimis amount to fit with what modeling shows is present under a 500 year flood event. Even if a court allows an agency to get away with setting a de minimis standard, that agency should not be allowed to later change the chosen de minimis standard amount. 500 year flood events do happen. I also note that even if some de minimis standard is I7-6

used, there is no way to avoid the fact that the Natomas Levee project as actually constructed is now revealed to include moving and raising the Garden Highway in the vicinity of where Sankey Road has been relocated to intersect with the Garden Highway just south of where the Natomas Cross Canal joins the Sacramento River. Where the Garden Highway originally ran has now been obliterated, but it appears to me that the actual levee height is, in places, well over six feet higher than the height of the original Garden Highway and the relocation of the Garden Highway to the east is an obvious change in the hydrology of the Sacramento River channel just upriver from my property. Such actual changes to the hydrology should logically require SAFCA to admit that the project inversely condemns my property. I7-6 (Con't.)

It is now obvious that water will be added to the channel via several drains that are already in place just north (upstream) from my property. The size of the drains is obvious and can be readily measured. Surface water that previously flowed away toward the inland side of the Garden Highway is now to be directly added to the Sacramento River just north of my property. The prior SAFCA engineer, Joe Countryman, assured the SAFCA board that there was no valid claim being presented by waterside land owners because "not a drop of water" was to be added to the river. One of the SAFCA board members, on the day SAFCA approved moving forward with the levee raising project, publically told the waterside land owners present at that meeting that our claims were not being recognized by SAFCA because "not a drop of water" was to be added to the channel. Now we subsequently find out that 23 drains' worth of surface water is being directly added to the channel. Would SAFCA have authorized proceeding in the manner previously approved by SAFCA if SAFCA board members had not received the express assurance of staff that "not a drop of water" was being added to the river? With the benefit of hindsight, it is clear this "not a drop of water" argument was simply a way (now admittedly not based on true facts) to deflect the board's thinking away from the obvious transfer of risk that comes with raising the levee. I7-7

A prior comment submitted a couple of years ago (July 2008) resulted in SAFCA taking the position that *Orpheum Building Company v. San Francisco Bay Area Rapid Transit District* (1978) 80 Cal.App.3d 863, 871, was SAFCA's legal authority for taking the position that there is no claim for inverse condemnation of my property present under these facts. *Orpheum* involved a situation where the absence of any trespass was stipulated to by the parties at trial, there was no physical entry onto the I7-8

property during construction, there was no contemplation that the project would result in physical invasion of the property in the future, and the jury heard the evidence that there was a special benefit of a value of over $100,000 (proximity to a new BART station) that flowed to the property as a result of the project. Those are not the facts present here in regard to my property and the Natomas Levee raising. There will not be a stipulation of "no trespass" when my case is tried. In fact, I have photos showing that the construction has included physically placing a monitoring box on my property, an actual trespass that I would expect SAFCA to admit and acknowledge as being a physical entry onto my property during construction. Additionally, the data shows that my property will be subjected to more frequent flooding with flood levels elevated, albeit in small amounts if the SAFCA data is to be believed, from the prior pre-project status quo. And I do not believe that there is any special benefit of any nature that flows to my property as a result of the project.

If, as I contend the evidence shows, my property is being effectively inversely condemned, then I am entitled to be compensated as required by law. My belief is that SAFCA's delay in acknowledging the inverse condemnation has significantly increased my damages. An argument can be made that the date of the take is no later than the date SAFCA's board originally authorized the project to proceed. I believe my immediate neighbor had his property on the market at the time of the SAFCA original board action for approximately $1.7 million. That property has remained on the market for almost the entire time since the original SAFCA board action and is now on the market for less than $1 million. The levee project's existence appears to be the obvious answer for why the property hasn't sold. I7-8 (Con't.)

Under the circumstances, as a minimum, any permission, permits, or authorization granted by the U.S. Army Corps of Engineers allowing the Natomas Levee project to proceed should require SAFCA to admit that the property of myself and my neighbors who live on the waterside of the current Garden Highway in areas where the levee is being raised is being inversely condemned and SAFCA should proceed as required by law in an inverse condemnation situation.

Roland L. Candee
10411 Garden Highway
Sacramento, CA 95837

Letter	
I7	**Roland L. Candee**
Response	**August 16, 2010**

I7-1 See responses to comments I7-2 through I7-8.

I7-2 USACE and SAFCA have prepared the NLIP environmental documents, including the DEIS/DEIR, in accordance with NEPA and CEQA, in particular the tiering provisions (see Section 1.5, "Environmental Regulatory Framework and Relationship of this EIS/EIR to Other Documents," of the DEIS/DEIR). USACE and SAFCA have strived to ensure that the NLIP environmental documents are understandable to decision makers and to the public, while still containing the level of detail necessary for a robust and technically adequate analysis aimed to withstand legal scrutiny. To help facilitate clarity, the NLIP environmental documents, including the DEIS/DEIR, include numerous plates, tables, and formatting considerations that explain and illustrate the relationship of the Phase 4b Project to the entire NLIP.

As explained in Section 1.1.1, "Scope of Environmental Analysis," of the DEIS/DEIR, the DEIS/DEIR is tired from and incorporates by reference the previous NLIP environmental documents. As explained in Sections 1.5.1, "National Environmental Policy Act," and 1.5.2, California Environmental Quality Act," of the DEIS/DEIR, this approach is encouraged by both NEPA (see, e.g., CEQ Regulations, 40 CFR Section 1500.4, 1502.21) and CEQA. CEQA requires tiering whenever feasible as determined by the lead agency, and authorizes lead agencies to treat large and complex, phased projects first in a general program-level analysis and then analyze subsequent actions within the program at a project level of detail while incorporating by reference (see California PRC Sections 21068.5, 21093, 31094). CEQA provides numerous alternative ways to accomplish the purposes of tiering (see, e.g., the State CEQA Guidelines CCR Sections 15152, 15157, 15168, 15385; see also CCR Section 15150 [incorporation by reference]). Thus, by tiering, the environmental effects associated with an entire suite of related actions are analyzed to the extent possible in a program-level document, and then specific actions within the program are analyzed at a project level when sufficient detail exists to perform project-level analysis.

USACE and SAFCA analyzed the impacts of the entire NLIP, including cumulative impacts, in the Phase 2 EIR (SAFCA 2007) and Phase 2 EIS (USACE 2008). Because this very large project is a phased project, as disclosed in the Phase 2 EIR and EIS, subsequent documents analyze the impacts of the Phase 3, 4a, and 4b Projects. Because USACE and SAFCA considered the impacts of the Phase 4b Project, incorporating by relevant program-level analysis by reference as authorized by NEPA and CEQA, USACE and SAFCA have considered the entirety of the Phase 4b Project and its relationship to the larger NLIP, of which it is a project phase, in the manner expressly provided for by NEPA and CEQA. The DEIS/DEIR, and all previous NLIP environmental documents, examined the cumulative effects of the NLIP and the Phase 4b Project consistent with the requirements of NEPA and CEQA. Because the effects of the entire NLIP have been disclosed in program-level documents, and the impacts of the NLIP and project phases have been analyzed in relation to the cumulative context, there is no factual basis to support the contention that the NLIP has in any way been piecemealed or segmented.

The comment regarding the methods for project funding is not a comment on the DEIS/DEIR. If there is insufficient funding for the Phase 4b Project, it will not be built and the identified environmental impacts will not occur.

The proposed alternative that would provide flood control by increasing flooding of the Yolo Bypass previously was considered and rejected as infeasible. See Section 2.1.5, "Alternatives Considered, But Eliminated from Further Consideration," and Appendix B1 of the DEIS/DEIR.

I7-3 See response to comment I7-4. See also response to comment O4-1.

I7-4 The comment suggests that the target elevation for minimum levee heights in Natomas (i.e., 200-year flood elevation plus three feet of freeboard) has changed. This comment is supported by reference to the following statement in the Natomas PACR (page 2-12):

> [t]he State has established a preliminary draft of a standard for urban flood protection in California. This standard would require levees to have a top elevation equal to the mean 200-year water surface profile, plus three feet of freeboard, plus an allowanee for wave run-up, plus one foot to account for climate change.

This "preliminary draft standard" is not being used in Natomas, where the target elevation for minimum levee heights remains the 200-year flood elevation plus three feet of freeboard. This is made clear in the Natomas PACR (page 4-9) which states,

> [i]n establishing the design levee crown profile, a freeboard of three feet above the 200-year design water surface elevation or the existing levee crown elevation profile (whichever is higher) was used by SAFCA…Wind and wave run-up and setup were evaluated and detennined to be contained within freeboard…

I7-5 As noted in response to comment I7-4, there has been no change in SAFCA's design levee crown profile for the NLIP. As discussed in Section 4.5.2, "Impacts and Mitigation Measures," of the DEIS/EIR, raising the levees to achieve this design standard would have no significant effect on water surface elevations in the Sacramento River channel in the vicinity of the NCC. Table 4.5-4 in the DEIS/DEIR compares existing conditions to conditions with the Phase 4b Project in place, and indicates a net change of 0.01 feet for the 200-year flood with or without levee failures upstream or across from Natomas. For the 500-year flood, Table 4.5-8 in the DEIS/DEIR indicates the change would be 0.03 assuming levees upstream or across from Natomas fail when overtopped. This is a reasonable assumption considering that the over topping would affect over 33 miles of levee as indicated in Table 4.5-2 in the DEIS/DEIR.

I7-6 See responses to comments I7-4 and I7-5. As discussed in Section 5.1.5.15, "Visual Resources," of the DEIS/DEIR, levee sections in up to 15 locations along the Sacramento River east levee would be raised an additional 2–4 feet beyond the design levee crown profile to accommodate project features such as pipeline crossings and roadway intersections. For example, the text notes that:

> Where Sankey Road intersects Garden Highway in Reach C:1, the adjacent levee, which was constructed in 2009 as part of the Phase 2 Project, is an additional 3–4 feet higher for a length of approximately 40 feet, with 100–150-foot-long transitions on both sides back to the typical adjacent levee profile.

These undulations were taken into account in the hydraulic modeling and impact analyses referenced in the responses to comments I7-4 and I7-5. The contention that the "true standard" for hydraulic impact analysis is "that development must not cause any rise in base flood elevation levels" was addressed in responses to comments made by the commenter in connection with the Phase 4a Project (see response to comment I4-2 in the Phase 4a FEIS). There it is noted that "[t]he Sacramento County Floodplain Management Ordinance…states that…0.1-foot change in base flood water surface elevation shall be considered to be zero impact."

See also response to comment I7-8 regarding inverse condemnation.

I7-7 The total peak discharge to the Sacramento River from for all proposed storm drains (Station 0+00 to Station 665+00) is estimated to be 104 cfs. This is a small fraction of the flow carried by the river channel, which is in excess of 110,000 cfs, and would have no measurable effect on water surface elevations in the channel.

I7-8 See response to comment O4-16 regarding NEPA and CEQA requirements to analyze economic effects.

In the example given by the commenter, the monitoring box is within the street right-of-way, which will be confirmed by SAFCA. The monitoring box is for noise and vibration monitoring for the Phase 2 Project, as required by Mitigation Measure 3.12-a, "Implement Noise-Reducing Construction Practices, Prepare a Noise Control Plan, and Monitor and Record Construction Noise Near Sensitive Receptors," in the Phase 2 EIR. The box will be in its current location temporarily, until the end of the construction season. Therefore, there are no reasonably foreseeable economic effects on the commenter's property. With regard to whether the commenter's property will be subject to increased flooding as a result of project implementation, see responses to comments I7-4, I7-5, 7-6, and I7-7.

The NLIP will, in fact, benefit properties on the waterside of Garden Highway, like the commenter's, by preserving trees and encroachments because construction of the adjacent levee will allow these encroachments to remain in place, and by reducing the likelihood that the levee will fail and cut off access to those properties. As an additional benefit, the new levee-top roadway will have improved safety for drivers who use it for access.

To the extent that property must be acquired to implement the Phase 4b Project, USACE and SAFCA would comply with all applicable legal requirements.

I8

Keith M. Seegmiller
2598 Garden Highway
Sacramento, CA 95833

16 August 2010

Mr. John Bassett, Director of Engineering
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814

Subject: Draft EIS/EIR
NLIP, Phase 4b

Ref.: APN 225-0210-022-0000

Dear Mr. Bassett:

The following comments relative to the Subject Draft EIS/EIR are submitted in accordance with the procedures stated on page ES-23 of the DEIS/DEIR.

Specifically, these comments address certain issues and certain potential mitigation measures applicable to landside properties situated in Reach 16 and the Southern portion of Reach 15. Within this area there are at least five -- and possibly an additional one or two-residential properties. (Since I have not yet had the opportunity to discuss these matters with my neighbors, I am presently speaking only for myself.) I8-1

1. The entire NLIP Project has as its objective preventing potentially catastrofic consequences resulting from what are - BY DEFINITION - episodic flooding events. Since I have lived in my home on Garden Highway - for thirty-three years - such events have happened only twice -- 1986 and 1997.

2. In my reading of the Subject DEIS/DEIR, I have not found any discussion of of the installation of "Relief Wells." If I am mistaken, I would appreciate being directed to the appropriate sections of The DEIS/DEIR. (I am referring, of course to "Relief Wells"relative to Reaches 15 and 16.) I8-2

3. My understanding is that, within Reaches 15 and 16, both active alternatives involve the construction of "barrier walls." ... PLUS the creation of * an "adjacent levee" AND untold hundreds of thousands of cubic yards of soil for multiple acres of "berm" to a possible depth of nine feet. I8-3

4. I believe that "Relief Wells" (in addition to a barrier wall and a single "Adjacent levee") are much more effective in mitigating the results of episodic flooding than millions of tons of dirt built on the assumption that tonnage will sufficiently compress the underlying soils to prevent underseepage. I8-4

* Not true for the "Fix-in-Place" alternative

SAFCA '10 AUG 16 PM2:26

--Ongoing, annual well maintenance and repair work for the "Relief Wells" can be billed/assessed to the beneficial properties (in lieu of the up-front capital costs of property acquisition and dirt hauling).

-- On Garden Highway, we are familiar with the operation of domestic water wells and the expenses of maintaining them. (We are also familiar with the deeper water supply wells drilled by the local farmers into the natural water table for irrigation water.) In 33 years, I believe I have had occasion twice (maybe three times) to do underground well maintenance -- and that for 24/7/365 water service. (I understand that the "Relief Wells" would be significantly deeper, which could entail higher maintenance charges.)

I8-4 (Con't.)

-- In other words, please deal with the potential problems of "underseepage" WHEN THEY OCCUR! Remove the water. Don't just pile tonnage of dirt on top of the existing soils.

5. In addition, I am the custodian of five (5) Heritage Oaks on my property. I believe that some significant consideration should be given to preserving these trees. An extensive "berm" - to the depth of nine feet -- would clearly kill them. I8-5

6. I have been a participant in a few informal conversations concerning the possibility/feasibility of installing such "Relief Wells" along this stretch of approximately one-half mile. I have not yet been aware of any in-depth analysis/consideration of this alternative for this location. I8-6

(Again, if I am mistaken, please direct me to the appropriate documents.)

I respectfully request that detailed consideration and analysis of the alternative of (1) Adjacent levee, (2) barrier wall**, and (3) Relief Wells be given thorough consideration -- in consultation with the affected property owners. I8-7

Respectfully submitted,

Keith M. Swanwick

** I also remember that a (INADEQUATE) barrier wall was constructed along this portion of Garden Highway in the late 1980s &/or early 1990s.

Letter I8 Response	Keith M. Seegmiller August 16, 2010

I8-1 See responses to comments I8-2 through I8-7.

The Phase 4b Project objectives are described in Section 1.4, "Project Purpose/Project Objectives and Need for Action," of the DEIS/DEIR.

I8-2 The footprint for levee improvements that are proposed to be constructed in Sacramento River east levee Reach B:15 are described in the Phase 4a EIS/EIR. Final design is ongoing for this project phase, and the exact locations of relief wells, if any, have not been finalized.

For Sacramento River east levee Reach B:16, Table 2-2 in the DEIS/DEIR notes that relief wells are a potential element. Relief wells would be constructed at selected locations where berms cannot be wide enough or cutoff walls deep enough to meet the required design parameters for seepage remediation. The need for relief wells in Sacramento River east levee Reach B:16 would be determined during final design. Each of the seepage remediation methods, including relief wells, are discussed in Section 2.1.3.2, "Seepage Remediation," of the DEIS/DEIR.

I8-3 Comment noted. See Chapter 2, "Alternatives," of the DEIS/DEIR.

I8-4 Comment noted. See response to comment I8-2.

I8-5 Impact 4.7-a, "Loss of Landside and Waterside Woodland and Shaded Riverine Aquatic Habitats," of the DEIS/DEIR addresses loss of oak woodland, including Heritage oaks. Table 4.7-2 in the DEIS/DEIR provides an estimate of the acreage that would be lost if the maximum levee improvement footprint (see Plates 2-7a and 2-7b in the DEIS/DEIR) were to be constructed. A woodland compensation plan is described in Section 2.3.4.2, "Woodland Compensation," in the DEIS/DEIR and this impact is also addressed by Mitigation Measure 4.7-a, "Minimize Effects on Woodland Habitat; Implement Woodland Habitat Improvements and Management Agreements; Compensate for Loss of Habitat; and Comply with Section 7 of the Federal Endangered Species Act, Section 2081 of the California Endangered Species Act, and Section 1602 of the California Fish and Game Code," of the DEIS/DEIR.

I8-6 See response to comment I8-2.

I8-7 See responses to comments I8-1 through I8-6.

I9

2342 Swainson Way
Sacramento, CA 95833
rjjohnson916@yahoo.com

August 16, 2010

John Bassett, P.E.
Director of Engineering
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814

Dear Mr. Bassett,

RE: Natomas Levee Improvement Program Phase 4b Landside Improvements Project

Subject: Draft EIS/EIR Comments

I am a homeowner within the River Oaks Community Association (ROCA) and my property is located within 800 feet of Garden Highway. After review of the Draft Environmental Impact Statement/Draft Environmental Impact Report dated July 2, 2010, I have several concerns that carry over from my comment letter based on my review of the NOP. I9-1

- **Power pole relocation** (page 2-30)- Relocating power poles to the waterside of the existing levee is acceptable, but it is preferred that they be undergrounded and placed at shallow depths above the 0.005 AEP flood surface elevation similar to the reconstructed pump station discharge pipes. Any above grade facilities can be placed on either side of the road. Relocating the existing land side power poles from the top of the levee down to the bottom of the slope is not acceptable. These are a real eyesore to put into our neighborhoods that were built to specifically avoid these and are a serious concern. I9-2
- **Seepage berm, up to 250' wide in addition to the adjacent levee construction at Tim Lewis -**. It appears that the berm and its grade transitions will extend all the way to the sidewalk along Wheelhouse Avenue.
    - Confirm the treatment to the top of it. A combination of natural park to replace the lost trees in the grove at the west end with manicured park is desired, including incorporation of a community park which has been planned near the I-80 crossing.
    - Provide beautification at the 12' wide transition slope behind the sidewalk. Leaving the existing temporary ditch that is weed filled and a magnet for trash is unacceptable as a permanent solution. I9-3
- **Existing Bike Trail along Swainson Way** (Upper figure on Page 2-101)-
    - Widening the levee and removal of the existing walk/bike path along the south side of Swainson Way/Avocet Court is an unacceptable loss. This is a heavily used pedestrian route in our community, and this path provides an important access between the Shorebird and Warmington subdivisions. It in part acts as an informal extension of Shorebird Park. I9-4

- Utilization of the future bike trail at the top is unacceptable, replacement of this path at the levee toe elevation is a must.
  - There will not be sufficient access points to provide similar access between Avocet and Marina Glen.
  - Using said trail would not only be highly inconvenient given the grade differential, but it would also be unsafe given the proximity to the very high speed traffic on Garden Highway.
- The retaining walls proposed through here need to be further setback and the height increased in order to maintain a minimum 6' wide walk along this stretch.
  - The retaining walls must not be a plain masonry unit or similar construction, and a design which will not attract graffiti. Rockery (Parson's) stone gravity walls as used in Folsom would be acceptable as they are less prone to graffiti, and provide a natural blending that a masonry unit wall does not. Should masonry unit be used, veneers and other architectural details that match other walls in the development need to be used.

I9-4 (Con't.)

- **Shorebird Park** (Upper figure on Page 2-101)-
  - Shorebird Park must be reconstructed to replace any walks, trees, or other amenities removed or otherwise disturbed by the construction. Loss of the walk along the south side is unacceptable.

I9-5

- **City of Sacramento Pump 160**
  - The drive access from Garden Hwy must be reconstructed as needed. Access from the residential area to Garden Hwy is an important connection for this immediate neighborhood, particularly with the loss of the old driveways at Marina Glen.

I9-6

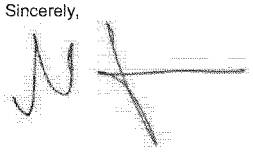
- **Access at W. River Drive/Wheelhouse Avenue**
  - This drive access from Garden Hwy must also be reconstructed as needed. This provides a key access from the residential area to Garden Hwy as well as to Sand Cove Park across the street from the access.

I9-7

Please incorporate these comments into your documentation. If you have any questions, please feel free to contact me via email or USPS mail.

I9-8

Sincerely,



Ronald Johnson, P.E.

Letter I9 Response	Ronald Johnson, P.E. August 16, 2010

I9-1 See responses to comments I9-2 through I9-8.

I9-2 Detailed engineering specifications, including the relocation of power poles, will be developed during final design. The options described by the commenter are still under consideration.

I9-3 Detailed engineering specifications will be developed during final design.

I9-4 The DEIS/DEIR addresses the potential environmental impacts of a worst-case levee improvement footprint. Approaches to avoiding encroachment on public facilities would be considered during final design. Mitigation Measure 4.13-c(1), "Prepare and Implement a Bicycle Detour Plan for All Bicycle Trails and On-Street Bicycle Routes, Provide Detours for Bicycle Facilities, and Coordinate with City and/or County Departments of Parks and Recreation to Repair of Damage to Recreational Facilities," requires coordination with local jurisdictions to restore access and repair or reconstruct any construction-related damage to bicycle facilities.

I9-5 See response to comment L5-4.

I9-6 See responses to comments L3-3 and L5-4.

I9-7 See responses to comments L3-3 and L3-4.

I9-8 See responses to comments I9-1 through I9-7.

PUBLIC HEARING

PH

Clerk:
Our next Item is a Timed Item:
Item 1 Public Hearing – Draft Environmental Impact Statement/Environmental Impact Report on the American River Watershed Common Features Project/Natomas Post-Authorization Change Report/Natomas Levee Improvement Program Phase 4b Landside Improvements Project

Tim Washburn:
Mr. Tretheway, Members of the Board, Tim Washbum, Director of Planning. This is a Public Hearing item, an opportunity for folks in the community to offer comments on the joint Environmental Impact Report/Environmental Impact Statement that was issued on July 2nd by the Corps, with the cooperation of the Central Valley Flood Protection Board and SAFCA. I am going to give some brief comments, take any questions the Board may have, and then ask you to open it up and take any comments that may be for the public.

So as the Board is aware, I mean this is the sixth environmental document that we have issued in the last three years. We started as you recall, in the beginning of 2007, with a program EIR that looked at the entire 200 year protection plan for SAFCA that was the basis for our forming the assessment. We followed up with a Project Level but also Program Level look at the Natomas Levee Improvement Program. Later in 2007, an EIS that complemented that document was issued at the beginning of 2008 and since then we have of course, issued two more Environmental Impact Reports and Environmental Impact Statements.

This is unprecedented, that we have been able to maintain this pace in analyzing these problems and proceeding with these documents through the process. And now we have arrived at a point where we believe this is the last document in the series, and it is a document that will cover the transition from the SAFCA led project, which is where we have been for the last three years, to the Corps coming on the scene and taking over the Project and commencing to construct the remainder of it.

So just to remind the Board, our environmental documents will bring us along and we've completed most of the Natomas Cross Canal. We have a substantial amount of the Sacramento River east levee done. We expect that we will be awarding a final contract on our part to carry us down past Powerline Road into the vicinity of Fisherman's Lake and from that point forward, we will hand the baton, by in large, to the Corps. So this document covers the elements of the Project that we have not yet evaluated in the five previous documents, at a level of detail and so that is the lower part of the Sacramento River east levee, essentially from San Juan Road down to I-5; the American River north levee from I-5 over to Northgate; and then

the upper part of the Natomas East Main Drain west levee, from Elkhorn up to Sankee Road. All other pieces of the perimeter were analyzed in prior documents, so this one focuses on those reaches and analyzes the impact of the Project there, but it also adds some elements that we've picked up from prior documents that weren't analyzed.

In particular, we are going to be re-aligning and altering the slope on the RD 1000 west drainage cannel from I-5 over to Fisherman's Lake. We are going to be doing some work along Pleasant Grove Creek Canal Levee that was not analyzed in prior documents, in particular, we have to either remove or improve five culverts that drain water from the Pleasant Grove area into Natomas and we still need to raise the Pleasant Grove Creek Canal levee slightly, about a foot, and we need to raise a portion of the Natomas East Main Dain west levee at the upper end, about a quarter mile or maybe a half mile.

The rest is levee strengthening. And so nothing that the Board hasn't heard about, cut-off wall construction where that is feasible, we do have to on the east side of the basin along the NEMDC west levee, probably widen that levee section because it is over steepened on the waterside and to be stable, it needs to be widened and that will require us probably to relocate Natomas East Levee Road and it should be noted, we are now going to be getting into a more heavily populated part of Natomas.

We have generally been operating in the northern and western part of the basin which is basically agricultural. As we get down the Sac River east levee, the parcels get smaller on the landside and for the first time, we will be confronting the challenges of improving the levee where there are urban subdivisions. And so this document foreshadows those challenges, evaluates those impacts and offers mitigation measures for the impacts that may result. We are going to most likely be removing a lot more landside trees. Those of you who have driven along the Garden Highway, in the Reach between the RD 1000 office and say down to the Arden/Garden, or say Northgate, there is a lot of trees at the landside tow of the levee there and this document suggests, analyzes and anticipates that those trees will have to be removed as part of the design of the Project, in order to flatten the back slope of the levee and in order to meet Corps requirements for maintaining Operation and Maintenance Roadways, at the toe of the levee.

Those trees will be mitigated within the corridors that we have been creating as part of our Project and also a substantial mitigation in the document, is anticipated in Lower Dry Creek where SAFCA and the City of Sacramento own substantial lands there, that will accommodate 40 to 50 acres of mitigation in Lower Dry Creek. But there will be trees taken out that are now close to where people now live and that will be a challenge for us.

We also face the challenge of dealing with all of the infrastructure that passes through and over the levees as you get into these urban areas: electrical/utility lines; natural gas lines; water mains; storm water facilities, these will pose major challenges to our design and construction capability and these also are analyzed in what we have referred to as the Phase 4b Document.

This is going to be a challenging part of the Project. We are happy that we have the Corps of Engineers to be able to step up to this challenge and of course we will assist them in every way we can. The purpose of this item is to appraise you of the issuance of this document, which occurred on July 2, and there is a 45 day document period that will remain open until August 16th. We will then quickly respond to any comments that we receive on the EIS/EIR and issue a Final EIS/EIR in the early part of September. It will go through a 30 day review process as is required under NEPA. We will then be required to respond to any comments we get on that Final document and bring this document to a position where it can be certified by this Board and approved by the Corps, toward the end of the year.

So that is the process going forward, this is an essential part of our bringing this Project forward for federal authorization and approval and for turnover to the Corps for construction. I would be happy to answer any questions you may have on the scope of this document.

Chairman Tretheway:
Okay I'll see if we have any questions at this time.
Mr. Shiels

John Shiels:
What is the Natomas Levee Class One Bike Trail Project?

Tim Washburn:
The, that project is a county sponsored project and the county, the Department of Transportation, specifically approached us and requested that we include in the description of the Project, the eventual construction of a bike trail on the adjacent levee that we are constructing around Natomas. We thought that was a reasonable request and so it is being included in the Environmental Document for environmental coverage. It is going to be up to the County of Sacramento, working with the City to advance that project forward in terms of actual permitting and construction.

John Shiels:
So we are not expecting to spend any, commit any funds…

Tim Washburn:
No, it is not in the SAFCA NLIP, it is an additional project that the County and the City would sponsor.

John Shiels:
Okay. I want to be sure that if that project goes forward, that it is understood that there are conditions that RD1000 has, that must be met.

Tim Washburn:
Yes, I think we have gained some valuable experience in building the WYDA Bike Trail on the NEMDC west levee. I think we have some experience and background to, to go from there.

John Shiels:
Thank you.

Chairman Tretheway:
Are there any other questions? Tim --this is the second public hearing?

Tim Washburn:
Yes, we had a Public Hearing in the South Natomas Community Center on Tuesday. There will be another one on the 21st I believe, a 3rd Public Hearing.

Chairman Tretheway:
And that is at the County Board of Supervisors?

Tim Washburn:
Yes.

Chairman Tretheway:
The one on Tuesday, what -- anyone show up and any comments?

Tim Washburn:
To be honest, it was not a very large turn out of the public. No. Now I should say, we have by direct mail notification, notified 900 property owners in the footprint of this Project, along the Garden Highway, on both sides of the Garden Highway, and the lower Sacramento River and along the American River north levee. So I don't know whether that suggests that people haven't paid attention to the notice or aren't interested or not sure.

Chairman Tretheway:
Well, it is only 700 pages, right? Okay we have no body signed up today to speak?

Clerk:
That's correct.

Chairman Tretheway:
Anybody? It is an opportunity to fill out the form and speak? Okay sign up afterwards - just introduce yourself and then ... can we help him get a sign up sheet

Clerk:
There is one on the lecturn.

Tim Washburn:
If you would open the Hearing, then we will record the statement

Chairman Tretheway:
Okay, so the Public Hearing is now open.

Phil Perry:
Very good. My name is Phil Perry. I am a resident that lives within about a block of the levee in the Bree/Sisto Rio Development. My property abuts the Reclamation District slough that goes to Pumping Plant 1. PH-1

Couple of concerns, I have not read the whole document, shame on me. What I do notice is the impact that it is going to have on our local area, just as a taxpayer it is a little concerning that we went through a levee improvement project years ago and that seems to have gone for not. So I apologize if I am somewhat reluctant to endorse this project as a local homeowner because I have already gone through this a few times and just recently when, and it kind of concerns me that we just recently filled in the area where the pumping plant is and looking at the document, it would appear that much of that will be taken apart again because they are going to have to raise all of the outlet pipes up and over the levee at the location. PH-2

According to the EIR, the original pumping – or I guess its 2, Number 2, which is in the old building. A lot of those pumps are going to have to be taking out they are going to have to make higher output because they are going to have to get more of a head to get up and over the levee. Strikes me as that is something that could have been looked at when they were filling in the slurry wall that they hadn't completed.

Those are the kind of things that cause me to doubt that this is being viewed in the most strategic way. The trees obviously it is quite sad the idea that one of the reasons I moved to the area is the bucolic look of it and that is going to be stripped clean. We're going to have basically a straight levee that is on La Lima Way there that now we have a number of wonderful trees. The park that is down the street, PH-3

down by Chevy's, I would imagine, that will lose a large portion of trees and it just kind of changes the look of the place. PH-3 (Con't.)

It seems there would be better and cheaper ways to do this, considering the improvements that have been made up river, considering the other improvements that have been made. I just want the Board to ensure they are looking at this as the most cost effective way of actually doing these repairs and make it safe. I also realize that I am also in a quite small minority, because I think you would find that anybody that lives much further away from the levee than I do, doesn't give a darn that it is going to be stripped clean. PH-4

They, there for the first time they started paying flood insurance. I have been paying it for 21 years living over there. It was very nice when it was down to $300 a year, this year we're up to a grand this year and next year we should be down to $300 again, so it's a pretty good deal. The people that live in the interior, that haven't been paying flood insurance, I feel for them, but it's a fairly small price. I am just asking that you guys look at this closely. I realize this is a comment period and I also understand that comments just basically get in the record. I am not sure really what kind of impact it has on the EIR in any way shape or form, thank you. PH-5

Chairman Tretheway:
Thank you Mr. Perry. I do believe I can share with you that your comments that are germain to the EIS/EIR will be replied to in the Final draft. Correct? As is every public comment either written or oral. Stein.

