105th Congress, 1st Session – – – – – – – – – – – – House Document 105–145

NORCO BLUFFS, RIVERSIDE COUNTY, CALIFORNIA

COMMUNICATION

FROM

THE ACTING ASSISTANT SECRETARY (CIVIL WORKS), THE DEPARTMENT OF THE ARMY

TRANSMITTING

A REPORT ON THE PROJECT FOR RIVER BANK EROSION CONTROL AND BLUFF STABILIZATION AT NORCO BLUFFS, RIVERSIDE COUNTY, CALIFORNIA, PURSUANT TO SECTION 101(b)(4) OF THE WATER RESOURCES DEVELOPMENT ACT OF 1996

OCTOBER 6, 1997.—Referred to the Committee on Transportation and Infrastructure and ordered to be printed

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LETTER OF TRANSMITTAL

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
CIVIL WORKS
108 ARMY PENTAGON
WASHINGTON DC 20310-0108

30 SEP 1997

REPLY TO
ATTENTION OF

Honorable Newt Gingrich
Speaker of the House
of Representatives
Washington, D.C. 20515

Dear Mr. Speaker:

Section 101(b)(4) of the Water Resources Development Act (WRDA) of 1996 authorized a project for river bank erosion control and bluff stabilization at Norco Bluffs, Riverside County, California. The project is described in the enclosed report of the Chief of Engineers dated December 23, 1996, which includes other pertinent reports and comments. The report was prepared in response to Section 116(b) of WRDA 1990.

The views of the State of California, the Department of the Interior and the Federal Emergency Management Agency are set forth in the enclosed communications.

The authorized project provides for erosion control and bank stabilization along a 1-mile reach of the south bank of the Santa Ana River. The project would halt both erosion which occurs at the toe of the bluff, as well as, further retreat of the bluff itself. The bluff would be stabilized by placement of a buttress fill along the river bank up to the top of the bluff. This fill would be stabilized and protected from erosion by a toe protection fill with an 8-foot-thick soil cement face. The soil cement protection would extend about 15 feet below the stream bed. The project would provide about a 100-year level of protection. Mitigation for the loss of habitats of various wildlife which reside in the area would be provided.

Based on October 1995 price levels, the total first cost of the authorized project is estimated at about $7,174,000. Cost sharing would be in accordance with the project specific cost sharing authorized in Section 101(b)(4) of WRDA 1996. The benefit-cost ratio of the authorized project is 1.02.

The authorized project is not the national economic development (NED) plan. The NED plan would protect the south river bank from erosion by providing for a toe protection fill with an 8-foot-thick soil cement face. The soil cement protection would extend about 15 feet below the stream bed. Stabilization of the bank slope is not included in the NED plan. The top of the bluff would continue to erode until a natural bank slope is achieved. The NED plan would provide for about a 25-year level of protection. The NED plan would have a first cost of about $4.0 million, and a benefit-cost ratio of 1.18.

The Norco Bluffs Project would provide for erosion protection and slope stabilization to prevent the loss of mostly private structures and lands. A project of this type is considered a non-Federal responsibility, and the authorized project would be considered a low budget priority.

The Office of Management and Budget advises that there is no objection to the submission of this report to the Congress for information. A copy of its letter is enclosed in the report.

Sincerely,

John Zirschky

John H. Zirschky
Acting Assistant Secretary of the Army
(Civil Works)

Enclosure

COMMENTS OF THE OFFICE OF MANAGEMENT AND BUDGET

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

JUL 24 [illegible]

The Honorable John H. Zirschky
Acting Assistant Secretary of the Army
for Civil Works
Pentagon - Room 2E570
Washington, DC 20310-0108

Dear Dr. Zirschky:

As required by Executive Order 12322, the Office of Management and Budget has completed its review of former Assistant Secretary Lancaster's recommendation for the Norco Bluffs, California, Feasibility Report on proposed bank stabilization.

The recommendation for this project in his letter of February 25, 1997, is consistent with the policies and program of the President. The Office of Management and Budget does not object to submission of this report to Congress.

Sincerely,

Kathleen Peroff
Deputy Associate Director
Energy and Science Division

COMMENTS OF THE STATE OF CALIFORNIA

STATE OF CALIFORNIA—THE RESOURCES AGENCY PETE WILSON, Governor

DEPARTMENT OF WATER RESOURCES
' NINTH STREET, P.O. BOX 942836
AMENTO, CA 94236-0001
) 653-5791

NOV 1 9 1996

Mr. David B. Sanford, Jr., Chief
Policy Review and Analysis Division
U.S. Army Corp of Engineers
ATTN: CEWC-AR (IP)
7701 Telegraph Road
Alexandria, Virginia 22315-3861

Dear Mr. Sanford:

This is in response to your correspondence dated September 24, 1996 regarding the report on Norco Bluffs, Santa Ana River, Riverside County, California. The Department of Water Resources has reviewed the feasibility study, the Final Environmental Impact Statement, and the proposed report of the Chief of Engineers. We concur in the feasibility study's finding that the Locally-Preferred Plan is economically justified and engineeringly and environmentally feasible. It would solve a serious public safety problem in Riverside County.

Although the Chief of Engineers' proposed report, transmitted on September 24, 1996, states that no statutory authority exists for the Corps to construct bluff stabilization projects, Section 101 (b) (4) of the Water Resources Development Act of 1996 (PL 104-303) appears to create statutory authority and authorize construction of the project. We recommend that the final report be modified to recognize statutory authority and be reissued so that the project can advance to the Preconstruction Engineering and Design stage.

If you have any questions, please contact George T. Qualley, Chief of DWR's Division of Flood Management, at (916) 574-2783.

Sincerely,

Stephen J. Kashiwada

for David N. Kennedy
Director

cc: Riverside County Flood Control
and Water Conservation District
1995 Market Street
Riverside, California 92501

COMMENTS OF THE DEPARTMENT OF THE INTERIOR

United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, D.C. 20240

ER 96/636

NOV 27 1996

Mr. Raleigh H. Leef
Acting Chief, Policy Division
Directorate of Civil Works
ATTN: CECW-AR (SA)
7701 Telegraph Road
Alexandria, VA 22315-3861

Dear Mr. Leef:

The Department of the Interior (Department) has reviewed the Chief of Engineers Proposed Report (Report) and the Final Environmental Impact Statement/Environmental Impact Report (FEIS/EIR) for the Norco Bluffs, Santa Ana River, Riverside County, California. The Department does not have any comments to either the Report or the FEIS/EIR.

Thank you for the opportunity to review these materials.

Sincerely,

Willie R. Taylor
Willie R. Taylor, Director
Office of Environmental
Policy and Compliance

cc: District Chief
U.S. Army Corps of Engineers
P.O. Box 2711
Los Angeles, California 90017-3401

COMMENTS OF THE FEDERAL EMERGENCY MANAGEMENT AGENCY

Federal Emergency Management Agency
Region IX
Building 105
Presidio of San Francisco
San Francisco, California 94129

DEC 26 1996

Pat Stevens IV
Major General, U.S. Army
Acting Chief of Engineers
U.S. Army Corps of Engineers
Kingman Building, Room 2D18
7701 Telegraph Road
Alexandria, VA 22315-3861

Reference: Norco Bluffs Feasibility Study
Final Environmental Impact Statement

Dear Major General Stevens:

This letter is in response to the October 25, 1996 transmittal from Mr. Raleigh H. Leef, Acting Chief, Policy Division, Directorate of Civil Works, regarding the subject project.

Our comments address the treatment of Executive Order 11988, Floodplain Management. We have reviewed the final environmental impact statement and have concluded that Executive Order 11988 has been adequately addressed.

As you are aware, federal guidelines prohibit encroachments within the regulatory floodway that would cause any increase in the base floodplain elevation. The Federal Emergency Management Agency (FEMA) continues to be concerned about the effects of any flood control project and the potential for increasing or altering the 100-year floodplain. Should there be the potential for the latter, FEMA should be alerted, because this will have consequences on public and private lands as well as the FEMA flood insurance program.

Thank you for the opportunity to comment on the environmental impact statement. If you have any questions, please contact me directly at (415) 923-7100, or your staff may contact Mr. Sandro Amaglio, Regional Environmental Officer, at (415) 923-7284.

Sincerely,

S Mattingly

Shirley Mattingly
Regional Director

NORCO BLUFFS, RIVERSIDE COUNTY, CALIFORNIA

REPORT OF THE CHIEF OF ENGINEERS, DEPARTMENT OF THE ARMY

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
WASHINGTON, D.C. 20314-1000

REPLY TO
ATTENTION OF:

2 3 DEC 1996

CECW-PE (10-1-7a)

SUBJECT: Norco Bluffs, Santa Ana River, Riverside County, California

THE SECRETARY OF THE ARMY

1. I submit for transmission to Congress my report on the study of bluff stabilization along the Santa Ana River in Norco, California. This report is accompanied by the report of the district and division engineers. These reports are in response to Section 116(b) of the Water Resources Development Act of 1990, Public Law 101-640, which requested a feasibility study of bank stabilization measures for Norco Bluffs.

2. Section 101(b)(4) of the Water Resources Development Act of 1996 (WRDA 1996), Public Law 104-303, authorized construction of a bluff stabilization project for Norco Bluffs subject to completion of a final report of the U.S. Army Corps of Engineers on or before December 31, 1996, and subject to the conditions recommended in that final report. This report constitutes the final report of the Corps of Engineers required by WRDA 1996. The authorizing language for the Norco Bluffs project reflects a cost of $8,600,000, with an estimated Federal Cost of $6,450,000. The authorizing language is based on an earlier estimate for the slope stabilization and toe protection plan and includes the estimated Federal and non-Federal costs associated with that estimate. The cost estimate for this plan has since been refined to reflect a current cost estimate of $7,174,000.

3. The reporting officers identified the slope stabilization and toe protection alternative as the preferred plan. The bluffs would be stabilized by placement of a buttress fill along the 1-mile-long (1,600 meters) reach of the Santa Ana River, at a slope of 1 vertical to 1.5 horizontal leading up to the top of the bluffs. The buttress fill would be protected by a toe

protection fill faced with an 8-foot thickness of soil cement on a slope of 1 vertical to 1 horizontal extending approximately 15 feet below the stream bed.

4. The estimated first cost of the authorized project, based on October 1995 price levels, is estimated at $7,174,000. Mitigation for the loss of nesting habitat for migratory birds as a result of implementation of this project would consist of removing about 51.5 acres of giant reed (*Arundo donax*) from a site adjacent to the project and monitoring the site for 8 years to prevent regrowth. Other highlights of the mitigation plan include: brown-headed cowbird trapping; biological resources monitoring (including the Bell's vireo and southwestern willow flycatcher); archeological monitoring during construction; surveying for hazardous materials before construction; and removing any hazardous materials. Mitigation also includes measures to reduce potential sedimentation impacts. Mitigation costs are estimated at $814,000 and are included in the total project costs. Operations, maintenance, replacement, repair, and rehabilitation costs for the project are estimated at $15,000 annually. Based on the report of the district engineer, average annual benefits and costs, based on a Federal discount rate of 7.625 percent and a 50-year period of analysis, are estimated at $601,220 and $591,900, respectively. The resulting benefit-cost ratio is 1.02.

5. The Washington level review indicates that the slope stability and toe protection plan authorized in Section 101(b)(4) of WRDA 1996 is economically justified. The authorized project is not however, the plan which maximizes net national economic development benefits. The costs associated with the slope stability features exceed the benefits for these features of the plan.

6. I generally concur in the findings of the reporting officers that the plan is technically sound, economically justified, and socially and environmentally acceptable.

However, bluff stabilization projects would receive a low budget priority, and it is unlikely that funding for this project will be included in future budget requests.

7. However, in light of the project authorization provided by Section 101(b)(4) of WRDA 1996, should the project receive construction appropriations for Federal implementation, it would be subject to the cost-sharing requirements of Section 101(b)(4) of WRDA 1996 and would be implemented with such modifications as the Chief of Engineers deems advisable. Federal implementation would also be subject to the non-Federal sponsor agreeing to comply with applicable Federal laws and policies, and that it shall be responsible for the following items of local cooperation:

a. Provide 25 percent of total projects costs as further specified below:

(1) Provide all lands, easements, rights-of-way, and suitable borrow and dredged or excavated material disposal areas, and perform or ensure the performance of all relocations determined by the Federal Government to be necessary for the construction, operation, and maintenance of the project;

(2) Provide, or pay to the Federal Government, the cost of all retaining dikes, wasteweirs, bulkheads, and embankments, including all monitoring features and stilling basins, that may be required at any dredged or excavated material disposal areas required for the construction, operation, and maintenance of the project; and

(3) Provide during construction any additional costs as necessary to make its total contribution equal to 25 percent of total project costs;

b. Give the Government a right to enter, at reasonable times and in a reasonable manner, upon land which the local sponsor owns or controls for access to the project for the purpose of inspection, and, if necessary, for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the project;

c. For so long as the project remains authorized, operate, maintain, replace, repair, and rehabilitate (OMRR&R) the project or completed functional portions of the project, including fish and wildlife mitigation features without cost to the Government, in a manner compatible with the authorized project purpose and in accordance with applicable Federal and State laws and specific directions prescribed by the Government;

d. Comply with Section 221 of the Flood Control Act of 1970, Public Law 91-611, as amended, and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended, which provide that the Secretary of the Army shall not commence the construction of any water resources project, or separable element thereof, until the non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element;

e. Hold and save the Government free from all damages arising from the construction, operation, maintenance, repair, replacement, and rehabilitation of the project and any project-related betterments, except for damages due to the fault or negligence of the Government or the Government's contractors;

f. Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project to the extent and in such detail as will properly reflect total project costs;

g. Perform, or cause to be performed, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. 9601-9675, that may exist in, on, or under lands, easements or rights-of-way necessary for the construction, operation, and maintenance of the project; except that the non-Federal sponsor shall not perform such investigations on lands, easements, or rights-of-way that the Government determines to be subject to the navigation servitude without prior specific written direction by the Government;

h. Assume complete financial responsibility for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or rights-of-way that the Government determines necessary for the construction, operation, or maintenance of the project;

I. To the maximum extent practicable, operate, maintain, repair, replace, and rehabilitate the project in a manner that will not cause liability to arise under CERCLA;

j. Prevent future encroachments on project lands, easements, and rights-of-way which might interfere with the proper functioning of the project;

k. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987, Public Law 100-17, and the Uniform Regulations contained in 49 CFR part 24, in acquiring lands, easements, and rights-of-way, and performing relocations for construction, operation, and maintenance of the project, and inform all affected persons of applicable benefits, policies, and procedures in connection with said act;

l. Comply with all applicable Federal and State laws and regulations, including Section 601 of the Civil Rights Act of 1964, Public Law 88-352, and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army;" and

m. Provide 25 percent of the total historic cultural, archeological resources preservation mitigation and data recover costs that are in excess of 1 percent of the total amount authorized to be appropriated for the project.

JOE N. BALLARD
Lieutenant General, U.S. Army
Chief of Engineers

REPORT OF THE DISTRICT ENGINEER

[First Endorsement]

CESPD-ET-P (August 1996) (1105 1st End Converse/tjm/415-977-8163
SUBJECT: Feasibility Report for Norco Bluffs, Riverside County, California

DA, South Pacific Division, Corps of Engineers, 333 Market Street, Room 923
San Francisco, CA 94105-2195 30 August 1996

FOR CDR USACE (CECW-AR), Kingman Building, 7701 Telegraph Road,
Alexandria, VA 22315-3861

I concur in the conclusions and recommendations of the District Commander.

DAVID E. PEIXOTTO
COL, EN
Acting Commander

SYLLABUS

The ***Norco Bluffs Feasibility Study*** is authorized by the Water Resources Development Act of 1990, which directed the Secretary of the Army, under the flood control program of the Corps, to investigate the bank stabilization potential for the Norco Bluffs in Riverside County, California. Based on recommendations from the April, 1993, Norco Bluffs Reconnaissance Study, this Feasibility Study was initiated on a 50/50 cost-shared basis with the **local sponsor, the Riverside County Flood Control and Water Conservation District** (RCFC&WCD).

The purpose of this study is to investigate the feasibility of bluff stabilization along the Santa Ana River in Norco, California through an evaluation of the costs, benefits, environmental impacts, current policies, and budgetary priorities related to solving the bluff erosion problem. The bluffs in the study area are subject to retreat caused by lateral migration of the Santa Ana river and subsequent erosion of the bluff toe. This undercutting of the toe causes destabilization of the bluff face. **The retreat of the bluffs is threatening public and private property as well as utilities located along the top of the bluff.**

The study area is located in Riverside County, California, approximately 64 kilometers (40 miles) southeast of Los Angeles, 13 kilometers (8 miles) upstream and northeast of the Corps of Engineers' Prado Dam, and 16 kilometers (10 miles) southwest of the City of Riverside, in Riverside County, California. The Reconnaissance Study originally investigated alternative solutions for an approximately 6 kilometer (3.75 mile) reach along the Santa Ana River near the northwest boundary of the City of Norco, yet recommended that only Zone 2 be evaluated in this Feasibility Study because the erosion problem was most severe in this area. Zone 2 is **1600 meters (1 mile) in length.** It begins just north of Temescal Avenue and terminates just upstream of the Interstate 15 bridge. The study also recommended that Zone 4 be studied. Zones 1, 3, and 5 are not subject to severe erosion and were therefore not carried forward into the Feasibility Phase.

The without-project condition is based upon erosion eventually destroying homes, roadways, recreation facilities, and public utilities along the bluff. Future costs related to erosion damage also include emergency response, bluff top monitoring, and demolition costs. The expected damages were computed based on when the various structures and facilities within the impacted bluff top area would be affected. **Annual damages due to slope failure are estimated at $601,220.**

The plan formulation process investigated several alternatives plus a No-Action Alternative. The No-Action Alternative represents the condition that would be expected to occur during the project life (50 years) in lieu of project implementation, and it constitutes the basis against which all alternative plans are evaluated. Initially, the alternatives included a range of solutions including toe protection, slope stabilization, channelization, non-structural measures, and construction of groins to deflect flow away from the bluffs. In most cases, these were eliminated during the initial screening due to high costs associated with regional solutions. The two structural alternatives that were carried forward provide (1) toe protection using soil cement slope, and (2) toe protection plus a buttress slope to stabilize the existing bank.

The National Economic Development (NED) Plan is the Soil Cement Toe Protection Alternative (Alternative 2b), optimized to provide a 25-year level of protection. The plan halts erosion at the toe of the bluff that causes oversteepening, destabilization, and subsequent retreat of the bluff top. However, under this alternative, the currently unstable bluff top would continue to slough until it reaches its natural angle of repose, thereby impacting an additional 52 feet along the bluff top prior to retreat being stopped. The NED Plan has average annual economic benefits of $453,560, with annual life-cycle costs of $384,900. The project would produce $68,660 in net NED benefits annually and would have a benefit-cost ratio of 1.18.

The Locally-Preferred Plan (LPP) is the Combination of Slope Stabilization and Toe Protection Alternative (Alternative 5) to provide a 100-year level of protection. This plan would provide the soil cement toe protection structure of the NED Plan, plus a buttress slope that would be constructed for slope stabilization purposes. The LPP is engineeringly and environmentally feasible, and is effective in not only stopping the toe erosion but also halting further retreat of the bluff top. The LPP is economically feasible with average annual economic benefits of $601,220 and annual life-cycle costs of $591,900, yielding $9,320 in net NED benefits annually and a benefit-cost ratio of 1.02.

The Locally-Preferred Plan would be the first choice for selection as a recommended plan because (1) it provides the area with a significant increase in the level of protection compared to the NED Plan, including unquantifiable benefits to public health and safety and (2) a justified NED Plan exists, so that the Locally-Preferred Plan may be considered as an upgraded plan. **However, since both the NED and LPP plans are erosion protection and/or slope stabilization projects, their project purpose is not currently supported by existing Corps statutory authority. They are, therefore, not being recommended for further study at this time.**

A **Final Environmental Impact Statement/Environmental Impact Report (EIS/EIR)** has been prepared in accordance with the requirements of the National Environmental Policy Act (NEPA) of 1969, as amended, and the California Environmental Quality Act (CEQA), amended January, 1995.

I. STUDY AUTHORITY

A. Authority

The Los Angeles District has been directed to perform feasibility level studies of bank stabilization problems at Norco, CA, as authorized by Section 116(b) of the Water Resources Development Act of 1990, as follows:

> "The Secretary shall conduct a feasibility study of bank stabilization measures for Norco Bluffs, California, under the flood control program of the Corps of Engineers."

Feasibility phase funding has been provided by annual Energy and Water Development Appropriations Bills, as follows:

Table 1. Appropriations Bills, by Fiscal Year

Fiscal Year	Public Law
1993	103-065
1994	103-126
1995	103-533
1996	104-293

B. Local Sponsorship

This Feasibility Study has been cost shared on a 50/50 basis with the Riverside County Flood Control and Water Conservation District (RCFC&WCD). The RCFC&WCD would also be the cost sharing local sponsor if bluff stabilization features become an authorized project purpose.

II. STUDY PURPOSE AND SCOPE

The purpose of this study is to investigate the feasibility of bluff stabilization along the Santa Ana River in Norco, California. The bluffs have experienced appreciable retreat due to advancing toe erosion caused by the lateral migration of the river. The retreat of the bluffs is threatening public and private property as well as utilities located along the top of the bluff.

This Feasibility Study completes the planning process of formulating and evaluating the array of alternative plans identified in the reconnaissance study, and selects a plan—if one exists—that maximizes net economic benefits while addressing bluff stabilization and other needs identified and defined throughout the planning process. The results presented in this report were developed in accordance with Federal water resources planning principles, guidelines, procedures, and policies.

The scope of this study is to evaluate potential benefits, impacts, and necessary mitigation requirements associated with bluff stabilization within the Norco Bluffs study area. The study identifies the costs of necessary improvements related to bluff stabilization. The study also makes a determination of the Federal interest and whether potential solutions exist that are in concert with current policies and budgetary priorities.

The study was conducted in coordination with public agencies, organizations, and concerned individuals within the realm of Federal participation as defined by law and current planning regulations. The analysis was accomplished for present (year 1998) and future (year 2048) conditions.

III. PRIOR STUDIES, REPORTS, AND EXISTING WATER PROJECTS

A. Prior Studies and Reports

Prior investigations of protection measures for the Norco Bluffs were first made by the Los Angeles District in the late 1970's under the Section 14 Program. Section 14 of the 1946 Flood Control Act, as amended, provides authority for the Corps of Engineers to develop and construct emergency streambank protection projects to protect endangered public facilities, with a Federal cost limited to $500,000. It was determined that the problem exceeded the cost and scope limitations of this authority.

During the 1980's, studies were conducted under the authority of Section 205 of the Flood Control Act of 1948, as amended, which provides the authority for the Corps to develop and construct flood control projects having a Federal cost limited to $5 million. In 1981, a Section 205 Reconnaissance Report was prepared, and in 1989 a Section 205 Reconnaissance Assessment Report was prepared. Both studies were terminated because the bank stabilization problem did not qualify under the Section 205 flood inundation reduction authority.

Investigation of the erosion problem and possible causes have been made five times over the past 27 years by the consulting geotechnical firm of Leighton and Associates, under contract by the City of Norco. Leighton and Associates' reports on the geological conditions and bluff stabilization problems were published in 1968, 1969, 1971, 1974, and 1980. These reports were generally prepared in response to extensive erosion that had occurred following major storms.

The results of the General Investigations Reconnaissance Study were reported in the "Reconnaissance Report, Norco Bluffs, Riverside County, California," dated April 1993. That study developed a technically and economically feasible plan which would provide toe protection and bank stabilization to the problem area. The Reconnaissance Study also included a District Engineer's recommendation that the Corps proceed into the current cost-shared Feasibility Study.

B. Existing Water Projects and Facilities

After the storms of 1969, the Corps of Engineers constructed 640 meters (2100 feet) of pile, rock, and rubble revetment levee in the study area under authority of the Disaster Relief Act (Public Law 92-288) for emergency storm damage assistance. This levee was only a temporary solution to the problem. By 1974, undercutting of the bluff was occurring behind the revetment, leaving it ineffective and isolated within the channel bed.

The California Department of Transportation (Caltrans) has placed rock slope protection along the river bank for approximately 100 meters upstream and downstream of the Interstate 15 Freeway. Also, in conjunction with construction of the freeway, a substantial buttress fill was placed along the toe of the bluff on the upstream side of the freeway. This fill extends about a third of the way up the bluff face.

Additionally, major flood control improvements that are currently proposed within the drainage basin include components of the Corps' Santa Ana River Mainstem Flood Control Improvement Project. Seven Oaks Dam, currently under construction, would reduce the peak discharges along the project reach by roughly 20%. While this dam would provide sediment storage generated in the Upper Santa Ana Canyon, it would not affect the current sediment budget in the vicinity of the Norco Bluffs. Similarly, while the Prado Dam spillway would be raised approximately 20 feet as a part of the Mainstem Project, the resulting flood storage inundation pool would not affect flood flows within the study area. Based on this, the Mainstem Project is not expected to affect the without-project condition in the vicinity of Norco Bluffs.

IV. PLAN FORMULATION

A. Location and Extent of Study Area

Location of the Study Area

The study area is located along an approximately 1600 meter (1 mile) reach of the Santa Ana River near the northeast limits of the City of Norco, California. Exhibit 1, "Regional Map," shows the location to be approximately 64 kilometers (40 miles) southeast of Los Angeles, 13 kilometers (8 miles) upstream of the Corps of Engineers' Prado Dam, and 16 kilometers (10 miles) southwest of the City of Riverside, in Riverside County, California. The study area is generally bounded on the west by the western extent of Shadow Canyon Circle, and on the east by Pinto Place in the river reach below Grulla Court, as shown by Exhibit 2, "Erosion Zones."

During the Reconnaissance Phase of the Norco Bluffs study, the study area was broken into 5 zones (See Exhibit 2, "Erosion Zones") that total 6 kilometers (3.75 miles) in length. The Reconnaissance Study recommended that only Zone 2 be evaluated in this Feasibility Study because the erosion problem was most severe in this area. Zone 2 is 1600 meters (1 mile) in length and it begins just north of Temescal Avenue and terminates just upstream of the Interstate 15 bridge. The study also recommended that Zone 4 be studied. Zones 1, 3, and 5 are not subject to severe erosion and were therefore not carried forward into the Feasibility Phase.

Drainage Basin Description

The watershed of the Santa Ana River above the Norco Bluffs is approximately 2,250 square kilometers (870 square miles), or about 35 percent of the overall Santa Ana River watershed of 6,400 square kilometers (2,450 square miles), as shown in Exhibit 3, "Norco Bluffs and Santa Ana River Drainage". Fully 62% of the watershed draining to the Norco Bluffs lies within the rugged San Gabriel and San Bernardino Mountains. Runoff from the major drainages of Lytle Creek, Cajon Creek, City Creek, Plunge Creek, and Mill Creek flows out of the mountains to the lower-sloped valleys that are formed by a series of broad alluvial fan surfaces. Tributary flow is then conveyed by improved and unimproved channels to the Santa Ana River. Discharge rates for flood events of various frequencies are discussed in Section D, "Without-Project Conditions-Hydrology."

In general, the mountain ranges within the upper basin are steep and sharply dissected. Maximum elevation within the watershed tributary to the Norco Bluffs area reaches 3,506 meters (11,502 feet) NGVD at Mount San Gorgonio in the San Bernardino Mountains. San Gorgonio's northern flank, along with the southern drainage from Sugarloaf Mountain, generate the headwaters of the Santa Ana River as it flows through the Upper Santa Ana Canyon upstream of the Seven Oaks Damsite. In the San Gabriel Mountains, the maximum elevation reaches 3,072 meters (10,080 feet) NGVD at Mount San Antonio. This peak's eastern flank, along with Telegraph Peak and Wright Mountain, generate the headwaters of Lytle Creek.

Invert slopes within the Santa Ana River average approximately 0.046 in the mountains and approximately 0.0038 just upstream of Prado Dam. The invert slope of the river in the study area averages approximately 0.004. By comparison, the average gradient of the tributaries is approximately 0.133 in the mountains and 0.006 in the valley areas.

Physical Setting

The Norco area is within the Peninsular Range Physiographic Province of Southern California, and is influenced by the tectonics and other features of that province, including Cenozoic block faulting.

The study area includes the Santa Ana River as well as the overbank area to the north and south. Both southern and northern floodplains are heavily vegetated with a willow-cottonwood riparian mix. This system is fed by the year-round flow within the channel, and represents prime least Bell's vireo habitat.

The northern bank of the river is significantly lower in elevation than the southern bank. This serves to limit the water surface elevation during periods of high flow. The bluff slopes along the south bank of the river range in height from 9 to 24 meters (30 to 80 feet), with an average of 18 meters (60 feet). The top of the bluff consists of a relatively flat terrace surface, the edge of which is notched by gullies that continue down the bluff face.

The bluffs consist of mostly Pleistocene non-marine river terrace deposits of clay, silt, sand, and occasional cobbles and boulders. These sediments were deposited by an ancient river occupying the same general area as the current Santa Ana River. The sediments are mostly flat-lying and underlain at depths of 30.5 meters (100 feet) or more by igneous rocks. These igneous rocks, which are mostly granitic, deter undercutting by the river in the occasional locations where outcrops occur.

Studies conducted for the Corps and others indicate that groundwater on top of the bluff is within 5 meters (16.4 feet) of the surface at some locations but may represent perched intervals. The water table plunges downward toward the toe of the slopes and does not affect the caving or sloughing of the bluffs. However, some surface water may percolate downward through the sediments, dissolving some of the cementing materials and thus accelerating sloughing.

Urban Setting

The subject area is fully urbanized and developed according to the Official Zoning Map of the City of Norco, as last amended in February 1993, with approximately 139 dwelling units that exist from Pedley Avenue to the Interstate 15 freeway. Exhibit 4, "Urban Area," displays the study area and its urban setting. Land use is comprised of residential parcels varying in size from 0.63 hectares (1.56 acres) to 0.07 hectares (0.18 acres), with the majority of the parcels being 0.20 hectares (0.5 acres). The property at the toe of the bluffs is owned by the City of Norco. Most of the area along the top of the bluff is owned by private parties, and is either zoned as open space (OS), agricultural--low density (A-1-20), or residential single-family. In addition to homes, the study area includes vacant lots, horse boarding facilities, horse trails, public utility lines, and major public roads including the Interstate 15 freeway. The southern bank area includes farm lands, residences, and some duck pond lagoons.

B. Problems and Opportunities

Problems

The problem affecting Norco Bluffs is retreat of the bluffs indirectly caused by lateral migration of the Santa Ana River during significant storm events. Lateral migration of the river causes erosional undercutting of the toe of the bluffs which leads to destabilization of the bluff face. Exhibit 5, "Chronologic Sequence of Bluff Retreat," diagrams the cyclic nature of the process. The exhibit shows that, as a result of erosional undercutting of the bluff toe by the Santa Ana River, the lower portion of the bluff steepens beyond the angle of repose and develops an unstable, vertical profile. In some areas the slopes are as steep as 80-90 degrees. In an attempt to return to a stable equilibrium slope, the forces of gravity and subsequent rain result in the upper portion of the bluffs sloughing down the slope to form a talus apron at the toe. The process repeats when flood flows wash away the talus and further undercut the bluff toe. Photos 1 through 14 show the steepening effect of erosion on the bluffs.

The problem is extensive, and has affected approximately 60% of an approximately 6 kilometer (3.75 mile) area shown on Exhibit 2, "Erosion Zones." These oversteepened conditions are primarily found north of River Drive between Hamner Avenue and Temescal Avenue (Zone 2, the Feasibility Study area), and northwest of Alhambra Avenue (Zone 4). The remaining area consists of relatively stable, grass-covered slopes that have achieved natural angles ranging from 32 to 43 degrees.

In 1969, flood flows in the Santa Ana River actively undercut more than 75% of the bluff length, with approximately 25% of the bluff length severely affected. Steep banks 3 to 6 meters (10 to 20 feet) in vertical height were produced, and estimates of 15 meters (50 feet) of horizontal retreat were made for several areas (Leighton and Associates, 1969). These areas were along River Drive between Sierra Avenue and Center Avenue, and just north of Alhambra Street for a distance of approximately 365 meters (1200 feet). In one location, the 1969 stormed caused retreat along the bluff of the crown to within 1 meter (3 feet) of the asphalt edge of River Drive. Since that time, long term bluff retreat has accelerated as flood flows repeatedly interrupt the natural process of establishing a stable, equilibrium slope.

Severe damages again occurred in 1980, primarily along River Drive between Sierra and Valley View Avenues, and behind homes along the north side of Alhambra Street. The immediate impact of flood flows in these two areas was rapid removal of the talus deposits at the base of the bluff, followed by undercutting of the bluff toe. Estimates of about 9 to 12 meters (30 to 40 feet) of bluff retreat were made following the storms during the months of January and February, 1980 (Leighton and Associates, 1980).

Presently, towards the upstream portion of the study area, there are homes located as close as 4.6 meters (15 feet) from the edge of the bluff face. Continued destabilization of the bluffs could damage these homes as well as a sewer line, roadway, and public recreation facilities along the bluff.

Damages would not only be from direct sloughing of material under property which lines the bluff, but also due to differential settlement of soil further away from the bank. The large movement of bluff material during the past 20-25 years has likely caused settlement of the surrounding area over time, which in turn has resulted in shifting of the ground under houses within the area. This differential movement occurs well beyond the residences which line the crown of the bluff. In the early 1970's several residents on the opposite side of the bluffs on River Drive near the intersection of Corona and River Drive reported having some foundation cracking. One of the houses experienced a severe crack which extended the entire length of the foundation. While this crack has not yet posed a threat to the house, continued settlement due to the loss of additional bluff material could render the crack severe enough to threaten the integrity of the house.

Further, the unstable conditions of the bluffs currently cause impacts beyond the physical damages to homes, property, and public facilities. Past damages have depressed housing and land values in the areas adjacent to the bluffs. The unpredictable ground shifting, differential settlement, and potential bluff failures represent a real estate liability that reduces property values far below normal market values. The forced closure and realignment of certain streets and the erection of safety barriers have caused an overall reduction in the socio-economic utility of the area.

Future impacts of maintaining an unstable, flood-susceptible bluff that is subject to failure are likely to be even larger than in the past. Conditions affecting property damage are getting worse since the land buffer that previously offered protection has receded or disappeared. Future road closures and realignments are also likely to increase, causing an increase in emergency costs compared to the past. Emergency/maintenance costs will be compounded by the need to relocate utilities, including gas, water, sewer, and telecommunications lines, as they become increasingly exposed to damage. Sanitary sewers are located on the north side of River Drive, and water and gas lines are generally on the south side. Electrical and phone lines are above ground on the south side of the street. Failure of these utility lines could create hazards from electrical shock, explosions, and downstream sewerage contamination.

Environmental damages due to excessive sedimentation may also occur from migration of the channel bed, bank sloughing, and debris flow. Poor water quality and excessive sedimentation from bluff sloughing could produce adverse effects on the extensive vireo habitat that exists below the bluffs. Excessive sedimentation could also affect vegetation and structures downstream. Higher than anticipated sediment transport into Prado Basin could possibly, though it appears unlikely, affect both flood control storage and the critical habitat within the basin.

Most significant is the future threat to public health and safety. In many ways, the potential failure of the bluff crown represents a "flood threat" more disconcerting than usual overbank flooding since it can occur at any time with little or no evacuation warning. Health and safety values are unquantifiable according to the current Federal guidance on economic and social analysis. As unquantifiable damages, their impacts are not reflected in the benefit-cost ratio (B/C) which determines economic justification. However, these issues are important in the planning process. They may provide a basis for choosing one alternative over another, equally justified alternative. Or, they may guide the plan formulation process through identification of study goals and objectives. Finally, significant safety concerns may warrant Congressionally-mandated implementation of a solution.

Opportunities

An opportunity exists for the protection of both public and private property, as well as increased health and safety, through bluff stabilization and erosion protection.

Stabilization of the Norco Bluffs also presents an opportunity to enhance recreational facilities within the study area. The City of Norco is experiencing and will continue to experience a shortage in recreation facilities, specifically picnic tables, playgrounds, and multi-purpose fields. Any consideration to improve the recreation near Norco Bluffs should include either picnic tables, playgrounds, and/or multi-purpose fields. Any recreation plan, however, that is on land that is not specifically part of a structural erosion control project would be entirely a non-Federal implementation responsibility.

C. Planning Objectives and Constraints

Planning Objectives

The Federal objective of water and related land resources project planning is to contribute to the overall National Economic Development (NED). NED contributions include increases in the net value of the national output of goods and services, expressed in monetary units. NED contributions are consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable Executive Orders, other Federal planning requirements.

The general objective of the Feasibility Study Phase is to complete the plan formulation process initiated in the Reconnaissance Study Phase by identifying the most cost-effective means of bluff stabilization in the study area. The most cost-effective means is the plan that maximizes contributions to National Economic Development (the NED plan). Contributions to National Economic Development are the net benefits of a project; these are the total benefits minus the total costs. Notably, the NED plan is the plan that maximizes net benefits rather than maximizes the benefit/cost ratio. The NED objective of this study is to develop a plan that will maximize bluff stabilization benefits in the study area.

In addition to meeting the criterion of economic efficiency, a federal project must comply with the National Environmental Policy Act of 1969 (NEPA).