Stein Buer:
I would like to supplement Tim's very good summary by reminding the Board and the public that the document casts an envelope of likely maximum environmental impacts and we will be working with the community, people like Mr. Perry and others, to minimize impacts wherever we can. And we will look at each and every structure to see if there are ways that we can minimize the additional work that needs to be done.

I would also like to mention, overtime, standards have changed. And the work that has been done before has certainly been very effective in improving the level of flood protection in the basin, a comparison of 1986 and 1997 show that we solved the huge problem of water seeping through the levee and causing the backside to erode, but the standards have changed and we have to meet those new standards to maintain or regain our accreditation.

So it is a moving target. And we will always be working on these levees and it can be frustrating that we are back out there over and over again, but that is really the

nature of this system, we will always be working on these levees one way or another to make them better.
Thank you very much.

Chairman Tretheway:
Thank you.
Mr. Gallagher.

James Gallagher:
Yeah, one thing I wanted to add, as another important component of this EIS, is the issues with the Pleasant Grove Creek Canal and a lot of you have been on this Board for a long time, so you know there have always been some issues and impacts to the Pleasant Grove area, in Sutter County. So I know staff has already been very much working with that community, and I know that is a priority for me as well. I know this Board we want to ensure we are good neighbors and that we are working with all these communities that are in some ways impacted by this Project. This Project is a necessity, we are all here to make sure it happens, but we all want to make sure that we address those impacts as they arise.

I do want to thank Stein and staff for working on that issue, and I know as we continue to work through the process, I think we can find a way to ensure that those impacts are fully mitigated.

Stein Buer:
In fact, we do have a Public Meeting scheduled for August 4th, in the Pleasant Grove Creek area. We don't have a location yet, but the last one is not the 21st, it is August 4th, for a total of four Public Meetings on this issue, so those people in that particular area will have a convenient way to express their concerns and learn more about the project.

Chairman Tretheway:
I want to thank James for taking a leadership role up in that community. We'll button this one up finally. Do we need to close Public Hearing? It says information only

So we need to close public hearing with a motion.

Virgina Moose:
So moved.

John Shiels:
Second.

Chairman Tretheway:
Second by Mr. Shiels. All in favor please say "aye"

All:
"I"

Chairman Tretheway:
Any noes or abstenstion?
Thank you.

Letter PH Response	Public Hearing Excerpt of Board of Director's Meeting July 15, 2010

PH-1 Comment noted.

PH-2 The DEIS/DEIR provides analysis of the maximum environment impacts that could occur under the Phase 4b Project. If Congress authorizes the Phase 4b Project, SAFCA and USACE will prepare the detailed plans and specifications to minimize impacts to existing structures.

PH-3 See response to comment I4-5.

PH-4 See response to comment I4-4.

PH-5 Flood insurance requirements and rates are not determined by USACE or SAFCA. The Federal Emergency Management Agency defines AE zones as areas with a 0.01 annual exceedance probability of flooding. The designation requires mandatory flood insurance purchases by homeowners.

References

Buck, Peter. Natural Resources Supervisor. SAFCA, Sacramento, CA. October 27, 2009—email to Marianne Lowenthal of AECOM regarding previous woodland planting success rates.

Sacramento Area Flood Control Agency. 2009 (October 23). *Construction Specifications for the: Natomas Levee Improvement Program Phase 2 Woodland Corridor Mitigation and Enhancement Project Contract 4043.* Prepared by EDAW/AECOM, Sacramento, CA.

U.S. Army Corps of Engineers. 1957 (August 1). Design Memorandum No. 2, Sacramento River Flood Control Project. California, CA.

APPENDIX I

Responses to Comments on the DEIS/DEIR

APPENDIX I
RESPONSES TO COMMENTS ON THE DEIS/DEIR

This appendix contains the comment letters received on the Phase 4b DEIS/DEIR, including transcribed comments received during the July 15, 2010 public hearing[1], and USACE's and SAFCA's individual responses to significant environmental issues raised in those comments. Each letter, as well as each individual comment within the letter, has been given a number for cross-referencing. Responses are sequenced to reflect the order of comments within each letter. **Table I-1** lists all parties who submitted comments on the Phase 4b DEIS/DEIR during the public review period.

Table I-1
List of Commenters

Letter #	Commenter	Date of Comment	Page Number
Federal Agencies (F)			
F1	U.S. Department of the Interior, Office of the Secretary, Office of Environmental Policy and Compliance, Pacific Southwest Region	August 9, 2010	I1-5
F2	U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Sacramento Area Office	August 9, 2010	I1-7
F3	U.S. Environmental Protection Agency, Region IX	August 16, 2010	I1-18
Tribal Government (T)			
T1	Shingle Springs Rancheria	July 21, 2010	I1-29
State Agencies (S)			
S1	State of California – The Resources Agency, Central Valley Flood Protection Agency	July 27, 2010	I1-37
S2	California State Lands Commission	August 12, 2010	I1-40
S3	State of California Department of Transportation, District 3 – Sacramento Area Office	August 17, 2010	I1-43
S4	Governor's Office of Planning and Research	August 17, 2010	I1-46
Local Agencies (L)			
L1	Sacramento Metropolitan Air Quality Management District	August 2, 2010	I1-51
L2	Sutter County Community Services Department	August 13, 2010	I1-57
L3	City of Sacramento Department of Transportation	August 16, 2010	I1-61
L4	Feather River Air Quality Management District	August 16, 2010	I1-72
L5	City of Sacramento Department of Parks and Recreation	August 16, 2010	I1-75
L6	Sacramento Regional County Sanitation District	July 20, 2010	I1-87
Organizations (O)			
O1	Sacramento Area Bicycle Advocates	August 13, 2010	I1-91
O2	Save the American River Association	August 16, 2010	I1-96

[1] In addition to the July 15 public hearing, three additional public meetings were conducted during the Phase 4b DEIS/DEIR public review period: July 13, 2010 at the South Natomas Community Center; July 21, 2010 at the Sacramento County Administration Building; and August 4, 2010 at the Pleasant Grove School. No formal comments were received at these three public hearings.

Table I-1 List of Commenters			
Letter #	**Commenter**	**Date of Comment**	**Page Number**
O3	Sacramento Tree Foundation	August 16, 2010	I1-99
O4	Garden Highway Community Association	August 17, 2010	I1-104
Businesses (B)			
B1	KVIE	July 14, 2010	I1-125
Individuals (I)			
I1	Jorge Jimenez, Ph.D., and Ron Selge	July 7, 2010	I1-131
I2	John Perry, Perry Farms Diversified Farming	July 28, 2010 and August 12, 2010	I1-136
I3	Imogene W. Amrine	July 28, 2010	I1-142
I4	Philip Day Perry	August 4, 2010	I1-146
I5	Melvin Borgman	August 15, 2010	I1-149
I6	Charlotte Borgman, C. Morrison Ranch	August 16, 2010	I1-153
I7	Roland L. Candee	August 16, 2010	I1-156
I8	Keith M. Seegmiller	August 16, 2010	I1-165
I9	Ronald Johnson, P.E.	August 16, 2010	I1-168
Public Hearing (PH)			
PH	July 15, 2010 Public Hearing	July 15, 2010	I1-173

FEDERAL AGENCIES

F1

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
Pacific Southwest Region
1111 Jackson Street, Suite 520
Oakland, California 94607

IN REPLY REFER TO:
ER# 10/599

Electronically Filed

9 August 2010

Elizabeth Holland
Planning Division
U.S. Army Corps of Engineers
1325 J Street
Sacramento, CA 95814

Dear Ms. Holland:

The Department of the Interior has received and reviewed the DEIS for the American River Watershed Common Features Project/Natomas Post-Authorization Change Report/Natomas Levee Improvement Program, Phase 4b Landside Improvements Project in Sacramento and Sutter Counties, CA and has no comments to offer. F1-1

Thank you for the opportunity to review this project.

Sincerely,

Patricia Sanderson Port

Patricia Sanderson Port
Regional Environmental Officer

cc:
Director, OEPC

Letter F1 Response	United States Department of the Interior, Office of the Secretary, Office of Environmental Policy and Compliance, Pacific Southwest Region Patricia Sanderson Port, Regional Environmental Officer August 9, 2010

F1-1 Comment noted.

F2

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Sacramento Area Office
650 Capitol Mall, Suite 8-300
Sacramento, California 95814-4706

AUG - 9 2010

Elizabeth Holland
Planning Division
U.S. Army Engineer, Sacramento District
1325 J Street
Sacramento, California 95814

Dear Elizabeth Holland:

This is in response to your June 30, 2010, letter requesting technical assistance and comments from NOAA's National Marine Fisheries Service (NMFS) for the draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR) on the American River Watershed Common Features Project/Natomas Levee Improvement Program (NLIP), Phase 4b Landside Improvements Project (Phase 4b Project) and the draft Natomas Post-authorization Change Report (Natomas PACR).

The draft EIS/EIR has been prepared by the US Army Corps of Engineers (Corps), Sacramento District and the Sacramento Area Flood Control Agency (SAFCA) in accordance with the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). The Corps is the lead for NEPA compliance and SAFCA is the lead for CEQA compliance. F2-1

The regional setting of the Phase 4b Project is the 53,000 acre Natomas Basin at the confluence of the American and Sacramento rivers. The project location includes parts of the City of Sacramento and portions of Sacramento and Sutter counties. The Natomas Basin is bordered by the American River to the south, the Sacramento River to the west, the Natomas Cross Canal (NCC) to the north, and the Pleasant Grove Creek Canal (PGCC) and Natomas East Main Drainage Canal (NEMDC) to the east. The Phase 4b Project involves levee construction on portions of all of these rivers and canals.

The NLIP addresses identified deficiencies in the Natomas Basin perimeter levee system. The main goal of the project is to reduce flood risk to the Natomas Basin and to bring the levee system up to at least a certified 100-year flood risk reduction under regulations adopted by the Federal Emergency Management Agency. Phases 1, 2, 3, and 4a of the NLIP should be completed by 2012. Phase 4b specifically addresses underseepage, stability, erosion.

penetration, and levee encroachments along approximately 3.4 miles of the Sacramento River, 1.8 miles of the American River, 6.8 miles of the NEMDC, 3.3 miles of the PGCC, and portions of the NCC. Assuming all funding, authorizations, environmental and other permits are in place, construction of the Phase 4b Project should begin in 2012 and be completed by 2016.

The Federal lead for the proposed project is the Corps, and the state lead is SAFCA. The Federal Aviation Administration is acting as a cooperating agency for NEPA. In addition to completing an EIS/EIR, the lead agencies will also be fulfilling requirements as for Section 10 and 14 of the Rivers and Harbors Act, Section 408, Section 404 of the Clean Water Act, and the Federal and state Endangered Species Acts.

In addition to the needs mentioned above, this EIS/EIR will be used to support Congressional approval of the Natomas PACR. If Congress does not authorize Corps to construct Phase 4b Project, SAFCA may choose to proceed without Federal participation and the EIS/EIR will be used to support Corp's decisions pursuant to Section 408, 404, and 10.

The Natomas PACR was prepared by the Corps as the result of a reevaluation study of the American River Common Features project that identified changes to the Natomas portion of the authorized project. The Federal sponsor for the reevaluation study is Corps and the state sponsor is the Central Valley Flood Protection Board (CVFPB). SAFCA has a cooperation agreement with CVFPB. The changes identified do not change the purpose of the project, but they do change the project scope, timeline, design, potential impacts, and cost.

F2-1 (Con't.)

NMFS has reviewed the information provided with your June 30, 2010, letter. As stated in the Executive Summary and Chapters 4 and 7 of the draft EIS/EIR, under Section 7, the Corps must consult with NMFS to ensure that the Phase 4b Project will not jeopardize endangered or threatened species, or destroy or adversely modify designated critical habitat, as designated by the Federal Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*). If the proposed project "may affect" a listed species or critical habitat, the lead agency is required to prepare a biological assessment (BA). In response to the BA, NMFS will issue a biological opinion with a determination on the impacts of the proposed project on listed species and critical habitat. Additionally, the Magnuson-Stevens Fishery Conservation and Management Act requires all Federal agencies to consult with NMFS regarding all action or proposed actions that my adversely affect Essential Fish Habitat.

As the project progresses, it is anticipated that the project proponents will seek out consultation as required under ESA. Be advised that NMFS can only enter section 7 consultation with another Federal agency or its designee. Future section 7 consultation for the Phase 4b Project will involve possible effects of the proposed project on the Federally listed threatened Central Valley (CV) steelhead (*Oncorhynchus mykiss*), the threatened Southern distinct population segment of North American green sturgeon (*Acipenser medirostris*), endangered Sacramento River winter-run Chinook salmon (*O. tshawytscha*), and threatened CV spring-run Chinook salmon (*O. tshawytscha*) and their critical habitats.

Some comments on the draft EIS/EIR and the Natomas PACR (found below) are general in nature, others relate to specific language in the draft EIS/EIR and Natomas PACR, and some are editorial.

VEGETATION REMOVAL AND VARIANCE COMMENTS

Central Valley levee vegetation has significant ecosystem importance. Vegetation along many levees provides critical fishery habitat and is ecologically significant to numerous ESA listed and protected species. Protection and enhancement of the riparian corridors is necessary for the survival and recovery of the Sacramento River winter-run and CV spring-run Chinook salmon and CV Steelhead.

Section 4.7.2 emphasizes that the Phase 4b Project could result in a direct loss of levee waterside vegetation. NMFS recommends pursuing a variance pursuant to the Central Valley Flood System Improvement Framework (Framework). NMFS acknowledges that on pages 2-24, 2-30, page 2-36 the EIS/EIR discloses the intent that Phase 4b Project will pursue a vegetation variance to allow waterside vegetation to remain. The Framework describes that major modifications of existing levee section will comply with the Corps' levee vegetation standards, but may allow vegetation to remain if these projects can demonstrate that the public safety risks posed to levee integrity have been adequately addressed and engineered into project design. The Central Valley Flood Protection Plan will be completed in 2012 and will outline levee vegetation policies. In the meantime, there are guidelines available on how to handle vegetation on levees. Additionally, NMFS encourages the project proponent to include assurances that habitat creation and preservation that is mitigation for the Phase 4b Project be successfully implemented. F2-2

Despite the mention of a variance in the draft EIS/EIR, the Natomas PACR lacks mention of obtaining a vegetation variance for levee work. This seems inconsistent with the EIS/EIR and the existing Framework. NMFS recommends that the Final Natomas PACR include a section detailing the desire to obtain a variance or a detailed explanation as to why a variance is not included as part of the Natomas PACR.

STANDARDIZED ASSESSMENT METHODOLOGY (SAM) COMMENTS

Prior to and during the process of any construction as part of the Phase 4b Project that impact waterside vegetation, NMFS recommends that you use the standardized assessment methodology (SAM) to evaluate the response to habitat features affected by bank protection projects. SAM is a modeling and tracking tool developed by Stillwater Sciences and was originally used for Corps Sacramento River Bank Protection Project (SRBPP). The SAM evaluates bank protection alternatives affecting threatened and endangered fish species. By identifying and quantifying the response of fish species to habitat conditions over time, users can determine necessary measures to avoid, minimize, or fully compensate for fish impacts for various life stages. F2-3

SAM has been used at numerous levee sites along the mainstem Sacramento River and tributaries as part of the SRBPP. Modeling outcome revealed long-term habitat losses and demonstrated the need for commensurate compensation measures and habitat enhancement such as: installing in-stream wood material for habitat complexity, planting riparian vegetation to stabilize the bank, and provide a source of shade and cover for channel margin habitat.

SPECIFIC COMMENTS

Throughout the document it is stated that without the levee repairs and upgrades flood risk will continue. While NMFS agrees with this statement, it is important to note that even with the improvements that are a part of the proposed project, there will still be potential flooding and risk of levee failure in the project area; this should be clearly stated in the final EIS/EIR. F2-4

Note: Both documents should have been with line numbers to simplify the review process. F2-5

PHASE 4b EIS/EIR

XIX: NLAP and NALP are both defined as North Area Local Project. NALP is used on page ES-7. F2-6

Page ES-4: The following is stated, "Sutter and Sacramento Counties", should be "Sutter and Sacramento counties". F2-7

Page ES-7: No apparent explanation or definition of an AE zone. F2-8

Page 1-2: The Federal Interest section is confusing. The purpose of the project is to increase levee protection to at least the 100 year flood protection and to the 200 year in the future thus ultimately reducing flood risk and flood damage in the Natomas Basin. Why is this not the Federal Interest? F2-9

Page 1-24: Plate 1-5 mentions that "approximately 15 sites..." In looking at Plate 1-5, there are 15 sites labeled. Not sure the "approximately" is appropriate. F2-10

Page 2-7: In section 2.1.3.4 there are discussions involving vegetation on the levees. There is no mention of the California Central Valley Flood System Improvement Framework that was put together in 2009. This Framework is to be used as a guide for vegetation on levees until the Central Valley Flood Protection Plan is completed in 2012. F2-11

Pages 2-24, 2-30, and 2-36: In the waterside vegetation removal section there is no mention of what may happen if a variance is not granted? F2-12

Page 2-68: In section 2.3.4.10 there is a discussion of landside vegetation mitigation. This section should also include a discussion on waterside vegetation mitigation. F2-13

Page 3-1 and 3-43: Should be "American and Sacramento rivers" not "American and Sacramento Rivers" F2-14

Page 3-46: Last sentence has Pacific chorus frog and bullfrog listed as reptiles. F2-15

Page 4.7-8: In the Temporal Loss of Landside and Waterside Woodland Habitats section there is no mention of utilizing the current California Central Valley Flood System Improvement Framework that guides vegetation along levees. Realizing that construction related to Phase 4b F2-16

will not occur until 2012 or later, this is when the Central Valley Flood Protection Plan will completed and will provide guidance on levee vegetation issues. These guidance documents should be mentioned and cited in the text. F2-16 (Con't.)

Page 4.7-8: Towards the bottom of the page the following is stated, "if habitat creation/preservation is not effectively implemented, the long-term loss of woodlands (including Heritage oaks) would result in a **potentially significant** impact." There should be an explanation as to why there is potential for the habitat creation and preservation to not be effectively implemented. The project proponent should ensure that the habitat creation and preservation is effectively done. F2-17

Page 4.7-11: Utilization of the SAM should be mentioned as part of the Mitigation Measure 4.7-a. Prior to and during the process of any construction as part of Phase 4b Project that impacts waterside vegetation, NMFS recommends that you use the SAM to evaluate the response to habitat features affected by various construction activities. SAM has been used at numerous levee sites along the mainstem Sacramento River and tributaries. F2-18

POST-AUTHORIZATION CHANGE REPORT AND INTERIM GENERAL REEVALUATION REPORT

Page PAC-7: The paragraph starting with "The original project..." is confusing and has grammatical errors.

Page PAC-10: The term MCACES is used in footnote 1. There is no explanation or definition of MCACES. This term is also used later in the document with no explanation.

Page PAC-11: There is no explanation for Table 7 in the text.

Page 1-3: Under heading "d" there is a floating quotation sign.

Page 1-4 and throughout document: Under heading "a" the text reads "Sacramento and American Rivers". It should be "Sacramento and American rivers". Same logic applies where the text reads "Feather, Yuba and American Rivers", should be "Feather, Yuba and American rivers". Make appropriate edits throughout entire document. F2-19

Page 2-11: Table 2-1 should be described in the main text.

Page 2-14: The document should include that obtaining a variance to maintain the levee vegetation would satisfy requirements of the ETL. The document correctly identifies the Framework and that it will expire in 2012. However, the document should include a description on how in 2012 there will be a new levee guidance document as part of the Central Valley Flood Protection Plan.

Page 2-15: For consistency, "Floodplains" under heading (7) should be underlined.

Page 2-16: Table 2-3 should be described in the text.

Page 2-17: Table 2-4 should be described in the text.

Page 2-20: In section 2-5 Planning Constraints, Central Valley steelhead should be included in bullet number 2.

Pages 2-24, 2-25, and 2-26: Tables 2-7, 2-8, 2-9, and 2-10 are incorrectly numbered and not properly described in the text.

Page 2-27: Figure 7B-1 is cited twice. It is unclear what this figure is and where it is located.

Page 2-27: No explanation for the basis for using of three flood events as the threshold for people to abandon Natomas Basin.

Page 3-9: Under heading "e. Vegetation and Encroachments", the text should describe that a vegetation variance could be obtained to satisfy the levee requirements under the ETL. To state that "complete removal of vegetation…" is necessary to fulfill the ETL is false.

F2-19 (Con't.)

Page 3-15: Table 3-5 is not described in the text.

Page 3-19: The following is found in the text, "compliance with the vegetation ETL will require that vegetation is removed from the levee." This is false, obtaining a vegetation variance will also comply with the ETL and this should be discussed as a viable alternative.

Page 3-27: Table 3-14 fails to mention that obtaining a variance is another method of complying with the ETL.

Page 3-34. The second sentence in the first full paragraph is incomplete.

Page 4-35: In Table 4-8 under the State section, CEQA should be listed.

Page 4-42: In Table 4-9 under the NMFS agency row, the Permit/Authorization/Approval text appears to be incorrect.

Page 7-1: The term "I" is used to initiate Chapter 7. Confusing as to who or what the "I" is? The final document should clarify.

This documents NMFS comments on the Phase 4b Project draft EIS/EIR and the Natomas PACR. NMFS comments to the draft EIS/EIR and Natomas PACR are intended to help guide the development of the final EIS/EIR and future ESA consultations.

If you have any questions regarding this correspondence please contact Mike Hendrick by telephone at (916) 930-3605 or by e-mail at Michael.Hendrick@noaa.gov.

Sincerely,

Maria Rea
Central Valley Office Supervisor

cc: Copy to file – ARN 2009SA00179
NMFS-PRD, Long Beach, California

Letter	United States Department of Commerce, National Oceanic and Atmospheric Administration,
F2	National Marine Fisheries Service, Sacramento Area Office
Response	Maria Rea, Central Valley Office Supervisor August 9, 2010

F2-1 Comment noted.

F2-2 As stated in Section 2.1.3.4, "Management of Levee Vegetation and Structural Encroachments," under the subheading "Vegetation Variance Request" of the DEIS/DEIR, SAFCA and CVFPB sought a vegetation variance from the standard vegetation guidelines set forth in USACE's Engineering Technical Letter 1110-2-571. This section has been updated in the FEIS/FEIR to reflect the fact that USACE granted the variance request in June 2010, and vegetation will be allowed to remain on a portion of the waterside slope and berm of several of the levee segments comprising the perimeter levee system protecting the Natomas Basin, except the lower 1/3 of the slope of the Natomas East Main Drainage Canal (NEMDC) where trees must be removed to comply with USACE levee vegetation guidance. Discussion of the Central Valley Flood System Improvement Framework and the Central Valley Flood Protection Plan was also added to this section. It is SAFCA's and USACE's intent that the habitat creation and preservation that is part of the Phase 4b Project and/or part of the mitigation measures identified for the Phase 4b Project would be successfully implemented.

The aforementioned DEIS/DEIR text is revised as follows:

> During preparation of the DEIS/DEIR, SAFCA and the Central Valley Flood Protection Board (CVFPB), the non-Federal sponsors of the NLIP, ~~are requesting~~ requested a variance from the standard vegetation guidelines set forth in USACE's Engineering Technical Letter 1110-2-571 (USACE 2009a). The *CVFPB and SAFCA Vegetation Variance for the Common Features (Natomas Basin) Project, Post-Authorization Change Report* (also referred herein as "vegetation variance") was developed to comply with applicable provisions of the California Central Valley Flood System Improvement Framework that was adopted by the California Levees Roundtable on March 26, 2009 (Framework). The Framework specifically states that where, as in the case of the Phase 4b Project, major modifications of existing levee sections are required, such modifications:
>
> > ...will comply with the [USACE] levee vegetation standards, but may allow vegetation to remain if these projects can demonstrate that the public safety risks posed to levee integrity have been adequately addressed and engineered into project designs.
>
> The Framework is to be used as a guide for vegetation on levees until the Central Valley Flood Protection Plan is completed in 2012.
>
> The vegetation variance request was granted by USACE in June 2010~~Under this variance~~, and vegetation will be allowed to remain on a portion of the waterside slope and berm of several of the levee segments comprising the perimeter levee system protecting the Natomas Basin, except the lower 1/3 of the slope of the NEMDC where trees must be removed to comply with USACE levee vegetation guidance. Although the variance was granted, this FEIS/FEIR retains the original scenarios presented in the DEIS/DEIR, which include both a with- and without-variance outcome to show the full range of potential adverse effects, including the worst-case scenario, as required under NEPA.

> The following sections describe the levee segments that ~~would be~~ are covered by this variance. Sections 2.3, "Proposed Action," and 2.4, "Fix-in-Place Alternative," describe the vegetation removal assumptions used by this EIS/EIR to provide environmental analysis to support consideration of this variance request.

The Natomas Post-Authorization Change Report (PACR) has been updated to reflect approval of the *CVFPB and SAFCA Vegetation Variance for the Common Features (Natomas Basin) Project, Post-Authorization Change Report* (also referred herein as "vegetation variance"), and the approval memo has been added as Appendix I of the Natomas PACR.

F2-3 The commenter recommends that prior to and during the process of construction, as part of the Phase 4b Project components that would affect waterside vegetation, the project proponent(s) should use the Standard Assessment Methodology (SAM) to evaluate habitat features affected by bank protection projects. As stated in the comment, SAM is a modeling tool that evaluates bank protection alternatives affecting threatened and endangered fish species. By identifying the response of fish species to habitat conditions over time, SAM users can determine necessary measures to avoid, minimize, or fully compensate for fish impacts for various life stages.

The comment does not question the analysis or conclusions in the DEIS/DEIR, rather, it recommends the use of a particular methodology (namely, SAM) to analyze impacts to the waterside vegetation. Section 4.7, "Biological Resources," of the DEIS/DEIR analyzes potential impacts to waterside vegetation that could result from implementation of the Phase 4b Project (see Impact 4.7-a, "Loss of Landside and Waterside Woodland and Shaded Riverine Habitats"). The analysis includes two different scenarios for the Phase 4b Project, one that assumes implementation of USACE's levee encroachment policy without a vegetation variance and another that assumes the vegetation variance would be granted. See response to comment F2-2.

The analysis of impacts identified both temporal and long-term losses of landside and waterside woodlands. As described in Mitigation Measure 4.7-a, "Minimize Effects on Woodland Habitat; Implement Woodland Habitat Improvements and Management Agreements; Compensate for Loss of Habitat; and Comply with Section 7 of the Federal Endangered Species Act, Section 2081 of the California Endangered Species Act, and Section 1602 of the California Fish and Game Code," in the DEIS/DEIR, the project proponent(s) shall be required to further avoid and minimize potential impacts to the extent feasible, compensate for any tree/woodland removal on a no-net-loss basis, and obtain and comply with Section 7 of the Federal Endangered Species Act, Section 2081 of the California Endangered Species Act, and Section 1602 of the California Fish and Game Code. The analysis found that habitat improvements from mitigation implementation would reduce long-term impacts to waterside woodland habitats loss to a less-than-significant level; however, this impact would remain significant and unavoidable for many years before reaching a less-than-significant level because replacement plantings would require a minimum of 10–15 years before providing important habitat components such as shade and structure and decades to replace older, more mature trees.

Because the impacts to waterside vegetation are relatively small, localized, and have been avoided and/or minimized to a large extent; mitigation measures will ensure no net loss (in the long-term); and consultation with resource agencies, including the National Marine Fisheries Service (NMFS) is underway, the use of the SAM model is not necessary to quantify impacts and/or determine if mitigation is commensurate.

F2-4 Residual flood risk is discussed in Section 2.7, "Residual Risk of Flooding," of the DEIS/DEIR.

F2-5 Comment noted.

F2-6 "NALP" is correct. The "Acronyms and Abbreviations" section is revised as follows:

...

NHPA	National Historic Preservation Act
~~NLAP~~	~~North Area Local Project~~
NLIP	Natomas Levee Improvement Program

...

F2-7 The first paragraph in Section ES.6, "Project Background and Phasing," of the DEIS/DEIR is revised as follows:

> As stated above, the overall purpose of the multi-phase NLIP is to bring the entire 42-mile Natomas Basin perimeter levee system into compliance with applicable Federal and state standards for levees protecting urban areas. The Phase 4b Project is the final phase of the NLIP Landside Improvements Project, and consists of improvements to the remaining portions of the Natomas Basin's perimeter levee system in the City of Sacramento and in Sutter and Sacramento ~~Counties~~ counties, California, associated landscape and irrigation/drainage infrastructure modifications, and habitat creation and management.

F2-8 In the paragraph beginning, "In January 2008..." on page ES-7 of the DEIS/DEIR, the second sentence provides the definition for AE zone: "FEMA defines AE zones as areas with a 0.01 AEP of flooding."

F2-9 See Section 1.1.1.1, "Relationship between the Federal interest and the Locally Preferred Plan," of the Phase 4b DEIS/DEIR.

F2-10 The first paragraph under the subheading, "Riverbank Erosion," in Section 1.4.2.1, "Flood Problems and Needs," of the DEIS/DEIR is revised as follows:

> As shown in **Plate 1-5**, ~~approximately~~ 15 sites along the waterside of the Sacramento River east levee are subject to bank erosion in the form of bed or toe scour and wave wash that threatens the stability of the adjacent levee. Risk priorities have been assigned to the affected sites based primarily on the risk of slope failure due to undermining. High-risk sites exhibit one or more of the following characteristics and are considered potentially susceptible to failure in a 100-year flood event...

F2-11 It is recognized that the Framework was used to shape the vegetation variance process. A variance was obtained and is included in Appendix I of the Natomas PACR.

F2-12 The last sentence of the last paragraph of Section 2.3.3.2, "Waterside Vegetation Removal," of the DEIS/DEIR states that if the vegetation variance is not granted, vegetation with stem widths that have a diameter at breast height (dbh) greater than two inches would be cleared within 15 feet of the waterside levee toe. Table 4.7-2 in the DEIS/DEIR shows the estimated acreages of vegetation that would be removed with and without the approval of the vegetation variance.

F2-13 The Phase 4b Project has been designed to accommodate waterside vegetation and address the risk of levee instability by enlarging the footprint of the levees protecting the Natomas Basin. The intent of the project is to minimize or avoid impacts on waterside vegetation. The majority of the vegetation removal that will occur as a result of project construction is on the landside of the

levees. Thus, the referenced paragraph in Section 2.3.4.10, "Vegetation Management," in the DEIS/DEIR references landside vegetation mitigation. Waterside vegetation mitigation is included in Mitigation Measure 4.7-a, "Minimize Effects on Woodland Habitat; Implement Woodland Habitat Improvements and Management Agreements; Compensate for Loss of Habitat; and Comply with Section 7 of the Federal Endangered Species Act, Section 2081 of the California Endangered Species Act, and Section 1602 of the California Fish and Game Code," in Section 4.7, "Biological Resources," of the DEIS/DEIR.

F2-14 Comment noted. No changes made to the DEIS/DEIR.

F2-15 The first paragraph under the subheading, "Wildlife," in Section 3.7.2.1, "General Biological Resources," of the DEIS/DEIR is revised as follows:

> Before European settlement, the Sacramento area floodplains supported a wide variety and large numbers of wildlife species associated with its riparian habitats, permanent and seasonal wetlands, and oak woodlands and savannas. Much of this habitat has been lost, locally and regionally. Initially, land within the Natomas Basin was converted to agriculture, though more recent land use conversions have been to urban development. As a result, there have been shifts in wildlife use as land uses and habitats have changed. With the conversion to agriculture, the abundance of species restricted to natural habitats likely decreased, and in some cases particular species ceased to occur (City of Sacramento, Sutter County, and TNBC 2003). However, remnant native habitat patches and created habitat associated with drainage and agricultural supply ditches and habitat reserves have allowed remnant wildlife populations to persist within the Natomas Basin. Wildlife species common within the Natomas Basin include black-tailed jackrabbit, Audubon's cottontail, raccoon, striped skunk, California ground squirrel, mule deer, coyote, and river otter. Reptile species that are routinely encountered in the Natomas Basin include gopher snake, common garter snake, and racer snake,~~.~~ Amphibian species that are routinely encountered in the Natomas Basin include Pacific chorus frog~~,~~ and bullfrog.

F2-16 See responses to comments F2-2 and F2-11.

F2-17 USACE's and SAFCA's intent is certainly to implement habitat creation and preservation effectively. However, this is not a certainty. The impact analysis and conclusion contained in the DEIS/DEIR attempt to be conservative in disclosing that if habitat creation and preservation is not implemented effectively, a potentially significant impact would result. Further, under the California Environmental Quality Act (CEQA) (State CEQA Guidelines, California Code of Regulations [CCR] Section 15126.4[a][3]), mitigation can only be required for significant and potentially significant impacts. Thus, the impact must at least be potentially significant to warrant mitigation.

F2-18 See response to comment F2-3.

F2-19 This comment pertains to the Natomas PACR. See Appendix A of the Natomas PACR for response.

F3

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

August 16, 2010

Ms. Elizabeth Holland
Environmental Resources Branch
U.S. Army Corps of Engineers
Sacramento District
1325 J Street, 10th Floor
Sacramento, California 95814-2922

Subject: Draft Environmental Impact Statement (DEIS) for the Natomas Levee Improvement Program Phase 4b Landside Improvements Project (CEQ# 20100240)

The U.S. Environmental Protection Agency (EPA) has reviewed the above-referenced document pursuant to the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508), and our NEPA review authority under Section 309 of the Clean Air Act.

F3-1

While we acknowledge the flood protection benefits of the proposed action for the current residents of the Natomas Basin, we have rated the DEIS as Environmental Concerns – Insufficient Information (EC-2, see enclosed "*Summary of Rating Definitions*") due to our concerns about air quality and indirect and induced growth.

EPA's primary concern regarding the subject DEIS is the applicability of conformity requirements under the Clean Air Act. We noted in our March 22, 2010 comments on the FEIS for Phase 4a of the Natomas Levee Improvement Project (NLIP) that "the State of California has requested, and EPA has proposed, a "severe" classification for this ozone nonattainment area." EPA finalized the severe classification, effective June 4, 2010. Because the Record of Decision (ROD) for Phase 4a was not certified before the effective date of the reclassification, the new conformity thresholds now apply to Phase 4a. Based on the FEIS, Phase 4a would exceed the recently reduced conformity threshold for 2011. Once conformity applies to a project, it applies to the entire project; thus, the applicability of conformity to Phase 4a would affect Phase 4b, as well.

F3-2

EPA staff discussed the conformity issue with you and a Corps' contractor in several phone conversations. Following that, you provided a revised table of emissions in an email to Tom Kelly, of my staff, on August 11, 2010. The table reflects a revised construction schedule with additional reduction of nitrogen oxide emissions, from 20% to 40%. Based on that revised table, the Phase 4a emissions no longer appear to exceed the conformity threshold. If the Corps intends to pursue this revised construction schedule, commitments to do so should be included in the ROD for Phase 4a and in the FEIS and ROD for Phase 4b. If the Corps does not intend to pursue this revised construction schedule, the RODs and Phase 4b FEIS should address how conformity requirements will be met.

We appreciate the opportunity to review this DEIS. When the FEIS is released for public review, please send one hard copy and one CD ROM to the address above (mail code: CED-2). If you have any questions, please contact Tom Kelly, the lead reviewer for this project, at (415) 972-3856 or kelly.thomasp@epa.gov, or me at (415) 972-3521. F3-3

Sincerely,

Tom Kelly

for Kathleen M. Goforth, Manager
Environmental Review Office

Enclosures:
Summary of EPA Rating Definitions
Detailed Comments

cc: Jennifer Hobbs, U.S. Fish and wildlife Service
Mike Hendrick, National Marine Fisheries Service
Robert Solecki, Central Valley Regional Water Quality Control Board
Jeff Drongesen, California Department of Fish and Game
John Bassett, Sacramento Area Flood Control Agency
Helen Thomson, Sacramento Area Council of Governments
Karen Huss, Sacramento Metropolitan Air Quality Management District
David A. Valler Jr., Feather River Air Quality Management District
John Roberts, The Natomas Basin Conservancy

SUMMARY OF EPA RATING DEFINITIONS*

This rating system was developed as a means to summarize the U.S. Environmental Protection Agency's (EPA) level of concern with a proposed action. The ratings are a combination of alphabetical categories for evaluation of the environmental impacts of the proposal and numerical categories for evaluation of the adequacy of the Environmental Impact Statement (EIS).

ENVIRONMENTAL IMPACT OF THE ACTION

"LO" (Lack of Objections)

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

"EC" (Environmental Concerns)

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

"EO" (Environmental Objections)

The EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

"EU" (Environmentally Unsatisfactory)

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potentially unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

F3-1 (Con't.)

ADEQUACY OF THE IMPACT STATEMENT

Category "1" (Adequate)

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category "2" (Insufficient Information)

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

Category "3" (Inadequate)

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From EPA Manual 1640, Policy and Procedures for the Review of Federal Actions Impacting the Environment.

Air Quality

The DEIS discusses the applicability of general conformity in Impact 4.11-b. For the proposed alternative, the DEIS states, "[w]ith mitigation, worst-case maximum annual emissions are below the *de minimis* [stat] thresholds and therefore would conform with the applicable SIP regional attainment goals (See Appendix F for detailed emission sources and assumptions)" (p.4-17). EPA does not agree with this conclusion. The general conformity thresholds for Volatile Organic Compounds (VOCs) and Nitrogen Oxides (NOx) were reduced, effective June 4, 2010 (75 FR 24409, May 5, 2010,), as noted in the DEIS, Table 4.11-4 and Appendix F. Since the Corps did not sign the ROD for Phase 4A prior to that date (p. ES-6), the new conformity limits apply to Phase 4a as well as 4b. Phase 4A emissions, described in Appendix F, exceed the current 25 tons per year general conformity threshold for NOx. Once conformity applies to a project, it is applicable to the entire project. So, if conformity applies to Phase 4A, it also applies to Phase 4B, regardless of the level of 4B emissions.

EPA staff raised this to the attention of the Corps and its contractor in several phone conversations. The Corps subsequently provided an alternative Table 21 that spread Phase 4a construction into 2012, and reduced NOx emissions, by 40%, to below the conformity threshold. Your contractor's message[1] clarified that the reduced emissions will be achieved through vehicle emission controls, not emission credits or off-sets purchased from a local air district. The table also reflected other schedule changes for Phase 4b. F3-4

The revised table also showed reduced emissions for 2009 and 2010. Because 2009 is past and 2010 is more than half over, it is not clear how these emissions could be reduced.

Table 21 and Table 22, from Appendix F, contain differing emission estimates for 2010 and 2011. The Corps contractor clarified[2] that "the emission levels shown in Table 22 in Appendix F were not used in the analysis and should be considered extraneous."

We also note the wording "would conform with the applicable SIP" (p. 4.11-17) is inappropriate. Such wording should be used only if the Corps is making an affirmative determination that the project conforms to the applicable SIP, pursuant to analysis showing that the project's emissions will be over the de minimis applicability threshold.

[1] "In Case You Were Interested" Message to Tom Kelly (EPA) from Gregory Wolffe (AECOM). 12 August 2010. Email.
[2] "Conference Call This Afternoon Re: Natomas." Message to John Kelly (EPA) from Gregory Wolffe (AECOM). 29 July 2010. E-mail.

Recommendation:
The FEIS should describe and commit to project changes that reduce emissions below the general conformity applicability threshold. If the Corps will rely on extension of the project schedule, in accordance with the alternative Table 21 provided to EPA, that table and any supporting information should be included in the Phase 4a and 4b RODs and the Phase 4b FEIS.

Alternatively, the FEIS could include a conformity determination that includes both Phase 4a and 4b.

F3-4 (Con't.)

The FEIS should remove Table 22 from Appendix F.

The FEIS should include a footnote for Table 21, in Appendix F , explaining that 2010 air emissions, from Phase 3 of the project, were included in the phase 3 FEIS which was relied upon in the phase 3 ROD, prior to the conformity limit change from 50 to 25 tons per year. Therefore, 50 tons per year was the correct general conformity applicability threshold to apply to Phase 3 for VOC and NOx.

Indirect and Growth Inducing Impacts

While the levees have been in place since 1915 (Table 1-2), currently the Natomas Basin (Basin) is subject to a building moratorium (p. 3-21). Without improvement of the levees, further development within the Basin will continue to be limited by the moratorium. The DEIS describes planned growth within the Natomas Basin of 60,000 dwellings and associated commercial and residential developments over the next two decades (p.2-81). The increase in emission of criteria pollutants from this development can cause health problems and further delay attainment of air quality standards set by the Clean Air Act.

The DEIS describes a regional blueprint for future growth in the Sacramento area, including the Natomas Basin, adopted by the Sacramento Area Council of Governments (SACOG) and Valley Vision (p. 2-16). EPA commends the Corps and Sacramento Area Flood Control Agency (SAFCA) for including the blueprint, a "unique regional visioning project . . . bringing smart growth principles . . . to growth projected in the Sacramento Region until 2050[3]." EPA supports this effort for the people of the Sacramento area to "spend less time in their cars, spend less money on gas, and protect our air quality while improving our overall quality of life," and we acknowledge the greenhouse gas benefits of the development recommended by the blueprint. Unfortunately, the DEIS does not commit to ensuring that future growth in the Basin is consistent with the blueprint.

F3-5

The DEIS ultimately concludes, "the Phase 4b Project, while accommodating planned regional growth, is not growth inducing itself" (p.5-37). This distinction (accommodating growth vs. inducing growth) does not exist in NEPA regulations. Because the levee improvements will allow future growth in the basin, which is not currently allowed, the project will induce growth.

[3] "Blueprint Then/Now/Next." *Sacramento Region Blueprint*. Sacramento Council of Governments, n.d. Web. 23 July 2010. <http://www.sacregionblueprint.org>.

Furthermore, SAFCA's reliance on development fees implies that growth in the Natomas Basin may be critical to funding future flood protection efforts. The DEIS explains (p. 2-81) that SAFCA will use development fees to fund activities that appear unrelated to development: waterside levee strengthening, landside levee strengthening, acquisition of agricultural easements (outside the basin), and improved system operations. The development impact fee applies to "all new structures placed anywhere in the 200-year (0.005 AEP) floodplain of SAFCA's capital assessment district." This implies the fee will be collected from many locations within SAFCA's jurisdiction. Yet, the vast majority of the remaining land to be developed appears within the 200-year floodplain appears to be located in the Natomas Basin, based on the SAFCA Boundary Map.

While the DEIS frequently notes the project is intended provide flood protection to current residents and property, the income generated from development fees appears to be a critical piece to ensuring adequate flood control protection remains in place. This further establishes growth inducement and future development as indirect impacts of the Natomas Levee Improvement Project.

F3-5 (Con't.)

The DEIS states that the City of Sacramento, Sacramento County, and Sutter County, which comprise three fifths of the organizations that comprise SAFCA, have developed general plans that provide a framework for growth and development within their jurisdictions. The DEIS does not state whether or not these plans are consistent with the blueprint. Several reports have documented that development fees are a significant revenue source for local governments[4]. The City and County of Sacramento have even developed a revenue sharing agreement for development in the Natomas Basin[5]. Like SAFCA, these entities are reliant on future development in the Natomas Basin to reduce future financial shortfalls.

EPA does not oppose development in the Natomas Basin, although we would advise against it in the deepest portions of the floodplain; however, we do think the FEIS should acknowledge that development is not incidental to the levee project, but an indirect and growth inducing impact of the project.

Recommendation:
The FEIS should describe all indirect and growth inducing impacts, including emissions of priority air pollutants and greenhouse gases from industrial, commercial, and residential development planned for the Natomas Basin.

[4] For example, "Pay to Play: Residential Development Fees in California Cities and Counties, 1999." California Department of Housing and Community Development. Web. August 11, 2010. <http://www.hcd.ca.gov/hpd/pay2play/fee_rpt.pdf>

[5] "Resolution No. 2002-830, Adopted by the Sacramento City Council on the date of December 10, 2002." Web. August 11, 2010. <http://www.msa2.saccounty.net/planning/Documents/Natomas%20Joint%20Vision/City-CountyMemorandumofUnderstanding.pdf>

To mitigate air pollution and traffic congestion from new housing, the FEIS should commit to ensuring future development in the Natomas Basin will be consistent with the SACOG and Valley Vision blueprint.

F3-5 (Con't.)

The FEIS should acknowledge that development fees are a necessary source of revenue to ensure future flood protection within SAFCA's jurisdiction.

Letter F3 Response	United States Environmental Protection Agency, Region IX Kathleen M. Goforth, Manager, Environmental Review Office August 16, 2010

F3-1 See responses to comments F3-2, F3-4, and F3-5.

F3-2 U.S. Environmental Protection Agency (EPA) General Conformity thresholds for volatile organic compounds (VOCs) and Nitrogen Dioxides (NO_X) for the Sacramento Metropolitan area were reduced from 50 tons per year (TPY) to 25 TPY, effective June 4, 2010. The reduced conformity threshold applies to the NLIP project phases beginning in 2011 through completion (projected to the year 2016). Revisions, including schedule adjustments and increased NO_X control efficiency (from 20% to 40%, based on contractor fleet requirements), have been incorporated into Section 4.11, "Air Quality," of the FEIS/FEIR and these adjustments provide demonstration that the NLIP (during 2011 through 2016) would achieve emissions below the reduced General Conformity threshold. Revisions to the tables in Sections 3.11, "Air Quality," and 4.11, Air Quality," of the DEIS/DEIR are shown in tracked changes in **Appendix F** of this FEIS/FEIR. Additionally, the air quality modeling has been updated and is included in **Appendix F** (Table 21).

F3-3 The FEIS/FEIR will be provided to EPA as well as all other commenters.

F3-4 See response to comment F3-2.

The achievement of 40% NO_X control, as proposed, would be demonstrated through newer model year contractor equipment that would be required by the project proponent(s). Based on contractor fleet inventories provided to the Sacramento Metropolitan Air Quality Management District (SMAQMD) pertaining to construction activities currently under way for previous NLIP project phases, contractor fleet inventories have typically shown a reduction of 60–65% compared to the California Air Resources Board (ARB) fleetwide average. Therefore, emissions during 2009 and 2010, based on actual fleet inventory data, are estimated to have achieved at least a 40% emissions reduction.

Table 22, which was originally included in **Appendix F** of the DEIS/DEIR was an extraneous table and has been removed from this FEIS/FEIR.

The second bullet under "Construction in Sacramento County (SMAQMD)," in Mitigation Measure 4.11-a, "Implement Applicable District-Recommended Control Measures to Minimize Temporary and Short-Term Emissions of ROG, NO_X, and PM_{10} During Construction," of the DEIS/DEIR is revised as follows:

- If overlapping construction phases in Sacramento County create unmitigated PM_{10} emissions in excess of the General Conformity threshold, per SMAQMD Rule 104, of ~~400~~100 TPY, the project proponent(s) shall use advanced dust suppressant materials (such as EnviroTac II) on all unpaved roadways and stockpiled materials to ensure enhanced fugitive dust control up to 90% or greater ~~control of~~ fugitive dust and ~~a reduction of~~ PM_{10} emissions ~~below 100 TPY~~.

In addition, a second footnote is included in the revised Table 21 (in Appendix F of the DEIS/DEIR) as follows:

[1] Control efficiencies are based on implemented control measures, per SMAQMD CEQA Guidance: control efficiency for NO_X emissions is based on enhanced exhaust

control measures per SMAQMD CEQA Guidance, including submittal of contracted construction fleet inventories for demonstration of 20% control compared to the ARB fleetwide average, with an additional 20% reduction imposed by the project to meet general conformity.

[2] Emissions from Phase 3 were included in the Phase 3 FEIS, and were approved through the authorization of the Record of Decisions (ROD), prior to the conformity limit change from 50 TPY top 25 TPY. Therefore, 50 TPY is the correct General Conformity Threshold applicable to Phase 3 emissions of VOCs and NO_X.

F3-5 Growth-inducing impacts of the NLIP are discussed in Section 5.2, "Growth Inducement," of the DEIS/DEIR. As described in that section, population growth and urban development within the project area are driven by local, regional, and national economic conditions. Local land use decisions within the Phase 4b Project area are within the jurisdiction of the City of Sacramento. The City has adopted a general plan consistent with state law that provides an overall framework for growth and development within its jurisdiction, including the project area. Although the City is a member of SAFCA, as a joint powers agency, SAFCA is limited to exercising powers common to all of its constituent members, including Reclamation District 1000 (RD 1000) and the American River Flood Control District, neither of which has any land use planning authority. Accordingly, SAFCA has no authority to permit development and has only limited authority to impose conditions on the development that is permitted.

The Blueprint prepared by the Sacramento Area Council of Governments (SACOG) serves as a serve as a framework to guide local government in growth and transportation planning through 2050, however, compliance with the principles of the Blueprint are not mandatory for local land use planning agencies. Because the local land use planning authority rests with local agencies (City of Sacramento, Sacramento County, Sutter County), neither USACE nor SAFCA have authority to ensure that future growth is consistent with the Blueprint.

Neither USACE nor SAFCA have the authority to plan land uses or direct development within the Natomas Basin. When developing the Phase 4b Project, USACE and SAFCA considered the planned regional growth as projected by local land use planning agencies. The cumulative impacts of this planned growth have been addressed in environmental documents prepared by the local land use planning agencies. Thus, the Phase 4b Project is not growth-inducing itself.

SAFCA has adopted a development fee program to ensure that new development in the undeveloped areas in the Natomas Basin and lower American River areas would not substantially increase the expected damage of an uncontrolled flood. The fee program is based upon the creation of a new assessment district and a development fee program to fund various project-related activities. The assessment district encompasses the properties in the developed areas within SAFCA's jurisdictional boundary in Sacramento and Sutter Counties that specially benefit from the activities and improvements. (See Section 3.2.1, "Project Features," of the *Environmental Impact Report on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area,* State Clearinghouse No. 2006072098).

TRIBAL GOVERNMENT

T1

SHINGLE SPRINGS RANCHERIA

Shingle Springs Band of Miwok Indians,
Shingle Springs Rancheria
(Verona Tract), California
5281 Honpie Road, Placerville, CA 95667
P.O. Box 1340, Shingle Springs, CA 95682
(530) 676-8010 Office, (530) 676-8033 Fax

July 21, 2010

Elizabeth Holland, Planning Division
USACE, Sacramento District
1325 J Street
Sacramento, CA 95814

RE: Comments on the American River Watershed Post-Authorization Change Report & Interim General Reevaluation Report & the Draft EIS/Draft EIT on the American River Watershed Common Features Project/Natomas Post-authorization Change Report/Natomas Levee Improvement Program, Phase 4b Landside Improvements Project

Dear: Ms. Holland

The Shingle Springs Band of Miwok Indians, ("Tribe"), has reviewed the American River Watershed Post-Authorization Change Report & Interim General Reevaluation Report & the Draft EIS/Drat EIT on the American River Watershed Common Features Project/Natomas Post-authorization Change Report/Natomas Levee Improvement Program, Phase 4b Landside Improvements Project (the "Reports"). Thank you very much for the opportunity to comment. The Tribe commends the USACE & SAFCA officials and representatives for producing a plan that strives to balance the numerous interests of the Parties affected and the safety of the residents of the Sacramento Valley. By and large, the plan represents a great amount of thought and consideration towards the Tribe and associated cultural remains. However the Tribe has various concerns about the draft, in particular, omissions of certain Tribal interests and areas where interests could be articulated more precisely. T1-1

The majority of the document appears thoughtfully crafted and the Tribe believes that Tribal issues in general have been keenly addressed. The Tribe feels that the USACE & SAFCA has shown a commitment to ensuring inclusion, fair treatment, and equitable outcomes between the tribes, Sacramento residents, and flood prevention. Recognizing the outstanding work done to produce these Reports, the Tribe would like to submit comments as outlined in the enclosed chart.

*(**Note: The comments have been arranged in chart form by page number, and include the title of the section and the heading to which they correspond. Included in each comment is a recommended addition to the existing text or in some cases, a slight revision.)*

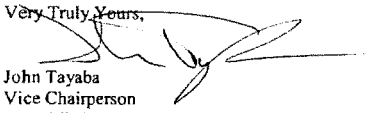
SAFCA '10 JUL 27 PM2:34

Conclusion

With these changes, the Tribe feels that the Reports will accurately represent the cooperative and equitable relationship that the USACE & SAFCA and Tribe envision. By accurately encompassing the cultural and communal welfare of the Tribe, the Reports can reflect the positive working relationship between tribes and the USACE & SAFCA.

Thank you for this opportunity to comment on USACE & SAFCA's work and the Tribe looks forward to continuing to be a part of USACE & SAFCA's process.

Very Truly Yours,



John Tayaba
Vice Chairperson
Most Likely Descendant

cc:
John Bassett, Director of Engineering
SAFCA
1007 7th Street, 7th Floor
Sacramento, CA 95814

Comment Chart

American River Watershed Post-Authorization Change Report & Interim General Reevaluation Report		
Page/ Section	Quote/section	Comment
1-5 (c.) 2nd paragraph lines 4 & 5	"…a group of Hudson Bay Company workers brought malaria to Natomas, and seventy-five percent of residents died."	Should say: "…seventy-five percent of local *Native Americans* died."
1-21 (10) paragraph 3 line 8	"…and/or protect the rights of Native Americans."	Should say:" …and/or protect the rights *and cultural resources* of Native Americans."
3-28 Table 3-15, Cultural Resources	"No long term effects will result from the project"	Issue: We believe that long term effects may result from the project if cultural resources must be removed/ and or damaged. Should Say: "Damage and permanent loss of some cultural resources may occur. Plan implements appropriate mitigation measures to minimize damage or loss."
3-33, 3-8 MITIGATION	Describes agencies that have included in coordination of mitigation	Issue: Does not mention local Native American Tribes. Should include: "*local Native American Tribes*."
4-43, Table 4-10-Costs of Potential Additional Increments	Total for Cultural Resource Preservation = 0 (zero)	Issue: This does not seem to be a realistic figure given the extensive amount of Cultural resources present along the river.
6-4, 6-6. Additional Required Coordination	Under Chapter 6 – Public Involvement, Review, and Consultation	Issue: Does not mention tribes or the NAHC Should Include: "NAHC" and "Local Tribes" as separate headings and say that consultation has been "on-going"
7-3, Chapter 7 – Recommendations (n.)	Compiy with all applicable Federal and State laws and regulations, including but not limited to:	Issue: does not list NAGPRA as one of the laws. NAGPRA should be included. Should Include: "*NAGPRA*" in the laws listed.

T1-2

Draft EIS/Drat EIT on the American River Watershed Common Features Project/Natomas Post-authorization Change Report/Natomas Levee Improvement Program, Phase 4b Landside Improvements Project		
Page/ Section	Quote/section	Comment
3.8 CUTURAL RESOURCES, 3-74 to 3-88; 4.8 Cultural Resources, 4.8-1	Testing	The Tribe would like consult in more detail where known cultural resources have been identified, in addition to having tribal monitors

T1-3

to4.8-13		present at all ground disturbing activity in the vicinity of the known site, including any testing. At sites where testing has not yet been performed, the Tribe would like to have testing at depths of at least 6 feet. When testing has been performed along the shore only, the Tribe would like testing to be done up through 150-200 yards from the shore, where impacts from the project are likely, so as to further mitigate potential damage. Also, the Tribe would like testing to be done at all borrow sites, before borrowing can begin.	T1-3 (Con't.)
4.8-7 Adjacent Levee Alternative (Proposed Action) and Fix-in-Place Alternative	Construction of the Phase 4b Project may affect two identified prehistoric archaeological deposits: NLIP-40, which consists of a newly identified prehistoric resource that occurs in the Fisherman's Lake Borrow Area...	Is there an alternative for borrowing from an area that does not contain cultural resources such as CA-Sac-18, and the site in the South Fisherman's Lake Borrow Area? The Tribe would like to see a reasonable effort made to Borrow from areas not containing cultural resources.	T1-4

Letter T1 Response	Shingle Springs Rancheria John Tayaba, Vice Chairperson, Most Likely Descendant July 21, 2010

T1-1 Comment noted.

T1-2 This comment pertains to the Natomas PACR. See Appendix A of the Natomas PACR for response.

T1-3 USACE will continue to consult with local tribes on known cultural resources that have been identified as affected by the NLIP, including the Phase 4b Project. Tribal monitors are not required by Federal law; however, Shingle Springs Rancheria or other local tribes or interested parties may provide monitors at their own cost as safety and construction permits. Surveying of the area of potential effects of the project area will occur prior to construction activities to determine the presence of potential cultural resources and determine the potential need for further testing to evaluate significance and effects. This may include limited shovel testing or auguring, where it is determined that ground cover or recent deposits would obscure cultural materials. This includes all non-commercial borrow sties before their use as borrow material. Commercial borrow sites will not be tested further as they will have already been required to comply with the National Historic Preservation Act.

T1-4 USACE will make good faith efforts to identify other sources of borrow material that do not include identified prehistoric or historic resources.

STATE AGENCIES

S1

STATE OF CALIFORNIA – THE RESOURCES AGENCY ARNOLD SCHWARZENEGGER, GOVE
CENTRAL VALLEY FLOOD PROTECTION BOARD
3310 El Camino Ave., Rm. 151
SACRAMENTO, CA 95821
(916) 574-0609 FAX: (916) 574-0682
PERMITS: (916) 574-0685 FAX: (916) 574-0682

RECEIVED
JUL 29 2010
STATE CLEARING HOUSE

July 27, 2010

John Bassett
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814

Dear Mr. Bassett:

State Clearinghouse (SCH) Number: 2009112025
Draft Environmental Impact Report Natomas Post-Authorization Change Report/Natomas Levee Improvement Program, Phase 4b Project

Staff for the Central Valley Flood Protection Board has reviewed the subject document and provides the following comments:

The proposed project is located within the jurisdiction of the Central Valley Flood Protection Board. The Board is required to enforce standards for the construction, maintenance and protection of adopted flood control plans that will protect public lands from floods. The jurisdiction of the Board includes the Central Valley, including all tributaries and distributaries of the Sacramento River and the San Joaquin River, and designated floodways (Title 23 California Code of Regulations (CCR), Section 2).

A Board permit is required prior to starting the work within the Board's jurisdiction for the following:

- The placement, construction, reconstruction, removal, or abandonment of any landscaping, culvert, bridge, conduit, fence, projection, fill, embankment, building, structure, obstruction, encroachment, excavation, the planting, or removal of vegetation, and any repair or maintenance that involves cutting into the levee (CCR Section 6); S1-1

- Existing structures that predate permitting or where it is necessary to establish the conditions normally imposed by permitting. The circumstances include those where responsibility for the encroachment has not been clearly established or ownership and use have been revised (CCR Section 6);

- Vegetation plantings will require the submission of detailed design drawings; identification of vegetation type; plant and tree names (i.e. common name and scientific name); total number of each type of plant and tree; planting spacing and irrigation method that will be within the project area; a complete vegetative management plan for maintenance to prevent the interference with flood control, levee maintenance, inspection and flood fight procedures (Title 23, California Code of Regulations CCR Section 131).

Potential significant effects - According to the draft document p. 4.7 – 8 "The plan for compensation for impacts to landside woodland would include transplanting suitable trees from the Phase 4b Project area, where feasible, as well as planting a variety of native tree species to create woodland habitat. Potential sites for plantings to compensate for landside woodland impacts would include locations along Reach A:16 of the Sacramento River east levee, and along Lower Dry Creek, immediately east of the NEMDC."

In accordance with CCR, Section 131 "(c) Vegetation must not interfere with the integrity of the adopted plan of flood control, or interfere with maintenance, inspection, and flood fight procedures." The draft document does not include detailed planting and management plans for the proposed increase in woodland habitat of the Sacramento River east levee, and along Lower Dry Creek. As a result, potential significant hydrological impacts due to the woodland plantings included in the proposed project could not be determined. The draft document should provide additional analysis and evaluation of the potential impacts and mitigation measures reducing impacts to the operations and maintenance of the flood control system and to the system's functioning. S1-1 (Con't.)

The permit application and Title 23 CCR can be found on the Central Valley Flood Protection Board's website at http://www.cvfpb.ca.gov/. Contact your local, federal and state agencies, as other permits may apply.

If you have any questions please contact me at (916) 574-0651 or by email jherota@water.ca.gov.

Sincerely,

James Herota
Staff Environmental Scientist
Flood Projects Improvements Branch

cc:
Governor's Office of Planning and Research
State Clearinghouse
1400 Tenth Street, Room 121
Sacramento, CA 95814

Letter S1 Response	State of California – The Resources Agency, Central Valley Flood Protection Board James Herota, Staff Environmental Scientist, Flood Projects Improvements Branch July 27, 2010

S1-1 Comment noted.

Impact 4.5-b, "Alteration of Local Drainage," in the DEIS/DEIR addresses impacts associated with woodland planting in Lower Dry Creek. Mitigation Measures 4.5-b(1), "Coordinate with Landowners and Drainage Infrastructure Operators, Prepare Final Drainage Studies as Needed, and Implement Proper Project Design," and 4.5-b(2), "Prepare Hydraulic Study, and Design and Implement Lower Dry Creek Woodland Panting Areas to Avoid Adverse Hydraulic Effects," in the DEIS/DEIR would rednce this impact to a less-than-significant level.

S2

STATE OF CALIFORNIA ARNOLD SCHWARZENEGGER, Gover

CALIFORNIA STATE LANDS COMMISSION
100 Howe Avenue, Suite 100-South
Sacramento, CA 95825-8202

PAUL D. THAYER, *Executive Officer*
(916) 574-1800 FAX (916) 574-1810
California Relay Service From TDD Phone 1-800-735-2929
from Voice Phone 1-800-735-2922

Contact Phone: (916) 574-1900
Contact FAX: (916) 574-1885

August 12, 2010

File Ref: SCH 2009112025

RECEIVED
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STATE CLEARING HOUSE

John Bassett
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814

Subject: Draft Environmental Impact Statement/Environmental Impact Report (DEIS/DEIR) for the American River Watershed Common Features Project / Natomas Post-authorization Change Report / Natomas Levee Improvement Program, Phase 4b Landside Improvements Project

Dear Mr. Bassett:

The California State Lands Commission (CSLC) staff has reviewed the subject DEIS/DEIR dated July 2, 2010. For this project, the CSLC is a Trustee Agency and, depending on the final alternative selected, may also be a Responsible Agency.

As general background, the State acquired sovereign ownership of all tidelands and submerged lands and beds of navigable waterways upon its admission to the United States in 1850. The State holds these lands for the benefit of all the people of the State for statewide Public Trust purposes of waterborne commerce, navigation, fisheries, water-related recreation, habitat preservation and open space. The State owns sovereign fee title to tide and submerged lands landward to the mean high tide line (MHTL) as they existed in nature, prior to fill or artificial accretions. On navigable non-tidal waterways, the State holds fee ownership of the bed landward to the ordinary low water mark and a Public Trust easement landward to the ordinary high water mark, as they last naturally existed. The State's sovereign interests are under the jurisdiction of the CSLC. S2-1

The current project is to address improving the 42 miles of flood protection levees for the Natomas Basin. The improvements will increase the level of flood protection to achieve a minimum of 200-year flood protection. Improvements to the levee system will result in disturbance and the potential loss of riparian habitat along sections of the proposed project. These changes, along with those proposed for the other levee system enhancements in the Sacramento Valley, will result in a cumulative loss of riparian vegetation and shaded riverine aquatic habitat along the river bank, which will be difficult to mitigate and may result in secondary impacts to the listed runs of salmonids and listed avian species. The CSLC recommends that the Sacramento Area Flood Control Agency work very closely with the California Department of Fish and S2-2

Game, U.S. Fish and Wildlife Service, NOAA Fisheries, and other applicable resources agencies, as well as with local representatives of adjoining landowners (such as the Sacramento River Conservation Area Forum), to address these cumulative impacts and to design appropriate mitigation/conservation areas. Other types of mitigation, such as avoidance, both in time and space (such as construction work windows), will also need to be considered. S2-2 (Con't.)

To the extent the proposed project involves State-owned sovereign lands including, but not limited to, the Sacramento River and the American River, a lease from the Commission will be required. Please contact Diane Jones at 916-574-1843 for information concerning our leasing requirements. If you have any questions concerning the environmental review, please contact Chris Huitt at (916) 574-1938 or by e-mail at huittc@slc.ca.gov. S2-3

Sincerely,

Cy R. Oggins, Chief
Division of Environmental Planning
and Management

cc: Office of Planning and Research
D. Jones, CSLC
C. Huitt, CSLC

Letter S2 Response	California State Lands Commission Cy R. Oggins, Chief, Division of Environmental Planning and Management August 12, 2010

S2-1 Comment noted.