Planning Constraints

There are two main planning constraints associated with bank stabilization in Norco. First, the Federally-listed endangered bird species of least Bell's vireo exists in the riparian habitat of the Santa Ana River within the study reach. The second constraint was the difficulty in realistically quantifying the erosion rate. This is discussed below under Section D, "Without-Project Condition," within the Hydraulics subsection.

A notable obstacle to the implementation of bluff stabilization measures is the existence of the least Bell's vireo, a Federally endangered species, in the riparian habitat of the Santa Ana River. Any bank or recreation project must include measures to avoid negative impacts to least Bell's vireo.

An overriding planning constraint for all alternatives formulated within the Corps of Engineers is that the without-project condition shall not be worsened, especially as related to flow diversions and quantities of stream discharge. This is important to the present study since any obstruction or encroachment into the floodplain would have to be analyzed for adverse effects on floodplain limits.

D. Without-Project Conditions

The without-project condition is the condition expected to prevail if no action is taken. The without-project existing condition is based on the year 1998. The without-project, future condition for this study takes place in the year 2048. Future conditions would only be affected by 50 years of erosion to the bluffs.

Hydrology

The mean seasonal precipitation in Norco is approximately 284 mm (11 in). Recorded yearly totals range in value from 80 to 700 mm (3 to 28 in) with the bulk of the precipitation occurring in the winter months. The hydrologic characteristics of the soils in the area are representative of soil class "D" as defined by the Soil Conservation Service. "D" soils are typically clayey soils depicted by very slow infiltration rates. When throughly wetted, "D" soils have high swelling potential.

Table 2, "Discharge-Frequency Values on the Santa Ana River in the Vicinity of the Norco Bluffs," indicates the calculated discharge for the present and expected future development conditions. The expected runoff values depend on completion of the Seven Oaks Dam component of the Santa Ana River Mainstem Project. Even though the dam is still under construction, the "Present Conditions" section in Table 2 reflects the existing level of development within the watershed with Seven Oaks Dam in place. The "Future Condition" section also reflects runoff expected with Seven Oaks Dam in place. A more detailed explanation of the area hydrology can be found in Appendix A, "Hydrology Appendix."

Table 2. Discharge Frequency Values for the Santa Ana River in the Vicinity of Norco Bluffs, in meters³/second (feet³/second shown in parentheses)

	100-year	50-year	25-year	10-year
Present Conditions	3,680 (129,960)	2,270 (80,160)	1,270 (44,850)	510 (18,010)
Future Conditions	3,960 (139,850)	2,320 (81,930)	1,330 (46,970)	540 (19,070)

Hydraulics

Previous studies of the Norco Bluffs have established historical annual rates of erosion based on measured bank retreat in various locations and the time between measurements. However, these measurements provide limited usefulness for the present study in determining a single, realistic, historic erosion rate for the entire study reach. The main reason for this is the lack of established and permanent control points from which to reference the measurements. Another reason is that this data does not reflect the efforts by local residents to curtail erosion. Some areas have actually displayed advancement of the bluff slope rather than retreat due to the addition of fill placed by local residents.

The methodology employed herein utilizes a series of aerial photographs of the study area for the years of 1938, 1969, 1974, 1980, and 1987. From these photos, a line delineating the top of the bluff was determined and plotted on a common scale base map using a CADD plotter. From this composite, the distance of bluff movement was correlated with the passage of time to yield an average annual erosion rate.

Specifically, the following steps were taken:

(1) Each photograph, whether singular or in a series, was scaled by measuring distances between two landmarks which remained unchanged through the years, and comparing this to the same known distance on a USGS quadrangle map.

(2) The top of the bluff for each year was identified using standard geographical and aerial photo interpretation methods.

(3) The top of the bluff line was digitally traced using CADD in 1-to-1, scale for each year.

(4) All the bluff lines were overlain with a common scale. The entire study reach was then broken up into thirteen (13) zones of similar geographic and geomorphic characteristics.

(5) To establish set reference points from which measurements between bluff lines could be consistently made, a reference control line was drawn through the plotted bluff lines. Grid lines, perpendicular to this line, were drawn at 100 foot intervals.

(6) The bluff lines corresponding to the beginning and end of each of the time period were identified. The distance between the bluff lines was measured at each grid line, and the average distance, corresponding to retreat or advancement, was calculated for each zone.

The results for the 13 zones were used to consolidate the study area into 5 zones, based on the existence of relatively uniform rates of erosion. The limits of the five zones are shown on Exhibit 2, "Erosion Zones." Further, the analysis identified the historic erosion rates shown in Table 3. The table shows the erosion rates over various time periods for all zones included in the Reconnaissance Study. ***It is important to note that these erosion rates are to be used for the purpose of economic analysis, and should not be used for zoning or floodplain management purposes.***

Table 3. Historic Erosion Rates

Years	Zones (Erosion Rates in Meters)				
	1	2	3	4	5
1938-1969	0.6	1.4	9.9	7.1	7.5
1969-1974	8.2	2.1	6.3	21.2	11.4
1974-1980	5.9	3.2	12.6	40.4	18.1
1980-1987	3	8.5	5.2	21.4	1.5
1988-1995	---*	1.1	---	---	---

*Unavailable at this time

Originally, it was anticipated that a correlation could be made between erosion rates and flood frequencies. The objective was to develop a frequency vs. erosion rate relationship by comparing the frequencies of various flood events that have undercut the bluffs with the amount of bank retreat that has occurred during each event. This relationship would have resulted in a frequency-bluff loss function that could be used to determine expected damages (bluff retreat) for various magnitudes of flood events.

To accomplish this correlation, the non-damaging event was first determined. This is the maximum event that would not cause significant erosion of the bluff. A discharge within the Santa Ana River of approximately 198 m^3/s (7000 cfs), corresponding to the 4-year event, was identified as the non-damaging event. This value was established by judgement based on information provided to the City of Norco by local residents, and by observations made by personnel of the Riverside County Flood Control and Water Conservation District. Next, historical floods were matched with their appropriate frequencies for those time periods with available aerial photography. It was anticipated that the flood frequencies would correlate with the bluff retreat distances in a predictable manner when plotted together.

Unfortunately, the data indicate that the amount of bluff erosion is totally unrelated to flood frequency. The amount of bluff retreat ranges from minor to substantial in a discontinuous manner. It is apparent that erosion of the bluff is a function of numerous interdependent and largely unpredictable factors. These factors are discussed below.

(1) A key factor concerns the existing slope of the bluff. Locations where the bluff slope is relatively mild and therefore stable can withstand substantial amounts of erosion at the toe from relatively large events without retreat of the top of the bluff. Conversely, locations where the bluff slope is steep and therefore unstable can suffer significant retreat of the top of the bluff from relatively minor flows. Unfortunately, the slope of the bluff at the beginning of each of the periods of time for which aerial photographs are available could not be determined because of difficulty in identifying the location of the bluff toe on the photographs. Thus, only the top of the bluff was plotted and measured, and a key factor contributing to the rate of bluff erosion could not be accounted for.

(2) Another key factor concerns the location and magnitude of the erosive forces. River flows tend to meander in a largely unpredictable fashion. The location of flows attacking the toe of the bluff can change between flood events and even within a single flood. In addition, the magnitude of the erosive forces is directly related to the local depth and velocity of flow, which are difficult to predict in alluvial rivers with movable channel boundaries.

(3) Human intervention also influences the retreat rate of the bluffs. Upstream of the Interstate 15 freeway, a considerable amount of refuse and rubble has been dumped in existing gullies and along the base of the bluff in an attempt to halt further erosion. Downstream of the freeway, the bluffs were modified in conjunction with the residential development that took place following 1976. The effect of these actions is to modify the rate of erosion, even if only temporarily.

These primary reasons for not being able to correlate flood frequency with the rate of bluff retreat necessitated the use of a different procedure in order to estimate future bluff retreat. It was assumed that the average rate of future retreat would be the same as the average rate of historic retreat. Then, individual erosion amounts were totaled and divided by the appropriate time span. (Bluff advancement was treated as a negative retreat.) The average annual rates were multiplied by the project life of 50 years to determine the total amount of bluff retreat that would occur for without-project conditions. The total amount was then adjusted to account for factors that would either increase or decrease the maximum amount of erosion. The adjustment factors included unerodable areas, existing slope stability, and the width of the meander zone of the river.

The results of the average amounts of future, without-project bluff retreat over the length of each zone are shown in Table 4, "Without-Project Bluff Retreat," below. It should be emphasized that, although average annual erosion rates were used in the analysis, any single major flood could result in significant erosion. Actual property loss could occur earlier (or later) than the projected average annual rate.

Table 4. Without-Project Bluff Retreat

Location	Average Annual Rate	
	m/yr	ft/yr
Zone 1	0.58	1.9
Zone 2	1.22	4.0
Zone 3	0.06	0.2
Zone 4	3.05	10.0
Zone 5	0.27	0.9

The without-project hydraulic condition also considers the floodplain limits within the Santa Ana River in the vicinity of the bluffs. Project features must not increase the water surface elevations within the river by significantly encroaching into the floodplain. The hydraulic criterion for maintaining the without-project condition floodplain is to limit encroachment to between 60 to 90 meters (200 to 300 feet) into the river, measured from the top of the bluff.

Geotechnical

Groundwater is locally as shallow as 10.7 meters (35 feet) below the bluff top. However this may be a perched water table. As the potentiometric surface reaches the edge of the bluffs, it is somewhat deeper at that point and doesn't affect the sloughing of the bluff. However, surface water may percolate down into the sediments and dissolve some of the cementing materials in the soil, thereby helping the progress of the sloughing at the bluffs. At the toe of the bluff the groundwater level is between 0 and 1.5 meters (0 and 5 feet) below the streambed.

The study area is prone to severe seismic shaking that would be generated by a number of faults in Southern California. Locally, the site is influenced by the Chino Hills Fault located approximately 9.7 kilometers (6 miles) southwest of the study area and is considered capable of generating an earthquake with a magnitude of 6.5 on the Richter scale. The Whittier fault zone which is located approximately 14.5 kilometers (9 miles) from the study area, the Elsinore fault zone which is located approximately 12.9 kilometers (8 miles) from the study area, and the San Andreas fault zone located 27.4 kilometers (17 miles) from the study area are all capable of creating earthquakes of magnitude 7.0 or greater on the Richter scale. No major faults lie beneath the bluffs. Seismic episodes have not caused bluff erosion along the study area, but the potential exists for a major seismic event to trigger increased sloughing of undermined portions of the bluffs.

Economics

As previously discussed, the annual erosion rate for the study reach is 1.2 meters (4 feet). Again it should be noted that average annual rates were used, and any single future major storm could result in substantial erosion. Actual property loss could occur earlier (or later) than this average rate. At this rate, the first structure will be lost in 5 years (the year 2000). If annual erosion continues at 1.2 meters (4 feet), the bluff will retreat a total of 61 meters (200 feet) in the next 50 years.

The without-project economic analysis was conducted based on (1) the expected value of damage to the number of homes and parcels that would be lost along the bluffs, and (2) additional costs incurred due to monitoring and restoration costs, plus costs due to the loss of River Drive, emergency operations, and future, without-project condemnation costs.

Evaluation of Real Estate Costs

There are 56 structures potentially affected by the erosion process in Zone 2 during the 50-year planning horizon. In addition to these structures, two vacant lots are subject to erosion losses. Structure condemnation is assumed to occur when either emergency access is precluded or the structure is within the bluff's angle of repose. Land value loss occurs when the remaining parcel is no longer sufficient in size to support the activity to which it is zoned. Table 5, "Without-Project Structure Loss," shows the distributions of structures according to the time it would take for their effective loss.

Table 5. Without-Project Structure Loss

Years	Number of Structures
0-4	0
5-10	31
11-20	6
21-30	3
31-40	7
41-50	9
TOTAL	56

In order to assess the property value—and, therefore, the value of damages due to property loss—comparable real estate sales and open listings for the general study area were obtained within the last year through DAMAR Real Estate Services. Sales during the past year have not been extensive (less than ten) and some professional judgement had to be made in interpreting the data. The construction value of residential structures based on sales, size, condition, and square footage costs from Marshall & Swift is approximately $70.00 per square foot. With the average house being approximately 1,600 square feet, depreciated replacement cost equals $112,000. Using this cost and the sales listings it was determined that residential lots have a value of $56,000 (approximate difference between sales price and construction value).

The expected damages from property loss were transformed to net present values (NPV) by considering the time-to-loss shown in Table 5, "Without-Project Structure Loss," above. The total property value affected by erosion in Zone 2 is $9,408,000 ($6,272,000 in structures). The NPV of the expected future damage stream is $5,404,500. Amortizing this value over 50 years results in expected average annual damages of $422,820.

Evaluation of Additional Costs

Other without-project costs include (1) monitoring, safety, and restoration costs incurred by the City and County, (2) the loss of River Drive, including utilities, and (3) relocation and demolition expenses.

(1) The 1989 economic reconnaissance assessment report for Norco Bluffs estimated that over the past decade, the City and County had expended approximately $1 million

on monitoring erosion, installing and maintaining safety fences, and attempting to restore portions of the bluff. These expenditures were reevaluated for the 1993 Reconnaissance Report and found to be substantially correct. These costs represent an equivalent annual loss of $100,000 per year.

(2) Continued erosion of the bluff will eventually destroy River Drive and its underground utilities. In the without-project condition, it is estimated that the loss of the road would occur in 9 years (2004). The City of Norco estimates the replacement cost of River Drive and utilities at $1,013,000, representing an equivalent annual loss of $51,000.

In addition to the actual road and utilities, erosion would also cause the loss of the land on which the road lies and the area between the road and the bluff's edge. Using the current cost of vacant land in the area of $2.05 per square foot, the expected net present value of the stream of public land losses is $128,000, representing an equivalent annual loss of $10,000.

(3) If erosion continues, homes will eventually be deemed uninhabitable due to safety reasons, and homeowners will be forced to move and thereby incur moving expenses. In addition to moving expenses, the vacated homes would have to be demolished to preclude them from unsafely falling into the river below. The cost for both moving and demolition is estimated at $11,000 per structure. Discounting to a present day value, the total relocation and demolition cost is estimated at $223,000, representing an equivalent annual cost of $17,400.

A summary of these values is presented in Table 6, "Without-Project Economics, Zone 2." The amortized values represent a 50-year period of analysis at 7⅝%, expressed in October 1995 price levels.

Table 6. Without-Project Economics, Zone 2

Category	Net Present Value	Annual Value
Expected Damages to Structures and Land	5,404,500	422,820
Monitoring, Safety, and Restoration Costs	n/a	100,000
Road Loss Costs	1,141,000	61,000
Relocation and Demolition Costs	223,000	17,400
Total Annual Without-Project Costs		601,220

Environmental

A summary of the without-project environmental conditions of the study area and surroundings are discussed below. A detailed assessment may be found in the Environmental Impact Statement/Environmental Impact Report (EIS/EIR) following this Main Report.

Surface Water Quality

Water quality in the Norco Bluffs area is affected primarily by inflows from mountain runoff, the Santa Ana River, Bear Creek, effluent released from two wastewater treatment plants, localized storm runoff, State Water Project discharges, and miscellaneous nonpoint discharges. During most dry years, the streamflow from the perennial mountain streams is diverted for groundwater recharge upstream of the study area; Santa Ana River flows that reach Prado Basin consist primarily of treatment plant discharge. Concentrations of total dissolved solids (TDS) in the Santa Ana River vary according to the origin of the flow. Stormflows usually have TDS levels near 200 milligrams per liter (mg/l), while summer flows having higher concentrations of effluent and localized agricultural runoff have TDS concentrations near 1,000 mg/l.

Biological Resources

The following paragraphs discuss the biological resources within both the immediate study area and within the region, including the Prado Basin. In addition, Table 7, "Special Status Species That Occur or May Occur in the Study Area," following this subsection, lists plant and wildlife species of special concern.

Vegetation - The floodplain of the Santa Ana River is approximately 1 kilometer (0.6 mile) wide in the study area and is dominated by lush cottonwood-willow riparian vegetation interspersed with small to very extensive areas of invasive *Arundo* scrub. The study area is characterized by the following eight plant communities: cottonwood-willow riparian forest, cottonwood-willow riparian forest with a significant *Arundo* scrub component, *Arundo* scrub, sand bar and sandy wash, marsh, arrow weed scrub, ornamental/ruderal vegetation, and open water.

Cottonwood-willow riparian forest, which is characterized by a multilayered canopy, exists in large patches throughout the Santa Ana River floodplain in the study area. The cottonwood-willow riparian forest with significant *Arundo* scrub component is found primarily near Interstate 15 in the western portion and in a smaller patch near Pedley Avenue in the eastern portion of the site. *Arundo* constitutes 70% of the relative vegetative cover in this community type in the study area.

As a plant community in itself, *Arundo* scrub is an invasive species that is increasingly displacing native riparian vegetation in the Santa Ana River floodplain. Large expanses of the floodplain within the study area are occupied by *Arundo* scrub.

Sand bars and sandy washes are deposited on the low floodplain along the banks of the Santa Ana River, and sandy washes are lower flow conveyance areas within the wide riparian zone. Because of periodic scouring from flood events, most sand bars and sandy washes are unvegetated. However, *Arundo* is rapidly becoming established on the sand bars throughout the active floodplain of the Santa Ana River.

A marsh of approximately 0.4 ha (1 acre) was identified at the base of the bluffs just east of Corona Avenue. The marsh community is dominated by persistent herbaceous plants, and ponds water for a long duration during the growing season.

Arrow weed scrub is a native riparian plant community that is found in the outer floodplain just east of Pedley Avenue. It is characterized by a relatively monotypic stand of arrow weed *(Pluchea sericea)*.

Ornamental and ruderal vegetation is typically composed of non-native species that are present in an almost contiguous linear stretch along the bluff tops and slopes of the southern boundary of the study area. Ornamental trees consist of planted species, such as eucalyptus, and escaped exotics, such as tree-of-heaven. Ruderal vegetation is dominated by herbaceous species that are able to persist with occasional disturbances.

The low-flow channel of the Santa Ana River below the riparian areas supports unvegetated open water habitat and is inundated on a year-round basis.

The potential occurrence of two sensitive plant species in the Prado Basin has been noted by the US Fish and Wildlife Service (USFWS). These are the Santa Ana River woollystar (*Eriastrum densifolium* spp. *sanctorum*), federally-listed as endangered, and the many-stemmed dudleya

(*Dudleya multicaulis*), listed as sensitive. However, the USFWS has never found specimens of the Santa Ana River woolly star nor suitable habitat within the Prado Basin. The many-stemmed dudleya was located at two sites, the nearest being approximately 3 kilometers (2.5 miles) downstream of the study area. Although no dudleya were found during the 1995 surveys of the study area, the bluff slopes have not been surveyed adequately to determine whether or not the species is in fact present.

Fish - Eleven species of fish, eight of which are introduced, have been documented in the Prado Basin. The three native species of fish, the Santa Ana sucker, speckled dace (*Rhinichthys osculus*), and arroyo chub, are known to be present in the Hidden Valley Wildlife Area approximately 4 kilometers (3 miles) upstream of the study area. Due to their presence upstream and downstream, as well as the presence of appropriate habitat in the study area, there is the potential for all fish species to be in the floodplain waterways and ephemeral pools of the study area.

Amphibians - Seven amphibian species have been confirmed by USFWS as being present in the Prado Basin and, therefore, it is possible and likely they would be found in the study area.

Reptiles - Several species of reptiles have been documented in the Prado Basin. Important species are the southwestern pond turtle (*Clemmys marmorata pallida*), a Category 1 candidate species for federal listing, the coastal western whiptail (*Cnemidophorus tigris multiscutatus*) and the San Diego horned lizard (*Phrynosoma coronatum blainvillei*), both regarded as sensitive species.

In addition to the San Diego horned lizard and the coastal western whiptail, four sensitive species are known to be found at the Hidden Valley Wildlife Area. These are the orange-throated whiptail (*Cnemidophorus hyperythrus beldingi*), banded gecko (*Coleonyx variegatus abbotti*), San Bernardino ringneck snake, and patch-nosed snake. Any of the species could be present in the study area.

Four sensitive species of reptiles have not been documented to date but could be present in the study area. These are the San Bernardino ringneck snake (*Diadophis punctatus modestus*), two-striped garter snake (*Thamnophis hammondi*), coastal rosy boa (*Lichanura trivirgata rosafusca*), and coast patch-nosed snake (*Salvadora hexalepis virgultea*).

Birds - A total of 208 species of birds have been recorded at the Prado Basin. At least 93 of these are breeding species. Six species federally- or state-listed as endangered or threatened, and four other species regarded as sensitive are found or may be found in the Prado Basin. Additionally, another 25 sensitive species are found or may be found. Of particular interest are the least Bell's vireo (*Vireo bellii pusillus*) and the Southwestern willow flycatcher (*Empidonax trailii extimus*), two riparian species federally-listed as endangered. The study area lies within the boundaries of "critical habitat" as defined by the federal Endangered Species Act of 1973, as amended, for the least Bell's vireo. This "critical habitat" is a portion of approximately 18,000 ha (38,000 acres) at 10 localities in six southern California counties.

The most common breeding species listed in their order of abundance in willow riparian habitats, include song sparrow (*Melospiza melodia*), rufous-sided towhee (*Pipilo erythrophthalmus*), common yellowthroat (*Geothlypis trichas*), house wren (*Troglodytes aedon*), and brown-headed cowbird (*Molothrus ater*).

In the Hidden Valley Wildlife Area, wood ducks (*Aix sponsa*) have been noted as a nesting species. This is particularly significant because few wood ducks nest in southern California. Rough-winged swallows (*Stelgidopteryx serripennis*) were observed using the vertical bluff slopes.

Terrestrial Mammals - Four species of mammals regarded as sensitive are present or could be present in the Prado Basin. The San Diego black-tailed jackrabbit (*Lepus californicus bennettii*) is present. The decline of the jackrabbit and the other candidate forms is believed to result primarily from the loss and fragmentation of habitat. The existence of habitat in the study area for the San Diego desert woodrat (*Neotoma lepida intermedia*), Los Angeles little pocket mouse (*Perognathus longimembris brevianus*), and grasshopper mouse (*Onychomys torridus*) is likely.

Bats - Two of the species of bats that potentially visit the Prado Basin are considered sensitive: the California leaf-nosed bat (*Macrotis californicus*) and the greater western mastiff bat (*Eumops perotis californicus*). Both bats are insectivorous. The greater western mastiff bat feeds extensively on Hymenoptera (e.g., bees and wasps). The greater western mastiff bat has a large range when foraging and does not roost as much as other species of bats. Both species have suffered a decline in numbers as a result of human disturbance.

Nine species of bats are reported to be present at the Hidden Valley Wildlife Area. Six are in the genus *Myotis*. The others are the red bat (*Lasiurus borealis*), hoary bat (*L. cinereum*), and guano bat (*Tadarida brasiliensis*).

Table 7. Special Status Species That Occur or May Occur in the Study Area

Documented Occurrences [a]	Common Name	Scientific Name	Legal Status [b]
Plants			
^	many-stemmed dudleya	*(Dudleya multicaulis)*	S
Fish			
+^	Santa Ana sucker	*(Catostomus santaanae)*	S
+	speckled dace	*(Rhinichthys osculus)*	S
+	arroyo chub	*(Gila orcutti)*	S
Amphibians			
^	red-legged frog	*(Rana aurora draytonii)*	PE
	arroyo southwestern toad	*(Bufo microscaphus californicus)*	FE
+	western spadefoot toad	*(Scaphiopus hammondii)*	S
Reptiles			
^	southwestern pond turtle	*(Clemmys marmorata pallida)*	C1
+	banded gecko	*(Coleonyx variegatus abbotti)*	S
+^	San Diego horned lizard	*(Phrynosoma coronatum blainvillei)*	S
+^	coastal western whiptail	*(Cnemidophorus tigris multiscutatus)*	S
+	orange-throated whiptail	*(Cnemidophorus hyperythrus beldingi)*	S
+	San Bernardino ringneck snake	*(Diadophis punctatus modestus)*	S
	two-striped garter snake	*(Thamnophis hammondii)*	S
	coastal rosy boa	*(Lichanura trivirgata rosafusca)*	S
+	coast patch-nosed snake	*(Salvadora hexalepis virgultea)*	S
Birds			
+^	white-faced ibis	*(Pelgadis chihi)*	S
+^	Swainson's hawk	*(Buteo swainsonii)*	ST
+^	ferruginous hawk	*(Buteo regalis)*	S
^	bald eagle	*(Haliaeetus leucocephalus)*	SE, FT
^	peregrine falcon	*(Falco peregrinus)*	SE, FE
^	burrowing owl	*(Athene cunicularia)*	S
^	western yellow-billed cuckoo	*(Coccyzus americanus occidentalis)*	SE
+^	Southwestern willow flycatcher	*(Empidonax trailii extimus)*	FE
+^*	least Bell's vireo	*(Vireo bellii pusillus)*	SE, FE
^	tricolored blackbird	*(Agelaius tricolor)*	S

Table 7. (continued). Special Status Species That Occur or May Occur in the Study Area

Documented Occurrences [a]	Common Name	Scientific Name	Legal Status [b]
Mammals			
+^	San Diego black-tailed jackrabbit	*(Lepus californicus bennettii)*	S
	California leaf-nosed bat	*(Macrotis californicus)*	S
	greater western mastiff bat	*(Eumops perotis californicus)*	S
+	San Diego desert woodrat	*(Neotoma lepida intermedia)*	S
+	Los Angeles little pocket mouse	*(Perognathus longimembris brevianus)*	S
+	southern grasshopper mouse	*(Onychomys torridus)*	S
+	ringtail	*(Bassariscus astutus)*	S

Notes: "Special - status species" listed in this table are species listed as endangered or threatened under the federal or California Endangered Species Acts, species proposed for listing, candidates for listing, and sensitive species.

[a] Occurrence explanations:

- \+ Reported at Hidden Valley Wildlife Area [approximately 4 kilometers (3 miles) upstream of the study area].
- ^ Reported at Prado Basin.
- • Reported at the study area.

[b] Status explanations:

FE = listed as endangered under the federal Endangered Species Act.
PE = proposed for listing as endangered under the federal Endangered Species Act.
SE = listed as endangered under the California Endangered Species Act.
ST = listed as threatened under the California Endangered Species Act.
C1 = Category 1 candidate for federal listing.
S = sensitive taxa for which existing information indicates that federal listing as endangered or threatened may be warranted, but for which sufficient biological information to support a proposed listing is lacking.

Source: USFWS 1995

Cultural Resources

No cultural resources of any significance have been recorded in or near the area of potential effect (APE). In addition, no paleontological sites have been recorded within the study area.

Hazardous, Toxic, and Radioactive Wastes

The potential for hazardous waste contamination within the study area is low due to the absence of industrial uses in the study vicinity. However, there is a remote possibility that unknown sites or discharges exist. Two potential sources of contamination within the study area that have been suggested include the homeowner-placed fill, the composition of which is unknown, and the bed of the Santa Ana River, which is considered an area of possible illegal dumping.

Noise and Air Quality

Future emergency work which will occur during times of flooding and bank failure would result in increased noise and lower air quality during those operations.

Recreation

Regional facilities in the project area include the Hidden Valley Wildlife Area approximately 4 kilometers (3 miles) upstream of the study area and Prado Basin Park downstream of the study area. These two facilities are part of the Santa Ana River Regional Park, which is in the jurisdiction of the County of Riverside. The Hidden Valley Wildlife Area is a passive use area with trails open to equestrians and pedestrians during portions of the year. The Prado Basin Park is a regional facility on the northern bank of the river which also provides primarily passive use areas.

The Norco area is part of the overall Santa Ana River Trail regional system. Although the trail is not continuous through the Norco area, future plans are for continuance of a trail on the north and south sides of the river, west of the Interstate 15 freeway, and an on-street trail on the south side of the river, east of freeway. In addition to the Santa Ana River Trail system, the County of Riverside General Plan includes a regional trail from the western edge of Hidden Valley Wildlife Area south past Ingalls Park and beyond.

In addition to these regional facilities, the City of Norco contains nine park facilities that total approximately 152 hectares (375 acres). These parks include the River Trails Park, Community Center, Parmenter Park, Norco Park System River Trails Park, Neal F. Snipes Park, Ingalls Park, Wayne Makin Park, Clark Field, Ted Brooks Equestrian Stop, and the Kips Korner Park. Within the park system, active park facilities include seven ball fields and tennis courts. Other facilities include a gymnasium, motorbike park, and numerous equestrian facilities. Also, the City of Norco is considering the establishment of an equestrian trail along River Drive, although, no exact placement has been determined.

The majority of the 152 hectares of parks in the City is comprised by the 110 ha (271 acre) River Trails Park, a passive park primarily for equestrian use that is within the river valley below the bluffs. Access points into the trail system are at the terminus of Old Hamner Road, at Pedley Road on the south side of the river, and at Rivertrails Stables on the north side of the river. There are also numerous "informal" equestrian trail heads along the southern side of the river. The areas of extreme bluff erosion, such as those along River Drive, have no trail connection with River Trails Park because of the steepness of the bluffs. The trails through the park are continually changing according to the meandering of the river, the effect of the last floodflow on the vegetation, and the density of the underbrush.

With a tremendous amount of bicycle, hiking and equestrian trails within the City, it is highly unlikely that new trails will ever be required to meet the demand by users. However, there does appear to be a demand for a trail connections to the existing River Trails Park. Although trails within River Trails Park are used by riders, a continuous trail does not exist to connect upstream and downstream reaches of the study area to the regional parks and trails beyond. There is also a need for additional, formalized access points from the bluffs to the streambed trails.

E. Formulation of Alternative Plans

Alternative plans with both erosion protection and slope stabilization components have been formulated in response to the Reconnaissance Study findings. During the reconnaissance phase of the study, the area was divided into 5 zones, as shown on Exhibit 2, "Erosion Zones." The results of the analysis determined that only Zone 2 was economically justified for further study based on considerations of the rate of erosion, potential for future erosion, projected damages due to erosion and bluff sloughing, and costs of implementing alternative solutions. The Reconnaissance Report also recommended that Zone 4 be investigated further due to the severe historical erosion even though it was not economically justified on an incremental basis. Zone 4, however is located in an area that will be addressed by the Santa Ana River Project as part of modifications to Prado Dam, and is therefore is not analyzed in this Feasibility Study.

The following alternatives, shown in Table 8, were initially considered during this Feasibility Study. All alternatives were formulated to provide a 100-year design level of protection. Following elimination of infeasible alternatives, the final array of alternatives will be optimized to determine the most cost-effective design level of protection. Descriptions of the alternatives and reasons why each was either continued into detailed evaluation or eliminated from further study follow the table.

Table 8. Alternative Plans

1	Slope Stabilization Plan Options:	
	1a	Buttress Fill (Imported)
	1b	Buttress Fill (Cut & Fill)
	1c	Hilfiker Retaining Wall
	1d	Crib &/or Earthlock Wall
	1e	Sheet Piling
	1f	Ribs & Wood Shoring
	1g	Shotcrete
	1h	Reinforced Earth
	1i	Concrete Retaining Wall
2	Toe Protection Plan Options:	
	2a	Grouted Rock
	2b	Soil Cement
	2c	Concrete
	2d	Articulated Concrete Block
	2e	Gabions
	2f	Groins
	2g	Semi-Permeable Jetties
	2h	Riprap
3	Non-Structural Plan	
4	No Action Plan	
5	Locally-Preferred Plan (Combination Toe Protection/Slope Stabilization)	
6	Channelization Plan	

Alternative 1: Slope Stabilization Plan

Alternative 1 is broken down into nine design options that provide slope stabilization to the bluffs. This alternative was initially formulated to only provide the component of slope stabilization, and not toe protection. During the evaluation phase, it was determined that this alternative does not provide a long-term solution to the bluff erosion problem without toe protection. Therefore, the intention in identifying and evaluating the options listed below is to find the most feasible slope stabilization method to be combined with a toe protection option from Alternative 2, below.

Option 1a - Buttress Fill (Imported) - This design involves importing fill and compacting the fill against the existing bluff to create a stable 1.5H:1.0V slope. The fill would be obtained locally. Buttress fill would be provided from the upstream location of the Interstate 15 rock abutment and continue upstream for a distance of approximately 1600 meters (5,250 feet). The fill would continue up the bluff face until the 1.5H:1.0V fill slope intersected a flatter portion of the bluff than 1.5H:1.0V; the fill would continue to the top of the bluff if necessary. Exhibit 6, "Alternative 1a: Buttress Fill (Imported)," illustrates this option.

Option 1b - Buttress Fill (Cut and Fill) - This method would be similar to the buttress fill with imported material (Option 1a) except that the earthwork would be balanced onsite to avoid transportation of borrow material from offsite locations. This would be accomplished by cutting the bluff top and using the cut material for fill to create a stable 1.5H:1.0V slope. Exhibit 7, "Alternative 1b: Buttress Fill (Cut & Fill)," illustrates this option.

Option 1c - Hilfiker Retaining Wall - A Hilfiker retaining wall is a reinforced soil embankment in which the soil itself is reinforced to become an integral part of the structure. Welded wire mats are layered with compacted fill to form a gravity retaining structure capable of withstanding the localized problems of instability. This alternative would reduce the amount of fill required compared to Options 1a and 1b since the wall alignment and required backfill may be place closer to the existing bluff face. Exhibit 8, "Alternative 1c: Hilfiker," illustrates this option.

Option 1d - Crib Wall/Earthlock - A crib wall is a gravity retaining wall constructed of multiple interlocking units made of either concrete or plastic (see Exhibit 9, "Alternative 1d: Crib Wall/Earthlock"). The *Earthlock* system utilizes plastic materials. The system derives its strength from interlocking cribs that are each filled with compacted soil to develop mass. The crib walls are placed at a slope of 1H:4V and have a maximum 2H:1V fill slope above them.

Option 1e - Sheet Piling - This alternative was not investigated because it was deemed unlikely that sheet piling would be economical, especially considering the area required for construction and the impacts to existing utilities and street embankments.

Option 1f - Ribs and Wood Shoring - This alternative would not provide a long-term solution, and therefore, it was not investigated.

Option 1g - Shotcrete - Spraying the steep slopes with shotcrete (concrete slurry "shot" from nozzles) would only retard further sloughing of the bluffs and temporarily increase the stability of the bluff; however, it is not considered a long-term slope stability solution. This design alternative was not further investigated.

Option 1h -Reinforced Earth - This alternative would consist of using a mechanically stabilized retaining wall composed of cohesionless soil and metallic reinforcement, as displayed in Exhibit 10, "Alternative 1h: Reinforced Earth". Reinforcing strips and compacted fill together create an earth mass capable of withstanding local slope instability problems. The reinforcing strips would be ribbed galvanized steel placed in the backfill, with concrete facing panels placed vertically for additional resistance.

Option 1i - Concrete Retaining Wall - This alternative uses a standard concrete retaining wall approximately 5.5 meters (20 feet) high, with an associated concrete footing and key (see Exhibit 11, "Alternative 1i: Concrete Retaining Wall"). Excavation limits would start from the inside of the footing at a ¾:1 slope.

Alternative 2: Toe Protection Plan

Alternative 2 is broken down into eight design options that deter further erosion through toe protection. The major differences between these options are in the materials used for erosion protection. Alternative 2 options may be used either as stand-alone toe protection alternatives or in conjunction with the options in Alternative 1 for slope stabilization. All options for toe protection extend approximately 1.6 kilometers (1 mile) in length. In addition, all would require clearing of the streambed for equipment access. The temporary clearing includes 1.0 hectare (2.5 acres) for a staging area near Interstate 15, 1.0 hectare for a 5 meter (16.5 feet) wide access road from Pedley, 1.0 hectare for a 5 meter wide access road from Hamner, and 1.0 hectare for a 5 meter wide access way along the project site. Because the toe of the slopes are subject to drawdown and a earthquake loading conditions, those options that utilize stone and bedding materials would be constructed at a slope of 1V:2H. Soil cement could be placed at a 1V:1H slope.

Option 2a - Grouted Rock - This option consists of constructing an earthen, compacted-fill embankment along the toe of the bluff. The embankment itself would be protected against erosion by utilizing rock revetment approximately 0.45 meters (18 inches) thick and strengthened by concrete grout within the voids. The embankment would be toed-down approximately 4.6 meters (15 feet) deep below the riverbed.

Option 2b - Soil Cement - This option is similar to Option 2a except that the earthen, compacted-fill embankment is protected against erosion by a soil cement face and toe (see Exhibit 12, "Alternative 2b: Soil Cement." Soil cement consists of a mixture of soil, water, and 7-9% cement. The mixture is spread out on 6-inch flat and approximately 2.5 meter (8 feet) wide lifts, with each lift being offset from the previously placed lifts to achieve a step effect. The corners are then shaved to achieve an approximately 1H:1V slope upon the protective face. The embankment would be toed-down approximately 4.5 meters (15 feet) deep below the riverbed.

Option 2c -Concrete - The concrete slab method of toe protection involves the construction of an earthen compacted-fill embankment with a 0.2 meter (8 inch) thick concrete-slab face and toe. The toe for this option would also extend approximately 4.6 meters (15 feet) deep below the riverbed. In a manner similar to soil cement, the hardened concrete surface would protect the compacted fill from erosion due to flow impingement.

Option 2d - Articulated Concrete Block - Articulated concrete block is a revetment system that consists of a matrix of individual blocks assembled to form a mattress overlay, with the blocks held together with steel cable. The result is a flexible and porous erosion-protection system that is able to accommodate minor subgrade drainage and allows the release of hydrostatic pressure. The revetment would be placed on an earthen compacted-fill embankment.

Option 2e - Gabions - A gabion is a basket or cage filled with rocks that is used in building support or abutment. The baskets are usually rectangular, galvanized steel wire mesh divided into cells.

Option 2f - Groins - This alternative consists of construction of compacted fill and rock defector groins. The groins would be constructed to divert flows away from the toe of the bluffs and prevent meandering of the river toward the bluffs. A cross-section of the groins is shown in Exhibit 13, "Alternative 2f, Groins." The groins would be approximately 50 meters (150 feet) long and would be spaced approximately 100 meters (300 feet) apart. A total of 22 groins would be required in the study area. The rock revetment over the compacted fill would be approximately 0.3 meters (12 inches) thick and extend 7 meters (23 feet) above the existing streambed and 1.5 meters (5 feet) below the streambed. At the bluff toe, there would be a 0.3 meter layer of riprap extending 7 meters (23 feet) above the streambed at a slope of 2:1.

Option 2g - Semi-Permeable Jetties - Semi-permeable jetties are river-training structures placed along the meandering stream in order to control the course of flow. Because of the likelihood of higher cost and lower effectiveness in reducing erosion compared to the armored, compacted fill embankment alternatives, this alternative was not investigated further.

Option 2h - Riprap - This alternative would use riprap along the bluff slope to provide erosion protection. The riprap would either be placed entirely above the streambed, or would be placed using an excavated toe-down section. The first method would require more riprap above ground to allow the rock to "self-heal," or replace the riverbed material as scouring takes place beneath the rock.

Alternative 3: Non-Structural Plan

Formulation of a nonstructural damage reduction alternative is mandated by Section 73 of the 1974 Water Resources Development Act. For the Norco Bluffs study area, however, damages do not occur in the floodplain nor do they necessarily occur during flooding conditions. Therefore, typical nonstructural solutions such as floodproofing, flood warning and evacuation, floodplain zoning regulations, and elevation of structures, would not apply. In addition, other non-structural solutions such as modifications in public policy, management practice, regulatory policy and pricing policy, do not appear to have application to the Norco Bluffs situation. There would be limited, if any, environmental benefits from this plan.

The nonstructural plan that was formulated consists of relocating the structures that are potentially subject to damage by future bluff failure. This includes the homes within an average width of 30-60 meters (100-200 feet) from the bluff, represented by the first row of homes along River Drive. Utilities on both sides of the street would also have to be relocated. The resulting vacant land could be used for recreational purposes.

Alternative 4: No Action Plan

Under this alternative, flood-related toe undercutting and bank failure would continue during the foreseeable future, eventually causing large scale destruction of the bluff, homes, roads, and utilities in the area.

Alternative 5: Combination Toe Protection and Bank Stabilization - Locally-Preferred Plan (LPP)

The Locally-Preferred Plan is a combination of both toe protection (Alternative 2) and bank protection (Alternative 1). Exhibit 14, "Alternative 5 (Combined 1a & 2b): Locally-Preferred Plan," illustrates the plan's cross-section.

Alternative 6: Channelization Plan

This alternative consists of complete channelization as well as realignment of the channel by dredging. Implementation of this alternative would require a regional solution beyond the scope of the bank stabilization problem because of the need to consider upstream and downstream conditions such as bed slope, scour characteristics, and sediment transport capacities. Channelization would also incur tremendous environmental impacts to the riparian channel habitat. Channel dredging and realignment alone is not a permanent solution and would be difficult to maintain due to the natural fluvial and morphological forces that change the streambed. For this reason, this alternative was eliminated from further consideration during the Reconnaissance Phase.

F. Evaluation of Alternative Plans

The alternatives described above were evaluated on how well they meet the following criteria:

(1) technical feasibility
(2) demonstration of federal interest based on economic and environmental criteria,
(3) support of the non-federal sponsor, and
(4) consistency with current policies and budgetary priorities.

Engineering, economic, environmental, and real estate analyses were performed in order to identify the most feasible solution to the erosion problem. The following sections summarize information from the technical appendices that are part of this Feasibility Report (the appendices are printed under separate cover).

Alternatives Carried Forward

The alternatives in **bold** in Table 9, "Evaluation Status of Alternatives," were carried forward for detailed evaluation. Reasons why alternatives are not considered feasible for detailed evaluation are also shown in the table. Alternatives that are not shown in the table below (1g, "shotcrete," and 2g, "semi-permeable jetties") were not investigated for reasons indicated in the previous section. Estimated costs shown represent late Reconnaissance and/or early Feasibility phase costs for 100-year design level of protection. These costs were used for the purposes of screening the alternatives for further evaluation.

Table 9. Evaluation Status of Alternatives

	Alternative	Evaluation Status
1	SLOPE STABILIZATION	
1a	**Buttress Fill (Imported)** [1] **Estimated cost: $4,164,500**	**Further evaluation as slope stabilization option to be combined with toe protection, as Alternative 5, below.**
1b	Buttress Fill (Cut & Fill) Estimated cost: $7,322,800	Considered infeasible because it would result in further cutting back of the top of the bluffs, resulting in potential damage to utilities and the roadways in some locations.
1c	Hilfiker Retaining Wall Estimated cost: $7,589,100	Considered economically infeasible because its costs were nearly twice those of the proposed the buttress fill.
1d	Crib &/or Earthlock Wall Estimated cost: $9,491,800	Considered economically infeasible because its costs were much higher than those of the buttress fill options.
1e	Sheet Piling Estimated cost: $12,417,800	Considered economically infeasible because its costs were much higher than those of the buttress fill options.

Alternative		Evaluation Status
1f	Ribs and Wood Shoring Estimated cost: $10,001,300	Considered economically infeasible because its costs were much higher than those of the buttress fill options, plus not considered a long-term solution.
1h	Reinforced Earth Estimated cost: $8,763,200	Considered economically infeasible because it was more costly than other methods of slope stabilization.
1i	Concrete Retaining Wall Estimated cost: $7,749,500	Considered economically infeasible because it would be more costly than the buttress fill alternatives.
2	TOE PROTECTION	
2a	Grouted Rock Estimated cost: $7,053,600	Considered economically infeasible because it would be approximately 40% more expensive than using soil cement due to the long distance that rock would have to be transported.
2b	**Soil Cement** **Estimated cost: $4,987,100**	**Feasible for further evaluation**
2c	Concrete Estimated cost: $6,361,700	Considered technically infeasible because the concrete slab could be prone to being undermined/stripped off during major flood events.
2d	Articulated Concrete Block Estimated cost: $9,665,800	Considered economically infeasible. Additionally, its reliability for use as erosion protection in extremely large, supercritical flow regimes has not been determined.
2e	Gabions Estimated cost: $8,365,200	Considered technically infeasible because gabions within the Santa Ana River would be prone to failure in heavy floods due to the extremely high tractive forces that exist. They would also have a shorter life span than other methods analyzed in this study primarily due to the potential for corrosion of the wire mesh.
2f	Groins Estimated cost: $6,174,000	Considered technically and environmentally infeasible. Groins alone would likely not offer sufficient erosion protection to the bluff toes. Additional toe protection similar to that of other options would be required. Additionally, the habitat loss associated with this alternative would be approximately twice that associated with other methods of armored soil embankments.
2h	Riprap Estimated cost: $9,177,700	Considered technically and economically infeasible because sloughing bluff would essentially cover up the rock protection over time, after which the resulting talus apron would still be potentially eroded.
3	Non-Structural Plan Estimated cost: $8,932,100	Dropped during the Reconnaissance Phase due to its low B/C ratio and negative responses from both the local residents and local sponsor. Further, the alternative would not actually stop or curtail bluff erosion; additional land or bluff erosion measures would eventually be required.
4	**No Action Plan**	**Feasible for further evaluation**
5	**Locally-Preferred Plan (Combination Toe Protection/Slope Stabilization)** **Estimated Cost: $7,173,900**	**Combining the options from Alternatives 1 and 2 that are feasible (Options 1a and 2b), this alternative was considered feasible for further evaluation.**

[1] Alternative concept revised from Reconnaissance study where Alternative 1a was buttress fill (imported) with grouted rock revetment. Currently displayed cost is for buttress fill (imported) without revetment.

The final array of alternatives, therefore, consists of the following:

- Alternative 2b - Soil Cement Toe Protection Alternative
- Alternative 4 - No Action Plan
- Alternative 5 - Combination of Slope Stabilization (1a) and Toe Protection (2b) Alternative

With-Project Impact Evaluation

This addresses the impacts associated with the alternatives. Significant impacts, as determined within the EIS/EIR based on impact thresholds selected for each resource type, would receive the appropriate level of mitigation.

Hydrology, Hydraulic, and Water Quality Impacts

No adverse impacts would take place to the region's hydrology from either of the structural alternatives. Potential hydraulic impacts to riverbed erosion could occur due to excavation for fill material under either structural protection alternatives. Excavation would be modified to reduce potential impacts by proper post-excavation grading of the channel, as necessary, in order to correct any potential erosion and thereby reduce impacts to less than significant levels.

To preclude project features from increasing the water surface elevations within the Santa Ana River by significantly encroaching into the floodplain, a key hydraulic design criterion was to limit encroachment to between 60 to 90 meters (200 to 300 feet) into the river, measured from the top of the bluff.

Under the No-Action Alternative, erosion of the toe and subsequent bluff retreat would continue. This impact would be considered significant.

Water quality impacts associated with both structural protection alternatives include: (1) potential sedimentation resulting from removal of vegetation associated with construction easements, access roads and potential borrow areas in the riverbed, (2) potential turbidity impacts associated with dewatering of construction excavations, and (3) potential accidental release of toxic materials, such as diesel fuel from construction vehicles.

Mitigation for impact 1 requires the implementation of a sediment control plan. Mitigation for impact 2 requires the contractor to obtain a NPDES permit and that settling basins or similar structures be constructed prior to release of dewatering discharges back into the river channel. Mitigation for impact 3 requires the development of a pollution-prevention plan which will list measures to reduce the potential for accidental releases of fuels and other hazardous materials.

Under the No-Action Alternative, there would be no change in water resources and water quality. The Santa Ana River would continue to undermine the bluffs, resulting in a significant impact.

Geological Impacts

Both structural protection alternatives would protect the toe of the bluffs in the project area from further erosion and undercutting, thus resulting in a beneficial geologic impact. However, removal of vegetation and other construction activities would result in potentially significant erosion impacts. Implementation of erosion control measures, including the revegetation of disturbed areas and the construction of sedimentation basins would reduce these impacts to less than significant levels.

Adoption of the No-Action Alternative would result in continued erosion of the bluffs, eventually damaging the homes on both sides of River Drive, the roadway and utilities. This would be considered a significant impact.

Biological Impacts

Vegetation Impacts - Under both structural protection alternatives it is estimated that 2.0 ha (4.9 acres) of vegetation would be permanently lost as a result of construction of the toe protection structure. This acreage includes approximately 1.3 ha (3.2 acres) of cottonwood-willow riparian forest, 0.5 ha (1.2 acres) of cottonwood-willow riparian forest with a significant *Arundo* scrub component, 0.2 ha (0.5 acre) of marsh, and a minor amount of ornamental/ruderal vegetation. Implementation of either alternative would also result in a temporary loss of approximately 4.5 ha (11.1 acres) of predominantly cottonwood-willow riparian forest along the edge of the toe protection structure; this area could be revegetated when construction is complete. Additionally, placement of a staging area near the Interstate 15 bridge would result in the temporary loss of approximately 1 ha (2.5 acres) of cottonwood-willow riparian forest with a significant *Arundo* scrub component. Construction of the access road from Pedley Avenue to the project area would result in the temporary loss of approximately 0.5 ha (1.2 acres) of predominantly *Arundo* scrub. Losses of *Arundo* scrub and ornamental/ruderal vegetation would be considered less than significant because these are common communities that support weedy non-native plant species. Impacts on cottonwood-willow riparian forest and marsh would be significant because these communities are considered sensitive vegetation types.

If fill material is mined from the areas of *Arundo* scrub near the project area, approximately 4.9 ha (12.1 acres) of *Arundo* scrub habitat would be removed. This would be considered a beneficial impact because of the opportunity for native riparian species to colonize this site.

Under the Combination of Slope Stabilization and Toe Protection Alternative (Alternative 5), placement of the fill would result in the removal of ornamental/ruderal vegetation on some aspects of the bluff slope. This loss would be considered less than significant because this community is dominated by non-native weedy plant species and is common locally, regionally, and statewide. If the buttress fill material for this alternative were mined from the river in *Arundo* scrub stands, 15 ha (37.1 acres) of *Arundo* scrub would be removed; this would be considered a beneficial impact because of the opportunity for native riparian species to colonize this site.

Mitigation would require the development of a detailed mitigation plan by the Corps and the Riverside County Flood Control and Water Conservation District (RCFC&WCD), in conjunction with the US Fish and Wildlife Service (USFWS), and the California Department of Fish and Game (CDFG), to compensate for the permanent and temporary loss of riparian forest and the permanent loss of marsh. Mitigation would involve the removal of *Arundo* scrub stands in the project area and revegetation with riparian species while regrowth of *Arundo* is controlled. Deeply excavated areas previously occupied by *Arundo* scrub may be hydrologically-connected with the Santa Ana River to promote the growth of marsh plants.

Wildlife Impacts - The loss of cottonwood-willow riparian habitat described above would be considered significant primarily because it would represent loss of habitat of riparian obligate bird species and amphibian species. There may also be impacts on nesting birds if the habitat is removed during their nesting season. Construction noise may indirectly affect nesting species and other wildlife in adjacent areas during the 6-month construction period for the Soil Cement Toe Protection Alternative (Alternative 2b) or during the 9-month construction period for the Combination of Slope Stabilization and Toe Protection Alternative (Alternative 5).

Threatened and Endangered Species Impacts - No confirmed populations of threatened or endangered plant species or otherwise sensitive plant species would be affected by implementation of either structural protection alternative. There is a remote potential that the Many-stemmed Dudleya, a Category 2 candidate for Federal listing, and the Santa Ana River woollystar, a State-listed and Federally-listed endangered species, may be located in the vicinity of the project area. The loss or disturbance of these individuals, if they exist, would constitute a significant impact. If these species are found during future surveys, specific mitigation measures would be developed in consultation with USFWS and CDFG.

Implementation of either structural protection alternative would result in the permanent or temporary loss of 6.5 ha (16.1 acres) of habitat of the least Bell's vireo. This significant impact includes direct loss of habitat for one confirmed nesting pair in the wetlands area near Corona Avenue. In addition, high noise levels associated with construction could also disturb other nesting pairs of the least Bell's vireo that may be present in the project area. This potential disturbance would also be considered a significant impact.

In addition to removal of *Arundo*, the following mitigation measures will be implemented: (1) any removal of riparian woodlands that are potential nesting habitats for least Bell's vireo and other migratory species for project-related facilities shall occur during periods of non-nesting (July through early March), (2) implementation of a least Bell's vireo monitoring program prior to and during construction, and (3) identification by flagging of riparian areas that are not to be disturbed.

The No-Action Alternative would result in no substantial changes to the riparian habitat near the toe of the bluffs and would not adversely impact sensitive wildlife species.

Recreational Resources

Implementation of either structural protection alternative would not result in any impacts to existing formal recreational resources. However, under the Soil Cement Toe Protection Alternative (Alternative 2b), an access road for maintenance purposes would be located on the top of the toe protection structure. Although built for private use, equestrians may gain access to the road and thereby be exposed to potential areas of sloughing of portions of the unstable bluff slopes. This impact would be considered significant. Mitigation for this identified impact to public safety involves posting warning signs along the access road in an attempt to discourage equestrians or other persons from using the road. Fencing would also be installed to help keep rocks and other materials from falling onto the access road.

Since the slopes would be stabilized under the Combination of Slope Stabilization and Toe Protection Alternative (Alternative 5), no public safety impacts are anticipated from further sloughing of the bluff. In addition, there may be a greater potential for establishing an equestrian/hiking trail along the access road with implementation of this alternative if a recreation local sponsor is agreeable to cost sharing the recreational cost increment.

Adoption of the No-Action Alternative (Alternative 4) would not directly affect recreation in the riverbed area. However, continued bluff erosion may make it infeasible to implement City of Norco plans to establish an equestrian trail along River Drive.

No alternatives, including the No-Action Alternative, could appropriately provide active recreational opportunities such as playgrounds and multi-purpose fields. There are two major factors which prohibit active uses or make active uses incompatible with the project site: (1) the location and physical characteristics of proposed toe and bluff structural improvements do not provide adequate area for active recreational uses, such as active fields and parking, and (2) the project's location next to a regional natural open space with sensitive wildlife habitat does not lend itself to active recreational uses.

Additional Impacts

The EIS/EIR lists additional significant impacts that would occur to various resource categories, as follows.

Cultural Resources - Significant impacts would occur if construction under both structural protection alternatives disturbs unknown paleontolgical and archeological resources. In order to mitigate this occurrence, qualified archeological and paleontolgical monitors will be retained onsite during construction activities and will halt work until any discovered resource can be evaluated and mitigated, if necessary.

Hazardous, Toxic, and Radioactive Wastes - Release of hazardous, toxic, and radioactive wastes could occur inadvertently if previously, illegally dumped materials are disturbed by construction activities. In addition, accidental release of such materials as diesel fuel, gasoline, and lubricating oils could occur from construction equipment. Mitigation for these potential impacts include surveying the construction area for hazardous materials and implementing a pollution-prevention plan to reduce the potential for release of fuels or other materials from construction operations.

Land Use, Population, and Housing Resources - Under the No-Action Alternative, impacts to land use, population, and housing resources would be significant since the erosion and bluff retreat would continue to have long-term potential for reducing the extent of residential areas.

Public Services and Utilities Resources - Implementation of the Soil Cement Toe Protection Alternative (Alternative 2b) would reduce the potential for adverse erosion impacts to public services and utilities resources, including the sanitary sewer line most at risk along River Drive. However, the potential for damage would still remain from localized sloughing at currently undermined areas. The Combination of Slope Stabilization and Toe Protection Alternative (Alternative 5) would eliminate any potential impact on utility systems because the bluff slopes would be stabilized, precluding localized sloughing.

Under the No-Action Alternative (Alternative 4), utility systems and local services such as fire, police, and public works, could be significantly affected by continued bluff retreat.

Transportation Resources - These would be significantly impacted from an increase in traffic volumes from either structural protection alternative. A potential area of concern regarding traffic safety is truck use during school hours adjacent to Riverview School on Pedley Avenue. Mitigation to reduce these traffic safety impacts would include the following measures: (1) avoidance of the use of Pedley Avenue during school hours when possible, (2) establishment of a construction traffic speed limit of 15 miles per hour within 100 feet of the school, and (3) provision of funding for school crossing guards when school is in session and vehicles are using Pedley Avenue for ingress or egress during the construction period. Implementing these measures would reduce the projected impacts to less-than-significant levels.

Under the No-Action Alternative, no additional traffic would be generated. However, River Drive would continue to be inaccessible at two locations, and additional sections of the road could be rendered unusable due to bluff retreat. These are potentially significant impacts.

Noise Impacts - Increases in construction noise levels to residences along River Drive would represent a significant impact, as would the conflict this noise increase has with the City of Norco's criteria for residential noise levels. In order to mitigate noise impacts to less than significant levels, construction activity would be limited to weekdays from 7:00 a.m. to 6:00 p.m. throughout the construction period (6 or 9 months) to minimize conflicts with sleeping and other noise-sensitive residential activities. No impacts would occur related to the No-Action Alternative. Noise impacts would exist during times of emergency flood fighting and bank instability.

Air Resources - Implementation of either structural protection alternative would result in short-term increases in NO_x and PM10 emissions during the construction period. These are considered significant. Mitigation measures would be used to reduce NO_x emissions from construction equipment, such as proper engine tuning, use of high-pressure injection installation, reduction in idling times, use of catalytic converters, and reduction in the dependence on diesel-powered equipment. While these measures would reduce air quality impacts, the impacts would remain significant and unavoidable. PM10-reducing construction practices would also be used, including watering and covering storage piles, covering haul trucks or leaving the top 2 feet of capacity empty, watering of active construction sites, prohibiting grading activities during greater than 50 kmph (30 mph) winds, using soil stabilizers and binders on exposed areas, and hydroseeding and planting vegetative cover on disturbed areas as soon as possible. Although these mitigation measures will help reduce PM-10 emissions, impacts to air quality would remain significant and unavoidable.

Under the No-Action Alternative, there would be no construction activity; therefore, no air quality impacts would result from adoption of this alternative. It should be noted however, that without bank stabilization, future emergency work would create negative air quality impacts during times of flooding and bank instability.

G. Plan Selection

The previous section identified alternatives that provide (1) toe protection only, and (2) toe protection plus bluff stabilization. It also evaluated the environmental and regional impacts related to the options in each of these two categories that initially appeared to offer the lowest cost and, hence, greatest net benefits. This section presents the results of more detailed economic and cost analyses on the two alternatives, and identifies whether a National Economic Development (NED) Plan exists for implementation in accordance with Federal water resources planning principles, guidelines, procedures and policies. A rationale for plan selection is also included, as is a discussion of sensitivity analysis and risks/uncertainties.

Once feasible alternatives are identified in the study process, the next step is to optimize each alternative's design level of protection. As the level of protection of any particular project increases, the benefits that are returned likewise increase. However, while the benefits for greater levels of protection typically level-off above the 80- to 150-year level of protection due to the increasing rarity of the damage-events, the costs associated with providing ever-higher levels of protection usually increase at greater and greater rates by comparison. There theoretically exists a level of protection that optimizes the *amount* of return, or net benefits (not necessarily the *rate* of return, or benefit/cost ratio) for a given project investment. The NED plan, therefore, provides the greatest net benefits (benefits minus costs) of all the plans under consideration, thereby maximizing contributions to the nation's economic development.

Benefits

Benefits from project implementation are primarily derived from preventing damages that would otherwise occur in the without-project condition. Benefits of providing a bluff stabilization project in Norco are based upon the economic cost of damages that would otherwise occur to land, structures, roads, and utilities. They also include savings in the estimated future costs of bluff monitoring, ensuring the safety of the area, and relocating and demolishing damaged houses. The benefits analysis is described in detail within Appendix G, "Economic Appendix."

Benefits are expressed as average annual values at the current Federal discount rate of 7% with a project economic life of 50 years. The price level for the analysis is October, 1995. The analysis was performed for various levels of protection for both **Alternative 2b**, "Soil Cement Toe Protection Alternative," and **Alternative 5**, "Combination of Slope Stabilization and Toe Protection Alternative."

Residual Erosion Rates

All benefit computations typically consider *residual damages*, which consist of damages that still take place when the design level of project protection is exceeded. With the Norco Bluffs project, residual damages not only include erosion due to exceedence of the design level of protection, but they also include the ongoing, natural slough rate that currently exists at the bluffs and that would continue to exist with the toe protection-only alternative in place. Alternative 5, the Combination of Slope Stabilization and Toe Protection Alternative, would preclude both natural sloughing and erosion due to exceedence of design events.

The evaluation of residual damages needs to consider the performance of the alternative plans in the greater-than design event condition. The computation of residual erosion as presented below is based on the assumption—supported by technical design—that overtopping of the toe-only protection structure by greater-than design events would not worsen the without-project condition nor cause catastrophic damages to occur. The same is true for the combined toe protection and bank stabilization alternative. The residual erosion rates indicate that while exceedence events would cause erosion with the toe-only protection alternative in place, the resulting erosion would be less than if there were no protective structure in place.

The natural slough rate, as estimated by the local sponsor, is 0.076 m/yr (0.25 ft/yr). This rate was determined by an evaluation of local soil conditions and historical, non-flood related bluff retreat. This rate is added to the erosion rate due to flooding with various levels of protection in place. It is important to note that erosion would proceed at the existing rate of 1.22 meters/year once the level of protection offered by the project is exceeded. Computationally, this rate of 1.22 meters/year is multiplied by the probability of exceedence for each level of project protection. In numerical terms, the residual erosion rate for a plan offering 100-year level of protection (exceedence probability = 0.01) would be (0.0762 meters/year + 0.01 (1.22 meters/year) = 0.0884 meters/year). The residual erosion rates for each design level of protection are shown in Table 10, "Residual Erosion Rates for Various Design Levels of Toe-Only Protection."

Table 10. Residual Erosion Rates for Various Design Levels of Toe-Only Protection (Alternative 2b)

Design Level of Protection	Annual Erosion Rate (meters)	(feet)
10-year	0.198	0.649
25-year	0.125	0.410
50-year	0.101	0.331
100-year	0.088	0.288

Benefits of the Soil Cement Toe Protection Alternative (Alternative 2b)

Implementation of Alternative 2b would preclude undercutting of the bluff by the particular flood event for which it is designed, yet would not stop the natural bluff sloughing until the bluff reestablishes stability according to its angle of repose (approximately 34 degrees). This would occur approximately 12.2 meters (40 feet) inward from the bluff-line. The bluff will also continue to erode at the current 1.22 m/yr (4ft/yr) from now until the protection is in place in 1998, for a total of 3.66 meters (12 feet). (This 3.66 meter retreat is due to toe erosion caused by flooding events and subsequent bluff instability; the slope angle of the existing bluff would theoretically remain approximately the same as currently exists. Therefore, following project implementation, the bluff would still retreat 12.2 meters while seeking the angle of repose.) Combining these distances totals 15.86 meters (52 feet) of bluff top retreat that would eventually occur with the toe-only protection alternative. The effect that higher levels of protection have on this retreat distance is to extend the time it takes for condemnation of the structures to be necessary according to the residual erosion rates from the table above. Thirty-six structures have condemnation points within 15.86 meters (52 feet). In fact, only 11 structures under the 10-year level of protection would be condemned within the 50-year project life. Table 11, "Annual Benefits for the Soil Cement Toe Protection Alternative (Alternative 2b)," shows the breakdown of benefits by design frequency. The categories shown in this table are recognized as the without-project damage categories shown in Table 6, "Without-Project Economics, Zone 2."

Table 11. Annual Benefits for the Soil Cement Toe Protection Alternative (Alternative 2b)

Category	10-Year	25-Year	50-Year	100-Year
Damages Prevented to Structures and Land	$335,220	$387,260	$402,340	$408,370
Monitoring & Safety	$0	$0	$0	$0
Extension of Road Life	$45,800	$48,900	$50,600	$50,800
Prevention of Relocation & Demolition Costs	$16,900	$17,400	$17,400	$17,400
TOTAL	$397,920	$453,560	$470,340	$476,570

Due to the continued instability of the bluff, even the 100-year toe protection-only design does not prevent the total damages valued at $601,220 associated with the without-project condition. The residual erosion rates discussed in the section above were used to determined the shift in the damage stream timeframe. This is reflected by the benefits under the "Damages Prevented to Structures and Lands" category. This category includes damages prevented to structures within the erosion zone as well as prevention of loss of land.

Since it is reasonable to assume that the City and County would continue to monitor the bluff because of continued bluff sloughing under this alternative, no benefits are taken in the category of "Monitoring and Safety."

The loss of River Drive would continue with toe-only protection, but at a much slower rate due to the slowing of the damage stream timeframe. This produces different NED benefits for each level of protection under the "Extension of Road Life" category.

For the "Prevention of Relocation and Demolition Costs" category, the table shows that all levels of protection except the 10-year design prevent the total without-project damages of $17,400 within this category. For the 10-year design level of protection, the residual erosion rate indicates that eleven homes would still be affected by erosion; therefore, the benefit is reduced to $16,900 annually.

Combination of Slope Stabilization and Toe Protection Alternative (Alternative 5)

Implementation of Alternative 5 would preclude undercutting of the bluff as well as stop all bluff sloughing at the bluff top. Therefore, once the project is completed in 1998, no loss will occur to the structures and land currently subjected to erosion damage *except* for the public land between the bluffs edge and River Drive that will continue to erode between 1996 and 1998. Therefore, this alternative would prevent all damages that occur in the without-project condition, as shown in Table 12, "Annual Benefits for the Combination of Slope Stabilization and Toe Protection Alternative (Alternative 5)."

Table 12. Annual Benefits for the Combination of Slope Stabilization and Toe Protection Alternative (Alternative 5)

Category of Benefit	Amount
Damages Prevented to Structures and Land	$422,820
Monitoring and Safety	$100,000
Extension of Road Life	$61,000
Prevention Relocation & Demolition Costs	$17,400
Total	$601,220

Incidental Benefits

In addition to the benefits quantified above, there are significant unquantifiable benefits that would accrue to the project. These include benefits to health and safety from (1) protecting against the further collapse and the potentially catastrophic failure of River Drive, (2) curtailing the dumping and accumulation of trash and debris placed by local residents as an attempt at erosion control, and (3) removing the threat of a sewer line rupture and the subsequent contamination of the local area and the Santa Ana River with raw sewage. Also, a small reduction in sediment delivery to Prado Dam due to erosion of the talus apron during flood flows would be expected.

Costs

The preliminary design cost estimates indicated that the "buttress fill with imported materials," Option 1a, was the least costly of all the options within Alternative 1 for slope stabilization, and that the "soil cement toe protection," Option 2b, was the least costly of all the options within Alternative 2 for toe protection. Detailed design costs during the latter phase of the Feasibility Study evaluated costs associated with providing different levels of protection for Alternative 2b and the combination alternative, Alternative 5. These are shown in Table 13, "Base Construction Costs—Soil Cement Alternative." These include (1) construction costs for project features, (2) related real estate costs, and (3) environmental mitigation costs. First costs do not include interest during construction (IDC) and operation and maintenance costs.

Table 13. Base Construction Costs—Soil Cement Alternative

Alternative	Cost
ALTERNATIVE 2B: Soil Cement Toe Protection	
10-year level	$3,630,900
25-year level	$3,998,500
50-year level	$4,590,500
100-year level	$4,987,100
ALTERNATIVE 5 Combination of Slope Stabilization and Toe Protection	
25-year level	$6,748,1000
50-year level	$7,002,800
100-year level	$7,173,900

Risk and Uncertainty: Life-Cycle Costs

In accordance with Corps of Engineers' planning guidance, a Risk and Uncertainty Analysis was performed to determine the reliability and costs associated with greater-than-design level events. This differs from the "residual analysis" discussed earlier that affects the *benefits* calculations. By comparison, risk and uncertainty relates to the *costs* attributed to structural damage to the project itself. Importantly, damage to the structural integrity of the project due to exceedence events would only occur to the toe protection project (Alternative 2b); the slope stabilization plus toe protection project (Alternative 5) would not be damaged from events that exceed the design level of protection.

Typically, risk and uncertainty analysis for flood protection projects involves comparing the flood levels associated with flood events that exceed the design level of protection. However, a stage-discharge relationship could not be developed between the erosion rate, flood stage, river discharge, or frequency, as discussed in the "Hydraulics" portion of Section IV.D, "Without-Project Conditions-Hydraulics." Therefore, the without-project condition does not involve a relationship between erosion damage and flood frequency upon which to apply the standard principles of risk and uncertainty. Instead, the principles of risk and uncertainty were applied to estimate true project costs by employing a risk-based estimate of "life-cycle" costs, represented by first costs plus future estimated reconstruction costs.

This was accomplished by determining a "damage function" that quantifies the damage to toe protection due to greater-than-design floods. The damage function consists of reconstruction costs equal to 30% of the original construction cost for floods that are twice the design frequency, and reconstruction costs equal to 60% of the original construction cost for floods that are four times the design frequency. The damage function is linear between points.

The occurrence of damaging floods was using a random number generator (Monte Carlo simulation) to produce flood frequencies during 10,000 fifty-year histories. Each year of each 50-year history produces a reconstruction cost based upon its random frequency and the damage function specified above. Each 50-year history's stream of costs are then converted to Net Present Value (NPV), and all 10,000 histories' NPV are averaged to produce the average live-cycle cost of the project. This average live-cycle cost, which includes the base construction cost, is amortized. The process is conducted for each level of protection.

Since the life-cycle cost represents the true economic cost for each alternative, it is used in the NED analysis for this project. Table 14, "Total Life-Cycle and Project Amortization Costs," shows the breakdown of the life-costs used in the NED analysis.

Table 14. Total Life-Cycle and Project Amortization Costs

Project Type	Life-Cycle Cost	IDC Cost	Total Cost	Amortized Cost [1]
ALTERNATIVE 2B: Soil Cement Toe Protection Toe-only Protection				
10-Year	$5,083,400	$94,200	$5,177,600	$420,100
25-Year	$4,642,400	$86,100	$4,728,500	$384,900
50-Year	$4,956,900	$91,900	$5,048,800	$410,000
100-Year	$5,185,700	$96,100	$5,281,800	$428,200
ALTERNATIVE 5 Combination of Slope Stabilization and Toe Protection				
25-Year	$6,748,100	$188,500	$6,936,600	$557,700
50-Year	$7,002,800	$195,700	$7,198,500	$578,200
100-Year	$7,173,900	$200,400	$7,374,300	$591,900

[1]Includes $15,000 per year O&M for each alternative.

Again, as stated in the beginning of this section, the slope stabilization plus toe protection project (Alternative 5) would not be damaged from events that exceed the design level of protection.

Benefit/Cost Analysis

The total annual cost for each alternative is compared to the expected annual benefits to arrive at a benefit-cost ratio. The alternative with the greatest net benefits is considered the NED plan. Table 15, "Benefit-Cost Summary," shows benefits, costs, benefits, net benefits, and benefit-cost ratio for each alternative. The NED plan for Norco Bluffs is the 25-year level of protection toe-only protection with net benefits of $68,660 and a B/C ratio of 1.18.

Table 15. Benefit/Cost Summary

Alternative	Amortized Life Cycle Cost	Annual Benefits	Net Benefits	B/C Ratio
ALTERNATIVE 2b: Soil Cement Toe Protection				
10-yr level	$420,100	$397,920	($22,180)	0.95
25-yr level	$384,900	$453,560	$68,660	1.18
50-yr level	$410,000	$470,340	$60,340	1.15
100-yr level	$428,200	$476,570	$48,370	1.11
ALTERNATIVE 5: Combination of Slope Stabilization and Toe Protection Alternative				
25-yr level	$557,700	$601,220	$43,520	1.08
50-yr level	$578,200	$601,220	$23,020	1.04
100-yr level	$591,900	$601,220	$9,320	1.02

System of Accounts

The US Water Resources Council System of Accounts was used as a method of displaying the positive and negative effects of the proposed alternatives. The accounts are categories of long-term environmental, economic and other social impacts of alternatives, including the No-Action Alternative. These are displayed in tables that allow efficient consideration of comparative effects. The Water Resources Council suggests using four accounts to compare proposed water resource development plans. These are the national economic development (NED); environmental quality (EQ); regional development (RD); and other social effects (OSE) accounts.

National Economic Development (NED) Account

This account identifies the economic effects of alternative plans on the nation's economic development. Beneficial effects are increases in the economic value of the national output of goods and services attributable to a plan. For the Norco Bluffs alternatives described under consideration, the increases in NED reflect the results of the benefit/cost analysis. Benefits are derived from (1) damage reduction to structures, land, and utilities that would otherwise occur in the without project condition due to erosion and bluff sloughing, and (2) savings in costs that would otherwise occur from monitoring and safety activities, emergency services activities, and relocation/demolition activities. Adverse NED effects are the costs of the project, and represent the opportunity cost of investing funds on the project rather than other potential economic development opportunities. Table 16, "System of Accounts - National Economic Development

Account," compares the alternative plans under consideration using the NED account. This table indicates that Alternative 2b with a 25-year level of protection has higher average annual net benefits than the other alternative and levels of protection.

Environmental Quality (EQ) Account

The environmental quality (EQ) account displays the long-term effects of alternative plans on significant environmental resources. Significant environmental resources are defined by the Water Resources Council as those components of the ecological, cultural, and aesthetic environments which, if affected by the alternative plans, could have a material bearing on the decision-making process of plan selection. Table 17, "System of Accounts - Environmental Quality Account," compares the effects that the alternative plans would have on EQ resources. The impacts, especially significant impacts indicated in the table would be mitigated according to discussions found in Section IV.G, "Evaluation of Alternative Plans," above.

Regional Economic Development (RED) Account

The regional economic development account is intended to illustrate the effects that the proposed plans would have on regional economic activity, specifically regional income and regional employment. Table 18, "System of Accounts - Regional Economic Development and Other Social Effects Account," compares the possible effects that the plans may have on these resources (this table combines the RED and OSE accounts). In general, the beneficial contributions to the RED account increase with Alternative 5 compared to Alternative 2b.

Other Social Effects (OSE) Account

This account typically includes long-term community impacts in the areas of public facilities and services, recreational opportunities, transportation and traffic, and man-made and natural resources. Table 18, "System of Accounts - Regional Economic Development and Other Social Effects Account," compares the effects that the proposed alternatives would have on OSE resources. There would appear to be significant improvements to the OSE account for either structural alternative compared to the No-Action Alternative, with Alternative 5 representing an additional increment of positive effects compared to Alternative 2b.