S2-2 Impact 4.7-a, "Loss of Landside and Waterside Woodland and Shaded Riverine Aquatic Habitats," in the DEIS/DEIR addresses impacts associated with the loss of shaded riverine aquatic (SRA) habitat. Mitigation Measure 4.7-a, "Minimize Effects on Woodland Habitat; Implement Woodland Habitat Improvements and Management Agreements; Compensate for Loss of Habitat; and Comply with Section 7 of the Federal Endangered Species Act, Section 2081 of the California Endangered Species Act and Section 1602 of the California Fish and Game Code," in the DEIS/DEIR requires that the project proponent(s) consult with NMFS, under the Federal Endangered Species Act (ESA), and the California Department of Fish and Game (DFG), under the California Endangered Species Act (CESA), regarding potential impacts to the loss of SRA habitat on Federally and state-listed fish species, respectively. Implementation of measures developed under ESA Section 7 and CESA consultation will be designed to ensure no net loss of SRA habitat function.

Section 5.1.5.6, "Water Quality/Fisheries," under the subheading "Phase 4b Project: Fisheries," in the DEIS/DEIR concludes that, combined with previous channel alterations, the Phase 4b Project would result in a cumulatively considerable incremental contribution to a cumulatively significant impact related to the loss of SRA habitat and woody debris.

S2-3 Comment noted. The project proponent(s) will meet the California State Lands Commission's leasing requirements, as necessary.

S3

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY ARNOLD SCHWARZENEGGER

DEPARTMENT OF TRANSPORTATION
DISTRICT 3 – SACRAMENTO AREA OFFICE
2800 GATEWAY OAKS DRIVE, MS 19
SACRAMENTO, CA 95833
PHONE (916) 274-0635
FAX (916) 263-1796
TTY 711

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August 17, 2010

032010SAC0037
03-SAC-99 PM VAR
American River Watershed Common Features Project Natomas Basin
Draft Environmental Impact Report
SCH# 2009112025

John Bassett, Director of Engineering
Sacramento Area Flood Control Agency (SAFCA)
1007 7th Street, 7th Floor
Sacramento, CA 95814

Dear Mr. Bassett:

Thank you for the opportunity to review and comment on the Draft Environmental Impact Statement/Draft Environmental Impact Report (DEIS/DEIR) for the American River Watershed Common Features Project/Natomas Levee Improvement Program, Phase 4b Landside Improvements Project and the Draft Natomas Post-Authorization Change Report. This review of Phase 4b is a portion of the process required to upgrading the levees in the Natomas area as part of the Natomas Levee Improvement Program. Our comments are as follows:

- Caltrans Encroachment Permits will be required for levee improvements at the Interstate 5 (I-5) American River North Levee crossing and the Interstate 80 (I-80) crossings across Sacramento River East Levee as well as the Natomas East Main Drainage Canal South Levee. All work proposed and performed within the State Highway right-of-way must be in accordance with Caltrans' standards. For more information on encroachment permits, the requirements, and an application form, please visit our web page at www.dot.ca.gov/doingbusiness and then click on "Encroachment Permits" or contact the Caltrans District 3, Office of Permits at (530) 741-4403. S3-1

- Caltrans District 3 would appreciate the opportunity to review the plans for levee improvements at the highway crossings. S3-2

"Caltrans improves mobility across California"

- The American River North Levee and Sacramento River East Levee 3B run under bridge structures on piers. Please provide a list of they type of equipment to be used under the structures and the plans/procedures in place to prevent any damage to existing bridge piers. S3-3

- The North East Main Drainage Canal South Levee runs under the bridge across the canal in close proximity to the bridge abutments. Please provide plans for the levee improvements at this location for Caltrans review. S3-4

If you have any questions regarding these comments, please contact Sadie Smith at (530) 741-4004 or sadie_smith@dot.ca.gov.

Sincerely,

Alyssa Begley

ALYSSA BEGLEY, Chief
Office of Transportation Planning - South

"Caltrans improves mobility across California"

Letter S3 Response	State of California, Department of Transportation, District 3, Sacramento Area Office Alyssa Begley, Chief, Office of Transportation Planning – South August 17, 2010

S3-1 As noted in Section 1.7.2.2, "State Actions/Permits," of the DEIS/DEIR, a California Department of Transportation (Caltrans) encroachment permit is listed as a requirement for project implementation, as appropriate.

S3-2 USACE and/or SAFCA will coordinate with Caltrans District 3, as appropriate, to ensure appropriate Caltrans review and input is received regarding highway crossings and construction near bridge structures. Additionally, Mitigation Measure 4.10-a, "Prepare and Implement a Traffic Safety and Control Plan for Construction-Related Truck Trips," in the DEIS/DEIR requires the preparation of a traffic safety and control plan as well as a Transportation Management Plan, both of which would be submitted to Caltrans for review.

S3-3 See response to comment S3-2.

S3-4 See response to comment S3-2.

S4

STATE OF CALIFORNIA
Governor's Office of Planning and Research
State Clearinghouse and Planning Unit

Arnold Schwarzenegger
Governor

Cathleen Cox
Acting Director

August 17, 2010

John Bassett
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814

Subject: Common Features/Natomas PACR/Natomas Levee Improvement Program, Phase 4b Project
SCH#: 2009112025

Dear John Bassett:

The State Clearinghouse submitted the above named Draft EIR to selected state agencies for review. On the enclosed Document Details Report please note that the Clearinghouse has listed the state agencies that reviewed your document. The review period closed on August 16, 2010, and the comments from the responding agency (ies) is (are) enclosed. If this comment package is not in order, please notify the State Clearinghouse immediately. Please refer to the project's ten-digit State Clearinghouse number in future correspondence so that we may respond promptly.

Please note that Section 21104(c) of the California Public Resources Code states that:

> "A responsible or other public agency shall only make substantive comments regarding those activities involved in a project which are within an area of expertise of the agency or which are required to be carried out or approved by the agency. Those comments shall be supported by specific documentation."

S4-1

These comments are forwarded for use in preparing your final environmental document. Should you need more information or clarification of the enclosed comments, we recommend that you contact the commenting agency directly.

This letter acknowledges that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act. Please contact the State Clearinghouse at (916) 445-0613 if you have any questions regarding the environmental review process.

Sincerely,

Scott Morgan
Director, State Clearinghouse

Enclosures
cc: Resources Agency

1400 TENTH STREET P.O. BOX 3044 SACRAMENTO, CALIFORNIA 95812-3044
TEL (916) 445-0613 FAX (916) 323-3018 www.opr.ca.gov

Document Details Report
State Clearinghouse Data Base

SCH# 2009112025
Project Title Common Features/Natomas PACR/Natomas Levee Improvement Program, Phase 4b Project
Lead Agency Sacramento Area Flood Control Agency

Type EIR Draft EIR

Description The overall purpose of the Natomas Levee Improvement Program (NLIP) is to bring the entire 42-mile Natomas Basin perimeter levee system into compliance with applicable Federal and state standards for levees protecting urban areas. The Phase 4b - Project - a component of the NLIP - consists of improvements to the remaining portions of the Natomas Basin's perimeter levee system and associated landscape, irrigation/drainage infrastructure modifications, and environmental mitigation, including habitat creation and management.

Lead Agency Contact

Name John Bassett
Agency Sacramento Area Flood Control Agency
Phone (916) 874-7606 **Fax**
email
Address 1007 7th Street, 7th Floor
City Sacramento **State** CA **Zip** 95814

Project Location

County Sacramento, Sutter
City Sacramento
Region
Lat / Long 38° 41' N / 121° 36' W
Cross Streets Various
Parcel No.
Township **Range** **Section** **Base**

Proximity to:

Highways Hwy 5, 99, 80
Airports Sacramento Int'l
Railways
Waterways Sacramento & American Rivers, NCC, NEMDC, PGCC
Schools
Land Use Various, including flood damage reduction facilities, agriculture, residential, and public right-of-way.

Project Issues Agricultural Land; Air Quality; Archaeologic-Historic; Biological Resources; Drainage/Absorption; Economics/Jobs; Flood Plain/Flooding; Forest Land/Fire Hazard; Geologic/Seismic; Minerals; Noise; Population/Housing Balance; Public Services; Recreation/Parks; Soil Erosion/Compaction/Grading; Solid Waste; Toxic/Hazarcous; Traffic/Circulation; Vegetation; Water Quality; Water Supply; Wetland/Riparian; Growth Inducing; Landuse; Cumulative Effects; Aesthetic/Visual

Reviewing Agencies Resources Agency; Department of Conservation; Department of Fish and Game, Region 2; Office of Historic Preservation; Department of Parks and Recreation; Central Valley Flood Protection Board; California Highway Patrol; Caltrans, District 3; Regional Water Quality Control Bd., Region 5 (Sacramento); Native American Heritage Commission; State Lands Commission; Department of Water Resources

Date Received 07/01/2010 **Start of Review** 07/01/2010 **End of Review** 08/16/2010

Note: Blanks in data fields result from insufficient information provided by lead agency.

Letter	Governor's Office of Planning and Research
S4	Scott Morgan, Director, State Clearinghouse
Response	August 17, 2010

S4-1 Comment noted.

LOCAL AGENCIES

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

L1

August 2, 2010

Mr. John Bassett
Director of Engineering
SAFCA
1007 Seventh Street, 7th Floor
Sacramento, CA 95814

Ms. Elizabeth Holland
Planning Division
USACE, Sacramento District
1325 J Street
Sacramento, CA 95814

American River Watershed Common Features Project, Natomas Levee Improvement Program (NLIP), Phase 4b Landside Improvements Project DEIS/DEIR (SAC200701184f)

Dear Mr. Bassett and Ms. Holland:

Thank you for providing the NLIP Phase 4b Landside Improvements Project DEIS/DEIR to the Sacramento Metropolitan Air Quality Management District (SMAQMD) for review. SMAQMD staff comments follow.

1. Please provide the analysis justifying the statement that a dust control plan has been developed that will "effectively reduce mass PM10 emissions below the concentration based threshold" (page 4.11-6, paragraph 2). Has modeling been performed to show concentrations below the 5% substantial contribution in non-attainment areas? L1-1
2. Why was the level of 400 tons/year of PM10 selected as a trigger to include the use of advanced dust suppression materials (page 4.11-14, last bullet)? L1-2
3. Would the application of advanced dust suppression materials reduce PM10 emissions from 400 to 100 tons/year (page 4.11-14, last bullet)? L1-3
4. The SMAQMD prefers that an estimated mitigation fee be disclosed in the DEIS/DEIR based on the emissions estimates and mitigation measures provided in the document (page 4.11-15, 4th bullet). L1-4
5. Because there is concern in the construction industry regarding the safe operation of off-road equipment with a diesel particulate filter (DPF) that blocks driver visibility, the SMAQMD suggests an alternative mitigation be available to the 15% DPF installation for off-road equipment. SMAQMD has determined that an additional 20% reduction in project-wide fleet average particulate emissions would be beneficial, which brings the total particulate emission reduction to 65% compared to the state fleet average (page 4.11-16, last bullet). L1-5
6. SMAQMD suggests adding the word "not" in the 3rd to last sentence of the first paragraph on page 4.11-23, regarding exposing sensitive receptors to substantial concentrations of Toxic Air Contaminants. L1-6

777 12th Street, 3rd Floor ▪ Sacramento, CA 95814-1908
916/874-4800 ▪ 916/874-4899 fax
www.airquality.org

7. Overall, the climate change and greenhouse gas discussion and analysis were done well (section 5.1.5.12). L1-7
8. The listing of potential greenhouse gas mitigation measures on page 5-22 should be referenced in Table ES-2, Summary of Impacts and Mitigation Measures, and/or another obvious place in the DEIS/EIR that future contractors will reference for project construction requirements. L1-8

All projects are subject to SMAQMD rules in effect at the time of construction. Attached is a list of rules that may apply to this project. For more information on SMAQMD rules call 916-874-4800 or visit www.AirQuality.org. L1-9

Please contact me at 916-874-4881 or khuss@airquality.org if you have any questions regarding these comments.

Sincerely,

Karen Huss

Karen Huss
Associate Air Quality Planner/Analyst

Attachment

Cc: Larry Robinson, Sacramento Metropolitan Air Quality Management District
Sondra Andersson, Feather River Air Quality Management District

SMAQMD Rules & Regulations Statement (revised 1/07)

*The following statement is recommended as standard condition of approval or construction document language for **all** development projects within the Sacramento Metropolitan Air Quality Management District (SMAQMD):*

All projects are subject to SMAQMD rules and regulations in effect at the time of construction. A complete listing of current rules is available at www.airquality.org or by calling 916.874.4800. Specific rules that may relate to construction activities or building design may include, but are not limited to:

Rule 201: General Permit Requirements. Any project that includes the use of equipment capable of releasing emissions to the atmosphere may require permit(s) from SMAQMD prior to equipment operation. The applicant, developer, or operator of a project that includes an emergency generator, boiler, or heater should contact the District early to determine if a permit is required, and to begin the permit application process. Portable construction equipment (e.g. generators, compressors, pile drivers, lighting equipment, etc) with an internal combustion engine over 50 horsepower are required to have a SMAQMD permit or a California Air Resources Board portable equipment registration. L1-9 (Con't.)

Other general types of uses that require a permit include dry cleaners, gasoline stations, spray booths, and operations that generate airborne particulate emissions.

Rule 403: Fugitive Dust. The developer or contractor is required to control dust emissions from earth moving activities or any other construction activity to prevent airborne dust from leaving the project site.

Rule 417: Wood Burning Appliances. Effective October 26, 2007, this rule prohibits the installation of any new, permanently installed, indoor or outdoor, uncontrolled fireplaces in new or existing developments.

Rule 442: Architectural Coatings. The developer or contractor is required to use coatings that comply with the volatile organic compound content limits specified in the rule.

Rule 902: Asbestos. The developer or contractor is required to notify SMAQMD of any regulated renovation or demolition activity. Rule 902 contains specific requirements for surveying, notification, removal, and disposal of asbestos containing material.

Letter L1 Response	Sacramento Metropolitan Air Quality Management District Karen Huss, Associate Air Quality Planner/Analyst August 2, 2010

L1-1 Emissions modeling was conducted to evaluate potential air quality impacts from emissions of particulate matter with an aerodynamic diameter of 10 micrometers or less (PM_{10}), using emission factors derived from the SMAQMD Road Construction Model, Versions 6.3.2. as well as EPA's AP-42 factors for bulldozing and haul transport on paved and unpaved roads. A Fugitive Dust Control Plan would be developed by the construction contractor(s) and will include enhanced fugitive dust control measures, as recommended by SMAQMD. Therefore, dispersion modeling has not been conducted for this air quality analysis. Upon further request, significance determination can be demonstrated using supporting dispersion modeling outcomes.

L1-2 SMAQMD notes that 400 tons per year of PM_{10} appears to have been selected as a trigger for implementation of advanced dust suppression technologies. This is a typographical error. The trigger for use of advanced suppression or chemical stabilizers is 100 tons per year, consistent with the threshold established per SMAQMD Rule 104 as well as EPA's General Conformity Rule.

The second bullet under the subheading, "Construction in Sacramento County (SMAQMD)," under Mitigation Measure 4.11-a, "Implement Applicable District-Recommended Control Measures to Minimize Temporary Emissions of ROG, NO_X, and PM_{10} during Construction," of the DEIS/DEIR has been modified as follows:

- If overlapping construction phases in Sacramento County create unmitigated PM_{10} emissions in excess of the General Conformity threshold, per SMAQMD Rule 104, of ~~400~~ 100 TPY, the project proponent(s) shall use advanced dust suppressant materials (such as EnviroTac II) on all unpaved roadways and stockpiled materials to ensure enhanced fugitive dust control up to 90% or greater ~~control~~ of fugitive dust and ~~a reduction of~~ PM_{10} emissions ~~below 100 TPY~~.

L1-3 See response to comment L1-2.

L1-4 The total estimated fee, including a 5% administrative fee, for Phase 4b Project elements occurring during the 2012 through 2016 construction seasons within Sacramento County would be $222,936. Detailed fee calculations for fees to be paid to SMAQMD, by proposed construction year, are presented in **Appendix F**, Table 22, of this FEIS/FEIR.

The last bullet of Mitigation Measure 4.11-a, "Implement Applicable District-Recommended Control Measures to Minimize Temporary Emissions of ROG, NO_X, and PM_{10} during Construction," of the DEIS/DEIR is revised as follows:

- The project proponent(s) shall pay ~~SMAQMD's off-site construction mitigation fund to further mitigate construction-generated emissions of NO_x that exceed SMAQMD's daily emission threshold of 85 lb/day, for the purpose of reducing impacts to a less-than-significant level. The total mitigation fee for project-related work conducted in Sacramento County during the 2012-2016 construction seasons will be quantified in coordination with SMAQMD using equipment inventories provided by the project proponent(s) prior to construction. Calculation of fees associated with the Phase 4b Project shall be conducted at the time of project approval. The applicable fee rate shall be determined and the total fee shall be calculated based on the fee rate in effect~~

~~at the time of project approval. The fee shall be remitted to SMAQMD before groundbreaking.~~ SMAQMD an off-site mitigation fee for implementation of any proposed alternatives for the purpose of reducing NO_X emissions impacts to a less-than-significant level. Based on the construction information presented in Chapter 2.0, "Alternatives" and the emissions calculations shown in **Appendix F**, if the Proposed Action is implemented, the total estimated fee, including a 5% administrative fee, for elements occurring during the 2012 through 2016 construction seasons within Sacramento County would be $222,936. The fee calculation to offset daily NO_X emissions is based on the cost to reduce 1 ton of NO_X at the time when the document is prepared (currently $16,400 per ton). An initial payment, based on 50% of the estimated fee, shall be remitted to SMAQMD before groundbreaking. The final mitigation fee shall be based on contractor equipment inventories provided by the project proponent(s) to SMAQMD and will reconcile any fee discrepancies due to schedule adjustments or increased equipment inventories.

L1-5 Contractor fleet inventories are currently provided to SMAQMD as part of an existing District-recommended mitigation measure adopted by a previous NLIP project phase to demonstrate a 40% reduction of particulate matter (PM) emissions, based on a comparison to the ARB fleetwide average. To date, fleet inventories provided to SMAQMD demonstrate achievement of 60–65% PM reduction when compared to the ARB fleetwide average. Due to the visibility concerns of retrofit equipment, SMAQMD's recommendation for 15% of contracted fleets to install diesel particulate filters (DPFs) is not required, but will be implemented as feasible.

The last bullet of Mitigation Measure 4.11-a, "Implement Applicable District-Recommended Control Measures to Minimize Temporary and Short-Term Emissions of ROG, NO_X, and PM_{10} During Construction," of the DEIS/DEIR is revised as follows:

- When feasible and determined to be necessary, ~~i~~install ARB-certified Level 3 diesel particulate filters (DPF) on ~~a minimum of 15% of the total number of off-road (non-street legal)~~ diesel-powered construction equipment pieces ~~with an engine size equal to or greater than 50 hp throughout the duration of the project. For fleets with six or fewer total applicable equipment pieces, a DPF shall be installed on a minimum of one engine~~. All DPFs shall be kept in working order and maintained in operable condition according to manufacturer's specifications. At the time of writing, a list of ARB-certified Level 3 DPF can be found at http://www.arb.ca.gov/diesel/verdev/level3/level3.htm.

L1-6 The last paragraph of Impact 4.11-d, "Exposure of Sensitive Receptors to Toxic Air Emissions," in the DEIS/DEIR is revised as follows:

As discussed under Impact 4.11-c, above, the RD 1000 pumping plants and City of Sacramento sump pumps to be modified as part of the Adjacent Levee Alternative (Proposed Action) or the Fix-in-Place Alternative would be minor stationary sources of TAC emissions in Sacramento Counties. Diesel-powered backup generators would be used in emergency situations and would be tested monthly. Consequently, diesel PM emissions associated with the modified pump stations would be infrequent. Furthermore, this category of stationary source (i.e., portable equipment), in addition to any other stationary sources that may emit TACs (i.e., dry cleaners), would be subject to FRAQMD and SMAQMD permitting and toxic best available control technology (T-BACT) requirements. If the implementation of T-BACT would not reduce emissions to an acceptable level, then FRAQMD and SMAQMD would deny the required permit for the stationary source (in this case, the diesel-powered backup generators). Therefore,

operation of these stationary sources would not expose sensitive receptors to substantial concentrations of TACs. No other stationary sources of emissions would be associated with any of the action alternatives. Thus, this impact is considered to be **less than significant**. ***(Similar)***

L1-7 Comment noted.

L1-8 The measures included in Mitigation Measure 4.11-a, "Implement Applicable District-Recommended Control measures to Minimize Temporary and Short-Term Emissions of ROG, NO_X, and PM_{10} During Construction," of the DEIS/DEIR would also serve to reduce greenhouse gas emissions. The specific measures listed on page 5-22 of the DEIS/DEIR are not required to be implemented; rather, they are best management practices. The project proponent(s) would implement measures such as these during construction of the Phase 4b Project to reduce greenhouse gas emissions.

L1-9 Comment noted; all projects are subject to SMAQMD rules at the time of construction. The impact discussion and mitigation measures in the DEIS/DEIR require that USACE and SAFCA comply with SMAQMD rules in place at the time of construction.

L2

SUTTER COUNTY
COMMUNITY SERVICES DEPARTMENT

Planning – Lisa Wilson, Planning Manager
Animal Control
Building Inspection
Environmental Health

Director – Larry Bagley
Assistant Director – Randy Cagle
Fire Services – Dan Yager
Emergency Services – John DeBeaux

CERTIFIED AND FIRST CLASS MAIL

August 13, 2010

John Bassett, P.E., Director of Engineering
Sacramento Area Flood Control Agency
1007 7th Street, 7th Floor
Sacramento, CA 95814

Re: Response to the Draft EIS/EIR on the Natomas Post-authorization Change Report/Natomas Levee Improvement Program, Phase 4b Landside Improvements Project

Dear Mr. Bassett,

Thank you for the opportunity to comment on the Draft EIS/EIR on the Natomas Post-authorization Change Report/Natomas Levee Improvement Program, Phase 4b Landside Improvements Project. The County of Sutter has the following comments on the proposed EIS/EIR. L2-1

- Plate 2-6 indicates the Triangle Properties borrow area were previously analyzed, while other portions of the document indicate the area is a new source of borrow. Please address this conflict.

- The proposed Triangle Properties borrow area will include an area currently occupied by the Pleasant Grove Cemetery District cemetery. Page 2-57 and Section 4.8 of the environmental document do not contain any discussion of the cemetery or the potential impacts of soil borrow on the cemetery. The County requests the proposed project's impacts on this cemetery be discussed and analyzed in the environmental document and effective mitigation be incorporated. L2-2

- Plate 2-6, Plate 2-13, and various tables in the environmental document indicate the Brookfield borrow site will be reclaimed to managed marsh. In previous discussions with SAFCA, the County understood the site would be reclaimed to agriculture, as rice production. Please be aware that Sutter County Zoning Code Section 1500-1412 requires approval of a development agreement by the Board of Supervisors for the conversion of agricultural land to permanent habitat. L2-3

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Typically, the removal of more than 1,000 cubic yards of material from a site is subject to the requirements of the Surface Mining and Reclamation Act (SMARA). This requires a surface mining permit and reclamation plan to be processed by Sutter County. If SAFCA would like to use this document as a basis for CEQA review for a subsequent surface mining and reclamation plan application, then the EIR needs to specifically address the potential impacts of borrow activities as well. We look forward to working with you to assure that all surface mining and reclamation impacts are properly analyzed and mitigated. Please provide our office with all future notices regarding this project. L2-4

Sincerely,

Douglas G. Libby, AICP
Principal Planner

DL:kf

P:\Planning\Projects - Misc\SAFCA - Phase 4b Levee Improvement Project\County response to EIR.doc

Letter	Sutter County Community Services Department
L2	Douglas G. Libby, AICP, Principal Planner
Response	August 13, 2010

L2-1 To be consistent with the project description, Plate 2-6 is revised in the FEIS/FEIR to show that the Triangle Properties Borrow Area is a new source of borrow for the Phase 4b Project, rather than a previously analyzed source.

L2-2 Under the subheading "Triangle Properties Borrow Area" in Section 2.3.3.4, "Borrow Sites," of the DEIS/DEIR, it is noted that "no demolition of residences or *other non-agricultural uses* (emphasis added) would occur as part of borrow excavation." This paragraph is revised in the FEIS/FEIR to note the existence of the Pleasant Grove Cemetery District cemetery, and to further clarify that no borrow site excavation would take place in or near it. The text is revised as follows:

> The Triangle Properties Borrow Area (**Plate 2-13**) is located to the northeast of the Natomas Basin on the east side of the PGCC. It is bordered on the east by the Union Pacific Railroad. Farmland would be excavated to a depth of up to 6 feet and either reclaimed for rice cultivation or converted to detention basins to store PGCC overflow in the event that the PGCC culverts are removed. No demolition of residences or other non-agricultural uses would occur as part of borrow excavation. Excavation sites within the Triangle Properties Borrow Area would be set back at least 100 feet from existing roads, utilities, ~~or~~ irrigation ditches, as well as residential and other non-agricultural land uses, such as the Pleasant Grove Creek Cemetery District cemetery. The bridges for Howsley, Fifield, Keys, and Sankey Roads would be used as haul routes to bring the borrow material over the PGCC into the Natomas Basin for the construction of the PGCC and north NEMDC. Alternatively, temporary crossings of the PGCC could be constructed with culverts or bridges over the low-flow channel, to provide for off-road hauling.

The following new paragraph is added after the last bullet in Section 3.8, "Cultural Resources," of the DEIS/DEIR to describe the Pleasant Grove Cemetery District cemetery:

> - **CA-Sut-80H (P-51-000080H)**. Located just north of the Sacramento-Sutter County line and just east of the NEMDC this resource consists of a trash scatter that was determined ineligible for listing on the NRHP (EBASCO 1992a, 1992b).
>
> In addition to the resources in the Sutter County portion of the Natomas Basin, the Pleasant Grove Cemetery District cemetery occurs on the northern edge of the proposed Triangle Properties Borrow Area. Although the cemetery is not recorded as a cultural resource, it contains human remains subject to management required under CEQA. The cemetery occurs on the south side of Howsley Road east of the intersection with Pacific Avenue. This resource would be excluded from the footprint of borrow activities.

The last paragraph of Impact 4.8-d, "Potential Discovery of Human Remains During Construction," in Section 4.8, "Cultural Resources," of the DEIS/DEIR is revised as follows:

> Prehistoric human remains have been found at several prehistoric sites in the vicinity of the Phase 4b Project area. Previously unknown buried human remains may be unearthed, damaged, or destroyed during excavation activities associated with project construction and excavation of borrow from the sites identified in Chapter 2, "Alternatives." This work includes construction of levee improvements, seepage remediation, and changes

and improvements to drainage and irrigation infrastructure. Both the Adjacent Levee Alternative (Proposed Action) and the Fix-in-Place Alternative have a high risk of disturbing previously undiseovered human remains because of the extent of ground-disturbing work required for the project. It should be noted that the Pleasant Grove Cemetery District cemetery oceurs on the northern edge of the proposed Triangle Properties Borrow Area. Although the cemetery is not recorded as a cultural resource, it contains human remains subject to management required under CEQA. The eemetery occurs on the south side of Howsley Road east of the intersection with Pacific Avenue. This resouree would be excluded from the footprint of borrow activities. Therefore, the Proposed Action would not affect human interments in the cemetery. However, beeause of the sensitivity for buried human remains in the areas where ground-disturbing work would occur-, this impact is considered **potentially significant**. ***(Similar)***

L2-3 Comment noted. Development agreement approvals will be obtained as necessary.

L2-4 The California Surface Mining and Reclamation Act (SMARA) permitting is described in Section 3.4.1.1, under "California Surface Mining and Reclamation Act," of the DEIS/DEIR and is also addressed by Mitigation Measure 4.4-a(2), "Secure and Implement the Conditions of the California Surface Mining and Reclamation Act Permit or Exemption," in the DEIS/DEIR. The environmental impacts of borrow site excavation, including at sites that would be located within the Triangle Properties Borrow Area, have been addressed throughout the DEIS/DEIR. Table 2-23 in the DEIS/DEIR describes the size and depth of the area that would be excavated and the proposed postreclamation use. Agricultural impacts are addressed in Section 4.2, "Agriculture," of the DEIS/DEIR. Hydrology, Water Quality, Biological Resources, Cultural Resources, Transportation and Traffic, Air Quality, and Hazards and Hazardous Materials impacts of borrow site excavation are addressed in Sections 4.5, 4.6, 4.7, 4.8, 4.10, 4.11, and 4.16, respectively, of the DEIS/DEIR.

L3

DEPARTMENT OF TRANSPORTATION

CITY OF SACRAMENTO
CALIFORNIA

915 I STREET, ROOM 2000
SACRAMENTO, CA
95814-2604

PH: (916) 808-8300
FAX: (916) 808-8291

August 16, 2010

Elizabeth Holland,
USACE Sacramento District, Planning Division,
1325 J Street,
Sacramento, CA, 95814

Dear Ms. Holland:

Attached to this letter you will find comments on behalf of the City of Sacramento Department of Transportation, Engineering Services Division for the Natomas Levee Improvement Program Draft Environmental Impact Statement/Draft Environmental Impact Report.

If you have any questions or require any additional information, please call me at (916) 808-8279.

Sincerely,

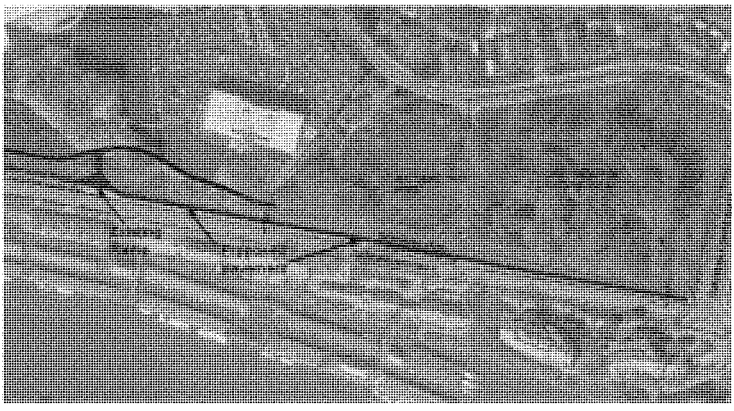
Ryan Moore
Supervising Engineer,
Funding and Project Delivery,
Department of Transportation

Department of TRANSPORTATION City of Sacramento

Part 1 - Project Description

Page 2-24 says "To comply with USACE vegetation guidance, all vegetation would be cleared at least 15 feet from the landside toes of the improved levees." The removal of heritage trees within the city must be done in accordance with the City of Sacramento heritage tree ordinance, including the proper mitigation of lost resources. Mitigation shall be coordinated with Urban Forest Division of the Department of Transportation. L3-1

Page 2-25 says "Construct a bicycle and pedestrian trail along the 42-mile loop of the Natomas Basin levee perimeter in the northwestern portion of the County of Sacramento, southern portion of Sutter County, and a portion of the City of Sacramento (program-level analysis only, because site specific details are not available)..." The environmental document should clarify that the actual construction of the finished paved bike and pedestrian trail is not necessarily funded. In this context, the City of Sacramento would like to request that a portion of the proposed trail be constructed through a contribution of funds from the City. This trail segment is on Reach 20, Sta. 940+00 to Sta. 955+00. The City of Sacramento would like to provide the additional funds for paving the proposed bike trail at the top of the levee along this segment. This would include the cost of paving the east leg of the ramps at Sta. 940+00. By including the paving of this segment of bike trail, a vital link in the City's off street bike trail system can be established connecting Natomas to the American River Parkway.



L3-2

Page 2-31 thru 2-32 says "Where cutoff wall construction occurs through the crown of the adjacent levee, some reconstruction work on Garden Highway would be required to restore the landside lane of the roadway. Garden Highway intersections at major roadway ramps would require degrading, rebuilding the embankment, and repaving to accommodate the installation of the cutoff wall and slope flattening. Traffic control and detours would be required during this phase of construction..." Will the repaving of the Garden Highway involve bringing the street up to city standards, including elements that would make the street more complete as outlined in the City's General Plan? At the very least, when this L3-3

segment of road is re-paved, the City of Sacramento would like to review and approve the striping plans to see if an additional eastbound bike lane can be striped within the existing roadway width. L3-3 (Con't.)