Table 16. System of Accounts - National Economic Development Account (October 1995 Price Levels)

Category	No-Action	Alternative 2b Soil Cement Toe Protection Alternative				Alternative 5 Combination of Slope Stabilization and Toe Protection Alternative		
		10-Year	25-Year	50-Year	100-Year	25-Year	50-Year	100-Year
I. Average Annual Benefits								
a. Monitoring & Safety	n/a	$0	$0	$0	$0	$100,000	$100,000	$100,000
b. Emergency[1]	n/a	~~$48,280~~	~~$48,280~~	~~$48,280~~	~~$48,280~~	~~$48,280~~	~~$48,280~~	~~$48,280~~
c. Road Loss	n/a	$45,800	$48,900	$50,600	$50,800	$51,000	$51,000	$51,000
d. Erosion Control - Structures	n/a	$249,340	$301,380	$316,460	$322,490	$336,940	$336,940	$336,940
e. Erosion Control - Land	n/a	$85,880	$85,880	$85,880	$85,880	$85,880	$85,880	$85,880
f. Relocation & Demolition	n/a	$16,900	$17,400	$17,400	$17,400	$17,400	$17,400	$17,400
g. Public Land	n/a	$0	$0	$0	$0	$10,000	$10,000	$10,000
Total Annual Benefits	n/a	$397,920	$453,560	$470,340	$476,570	$601,220	$601,220	$601,220
II. Project Costs								
a. Project First Cost	n/a	$3,630,900	$3,998,500	$4,590,500	$4,987,100	$6,748,100	$7,002,800	$7,173,900
b. Interest During Construction (IDC)	n/a	$94,200	$86,100	$91,900	$96,100	$188,500	$195,700	$200,400
c. Total Gross Investment	n/a	$3,725,100	$4,084,800	$4,685,400	$5,083,200	$6,936,600	$7,198,500	$7,374,300
d. Total Life-Cycle Cost (incl. IDC)	n/a	$5,177,600	$4,728,500	$5,048,800	$5,281,800	$6,936,600	$7,198,500	$7,374,300
e. Annualized Life-Cycle Cost (incl. IDC)	n/a	$405,100	$369,900	$395,000	$413,200	$542,700	$563,200	$576,900
f. Annual O&M[2]	n/a	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
III. Net Benefits (Total Annual Benefits Less Cost)	n/a	($22,180)	$68,660	$60,340	$48,370	$43,520	$23,020	$9,320
IV. B/C Ratio	n/a	0.95	1.18	1.15	1.11	1.08	1.04	1.02

[1]Deleted at direction of Corps HQ

[2]Operations and Maintenance

Table 17. System of Accounts - Environmental Quality Account

Category	Alternative 2b Soil Cement Toe Protection Alternative	Alternative 4 No-Action Alternative	Alternative 5 Combination of Slope Stabilization and Toe Protection Alternative
I. PHYSICAL ENVIRONMENT			
a. Erosion	Bluff will continue to erode approximately 16 m (52 ft) until it reaches the angle of repose.	Erosion will continue at 1.2 m/yr (4ft/yr).	Erosion is halted.
b. Water Quality	Potential temporary sedimentation impacts resulting from removal of vegetation associated with construction easements, access roads, and potential borrow areas in the riverbed. Potential temporary turbidity impacts associated with dewatering of construction excavations. Overall improvement to downstream turbidity following construction.	No changes in water quality from current conditions. Minor contribution of sediment from erosion of talus apron would continue to be conveyed to Prado Dam.	Potential temporary sedimentation impacts resulting from removal of vegetation associated with construction easements, access roads, and potential borrow areas in the riverbed. Potential temporary turbidity impacts associated with dewatering of construction excavations. Overall improvement to downstream turbidity following construction.
c. Air Quality	Construction would significantly contribute PM10 and NO_x to the area for a 6 to 9 month period.	No air quality impacts are associated with this alternative.	Construction would significantly contribute PM10 and NO_x to the area for a 6 to 9 month period. This alternative involves higher emissions than Alternative 2b.
d. Noise Conditions	Construction under this alternative would increase the exposure of River View School and residences along Pedley Ave. and River Dr. to traffic and/or construction noise. Impacts would be mitigated.	No noise impacts are associated with this alternative.	Construction under this alternative would increase the exposure of River View School and residences along Pedley Ave. and River Dr. to traffic and/or construction noise. Impacts would be mitigated.
e. Hazardous, Toxic, and Radioactive Wastes	Implementation of this alternative would not result in the disturbance of known hazardous waste sites. Construction activities could result in the accidental release of hazardous or toxic materials such as diesel fuel, gasoline, and lubricating oils.	The fill area near Corona Ave. which may contain hazardous and toxic wastes would remain unprotected. There would also be potential for continued illegal dumping of material in the riverbed.	Implementation of this alternative would not result in the disturbance of known hazardous waste sites. Construction activities could result in the accidental release of hazardous or toxic materials such as diesel fuel, gasoline, and lubricating oils.

Table 17. System of Accounts - Environmental Quality Account (continued)

II. BIOLOGICAL ENVIRONMENT			
a. Vegetation	Approximately 2.0 ha (4.94 ac) of vegetation would be permanently lost. Approximately 4.5 ha (11.11 ac) of vegetation would be temporarily lost due to construction. Potential removal of *Arundo* is considered beneficial. Impacts would be mitigated.	Continued growth of *Arundo* anticipated.	Same as Alt. 2b since most impacts due to implementation of toe protection structure.
b. Wildlife	Loss of riparian habitat would negatively affect the riparian obligate bird and amphibian species. Impacts would be mitigated to less than significant level.	No potential impact.	Same as Alt. 2b
b. Endangered Species	Implementation of this alternative would result in the temporary or permanent loss of 6.5 ha (16.1 ac) of habitat of the least Bell's vireo. There is potential for a Category 2 candidate plant species, the many-stemmed dudleya, to be negatively impacted due to toe construction.	No potential impact.	Same as Alt. 2b
III. CULTURAL ENVIRONMENT			
a. Cultural Resources	There exists a potential to unearth buried cultural resources; however, no cumulative significant loss of cultural resources is anticipated.	If the area contains paleontological resources, this alternative may result in impacts due to continued bluff sloughing.	Same as Alt. 2b
b. Aesthetics	Temporary reduction in visual quality expected. This impact is considered less-than-significant.	No potential impact.	Same as Alt. 2b

Table 18. System of Accounts - Regional Economic Development and Other Social Effects Account

Category	Alternative 2b Soil Cement Toe Protection Alternative	Alternative 4 No-Action Alternative	Alternative 5 Combination of Slope Stabilization and Toe Protection Alternative
I. REGIONAL ECONOMIC DEVELOPMENT			
a. Employment/Labor Force	6 month temporary change in construction-related employment.	No change in employment.	9 month temporary increase in construction-related employment.
b. Business and Industrial Activity	No change in business and industrial activity.	Same as Alt 2b.	Same as Alt 2b.
c. Local Government Finance	Significant reduction in costs due to erosion damage. Implementation costs of alternative would need to be financed.	Costs associated with monitoring, safety , road loss, relocation, demolition, loss of public land, emergency services	Same as Alt 2b
II. OTHER SOCIAL EFFECTS			
a. Public Health and Safety	Significant reduction in the threat to public health and safety through protection of bluff erosion.	Continued risks due to erosion, bluff sloughing, and potentially catastrophic failure of River Drive.	Same as Alt 2b but greater magnitude of protection to upper bluff top.
b. Public Facilities and Services	Postponement of time to failure of portions of River Drive and public utilities within first 16 meters (52 feet) of bluff top, and significant reduction in threat beyond the 16 meters.	Continued risk to roads and public utilities due to continued erosion and bluff sloughing.	Significant reduction in threat of failure to River Drive and public utilities that currently exists.
c. Recreation and Public Access	No recreational potential related to this alternative. No change in existing recreational facilities.	Recreational facilities near bluff top would eventually be destroyed by bluff sloughing.	Potential for equestrian trail along toe protection levee adjacent to fill. No change in existing recreational facilities.
d. Traffic/Transportation	River Drive closures would be extended as bluff receded approximately 16 meters (52 feet). Temporary increase in construction traffic during 6 month construction period.	River Drive closures would be extended as bluff continued to disappear; eventually the road would no longer exist.	River Drive could become accessible again with bluff stabilization. Additional road closures and losses would be precluded.
e. Man Made Resources	Significant reduction in damages to property.	Damage to residential and municipal property would continue.	Significant reduction in damages to property. Greater reduction than Alt 2b.
f. Natural Resources	Mitigated impacts to vegetation and habitat within riverbed. Mitigation includes removal of *Arundo*	No change in vegetation or habitat in area, except that continued proliferation of *Arundo* would be expected.	Same as Alt 2b.

Additional Evaluation Criteria

The alternative plans were also evaluated using the four criteria suggested by the US Water Resources Council. These criteria are completeness, effectiveness, efficiency and acceptability.

Completeness

Completeness is the determination of whether or not the plan includes all elements necessary to achieve the national objectives of the plan. The alternative plans may be considered as satisfying this criterion. All levels of protection for both structural alternatives would provide the stated objective of reducing bluff erosion, and the designs for both alternatives provide complete engineering solutions to controlling continual bluff retreat. The No-Action Alternative does not meet the objectives of controlling the problem.

Effectiveness

Effectiveness is defined as a measure of the extent to which a plan achieves its objectives. All of the plans achieve the objectives of controlling bluff erosion and subsequent retreat. However, the degree to which the plans address this objective differs. Alternative 2b only provides toe protection and does not preclude the bluffs from receding to their angle of repose. Bluff retreat would eventually be stopped with Alternative 2b, yet additional damage to the facilities and structures within the immediate bluff top would still occur until the bluff stabilized. Alternative 5, by comparison, offers a more effective solution to the bluff erosion problem. The No-Action Alternative would not be effective in controlling bluff erosion.

Efficiency

Efficiency is the cost effectiveness of the plan expressed in net economic benefits. Alternative 2b with a 25-year level of protection has the greatest net economic benefits and is therefore the most efficient plan. Net economic benefits for both alternatives are shown in Table 15, "Benefit/Cost Summary." The No-Action Alternative would not provide an efficient means of meeting the study objectives because the damages would continue to cost the nation approximately $601,220 on an average annual basis.

Acceptability

Acceptability is defined as acceptance of the plan by the local sponsor and the concerned public. From the standpoint of erosion protection, a plan that provides a more effective solution and offers a higher-level of protection is desired by the local sponsor and the public. Alternative 5 with a 100-year level of protection is therefore the plan with the greatest degree of acceptability. The sponsor understands that the most efficient plan (Alternative 2b) is likely the plan that sets the limit of Federal cost-sharing involvement. This is discussed in Chapter VI, "Plan Implementation," below.

V. DESCRIPTION OF THE SELECTED PLAN

This chapter presents the Nation Economic Development (NED) Plan and the Locally-Preferred Plan (LPP), and presents the rationale for plan selection.

A. NED Plan

The NED Plan as presented in Chapter IV, "Plan Formulation" is the **Soil Cement Toe Protection Alternative (Alternative 2b)** optimized to provide a 25-year level of protection. A cross-section of this alternative is shown in Exhibit 12. Exhibit 15, "Alternative 2b: Soil Cement Toe Protection Alternative, Plan View," illustrates the plan view and limits of the project. The NED Plan would protect the toe of the bluffs from the effects of scouring erosion due to the meandering of the Santa Ana River. Under the NED Plan, the bluffs would continue to erode albeit at a much slower rate. With this alternative, the City would have to continue to monitor the bluff and potentially provide emergency services if a situation occurs. Condemnation would eventually be required for some structures nearest the bluff as well as for River Drive, but it would take place much later in time due to the toe protection project. The NED Plan would reduce the erosion rate to 0.125 meters (0.41 feet) per year compared to the without-project rate of 1.22 meters (4.0 feet) per year.

Average annual economic benefits associated with the NED Plan amount to $453,560, with annual life-cycle costs of $384,900. The project would produce $68,600 in net NED benefits annually and would have a benefit-cost ratio of 1.18.

Alternative 2b would involve the placement of fill material to a level just above the 25-year floodplain for a length of approximately 1,600 meters (1 mile) at a 1V:1H slope. The outer edge (river side) of the fill would be protected by 2.5 meters (8.0 feet) of soil cement. Soil cement is formed through the onsite mixture of soil, water, and 7-9% cement. The mixture is spread out on 6-inch flat and approximately 2.5 meter (8 feet) wide lifts, with each lift being offset from the previously placed lifts to achieve a step-like effect. The corners are then trimmed to achieve an approximately 1H:1V slope upon the protective face. This mixture dries to a concrete-like hardness. The soil cement embankment would extend approximately 4.6 meters (15 feet) below the streambed surface to protect against undercutting of the toe structure during floodflows.

The normal fill procedure would be to extend the fill approximately 27 meters (90 feet) from the center point of the bluffs. The extension of fill would vary according to the profiles of the slopes in individual areas. Implementation of this alternative would result in the loss of approximately 3.4 ha (8.4 acres) of habitat as a result of placement of fill. Approximately 85,000 cubic meters (110,500 cubic yards) of fill and 45,000 cubic meters (58,800 cubic yards) of soil cement would be required.

Construction of this alternative would initially involve clearing vegetation, roots, and stumps from the area. The total area cleared would include approximately 3.4 ha (8.4 acres) where the fill would be placed. An additional 3.1 ha (7.7 acres) would be temporarily disturbed during construction. An approximately 1 ha (2.5 acre) area near Interstate 15 would be used as a staging and turnaround area.

Construction access is anticipated to stage from the toe of the bluffs requiring temporary access roads in the streambed. Temporary access roads would be constructed from Pedley Avenue to the construction area and from the downstream portion of the project under the Interstate 15 bridge to Hamner Avenue. Most of the area proposed for the access road is on land vegetated with giant reed (*Arundo donax*). Because this road lies within the streambed, it would not be maintained as a permanent road and native vegetation would be replanted after construction.

A permanent access road would be placed on top of the toe protection structure. This road would start at River Drive and continue down a grade to the top of the soil cement at the downstream end of the project. The road would be cut from the existing bluff with a grade of 8.3%. For turn-around capabilities, cul-de-sacs are proposed at both ends of the project. The road would be used for maintenance only and signage would indicate that it is not planned for recreation; however, a fence may be placed along the road as a safety precaution that recognizes people may use it for hiking and horseback riding if it is constructed.

The project would tie into the existing rock revetment placed by Caltrans underneath and slightly upstream of the Interstate 15 bridge. A small portion of the existing rock would need to be structure; this area could be revegetated when construction is complete. Additionally, placement of a staging area near the Interstate 15 bridge would result in the temporary loss of approximately 1 ha (2.5 acres) of cottonwood-willow riparian forest with a significant *Arundo* scrub component. Construction of the access road from Pedley Avenue to the project area would result in the temporary loss of approximately 0.5 ha (1.2 acres) of predominantly *Arundo* scrub. Losses of *Arundo* scrub and ornamental/ruderal vegetation would be considered less than significant because these are common communities that support weedy non-native plant species. Impacts on cottonwood-willow riparian forest and marsh would be significant because these communities are considered sensitive vegetation types.

If fill material is mined from the areas of *Arundo* scrub near the project area, approximately 4.9 ha (12.1 acres) of *Arundo* scrub habitat would be removed. This would be considered a beneficial impact because of the opportunity for native riparian species to colonize this site.

Under the Combination of Slope Stabilization and Toe Protection Alternative (Alternative 5), placement of the fill would result in the removal of ornamental/ruderal vegetation on some aspects of the bluff slope. This loss would be considered less than significant because this community is dominated by non-native weedy plant species and is common locally, regionally, and statewide. If the buttress fill material for this alternative were mined from the river in *Arundo* scrub stands, 15 ha (37.1 acres) of *Arundo* scrub would be removed; this would be considered a beneficial impact because of the opportunity for native riparian species to colonize this site.

Mitigation would require the development of a detailed mitigation plan by the Corps and the Riverside County Flood Control and Water Conservation District (RCFC&WCD), in conjunction with the US Fish and Wildlife Service (USFWS), and the California Department of Fish and Game (CDFG), to compensate for the permanent and temporary loss of riparian forest and the permanent loss of marsh. Mitigation would involve the removal of *Arundo* scrub stands in the project area and revegetation with riparian species while regrowth of *Arundo* is controlled. Deeply excavated areas previously occupied by *Arundo* scrub may be hydrologically-connected with the Santa Ana River to promote the growth of marsh plants.

<u>Wildlife Impacts</u> - The loss of cottonwood-willow riparian habitat described above would be considered significant primarily because it would represent loss of habitat of riparian obligate bird

Real Estate and Construction Easements

The project would appear to require some fee title acquisitions of real estate. Some construction easements will be required for the temporary and permanent access roads, staging areas, and the project site itself. For the most part, however, these features are located within the streambed and are in public ownership.

The following information is from the Appendix D, "Real Estate Appendix," and relates to both alternatives: The bluff project area would encompass 0.07 square kilometers (17.5 acres). The project would extend along the bluffs for approximately 1,600 meters (1 mile) and would extend away from the bluffs for approximately 46 meters (150 feet). Two temporary roads would be used for access to the base of the bluffs for construction purposes, as well as operation and maintenance purposes. The estimated dimensions of these roads are 700 meters (2,296 feet) by 4.6 meters (15 feet) and 300 meters (984 feet) by 4.6 meters (15 feet) for a total area of 4,570 square meters (49,200 square feet). The required staging area would involve approximately 16,800 square meters (4.2 acres) located on and near Caltrans property.

Operation and Maintenance

The soil cement toe protection structure would require very little maintenance as it should endure much wear. Typically, soil cement structures require very little maintenance as evidenced by conversations with engineers and maintenance personnel of Pima and Maricopa Counties Arizona. Operational inspections are made quarterly, official inspections are made annually, and periodic inspections are made during the flood season as needed. Inspections are made for cracking, which can be patched easily with grout or cement, and surface erosion may be repaired using shotcrete. Inspections are also made for plants that may exacerbate a crack if allowed to grow. These plants are typically killed with a chemical spray. This kind of annual maintenance should cost only $15,000 annually, representing less than 1% of the construction cost.

Catastrophic failure of the structure is not expected, but could occur if the soil below or behind the structure is eroded. This is not expected due to the depth at which the toe is buried (see Appendix B, "Hydraulic Appendix"). Since the NED Plan consists of toe-only protection, the structure could endure up to approximately 1 meter (3.3 feet) of backfill erosion. Backfill erosion would be caused by the greater-than-design flood water elevations. The cost estimate for repair and replacement of the project structure is included in the economic analysis as part of the "life cycle cost" evaluation.

Mitigation Plans

Mitigation for this alternative would include the removal and monitoring of *Arundo*. In addition, the following environmental commitments would be implemented for construction of Alternative 2b.

(1) Warning signs would be placed along the toe protection structure warning persons, including equestrians, of potentially unstable slope conditions.

(2) An erosion control plan would be developed to reduce erosion and sedimentation during construction.

(3) An NPDES permit would be obtained and measures such as use of settling basins would be employed to control turbidity associated with dewatering.

(4) A pollution-prevention and -control plan would be developed to reduce the potential of accidental spills during construction and ensure quick response to clean up any spills.

(5) Water trucks and other standard dust control methods would be used to reduce dust generated by the project.

(6) Habitat lost as a result of implementation of the NED Plan Alternative would be replaced through removal of Arundo and monitoring for a five-year period.

(7) A cowbird trapping plan.

(8) Construction activities will be scheduled to reduce potential impacts on nesting bird species and to preclude removal of nesting birds during vegetation removal.

(9) Biological resources and construction activities would be monitored during the construction period.

(10) Monitoring would be conducted during initial grading to determine whether paleontological resources or prehistoric/historic resources are found.

Construction would halt in areas where any materials are found until a qualified paleontologist or archeologist determines the significance of the find and mitigation is completed if needed.

(11) The project site would be surveyed for hazardous materials before construction begins and any hazardous materials that are found would be removed.

(12) Where possible, construction traffic would use Hamner Avenue to avoid noise and traffic impacts on Pedley Avenue and construction traffic would be reduced during school hours.

(13) Reduced speed limits and funding of crossing guards would be instituted near River View School to decrease construction safety impacts.

Recreation Plans

No recreation plan is associated with Alternative 2b. The NED Plan *could* include an equestrian and pedestrian trail; however, the incorporation or construction of a trail would require additional, potentially major improvements in order to insure the public's safety. Without stabilization of the adjoining bluff, continual erosion and sloughing of the bluff may cause hazardous conditions and present considerable safety concerns. Other than stabilizing the bluff with buttress fill as proposed under the locally preferred plan, safety devices such as barrier fences would need to be so massive as to be cost prohibitive. Although it is expected that people may utilize the access road on top of the soil cement embankment as an equestrian and hiking trail, this practice would be discouraged through the use of signage and caution features. In addition, no recreation local sponsor has been identified for this recreation opportunity.

B. Locally-Preferred Plan

The Locally-Preferred Plan (LPP) as presented in Chapter IV, "Plan Formulation" is the **Combination of Slope Stabilization and Toe Protection Alternative (Alternative 5)** to provide a 100-year level of protection. A cross-section of this alternative is shown on Exhibit 14. Exhibit 16, "Alternative 5: Combination of Slope Stabilization and Toe Protection Alternative, Plan View" displays the plan view of the LPP. The locally preferred plan has the advantage of essentially stopping further bluff retreat. Under the LPP, toe protection component would be constructed as described in the NED Plan section, above, and the bluff slopes would be stabilized with buttressed fill using imported soil. The inclusion of slope stabilization measures in the LPP is considered an incremental upgrade to the NED plan.

Average annual economic benefits associated with the LPP Plan amount to $601,220, with annual life-cycle costs of $591,900. The project would produce $9,320 in net NED benefits annually and would have a benefit-cost ratio of 1.02.

The methods used to construct toe protection under this alternative would be identical to the NED plan, as described above. Once toe protection is in place, the top of the fill would be further compacted and approximately 233,000 cubic meters (305,000 cubic yards) of material would be placed and compacted at a 1V:1.5H slope leading up to the top of the bluff. The LPP would also require approximately 50,000 cubic meters (65,350 cubic yards) of soil for soil cement. With the exception of soil cement, fill material would come from the site. Both permanent and temporary access roads similar to those in the NED plan are part of the LPP. Dewatering allowances for the Locally-Preferred Plan are the same as those for the NED plan.

The estimated time to construct the toe protection portion of the Locally-Preferred Plan is 6 months, the same as the NED plan. Slope stabilization would take approximately 7-9 months to construct but could overlap with construction of the toe protection work—provided the toe protection is in place before the placement of the slope protection begins—so that the total estimated construction time would remain approximately 9 months. Slope stability construction is not necessarily restricted by the flood season, because the protection is located above the 100-year water surface elevation. However, the access road to the site is in the streambed and appropriate precautions would have to be taken to protect equipment and facilities during the flood season. The same modifications to construction timing due to the nesting of the least Bell's vireo would apply to the LPP as well as the NED plan.

Downstream Impacts

No significant downstream (or adjacent area) impacts to erosion, deposition, or turbidity are expected as a result of this plan.

Real Estate and Construction Easements

The project would appear to require some fee title acquisitions of real estate. For the most part, however, these features are located within the streambed and are in public ownership. The LPP will likely impact five privately owned parcels at the top of the bluffs. There would be no need to obtain easements or other rights. Real estate administrative costs were increased for the LPP to reflect the additional costs involved in preparing and processing the rights-of-way.

The following information is from the Appendix D, "Real Estate Appendix," and relates to both alternatives: The bluff project area would encompass 0.07 square kilometers (17.5 acres). The project would extend along the bluffs for 1,600 meters (1 mile) and would extend away from the bluffs for approximately 46 meters (150 feet). Two temporary roads would be used for access to the base of the bluffs for construction purposes, as well as operation and maintenance purposes. The estimated dimensions of these roads are 700 meters (2,296 feet) by 4.6 meters (15 feet) and 300 meters (984 feet) by 4.6 meters (15 feet) for a total area of 4,570 square meters (49,200 square feet). The required staging area would involve approximately 16,800 square meters (4.2 acres) located on and near Caltrans property.

Operation and Maintenance

The operation and maintenance of the toe protection component of the LPP is the same as described under the NED plan. The buttress fill slope protection component would be hydroseeded after completion. Local drainage is insignificant and erosion of the buttress fill is not expected. The annual operation and maintenance cost of the LPP would be similar to that for the NED Plan.

Catastrophic failure of the structure is not expected, but could occur if the soil below the structure is eroded. This is not expected due to the depth at which the toe is buried (see Appendix B, "Hydraulic Appendix"). The "life-cycle costs" for the LPP do not include any repair and replacement costs since the buttress fill slope stabilization component of the LPP precludes any adverse effects from occurring from a greater-than-design event.

Mitigation Plans

Mitigation for this alternative would include provisions for vegetative growth along the slopes to reduce the potential for erosion from overland, bluff-top runoff. Increased development of marsh and riparian habitat at the base of the bluffs would offer additional habitat value and could help mitigate any environmental impacts from implementation of the LPP. An overriding priority would be given to removing as much of the invasive *Arundo donax* as possible. The following environmental commitments would be implemented for construction of the Locally-Preferred Plan.

(1) An erosion control plan would be developed to reduce erosion and sedimentation during construction.

(2) An NPDES permit would be obtained and measures such as use of settling basins would be employed to control turbidity resulting from dewatering.

(3) A pollution-prevention and -control plan would be developed to reduce the potential of accidental spills during construction and ensure quick response to clean up any spills.

(4) Water trucks and other standard dust control methods would be used to reduce dust generated by the project.

(5) Habitat lost as a result of implementation of the LPP Plan Alternative would be replaced through removal of Arundo for a 5-year period.

(6) A cowbird trapping plan.

(7) Construction activities will be scheduled to reduce potential impacts on nesting bird species and to preclude removal of nesting birds during vegetation removal.

(8) Biological resources and construction activities would be monitored during the construction period.

(9) Monitoring would be conducted during initial grading to determine whether paleontological resources or prehistoric/historic resources are found. Construction would halt in areas where materials are found until a qualified paleontologist or archeologist determines the significance of the find and mitigation is completed if needed.

(10) The project site would be surveyed for hazardous materials before construction begins and any hazardous materials that are found would be removed.

(11) Where possible, construction traffic would use Hamner Avenue to avoid noise and traffic impacts on Pedley Avenue and construction traffic would be reduced during school hours.

(12) Reduced speed limits and use of crossing guards would be instituted near River View School to decrease construction traffic safety impacts.

Recreational Plans

The LPP provides a reasonable opportunity for an equestrian and pedestrian trail. There are several factors which enhance the suitability of the site for passive recreational use, including (1) the five meter (16.4 feet) wide service road along the top of the soil cement toe protection component, (2) the stabilization of the slope above the permanent service road, (3) the project's location next to a regional natural open space park, and (4) the informal use of the area by local equestrians and hikers.

The trail associated with the LPP would be constructed of decomposed granite or other material suitable as both an equestrian and service vehicle road. The trail would terminate at the proposed limits of the service road, but could be extended from its current terminus east to the City of Norco's planned equestrian facility at Pedley Avenue. At the southern terminus of the planned road, the trail could be extended to Hamner Avenue on the west side of the Interstate 15 freeway.

The cost of incorporating a trail into the LPP would be reduced due to the fact that the proposed service road would not require modification for equestrian use. The cost would include trail head signage and a safety fence. The estimated construction costs are $114,250.

It should be noted, however, that the study local sponsor, is not proposing any recreational component to the LPP, no recreation local sponsor has been identified, and no recreation costs are included in project costs.

C. Plan Selection

The plan that is selected for recommendation is the Locally-Preferred Plan, the Combination of Slope Stabilization and Toe Protection Alternative (Alternative 5), for the following reasons. It provides substantially more protection for the homes and utilities on the bluff. With the NED Plan in place, the near-vertical, 15 meter (50 foot) high face of the existing bluff would continue to retreat to its natural angle of repose. Based upon observations provided by the local sponsor, the Riverside County Flood Control and Water Conservation District (RCFC&WCD), the bluff top would continue to recede at a rate of at least 0.076 meters (0.25 feet) per year. Even with the NED Plan in place, the factors that contribute to bluff sloughing would still be in effect. The factors include streamflow over the top of the toe protection and running along the face of the bluff (residual damages), frequent earthquake vibrations or forces acting on the bluffs, continual loading and unloading forces of the traffic along River Drive, any change in the location of the ground water table, plus the minor effects of wind and rain erosion, decaying roots, animal and bird burrows, and the vibrations due to any local construction work including the installation of the toe protection or repaving of River Drive. The LPP, by comparison, precludes additional bluff sloughing due to any of these damage sources. It thereby extends the life of 36 structures for a longer period of time than does the NED plan. In addition, the LPP also eliminates the possible condemnation of River Drive. Since a justified NED Plan exists, the Locally-Preferred Plan is considered an upgraded plan that provides the local sponsors with a higher level of protection than the NED plan.

VI. PLAN IMPLEMENTATION

A. Study Recommendation

Both the identified NED and LPP Plans are bank stabilization projects. Since these project purposes are not currently supported by any existing Corps statutory authority, no further Federal action is being recommended.

B. Cost Allocation

If a project were to be authorized, appropriate cost sharing would need to be established in the authorizing language.

C. Institutional Requirements

If the study recommendation were to implement a cost-shared project, the local sponsor, Riverside County Flood Control and Water Conservation District (RCFC&WCD), would normally prepare the following preliminary financial analysis:

(1) RCFC&WCD's project-related yearly cash flows (both expenditures and receipts where cost recovery is proposed), including provisions for major rehabilitation and operational contingencies and anticipated but uncertain repair costs resulting from damages from natural events;

(2) RCFC&WCD's current and projected ability to finance its share of the project cost and to carry out project implementation operation, maintenance, and repair/rehabilitation responsibilities; and

(3) The means for raising additional non-Federal financial resources including but not limited to special assessment districts.

(4) The steps that RCFC&WCD would take to ensure it would be prepared to execute its project-related responsibilities at the time of project implementation.

In addition, as part of any Project Cost Sharing Agreement, the RCFC&WCD would be required to undertake to save and hold harmless the Federal government against all claims related to bluff stabilization.

D. Environmental Requirements

The NED Plan Alternative and the Locally-Preferred Plan Alternative would result in discharge of fill material into waters of the United States. It also may result in longer-term discharges associated with operation and maintenance activities. A Section 404(b)(1) evaluation has been prepared to address practicable alternatives. The Corps will be recommending no Federal involvement in the project and the project will not then be exempt under 404(r) criteria. The local sponsor will then be required to obtain permits under Section 404 and Section 101. An NPDES permit will also be required if excavations are dewatered and water discharged to the river.

Other requirements relating to the California Department of Fish and Game and California Regional Water Quality Control Board, Santa Ana Region, would need to be addressed by the local sponsor.

E. Views of the Non-Federal Sponsor

The Riverside County Flood Control and Water Conservation District (RCFC&WCD) has expressed interest in continuing to be the local sponsor for any project implementation. They have indicated their support for the project and a willingness to assume cost shared financial obligations for its implementation.

VII. SUMMARY OF COORDINATION, PUBLIC VIEWS, AND COMMENTS

A public workshop was held in the City of Norco in 1993 during preparation of the Reconnaissance Study. The major issues raised included public concern about bluff erosion and potential for damage to private property and utilities.

At the start of the Feasibility Phase of study, a notice of intent (NOI) to prepare an EIS was published by the Corps of Engineers to solicit comments on the document, and a notice of preparation (NOP) to prepare an EIR was prepared by the Riverside County Flood Control and Water Conservation District (RCFC&WCD). A single written response to the NOI was received from the United States Fish and Wildlife Service (USFWS). Comments in response to the NOP were received from USFWS, California Regional Water Quality Control Board (Santa Ana Region), California Department of Transportation, and the California Department of Fish and Game (CDFG). The major concerns expressed in these comments related to habitat loss, effects on wildlife species, and potential impacts on water quality that a bluff stabilization/erosion protection project may have.

A Public Involvement Plan was developed by the local sponsor and the Corps of Engineers during the initial few months of the feasibility phase. This plan identified the public involvement work and services necessary during the Feasibility Phase of the study. In addition, the plan included copies of applicable guidance from Corps regulations. As part of the Public Involvement Plan, copies of the 1993 Corps Norco Bluffs Reconnaissance Report were placed in public libraries in Norco, Corona, and Riverside, California.

The Public Involvement Plan also included the development of a mailing list by the Corps, the Local Sponsor, and the City of Norco. This list includes Congressional contacts, interested agencies and groups, and individuals. The list totals about 220 names, including all landowners along the bluff edge.

A Public Workshop was held in Norco on November 29, 1994. The mailing list was used, in addition to a news release to local newspapers, to announce the workshop. About 80 interested individuals attended the workshop. In March 1995, a five page mailer was sent to all meeting attendees, as well as the entire mailing list, which summarized the results of the workshop.

Public concerns identified during the November 1994 Public Workshop included:

(1) A high level of interest and concern exists, particularly from residents along the bluff top, for a rapid and permanent solution to stabilizing the bluffs.

(2) Environmental issues, especially protection of the riparian habitat for the endangered least Bell's vireo, are of major concern to environmental agencies and a few local residents.

(3) Relocation of homes along the bluff top is not a locally acceptable solution.

(4) Local citizens would like to see a solution which enhances recreational opportunities in the area.

(5) Any solution should be visually acceptable to the local community.

A public scoping meeting was held on September 21, 1995 to obtain comments from the general public concerning the scope and alternatives to be considered in the EIS/EIR. Approximately 35 persons attended the meeting. The meeting included a short presentation by Corps staff members and an opportunity for questions and formal comments.

Most comments centered around the project itself and the timing of construction. Alternative types of toe protection and slope stabilization were also discussed. Major environmental concerns included the speed of the project and the necessity to mitigate for habitat loss. There was also concern expressed by residents near River Drive regarding plans by the City of Norco to designate the area on the south side of the street as an equestrian trail, forcing on-street parking to the northern side near the bluff face.

A public hearing on the draft EIR/EIS and Report was held in Norco on July 18, 1996. About 60 persons attended. There was widespread support expressed for implementation of a bank

stabilization project, with the LPP being the favored plan. The lack of current Corps authorization was discussed, and public comments at the meeting expressed a desire for such authorization and subsequent construction.

VIII. CONCLUSIONS AND RECOMMENDATION

A. Conclusions

Implementation of a plan to provide erosion control and/or bluff stabilization in the Norco Bluffs area presents an opportunity to eliminate the continual bluff retreat that currently threatens existing homes, public utilities, and public roads. Under the without-project scenario, bluff retreat would continue at an average annual rate of 1.2 meters (4.0 feet), resulting in expected annual damages of $601,220. This Feasibility Study has identified two alternatives that would offer protection against the erosive effects of the Santa Ana River and subsequent bluff sloughing.

The NED Plan would provide toe-only protection through the construction of a soil cement levee throughout the 1,600 meter (1 mile) length of the study area. The NED Plan is economically, engineeringly, and environmentally feasible and would be effective in stopping the toe erosion that destabilizes the bluff face. However, the currently unstable bluff top would continue to slough until it reaches its natural angle of repose. This would impact an additional 52 feet along the bluff top that would be lost. The NED Plan has average annual economic benefits of $453,560, with annual life-cycle costs of $384,900. The project would produce $68,660 in net NED benefits annually and would have a benefit-cost ratio of 1.18.

In addition, this study identified a 100-year level of protection, Locally-Preferred Plan (LPP) that would provide toe protection plus slope stabilization through the construction of a buttress slope throughout the 1,600 meter (1 mile) study length. The LPP is engineeringly and environmentally feasible, and would be effective in not only stopping the toe erosion but also halting further retreat of the bluff top. The LPP is economically feasible using fill material from an adjacent area, with average annual economic benefits of $601,220 and annual life-cycle costs of $591,900, yielding $9,320 in net NED benefits annually and a benefit-cost ratio of 1.02.

Although the LPP costs more than the NED Plan, it provides greater benefits by halting erosion, saving bluff top homes, and protecting River Drive and existing utilities from destruction. Trade-offs between the NED Plan and LPP include the increased, unquantifiable benefits to public health and safety provided by the LPP. The LPP would be the most satisfactory choice for selection as the recommended plan. However, both the NED and LPP plans are bank stabilization projects for which no statutory Corps authority exists. They are, therefore, not being recommended for further Federal participation at this time.

B. Additional Study Needs

If this study is pursued to the next level of detailed design, it would need to further investigate fill sources. Due to the construction schedule potentially impacting least Bell's vireo nesting habitat, the effect of staged construction on costs and constructibility would also need to be further investigated.

C. Recommendation

REGRETFULLY
I do not recommend implementation of a plan of bank stabilization for the Norco Bluffs area in Riverside County, California, because no statutory Corps authority exists.

Michal R. Robinson
Colonel, Corps of Engineers
District Engineer

IX. REFERENCES

COE, 1995. *Draft Technical Review Team Assessment of F-4 Report on Norco Bluffs Feasibility Study*. November 18, 1995.

COE, 1993. *Reconnaissance Report, Norco Bluffs, Riverside County, California, Main Report*. April 1993.

Leighton and Associates, 1969. *Geologic Engineering Investigation of the Bluff Area, City of Norco, County of Riverside*. October 21, 1969.

Leighton and Associates, 1980. *Report of 1980 Storm Damage along the Santa Ana River Bluffs, City of Norco, California*. July 10, 1980.

EXHIBITS

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Exhibit 2.	Erosion Zones
Exhibit 3.	Norco Bluffs and Santa Ana River Drainage
Exhibit 4.	Urban Area
Exhibit 5.	Chronological Sequence of Bluff Retreat
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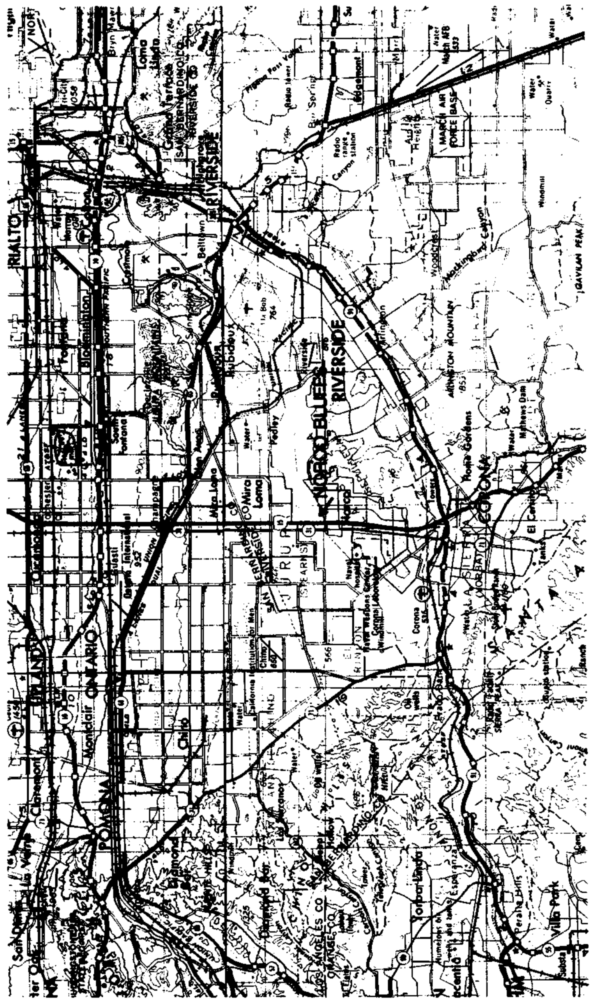
Exhibit 15.	Alternative 2b: Soil Cement Toe Protection Alternative, Plan View
Exhibit 16.	Alternative 5: Combination of Slope Stabilization and Toe Protection Alternative, Plan View



Map Source: USGS 1:250,000 Santa Ana & San Bernardino Topographic Map

1" = 3.95 miles

NORCO BLUFFS FEASIBILITY STUDY
Bluff Stabilization Study

Regional Map

Exhibit 1

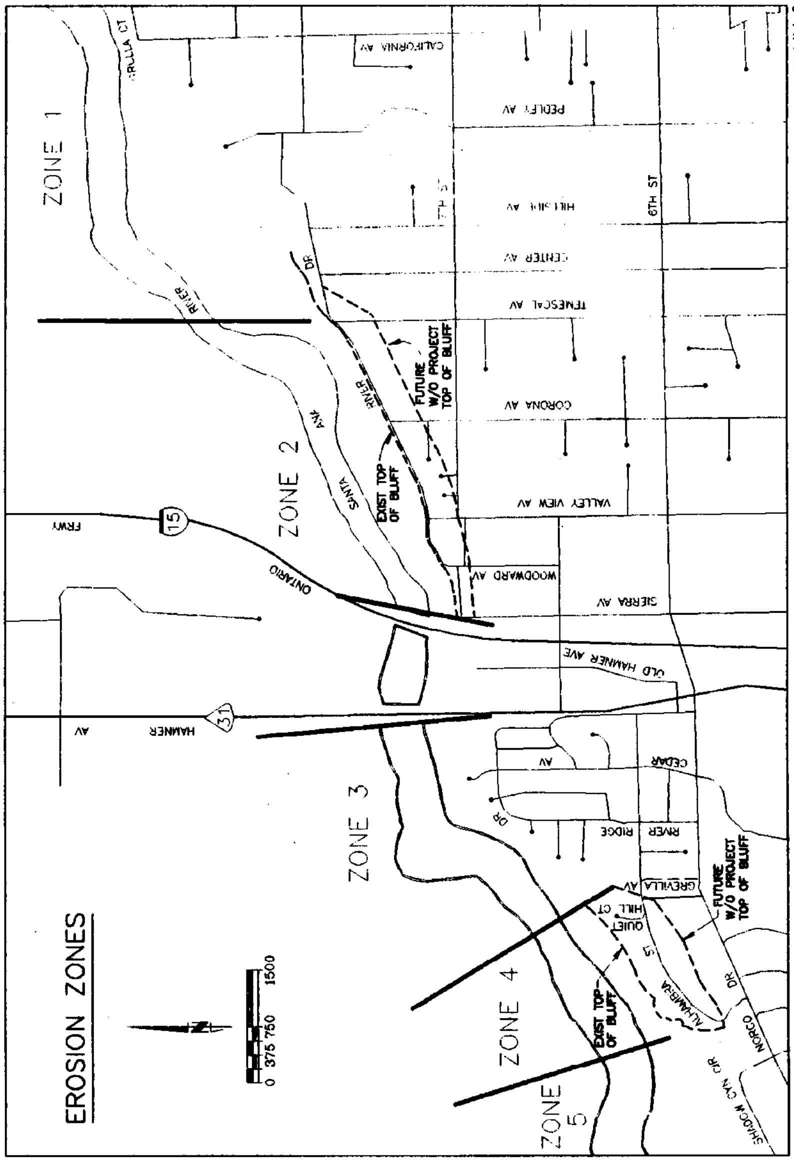

EROSION ZONES
0 375 750 1500
ZONE 1
ZONE 2
ZONE 3
ZONE 4
ZONE 5
EXIST TOP OF BLUFF
FUTURE W/O PROJECT TOP OF BLUFF
SANTA ANA RIVER DR
ONTARIO FRWY
15
31
HAMNER AV
OLD HAMNER AVE
CALIFORNIA AV
PEDLEY AV
HILLSIDE AV
CENTER AV
TEMESCAL AV
CORONA AV
VALLEY VIEW AV
WOODWARD AV
SIERRA AV
6TH ST
CEDAR AV
RIVER RIDGE DR
GREVILLA AV
QUIET HILL CT
ALHAMBRA ST
NORCO DR

Exhibit 2

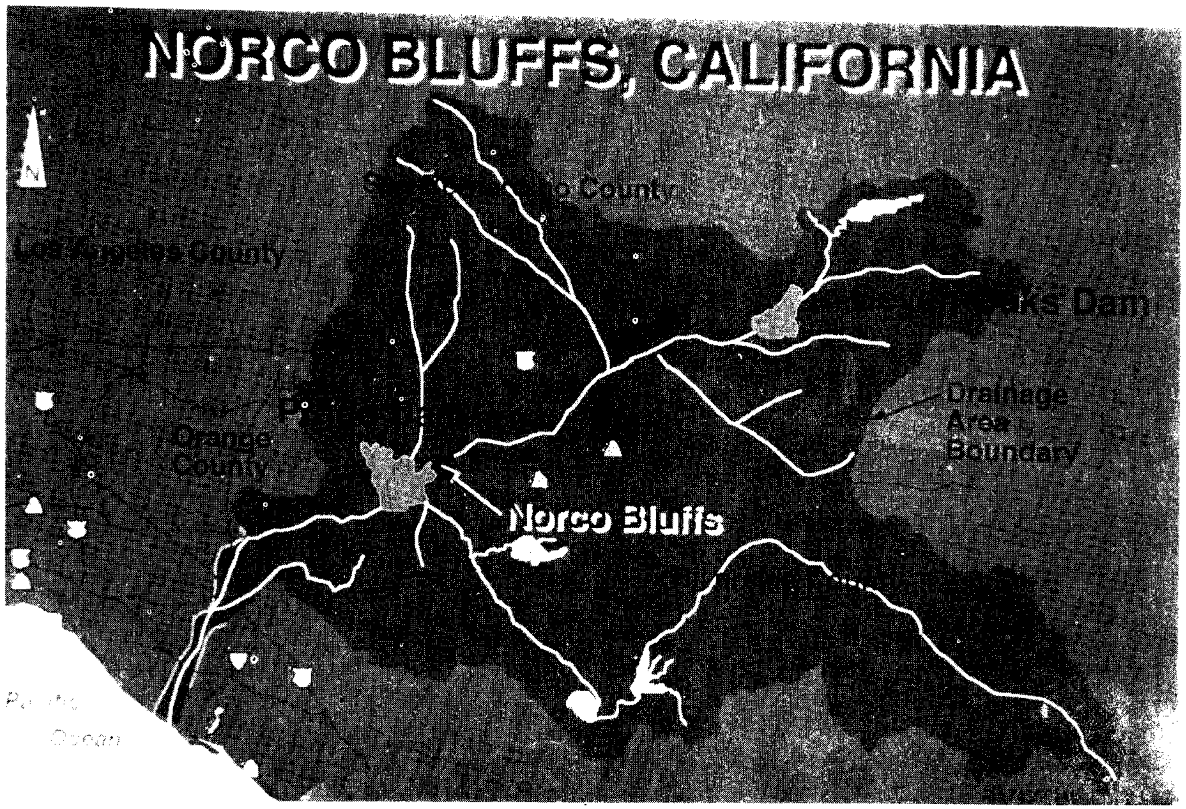


Exhibit 3. Norco Bluffs and Santa Ana River Drainage

Aerial View of Norco Bluffs, CA Study Area
View Looking South (1992)

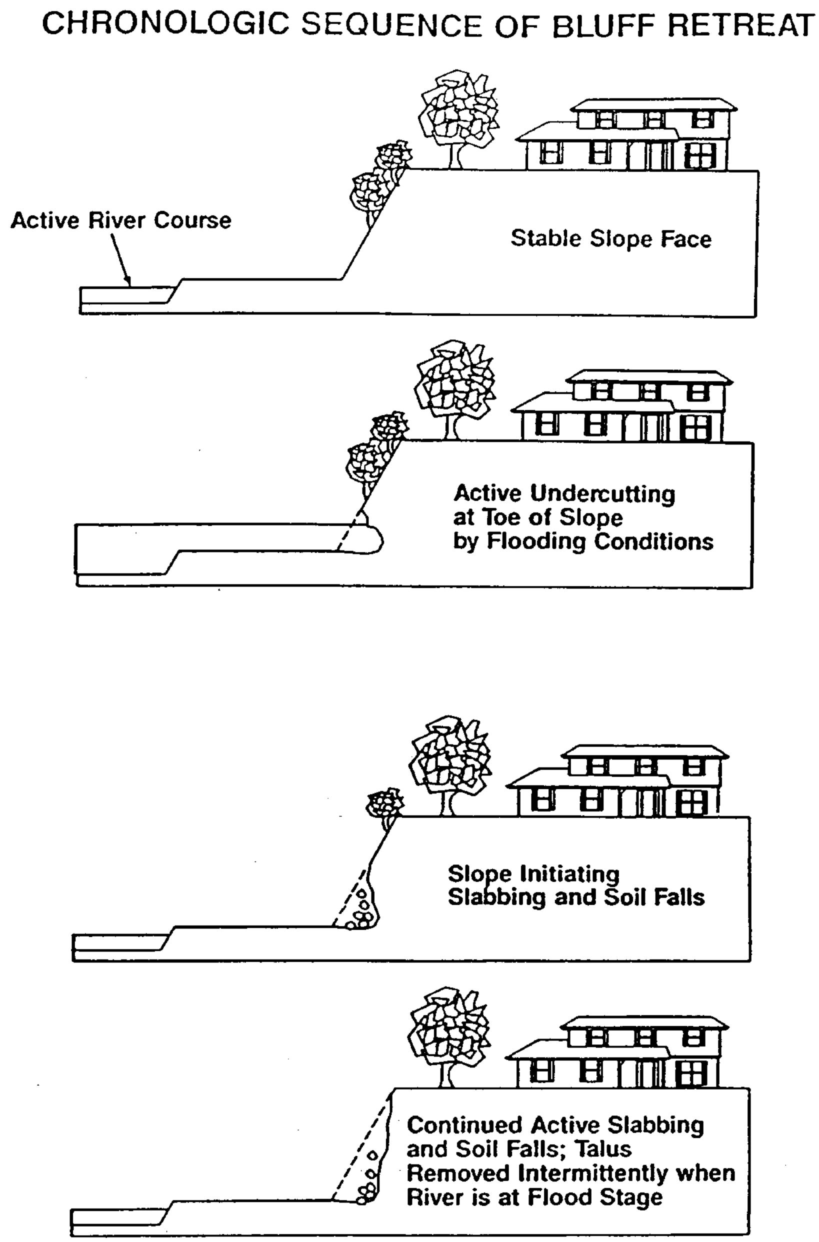
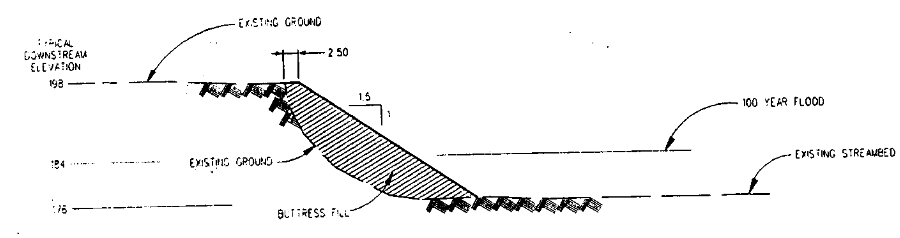


Exhibit 5. Chronological Sequence of Bluff Retreat

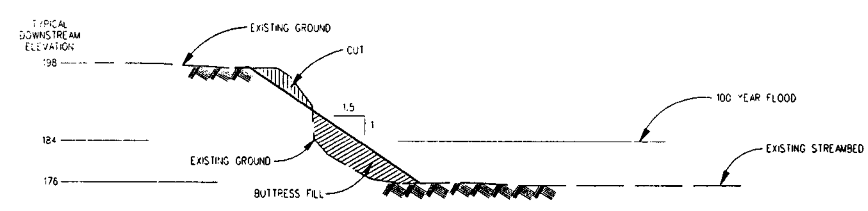


Not to scale
All dimensions shown in meters

NORCO BLUFFS FEASIBILITY STUDY

ALTERNATIVE 1A: BUTTRESS FILL (IMPORTED)

Exhibit 6



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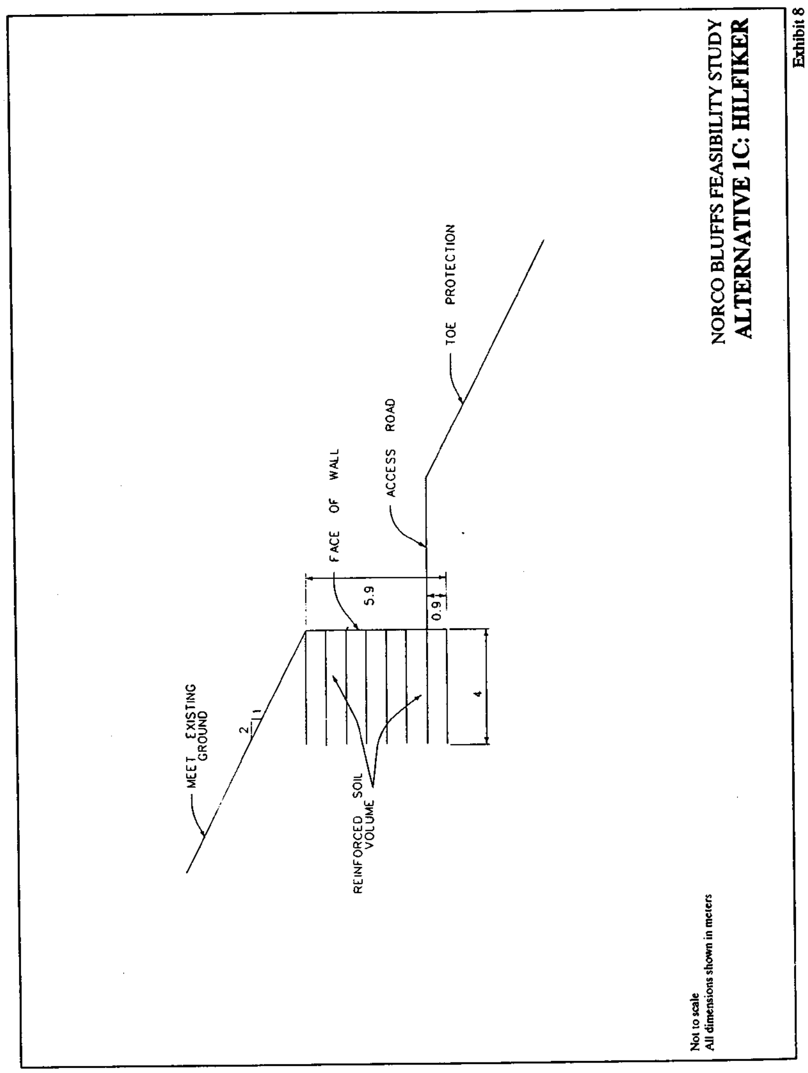
All dimensions shown in meters

NORCO BLUFFS FEASIBILITY STUDY

ALTERNATIVE 1B: BUTTRESS FILL (CUT & FILL)

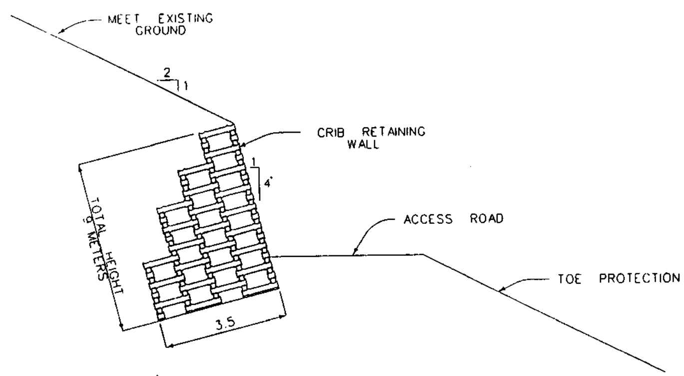
Exhibit 7



NORCO BLUFFS FEASIBILITY STUDY

ALTERNATIVE 1C: HILFIKER

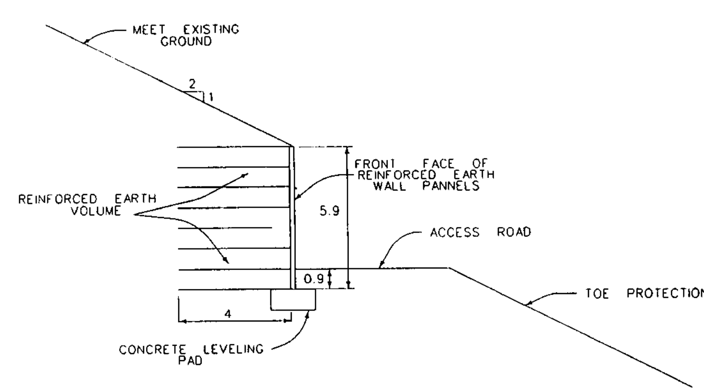
Exhibit 8



Not to scale
All dimensions shown in meters

NORCO BLUFFS FEASIBILITY STUDY
ALTERNATIVE 1D: CRIB WALL/EARTHLOCK

Exhibit 9



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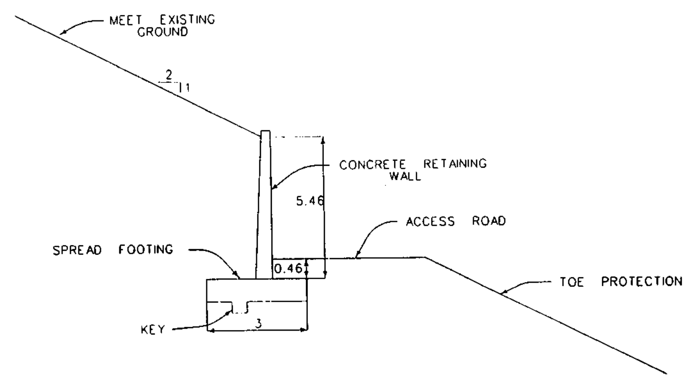
All dimensions shown in meters

NORCO BLUFFS FEASIBILITY STUDY

ALTERNATIVE 1H: REINFORCED EARTH

Exhibit 10



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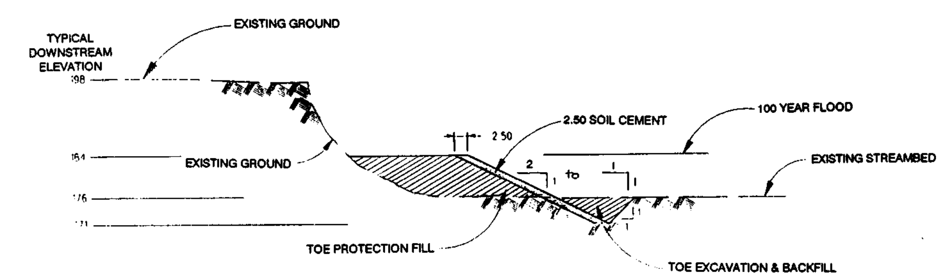
All dimensions shown in meters

NORCO BLUFFS FEASIBILITY STUDY
ALTERNATIVE 1I: CONCRETE RETAINING WALL

Exhibit 11

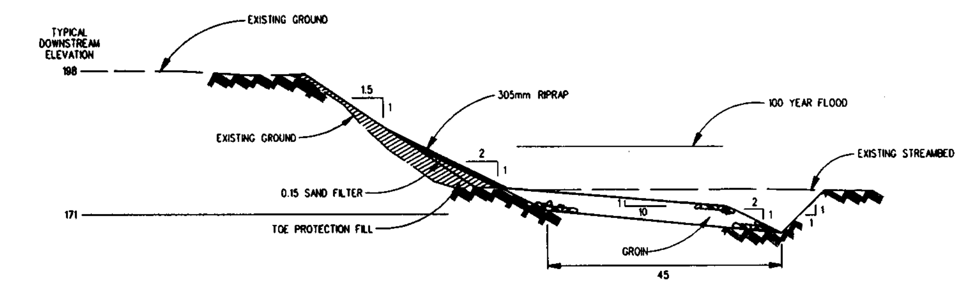


Not to scale
All dimensions shown in meters

NORCO BLUFFS FEASIBILITY STUDY

ALTERNATIVE 2B: SOIL CEMENT

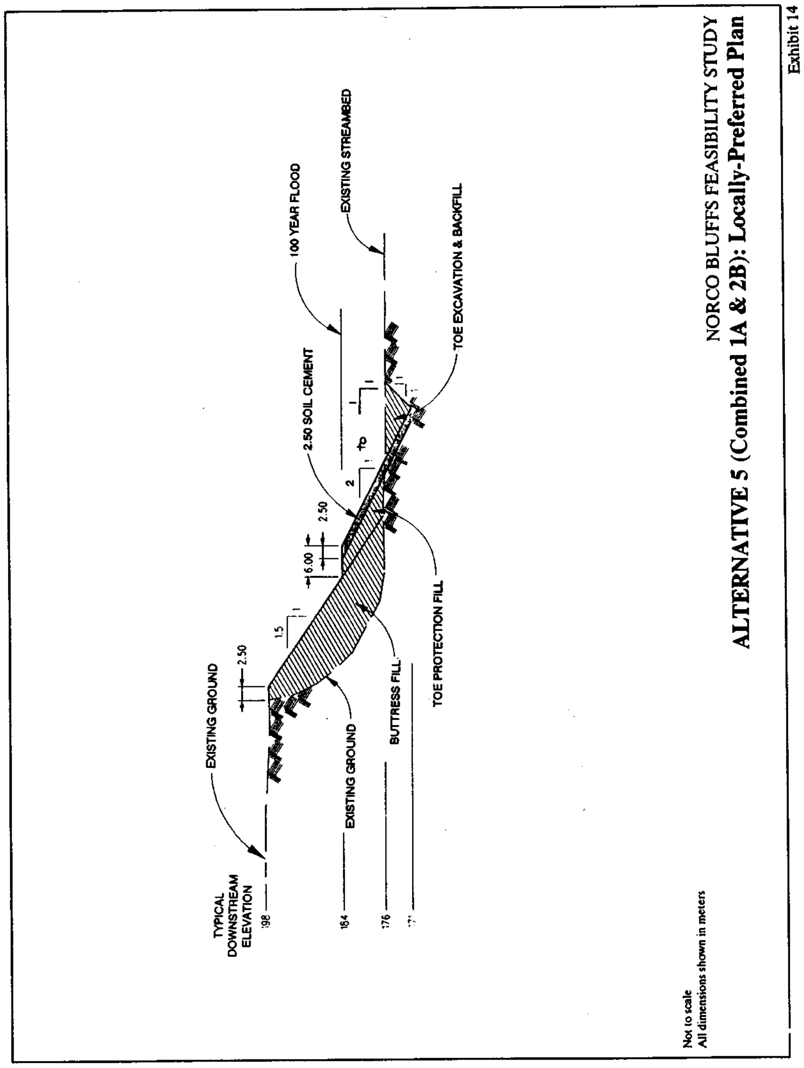
Exhibit 12



NORCO BLUFFS FEASIBILITY STUDY

ALTERNATIVE 2F: GROINS

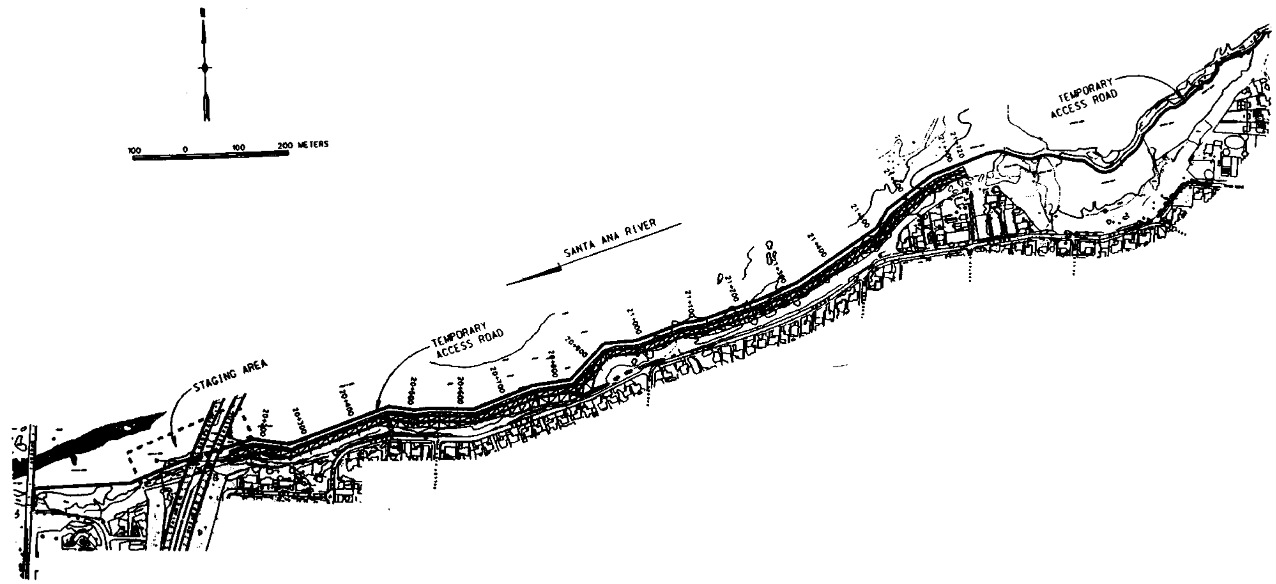
Exhibit 13



NORCO BLUFFS FEASIBILITY STUDY

ALTERNATIVE 5 (Combined 1A & 2B): Locally-Preferred Plan

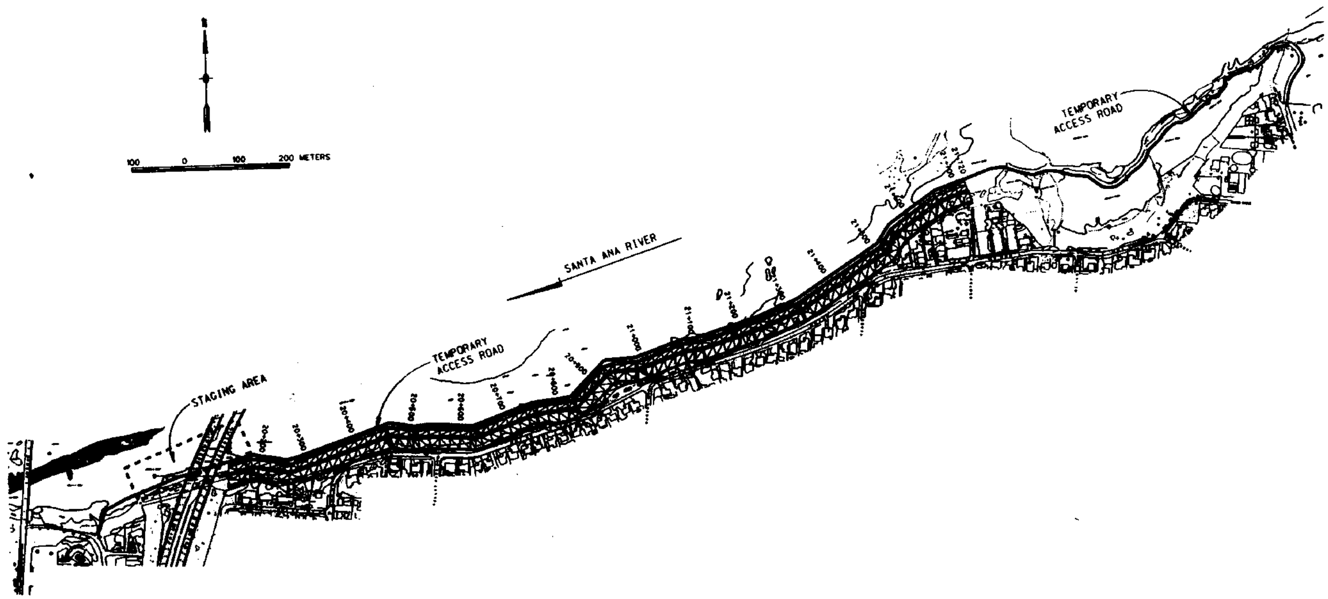
Exhibit 14



NORCO BLUFFS FEASIBILITY STUDY

Alternative 2b: Soil Cement Toe Protection Alternative, Plan View

Exhibit 15



NORCO BLUFFS FEASIBILITY STUDY

Alternative 5: Combination of Slope Stabilization and Toe Protection Alternative, Plan View

Exhibit 16

PHOTOGRAPHS

Photo 1 - Heavy runoff in 1980 caused major flows to impinge upon the bluffs near Woodward Drive, scouring the base of the bluffs. Geologists estimate that approximately 30 feet of bluff top receded during the 1980 storms.

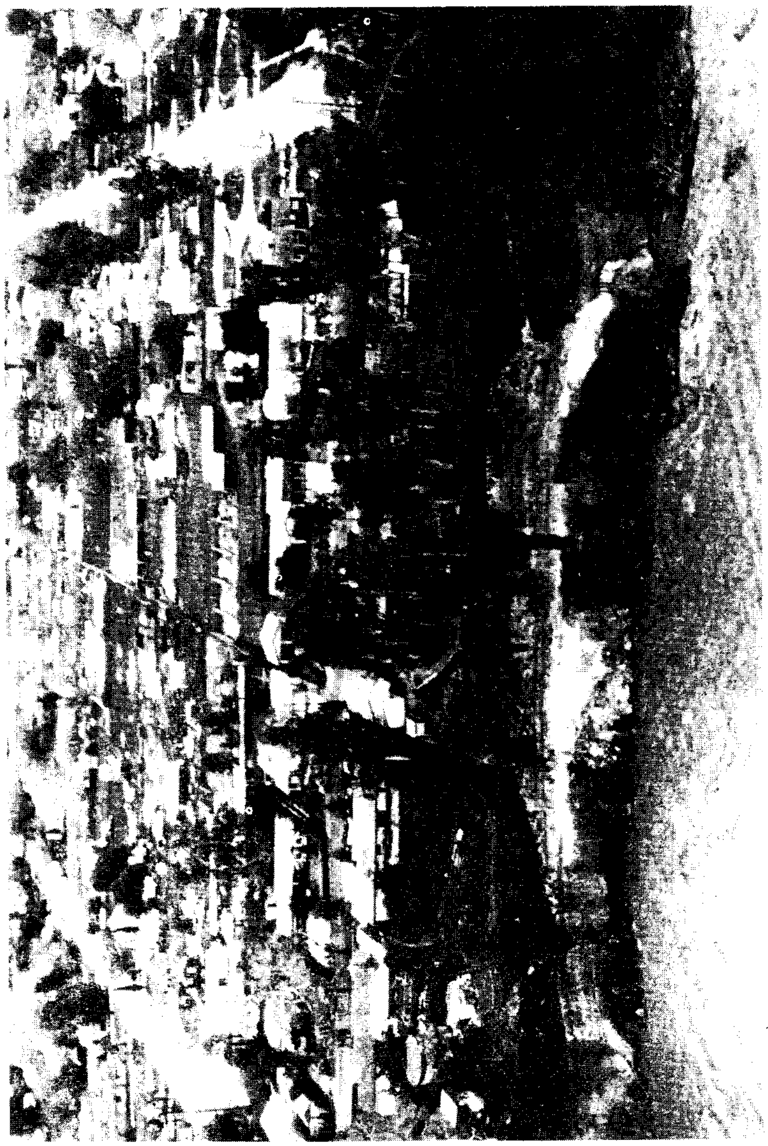


Photo 2- This photo was taken in 1980 in the same area as photo 1. Note the scouring action taking place at the base of the bluffs.

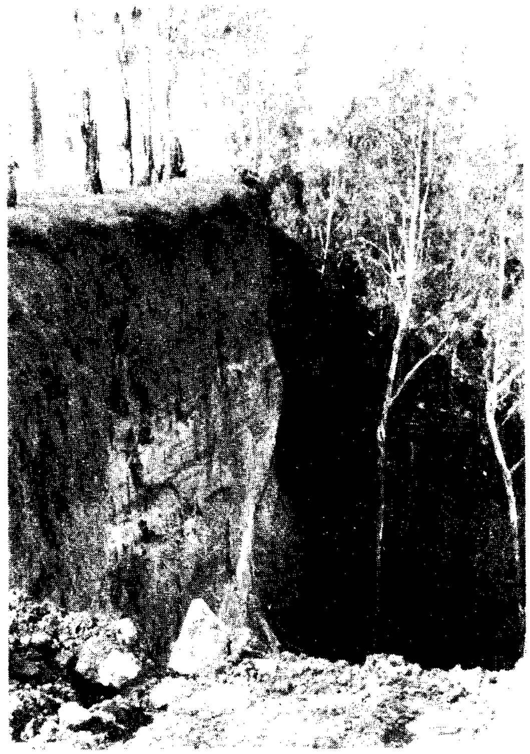


Photo 3 View Looking Downstream (West) Along River Drive (Feb. 95)

Photo 4 View Looking Upstream (East) along River Drive. Area of Local Fill and Trash Disposal

Photo 5 View Along River Drive Looking Downstream (West).
Note Local Attempts to Control Erosion. (Feb. 95)

Photo 6 View Looking Upstream (East) Along River Drive.
Bluffs Approx. 60′ at This Location. (Feb. 95)

Photo 7 Bluff top erosion along River Dr. During storm in January 1995.

Photo 8 Downstream end of Study Area (Zone 2). Interstate 15 Bridge in background. (Feb. 95)

Photo 9 View of Trash Accumulation at Toe of Bluff (Feb. 95)

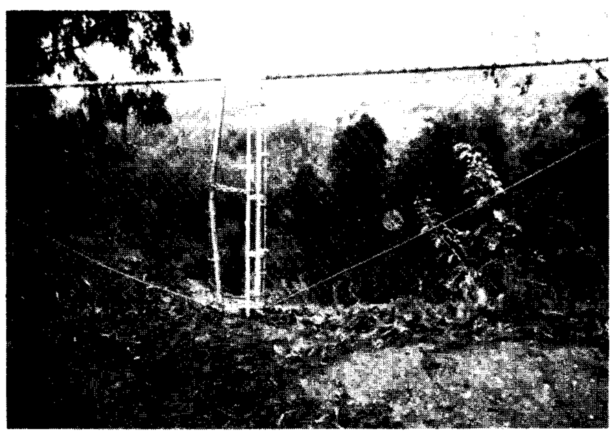


Photo 10 Attempt by locals to fence bluff top.
This fence is within three feet of River Dr. (Feb. 95)

Photo 11 Illegal dumping along River Dr. Note cracks in bluff top foreground. (Feb 95)

Photo 12 View looking over bluff along River Dr. Note trash accumulation. (Feb. 95)

Photo 13 Aerial view , looking south, of Zones 3,4, and 5. This area is downstream from the Interstate 15 Bridge, and bluff instability will be addressed by the Santa Ana Project as part of Prado Dam modifications.

ENVIRONMENTAL IMPACT STATEMENT

Draft Environmental Impact Statement/Environmental Impact Report

Norco Bluffs Bank Stabilization Measures

SCH #96061044

Los Angeles District
U.S. Army Corps of Engineers

Riverside County Flood Control and Water Conservation District

August 1996

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**FINAL ENVIRONMENTAL IMPACT STATEMENT/
ENVIRONMENTAL IMPACT REPORT
FOR THE NORCO BLUFFS BANK STABILIZATION MEASURES**

FEDERAL LEAD AGENCY:	Department of the Army, U.S. Army Corps of Engineers, Los Angeles District
STATE LEAD AGENCY:	Riverside County Flood Control and Water Conservation District
AFFECTED JURISDICTION:	City of Norco, Riverside County, California

ABSTRACT

This document addresses the potential environmental impacts associated with implementation of the proposed stabilization of the Norco Bluffs banks, which are located along the Santa Ana River in the city of Norco. The toe of the bluffs has undergone substantial erosion resulting in the collapse of sections of the bluff and the endangerment of approximately 56 structures, roadways, and utilities along the bluff. Two alternatives plus the No Action Alternative are under consideration. The preferred action National Economic Development Alternative is the construction of an earthen toe protection structure with soil cement erosion protection. The Locally Preferred Plan is the preferred alternative and consists of toe protection with stabilization of the bluff slopes using buttress fill.