Page 2-31 says "Garden Highway intersections at Natomas Park Drive, Truxel Road, Arden-Garden Connector, Northgate Boulevard, and four additional private parcel ramps would require degrading, rebuilding the embankment, and repaving to accommodate the installation of the cutoff wall and slope flattening. The ramps would be reconstructed to the current general ramp and intersection geometry..." At Reach 4, Sta. 100+00, the Garden Highway runs past the Niños Parkway. Will there be an access ramp to the open space as part of this project? If so, can the ramp be made so that it one day can become a bike trail access point to the Niños Parkway? L3-4

Page 2-53 and a similar paragraph on page 2-55 says "To facilitate raising of the pump discharge pipes, the existing bike trail would require a local raise in grade over the pipes. The trail raise would transition back down to existing grade upstream and downstream of the local raise. This work would require partial regrading of the waterside slope for the length of the raised bike trail. At this site, the levee would be degraded and reconstructed with engineered fill. A detour or closure of the bike trail would be required for up to 30 days..." Will the bike trail be reconstructed to meet current city standards? L3-5

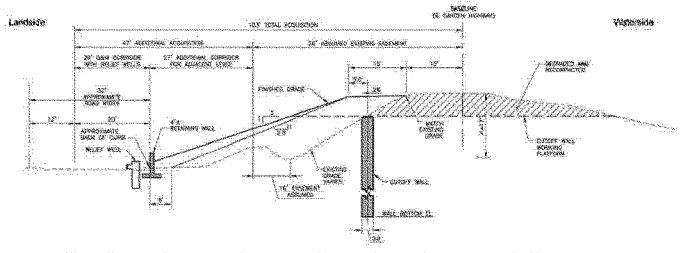
Page 2-53 says "The bike trail would be funded locally, separate from this project." Will there be an opportunity for the City of Sacramento to contribute funds to the project to construct a portion of the trail? L3-6

Page 2-53 says "Where a Class I bike trail cannot be constructed because of physical constraints, the bikeway would be designed to exceed or meet the minimum standards for a Class II facility (a lane set aside in city/county streets exclusively for bikes)." Will the process of delivering this project include an opportunity to work with City and County representatives to plan the locations of these locations? L3-7

Page 2-67 says "Because of the requirement to have newly constructed levees settle prior to final inspection and certification, trail construction in these areas would not occur until the following year's construction season, at the earliest. In addition, the long lead time in securing funding sources could delay construction for several years after completion of levee construction." Would this apply to the segment of bike trail on Reach 20, Sta. 940+00 to Sta. 955+00 where the levee is going to be regarded and repaved for the Garden Highway? L3-8

Part 2 - Plates

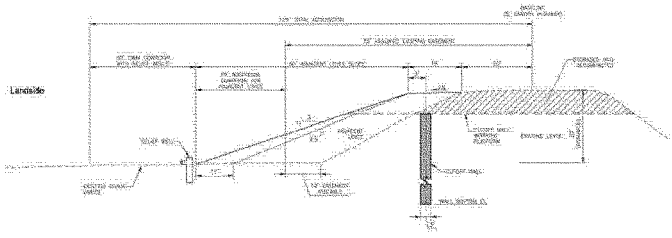
Page 2-101: The cross section on this page does not indicate the existing bike and pedestrian trail that is at the toe of the levee which will be covered over as a result of the project. L3-9



Adjacent Levee Section – Reaches 19B (partial) – 3:1 to 2.5:1 Slope with Cutoff Wall and Relief Wells

Page 2-103: The cross section on this page does not indicate the existing bike and pedestrian trail that is at the toe of the levee which will be covered over as a result of the project. In addition, this section shows a half width of Garden Highway at 20 feet. The crown of the Garden Highway actually varies in size, making the half width as much as 26 feet. Are we to make the assumption that the placement of the adjacent levee will be 15 feet to the north of the existing hinge point of the levee, or will it be set at 20 feet from the centerline of the Garden Highway?

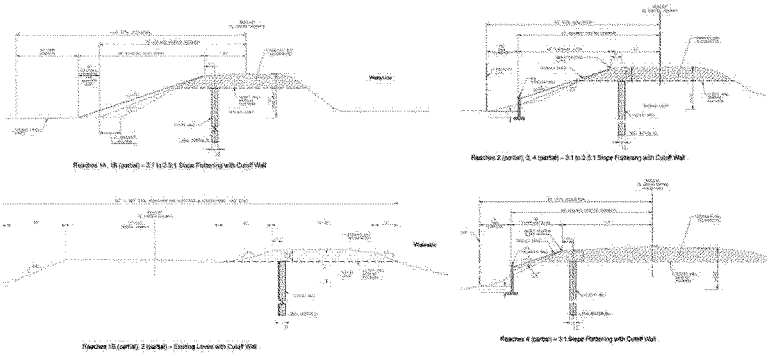
L3-10



Adjacent Levee Section – Reaches 19B (partial), 20 – 3:1 to 2.5:1 Slope with Cutoff Wall and Relief Wells

Pages 2-107 and 2-109: The cross sections on these pages do not indicate the existing bike and pedestrian trail that will be removed and presumable replaced as a result of the project. In the areas between Natomas Park Drive and Northgate Boulevard, will the future bike trail be on the north or south side of the Garden Highway?

L3-11



Part 4 – Impacts Assessments

In Section 4.10.1.2, The environmental document states that the threshold of significance for transportation related impacts would result in a significant impact related to transportation and circulation if the proposed project, or project alternatives would do any of the following:

- "...substantially increase hazards due to a design feature or incompatible uses;
- result in inadequate emergency access; or
- conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities."

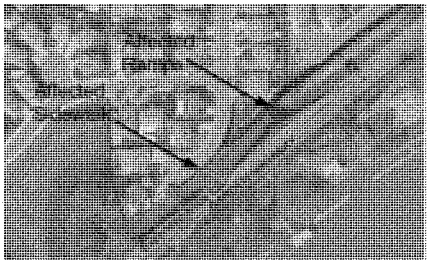
Within this context, this environmental document does not adequately address significant impacts that would result from the construction of the proposed adjacent levee structures. These impacts generally are the loss of existing emergency vehicle access points and the loss of existing pedestrian and bicycle facilities.

Within the City of Sacramento along the Garden Highway between Interstate 80 and Interstate 5, there are at least 2 public streets, 8 property access ramps and 6 emergency access points that connect with the Garden Highway and/or to each other. The proposed project does not show sufficient detail of how these connections will be modified. Based on the information provided, the proposed project will completely eliminate some of the emergency access points. Mitigations for these losses should be provided.

Furthermore, the stretch along the Garden Highway between Interstate 80 and Natomas Park Drive has at least 4 existing bike and pedestrian facilities that will be affected. The proposed project does not indicate what will happen to these facilities. Using the information provided about the proposed project, the loss of existing bike and pedestrian facilities is anticipated. Mitigations for these losses should be provided. L3-12

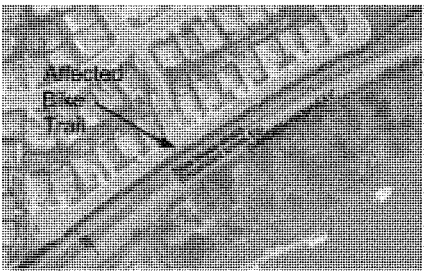
Details of these impacted areas are as follows:

1. Reach 19B, Sta. 879+00 to Sta. 885+00; there are two emergency access ramps at this location which provide access to the cul-de-sacs streets called Avocet Court and Marina Glen Way. The construction of the proposed project will require some re-alignment of these ramps to allow continued emergency vehicle access. These access ramps also function as bike and pedestrian access ramps. Construction of the re-aligned ramps should comply with accessibility standards. The ramp to Marina Glen Way may require a retaining wall structure as mitigation. The construction of the proposed project will also interfere with the existing pedestrian walkway along the end of Marina Glen Way. The existing sidewalk should not be impacted, and proper mitigation, such as the inclusion of a retaining wall should be included.



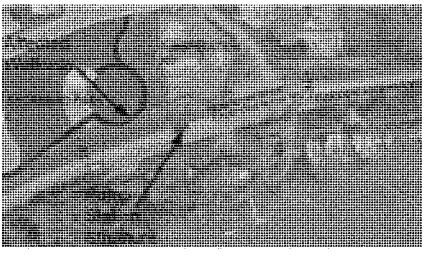
5

2. Reach 19B, Sta. 883+00 to 892+00; there is a bike and pedestrian facility along Swainson Way/Avocet Court between the street curb and the toe of the levee. The construction of the proposed project will place the levee on top of this facility, rendering it unusable and disconnected from Shorebird Park. Mitigation for the loss of this facility must be provided. One option for mitigation would be the construction of the proposed bike trail at the top of the levee. If this is done, part of this mitigation should include connectivity to Shorebird Park near Sta. 892+00.



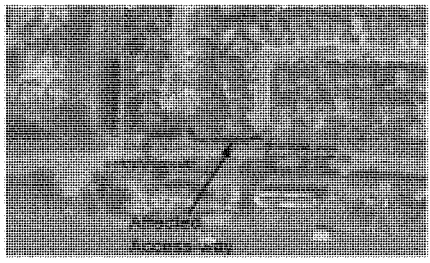
3. Reach 19B, Sta. 892+00 to Sta. 895+00; the existing pedestrian pathways within Shorebird Park run along the toe of the levee. The construction of the proposed project will place the levee on top of these pathways, rendering them unusable. Mitigation for the loss of these pathways must be provided. One option for mitigation would be the reconstruction of these pathways in a similar location and layout, but at a higher elevation. This could also be an opportunity to create connectivity to the proposed bike trail at the top of the levee.

L3-12 (Con't.)



4. Reach 19B, Sta. 895+00; there is an elevated concrete structure adjacent to the Garden Highway that is associated with City Pump Station 160. The size and location of this structure appears to be in conflict with the location of the proposed bike trail at the top of the levee. While it is understood that the proposed project does not normally include the construction of this proposed bike trail, should this trail be selected as mitigation for the impact identified previously, the design of this trail should look at ways to coordinate with the pump station structure. This could be an opportunity to connect to the pedestrian pathways in Shorebird Park.

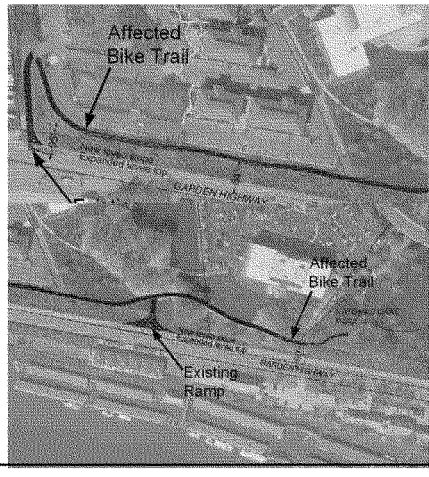
5. Reach 19B, Sta. 913+00 to 917+00; this area includes the intersection of Orchard Lane and Garden Highway and an emergency vehicle access/bike and pedestrian facility connecting Durazno Court to La Lima Way. The proposed project does not appear to significantly change the intersection at Orchard Lane; however there will likely be impacts during the construction. Appropriate detours and construction phasing for this intersection would be required. The proposed project will place the levee on top of the emergency vehicle access between Durazno Court and La Lima Way. The loss of this access-way must be mitigated. The proper mitigation for this impact would be the construction of an alternative access-way which will provide adequate emergency vehicle access and maintain bike and pedestrian connectivity between these streets. One option would be to construct ramps from the new proposed bike trail at the top of the levee to the two streets below.



L3-12
(Con't.)

6. Reach 20, Sta. 929+00; there is a traffic channelization island and an emergency access road at this location. The size and location of this structure appears to be in conflict with the location of the proposed bike trail at the top of the levee. While it is understood that the proposed project does not normally include the construction of this proposed bike trail, evaluation for the need for the continued use of this channelization island should be considered. Additionally, there is an existing emergency access road at this location. It does not appear that the propose project will require a modification of this access road, since it already ties into a wide part of the existing levee. The environmental document should verify that there is no impact at this location.

7. Reach 20, Sta. 929+00 to Sta. 940+00 and at Sta. 945; there is an existing bike and pedestrian trail near the toe of the levee. The construction of the proposed project will place the levee on top



of or near the edge of these pathways, rendering them unusable. Mitigation for the loss of is trail must be provided. One option for mitigation would be the reconstruction of this trail in a similar location and layout, but at a higher elevation. This could also mitigated by using the alternative 2.5:1 slope for the levee. Another alternative could be the installation of a retaining wall.

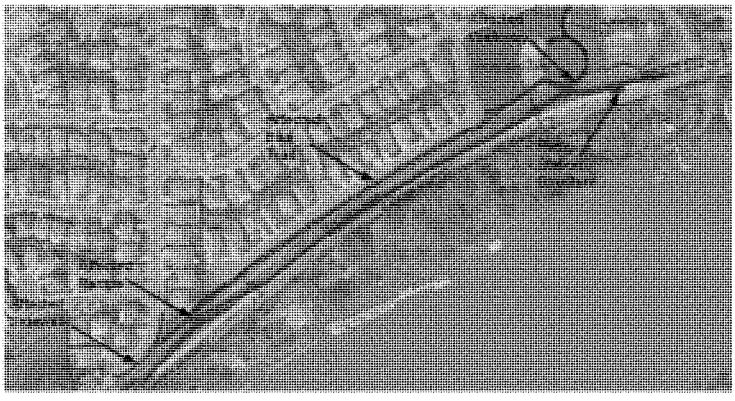
8. Reach 20, Sta. 949+00; there is a property access ramps to the Garden Highway at this location. This ramp is currently used as an unpaved footpath. The construction of the proposed project will require a re-alignment of this ramp to allow continued access to the City Park property and the existing nature trail further north. The proper construction to appropriate standards for these ramps should be part of the mitigation plan.

9. Reach 1A/1B and Reach 2, Sta. 0+00 to Sta. 37+00; there is an existing bike trail along the top of the levee for this segment. The construction of this project should replace the bike trail according to current standards.

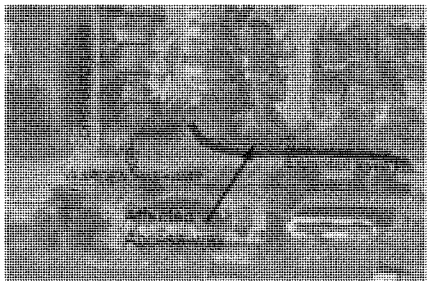
L3-12 (Con't.)

Suggested Mitigations

1. Reach 19B, Sta. 879+00 to Sta. 885+00; To address several impacts, the City is suggesting that the proposed bike trail at the levee top be implemented for this segment. At the west end, the ramps to the cul-de-sac streets would be reconstructed, the trail would have a new ramp into Shorebird Park. The walkways within the park could be elevated to tie-in with the trail. To avoid the pump station structure, the trail would run along the north of it.



2. Reach 19B, Sta. 913+00 to 917+00; Since the construction will cut off the access to Durazno Court, one form of restoring emergency access would be to provide a new ramp up to the Garden Highway.



L3-12 (Con't.)

Letter L3 Response	City of Sacramento, Department of Transportation Ryan Moore, Supervising Engineer, Funding and Project Delivery August 16, 2010

L3-1 Comment noted. As detailed project design develops, the project proponent(s) will coordinate with the City of Sacramento as appropriate.

L3-2 The description of the Natomas Levee Class 1 Bike Trail Project on page 2-25 of the DEIS/DEIR is only a brief summary in a list of project components. The full description is located in Section 2.3.4.7, "Natomas Levee Class 1 Bike Trail Project," of the DEIS/DEIR where it is noted that the bike trail would be funded locally, separate from the Phase 4b Project. The description also notes that the DEIS/DEIR provides only program-level environmental analysis of the bike trail component. Detailed design, including a specific route, has not been developed. Site-specific environmental review will be conducted once detailed design is available.

L3-3 The extent to which levee construction would affect Garden Highway, such that it would require reconstruction, would be determined during final design. The decision of how to reconstruct Garden Highway will be determined in conjunction with local jurisdictions and non-Federal sponsors.

L3-4 The DEIS/DEIR addresses the potential environmental impacts of a worst-case levee improvement footprint based on preliminary design. Detailed engineering specifications would be developed during final design and coordinated with the City of Sacramento.

L3-5 See response to comment L3-3. Mitigation Measure 4.13-c(1), "Prepare and Implement a Bicycle Detour Plan for All Bicycle Trails and On-Street Bicycle Routes, Provide Detours for Bicycle Facilities, and Coordinate with City and/or County Departments of Parks and Recreation to Repair of Damage to Recreational Facilities," in the DEIS/DEIR requires coordination with the City of Sacramento to restore access and repair or reconstruct any construction-related damage to bicycle facilities.

L3-6 Sacramento County is the project proponent for the Natomas Levee Class 1 Bike Trail Project and would be responsible for coordinating design and funding for this component.

L3-7 See response to comment L3-6.

L3-8 If the commenter refers to the existing bike trail, which is located at the landside toe of the levee, reconstruction of the bike trail would likely occur at the toe of the levee but would be determined during final design of this component of the Phase 4b Project. If the commenter is referring to the proposed Natomas Levee Class 1 Bike Trail Project, the exact route would be determined during detailed design of that project.

L3-9 The cross sections shown in Plates 2-8a through 2-8d of the DEIS/DEIR are not intended to show existing conditions, but rather to provide examples of typical levee design in these levee segments. Existing infrastructure affected by construction would be replaced in kind.

L3-10 See responses to comments L3-4 and L3-9.

L3-11 See responses to comments L3-4 and L3-9.

L3-12 The DEIS/DEIR addresses temporary and short-term disruption of emergency service response times and access in Impact 4.10-c, "Temporary and Short-Term Disruption of Emergency Service Rees Times and Access," of the DEIS/DEIR. Implementation of Mitigation Measure 4.10-a, "Prepare and Implement a Traffic Safety and Control Plan for Construction-Related Truck Trips," of the DEIS/DEIR bullet (f) would ensure coordination with the City of Sacramento regarding the timing of specific road closures that would affect access for emergency vehicles. See response to comment L3-3 regarding reconstruction of roadway intersections. Detailed engineering specifications for reconstructing roadways will be developed during final design.

Table 4.13-1 in the DEIS/DEIR identifies temporary impacts to bike trails from project construction. Mitigation Measure 4.13-c(1), "Prepare and Implement a Bicycle Detour Plan for All Bicycle Trails and On-Street Bicycle Routes, Provide Detours for Bicycle Facilities, and Coordinate with City and or County Department of Parks and Recreation to Repair of Damage to Recreational Facilities," of the DEIS/DEIR requires a bicycle detour plan to reduce impacts to temporary closure of bicycle facilities and coordination with the City of Sacramento to restore access and repair or reconstruct any construction-related damage to bicycle facilities. Detailed engineering specifications for reconstructing bike facilities will be developed during final design.

L4

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www.fraqmd.org

David A. Valler, Jr.
Air Pollution Control Officer

August 16, 2010

Mr. John Bassett, Director of Engineering
Sacramento Area Flood Control Agency
1007 Seventh Street, 7th Floor
Sacramento, CA 95814

Ms. Elizabeth Holland, Planning Division
USACE, Sacramento District
1325 J Street
Sacramento, CA 95814

Re: DEIS/DEIR American River Watershed Common Features Project/Natomas Post-Authorization Change Report/Natomas Levee Improvement Program, Phase 4b Landside Improvements Project.

Dear Mr. Bassett and Ms. Holland,

The Feather River Air Quality Management District (District) appreciates the opportunity to provide comments on the above referenced project. The District has reviewed the project and has the following comments:

- In Table 3.11-1 on page 3-100, under the Yuba City-Almond Street Monitoring Station section, only State Maximum 24-hour $PM_{2.5}$ concentrations have been reported. The State does not have a 24-hour $PM_{2.5}$ ambient air quality standard (AAQS). The State AAQS is an annual average not to exceed 12 $\mu g/m^3$. The District recommends adjusting the table to clarify the $PM_{2.5}$ State annual average AAQS (12$\mu g/m^3$) and the National 24-hour AAQS (35 $\mu g/m^3$) and annual average AAQS (15.0 $\mu g/m^3$), which is reported accurately in Table 3.11-2 on the following page. L4-1
- In Table 3.11-2 on page 3-101, south Sutter County and Sacramento County should have the same nonattainment status for the National 8-hour ozone AAQS as they both included in the Sacramento Federal Nonattainment Area. Table 3.11-2 states that the attainment status for Sutter County is Severe Nonattainment and Sacramento County is Serious Nonattainment. L4-2
- Also on Table 3.11-2 on page 3-101, the National 1-hour AAQS for nitrogen dioxide was adopted on January 22, 2010. The new standard is 0.100 ppm. L4-3

- As an alternative to the mitigation measure listed in the last bullet on page 4.11-16, the District has authorized an additional 20% PM reduction in project wide fleet-wide averages in lieu of 15% DPF's required on off-road construction equipment. L4-4

If you need further information or assistance, please contact me at (530) 634-7659 x210. Air District staff will be available to assist the project proponent or Lead Agency as needed.

Sincerely,

Sondra Andersson

Sondra Andersson
Air Quality Planner

Enclosures: None

File: Chron

Letter L4 Response	Feather River Air Quality Management District Sondra Andersson, Air Quality Planner August 16, 2010

L4-1 Table 3.11-1 in the DEIS/DEIR is revised to clarify that the California Ambient Air Quality Standards (AAQS) for fine particulate matter with an aerodynamic diameter of 2.5 micrometers or less ($PM_{2.5}$) is based on an annual average (not to exceed 12 $\mu g/m^3$); and the National $PM_{2.5}$ AAQS is based on a 24-hour and annual average. See revisions in **Appendix F** to this FEIS/FEIR.

L4-2 Table 3.11-2 in the DEIS/DEIR is revised to indicate that the National 8-hour ozone nonattainment designation for both south Sutter County and Sacramento County is "Severe-15" Non-attainment, effective June 4, 2010 for Sacramento Metropolitan areas per EPA-R09-OAR-2008-0467; FRL-9141-8. See revisions in **Appendix F** to this FEIS/FEIR. The Feather River Air Quality Management District (FRAQMD) suggested that the designation be updated to reflect a "serious" non-attainment designation; however, the current Federal non-attainment designation is "Severe-15."

L4-3 The National 1-hour nitrogen dioxide (NO_2) standard provided in Table 3.11-2 in the DEIS/DEIR is updated to 0.100 parts per million (ppm), as adopted on January 22, 2010. See revisions in **Appendix F** to this FEIS/FEIR.

L4-4 See response to comment L1-5.

L5

DEPARTMENT OF
PARKS AND RECREATION

CITY OF SACRAMENTO
CALIFORNIA

915 I STREET, 5TH FLOOR
SACRAMENTO, CA 95814

PARKS ADMINISTRATION
Park Planning and Development Services

PH: 916-808-5200
FX: 916-808-8266

August 16, 2010

Ms. Elizabeth Holland
Planning Division
U.S. Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814

Subject: *Draft Environmental Impact Statement/ Draft Environmental Impact Report on the American River Watershed Common Features Project/ Natomas Post-authorization Change Report/ Natomas Levee Improvement Program, Phase 4b Landside Improvements Project*

Dear Ms. Holland:

Thank you for the opportunity to review the *Draft Environmental Impact Statement (DEIS) and Environmental Impact Report (DEIR)* for these important flood control projects. We are pleased that these levee improvements are in the process of being implemented; this is a very important project for the entire region.

The City of Sacramento Department of Parks and Recreation is responsible for the management of all parks and off-street bikeways within the City of Sacramento. A letter has been submitted separately from the City of Sacramento Department of Transportation concerning impacts to the City's existing and planned off-street bikeways. We did not want to duplicate those comments, but support them as they relate to the City's off-street bikeway system. Our comments provided below focus on impacts to City parks. L5-1

The City of Sacramento owns and manages thirteen neighborhood and community parks or regional parkways within or near the Phase 4B Project Area. All will be impacted in the short term and/or long term under the various alternatives identified in the report. From our preliminary calculations, it appears that the overall impact to the park system serving the South Natomas Community Plan Area would total about six (6) acres, with the greatest impact occurring at the Costa Park Site.

The following comments are offered:

Page 4.7-8, Adjacent Levee Alternative (Proposed Action), Long-Term and Permanent Impacts Due to Loss of Landside and Waterside Woodland and Shaded Riverine Aquatic Habitats, 1st Paragraph: The last sentence mentions the planting of native trees to create woodland habitat along the Lower Dry Creek immediately east of NEMDC. Any plantings of mitigation trees at this location, also known as Hansen Ranch, will need to consider affects to the long term development plans for this site since mitigation trees would need to be protected thereafter. L5-2

Page 4.13-3, No Action Alternative, No Phase 4b Project Construction, 1st Paragraph:
In order to gain an understanding of the magnitude of the impact on heritage trees in the affected City parks, a survey of the affected areas should be conducted.

The United States Army Corps of Engineers (USACE) will need to follow Sacramento City Code Chapter 12.64 Heritage Trees, including pulling necessary permits for the removal of Heritage Trees. Language should state that USACE will identify each tree that qualifies for Heritage Tree status through a survey. In regards to the Heritage Trees that are being targeted for removal, mitigation will be based on diameter inches at a 1 to 1 replacement ratio. Therefore, if a 24 inch diameter Heritage Tree is removed than 24 diameter inches of new trees will be the replacement. In addition the Army Corps of Engineers will be required to maintain the new trees during the first 3 year establishment period, and longer if planted under difficult cultural conditions. You may need to contract with a third party maintenance provider for the work, like the Tree Foundation (http://www.sactree.com/) L5-3

Page 4.13-3, Adjacent Levee Alternative (Proposed Action), 2nd Paragraph:
See comments above regarding Sacramento City Code Chapter 12.64 on Heritage Tree removal

Page 4.13-11, Fixed-in-Place Alternative, Mitigation Measure 4.13-b: Compensate City of Sacramento Department of Parks and Recreation for Loss of Parkland and Park Amenities:
The City will work with SAFCA and USACE staff to find suitable alternatives to compensate for parkland loss, preferably in the form of additional parkland within the South Natomas Community Planning Area. Where manmade amenities are impacted, including irrigation systems, play structures, walkways, landscaping, or other associated features, we will expect that funds will be made available for the redesign and reconstruction of the impacted parks under the direction of the City of Sacramento Department of Parks and Recreation. In addition, at the appropriate time, USACE and Sacramento Area Flood Control Agency (SAFCA) will need to obtain all necessary property rights (rights of entry or temporary or permanent easements) prior to conducting any work on any of the parks. L5-4

Page 4.13-4, Table 4.13-1, Bannon Creek Nature Preserve, Permanent Impacts:
Both the Adjacent Levee Alternative and the Fix-in-place Alternative will encroach 50 feet into the Bannon Creek Nature Preserve causing the loss of Heritage Oak Trees. See comments above regarding Sacramento City Code Chapter 12.64 on Heritage Tree removal. (See attached aerial photo) L5-5

Page 4.13-4, Table 4.13-1, Costa Park Site (Park Site SN2), Permanent Impacts:
Both the Adjacent Levee Alternative and the Fix-in-place Alternative propose the construction of an adjacent levee, seepage berm and utility corridor that would encroach 280'-290' into the park site making any future park use unfeasible, which is a more than significant impact. Can park amenities be built on top of the seepage berm or can the USACE mitigate the impact by providing equivalent park acreage within ½ mile of the park site? In addition, there is no mention of the existing building on the site and how the elimination of that building will be mitigated. In order to investigate if park features can be built on top of the seepage berm we need to know, 1) what is the slope of the seepage berm?; and, 2) can a park be placed on top of the seepage berm as an approach to co-locate the park on the property and fully utilize the entire park acreage? Are there other alternatives to the seepage berm that would not render this park site undevelopable? (See attached aerial photo) L5-6

Page 4.13-6, Table 4.13-1, Garden Land Park, Permanent Impacts:
Both the Adjacent Levee Alternative and the Fix-in-place Alternative propose expansion and/or relocation of the City of Sacramento Sump Pump 102 at this park site. This will have substantial impact on the usability of this park and more information is needed as to where and when the USACE is proposing to relocate the Sump Pump and to what extent it will be expanded. This information is essential to understand the full impact to the park site. Timing is especially important because we are scheduled to construct park improvements in June 2011 and we would not want to construct improvements that would conflict with the Sump Pump expansion/relocation. Can this sump pump be moved off of the park site altogether? If the sump pump will be moved within the park site, can it be moved to the northeast or southeast corner of the site for better utilization of the park? (See attached master plan) L5-7

Page 4.13-7, Table 4.13-1, Natomas Oaks Park, Permanent Impacts:
Both the Adjacent Levee Alternative and the Fix-in-place Alternative propose 50 to 70 foot encroachments L5-8

into the park, which will cause the loss of approximately 5-7 Heritage Oak Trees. See comments above regarding Sacramento City Code Chapter 12.64 on Heritage Tree removal. In addition there is an unpaved access ramp that slopes down into the natural preserve which will need to be rebuilt and maintained for access. Also, the improvements at this Park Site where funded by the Federal Land and Water Conservation Grant Program subject to Section 6(f)3 protections and shall not be converted to other than public outdoor recreation use without the approval of the U.S. Secretary of the Interior. (See attached master plan) L5-8 (Con't.)

Page 4.13-7, Table 4.13-1, Ninos Parkway, Permanent Impacts:
Both the Adjacent Levee Alternative and the Fix-in-place Alternative proposal would encroach into the southern edge of the Ninos Parkway. If community garden plots are permanently affected, how will encroachment be mitigated? Will the USACE mitigate the impact by providing equivalent park acreage somewhere else within the SN Community Plan Area? Since the City's Bikeway's Master Plan calls for a bike trail connection between Ninos Parkway and Garden Highway using an off-street bike ramp, can one be built as part of the mitigation measure for encroaching into the Ninos Parkway? (See attached master plan) L5-9

Page 4.13-8, Table 4.13-1, Sand Cove Park, Permanent Impacts (Fix-in-Place Alternative):
In 2007, USACE, Sacramento District, City of Sacramento, Reclamation District 1000 and SAFCA completed bank protection measures to prevent ongoing streambank erosion and resource vandalism at this location. Any work at this site will need to avoid any impacts to this recently completed project. (See attached master plan) L5-10

Page 4.13-8, Table 4.13-1, Shorebird Park, Permanent Impacts:
The Adjacent Levee Alternative will encroach 50 feet into the park, causing impacts to irrigation lines, concrete walkways, landscaping, berms and lawns. Redesign of the park will be necessary to redevelop the public amenities and reconfigure the irrigation system, which need to be funded. This work shall be considered a part of the compensation for impacts to the park. Also, will a "utility corridor" consume additional park acreage? Are you proposing a "utility corridor" abutting the new landside toe the levee? What is allowed in a "utility corridor"? Can landscaping be planted abutting the new landside toe of the levee or are there restrictions? (See attached master plan) L5-11

Page 4.13-10, Table 4.13-1, Ueda Parkway, Permanent Impacts:
See comments above regarding Sacramento City Code Chapter 12.64 on Heritage Tree removal. L5-12

I am also attaching the Park Master Plan and aerial photographs for each of park sites impacted in order to give a better understanding of the site and the potential disturbance to park features.