This document will be used by the U.S. Army Corps of Engineers (Corps) in conjunction with the Corps' feasibility report for the project to determine whether to implement one of the alternatives. As discussed in the Main Report, no statutory authority rests with the Corps to implement this project. Congressional authorization would be required. The Riverside County Flood Control and Water Conservation District will also use this document to determine whether or not to implement the project.

Public Comments on the final document and further information may be provided to Mr. Alex Watt at the U.S. Army Corps of Engineers, Los Angeles District, at 911 Wilshire Boulevard, P.O. Box 2711, Los Angeles, California 90017-3401. Phone (213) 452-3860.

Executive Summary

INTRODUCTION

This final environmental impact statement/environmental impact report (EIS/EIR) has been prepared by the U.S. Army Corps of Engineers, Los Angeles District (Corps), and the Riverside County Flood Control and Water Conservation District to analyze the environmental impacts of the proposed protection of a portion of the bluffs along the Santa Ana River in the City of Norco, California. This project is proposed to stop extensive undercutting of the toe of the bluffs, which has caused bluff collapse and endangerment of homes, roads, and utilities. This executive summary generally describes the conclusions of the EIS/EIR. The reader is referred to the main document for detailed information.

PROJECT PURPOSE AND NEED

The purpose of the National Economic Development (NED) Plan Alternative and the Locally-Preferred Plan Alternative (Preferred Alternative) is to reduce the potential for slope erosion along the actively eroding portions of the Norco Bluffs. The toe of the Norco Bluffs along the Santa Ana River has undergone extensive undercutting, resulting in erosion and threatening future retreat of the bluffs. The erosion has resulted in the condemnation and subsequent demolition of one home and undermining and closure of a major residential access street. It is estimated that approximately 56 structures, as well as roadways and utilities such as sewer lines, water lines, and gas lines, may be at risk during future erosional events.

ALTERNATIVES CONSIDERED

Alternatives Considered in Detail in the Environmental Impact Statement/ Environmental Impact Report

Toe Protection Only, Using Soil Cement (NED Plan Alternative)

This alternative would involve the placement of fill material to a level just above the 25-year floodplain for a length of approximately 1,600 meters (5,249 feet). The outer edge (river side) of the fill would be hardened by soil cement to prevent erosion. Approximately 61,000 cubic meters (79,701 cubic yards) of fill material and approximately 37,300 cubic meters (48,786 cubic yards) of soil cement would be required for this alternative. This material either would be obtained offsite and trucked in or would be mined in disturbed areas of the Santa Ana River. The project would involve permanent removal 2.0 hectares (ha) (4.94 acres) of habitat on a permanent basis and 4.5 ha (11.1 acres) of habitat on a temporary basis. Construction time is estimated at 6 months.

Toe Protection Using Soil Cement with Slope Protection Using Buttressed Fill (Locally Preferred Plan Alternative and Preferred Alternative)

Under this alternative, slope stabilization measures would be taken concurrently with construction of toe protection. The slope protection process would add approximately 3 to 4 months (a total of 9 to 10 months) to the construction schedule and increase the amount of fill material by 213,000 cubic meters (278,592 cubic yards). This alternative would have the advantage over the NED Plan Alternative (toe protection only) of stabilizing currently unstable slopes. Total construction time is estimated at nine to ten months.

No-Action Alternative

The No-Action Alternative would consist of continuation of present conditions without toe protection or slope stabilization or any other method of reducing erosion. The bluffs would continue to erode, which would cause more residential units and outbuildings to become jeopardized and result in the eventual loss of utilities and homes along River Drive.

Alternatives Considered, but Not Analyzed in Detail in the Environmental Impact Statement/Environmental Impact Report

Several other alternatives were considered initially but were rejected from detailed analysis because they were determined to be technically, environmentally, and/or economically infeasible.

Nonstructural Alternative

This alternative would consist of the acquisition and removal of homes that are in jeopardy from bluff failure. No toe protection would be used under this alternative. Although this alternative would not result in loss of riparian vegetation in the Santa Ana River, the alternative was rejected because it would not resolve the bluff erosion problem, could result in substantial socioeconomic impacts, was economically infeasible, and not locally acceptable.

Channelization

This alternative would involve channelizing the section of the Santa Ana River in the area of erosion. This alternative was rejected because of the potentially significant environmental damage that channelization would create and because it was economically infeasible.

Alternative Toe Protection Designs

Several other methods were considered for toe protection, including use of groins, riprap, and concrete. These alternatives were more costly than the NED Plan Alternative and Locally-Preferred Plan Alternative. Environmental impacts would be the same as or greater than those associated with the NED Plan Alternative and the Locally-Preferred Plan Alternative.

Alternative Slope Stabilization Methods

Several methods of slope stabilization were investigated, including retaining walls and similar devices. These methods would be more expensive than the methods proposed.

MAJOR FINDINGS AND CONCLUSIONS

Table S-1 summarizes impacts of and suggested mitigation for the two alternatives for bluff stabilization and the No-Action alternative. In general, both alternatives would result in a substantial impact on riparian vegetation in the riverbed. Although some of the area can be revegetated, the impact is considered significant. This riparian vegetation is also critical habitat for the least Bell's vireo and the willow flycatcher. Both alternatives would result in significant construction-related impacts, including impacts related to noise, air pollutant emission, traffic safety issues, and water quality.

Monitoring by the Corps or an environmental contractor approved by the Corps will be conducted throughout project construction to ensure that all activities strictly adhere to the project's erosion and sediment control and pollution prevention and control plans, and to ensure project compliance with all permit conditions and pollution prevention measures including those attached to Regional Water Quality Control Board's Water Quality Certification (Section 401) and the California Department of Fish and Game Streambed Alteration Agreement (Section 1601). A construction monitoring plan will be developed prior to the state of construction to specifically address the timing and frequency of construction monitoring and the procedure for communicating potential noncompliance issues to the Corps, the project sponsor(s) and the construction contractor(s).

Table S-1. Summary of Impacts and Mitigation Measures

NED Plan Alternative	Locally-Preferred Plan Alternative (Preferred Alternative)	No Action Alternative
	Topography	
Impact - no significant impact Mitigation - no mitigation required	Impact - no significant impact. Mitigation - No mitigation required.	Bluff retreat will continue.
	Geology	
Impact - alternative will protect against further undercutting. Slopes remain unstable. No mitigation proposed - impact remains significant. Impact - Short-term erosion may occur. Mitigation - erosion control measures.	Impact - beneficial impact; bluffs will remain stable. Mitigation - no mitigation required. Impact - short-term erosion impacts may occur. Mitigation - erosion control measures.	Bluff erosion will continue - significant impacts will continue.
	Water Resources/Water Quality	
Impact - potential fluvial/hydraulic impacts with borrowing in river. Mitigation - hydrology analysis indicated no significant impact.	Impact - potential fluvial/hydraulic impacts with borrowing in River. Mitigation -hydrology analysis indicated no significant impact.	Hydrological impacts will continue.
Impact - potential sedimentation and turbidity impacts associated with loss of vegetation and dewatering. Mitigation - Erosion control measures and treatment of water from dewatering - erosion impacts remain significant in case of heavy flows.	Impact - potential sedimentation and turbidity impacts associated with loss of vegetation and dewatering. Mitigation - erosion control measures and treatment of water from dewatering - erosion impacts remain significant in case of heavy flows.	
Impact - potential accidental release of hazardous materials during construction. Mitigation - preparation and implementation of contingency plans.	Impact - potential accidental release of hazardous materials during construction. Mitigation - preparation and implementation of contingency plans.	

Table S-1. Continued

NED Plan Alternative	Locally Preferred Plan Alternative (Preferred Alternative)	No Action Alternative
	Biological Resources	
Impact - loss of 6.5 ha of cottonwood willow to riparian forest and freshwater marsh. Mitigation - Arundo removal.	Impact - loss of 6.5 ha of cottonwood willow to riparian forest and freshwater marsh. Mitigation - Arundo removal.	Impact - no significant impact. Mitigation - no mitigation required.
Impact - loss of wildlife habitat especially for riparian obligate birds. Mitigation - Arundo removal.	Impact - loss of wildlife habitat especially for riparian obligate birds. Mitigation - Arundo removal.	Impact - no significant impact. Mitigation - no mitigation required.
Impact - disturbance to nesting birds from noise and vegetation removal. Mitigation - no construction during nesting period.	Impact - disturbance to nesting birds from noise and vegetation removal. Mitigation - no construction during nesting period.	Impact - no significant impact. Mitigation - no mitigation required.
Impact - loss of one pair and critical habitat for least Bell's vireo, an endangered species. Mitigation - Arundo removal, cowbird trapping.	Impact - loss of one pair and "critical habitat" for least Bell's vireo, an endangered species. Mitigation - Arundo removal, cowbird trapping.	Impact - no significant impact. Mitigation - no mitigation required.
	Aesthetics	
Impact - no significant impact. Mitigation - no mitigation required.	Impact - no significant impact. Mitigation - no mitigation required.	Impact - no significant impact. Mitigation - no mitigation required.
	Cultural Resources	
Impact - no known impact to cultural sites. Potential for hidden prehistoric, historic or paleontological resources. Mitigation - monitoring during construction.	Impact - no known impact to cultural sites. Potential for hidden prehistoric, historic or paleontological resources. Mitigation - monitoring during construction.	Impact - no significant impact. Mitigation - no mitigation required.

Table S-1. Continued

NED Plan Alternative	Locally Preferred Plan Alternative	No Action Alternative
	Hazardous, Toxic and Radioactive Waste	
Impact - no impact to known sites. Mitigation - no mitigation required.	Impact - no impact to known sites. Mitigation - no mitigation required.	Impact - no significant impact. Mitigation - no mitigation required.
Impact - Potential for release of toxic materials during construction. Mitigation - surveys and spill contingency plans.	Impact - Potential for release of toxic materials during construction. Mitigation - surveys and spill contingency plans.	Impact - no significant impact. Mitigation - no mitigation required.
	Land Use, Population and Housing	
Impact - no significant impact. Mitigation - no mitigation required.	Impact - no significant impact. Mitigation - no mitigation required.	Substantial loss of homes and utility infrastructure due to continued bluff retreat.
	Recreation	
Impact - no impact to formal recreation facilities. Mitigation - no mitigation required	Impact - no impact to formal recreation facilities. Mitigation - no mitigation required.	Impact - no significant impact. Mitigation - no mitigation required.
Impact - potential public safety issues associated with use of access road without bluff stabilization. Mitigation - posting area to warn of potential danger.	Impact - no significant impact. Mitigation - no mitigation required.	Impact - no significant impact. Mitigation - no mitigation required.
	Public Services and Utilities	
Impact - no significant impact. Mitigation - no mitigation required.	Impact - no significant impact. Mitigation - no mitigation required.	Potential significant impact to utilities due to bluff retreat.

Table S-1. Continued

NED Plan Alternative	Locally Preferred Plan Alternative	No Action Alternative
	Transportation	
Impact - potential safety impact near Riverview School during construction. Mitigation - speed limit and crossing guards.	Impact - potential safety impact near Riverview School during construction. Mitigation - speed limit and crossing guards.	Potential loss of River Drive.
	Noise	
Impact - potential significant noise impacts during construction. Mitigation - restriction of construction hours.	Impact - potential significant noise impacts during construction. Mitigation - restriction of construction hours.	No impact.
	Air Quality	
Impact - significant construction related emissions especially PM-10 and NO_x Mitigation - dust control plus control of NO_x emitting equipment.	Impact - significant construction related emissions especially PM-10 and NO_x Mitigation - dust control plus control of NO_x emitting equipment.	No impact.

One issue area differentiates the two alternatives. Although both alternatives will protect against further erosion of the bluff toe, only the alternative with buttress fill (Locally-Preferred Plan Alternative) would stabilize those areas of the bluff that are currently unstable.

The No-Action Alternative will not significantly affect sensitive habitat or result in construction impacts. However, bluff erosion will continue, resulting in substantial loss of homes, roadways, and utilities.

As a discussed in the Feasibility Report, there is no statutory Corps authority for construction of the project. Congressional authorization and direction would be required to proceed to design and construction.

As required by the California Environmental Quality Act (CEQA), the following impacts were not considered significant for the NED Plan Alternative and Locally-Preferred Plan Alternative:

- Topography
- Aesthetics
- Cultural resources
- Land use, population and housing
- Public utilities and services

AREAS OF CONTROVERSY

The major area of controversy associated with this project concerns the loss of riparian vegetation and the critical habitat for the least Bell's vireo and willow flycatcher. There is also considerable concern among the citizens of the area whether Congressional authorization and funding will be provided to allow the project to proceed.

UNRESOLVED ISSUES

All unresolved issues have been resolved at the Draft EIS/EIR level.

RELATIONSHIP TO ENVIRONMENTAL STATUTES

The relationship of the project to environmental laws and the status of compliance is noted in Table S-2.

Table S-2. Relationship to Environmental Statutes

Statute	Status
National Environmental Policy Act and the Council on Environmental Quality Implementing Regulations	This EIS/EIR has been prepared in accordance with the requirements of Section 102 of the National Environmental Policy Act (NEPA) and with the Council on Environmental Quality Regulations for implementing the procedural provisions of NEPA.
Fish and Wildlife Coordination Act	Coordination efforts have been initiated and continue with the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Game (DFG) in accordance with the Fish and Wildlife Coordination Act. USFWS has submitted a Planning Aid Report and Coordination Act Report and is a member of the team conducting the habitat evaluation procedure (HEP) analysis team. The USFWS has issued a Biological Opinion for the project.
Federal Endangered Species Act, as Amended	As required by Section 7 of the Federal Endangered Species Act, the Corps requested from USFWS a list of species that are listed under the act as threatened or endangered, proposed for listing, or candidates for listing. Section 7 consultation is being conducted as part of this action; informal coordination has been ongoing. A biological assessment has been prepared and the U.S. Fish and Wildlife Service has prepared a Biological Opinion which is attached in Appendix D.
National Historic Preservation Act of 1966, as Amended	The area of potential effect for this project has been surveyed by Corps archeologists. No significant prehistoric or historic resources have been found within the Norco Bluffs area. Any cultural resources in the Prado Basin where barrow pits may be located will be avoided. Coordination with the State Historic Preservation Officer has been initiated and will be maintained. A memorandum of agreement is not anticipated to be required.
Clean Water Act, as Amended	The NED Plan Alternative and the Locally-Preferred Plan Alternative would result in discharge of fill material into waters of the United States. It also may result in longer-term discharges associated with operation and maintenance activities. A Section 404(b)(1) evaluation has been prepared to address practicable alternatives. This evaluation may also include the potential operation and maintenance activities. The corps will be recommending no federal involvement in the project and the project will not then be exempted under 404(r) criteria. The local sponsor will then be required to obtain permits under Section 404 and Section 101. An NPDES permit will also be required if excavations are dewatered and water discharged to the river.

Table S-2. Relationship to Environmental Statutes

Statute	Status
Clean Air Act	The project site is in an air quality nonattainment area. The South Coast Air Quality Management District (SCAQMD) is the agency with jurisdiction to enforce the Clean Air Act in this area. The U.S. Environmental Protection Agency also retains authority to enforce provisions of the Federal Clean Air Act for criteria air pollutants as well as hazardous air pollutants. Significant impacts may occur during construction. Consultation with the SCAQMD is ongoing. Feasible measures for reduction of emissions have been proposed.
Wild and Scenic Rivers Act	The Wild and Scenic Rivers Act affords protective status to certain rivers. The Santa Ana River is not listed in the Phase II Western Region component of the Nationwide Rivers Inventory published by the National Park Service in January 1992. Therefore, the Wild and Scenic Rivers Act would not apply to this project.
Migratory Bird Treaty Act	The Migratory Bird Treaty Act prohibits the taking, killing, or possession of migratory birds. Coordination with USFWS and DFG has been ongoing. Mitigation measures proposed for the NED Plan Alternative and Locally-Preferred Plan Alternative would ensure compliance with this act.
Executive Order 11990, Protection of Wetlands	The Corps considered the effect of the NED Plan Alternative and Locally-Preferred Plan Alternative on wetlands. Mitigation measures have been identified to reduce impacts on wetlands.
Executive Order 11988, Floodplain Management	The NED Plan Alternative or the Locally-Preferred Plan Alternative will not affect floodplains in the project area and is in compliance with Executive Order 11988.
Anadromous Fish Conservation Act (PL 89-304)	The Santa Ana River in this reach does not support anadromous fish and therefore is in compliance with this act.
Land and Water Conservation Fund Act (PL 88-578)	The project does not involve funding from this source.
Migratory Bird Conservation Act of 1928 and Migratory Bird Treaty Act of 1918	Mitigation measures proposed will assure that active nests of migratory species would not be disturbed.

Table S-2. Relationship to Environmental Statutes

Statute	Status
Resource Conservation and Recovery Act of 1976 (PL 94-580)	Chemical and pesticide use will be in conformance with this law.
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)	This act as well as various state of California acts govern the use of pesticides.
River and Harbor Act of 1899	This portion of the Santa Ana River is no longer considered navigable, and this act will not apply.
Watershed Protection and Flood Prevention Act as Amended (PL 83-566)	The project is in conformance with this act.
California Environmental Quality Act (CEQA)	The Riverside County Flood Control and Water Control District has determined through the preparation of an initial study that implementing the project might cause a significant environmental impact. A joint environmental impact statement environmental impact report is being prepared.

Section 1.0 Introduction

1.1 BACKGROUND

The U.S. Army Corps of Engineers, Los Angeles District (Corps), proposes a stabilization project to prevent future erosion of the Norco Bluffs along a 1.6-kilometer (5,249 foot) portion of the Santa Ana River in the City of Norco, in Riverside County, California. The bluffs along the southern portion of the river have been eroding, causing retreat of the bluffs. This has resulted in loss of one home and the endangerment of several other homes, roadways, and utilities. The Corps' National Economic Development (NED) Plan Alternative consists of construction of toe protection using soil cement along the south bank of the Santa Ana River. The local sponsor, the Riverside County Flood Control and Water Conservation District (RCFCWCD), is proposing the construction of a toe protection structure plus slope stabilization using buttress fill. This is the preferred alternative.

This final environmental impact statement/environmental impact report (EIS/EIR) has been prepared pursuant to the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA), which require that lead agencies consider the environmental implications of their actions and of projects over which they have discretionary authority. As sponsor of the NED Plan Alternative, the Corps is considered the lead federal agency under NEPA. As local sponsor, the RCFCWCD is the lead agency under CEQA. The Corps and the RCFCWCD will use this EIS/EIR in its decision to provide toe protection and slope protection for the study area.

The purpose of this EIS/EIR is to analyze and disclose potential environmental effects of the NED Plan Alternative and Locally-Preferred Plan Alternative, to identify ways to reduce or avoid potential adverse environmental impacts resulting from implementation of the Alternatives, and to identify and assess other alternatives. In addition to the two Alternatives, the lead agencies are investigating a No-Action Alternative. Consideration of the No-Action Alternative, which represents the continuation of current practices and no additional bank stabilization measures, is required by NEPA and CEQA to provide a reference against which to assess the other alternatives. As required by NEPA and CEQA, this final EIS/EIR also discloses significant environmental effects that cannot be avoided; growth-inducing effects; and significant cumulative impacts of reasonably related past, present, and reasonably foreseeable future projects.

The NED Plan Alternative, the Locally-Preferred Plan Alternative, and the No-Action Alternative are described in detail in Section 2.0, "Alternatives".

1.2 AUTHORITY

The Corps is conducting a feasibility study of stabilization measures under the following authority of Section 116(b) of the Water Resources Development Act of 1990:

> "The Secretary shall conduct a feasibility study of bank stabilization measures for Norco Bluffs, California under the Flood Control Program of the Corps of Engineers."

This EIS/EIR supports the Corps's feasibility study for the project, which is ongoing; the feasibility study will incorporate the conclusions of this EIS/EIR. The Corps studied several alternative actions (both structural and nonstructural) to determine which approaches would be economically, technologically, and environmentally feasible. Some alternatives were eliminated as being infeasible; those that were retained for further consideration are analyzed in this EIS/EIR. The alternatives considered in the feasibility study and those considered further in this EIS/EIR are described in Section 2.0.

1.3 STUDY AREA DESCRIPTION

The study area consists of an approximately 3-kilometer-long (1.86-mile-long) portion of the southern bank of the Santa Ana River from Pedley Avenue to the Interstate 15 (I-15) bridge in the City of Norco. This area has undergone extensive erosion, resulting in receding of the bluff face. Figures 1-1 and 1-2 show the regional and site-specific locations of the study area, respectively. The actual area proposed for stabilization is approximately 1,600 meters (5,249 feet) long. The Santa Ana River is the largest drainage system in southern California, extending from the montane region of the Peninsular Range to the Pacific Ocean. Even with flood control facilities on the river, the river presents a significant flood hazard to urban Orange County. The Corps is currently implementing new flood control measures on the Santa Ana River as part of the Santa Ana River Mainstem Project. These measures include construction of the Seven Oaks Dam in Santa Ana Canyon near the base of the San Bernardino Mountains, raising of the Prado Dam at the Prado Flood Control Basin (Prado Basin), and channelization in the lower Santa Ana River. Although the preferred action is not part of the Santa Ana River Mainstem Project, the study area is only approximately 4 kilometers (2.5 miles) upstream of the Prado Basin.

Figure 1-1
Regional Location

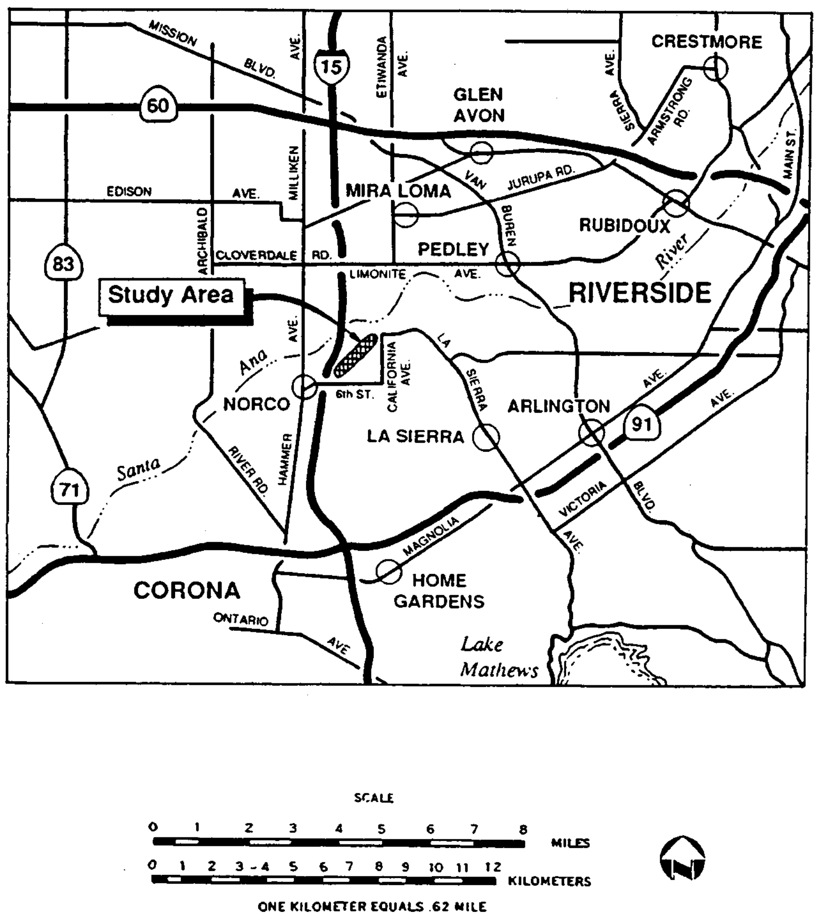
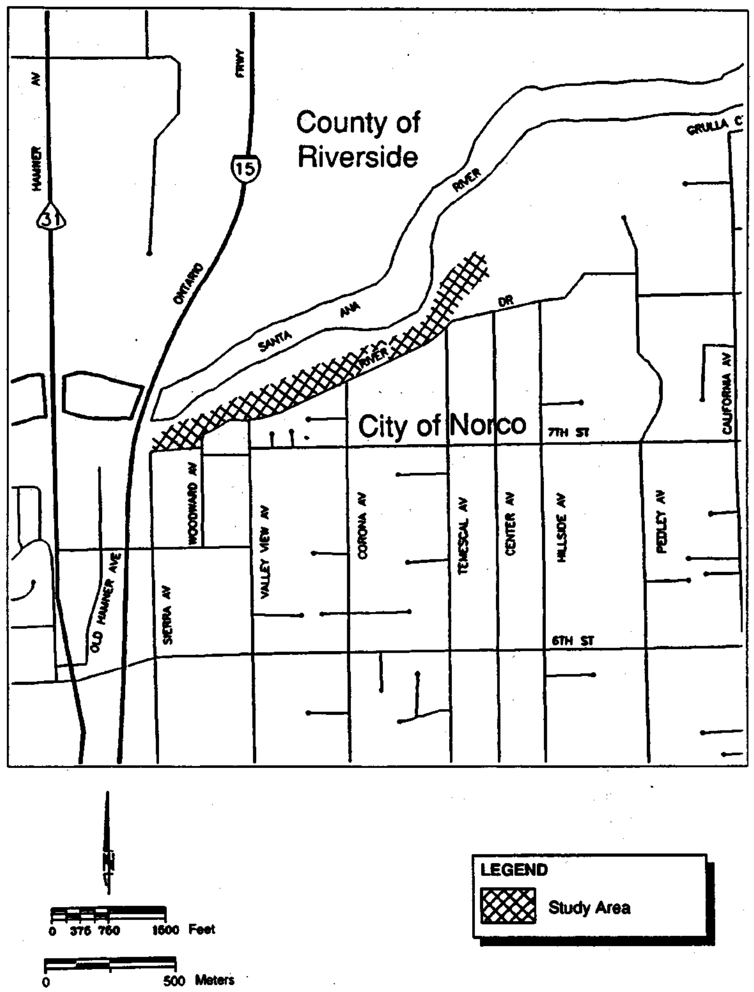


Figure 1-2
Study Area Location



Source: U.S. Army Corps of Engineers 1993.

1.4 PURPOSE AND NEED

The purpose of the NED Plan Alternative is to reduce the potential for slope erosion along the actively eroding portions of the Norco Bluffs. The toe of the Norco Bluffs along the Santa Ana River has undergone extensive erosion, resulting in undercutting and collapse of the slopes. This erosion is greatest during storm events when the river changes its course and causes erosion at different locations. Geologic studies prepared in 1968, 1969, and 1974 have indicated that erosion is extremely rapid at times, with bluff-top retreats of up to 15 meters (50 feet) per erosional event. This erosion has resulted in the condemnation and subsequent demolition of one home and undermining of a major residential access street. It is estimated that up to 56 structures, as well as roadways and utilities such as sewer lines, water lines, and gas lines, may be at risk during future erosional episodes.

1.5 SCOPING

A notice of intent (NOI) to prepare an EIS was published on July 18, 1995 by the Corps to solicit comments from agencies and the public. A notice of preparation (NOP) was also mailed to responsible agencies and other interested agencies by the RCFCWCD. Additionally, a scoping meeting was held at the Norco City Hall on September 21, 1995. The major issues identified during this process include potential for flooding and erosion; loss of riparian habitat, including habitat for the least Bell's vireo; and construction-related impacts related to air quality, noise, and traffic. The scoping process for this EIS/EIR is described in Section 10.0, "Public Involvement". The following resource topics are addressed in the EIS/EIR:

- topography;
- geology;
- water resources and water quality;
- biological resources;
- aesthetics;
- cultural resources;
- hazardous, toxic, and radioactive wastes;
- land use, population, and housing;
- recreation;
- public services and utilities;
- transportation;
- noise; and
- air quality.

1.6 REVIEW OF DRAFT EIS/EIR

The Draft EIS/EIR together with the Main Report of the Feasibility Study was mailed to a wide number of agencies as shown in Appendix G mailing list. The Notice of Availability was published in the Federal Register on June 14, 1996. The Notice of Completion was mailed to the California State Clearinghouse with formal review starting on June 17, 1996.

A public hearing to receive comments on the Main Report and Draft EIS/EIR was held on Thursday, July 18 in the council chambers at the City of Norco, Civic Center. A transcript of the hearing plus responses to comments are provided in Appendix G. Appendix G contains written comments on the Draft EIS/EIR as well as responses to those comments.

1.7 ORGANIZATION OF THE EIS/EIR

The EIS/EIR is written in an EIS format but contains all required elements of an EIR. Table 1-1 outlines the location of major sections required under CEQA and NEPA. This report is organized into the following sections:

- "Executive Summary" discusses NEPA and CEQA requirements; summarizes the impacts, mitigation measures, and environmental commitments associated with each alternative action; discusses known areas of controversy; and describes the relationship of the EIS/EIR to other environmental requirements and previously prepared environmental documents.

- Section 1.0, "Introduction", provides background information regarding the purpose of this EIR/EIS, describes the study area, and explains the purpose and need for the NED Plan Alternative.

- Section 2.0, "Alternatives", describes the alternatives considered in detail in this EIS/EIR and those alternatives also considered but not analyzed in detail because of technical, environmental, or economic constraints. This section also summarizes the potential impacts and mitigation measures associated with each of the alternatives considered in detail.

- Section 3.0, "Affected Environment", describes existing conditions in the study area for each of the resource topics listed above.

- Section 4.0, "Environmental Consequences", details the results of the analysis of impacts of those alternatives considered in detail, describing potential impacts and suggested mitigation measures by resource topic for each alternative action.

Table 1-1. Required EIR/EIS Contents

Required Section	CEQA Section	Section in EIR/EIS	NEPA Section*
Table of Contents	15122	Table of Contents	1502.10(c)
Summary	15123	ES	1502.10(b)
Purpose and Need	N/A	1	1502.10(d)
Project Description	15124	2	1502.10(e)
Environmental Setting	15125	3	1502.10(f)
Environmental Impact	15126	4	1502.10(g)
Significant Environmental Effects of Proposed Project	15126a	4	1502.10(g)
Unavoidable Significant Environmental Effects	15126b	5	1502.10(g)
Mitigation Measures	15126c	4/Summary	1502.10(g)
Alternatives to the Proposed Action	15126d	2	1502.10(e)
Local Short-Term Uses Versus Long-Term Productivity	15126e	8	1502.10(g)
Irreversible Environmental Changes	15126f	8	1502.10(g)
Growth Inducing Impacts	15129g	7	1508.08
Effects Found Not to be Significant	15128	4	1502.10(g)
Organizations and Persons Consulted	15129	11	1502.10(h)
Cumulative Impacts	15130	6	1502.10(g)

Note:

N/A - Not Applicable
* - Under 40 CFR

- Section 5.0, "Environmental Commitments", describes the mitigation measures that the Corps and the RCFCWCD have committed to implementing.

- Section 6.0, "Cumulative Impacts", describes the incremental impacts of the NED Plan Alternative when added to other past, present, and reasonably foreseeable future actions.

- Section 7.0, "Growth-Inducing Impacts", describes ways in which the NED Plan Alternative may foster growth inducement (e.g., economic or population growth, or the construction of housing).

- Section 8.0, "Relationship between Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity", provides a comparison of short-term and long-term effects of implementation of the NED Plan Alternative, the Locally-Preferred Plan Alternative and the No Action Alternative.

- Section 9.0, "Irreversible and Irretrievable Commitments of Resources", discusses irreversible and irretrievable losses of resources that would result from implementation of the Alternatives.

- Section 10.0, "Public Involvement", describes the scoping process for the project and coordination with the public and interested agencies.

- Section 11.0, "List of Preparers and Contributors", lists those individuals and organizations contributing to preparation of this EIS/EIR.

- Section 12.0, "Citations", lists the printed references and personal communications cited in this document.

- Section 13.0, "Index", directs the reader to major topics of importance in the EIS/EIR.

Section 2.0 Alternatives

2.1 INTRODUCTION

This section describes the alternatives selected for equal detailed analysis in this EIS/EIR. The Corps, in its initial evaluation of potential measures to reduce slope erosion, determined that these alternatives meet the project purpose and need and are technically, economically, and environmentally feasible. Section 4, "Environmental Consequences", presents a detailed impact analysis of each of these alternatives; the description below, in Section 2.2, includes a summary of the potential impacts and mitigation measures detailed in Section 4. Other potential actions have been included by the Corps in the screening process for the feasibility study but were eliminated from detailed analysis in this EIS/EIR; these measures are described in the final part of this section.

2.2 DETERMINATION OF STUDY AREA BOUNDARIES

The reconnaissance report for the Norco Bluffs stabilization project, prepared by the Corps in 1993, identified a study area approximately 4,000 meters (13,120 feet) long. This study area was divided into five geographic zones, Zones 1 through 5. The Corps during the initial phases of the feasibility study determined that portions of Zones 1, 2, 3, 4 and 5 were undergoing significant erosion. These zones are no longer used in the study. Bluff stabilization measures for Zones 3, 4, and 5 were not included in the NED Plan Alternative because the Santa Ana Mainstem Project encompasses bluff stabilization in these areas. Zone 1 was further evaluated and it was determined that the rate of erosion and potential for erosion were not significant and that federal participation in this zone was not justified. Therefore, the study area was narrowed to include only the area designated as Zone 2 in the reconnaissance report. The alternatives described in the following discussions and in other sections of this report therefore are being considered only for this more limited study area. The extent of the study area is shown in Figure 2-1.

2.3 DESCRIPTION OF ALTERNATIVES CONSIDERED IN DETAIL

2.3.1 Toe Protection Only, Using Soil Cement (NED Plan Alternative)

2.3.1.1 Description of the Alternative

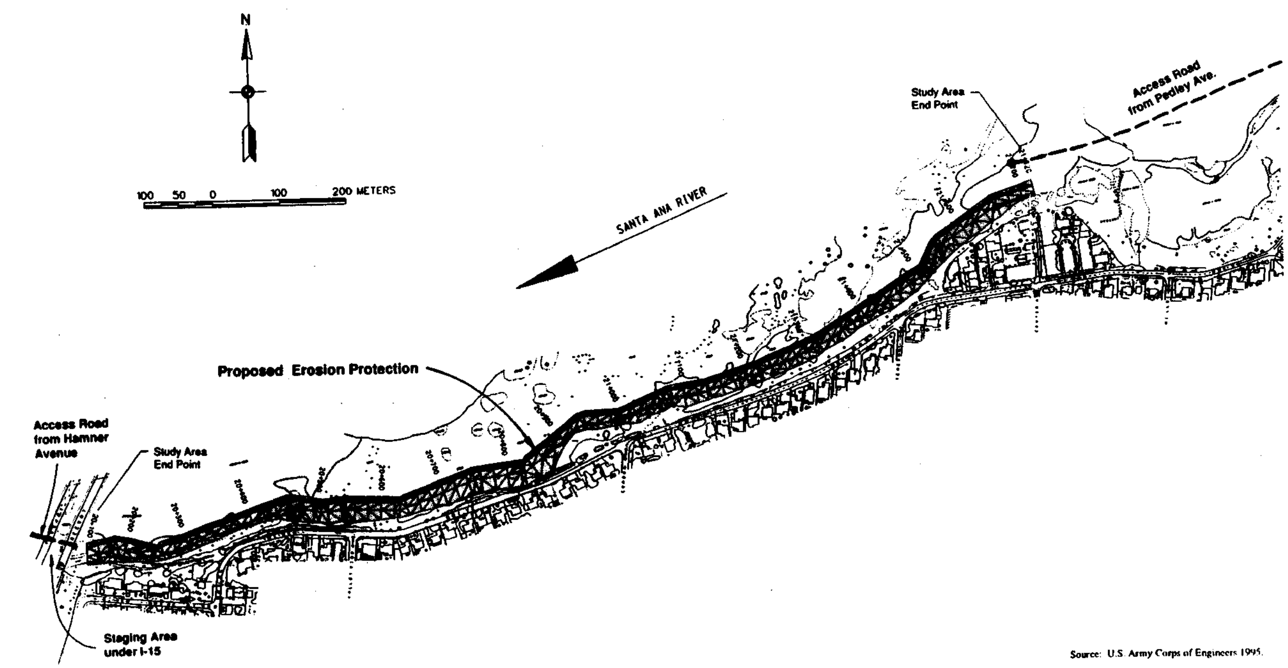
Protection of the bluff toe (bottom of the bluffs) from erosion is considered the most critical bluff stabilization measure because this protection would prevent the undercutting of the bluffs. In general, toe protection would involve the construction of rock or concrete structures placed between the toe of the slopes and the river channel. This hardened material would then protect the softer bluff material.

This alternative would involve the placement of fill material to a level at the 25-year floodplain for a length of approximately 1,600 meters (5,249 feet), as shown in Table 2-1. The outer edge (river side) of the fill would be hardened by 2.5 meters (8.0 feet) of soil cement. Soil cement is formed through the onsite mixture of soil and cement with water and is placed in layers along the side of the fill. This mixture dries to a concrete-like hardness and can be shaved smooth or left rough.

Figure 2-2 is a representative illustration of the cross sections of the toe protection under this alternative. The normal fill procedure, shown in the top portion of Figure 2-2, would be to extend the fill approximately 30 meters (98.4 feet) from the center point of the bluffs. This extension of fill would vary according to the exact profiles of the slopes in individual areas and would be substantially reduced at the fill area near Corona Avenue and near I-15, as illustrated in the bottom portion of Figure 2-2. The soil cement protection would extend approximately 5 meters (16.4 feet) below the streambed surface to protect against undercutting of the toe protection structure during floodflows. Implementation of this alternative would result in the loss of approximately 3.4 hectares (ha) (8.4 acres) of habitat as a result of placement of the fill. Approximately 61,000 cubic meters (79,701 cubic yards [cu yd]) of fill and up to 37,300 cubic meters (48,786 cu yd) of soil cement would be required for this alternative. Table 2-1 defines the quantitative parameters of the alternative.

Construction of this alternative would involve the initial grubbing of the project area. The total area grubbed for construction would include the approximately 2.0 ha (4.94 acres) where the fill would be placed and an additional 4.5 ha (11.1 acres) that would be disturbed during construction but not permanently lost. An approximately 1-ha (2.5-acre) area near I-15 would be used as a staging and turnaround area. An access road would be constructed from Pedley Avenue to the construction area and from the downstream portion of the project site under the I-15 bridge to Hamner Avenue. Most of the area proposed for the access road is on land vegetated with giant reed (*Arundo donax*).

Figure 2-1
Study Area



Source: U.S. Army Corps of Engineers 1995.

Table 2-1. Characteristics of Alternatives

Comparison Feature	Toe Protection Only with Soil Cement (NED Plan Alternative)	Toe Protection with Soil Cement and Slope Stabilization Using Buttressed Fill (Locally Preferred Plan)
Length of area of protection	1,600 m (5,249 feet)	1,600 m (5,249 feet)
Permanent loss of habitat (a)	2.0 ha (4.94 acres)	2.0 ha (4.94 acres)
Temporary loss of habitat (b)	4.5 ha (11.11 acres)	4.5 ha (11.11 acres)
Temporary loss of habitat staging area	1 ha (2.5 acres)	1 ha (2.5acres)
Access road requirements (c)	0.5 ha (2.3 acres)	0.5 ha (2.3 acres)
Quantity of fill required	61,000 cm (79,701 cy)	213,000 cm (278,592 cy)
Soil cement required	37,300 cm (48,786 cy)	50,000 cm (65,397 cy)
Project duration	6 months	9 months
Mining area in river bed (d)	3.92 ha (9.68 acres)	15.9 ha (39.4 acres)

Notes:

(a) This area of habitat will be lost through fill and construction of permanent structures.

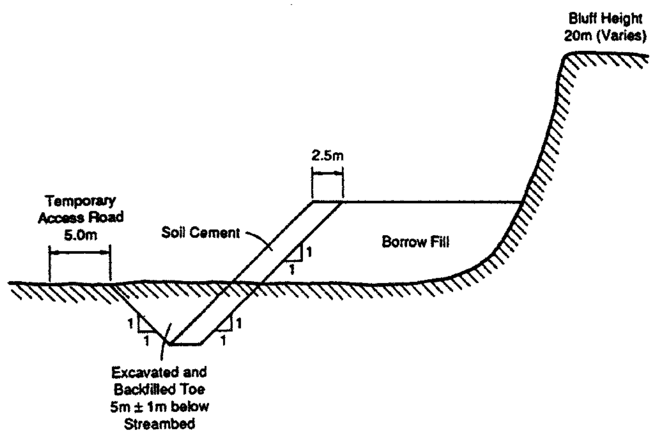
(b) This area will be required to be grubbed during construction, but revegation will be possible after construction.

(c) For the most part, the access road will be constructed through areas containing Arundo or through other disturbed areas.

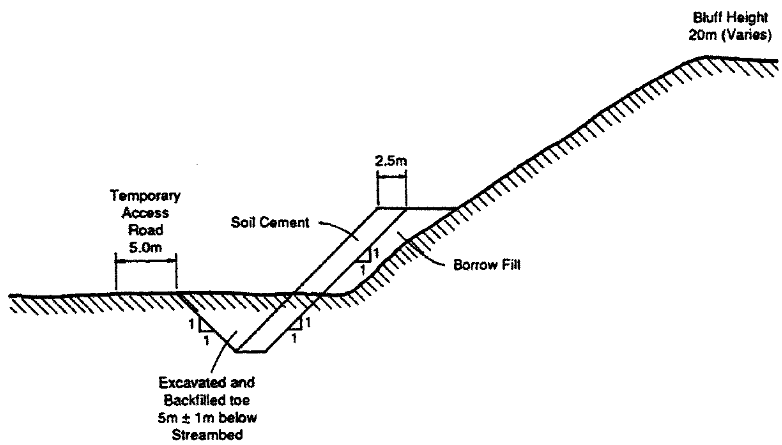
(d) Areas containing nearly homogenous stands of Arundo are proposed to be mined. It is assumed that these areas will be mined to an average depth of 1.5 meter (5 feet).

m = meters
ha = hectars
cy = cubic yards
cm = cubic meters

Figure 2-2
Cross Sections of Toe Protection Only



Typical Cross-Section View at Natural Bluff Areas



Typical Cross-Section View at Fill Areas (I-15 and Corona Avenue)

Source: U.S. Army Corps of Engineers 1995.

An access road would be placed on top of the toe protection structure. This road would be used for maintenance only and is not planned for recreation.

Once an area has been cleared, excavators would be used to prepare for the subsurface placement of toe protection and to compact the streambed areas. It is probable that the trenched areas would be dewatered using pumps.

The cleared area would then be filled with soil from the nearby riverbed and soil for soil cement imported from the Prado Basin. Soil imported from the Prado Basin, or a local quarry, would be trucked to the site. Depending on the location where fill would be placed, the trucks either would enter the project area via Pedley Avenue and exit via Hamner Avenue or would enter via Hamner Avenue and exit via Pedley Avenue. Other construction-related traffic would also use one or both of these access points.

If fill material will be used directly from the riverbed in the study area, it is proposed that areas be mined to an average depth of 1.5 meters (5 feet). Mining would be restricted to areas containing nearly pure stands of Arundo. It is envisioned that the mining process would also be used as mitigation for removal of riparian habitat because it would involve the removal of Arundo, an invasive exotic species. Arundo stalks and roots would be removed from the area to be mined and the plant material would be burned, hauled to a landfill, or chipped and dried to preclude revegetation of more Arundo through regrowth of the stalks. It is estimated that 3.92 ha (9.68 acres) of Arundo stands would be removed to obtain sufficient fill material.

Once the fill material is placed and compacted in layers, soil cement consisting of 10% cement and 90% soil would be layered over the fill to a thickness of 2.5 meters (8 feet). The area would then be cleaned up, recontoured, and allowed to revegetate. The entire construction process is expected to take 6 months.

An important element of the project will be the monitoring of the site for five years to detect growth of Arundo. Any Arundo growing in the area would be removed mechanically and/or chemically.

The vegetative portion of the Arundo will be chemically treated both initially and for any subsequent regrowth with Rodeo (active ingredient Gyphospate Nglycine). The material will be sprayed and/or painted on Arundo under the supervision of a licensed applicator. Rodeo is registered by the EPA for use in wetlands.

2.3.1.2 Summary of Impacts, Mitigation, and Environmental Commitments

Impacts. The following sections summarize by issue area the impacts anticipated to result from implementation of the NED Plan Alternative.

Topography. No significant impacts on topography are anticipated.

Geology. Implementation of the NED Plan Alternative would result in the protection of the toe of the bluffs from further erosion and would thus prevent further undermining of the bluffs. Some areas of the bluff would remain undercut and localized sloughing would still occur.

Water Resources and Water Quality. Potential sedimentation and turbidity associated with dewatering during construction of the toe protection structure could result in significant water quality impacts. Potential impacts associated with changes in hydraulic characteristics of the river caused by borrowing activities could also be significant. Fuels and lubricating oils may be accidentally released during the construction period; such accidental release would also be considered a significant impact.

Biological Resources. A substantial amount (6.5 ha) of cottonwood-willow riparian forest and a small freshwater marsh would be lost with implementation of the NED Plan Alternative. This habitat is also critical habitat for the federally listed least Bell's vireo, and willow flycatcher, both endangered species. Other sensitive plant and wildlife species may also be affected. Noise impacts and other disturbances may preclude nesting in the area during the construction period.

Aesthetics. No significant aesthetic impact would result from implementation of the NED Plan Alternative.

Cultural Resources. No significant impacts on prehistoric or historic resources are anticipated to result from implementation of the NED Plan Alternative. There is a potential that some buried resources may remain in the study area. There is also a potential that paleontological resources may be present in the study area.

Hazardous, Toxic, and Radioactive Wastes. There is a potential that hazardous materials, including herbicides, may be encountered during project construction operations, as well as the potential for accidental spills during construction activities.

Land Use, Population, and Housing. There would be no impact on land use, population, or housing associated with the NED Plan Alternative.

Public Utilities and Services. No significant impact on public services and utilities would result from implementation of the NED Plan Alternative.

Recreation. Implementation of the NED Plan Alternative would result in potential recreation-related impacts associated with equestrians' unauthorized use of the service road on the toe protection structure below unstable slopes.

Transportation. Construction traffic during the approximately 6-month construction period would have the potential to create traffic safety impacts on Pedley Avenue near River View School.

Noise. Construction-related noise may reach significant levels.

Air Quality. There will be significant and unavoidable short-term impacts on air quality associated with the use of construction vehicles for the approximately 6-month construction period.

Mitigation and Environmental Commitments. The following mitigation measures are recommended to reduce impacts of the NED Plan Alternative:

- Warning signs will be placed along the toe protection structure warning persons, including equestrians, of potential unstable slope conditions.
- An erosion control plan will be developed to reduce erosion and sedimentation during construction.
- A NPDES permit will be obtained and measures such as settling basins will be used to control turbidity from dewatering. The Local Sponsor will apply for a 404/401 permit if no Federal action is involved.
- A pollution-prevention and -control plan will be developed to reduce the potential for accidental spills, including herbicides, during construction and ensure quick response to clean up any spills.
- Water trucks and other standard dust control methods will be used to reduce dust generated by the project. Measures to reduce NO_x during construction will be implemented.
- Habitat lost due to the proposed project will be replaced through removal of 20.6 ha (51.5 ac.) Arundo and monitoring of the reestablishment of riparian species. Monitoring will occur during the first two consecutive years and then every other year for the next eight years.
- Vegetation removal will not occur from April to July, to reduce potential impacts on nesting bird species and to preclude removal of nesting birds during vegetation removal.
- Cowbird trapping will be conducted for a period of six years.
- Biological resources and construction activities will be monitored during the construction period.
- A monitoring program will be implemented prior to and during construction for the least Bell's vireo and willow flycatcher.

- Monitoring will be conducted during initial grading to determine whether paleontological resources or prehistoric/historic resources are located at the site. Construction will halt in the area of any finding of material until a qualified paleontologist or archeologist determines the significance of a find and mitigation is completed if needed.

- The project site will be surveyed for hazardous materials prior to construction and any of this material will be removed.

- Where possible, construction traffic will use Hamner Avenue to avoid noise and traffic impacts on Pedley Avenue.

- Reduced speed limits and use of crossing guards will be instituted when necessary near River View School to decrease construction safety impacts.

2.3.2 Toe Protection Using Soil Cement with Slope Stabilization Using Buttress Fill (Locally-Preferred Plan Alternative and Preferred Alternative)

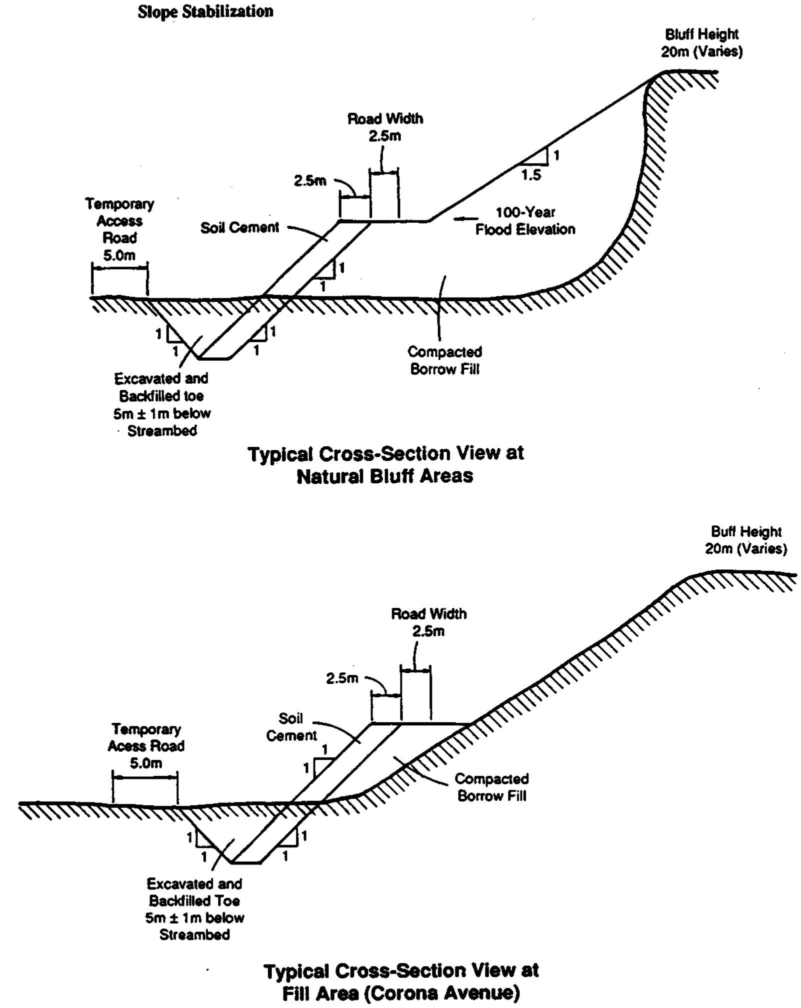
In the preferred alternative, slope protection measures may be used in addition to toe protection to stabilize the slopes after the toe of the bluffs has been protected from further erosion and undercutting. This alternative, the RCFCWCD's Locally-Preferred Plan Alternative, would allow for the stabilization of slopes in danger of sloughing onto the toe protection structures or protection from loss of land from areas already undermined.

2.3.2.1 Description of the Alternative

Under this preferred alternative, slope stabilization methods would be used in addition to toe protection. Slope stabilization material may be placed throughout the study area or only in areas that are more prone to sloughing. Slope stabilization measures would be used concurrently with the construction of the toe protection structure. The slope protection process would add approximately 3 to 4 months to the schedule for toe protection alone, resulting in a total construction period of 9 to 10 months.

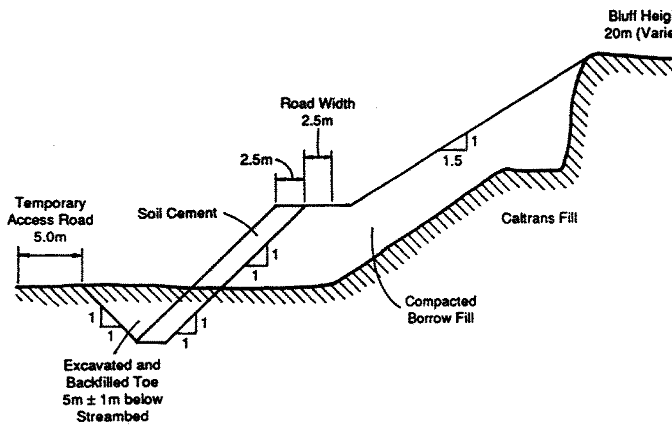
Under this alternative, toe protection would be constructed as described above and then slopes would be protected with buttressed fill using imported material from the Prado Basin, a local quarry, or material from the adjacent Santa Ana River bed. As illustrated in Figure 2-3, the alternative would involve the construction of toe protection using soil cement, then addition of buttressed fill on a 1.5:1 slope up to the top of the bluffs. This alternative would provide additional stability to the slope and prevent further sloughing of the slopes that are currently undermined.

Figure 2-3
Cross Sections of Toe Protection with Slope Stabilization



Source: U.S. Army Corps of Engineers 1995.

Figure 2-3
Continued



Typical Cross-Section View at Fill Area (I-15)

Source: U.S. Army Corps of Engineers 1995.

Table 2-1 summarizes the quantitative aspects of the project. The methods used to construct toe protection under this alternative would be identical to those described above. Once toe protection is in place, the top of the fill would be further compacted and approximately 147,000 cubic meters (192,267 cu yd) of material would be placed and compacted at a 1.5:1 slope. This slope would then be vegetated with native plant species to both increase habitat value and reduce erosion.

As described for the above alternative, the soil for soil cement will be obtained from the Prado Basin and fill material will be obtained from nearby areas of the Santa Ana River containing Arundo. If areas of the river are mined, approximately 15.9 ha (39.4 acres) of Arundo stands would be mined to meet fill requirements for both toe protection and the buttress.

Total construction time for this alternative would be approximately 9 to 10 months. It is possible that toe protection could be constructed initially and slope stabilization placed at a later date.

2.3.2.2 Summary of Impacts, Mitigation, and Environmental Commitments

Impacts. The following sections summarize by issue area the impacts anticipated to result from implementation of the Locally-Preferred Plan Alternative.

Because most impacts associated with this alternative would result from the toe protection activities, impacts of this alternative would be similar to those of the NED Plan Alternative. This alterative would eliminate potential geologic impacts associated with sloughing of currently undermined slopes.

Topography. No significant impacts on topography are anticipated.

Geology. Implementation of this alternative would result in the protection of the toe from further erosion and would thus prevent further undermining of the bluff toe. Bluff slopes would also be stabilized under this alternative.

Water Resources and Water Quality. Potential sedimentation and turbidity associated with dewatering during construction of the toe protection structure could result in significant water quality impacts. Potential nonsignificant impacts associated with changes in hydraulic characteristics of the river caused by borrowing activities could also be significant. Fuels and lubricating oils may be accidentally released during the construction period; such accidental release would also be considered a significant impact.

Biological Resources. A substantial amount (6.5 ha) of cottonwood-willow riparian forest and a small freshwater marsh would be lost with implementation of this alternative. This habitat is also critical habitat for the federally listed least Bell's vireo and willow flycatcher, both endangered species. Noise and other disturbances may preclude nesting during the construction period. Other sensitive plant and wildlife species may also be affected.

Aesthetics. No significant aesthetic impact would result from implementation of this alternative.

Cultural Resources. No significant impacts on prehistoric or historic resources are anticipated. There is a potential that some buried resources may remain in the study area. There is also a potential that paleontological resources may be present in the study area.

Hazardous, Toxic, and Radioactive Wastes. There is a potential that hazardous materials may be encountered during project construction operations, as well as the potential for accidental spills during construction activities.

Land Use, Population, and Housing. There would be no impact on land use, population, or housing associated with this alternative.

Public Utilities and Services. No significant impact on public services and utilities would result from implementation of this alternative.

Recreation. No significant impacts on recreation resources are anticipated with implementation of this alternative.

Transportation. Construction traffic during the approximately 9-month construction period would have the potential to create traffic safety impacts on Pedley Avenue near River View School.

Noise. Construction-related noise may create significant impacts.

Air Quality. There will be significant and unavoidable short-term impacts on air quality associated with the use of construction vehicles for the approximately 9-month construction period.

Mitigation and Environmental Commitments. The following mitigation measures are recommended to reduce impacts of this alternative:

- An erosion control plan will be developed to reduce erosion and sedimentation during construction.
- An NPDES permit will be obtained and measures such as settling basins will be used to control turbidity from dewatering.
- A pollution-prevention and -control plan will be developed to reduce the potential for accidental spills, including herbicides, during construction and ensure quick response to clean up any spills.

- Water trucks and other standard dust control methods will be used to reduce dust generated by the project. Methods to reduce No_x emissions will be implemented.

- Habitat lost due to the proposed project will be replaced through removal of 20.6 ha (51.5 acres) Arundo and monitoring of the reestablishment of riparian species. Monitoring will occur during the first two consecutive years and then every other year for a period of eight years.

- Cowbird trapping will be conducted for a period of six years.

- Vegetation removal will not occur from April to July, to reduce potential impacts on nesting bird species and to preclude removal of nesting birds during vegetation removal.

- Biological resources and construction activities will be monitored during the construction period. This includes monitoring for least Bell's vireo and willow flycatcher prior to and duirng construction.

- Monitoring will be conducted during initial grading to determine whether paleontological resources or prehistoric/historic resources are located at the site. Construction will halt in the area of any finding of material until a qualified paleontologist or archeologist determines the significance of a find and mitigation is completed if needed.

- The project site will be surveyed for hazardous materials prior to construction and any of this material will be removed.

- Where possible, construction traffic will use Hamner Avenue to avoid noise and traffic impacts on Pedley Avenue.

- Reduced speed limits and use of crossing guards will be instituted as needed near River View School to decrease construction safety impacts.

2.3.3 No-Action Alternative (Future Environment without the Project)

2.3.3.1 Description of the Alternative

Implementation of the No-Action Alternative would consist of continuation of present conditions, without toe or slope protection or any other method of reducing erosion. The bluff would continue to erode, which would cause more residential units and outbuildings to bedome jeopardized and result in the eventual loss of utilities and homes along the River Drive area. Local agencies may sponsor localized stabilization projects, but the overall area would not be stabilized.

2.3.3.2 Summary of Impacts and Environmental Commitments

Implementation of the No-Action Alternative would result in substantial socioeconomic impacts; impacts on land use, population, and housing; and impacts on the utility infrastructure. However, there would be no construction-related impact on riparian habitat or sensitive bird species. Furthermore, the adoption of the No-Action Alternative would preclude the occurrence of any construction-related impacts, including noise, truck traffic, and short-term impacts on water quality.

2.4 COMPARISON OF ALTERNATIVES

Table S-1 in the executive summary provides a comparison of the alternatives considered in detail. The major differences in impacts center around the greater slope stability that would be provided using buttress fill slope stabilization, although the alternative involving both toe and slope protection would result in greater construction-related impacts because the construction period would be 3 months longer.

2.5 DESCRIPTION OF ADDITIONAL ALTERNATIVES INITIALLY CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

This section describes alternatives that were initially considered to meet the purpose and need for the NED Plan Alternative but that were eliminated from detailed analysis in the EIS/EIR because they were determined to be technically, economically, and/or environmentally infeasible.

2.5.1 Nonstructural Alternative

This alternative would consist of the acquisition and removal of homes that are in jeopardy from bluff failure associated with future floodflows. Properties located approximately 30-60 meters (100-200 feet) from the bluff would need to be acquired. This would involve the removal of the first row of homes along River Drive and relocation of the utilities on both sides of the street. The vacated land could be used for recreational purposes.

This alternative was rejected from detailed consideration in the EIS/EIR for the following reasons:

- The alternative would not fully meet the purpose and need of the project because it would not stop or curtail bluff erosion.

- There is no evidence that erosion would stop with implementation of this alternative. Additional land or bluff erosion measures eventually would be required.

- Implementation of this alternative would create significant socioeconomic impacts affecting as many as 136 residents who would be required to leave their homes.

- Implementation of this alternative would be extremely costly when compared with construction alternatives.

It should be noted that the U.S. Fish and Wildlife Service (USFWS) in its Coordination Act Report (Appendix D) considered this alternative the least damaging to wildlife.

2.5.2 Channelization

This alternative would involve channelizing the river using concrete or riprap throughout the length of the study area. Implementing this alternative would result in substantial environmental impacts because of the loss of extensive riparian vegetation throughout the reach of the river. This alternative would be difficult to permit and would require extensive and costly mitigation measures if it were permitted. There may also be upstream and downstream hydrologic impacts associated with this alternative. For these reasons, this alternative was eliminated from detailed analysis.

2.5.3 Alternative Toe Protection Designs

Several alternative designs for toe protection were considered. Construction of each alternative design would be similar to that of the NED Plan Alternative. Construction activity would include removal of vegetation and hauling of construction materials. The major differences between these designs are in the materials used and in specific design features. These designs all result in more costly alternatives. Because the NED Plan Alternative would accomplish project objectives at least cost, the other designs were eliminated due to economics.

2.5.3.1 Grouted Rock

The grouted rock method of toe protection involves the construction of an earthen compacted-fill embankment. Stone riprap secured by concrete grout would be used instead of the soil cement that would be used under the NED Plan Alternative. The structure would consist of approximately 60% stone and 40% grout. This alternative would have impacts similar to those of the NED Plan Alternative but would be considerably more expensive (40% more) because of the cost of rock.

2.5.3.2 Concrete Slab

The concrete slab method of toe protection involves the construction of an earthen compacted-fill embankment with an 0.15 meters (6-inch) thick concrete-slab face and toe placed for erosion protection. In a manner similar to soil cement, the hardened concrete surface would protect the compacted fill from erosion. Use of a concrete slab for erosion protection was not considered feasible. Because the concrete slab would not be as thick as soil cement, it would be more prone to be undercut and result in potentially being ripped out during major flood events.

2.5.3.3 Armorflex

The Armorflex™ articulated concrete block revetment system is a matrix of individual blocks assembled to form a mattress overlay. The result is a flexible and porous erosion-protection system able to accommodate minor subgrade drainage and allow the releases of hydrostatic pressure. This alternative was not considered economically feasible. Additionally, its reliability for use as erosion protection has not been determined.

2.5.3.4 Gabions

A gabion is a basket or cage filled with rocks that is used in building support or abutment. The baskets are usually rectangular wire mesh divided into cells. The mesh is generally made of galvanized steel wire. Prior to placement of the baskets, a support apron would be laid on the bank toe that would extend past the foot of the gabion. This alternative was not considered feasible because this type of protection would have a much shorter life span than other methods analyzed in this study.

2.5.3.5 Groins

This alternative consists of construction of compacted fill and rock reflector groins. The groins would be constructed to divert flows away from the toe of the bluffs and prevent meandering of the river toward the bluffs. The groins would be approximately 50 meters (164 feet) long and would be spaced approximately 100 meters (328 feet) apart. A total of 22 groins would be required in the study area. The groins would be buried and would extend to a depth of 5 meters (16.4 feet) below the streambed surface at the bluff toe and 9 meters (30 feet) below the surface at the end extending into the river channel. A limited amount of toe protection would be required between each groin. At the bluff toe, there would be a 30-centimeter (11.82 inches) layer of riprap extending 7 meters (23 feet) above the streambed at a slope of 2:1. This alternative was not considered technically or environmentally feasible. There is considerable doubt regarding whether groins alone would offer sufficient erosion protection to the bluff toes. Additional toe protection similar to that of the NED Plan Alternative would also be required. Additionally, the habitat loss associated with this alternative would be approximately twice that associated with the NED Plan Alternative.

2.5.4 Slope Stabilization Alternatives

Several other methods of slope stabilization were investigated and were not considered feasible because of cost and environmental considerations.

2.5.4.1 Buttress Fill (Cut and Fill)

This method would be similar to the buttress fill with imported material except that the earthwork would be balanced onsite to avoid transportation of borrow material from offsite. The alternative was considered infeasible because it would result in further cutting back of the top of the bluffs, resulting in damage to utilities and the roadways in some locations.

2.5.4.2 Hilfiker Retaining Wall

A Hilfiker retaining wall is a reinforced soil embankment in which the soil itself is reinforced to become an integral part of the structure. Welded wire mats are layered with compacted fill to form a gravity retaining structure. This structure was considered economically infeasible because its costs were nearly double the costs of the NED Plan Alternative.

2.5.4.3 Crib Wall/Earthlock

A crib wall is a gravity retaining wall constructed of multiple interlocking units. Earthlock is a plastic system that uses multiple crib depths to create a gravity retaining structure that can manage local slope instability problems. This alternative was also considered economically infeasible because its costs were much higher than those of the NED Plan Alternative.

2.5.4.4 Reinforced Earth

This method consists of using a mechanically stabilized retaining wall composed of cohesionless soil and metallic reinforcement. Reinforcing strips and compacted fill together create an earth mass capable of withstanding local slope instability problems. This alternative was considered economically infeasible because it was over 30% more costly.

2.5.4.5 Concrete Retaining Wall

This method consists of using a standard concrete retaining wall approximately 5.5 meters (18.4 feet) high, with a 3-meter (9.84-foot) footing. Excavation limits would start from the inside of the footing at a ¾:1 slope. This alternative would be 40% more costly than the NED Plan Alternative.

Section 3.0 Affected Environment

3.1 INTRODUCTION

This section describes the existing environmental conditions of the study area. These conditions would be expected to continue in the foreseeable future if neither the NED Plan Alternative or Locally-Preferred Plan Alternative were implemented.

3.2 TOPOGRAPHY

The City of Norco is within the Peninsular Range Physiographic Province of southern California and is influenced by tectonics and other features of that province, including Cenozoic block faulting modified by erosion.

The study area, located within the City of Norco, includes the Santa Ana River channel and the overbank areas to the south. The River is heavily vegetated with a willow-cottonwood riparian mix, as well as areas of giant reed (Arundo). The system is fed by year-round flow in the channel and represents habitat for least Bell's vireo. The vegetation and wildlife resources of the study area are described in detail below under Section 3.4, "Biological Resources".

The northern bank of the river is significantly lower in elevation than the southern bank. This limits the water elevation during periods of high flow on the southern side of the river. The bluff slopes that compose the southern bank of the river range in height from 9 meters to 24 meters (29.5 feet to 78.7 feet) and have an average height of 18 meters (59 feet). The top of the bluffs consists of a relatively flat terrace surface, the edge of which is notched by gullies that continue down the face of the bluffs.

3.3 GEOLOGY

3.3.1 Geology of the Study Area

The bluffs in the study area are composed mostly of Pleistocene nonmarine river terrace deposits, consisting of clay, silt, sand, and gravel, with occasional cobbles and boulders. These sediments were deposited by the ancient Santa Ana River. The sediments are mostly flat-lying and underlain at depths of 30.5 meters (100 feet) or more by igneous rocks (mostly granite) typical of the Southern California Batholith.

Studies conducted for the Corps and others indicate that groundwater on top of the bluff is within 5 meters (16.4 feet) of the surface at some locations but may represent perched intervals. The potentiometric surface (water table) plunges downward toward the toe of the slopes and does not affect the caving or sloughing of the bluffs. However, some surface water may percolate downward through the sediments, dissolving some of the cementing materials and thus accelerating sloughing. Groundwater in the channel is near or at the surface.

3.3.2 Seismicity

The study area, like most of southern California, is prone to severe seismic shaking that could be generated by a number of faults. Locally, the site is influenced by the Chino Hills Fault, which is approximately 9.7 kilometers (6 miles) south of the study area. This fault is considered capable of generating an earthquake with a richter scale magnitude of 6.5. The Whittier-Elsinore and San Andreas Faults are within 35 kilometers (20 miles) of the study area and are capable of creating earthquakes of much larger magnitude.

Seismic episodes have not caused bluff erosion along the Norco Bluffs. However, the potential exists that a major seismic event may trigger increased sloughing of undermined bluff areas.

3.3.3 Slope Stability and Bluff Erosion

Overall erosion of the bluffs occurs when the river meanders near the bluffs during storm flows. The flows erode the toe of the bluffs, and the bluff faces slough off in time because of lack of support.

Studies of bluff stability and erosion rates have been conducted by various geological consultants since the 1969 storm event during which approximately 75% of the bluffs in the City of Norco were undercut. The Corps installed approximately 640 meters (2,099 feet) of revetments to protect the slopes. These revetments have lost their effectiveness and no longer are capable of erosion protection.

An aerial photograph analysis by the Corps has indicated an increase in erosion rates in the study area from approximately 1.4 meters (4.6 feet) per year during 1938-1969 to 8.5 meters (27.9 feet) per year during 1980-1987. Recent estimates have indicated that this rate has slowed to approximately 2.5 meters (8.2 feet) per year. It should be noted that the degree of erosion is quite variable. One reason that erosion has slowed recently is that the river has meandered away from the bluffs during floodflows.

3.4 WATER RESOURCES AND WATER QUALITY

3.4.1 Surface Hydrology

The Santa Ana River has a drainage area of approximately 2,253 square kilometers (870 square miles) in the Norco Bluffs area. Study results indicate that the present flows for a 100-year event at the Norco Bluffs are 4,451 cubic meters per second (157,200 cfs). It is also estimated that the sediment inflow is 391,000 cubic meters (154,836,000 cfy) per year at the Norco Bluffs. (U.S. Army Corps of Engineers 1993.)

Erosion of the toe of the Norco Bluffs has been caused primarily by meandering flows in the Santa Ana Rivers. These flows typically exit a meander loop and impinge on the bluffs at a sharp angle. The flows can remain concentrated against the bluff toe for a considerable distance downstream before entering another meander loop directed away from the bluffs. Also, the location of the impingement and flow concentration can vary considerably from flood to flood.

The Corps has documented the behavior of the Santa Ana River during major flood events. In the 1938 flood, flood waters impinged on the slopes at an angle of approximately 70 degrees between Temescal and Corona Avenues. In 1969, floodflow impingements of nearly 90 degrees were observed between Corona and Valley View Avenues. (U.S. Army Corps of Engineers 1993.)

3.4.2 Water Quality

3.4.2.1 Surface Water Quality

Water quality in the Norco Bluffs area is affected primarily by inflows from mountain runoff, the Santa Ana River, and Bear Creek, as well as input from two wastewater treatment plants effluent, storm discharges, State Water Project discharges, and nonpoint discharges. During most dry years, the streamflow from the perennial mountain streams is diverted for groundwater recharge upstream of the study area, and the Santa Ana River flows that reach the Prado Basin consist primarily of treatment plant discharge. Because of this, the Riverside County Health Department has determined that the river should not be considered suitable for full body contact.

Concentration of total dissolved solids (TDS) in the Santa Ana River varies according to the type of water flow. Storm flows usually have TDS levels near 200 milligrams per liter (mg/l), and the TDS concentrations of summer flows range near 1,000 mg/l.

3.4.2.2 Groundwater Quality

The City of Norco uses groundwater for part of its water supply and has several wells inside the city boundaries. Water quality from these wells meets all federal and state drinking water standards.

3.5 BIOLOGICAL RESOURCES

3.5.1 Vegetation

The floodplain of the Santa Ana River is approximately 1 kilometer (0.6 mile) wide in the study area and is dominated by lush cottonwood-willow riparian vegetation interspersed with small to very extensive areas of invasive Arundo scrub. Numerous depositional bars and backwater swales are found throughout this wide floodplain. The native riparian vegetation is considered suitable habitat for least Bell's vireo, which is state and federally listed as endangered and is designated as critical habitat.

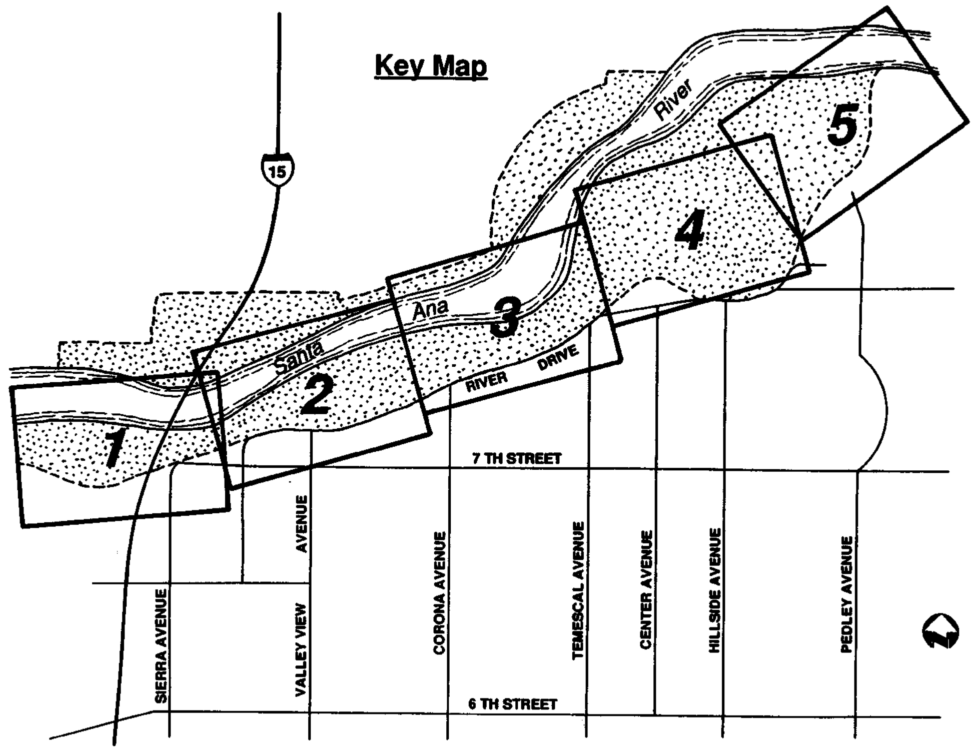
On August 25, 1995, a Corps-contracted botanist conducted a site visit to identify and map vegetation communities characterizing the study area. The botanist revisited the site on October 18 and 19, 1995, to assist with data collection for the habitat evaluation procedure (HEP) (see Appendix B) and verify the vegetation mapping. The information provided in this section is based on the field visits, a review of existing information about the study area, and pertinent literature.

The study area is characterized by eight plant communities: cottonwood-willow riparian forest, cottonwood-willow riparian forest with a significant Arundo scrub component, Arundo scrub, sand bar and sandy wash, marsh, arrow weed scrub, ornamental/ruderal vegetation, and open water. The distribution of these communities is shown in Figure 3-1. Scientific and common names of plant species mentioned in the text are presented in Table 3-1.