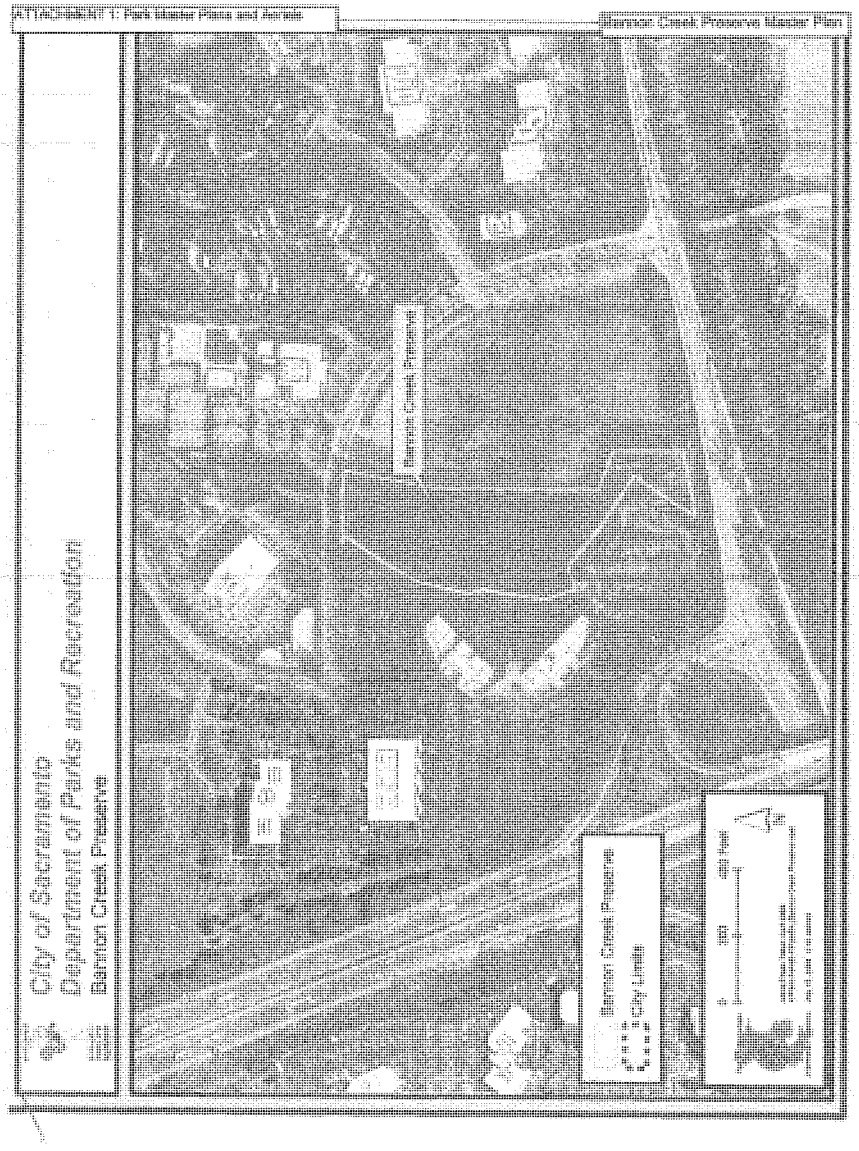
Again thank you for the opportunity to review this document. My staff and I look forward to working with you on this project and want to speak further about project specifics. Areas of further discussion include identifying developable parkland to compensate the loss of parkland in the South Natomas Community Plan Area location of heritage trees mitigation, mitigation of impacted park amenities, processing of property rights, and rebuilding of access ramps. I am available to meet to further discuss these concerns and questions. You can contact me at 916-808-1955 or Raymond Costantino at 916-808-8826 to arrange a meeting. L5-13

Sincerely,

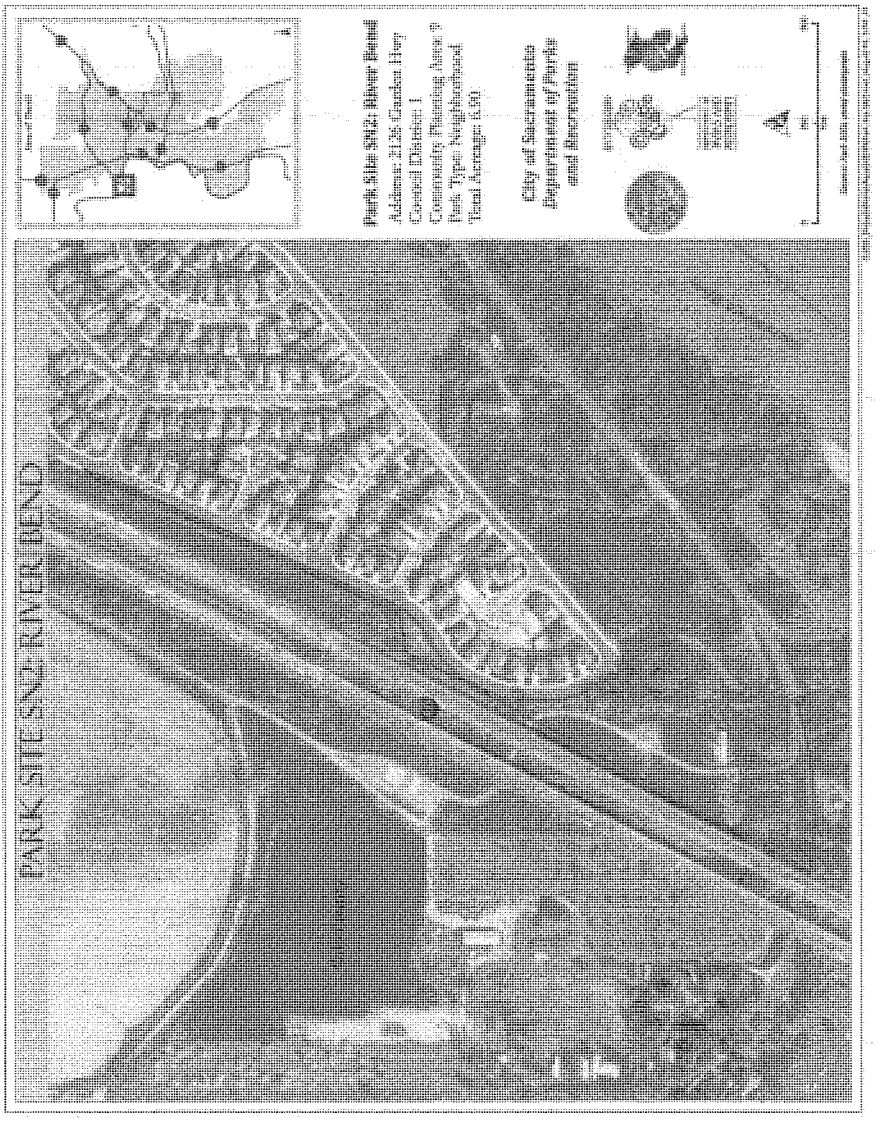
J.P. Tindell
Park Planning & Development Manager

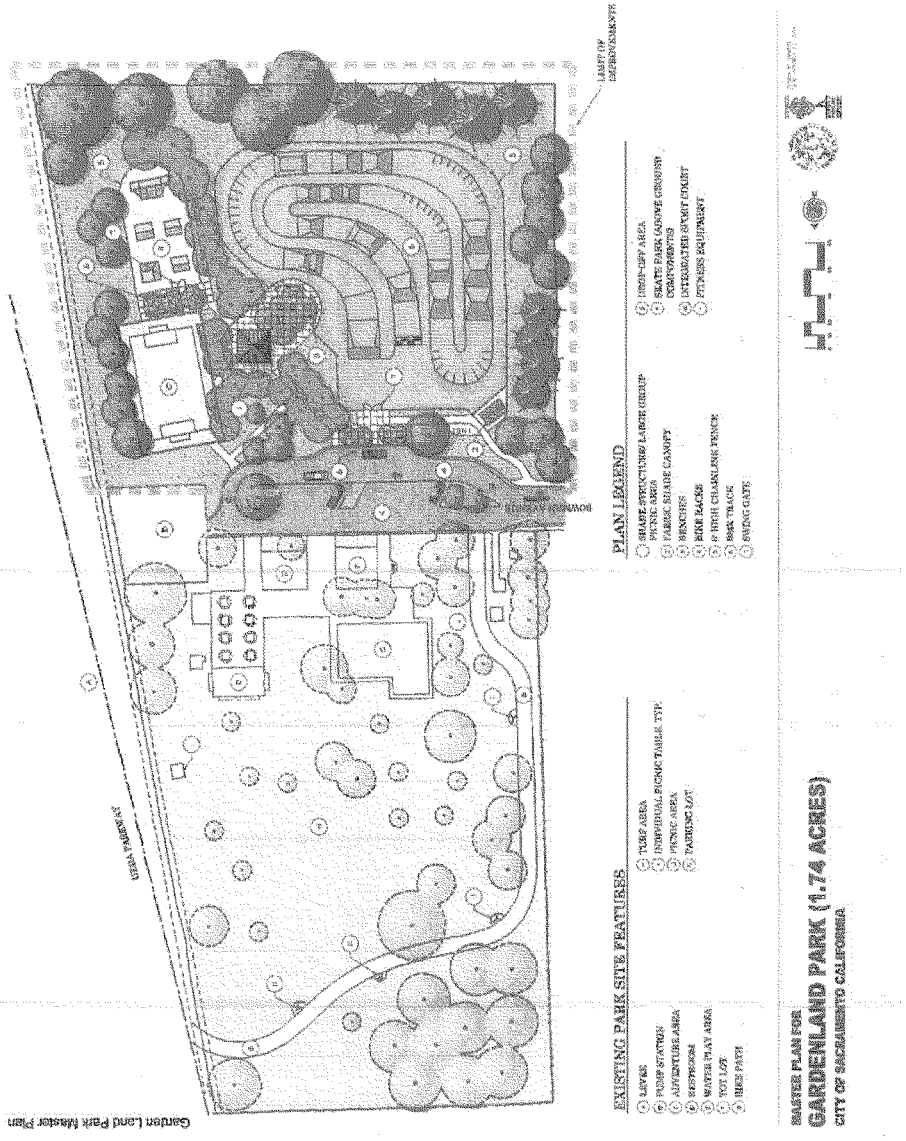
Attachment 1: Park Master Plans and Aerials

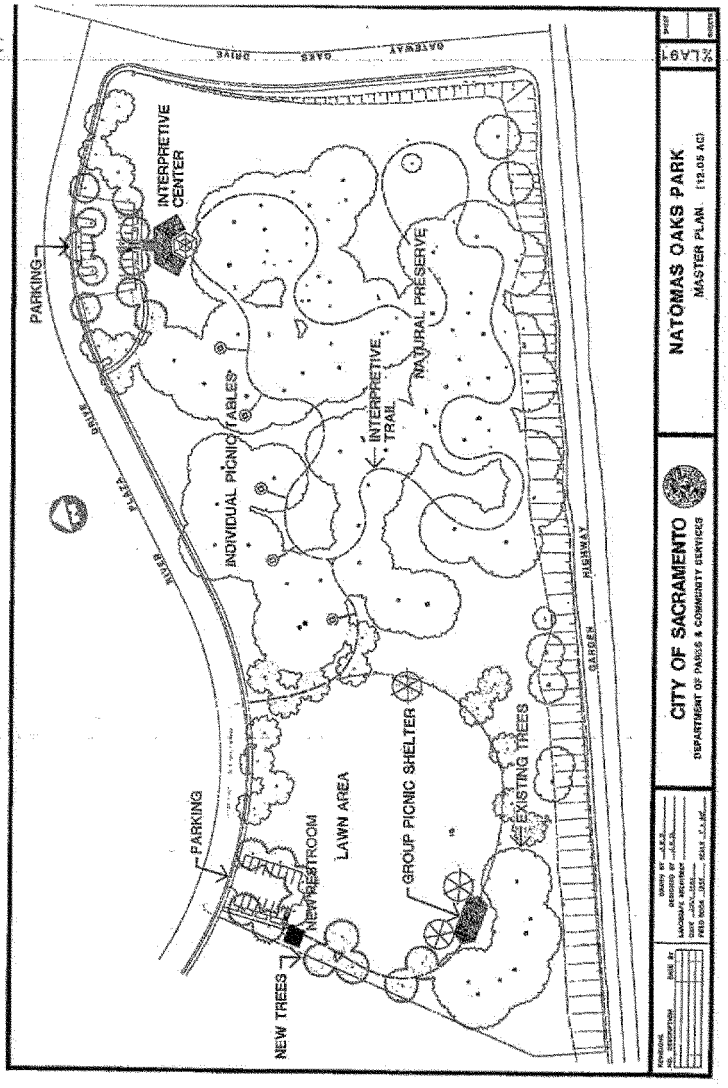
cc: John Bassett, Sacramento Area Flood Control Agency
Mary de Beauvieres, City of Sacramento, Parks and Recreation Department
Ed Cox, City of Sacramento, Department of Transportation
Dan Roth, City of Sacramento, Council District 1 District Director


ATTACHMENT 1: Park Master Plans and Aerials
Barrett Creek Preserve Master Plan
City of Sacramento
Department of Parks and Recreation
Barrett Creek Preserve
Barrett Creek Preserve
City Limits

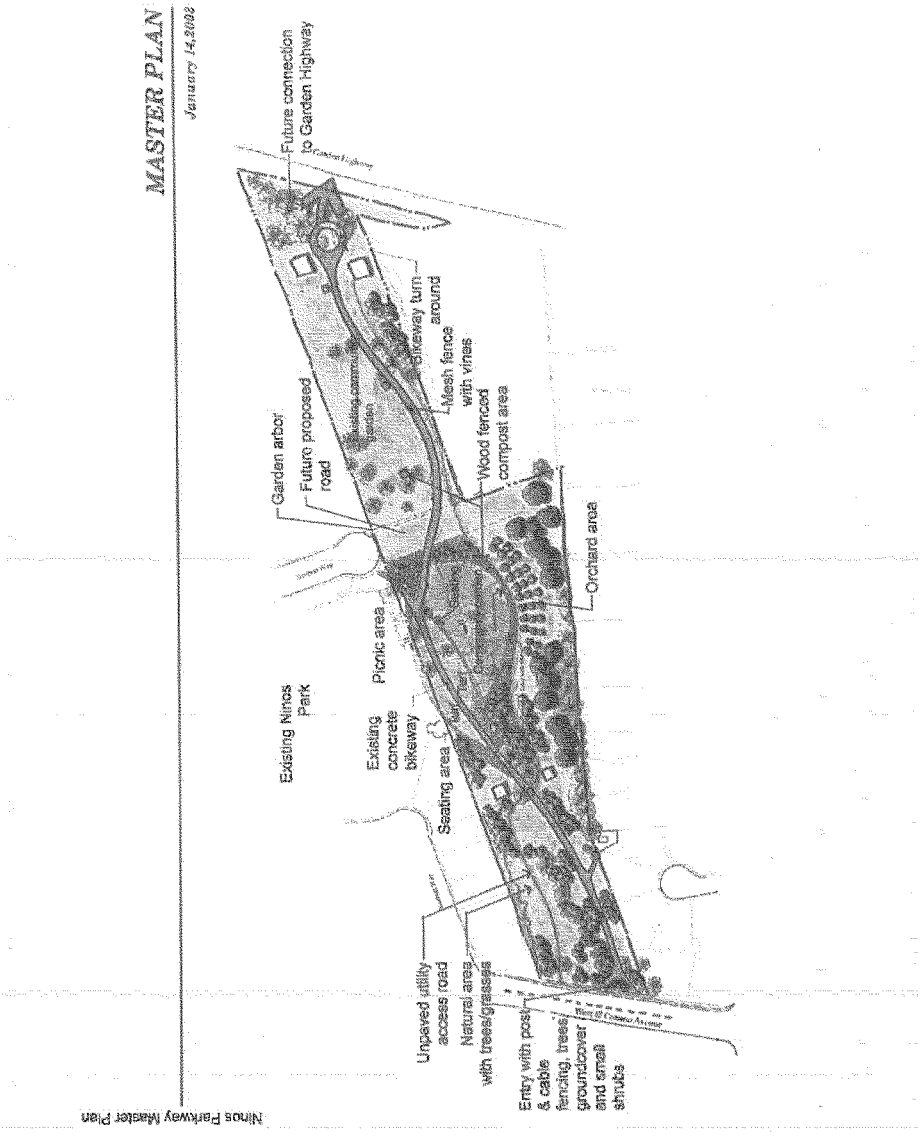
Costa Property, 2126 Garden Highway

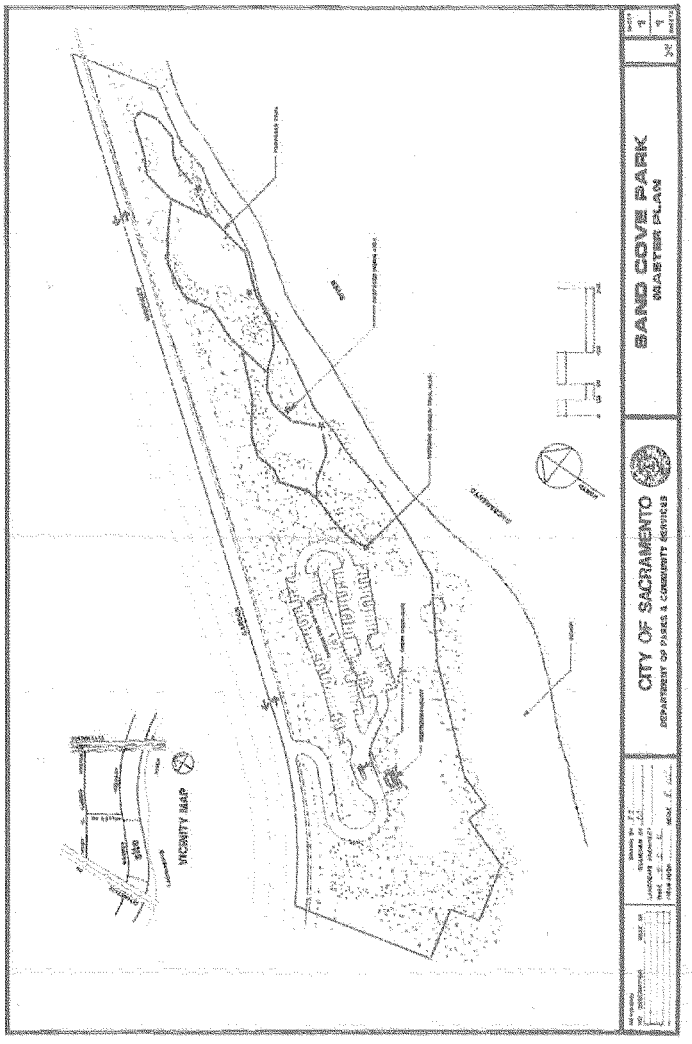



Garden Land Park Master Plan
EXISTING PARK SITE FEATURES
PLAN LEGEND
MASTER PLAN FOR
GARDENLAND PARK (1.74 ACRES)
CITY OF SACRAMENTO CALIFORNIA

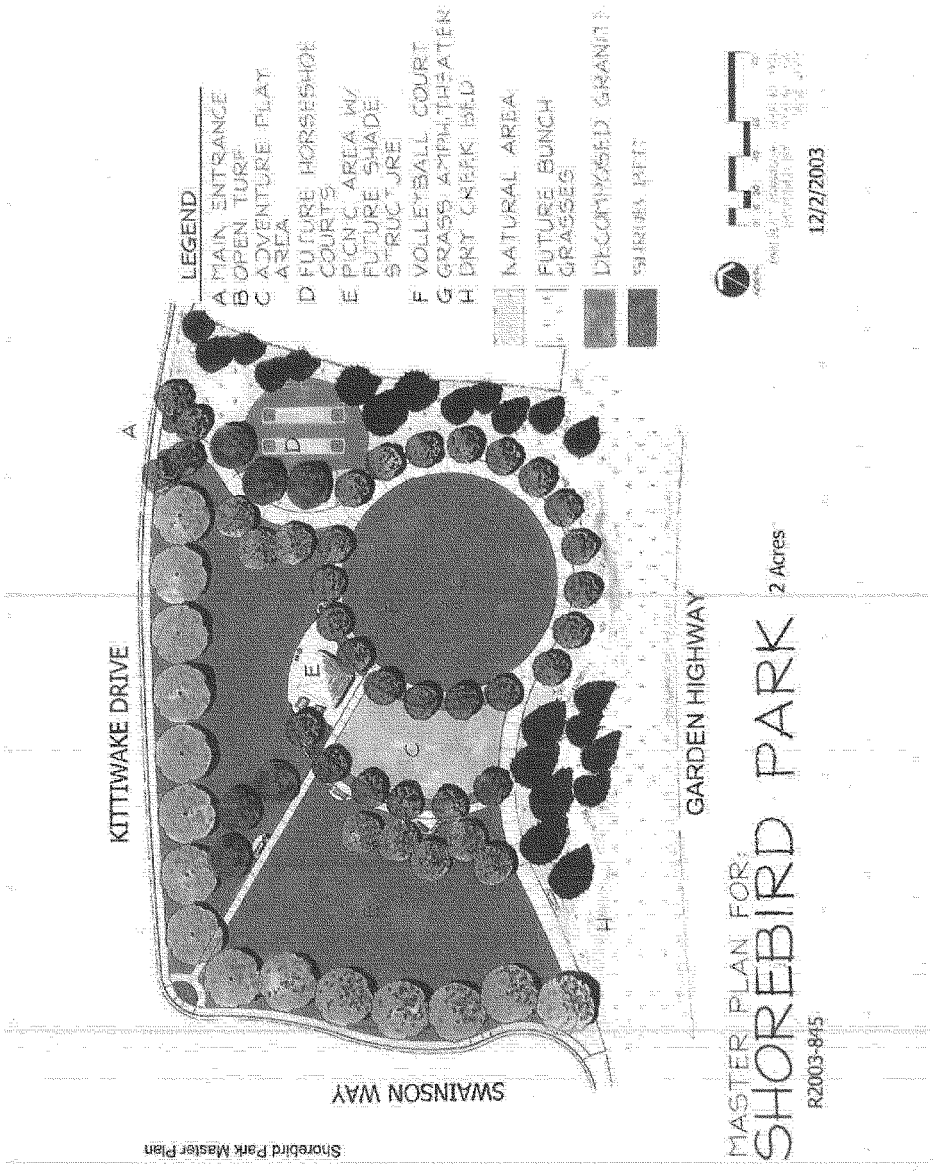


Natomas Oaks Park Master Plan


MASTER PLAN
January 14,2002
Future connection to Garden Highway
Bikeway turn around
Mesh fence with vines
Wood fence
compost area
Orchard area
Garden arbor
Future proposed road
Existing community garden
Existing Nimbs Park
Picnic area
Existing concrete bikeway
Seating area
Unpaved utility access road
Natural area with trees/grasses
Entry with post & cable fencing, trees, groundcover and small shrubs
Nimbs Parkway Master Plan



Sandcove Park Master Plan


LEGEND
A MAIN ENTRANCE
B OPEN TURF
C ADVENTURE PLAY AREA
D FUTURE HORSESHOE COURTS
E PICNIC AREA W/ FUTURE SHADE STRUCTURE
F VOLLEYBALL COURT
G GRASS AMPHITHEATER
H DRY CREEK BED
NATURAL AREA
FUTURE BUNCH GRASSES
DECOMPOSED GRANITE
SURFACING MIX
KITTIWAKE DRIVE
SWAINSON WAY
GARDEN HIGHWAY
MASTER PLAN FOR:
SHOREBIRD PARK
2 Acres
R2003-845
12/2/2003
Shorebird Park Master Plan

Letter L5 Response	City of Sacramento, Department of Parks and Recreation J. P. Tindell, Park Planning & Development Manager August 16, 2010

L5-1 See responses to comment letter L3 and see responses to comments L5-2 through L5-12.

L5-2 Section 2.3.4.2, "Woodland Compensation," of the DEIS/DEIR states that Hansen Ranch is a 420-acre open space area located north of Main Avenue and east of the NEMDC. This area consists of Hansen Park, owned by the City of Sacramento, and the Coyle Property, which is owned by SAFCA. SAFCA has a conservation easement on Hansen Park (the western portion of the Lower Dry Creek area) that already limits future development of the park. However, the conservation easement does permit habitat enhancements, such as tree plantings.

L5-3 See response to comment L3-1.

L5-4 Mitigation Measure 4.13-b, "Compensate City of Sacramento Department of Parks and Recreation for Loss of Parkland and Park Amenities," in the DEIS/DEIR requires that the project proponent(s) compensate for loss of parkland and amenities.

L5-5 See responses to comment L3-1.

L5-6 The DEIS/DEIR analyzes the environment impacts, including encroachments on park facilities, of a worst-case levee improvement footprint. Mitigation Measure 4.13-b, "Compensate City of Sacramento Department of Parks and Recreation for Loss of Parkland and Park Amenities," of the DEIS/DEIR addresses impacts to park facilities. The actual extent of encroachments by levee improvements on park facilities and the degree to which park facilities may co-locate with flood control facilities, such as seepage berms, would be determined as part of final design.

L5-7 The precise modifications and construction timing for Sump Pump 102 would be determined during final design. To ensure coordination with the City of Sacramento, the following text is added at the end of the 2nd paragraph of Mitigation Measure 4.13-b, "Compensate City of Sacramento Department of Parks and Recreation for Loss of Parkland and Park Amenities," of the DEIS/DEIR as follows:

> The project proponent(s) shall compensate for loss of Heritage trees and native oak trees from within the City of Sacramento's public parks and open space areas. Heritage trees shall be replaced in accordance with Sacramento City Code, Title 12, Streets, Sidewalks and Public Places, Chapter 12.64 Heritage Trees. California native trees shall be replaced with like species. Priority shall be given to replacement plantings within the Natomas Basin on public park land or open space/natural areas accessible to the public. Second priority would be replacement in public park areas of North Sacramento located within the City. Project proponent(s) shall consult with City of Sacramento Department of Parks and Recreation regarding the location of compensatory woodland plantings on City property, including but not limited to the City-owned portion of the Hansen Ranch property.

L5-8 See responses to comments L5-3 and L5-4.

L5-9 Mitigation Measure 4.13-b, "Compensate City of Sacramento Department of Parks and Recreation for Loss of Parkland and Park Amenities," of the DEIS/DEIR addresses impacts to park facilities.

See responses to comments L5-3 and L5-4. As noted in Table 4.13-1 in the DEIS/DEIR, the levee and operations and maintenance (O&M) corridor and utility corridors would encroach onto the southern edge of the garden. Future plans for bikeway connection to Garden Highway shown in the master plan may need to be modified to accommodate adjacent levee. This would be addressed by the project proponent(s) during consultation with the City regarding compensation for loss of park property and amenities as described in response to comment L5-4.

L5-10 Comment noted. As described in the DEIS/DEIR, the Adjacent Levee Alternative (Proposed Action) would have no impact on the waterside levee at Sand Cove Park. The Fix-in-Place Alternative would remove vegetation, but would not disturb the waterside levee.

L5-11 The location of the utility corridor will be determined during final design, in coordination with the City. Mitigation Measure 4.13-b, "Compensate City of Sacramento Department of Parks and Recreation for Loss of Parkland and Park Amenities," of the DEIS/DEIR addresses impacts to park facilities.

L5-12 See response to comment L5-3.

L5-13 As noted in response to comment L5-4, USACE and SAFCA will coordinate with the City.

wastewater manag

L6

July 20, 2010

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Claudia Goss
Director of Communications

Elizabeth Holland
Planning Division
USACE Sacramento District,
1325 J Street
Sacramento, CA 95814

Subject: Draft Environmental Impact Report/Draft Environmental Impact Statement for the American River Watershed Common Features Project/Natomas East Levee Improvement Program, Phase 4b Landslide Improvements Project and the Draft Natomas Post-authorization Change Report

Dear Ms. Holland:

The Sacramento Regional County Sanitation District (SRCSD) and Sacramento Area Sewer District (SASD) have reviewed the Draft Environmental Impact Report/Draft Environmental Impact Statement for the American River Watershed Common Features Project/Natomas East Levee Improvement Program, Phase 4b Landslide Improvements Project and the Draft Natomas Post-authorization Change Report and have the following comments:

SRCSD currently has critical facilities in operation that serve the entire Northern Sacramento region which are located in the proposed project area. The New Natomas Sewerage Pump Station Force Main crosses under the Sacramento River, near Interstate 80, the Old Natomas Force main is located near the intersection of San Juan and East Levee Road, and The Upper Northwest Interceptor (UNWI) is located near the intersection of Elkhorn Blvd. and East Levee Road. L6-1

There needs to be close coordination with SRCSD during the design and construction phases for projects within the vicinity of these interceptors to ensure that this project does not adversely affect these facilities.

If you have any questions regarding these comments, please contact me at (916) 876-9994.

Sincerely,

Sarenna Deeble

Sarenna Deeble
SRCSD/SASD
Policy and Planning

cc: Ruben Robles
Michael Meyer
John Bassett, SAFCA
SRCSD Development Services
SASD Development Services

Letter	Sacramento Regional County Sanitation District
L6	Sarenna Deeble, SRCSD/SASD, Policy and Planning
Response	July 20, 2010

L6-1 Potential impacts to utilities are discussed in Impact 4.15-b, "Potential Disruption of Utility Service," in the DEIS/DEIR and associated mitigation, including the requirement for the project proponent(s) to coordinate with applicable utility providers before construction, is provided in Mitigation Measure 4.15-b, "Verify Utility Locations, Coordinate with Utility Providers, Prepare and Implement a Response Plan, and Conduct Worker Training with Respect to Accidental Utility Damage," of the DEIS/DEIR.

APPENDIX J

USACE and SAFCA Responses to Comments on
Previous NLIP Environmental Documents

J1 Phase 2 FEIR Master Response: Hydraulic Impacts on the NLIP

2 MASTER RESPONSES TO COMMENTS ON THE DRAFT EIR

2.1 INTRODUCTION

The following discussion presents responses to environmental issues raised in multiple comments. These responses have been titled, "master responses," because they address numerous comments concerning the same or very similar topics. These responses are organized by topic to provide a more comprehensive response than may be possible in responding to individual comments. Table 2-1 lists each issue addressed in a master response.

Table 2-1
List of Master Responses

Master Response Number	Title
1	Hydraulic Impacts of the NLIP
2	Biological Resources and Habitat Mitigation
3	Temporary Construction Impacts on Traffic Safety, Noise, and Other Nuisances
4	Utilities Relocation

All individual comments on environmental issues along with individual responses to these comments are presented in Chapter 3, "Individual Responses to Comments on the Draft EIR." In that chapter, the reader is referred back to these master responses as appropriate.

2.2 MASTER RESPONSE 1: HYDRAULIC IMPACTS OF THE NLIP

2.2.1 INTRODUCTION

In response to several comments received on the DEIR that question whether SAFCA's approach to evaluating hydraulic impacts is reasonable, SAFCA has prepared the following master response.

2.2.2 DETERMINING THE SIGNIFICANCE OF HYDRAULIC IMPACTS

CEQA requires lead agencies to determine whether "the proposed project [would] expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam" (State CEQA Guidelines, Appendix G, Section VIII, i). SAFCA has historically made this determination by evaluating the potential effects of its levee improvement projects on water surface elevations in the stream and river channels in the project area and in the larger watershed within which the project is situated. This approach was used to evaluate the flood related impacts of the Natomas Levee Improvement Program (NLIP). Specifically, SAFCA's engineering consultant, MBK Engineers, used a UNET hydraulic computer model to compare existing conditions in the waterways surrounding the Natomas Basin and in the larger Sacramento River Flood Control Project (SRFCP) with and without the project. The analysis consisted of calibrating the hydraulic model to historic flood events using high-water marks and stream gage data, modeling the "with" and "without" project condition under several flood scenarios, and determining whether the proposed project would produce a significant difference in the relevant water surface elevations.

The results of this analysis were initially presented in Chapter 4.4, "Hydrology and Hydraulics," and Appendix C, "Hydraulic Modeling Results," of the program-level EIR on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area, which was certified by the SAFCA Board of Directors in February 2007. Using the same methodology, the analysis was performed again and presented in Chapter 3.4,

"Hydrology and Hydraulics," of the DEIR for the NLIP Landside Improvements Project. In both cases, the modeling showed that the proposed NLIP improvements would not increase the "1957" water surface profiles that serve as the minimum design standard for all reaches of the SRFCP and would not substantially increase the 100-year or "200-year" water surface elevations in any urban areas upstream or downstream of the project study area. On this basis, both EIRs concluded that the NLIP improvements would not cause any significant hydraulic impacts.

A surface water elevation increase of 0.1 foot was used as a threshold for determining potential a significant impact because it represents a minimum change from existing conditions. As discussed on pages 3.4-6 and 3.4-7 of the DEIR, a 0.0 foot increase in both the "1957," "100-year," and "200-year" water surface profiles would result with implementation of the NLIP Landside Levee Improvement Project.

2.2.3 THE EIR'S TWO-THRESHOLD APPROACH IS CONSISTENT WITH THE FRAMEWORK HISTORICALLY USED TO MANAGE THE SRFCP

The perimeter levee system around the Natomas Basin is part of a larger integrated system of levees, dams, and bypass channels known as the SRFCP that encompasses five historic flood basins in the Sacramento Valley (Colusa, Sutter, Feather, Yolo and American Flood Basins) and the subbasins contained therein. Planning, design, and construction of the SRFCP has been ongoing since the early 1900s under the leadership of the U.S. Army Corps of Engineers (USACE) and the State of California (state), with local levee and reclamation districts playing the principal role in operating and maintaining the system.

Initially, the river channel and bypass levees in each segment of the system were constructed based on a standard geometry. The levees were designed with a predetermined freeboard allowance tied to specified flows and associated water surface profiles generally matched to observed conditions during the 1907 and 1909 floods. Over time, the standard freeboard allowance of each levee section was increased because of numerous levee failures. The minimum standard levee changed from a levee with a top width of 10 feet to one with a top width of 20 feet. In addition, the design flows were modified substantially on the Feather and American Rivers. This was the result of floods that occurred after 1909, which demonstrated these rivers could produce substantially greater flows than occurred during the 1907 and 1909 floods. Because numerous levee failures occurred along the Feather River levees between 1920 and 1934, the levees were set back and enlarged to accommodate greater flows. These changes were summarized in design memorandums, which define the minimum freeboard requirements for each segment of the SRFCP, collectively referred to as the "1957 profile." Over the years, the system capacity of the SRFCP was also greatly expanded by the construction of five major multiple-purpose reservoirs (Shasta, Black Butte, Oroville, New Bullards Bar, and Folsom Reservoirs) containing 2.7 million acre-feet of dedicated flood space.

The record floods of 1986 and 1997 triggered additional system modifications. Although these floods were significantly larger than the 1907 and 1909 floods, the availability of reservoir storage largely prevented flows in the system from exceeding the design of the SRFCP. Nevertheless, numerous project levees experienced unexpectedly severe stress and some failed. This experience caused the USACE, the state, and their local partners to perform a series of geotechnical evaluations on the SRFCP's levees and to adopt new, more rigorous levee design standards for urban areas, including standards for seepage through and under project levees. To meet these new standards, USACE, the state, and local flood control agencies have made substantial investments in addressing identified deficiencies in levees throughout the SRFCP and in improving the level of flood protection provided by the levees, particularly in urban areas.

Although the SRFCP and its design standards have evolved over the years based on experience, new engineering tools and analysis, and changes in public policy, this evolution has occurred within a system management framework that has allowed necessary adaptations to the system without undermining its basic operational principles. These principles are discussed below.

The SRFCP is not intended to provide a uniform level of flood protection (statistical probability of flooding) to the various subbasins within the protected area. Rather, each subbasin is protected by levees that at least meet the SRFCP's minimum geometrical standards, including freeboard reflecting the water surface profile prescribed for that segment of the system. Each subbasin's protection is dependent on the fitness of its own levees and not on the condition (or failure) of any other subbasin's levees. Accordingly, each subbasin has the right to keep its levees in the fittest possible condition to ensure that these levees will perform as reliably as possible in a flood.

2.2.4 EFFECT OF THE NLIP ON SRFCP FUNCTION AND OPERATIONS

Even the most modest levee-tending activity, such as eradicating rodent burrows, has the potential to trigger a "transfer of risk," at least in theory. Yet there are currently no data and modeling tools available to quantify such transfers of risk and assess their significance. One of the SRFCP's most important accomplishments is to avoid this problem by relying on the more practical and measurable indicator of a change in water surface elevation, using this measure as the guideline for evaluating the effects of levee-tending activity. Because the SRFCP is designed to operate as an integrated system based on prescribed water surface elevations, the "transfer of risk" that may occur when a subbasin improves the fitness of its levees is not considered to adversely affect the performance of the SRFCP with respect to other subbasins as long as the improvement activity does not alter any water surface elevations designed by the SRFCP. Under this water surface elevation guideline, levee and reclamation districts can operate and maintain their levees (and thus reduce flood damages without engaging in overly complex "transfer of risk" arguments) unless there is evidence that their levee fitness activities will cause a change in a relevant design water surface profile. If the activities of these levee and reclamation districts would produce a significant adverse change in a water surface profile prescribed by the SFRCP, then the district would be expected to offset the adverse impact.

It is clear that levee-tending activities involving physical changes in the geometry of the river channel are the activities most likely to cause changes in water surface elevations prescribed by the SRFCP. These types of activities include placement of fill or construction of structures in the floodway, construction of new levees, relocation of existing levees, excavation within the floodway, construction of large berms for protecting riverbanks, raising an existing levee (waterside raise), construction of a new bypass, and planting of vegetation within the floodway. Improvement activities on the land side of a levee also require evaluation. Such activities include placing a slurry wall in a levee, adding a seepage berm to a levee, placing a field of seepage relief wells along a levee, raising a levee (landside raise), widening a levee (increase top width), and relocating a seepage ditch.

Three design water surface elevations should be considered when determining whether a levee-tending activity would result in an adverse impact to a SRFCP levee. First, the elevations prescribed for each segment of the SRFCP must be considered. These elevations are referred to as the "1957 profile" and they define the minimum freeboard requirements for each segment of the SRFCP. Second, because of the participation of virtually all communities protected by segments of the SRFCP in the National Flood Insurance Program, the 100-year water surface profile must be considered. Third, because the California Legislature has now established "200-year" flood protection as the appropriate standard of flood protection for all urban areas within the SRFCP, the "200-year" water surface profile must also be considered. (Statutes of 2008, Chapter 364 [adding Water Code Section 9602(i)]).

In determining whether a proposed improvement or activity could result in changes to these water surface profiles, the standard analysis procedure is to use hydrologic and hydraulic computer modeling tools such as, HEC-1, HEC-2, UNET, HEC-RAS, RMA2, FESWMS, etc. The analysis consists of calibrating the hydraulic model to historic flood events using high-water marks and stream gage data. The calibration activity is normally conducted on systemwide instead of a site-specific basis. However, data available for computer model calibration can be sparse or nonexistent. In addition, assumptions must be made regarding reservoir operations. Because all of the reservoirs that contribute to the operation of the SRFCP (Shasta, Black Butte, Oroville, New Bullards Bar and Folsom) are governed by water control manuals issued by USACE, current reservoir operations are assumed

to continue except where it is reasonably foreseeable that the current operation could change (as in the case of Folsom Dam and Reservoir, where Congress has directed USACE to formalize the variable space storage operation that has been in effect by agreement between SAFCA and the U.S. Bureau of Reclamation since 1995).

Once the model is calibrated, the "with project" condition is compared to the "without project" condition under several flow conditions (1957 profile, 100-year FEMA flood, and "200-year" urban flood) to determine whether a difference exists in water surface elevations under these different conditions. This analysis is complicated because, for the 100-year flood and "200-year" flood, it involves assumptions about the performance of project levees under flow conditions that exceed the minimum design of the SRFCP and thus involve the possibility of levee failure. As noted above, the design of the SRFCP was not historically based on assumed levee failures. On the contrary, the design assumed no levee failures but included five engineered diversions and one natural overflow diversion. The natural diversion is to Butte Basin, which is upstream from the SRFCP levees. This diversion did not include flow easements because Butte Basin is a historic flood basin. The five engineered diversions include two diversions to Butte Basin (Moulton and Colusa Weirs), one diversion to the Sutter Bypass (Tisdale Weir), and two diversions to the Yolo Bypass (Fremont and Sacramento Weirs). All of the engineered diversions included the acquisition of property rights to support the diversions. The deliberate planning, construction, and maintenance of the diversions assured that they would function during flood conditions and serve as reliable features of the flood project.

The historic record of SRFCP levees under high flow conditions does not reveal a direct relationship between river stage and levee performance, particularly given the potential for flood fighting activities to influence this relationship. This greatly complicates the challenge of establishing reasonable assumptions on which to conduct hydraulic modeling evaluations. Most hydraulic modeling efforts make the simplifying assumption that a levee fails when the water surface reaches a defined elevation. The most common failure scenarios consider the following:

(a) Assume levee fails when water level exceeds top of levee by 0.5 feet.
(b) Assume levee fails when water level reaches top of levee.
(c) Assume levee fails when water exceeds design stage by 1.5 feet.
(d) Assume levee fails when design stage is exceeded.

The performance of the Reclamation District (RD) 784 levee on the Yuba River highlights the problems associated with these scenarios. This levee has never been overtopped; however, during the 1955 flood, the water surface level reached to within 0.5 feet of the top of the levee and the levee did not fail. Although not quite reaching the limit described by scenario (b), the water surface did exceed the levels specified by scenarios (c) and (d). These scenarios would have incorrectly assumed a levee failure and overestimated the beneficial effect of a levee failure to adjacent or downstream areas during the 1955 flood. During the 1986 flood, the maximum water level was approximately 4.5 feet below the top of the levee; however, the levee failed after the peak stage when the water level was approximately 6.6 feet below the top of the levee. All of the above scenarios would have assumed no levee failure. Because the levee failure occurred approximately 24 hours after the peak stage, the adjacent or downstream areas did not receive any benefit in peak stage reduction. During the 1997 flood, the maximum water level was 2.5 feet below the top of levee and the levee did not fail. Scenario (d) would have assumed a levee failure and would have overestimated the benefit a levee failure would have provided to the adjacent or downstream areas.

The only documented SRFCP levee overtopping that did not result in a levee failure occurred in 1995, when the Cache Creek levees were overtopped by approximately 0.1 to 0.2 feet and did not fail. An extensive flood fight was conducted by the California Department of Water Resources (DWR) forces to save the levee during this event. There were many instances in 1986 and 1997 when a levee did not fail even though scenarios (c) and (d), above, would have predicted failures. These locations were primarily along Feather River, American River, and Yolo Bypass areas in 1997, and Sacramento River, American River, and Yolo Bypass areas in 1986. Extensive flood fight activities took place during these floods. Flood flows were near or exceeded SRFCP design levels

during these floods. It is interesting to note that current USACE design criteria would not find these areas to have "certifiable" levees.

In short, the historic record does not reveal a direct relationship between river stage and levee failure, particularly given the potential for flood fighting activities to influence this relationship. The state holds flood fighting schools annually before the start of the flood season. Participants at the training learn how to construct a temporary levee raise, provide protection to the levee from overtopping and wind and wave attack, and learn how to deal with underseepage (boils).

For purposes of evaluating the hydraulic effects of the NLIP, SAFCA employed levee failure scenario (a), because it is reasonable, practical, is easily understood, and because a sensitivity analysis indicated that the estimated hydraulic characteristics would be the same for each of the level failure scenarios analyzed. In addition, because the NLIP improvements are based on a levee design profile calculated assuming that SRFCP levees do not fail when overtopped, SAFCA added a "no levee failure" scenario to the modeling effort. In each case, the hydraulic modeling study assumed that all SRFCP levees in nonurban areas would be raised to their design heights (designated freeboard above the SRFCP design water surface profile) as part of the state's ongoing levee repair program. Several of these levees overtopped in the 100-year and "200-year" modeling runs. In scenario (d), it was assumed that this overtopping would result in a levee breach with water leaving the adjacent river channel through the breach. In the "no levee failure" scenario, the overtopped levee was assumed to act as a weir, allowing water to leave the adjacent river channel over the top of the levee without a breach occurring. None of the existing NLIP levees failed under either of these scenarios. Accordingly, in both cases it was determined that increasing the height of the NLIP levees would not increase the 1957 water surface profiles in any project reach and would not increase the 100-year or "200-year" water surface elevations in any urban areas upstream or downstream of the project study area.

2.2.5 The Approach Used in the NLIP Has Been Adopted by the State Legislature

In September 2007, the state legislature enacted the Central Valley Flood Protection Act of 2008 (Act), Water Code Section 9600 et seq., which was signed into law by the governor in October 2007. The Act is based on the following findings:

- The Central Valley of California is experiencing unprecedented development, resulting in the conversion of historically agricultural lands and communities to densely populated residential and urban centers.
- The legislature recognizes that by their nature, levees, which are earthen embankments typically founded on fluvial deposits, cannot offer complete protection from flooding, but can decrease its frequency.
- The legislature recognizes that the level of flood protection afforded rural and agricultural lands by the original flood control system would not be adequate to protect those lands if they are developed for urban uses, and that a dichotomous system of flood protection for urban and rural lands has developed through many years of practice.
- The legislature further recognizes that levees built to reclaim and protect agricultural land may be inadequate to protect urban development unless those levees are significantly improved.
- Cities and counties rely upon federal floodplain information when approving developments, but the information available is often out of date and the flood risk may be greater than that indicated using available federal information.
- The legislature recognizes that the current federal flood standard is not sufficient to protect urban and urbanizing areas within flood prone areas throughout the Central Valley.

(Statutes of 2007, Chapter 364, Section 9.)

Based on these findings, the Act embraces a new flood protection standard for urban areas (defined as "developed areas in which there are 10,000 residents or more") located in levee protected floodplains in the Central Valley. This new "urban level of flood protection" is defined as "the level of protection that is necessary to withstand flooding that has a 1-in-200 chance of occurring in any given year using criteria consistent with, or developed by, the Department of Water Resources." (Statutes of 2007, Chapter 364 [adding Water Code Section 9602(i)]).

Consistent with this new state standard, the legislature also approved "the project features necessary to provide a 200-year level of flood protection along the American and Sacramento Rivers and within the Natomas Basin as described in the final engineer's report dated April 19, 2007, adopted by the Sacramento Area Flood Control Agency." (Statutes of 2007, Chapter 641 [amending Water Code Section 12670.14(b)]) Moreover, in connection with this approval, the legislature adopted the following findings and declarations (Statutes of 2007, Chapter 641, Section 1[k]):

> As evidenced by the environmental impact reports certified in connection with these projects, including the hydrology and hydraulics impact analysis set forth in the environmental impact report prepared by the Sacramento Area Flood Control Agency with regard to local funding mechanisms for comprehensive flood control improvements for the Sacramento area dated February 2007, the increase in flood protection associated with improving the American and Sacramento River levees and modifying Folsom Dam will be accomplished without altering or otherwise impairing the design flows and water surface elevations prescribed as part of the Sacramento River Flood Control Project. Accordingly, these improvements will not result in significant adverse hydraulic impacts to the lands protected by the Sacramento River Flood Control Project. Thus, it is not necessary or appropriate to require these projects to include hydraulic mitigation.
>
> The projects authorized in Section 12670.14 of the Water Code will increase the ability of the existing flood control system in the lower Sacramento Valley to protect heavily urbanized areas within the City of Sacramento and the Counties of Sacramento and Sutter against very rare floods without altering the design flows and water surface elevations prescribed as part of the Sacramento River Flood Control Project or impairing the capacity of other segments of the Sacramento River Flood Control Project to contain these design flows and to maintain water surface elevations. Accordingly, the projects authorized in that section will not result in significant adverse hydraulic impacts to the lands protected by the Sacramento River Flood Control Project and neither the Reclamation Board nor any other state agency shall require the authorized projects to include hydraulic mitigation for these protected lands.

SAFCA's hydraulic impact analysis assumes that portions of the levees on the west side of the Sacramento River opposite the Natomas Basin will be raised to meet the minimum freeboard requirements of the SRFCP but not the more rigorous standard for urban development adopted by the state legislature. This assumption is consistent with the current agricultural zoning of the subbasin protected by these levees and with the standards adopted by the legislature in connection with the Central Valley Flood Protection Act, which tie the prospects for urban development in SRFCP subbasins to achievement of at least a "200-year" level of flood protection within the next two decades. (Statutes of 2008, Chapter 364, Sections 1–6.)

Efforts to meet this standard in existing urban and urbanizing SRFCP subbasins (Sacramento, including Natomas; West Sacramento, including Southport; Marysville, including Reclamation District 784 [Plumas Lakes]; and Yuba City, possibly including Live Oak) demonstrate the enormous cost and difficulty of this undertaking, even in areas that start with a substantial urban population. As a practical matter, it is not reasonably foreseeable that the subbasin across from Natomas, which has virtually no population base and a very large levee perimeter that would have to be upgraded, could meet this challenge. Accordingly, it is reasonable for SAFCA's hydraulic modeling evaluation to assume that the levees protecting this area will be raised to meet the minimum standards

of the SRFCP but not the more demanding urban protection standard that has been adopted by the state legislature.

2.2.6 "200-YEAR" FLOOD CRITERIA AND FREEBOARD REQUIREMENTS

The design of the NLIP calls for the Natomas levees to be strengthened to minimize the risk of levee failure caused by the potential for through- and underseepage generated by the water surface elevations around the Natomas Basin that would result from a "200-year" flood event in the Sacramento-Feather and American River watersheds (assuming no levee failures across or upstream from the project area). Although this water surface elevation would be contained by the current perimeter levee system, the NLIP also calls for the levees to have 3 feet of freeboard above this design water surface elevation. This freeboard requirement originates in the regulations of the Federal Emergency Management Agency and the engineering practice of DWR, which has been mandated to develop design standards for providing a "200-year" level of flood protection for urban areas protected by levees in the Central Valley.

This freeboard requirement is intended to address hypothetical uncertainties in levee performance and hydrology and hydraulics. However, its more critical purpose is to address the potential for wind and wave run-up generated by conditions produced by the "200-year" design water surface elevations. An analysis prepared for SAFCA by Mead & Hunt indicates that under reasonably foreseeable wind conditions, this water surface elevation could generate waves up to 2.5 feet in height along the reach of the east levee of the Sacramento River extending from the mouth of the Natomas Cross Canal to Powerline Road. Without the freeboard called for in the NLIP design, these waves could overtop the levee and potentially cause its failure. Thus, the freeboard is needed to ensure safe containment of the "200-year" design flood.

Although it is conceivable that this freeboard could also serve to contain river flows in excess of the "200-year" design, the potential to experience sustained water surface elevations above this level is considered extremely unlikely, speculative at best, and not reasonably foreseeable. While the "200-year" design conservatively assumes no upstream levee failures, it is unreasonable to extend this "no levee failure" assumption to even more extreme flood events. If the upstream levees are assumed to fail in floods greater than the "200-year" event, then the "200-year" "no levee failure" elevation likely represents a worst-case scenario for the Sacramento River channel and the Natomas Cross Canal. For example, SAFCA's modeling shows that a "500-year" flood with upstream levee failures would produce water surface profiles in the Sacramento River channel that would be about 1 foot lower than the NLIP "200-year" design profile, and thus well within the current height of the levee, because the assumed failures allow flood waters to be stored in the upstream floodplains rather than having to be conveyed through the system during peak flow periods.

2.2.7 IMPACTS ON GARDEN HIGHWAY RESIDENCES

The discussion presented in Section 2.2.4 demonstrates that implementation of the NLIP would not cause the SRFCP operations to be altered, therefore, the principal risks of flood damage to existing Garden Highway residences would continue to be either inundation by the water surface elevations that are unchanged by the NLIP or damage by the wind and wave run-up generated during these water surface elevations. In either event, the risk of damage is the same under the "with" and "without" project conditions. Moreover, if under the "without" project conditions, these wind and wave conditions were to fail the Garden Highway levee, some waterside residences could be engulfed by the resulting levee breach, while the rest of these residences would become uninhabitable once the Natomas Basin became fully inundated. Given the severity of the storm that would be required to create these conditions, this inundation would likely last for several weeks, if not months. Interior roadways would be unusable and the landside of the Garden Highway would likely be destabilized by ponded water and wind and wave action. Portions of the roadway would slough away and the entire road would become impassable, leaving Garden Highway residents with no land-based access to their homes. These conditions would be alleviated by the project because the freeboard added to the Sacramento River east levee would prevent a potential wind- and wave-induced levee failure.

2.2.8 CONSIDERATION OF USE OF YOLO AND SACRAMENTO BYPASS SYSTEMS TO CONVEY FLOOD WATERS

SAFCA has given extensive consideration to the feasibility of improving flood water conveyance through the Yolo and Sacramento Bypass systems. In 2003, SAFCA made substantial investments in hydraulic studies and analyses of the improvements that would be required to move more flood water into and through the Yolo Bypass during large flood events in the Sacramento-Feather River watershed to reduce flows and water surface elevations in the Sacramento River channel downstream of the Fremont weir.

The Lower Sacramento River Regional Project Initial Report (SAFCA 2003) indicated that this could be accomplished by widening the Fremont weir, setting back the levees on the east side of the Yolo Bypass, discharging flows into the Sacramento Deep Water Ship Channel and eliminating low elevation levees at the lower end of the Yolo Bypass. However, these improvements would be extremely costly and time consuming to implement; they would occur entirely outside SAFCA's jurisdiction, and would require extraordinary cooperation among affected federal, state, and local interests; and they would not resolve the seepage problems affecting the Sacramento River east levee and the Natomas Cross Canal south levee. For these reasons, as explained in Section 7.1.2.3, "Alternatives Considered but Rejected from Further Consideration," of the DEIR on Local Funding Mechanisms for Comprehensive Flood Control Improvements for the Sacramento Area, SAFCA concluded that this alternative would not achieve the objectives of the NLIP and, therefore, it was not carried forward for further analysis. Nevertheless, regionally oriented improvements to the Yolo and Sacramento Bypass systems are of long-term interest to SAFCA, independent of the NLIP, and SAFCA fully intends to cooperate with any federal, state, or local initiative that has the potential to move such improvements forward.

2.3 MASTER RESPONSE 2: BIOLOGICAL RESOURCES AND HABITAT MITIGATION

Several commenters state that the DEIR does not provide sufficient detail regarding impacts to Swainson's hawks and giant garter snake (GGS) and mitigation for such impacts. This master response is intended to provide more detail of specific impacts and habitat creation and enhancement commitments related to these species for 2008 project activities. Project components to be implemented in 2009–2010 are addressed at a programmatic level in the DEIR, because sufficient detail is not available at this time to address them at a project level. However, the approach used here for 2008 will be repeated for 2009–2010 in subsequent project-level CEQA analyses.

2.3.1 GIANT GARTER SNAKE

In 2008, a total of 243.5 acres of potentially suitable habitat for giant garter snake (240 acres of rice, 1.5 acres of irrigation/drainage canal and ditch, and 2 acres of upland) is anticipated to be permanently lost as a result of project implementation. In addition, a total of 116 acres would be temporarily disturbed (40 acres of rice used for borrow and converted to managed marsh, 1 acre of canal, and 75 acres of upland). To compensate for the habitat effects in 2008, a total of 83 acres of habitat would be created (40 acres of managed marsh, 24 acres of irrigation/drainage canal, and 19 acres of upland adjacent to canals), and 160 acres of existing rice land would be preserved as indicated in Table 2-2.

Table 2-27 of the DEIR has been updated to reflect these acreages.

J2 Phase 3 FEIR Master Response:
Sacramento River East Levee Prism and
Master Response: 24/7 Cutoff Wall Construction

2.2.2 MASTER RESPONSE: SACRAMENTO RIVER EAST LEVEE PRISM

Several comment letters stated that the Phase 3 DEIS/DEIR did not provide enough information to fully explain the levee prism concept, the adjacent setback levee footprint, and potential construction-related impacts to vegetation and improvements. SAFCA has prepared the following response regarding the levee prism.

Plate 4 shows a typical profile view of the existing levee along the east side of the Sacramento River in comparison to the adjacent setback levee proposed for the Phase 3 Project (Reaches 5A–9B). The prism for the existing levee consists of:

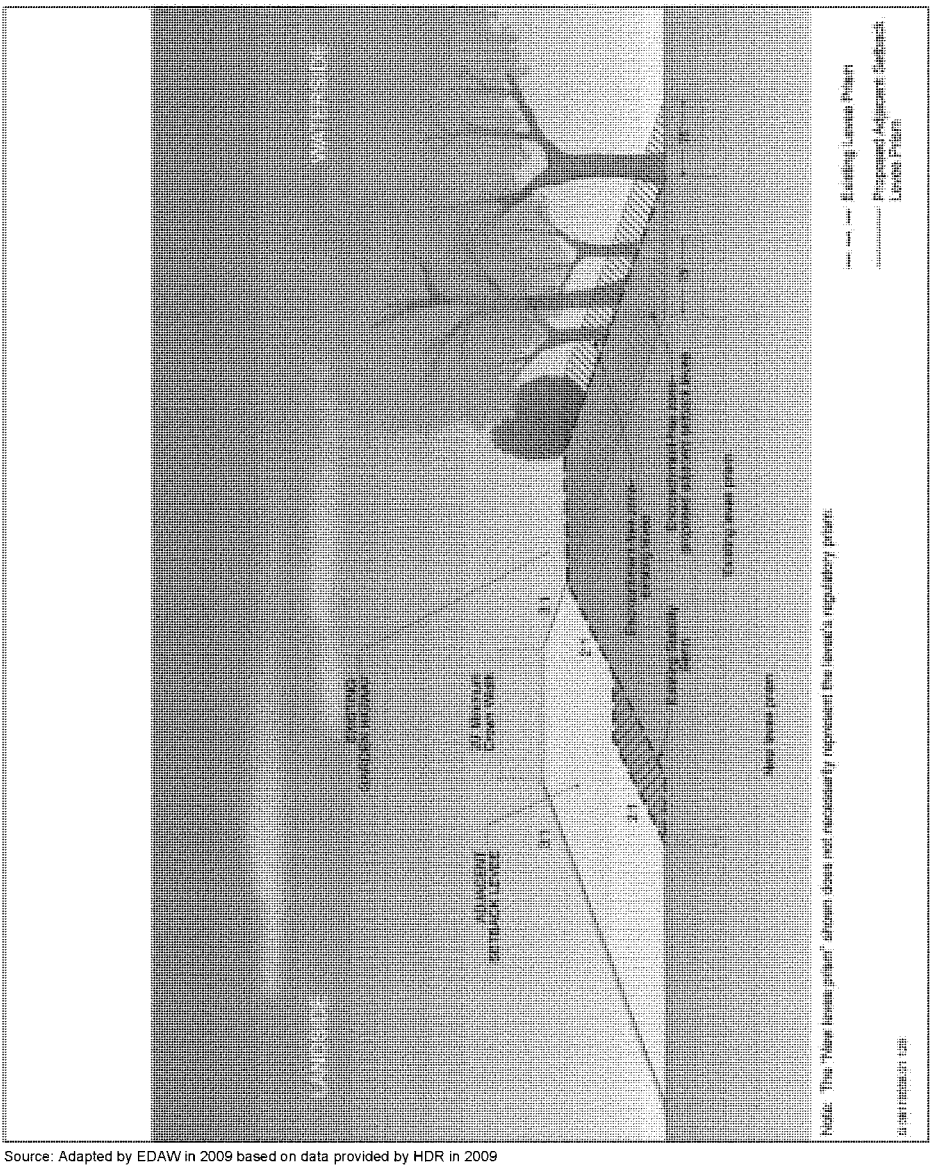
- the levee crown (a minimum of 20 feet wide), on which the Garden Highway currently sits;
- a landside levee slope, typically 2H:1V
- a landside stability berm; and
- a waterside slope that is defined by a projected 3H:1V slope from the waterside hinge point of the levee crown that may or may not be exposed depending upon natural ground surfaces and property improvements, such as construction fill for foundations and driveways.

The prism of the proposed adjacent setback levee would consist of:

- a minimum 20-foot crown,
- a 3H:1V landside slope from the hinge point of the levee crown,
- an exposed upper waterside slope from the hinge point of the adjacent levee crown to the landside of Garden Highway, and
- the continuation of a projected (non-exposed) minimum 3H:1V waterside slope through the existing levee to a point that would be set back a minimum of 15 feet from the existing waterside toe.

The setting back of the Sacramento River east levee under the Proposed Action would provide the USACE-required 15 feet of clearance of encroachments (including vegetation greater than 2 inches in diameter) from the theoretical waterside toe of the new adjacent setback levee. As shown on **Plate 4**, this approach would shift the encroachment-free zone landward, potentially reducing the extent to which USACE, the State, SAFCA, and RD 1000 would require the removal of existing encroachments to meet this requirement under the Levee Raise-in-Place Alternative. The impact of the removal of waterside vegetation greater than 2 inches that would potentially occur in the event of that the adjacent setback levee would not be constructed was analyzed in the Phase 3 DEIS/DEIR under Impact 4.8-a, "Loss of Woodland Habitats," under the Levee Raise-in-Place Alternative. This loss was estimated to be up to 22 acres for Reaches 5A–9B.

As described in Section 2.3.5, "Additional Actions to Meet FEMA, USACE, and State Design Requirements: Encroachment Management," of the Phase 3 DEIS/DEIR, the adjacent setbaek levee proposed as part of the Phase 3 Project would be designed to significantly reduce conflicts between waterside encroachments and applicable USACE levee operation and maintenance requirements. However, the full extent of this reduction cannot be known until the proposed levee improvements are completed, and USACE, the State, SAFCA, and RD 1000 have inspected and evaluated whether there are any encroachments that affect the integrity of the levee. Section 1.4.2.1,



Source: Adapted by EDAW in 2009 based on data provided by HDR in 2009

Levee Prism Concept for the Sacramento River East Levee **Plate 4**

"Encroachment," in the Phase 3 DEIS/DEIR has been revised to reflect the fact that removal of any encroachments that could be identified as threatening levee integrity would be subject to future environmental review. See Chapter 4.0, "Revisions to the DEIS/DEIR," of this FEIR for the text revision.

2.2.5 MASTER RESPONSE: 24/7 CUTOFF WALL CONSTRUCTION

Numerous comment letters expressed concern about 24 hour-per-day, 7 days-per-week (24/7) construction activities associated with cutoff wall construction. Specifically, commenters requested a more detailed engineering explanation of why 24/7 cutoff wall construction work would be necessary, consideration of using multiple pieces of equipment at once to increase the productivity rate, resident relocation allowances, anticipated duration of potential relocation for residents within 500 feet of construction, and that SAFCA appears to be placing a higher priority on speed rather than environmental impacts. SAFCA has prepared the following response to these concerns.

Normal hours for construction would be from 6:00 a.m. to 8:00 p.m. as stated in the Phase 3 DEIS/DEIR. Installation of cutoff walls during night hours (from 8:00 p.m. to 6:00 a.m.) would be necessary to maintain the construction schedule and install a quality cutoff wall. The 24/7 construction is required due to regional and national demand for the long-stick excavators and deep soil mixing equipment that are needed for cutoff wall construction, the relatively short levee construction window (May 1 through November 1), the potential for wall imperfections that result from sand in the slurry trench settling to the bottom when work progress is interrupted, and the requirement that the cutoff wall be allowed to cure for at least 4 weeks before completing construction of the encapsulating adjacent levee.

It is anticipated that the 24/7 cutoff wall construction would occur Monday through Saturday, with Sunday reserved for equipment maintenance. However, if unanticipated events occur, cutoff wall construction could also be conducted on Sundays. Lights and power generators would be used during nighttime construction hours. Additional equipment would include cutoff wall rigs, excavators, generators, pumps, support vehicles, and other ancillary equipment. The cutoff wall would be installed in several headings. The number and locations of the headings would be dependent on the project schedule and contractor preference. Each cutoff wall rig would move continuously along the proposed alignment to ensure an uninterrupted cutoff wall and to reduce prolonged disturbance to adjacent residences. Each cutoff wall rig can move between 50 and 100 feet horizontally during a twelve-hour work shift.

As stated in the Phase 3 DEIS/DEIR, residents in or near the affected work area would be afforded the opportunity, at SAFCA's expense, to temporarily relocate to a nearby hotel for as long as the 24/7 schedule persists within 500 feet of their residence (see Mitigation Measure 4.14-a, "Implement Noise-Reducing Construction Practices, Prepare a Noise Control Plan, and Monitor and Record Construction Noise Near Sensitive Receptors"). The 500-foot distance was determined to be the distance at which models indicate that noise levels from cutoff wall construction equipment (deep soil mixing equipment or long-stick excavators) would be at or below 60 dBA L_{dn}, which is the standard for exterior night time noise levels established by Sacramento County and the City of Sacramento, as stated in Section 4.14, "Noise," of the Phase 3 DEIS/DEIR. Based on this distance of 500 feet from construction equipment, in the worst case, residents in the vicinity of cutoff wall construction could be affected by round-the-clock construction for approximately one week as the cutoff wall is installed along the levee.

The 500-foot distance is modeled based on the assumption that sensitive receptors are located in the line-of-sight from the noise source. Additional reductions in noise levels would come from natural sound barriers, such as existing levees or other structures, including dwellings. For example, cutoff walls along the Sacramento River east levee would be constructed on the land side of the levee at an elevation below the crown of the levee. Therefore, the existing levee would provide some shielding to residents on the water side of the Garden Highway, reducing exterior noise levels at 500 feet by an additional 10–12 dB below the predicted level of 60 dBA L_{dn}. This

estimate is based on the assumption that cutoff wall construction equipment would generate noise at the level of 10 feet above ground surface, and the height of the existing levee is 25 feet above ground surface. Waterside residences would be out of the line-of-sight of this equipment.

Residences located adjacent to the NEMDC west levee, where cutoff wall construction would also be conducted as part of the Phase 3 Project, would not be shielded by the existing levee because construction would take place on top of the degraded levee. However, for residents not located immediately adjacent to the levee, intervening building façades and ground absorption would significantly reduce noise levels, and residents located at or beyond 500 feet from construction would likely experience noise levels below the exterior noise standard of 60 dBA L_{dn} due to these obstructions and the increasing distance from the noise source.

J3 Phase 3 FEIR:
U.S. Environmental Protection Agency Letter and
USACE/SAFCA Response

F2

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

April 3, 2009

Ms. Elizabeth Holland
Planning Division
Sacramento District
U.S. Army Corps of Engineers
1325 J Street
Sacramento, California 95814-2922

Subject: Draft Environmental Impact Statement (DEIS) for the Natomas Levee Improvement Program, Phase 3 Landside Improvements Project (CEQ# 20090040)

The U.S. Environmental Protection Agency (EPA) has reviewed the above-referenced document pursuant to the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508), and our NEPA review authority under Section 309 of the Clean Air Act.

EPA previously reviewed the DEIS and Final EIS (FEIS) for 408 Permission and 404 Permit to Sacramento Area Flood Control Agency (SAFCA) for the Phase 2 Landside Improvements Project and programmatic evaluation of the entire Natomas Levee Improvement Program (NLIP). We provided comments to the U.S. Army Corps of Engineers (Corps) on August 4, 2008 and December 11, 2008, expressing concerns because of our inability to determine whether or not the preferred alternative represents the Least Environmentally Damaging Practicable Alternative (LEDPA). We also expressed concern with the residual flood risk to development in a floodplain protected by levees, and the indirect and cumulative environmental effects of planned development facilitated by this levee project. F2-1

We continue to have concerns regarding the residual flood risk and the potential indirect and cumulative impacts of future development. We recommend implementation of the Natomas Basin flood safety plan (pps. 2-40 to 2-41) as soon as possible and prior to approval of additional development, so that new development does not compromise the flood-damage-and-risk-reduction achievements of this project. F2-2

While we commend efforts to avoid and fully compensate for the loss of riparian woodland, Giant garter snake habitat, wetlands, and Swainson's hawk habitat; we continue to have concerns with 371.48 acres of temporary effects and 36.75 acres of permanent effects on waters of the United States (US) for all four phases of the Natomas Levee Improvement Program (2008 - 2010) (p. ES-12, Phase 2 FEIS, November 2008). We recommend continued close consultation and collaboration with the U.S. Fish and F2-3

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Wildlife Service, California Department of Fish and Game, The Natomas Basin Conservancy, SAFCA, and Sacramento Area Council of Governments to ensure effects on woodlands, threatened and sensitive species habitat, and waters of the US are avoided and minimized. F2-3 Cont'd

Phases 1 to 4 of the Natomas Landside Improvement Project constitute an "early implementation project" to improve Natomas Basin perimeter levees to meet the 100-year flood protection design criteria adopted by the Federal Emergency Management Agency. The remaining segments of the perimeter levee system would be improved by the Corps to provide flood protection that would meet California standards for the "200-year" flood stage surface water elevation. The Corps plans to seek Congressional authorization for this additional work based on a General Re-evaluation Report for the American River Common Features Project to be presented to Congress in 2010 (p. ES-3). As a reasonably foreseeable future action, the Corps' proposed "200-year" levee improvement project should be included in the evaluation of cumulative effects in the FEIS for the NLIP Phase 3 Landside Improvements Project. F2-4

Based on the above concerns, we have rated this DEIS as Environmental Concerns – Insufficient Information (EC-2) (see enclosed "*Summary of Rating Definitions*"). We appreciate the opportunity to review this DEIS. When the FEIS is released for public review, please send one hard copy and a CD ROM to the address above (mail code: CED-2). If you have any questions, please contact me at (415) 972-3521, or contact Laura Fujii, the lead reviewer for this project. Laura can be reached at (415) 972-3852 or fujii.laura@epa.gov. F2-5

Sincerely,

Kathleen M. Goforth, Manager
Environmental Review Office
Communities and Ecosystems Division

Enclosures: Summary of Rating Definitions

cc: Ken Sanchez, U.S. Fish and Wildlife Service
Robert Solecki, Central Valley RWQCB
Jeff Drongesen, California Department of Fish and Game
John Bassett, Sacramento Area Flood Control Agency

U.S. Environmental Protection Agency Rating System for Draft Environmental Impact Statements Definitions and Follow-Up Action*

Environmental Impact of the Action

LO – Lack of Objections

The U.S. Environmental Protection Agency (EPA) review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC – Environmental Concerns

EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce these impacts.

EO – Environmental Objections

EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no-action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU – Environmentally Unsatisfactory

EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

Adequacy of the Impact Statement

Category 1 – Adequate

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis of data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2 – Insufficient Information

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses or discussion should be included in the final EIS.

Category 3 – Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the National Environmental Policy Act and or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

* From EPA Manual 1640 Policy and Procedures for the Review of Federal Actions Impacting the Environment. February, 1987.

Letter	U.S. Environmental Protection Agency, Region IX
F2	Kathleen M. Goforth, Manager
Response	April 3, 2009

F2-1 USACE and SAFCA received U.S. Environmental Protection Agency's (EPA's) referenced comment letters (dated August 4 and December 11, 2008) on the Phase 2 EIS. Responses were provided in the Phase 2 FEIS (USACE 2008) and Record of Decision (ROD) (USACE 2009), respectively, which are in the record and were considered by USACE and SAFCA in their decision-making on the Phase 2 Project; the content of the letters was also considered during preparation of this FEIR.

F2-2 Sacramento and Sutter County and the City of Sacramento have developed and are administering flood safety plans affecting the Natomas Basin within their respective jurisdictions. These plans will be updated as additional development in the Natomas Basin is approved.

Section 2.5.1, "Residual Risk of Flooding," in the Phase 3 DEIS/DEIR describes SAFCA's ongoing efforts to manage the residual risk of flooding in the Natomas Basin, which would remain even with achievement of a "200-year" level of flood risk reduction. As noted in Section 2.5.1, these efforts include providing the state with a safety plan (including a flood preparedness plan, levee patrol plan, flood-fight plan, and evacuation plan). Additionally, SAFCA has implemented a development impact fee program with the objective of avoiding any substantial increase in the expected damage due to an uncontrolled flood as new development proceeds in the floodplain. The revenue generated by the fee program will be used to implement flood risk reduction measures on an ongoing basis and to further reduce flood risk as new development occurs in the floodplain (see also Response to Comment L3-9).

F2-3 The Natomas Levee Improvement Program (NLIP) includes habitat conservation components as part of each project phase, as well as mitigation measures to avoid and minimize impacts to sensitive habitats and species. For example, Mitigation Measure 4.6-b, "Restore, Replace, or Rehabilitate Degraded SRA Habitat Function and Comply with Section 7 of the Federal Endangered Species Act, Section 1602 of the California Fish and Game Code, and Section 2081 of the California Endangered Species Act Permit Conditions," requires restoration, replacement or rehabilitation of degraded SRA habitat function and compliance with Section 7 of the Federal Endangered Species Act, Section 1602 of the California Fish and Game Code, and Section 2081 of the California Endangered Species Act Permit conditions; and Mitigation Measure 4.7-a, "Minimize Effects on Jurisdictional Waters of the United States, Complete Detailed Design of Habitat Creation Components and Secure Management Agreements to Ensure Compensation of Waters Filled, and Comply with Section 404, Section 401, Section 10, and Section 1602, Permit Processes," requires minimization of effects on jurisdictional Waters of the United States, completion of detailed design of habitat creation components and securing management agreements to ensure compensation of waters filled, and compliance with Section 404, Section 401, Section 10, and Section 1602, permit processes. SAFCA will continue to consult and collaborate closely with Federal, state, regional, and local agencies (including USACE, the U.S. Fish and Wildlife Service [USFWS], the California Department of Fish and Game [DFG], and The Natomas Basin Conservancy [TNBC]) on developing and implementing these measures. SAFCA is working closely with USACE on impacts to Waters of the United States for the NLIP through several NEPA documents covering Clean Water Act Section 404 approval, as well as several permit applications to fill Waters of the United States. SAFCA is also working closely with USFWS, the National Marine Fisheries Service (NMFS), DFG, and TNBC to ensure biological effects are avoided and/or minimized to the extent practicable.

Chapter 7.0, "Consultation and Coordination," of the Phase 3 DEIS/DEIR describes the consultation activities between USACE, SAFCA, USFWS, and DFG that have taken place in connection with the NLIP. Additionally, SAFCA has collaborated with TNBC on the planning, design, and long-term management of the NLIP's proposed habitat conservation components. This has involved multiple meetings and negotiations with the resource agencies and other Natomas Basin land managers such as Reclamation District (RD) 1000, and is ongoing. SAFCA has also coordinated with the Sacramento Area Council of Governments (SACOG), which endorsed SAFCA's White Paper in April 2006 (available on SAFCA's Web site at www.safca.org), to discuss the regional implications of providing improved flood damage reduction to the Natomas Basin. USACE and SAFCA will continue to work collaboratively with USFWS, DFG, TNBC, and SACOG.

F2-4 The Phase 1 Project, which was analyzed in the Local Funding EIR (SAFCA 2007a), has been constructed. The Phase 2, 3, and 4 Projects were fully analyzed in the Phase 2 EIR (SAFCA 2007b) and Phase 2 EIS (USACE 2008), and constitute the remainder of the NLIP Landside Improvements Project. This project-levee EIR is tiered from the above-mentioned documents and involves a portion of that bigger project. As described in Chapter 2.0, "Alternatives," in the Phase 3 DEIS/DEIR, where repairs are required in the Natomas Basin perimeter levee to address 100-year levee height deficiencies, SAFCA would repair the levee to meet the desired minimum of 3 feet of levee height above the "200-year" design water surface profile, thereby laying the groundwork for completion of "200-year" flood risk reduction over time. As part of the Phase 3 Project, the Sacramento River east levee improvements would be constructed with a levee crown at least 3 feet above the "200-year" design water surface profile. The existing height of the NEMDC west levee between Elkhorn Boulevard and Northgate Boulevard is anticipated to meet the "200-year" height requirement. Under SAFCA's approach, this would leave only a minor amount of work for USACE to complete the "200-year' improvements, primarily along the American River north levee and the NEMDC west levee between Elkhorn Boulevard and Sankey Road. These remaining repairs would make a minor contribution to the significant cumulative impacts that have been identified for the NLIP, as discussed in Chapter 5.0, "Cumulative and Growth-Inducing Impacts, and Other Statutory Requirements," in the Phase 3 DEIS/DEIR.

F2-5 Comment noted; a copy of the FEIR, and subsequently the FEIS to be prepared by USACE, will be provided to EPA as requested.

J4 Phase 3 FEIR:
California Department of Fish and Game Letter and
USACE/SAFCA Response

S5

California Natural Resources Agency ARNOLD SCHWARZENEGGER, Governor
DEPARTMENT OF FISH AND GAME
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Rancho Cordova, CA 95670
916-358-2900

April 9, 2009

John Bassett
Sacramento Area Flood Control Agency
1007 Seventh Street, 7th Floor
Sacramento, CA 95814

Subject: Comments on the Sacramento Area Flood Control Agency's February 2009, Draft Environmental Impact Report on the Natomas Levee Improvement Program Phase 3 Landside Improvement Project

Dear Mr. Bassett:

The California Department of Fish and Game (DFG) has reviewed the Sacramento Area Flood Control Agency's (SAFCA) February 2009, Draft Environmental Impact Report on the proposed Natomas Levee Improvement Program Phase 3 Landside Improvement Project (DEIR/EIS). As described in the DEIR/EIS, the project objectives include: 1) provide at least a 100-year level of flood protection to the Natomas Basin as quickly as possible, 2) provide "200-year" protection to the Natomas Basin over time, and 3) avoid any substantial increase in expected annual damages as new development occurs in the Basin. S5-1

The DFG is providing comments on the DEIR/EIS as a trustee agency and a responsible agency. As trustee for the State's fish and wildlife resources, the DFG has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and the habitat necessary for biologically sustainable populations of such species. In this capacity the DFG administers the California Endangered Species Act (CESA), the Native Plant Protection Act (NPPA), and other provisions of the California Fish and Game Code that afford protection to the State's fish and wildlife public trust resources. As a responsible agency the DFG will review a Lake and Stream Alteration Agreement notification package for components of the proposed project.

Enforceable Mitigation Measures

CEQA Guidelines §§15126.4 (a)(1)(B) states that formulation of mitigation measures should not be deferred until some future time. Table ES-2 lists a number of mitigation measures for fisheries and aquatic resources (i.e. mitigation measures 4.6a and 4.7a), terrestrial biological resources (i.e. mitigation measures 4.8a, 4.8b, 4.9a, 4.9c, and 4.9f) that rely on future approvals or agreements with the Wildlife Agencies. These entities are entrusted with carrying out the Natomas Basin Habitat Conservation Program's (NBHCP's) permit conditions, Natomas Basin Conservancy (NBC), and agencies entrusted with providing public safety (Federal Aviation Administration (FAA) approval over mitigation on proposed borrow site / Sacramento Airport buffer lands), as a means S5-2

Conserving California's Wildlife Since 1870

to bring identified significant environmental effects to below a level that is significant. As there is no guarantee that these approvals or cooperation with all of the above entities will ultimately occur, the DFG believes the above mitigation measures are potentially unenforceable and may not bring the impacts to fisheries and aquatic resources to below a level that is significant. S5-2 Cont'd

Mitigation measures should establish performance standards to evaluate the success of the proposed mitigation, provide a range of options to achieve the performance standards, and must commit the lead agency to successful completion of the mitigation. Mitigation measures should also describe when the mitigation measure will be implemented and explain why the measure is feasible. The DFG recommends the mitigation measures summarized in Table ES-2, include measures that are enforceable and do not defer mitigation details to some future time. The DEIR/EIS should identify the following items: how each measure will be carried out; who will perform the measures; when the measures will be performed; the performance standards and mechanisms for achieving success; and an assured source of funding to acquire and manage identified mitigation lands. The DEIR/EIS could describe a range of enforceable mitigation measures that will be implemented in instances where approval and cooperation with the entities identified above either does or does not occur. S5-3

CESA

As we have done for previous phases of this project, the Department anticipates issuing an Incidental Take Permit (ITP) for this phase under the provisions of the California Endangered Species Act. Issuance of an ITP is subject to CEQA documentation. Because of this, it is critical that the CEQA analysis and the identification of specific mitigation measures be as thorough as possible in the EIR in order for us to be able to rely on the existing environmental document when making our CEQA findings for the ITP. The DFG may only issue a CESA permit if it is determined that impacts associated with the authorized take of the species are minimized, fully mitigated, and that adequate funding has been ensured to implement the mitigation measures. The DFG may only issue a CESA permit if it determines that issuance of the permit will not jeopardize the continued existence of the species. This determination will be made based on the best scientific information available and shall include consideration of the species capability to survive and reproduce, including the species known population trends and known threats to the species. Issuance of a CESA permit may take up to 180 days from receipt of an application for take authorization. S5-4

Potential Impacts to Special-Status Plant Species

The DEIR/EIS states that three special-status plant species have the potential to occur within the project area, including Rose Mallow (*Hibiscus lasiocarpus*), Delta Tule Pea (*Lathyrus jepsonii* var. *jepsonii*), and Sanford's Arrowhead (*Sagittaria sanfordii*). The DEIR/EIS states: "no surveys have been conducted to confirm that the species in question are present in these habitats; however, surveys for special-status plants within the Phase 3 Project area will be conducted during the appropriate time for identification in 2009, before project construction". The DFG recommends focused rare-plant surveys be conducted at the appropriate time of year to identify any special-status plants which may be present within the project area. The results of these floristic S5-5

surveys need to be evaluated in the final EIR/EIS along with appropriate minimization and mitigation measures. Compliance with CEQA is predicated on a complete and accurate description of the existing site conditions that will be altered if the proposed project is approved. Without a complete and accurate description of the existing plant flora in and around the project site the DEIR/EIS likely provides an incomplete analysis of project-related environmental impacts. S5-5 Cont'd

Mitigation measure 4.9a of the DEIR/EIS states: "if special-status plants are present in areas that cannot be avoided... affected plants may potentially be transplanted to the GGS/Drainage Canal, if feasible". The DFG has found transplantation of herbaceous plants is typically unsuccessful and should be considered experimental. Mitigation measures for any potentially unavoidable impacts to special-status plants should include additional measures to increase the chances of survival for the population in question. If special-status plants cannot be avoided during project activities, seed should be collected and propagated at a DFG approved nursery facility in order to provide additional plantings at an approved mitigation site. Additionally, a mitigation plan approved by the DFG should be developed, which includes a planting plan, monitoring plan, success criteria, and a remediation plan in the event that success criteria are not met. These mitigation sites should be permanently protected and managed in perpetuity. S5-6

Impacts to Swainson's Hawk and Other Raptor Species

The DFG is concerned with potential impacts to raptor nesting behavior not currently addressed in the DEIR/DEIS. Page 2-25 of the DEIR/DEIS describes construction activities including the 24/7 construction of cutoff walls before the start of flood season (November 1), as well as an estimated 900-1,000 haul trips per day to deliver fill material to construct reaches 5A-9B of the Sacramento River east levee. The DFG believes that each of these activities could potentially result in significant impacts to nesting raptors including nest abandonment, starvation of young, and/or reduced health and vigor of eggs or nestlings that could result in death.

The final EIR/EIS should identify the potential impacts to nesting raptors associated with 24-hour construction schedules along riparian zones such as the Sacramento River, which contains a higher density of nesting raptors than elsewhere in the Natomas Basin. In its current form the DEIR/DEIS does not explore the potential impacts of nighttime construction activities on nesting raptors such as: high-intensity lighting, operation of heavy equipment or the presence of construction personnel at all hours of the night. Furthermore, construction at night poses additional complications for the effectiveness of biological monitors in ensuring that appropriate buffer zones are in place around active nests and that birds do not abandon their nest. The final EIR/EIS should include feasible mitigation measures that reduce these impacts to below a level of significance. S5-7

Mitigation measure 4.9f states: "surveys for nesting birds shall be conducted before project activities are initiated during the nesting season (March 1-July 31)". The DFG recommends that nesting bird surveys be conducted until September 15th, in accord with current DFG survey protocols for nesting birds. Additionally, mitigation measure 4.9f states: "the biologist shall conduct preconstruction surveys to identify active nests S5-8

within 0.25-mile of construction areas, in accordance with DFG guidelines". Current DFG guidelines require preconstruction surveys be conducted within 0.5-miles of construction areas, with a 0.25-mile construction buffer zone placed around any active nest that is identified. S5-8 Cont'd

Northern Harrier

The Northern Harrier (*Circus cyaneus)* (NOHA) is listed in California as a Species of Special Concern, and is protected from take by Fish and Game section 3503.5. The DEIR/EIS does not provide a discussion of potential impacts to these ground nesting raptors associated with construction and borrow site activities and does not consider avoidance or mitigation measures to avoid "take" or lessen potential impacts to below a level that is significant. The DFG recommends that the DEIR/EIS provide a discussion of the project's potential to impact NOHA, and include measures to avoid take of these birds, and their nests and eggs. S5-9

We appreciate your consideration of our comments. DFG personnel are available for consultation regarding biological resources and strategies to minimize impacts. If you have questions please contact Patrick Moeszinger, Environmental Scientist, at 916-358-2850 or Jeff Drongesen, Senior Environmental Scientist, at 916-358-2919.

Sincerely,

Kent Smith
Habitat Conservation Program Manager

cc: Patrick Moeszinger
Jeff Drongesen
Kent Smith
Department of Fish and Game
North Central Region

USFWS
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Letter S5 Response

California Department of Fish and Game
Kent Smith, Habitat Conservation Program Manager
April 9, 2009

S5-1 Comment noted; DFG is providing comments as a trustee agency and responsible agency under CEQA.

S5-2 **Table 3-2** includes permits and other resource agency coordination activities for current and future NLIP project construction phases.

Table 3-2
NLIP Resource Agency Coordination

Agency	Regulatory Permit/Issue	Status
Programmatic		
USFWS/NMFS	Programmatic Biological Opinion	Issued October 2008
NMFS	Concurrence of Determination of Not Likely to Adversely Affect	January 2009
DFG, RWQCB, USACE, and USFWS	Long Term Management Plan Approval	Under Review
Phase 2 Project		
USACE	Section 408 Permission	Issued January 2009
USACE	Section 404 Permit	Issued January 2009
RWQCB	Section 401 Water Quality Certification	Issued January 2009
DFG	2081 Incidental-Take Authorization	Expected April 2009
DFG	1602 Streambed Alteration Agreement	Signed and issued January 2009
USFWS/NMFS	Biological Opinion	Issued October 9, 2008
Sacramento County	SMARA Exemption	February 2009
Sutter County	SMARA Exemption	February 2009
DFG, RWQCB, USACE, and USFWS	MMP	Under review
SWRCB	Section 402 NPDES Permit	Notice of Intent filed March 2009
Phase 3 Project[2]		
USACE	Section 408 Permission	Under review
USACE	Section 404 Permit	Under review
USACE	Section 10 Permit	Under review
RWQCB	Section 401 Water Quality Certification	In preparation
DFG	2081 Incidental Take Authorization	In preparation
DFG	1602 Streambed Alteration Agreement	In preparation
USFWS/NMFS	Biological Opinion	Biological Assessment under review

Table 3-2
NLIP Resource Agency Coordination

Agency	Regulatory Permit/Issue	Status
Sacramento County	SMARA Exemption	In preparation
Sutter County	SMARA Exemption	In preparation
DFG, RWQCB, USACE, and USFWS	MMP	In preparation
SWRCB	Section 402 NPDES Permit	In preparation
Phase 4a Project		
USACE	Section 408 Permission	Anticipated January 2010
USACE	Section 404 Permit	Anticipated January 2010
USACE	Section 10 Permit	Anticipated January 2010
RWQCB	Section 401 Water Quality Certification	Anticipated January 2010
DFG	2081 Incidental Take Authorization	Anticipated January 2010
DFG	1602 Streambed Alteration Agreement	Anticipated January 2010
USFWS/NMFS	Biological Opinion	Anticipated November 2009
Sacramento County	SMARA Exemptions or Permit	In preparation
DFG, RWQCB, USACE, and USFWS	MMP	Anticipated January 2010
SWRCB	Section 402 NPDES Permit	Anticipated January 2010
Phase 4b and 4c Projects – Anticipated 2010-2012		

Notes: USFWS = U.S. Fish and Wildlife Service; NMFS = National Marine Fisheries Service; DFG = California Department of Fish and Game; RWQCB = Regional Water Quality Control Board; USACE = U.S. Army Corps of Engineers; SMARA = Surface Mining and Reclamation Act; MMP = Mitigation and Monitoring Plan; SWRCB = State Water Resources Control Board; NPDES = National Pollutant Discharge Elimination System

[1] Although Phase 1 Project permitting requirements were fulfilled, they are not included in this table because construction is complete.

[2] The Phase 3 Project permits have been separated into 3 subphases (a, b, and c); status listed in table refers to the Phase 3a permit.

Source: Data compiled by EDAW in 2009

It is common to receive permits from these agencies, in their capacities as responsible agencies, after an FEIR is certified. The BOs and incidental take permit, which will contain specific conditions to protect species at a higher performance standard than exists under CEQA ("take" versus no substantial effect), specify that implementation is the responsibility of SAFCA, and establish measurable parameters (performance standards) and actions that SAFCA will be required to implement if the parameters are not met. USFWS, NMFS, and DFG permits include specific and stringent performance standards. These agency documents are not studies, but permits with legally binding and enforceable terms and conditions. If SAFCA does not receive permits from these agencies, SAFCA simply cannot implement the Proposed Action. Permit terms in USFWS, NMFS, and DFG permits are enforceable and must be complied with by SAFCA. The established mitigation in the Phase 3 DEIS/DEIR does not constitute impermissible "deferred mitigation" and meets CEQA requirements for effective and legally adequate mitigation. The following discussion provides additional supportive information.

Impacts to wildlife habitat from project construction would be compensated for through a Natomas Basinwide habitat creation, enhancement, and preservation component as part of the NLIP (See Section 2.3.3, "Habitat Conservation Components," in the Phase 3 DEIS/DEIR). These components include creation and/or preservation of managed grasslands, aquatic habitat, uplands, woodlands, field crops, and rice that function as wildlife habitat. This conservation strategy is designed to offset impacts to habitat and to contribute towards long-term viability of the giant garter snake, valley elderberry longhorn beetle, Swainson's hawk, and other nesting raptors and songbirds. Therefore, these conservation components are not "mitigation measures;" rather, they are part of the Proposed Action. Nevertheless, these aspects of the Phase 3 Project will still meet the same requirements of enforceability and approval by permitting agencies as they would if they were mitigation measures. The conservation strategy was designed to meet all the requirements of mitigation specified in the State CEQA Guidelines.

As stated in State CEQA Guidelines (Section 15126.4[a][1][B]), "formulation of mitigation measures should not be deferred until some future time. However, measures may specify performance standards which would mitigate the significant effect of the project and which may be accomplished in more than one specified way." Hence, mitigation measures commonly are adopted in which the agency commits to achieving a performance standard and the mitigation measure lists options and alternatives for achieving the performance standard, some or all of which may be selected for implementation as part of a future, specific mitigation or management plan.

S5-3 Section 2.3.3, "Habitat Conservation Components," in the Phase 3 DEIS/DEIR includes performance criteria for assessing the success of conservation components along with how and when assessment monitoring would be carried out for aquatic habitat, rice and field crops, managed grasslands, and woodlands.

Further description of these conservation components and how they are expected to function can be found in Sections 4.8, "Vegetation and Wildlife," and 4.9, "Special-Status Terrestrial Species," in the Phase 3 DEIS/DEIR under the Proposed Action. Construction details for the proposed GGS/Drainage Canal can be found in Appendix H of the Phase 3 DEIS/DEIR along with dates for completion.

See also Section 2.3.3.6, "Long-Term Management of Habitat Components," in the Phase 3 DEIS/DEIR for a description of land protection and management mechanisms for long-term management of conservation components. Construction of conservation components and assessment monitoring will be carried out by SAFCA or its contractors.

The Draft NLIP Landside Improvements Project Programmatic Long-Term Management Plan (LTMP) and the NLIP Phase 3 Mitigation and Monitoring Plan (MMP) provide further details for ensuring that habitat improvement and compensation sites are managed, monitored, and maintained in perpetuity. The completion of these documents is expected by June 2009. Funding agreements for proposed parties responsible for management are detailed in the LTMP and MMP. Before project construction that could affect agency-regulated habitat can begin, permits must be issued by the applicable resource/regulatory agencies, and the LTMP and MMP documents are subject to their approval. Management responsibilities and protection obligations under these plans will be held by USFWS, DFG, SAFCA, TNBC, Sacramento County, Sacramento County Airport System (SCAS), the Natomas Central Mutual Water Company (NCMWC), and RD 1000.

S5-4 SAFCA acknowledges the Proposed Action could result in take of giant garter snake and Swainson's hawk, and that a California Endangered Species Act (CESA) 2081 Permit is required for these species. SAFCA will fully comply with the CESA permitting process, including

necessary compensation/mitigation for impacts to state-listed species, funding for said compensation/mitigation, and the amount of time potentially required for issuing a permit.

S5-5 Mitigation Measure 4.9-a, "Conduct Focused Surveys for Special-Status Plants, Minimize Effects, and Develop Detailed Design of Created Habitat and Management Agreements to Ensure Compensation for Loss of Habitat, and Implement all Management Agreements," in the Phase 3 DEIS/DEIR includes conducting plant surveys at the appropriate time of year to identify any special-status species in the area, ensures no net loss of special-status species if they are found, and includes consultation with appropriate regulatory agencies including DFG. These surveys are planned for the appropriate blooming season in June/July 2009, which is after the FEIR is completed. DFG will be notified of all results of the special-status plant surveys when the surveys are conducted.

Preconstruction surveys must take place immediately prior to construction activities. When preconstruction surveys are coupled with specific actions to be taken if the species are found, and there are specific performance standards established, then the mitigation is adequate under CEQA.

S5-6 SAFCA understands that transplanting herbaceous plants can be unsuccessful. If surveys indicate that special-status plants would be lost as a result of project implementation, Mitigation Measure 4.9-a, "Conduct Focused Surveys for Special-Status Plants, Minimize Effects, and Develop Detailed Design of Created Habitat and Management Agreements to Ensure Compensation for Loss of Habitat, and Implement all Management Agreements," is revised to include the following: SAFCA commits to implement additional measures to increase the chance of success for establishment of special-status plant populations in created habitats, such as seed collection and propagation at a DFG-approved nursery to provide additional plantings and conducting transplantation during the dormant season, if feasible, to an approved site. SAFCA will develop a mitigation plan to be approved by DFG, and mitigation lands will be protected and managed in perpetuity, as recommended. See Chapter 4.0, "Revisions to the DEIS/DEIR," of this FEIR for the text revision.

S5-7 Mitigation Measure 4.9-f, "Minimize Potential Impacts on Swainson's Hawk and Other Special-Status Birds Foraging and Nesting Habitat, Monitor Active Nests during Construction, Develop and Implement a Management Plan in Consultation with DFG, Obtain Incidental Take Authorization, and Implement Mitigation Measure 4.8-a, [Minimize Effects on Woodland Habitat, Complete Detailed Design of Woodland Creation and Management Agreements to Ensure Compensation for Loss of Quantity and Quality of Habitat, Implement all Agreements, and Comply with the DFG Section 1602 Permit Process]," in the Phase 3 DEIS/DEIR is intended to (1) be encompassing enough to mitigate any and all construction activities, day or night, (2) provide for monitoring to identify any unanticipated nest disturbance, and (3) provide flexibility to determine an appropriate course of action in consultation with DFG if unanticipated effects occur. This measure addresses any impacts that may occur from 24/7 construction and haul trips.

S5-8 Mitigation Measure 4.9-f, "Minimize Potential Impacts on Swainson's Hawk and Other Special-Status Birds Foraging and Nesting Habitat, Monitor Active Nests during Construction, Develop and Implement a Management Plan in Consultation with DFG, Obtain Incidental Take Authorization, and Implement Mitigation Measure 4.8-a, [Minimize Effects on Woodland Habitat, Complete Detailed Design of Woodland Creation and Management Agreements to Ensure Compensation for Loss of Quantity and Quality of Habitat, Implement all Agreements, and Comply with the DFG Section 1602 Permit Process]," in the Phase 3 DEIS/DEIR has been revised to reflect these updates to DFG protocol for nesting raptors. See Chapter 4.0, "Revisions to the DEIS/DEIR," of this FEIR for the text revision.

S5-9 The northern harrier is discussed as a special-status species in Section 3.3.9.2, "Special-Status Wildlife Species," and in Table 3.9-2 in the Phase 3 DEIS/DEIR. Impacts 4.7-a, "Impacts on Jurisdictional Waters of the United States," and 4.9-f, "Impacts on Swainson's Hawk and Other Special-Status Birds," in the Phase 3 DEIS/DEIR describe and evaluate the Phase 3 Project's potential impacts to potential nesting habitat for Swainson's hawk and other special-status birds, including grasslands, croplands, and marsh. To provide additional clarification, northern harrier will be specifically identified in Impact 4.9-f as a special-status bird. See Chapter 4.0, "Revisions to the DEIS/DEIR," of this FEIR for the text revision.

Mitigation Measure 4.9-f, "Minimize Potential Impacts on Swainson's Hawk and Other Special-Status Birds Foraging and Nesting Habitat, Monitor Active Nests during Construction, Develop and Implement a Management Plan in Consultation with DFG, Obtain Incidental Take Authorization, and Implement Mitigation Measure 4.8-a, [Minimize Effects on Woodland Habitat, Complete Detailed Design of Woodland Creation and Management Agreements to Ensure Compensation for Loss of Quantity and Quality of Habitat, Implement all Agreements, and Comply with the DFG Section 1602 Permit Process]," provides measures that cover surveys and avoidance for all nesting special-status birds, including the northern harrier. Focused transect surveys will be used to survey for northern harrier nests. If an occupied nest is found, this measure requires developing an appropriate buffer that minimizes potential disturbance of the nest to be determined by the biologist and in coordination with DFG.