3.5.1.1 Cottonwood-Willow Riparian Forest

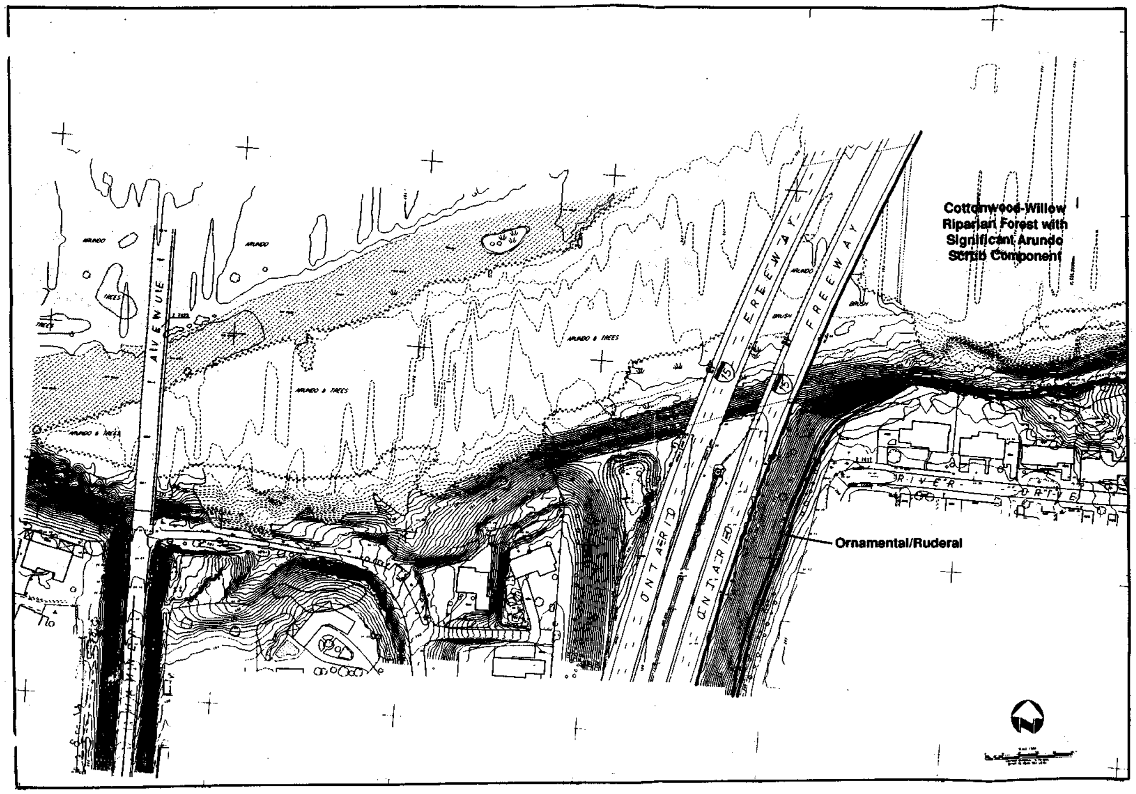
Riparian forest exists in large patches throughout the Santa Ana River floodplain in the study area. This community is characterized by a multilayered canopy dominated by black willow (*Salix gooddingii*), arroyo willow (*Salix lasiolepis*), and Fremont cottonwood (*Populus fremontii*). Blue elderberry (*Sambucus mexicana*) is found occasionally on the outer edge of the riparian zone adjacent to the upland community, and sandbar willow (*Salix exigua*) is supported on the edges of sandy washes and along some trails. Giant reed (*Arundo donax*) is typically a sparse component of the understory. The sparse to dense understory layer supports California blackberry (*Rubus ursinus*), mulefat (*Baccharis salicifola*), umbrella sedge (*Cyperus eragrostis*), celery (*Apium graveolens*), western goldenrod (*Euthamia occidentalis*), and barnyard grass (*Eichinochloa crus-galli*). Desert wild grape (*vitus girdiana*) is found trailing on trees and shrubs and is very dense in some places.

Figure 3-1
Plant Communities of and
Adjacent to the Study Area



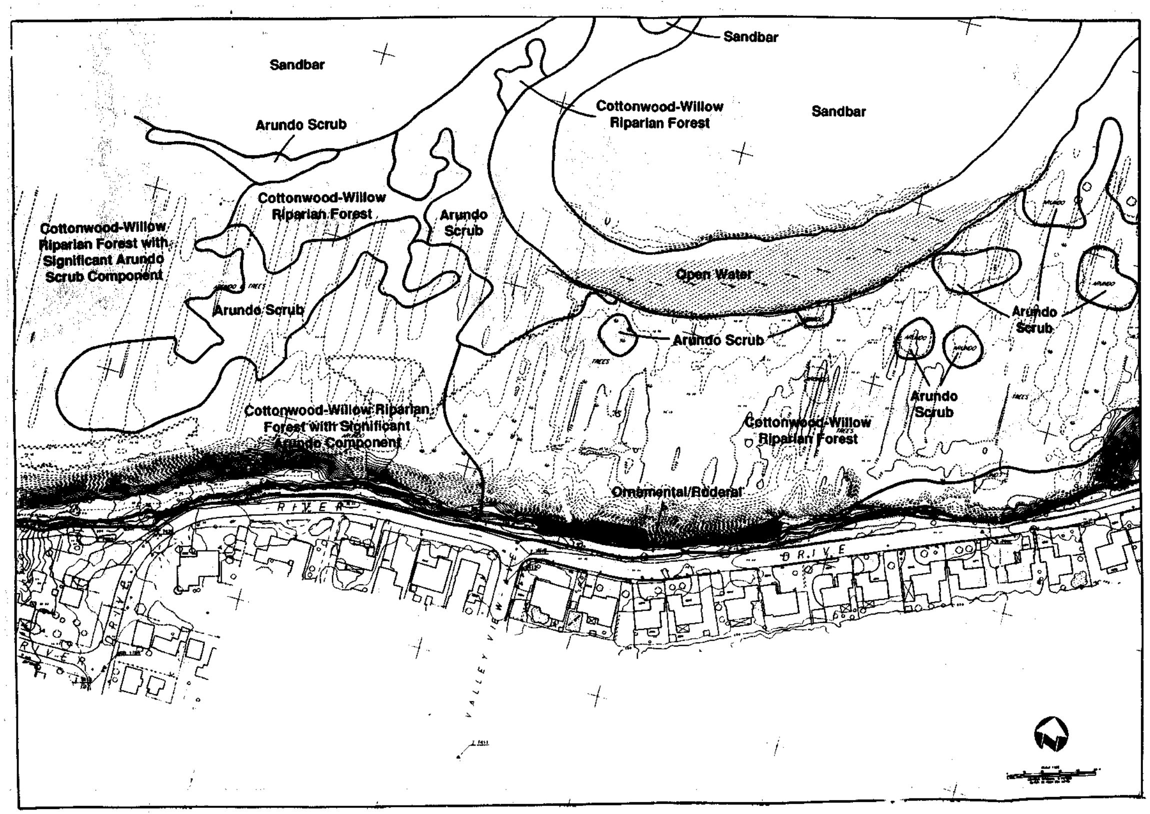
Jones & Stokes Associates, Inc

Figure 3-1
Continued



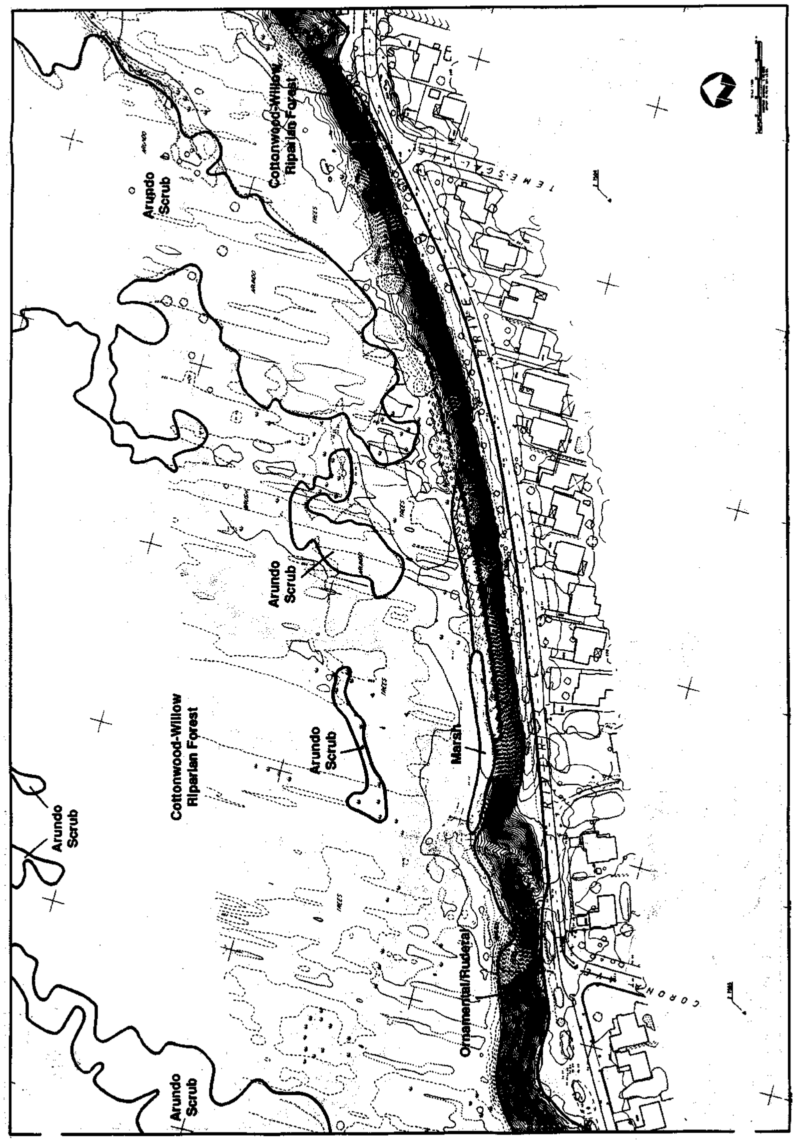
Sheet 1 of 5

Figure 3-1
Continued



Sheet 2 of 5

Figure 3-1
Continued



Sheet 3 of 5

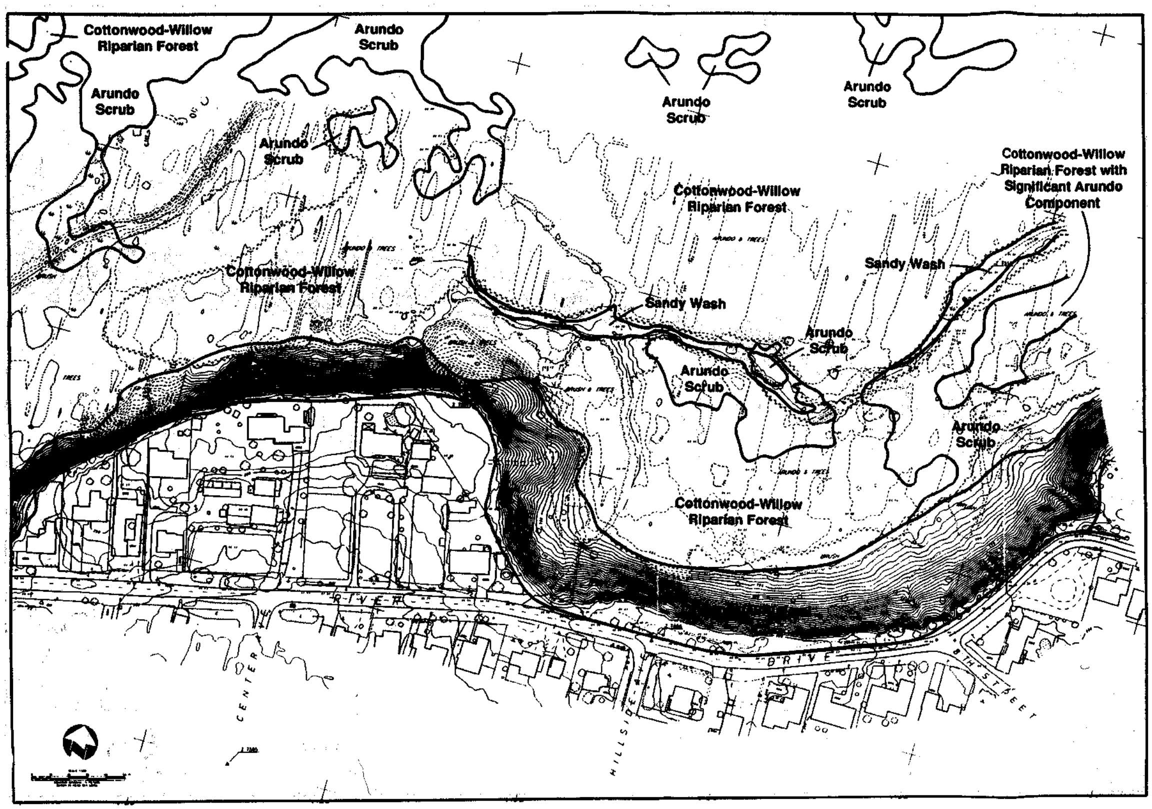


Figure 3-1
Continued

Sheet 4 of 5

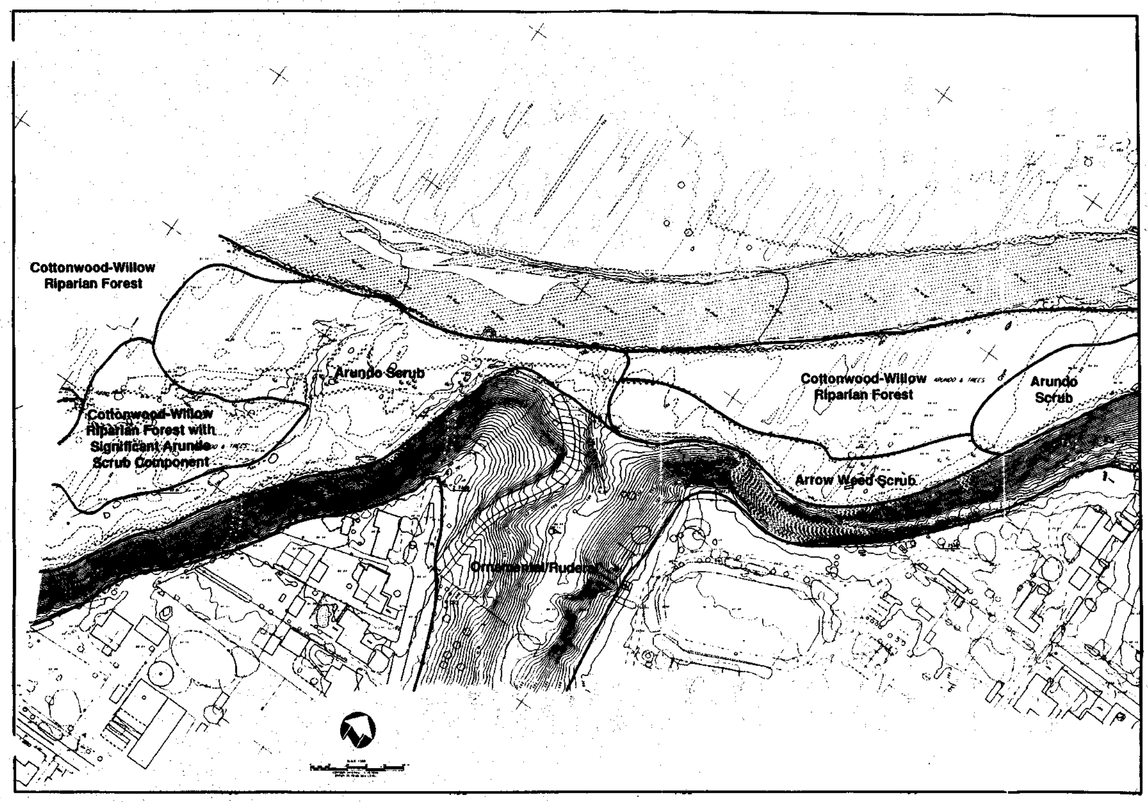


Figure 3-1
Continued

Sheet 5 of 5

Table 3-1. Summary of Common and Scientific Names of Plant Species as Presented in the Text

Common Name	Scientific Name
Arrow weed	*Pluchea sericea*
Arroyo willow	*Salix lasiolepis*
Arundo	*Arundo donax*
Barnyard grass	*Eichinochloa crus-galli*
Bermuda grass	*Cynodon dactylon*
Black willow	*Salix gooddingii*
Blue elderberry	*Sambucus mexicana*
Bur-marigold	*Bidens laevis*
California blackberry	*Rubus ursinus*
Celery	*Apium graveolens*
Cocklebur	*Xanthium strumarium*
Common sow thistle	*Sonchus oleraceus*
Desert wild grape	*Vitis girdiana*
Eucalyptus	*Eucalyptus* sp.
Fremont cottonwood	*Populus fremontii*
Lady's thumb	*Polygonum persicaria*
Mugwort	*Artemesia douglasiana*
Mulefat	*Baccharis salicifolia*
Olney's bulrush	*Scirpus americanus*
Poison oak	*Toxicodendron diversiloba*
Prickly wild lettuce	*Lactuca serriola*
Red willow	*Salix laevigata*
Ripgut brome	*Bromus diandrus*
Sandbar willow	*Salix exigua*
Tree-of-heaven	*Ailanthus altissima*
Turkey mullen	*Eremocarpus setigerus*
Umbrella sedge	*Cyperus eragrostis*
Western goldenrod	*Euthamia occidentalis*
Wild mustard	*Brassica* sp.
Wild oat	*Avena* sp.
Yellow willow	*Salix lucida* ssp. *lasiandra*

Native riparian habitats are recognized throughout California as important communities because of their limited extent compared with their historical distribution, their importance to dependent plant and wildlife species, and threats facing remaining communities. This status is supported by the California Department of Fish and Game (DFG) policy promoting "no net loss" of wetland habitat, which often includes riparian areas California Fish and Game Commission 1987). Riparian forest may qualify as wetlands or other waters of the United States under Section 404 of the Clean Water Act see Section 3.5.1.9, "Potential Jurisdictional Wetlands").

3.5.1.2 Cottonwood-Willow Riparian Forest with Significant Arundo Scrub Component

This community is similar to cottonwood-willow riparian forest but includes Arundo as a codominant with the native riparian forest plant species. Arundo constitutes 70% of the relative vegetative cover in this community type in the study area. Even under the native riparian forest canopy, Arundo is common in the understory. In the study area, this plant community is found primarily near I-15 in the western portion and in a smaller patch near Pedley Avenue in the eastern portion of the site. As with cottonwood-willow riparian forest, this community may qualify as jurisdictional wetlands or other water of the United States under Section 404 of the Clean Water Act.

3.5.1.3 Arundo Scrub

Arundo scrub is an invasive plant community that is increasingly displacing native riparian vegetation in the Santa Ana River floodplain (Douthit 1993). Large expanses of the floodplain are occupied by Arundo scrub in the study area. This community is characterized by monotypic stands of Arundo. Occassionally, sandbar willow or other native plant species are found interspersed. Arundo takes advantage of disturbances and colonizes trails and areas opened up by flood scour events. Arundo is on the California Exotic Pest Plant Council's List A-1, which identifies the most widespread invasive wildland pest plants in the state. Arundo is considered a threat to native riparian habitats, especially in the southwestern United States.

Arundo scrub is a riparian community that may qualify as jurisdictional wetlands or other waters of the United States under Section 404 of the Clean Water Act.

3.5.1.4 Sand Bar and Sandy Wash

Sand bars are deposited on the low floodplain along the banks of the Santa Ana River, and sandy washes are seasonal drainages in the wide riparian zone. Because of periodic scouring from flood events, most sand bars and sandy washes are unvegetated. However, Arundo is rapidly becoming established on the sand bars. Sand bars are important as part of a natural water filtration process for runoff at the site. These habitats likely exist within the normal inundation area of the Santa Ana River and thus may be considered jurisdictional waters of the United States.

3.5.1.5 Marsh

A marsh of approximately 0.4 ha (1 acre) was identified at the base of the bluffs just east of Corona Avenue. Marsh is a community that is dominated by persistent herbaceous plants and that ponds water for a long duration during the growing season. The marsh in the study area is perennially fed and hydrogically connected to a backwater drainage. It is dominated by Olney's bulrush (*Scirpus americanus*), a hydrophytic ("water-loving") plant. The upper edges of the marsh support bur-marigold (*Bidens laevis*), cocklebur (*Xanthium strumarium)*, and lady's thumb (*Polygonum persicaria*).

Wetland habitats, including marshes, have been significantly reduced locally and statewide by agricultural and urban development. Marshes are important because they provide habitat for dependent plant and wildlife species and serve as stormwater detention basins and sites for groundwater infiltration. The marsh in the project area probably qualifies as a jurisdictional wetland under Section 404 of the Clean Water Act. See Section 3.5.1.9, "Potential Jurisdictional Wetlands", below, for a discussion of Corps regulation over wetlands and other waters of the United States.

3.5.1.6 Arrow Weed Scrub

Arrow weed scrub is a native riparian plant community that is found in the outer floodplain just east of Pedley Avenue. It is characterized by a relatively monotypic stand of arrow weed (*Pluchea sericea*). This community may meet the definition of jurisdictional wetlands or other waters of the United States under Section 404 of the Clean Water Act.

3.5.1.7 Ornamental/Ruderal Vegetation

Ornamental and ruderal vegetation is present in an almost contiguous linear stretch along the bluff tops and slopes of the southern boundary of the study area. Ornamental trees consist of planted species, such as eucalyptus (*Eucalyptus* sp.), and escaped exotics, such as tree-of-heaven (*Ailanthus altissima*). Ruderal vegetation is dominated by herbaceous species that are able to persist with occasional disturbances and includes species such as ripgut brome (*Bromus diandrus*), wild oat (*Avena sp.*), prickly wild lettuce (*Lactuca serriold*), turkey mullen (*Eremocarpus setigerus*), wild mustard (*Brassica* sp.), and common sow thistle *(Sonchus oleraceus)*. Ornamental and ruderal areas are common communities regionally and statewide.

3.5.1.8 Open Water

The low-flow channel of the Santa Ana River down stream the riparian areas supports unvegetated open water habitat and is inundated on a year-round basis. Small sand bar islands emerge in the summer when water levels recede. The channel meets the definition of other waters of the United States (see Section 3.5.1.9, "Potential Jurisdictional Wetlands", below).

3.5.1.9 Potential Jurisdictional Wetlands

"Waters of the United States" is the encompassing term for areas under federal jurisdiction pursuant to Section 404 of the Clean Water Act. Waters of the United States are divided into "wetlands" and "other waters of the United States". Riparian forests, Arundo scrub, sand bar and sandy wash, marsh, and open water habitat in the study area may meet the definition of wetlands or other waters of the United States under Section 404. The Corps could exert jurisdiction over the portion of the study area that contains wetlands and other waters of the United States.

Wetlands are defined as "areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (33 CFR 328.3[b], 40 CFR 230.3). To be considered under federal jurisdiction, a wetland must support positive indicators for hydrophytic vegetation, hydric soil, and wetland hydrology.

Other waters of the United States are seasonal or perennial water bodies, including rivers, lakes, stream channels, drainages, ponds, and other surface water features that exhibit an ordinary high-water mark but lack positive indicators for one or more of the three wetland parameters (33 CFR 328.4). Wetlands and other waters of the United States are considered by the Corps in a 404 b (1) analysis which documents project effects to waters of the United States and wetlands.

3.5.2 Fish and Wildlife

This section is based on the USFWS Coordination Act Report dated November 1995 (see Appendix D for the text of this report). This report is primarily based on existing data from the Prado Basin and the Hidden Valley wildlife area. Except for studies for the least Bell's vireo, extensive field studies have not been completed. Site-specific surveys are planned for spring 1996.

3.5.2.1 Fishes

Fishes function as predators and prey in the food web of the ecosystem. The present ichthyofauna of the study area is a result of accidental and purposeful introductions on behalf of sport fishery enhancement and mosquito control. Eleven species of fishes, eight of which are introduced species, have been documented in the Prado Basin. The introduced forms are the threadfin shad (*Dorosoma petenense*), goldfish (*Carassius auratus*), carp (*Cyprinus carpio*), brown bullhead (*Ictalurus nebulosus*), mosquitofish (*Gambusia affinis*), bluegill (*Lepomis macrochirus*), green sunfish (*Lepomis cyanellus*), and largemouth bass (*Micropterus salmoides*) (U.S. Fish and Wildlife Service 1985).

The native ichthyofauna of southern California consists of only a few species, most of which are believed to be in decline. The Santa Ana sucker (*Catostomus santaanae*), a sensitive taxon, is known to be found in the Prado Basin. The arroyo chub (*Gila orcutti*) was documented in the early to middle 1970s but may no longer be present in the Prado Basin (Wells and Diana 1975). Three native species of fishes, the Santa Ana sucker, speckled dace (*Rhinichthys osculus*), and arroyo chub, are known to be present in the Hidden Valley Wildlife Area approximately 4 kilometers (3 miles) upstream of the study area (Riverside County Parks Department 1990).

During surveys of the project area conducted in 1996, Santa Ana sucker and arroyo chub were found inthe Santa Ana River. In additicn, the introduced mosquito fish and fathead minnow (*Pimephales promelas*) were found in pools located within the riparian forest.

3.5.2.2 Amphibians

Seven amphibian species have been confirmed by USFWS (1985) as being present in the Prado Basin. One rare amphibian known to be found in the Prado Basin is the California red-legged frog (*Rana aurora draytonii*), which is proposed for federal listing as an endangered species. It was documented on the southern side of the Prado Basin (U.S. Fish and Wildlife Service 1985). Habitat for this species consists of well-vegetated moist areas, such as woods and cattail marshes, in a very limited number of drainages in southern California (Stebbins 1985).

More commonly observed amphibians in the Prado Basin are bullfrog *(Rana catesbeiana)*, Pacific treefrog (*Hyla regilla*), and western toad (*Bufo boreas*). Garden slender salamander (*Batrachoceps major*), California slender salamander (*B. attenuatus*), and African clawed frog (*Xenopus laevis*) have also been documented there (U.S. Fish and Wildlife Service 1985).

In the Hidden Valley Wildlife Area, western spadefoot toad (*Scaphiopus Hammond*), a sensitive species, has been documented (Riverside County Parks Department 1990). Pacific slender salamander (*Batrachoseps pacificus*), western toad, bullfrog, and Pacific treefrog have also been documented in the Hidden Valley Wildlife Area.

During surveys conducted in 1995 and 1996, service personnel found Pacific tree frogs, California toads, and bullfrogs in the project area. Tadpoles of all three species were also documented in the study area. During these surveys, no southwestern arroyo toads nor California red-legged frogs were found.

3.5.2.3 Reptiles

Several species of reptiles have been documented in the Prado Basin. Important species are southwestern pond turtle (*Clemmys marmorata pallida*), a Category 1 candidate species for federal listing, and coastal western whiptail (*Cnemidophorus tigris multiscutatus*) and San Diego horned lizard (*Phrynosoma coronatum blainvillei*), both regarded as sensitive species.

USFWS (1985) observed southwestern pond turtles near the mouth of Mill Creek and near the River Drive crossing of the Santa Ana River, about 5 kilometers (4 miles) downstream of the study area. Additional records in the vicinity are mentioned, suggesting that the species is present in the study area. This turtle is found in a limited number of drainages in southern California.

Coastal western whiptails were observed in the least disturbed open shrublands of the Prado Basin (U.S. Fish and Wildlife Service 1985). The species is also found in woodlands and streamside growth (Stebbins 1985). There appears to be potential for the species to be found along the edges of the riverine habitats in the study area.

San Diego horned lizards have been observed in the Hidden Valley Wildlife Area. McGurty (1981) has described the habitat for the San Diego horned lizard. Ideal topography includes alluvial valley floors, old floodplains and alluvial terraces from near sea level to 600 meters (2,000 feet), with well-drained, deep, loose alluvial soils. Preferred plant communities are either chaparral or a mix of chaparral and coastal sage scrub, with ground coverage averaging 20%-40%. California buckwheat is considered to be a primary indicator species for favorable soil and climatic conditions for the San Diego horned lizard. This species has a highly specialized diet consisting almost exclusively of ants (McGurty 1981). Habitat for these species does not appear to be present onsite.

In the Prado Basin, side-blotched lizard (*Uta stansburiana*) and western fence lizard (*Sceloporus occidentalis*) appear to be the most prevalent reptiles. Gopher snakes (*Pituophis melanoleucus*) have been observed regularly as well. The western skink (*Eumeces skiltoniansus*) has been observed on occasion in low numbers in the remnant shrublands. (U.S. Fish and Wildlife Service 1985.) The common kingsnake (*Lampropeltis getulus*) has also been frequently observed. Species also expected at the Prado Basin include the southern Pacific rattlesnake (*Crotalus viridis helleri*), red racer (*Masticophis flagellum piceus*), and striped racer (*Masticophis lateralis*).

In addition, four other sensitive species of reptiles have not been documented to date but could be present in the study area. These are the San Bernardino ringneck snake (*Diadophis punctatus modestus*), two-striped garter snake (*Thamnophis Hammond*), coastal rosy boa (*Lichanura trivirgata rosafusca*), and coast patch-nosed snake (*Salvadora hexalepis virgultea*).

In addition to the San Diego horned lizard, five sensitive species are known to be found at the Hidden Valley Wildlife Area (Riverside County Parks Department 1990). These are the orange-throated whiptail (*Cnemidophorus hyperythrus beldingi*), coastal western whiptail, banded gecko (*Coleonyx variegatus abbotti*), San Bernardino ringneck snake, and patch-nosed snake.

During surveys conducted in 1995 and 1996, no sensitive reptile species were found in the study area. The only reptile detected was the western fence lizard and this species was found throughout the study. Despite the lack of detection, four sensitive species of reptiles may still be present in the project area. They include the San Bernardino ringneck snake (*Diadophis punctatus modestus*), two-striped garter snake (*Thamnophis hammodii*), coast patch-nosed snake, and southwestern pond turtle.

3.5.2.4 Birds

A total of 208 species of birds have been recorded at the Prado Basin (Hays 1987 in U.S. Fish and Wildlife Service 1988). At least 93 of these are breeding species. Six species federally or state listed as endangered or threatened and four other species regarded as sensitive are found or may be found in the Prado Basin (U.S. Fish and Wildlife Service 1988) (Table 3-2). Additionally, another 25 sensitive species are found or may be found (Tate 1986). Censuses of breeding birds conducted on fixed plots in the Prado Basin indicated that densities there were high compared with densities in other southern California willow woodlands, but that diversity was medium to low. On these plots, 746-1,013 bird territories per 100 acres were estimated, and 21-34 species were detected as presumed breeders.

The most common breeding species observed during the surveys, listed in their order of abundance in willow riparian habitats, include song sparrow (*Melospiza melodia*), rufous-sided towhee (*Pipilo erythrophthalmus*), common yellowthroat (*Geothlypis trichas*), house wren (*Troglodytes aedon*), and brown-headed cowbird (*Molothrus ater*). Additional information is provided by USFWS (1988). Annotations for the avifauna of the Prado Basin are available in USFWS (1985) and Hays (1987).

In the Hidden Valley Wildlife Area, wood ducks (*Aix sponsa*) have been noted as a nesting species. This is particularly significant because few wood ducks nest in southern California (Garrett and Dunn 1981). The species nests in natural tree cavities and also artificial nest boxes. Wood ducks have been the focus of a nest box installation program at the Hidden Valley Wildlife Area (Pedley pers. comm.). In 1993, 20 nests were observed.

Rough-winged swallows (*Stelgidopteryx serripennis*) were observed using the vertical bluff slopes. Swallow nests were seen also on the I-15 bridges. Evidence of human disturbance of the swallow nests has been observed: paintball remains were seen at and around these nests. Rough-winged swallow, although not considered a sensitive species, is considered a species of special interest.

3.5.2.5 Mammals

USFWS (1988) observed 23 mammalian species in the Prado Basin. An additional 15 species of bats potentially exist there. Annotations for all the mammals observed are in USFWS (1985).

Terrestrial Mammals. The mammals documented by USFWS (1988) consist of one marsupial, one insectivore, two lagomorphs, 11 rodents, seven carnivores, and one cervid. Feral pigs (*Sus scrofa*) are regarded as prevalent throughout the areas of giant reed.

Table 3-2. Special - Status Species That Occur or May Occur in the Study Area

Documented Occurences [a]	Common Name	Scientific Name	Legal Status [b]
Plants			
^	many-stemmed dudleya	*Dudleya multicaulis*	S
Fishes			
+^	Santa Ana sucker	*Catostomus santaanae*	S
+	speckled dace	*Rhinichthys osculus*	S
+	arroyo chub	*Gila orcutti*	S
Amphibians			
^	red-legged frog	*Rana aurora draytonii*	PE
	arroyo southwestern toad	*Bufo microscaphus californicus*	FE
+	western spadefoot toad	*Scaphiopus hammondii*	S
Reptiles			
^	southwestern pond turtle	*Clemmys marmorata pallida*	C1
+	banded gecko	*Coleonyx variegatus abbotti*	S
+^	San Diego horned lizard	*Phrynosoma coronatum blainvillei*	S
+^	coastal western whiptail	*Cnemidophorus tigris multiscutatus*	S
+	orange-throated whiptail	*Cnemidophorus hyperythrus beldingi*	S
+	San Bernardino ringneck snake	*Diadophis punctatus modestus*	S
	two-striped garter snake	*Thamnophis hammondii*	S
	coastal rosy boa	*Lichanura trivirgata rosafusca*	S
+	coast patch-nosed snake	*Salvadora hexalepis virgultea*	S
Birds			
+^	white-faced ibis	*Pelgadis chihi*	S
+^	Swainson's hawk	*Buteo swainsonii*	ST
+^	ferruginous hawk	*Buteo regalis*	S
^	bald eagle	*Haliaeetus leucocephalus*	SE, FT
^	peregrine falcon	*Falco peregrinus*	SE, FE
^	burrowing owl	*Athene cunicularia*	S
^	western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	SE
+^	Southwestern willow flycatcher	*Empidonax trailii extimus*	FE
+^*	least Bell's vireo	*Vireo bellii pusillus*	SE, FE
^	tricolored blackbird	*Agelaius tricolor*	S

Table 3-2. Continued

Documented Occurences [a]	Common Name	Scientific Name	Legal Status [b]
Mammals			
+^	San Diego black-tailed jackrabbit	*(Lepus californicus bennettii)*	S
	California leaf-nosed bat	*(Macrotis californicus)*	S
	greater western mastiff bat	*(Eumops perotis californicus)*	S
+	San Diego desert woodrat	*(Neotoma lepida intermedia)*	S
+	Los Angeles little pocket mouse	*(Perognathus longimembris brevianus)*	S
+	southern grasshopper mouse	*(Onychomys torridus)*	S
+	ringtail	*(Bassariscus astutus)*	S

Notes: "Special-status species" listed in this table are species listed as endangered or threatened under the federal or California Endangered Species Acts, species proposed for listing, candidates for listing, and sensitive species.

[a] Occurrence explanations:

- \+ Reported at Hidden Valley Wildlife Area approximately 4 kilometers (2.4 miles) upstream of study area.
- ^ Reported at Prado Basin approximately 8 kilometers (4.9 miles) downstream of study area.
- * Reported at the study area.

[b] Status explanations:

FE = listed as endangered under the federal Endangered Species Act.
PE = proposed for listing as endangered under the federal Endangered Species Act.
SE = listed as endangered under the California Endangered Species Act.
ST = listed as threatened under the California Endangered Species Act.
C1 = Category 1 candidate for federal listing.
S = sensitive taxa for which existing information indicates that federal listing as endangered or threatened may be warranted, but for which sufficient biological information to support a proposed listing is lacking.

Source: USFWS 1995.

Four species of mammals regarded as sensitive are present or could be present in the Prado Basin. The San Diego black-tailed jackrabbit (*Lepus californicus bennettii*) is present. The decline of the jackrabbit and the other candidate forms is believed to result primarily from the loss and fragmentation of habitat. Habitat for the San Diego desert woodrat (*Neotoma lepida intermedia*), Los Angeles little pocket mouse (*Perognathus longimembris brevianus*), and grasshopper mouse (*Onychomys torridus*) is likely present as well.

In the study area, a dead ornate shrew (*Sorex ornatus*) was discovered under the I-15 bridge. Pet cats and dogs were commonly observed on the bluff tops, adjacent to the houses. Some of these animals probably move through portions of the study area. Further surveys for species of interest will be conducted by USFWS in fall 1995 and spring 1996.

Bats. Two of the species of bats that potentially visit the Prado Basin are considered sensitive: the California leaf-nosed bat (*Macrotis californicus*) and the greater western mastiff bat (*Eumops perotis californicus*). Both bats are insectivorous. The greater western mastiff bat feeds extensively on Hymenoptera (e.g., bees and wasps). The greater western mastiff bat has a large range when foraging and does not roost as much as other species of bats. It has been recorded foraging for as long as 6½ hours per night up to 18 kilometers (13 miles) from its known daytime roost (Barbour and Davis 1969). Both species have suffered a decline in numbers as a result of human disturbance.

Nine species of bats are reported to be present at the Hidden Valley Wildlife Area (Riverside County Parks Department 1990). Six are in the genus *Myotis*. The others are the red bat (*Lasiurus borealis*), hoary bat (*L. cinereum*), and guano bat (*Tadarida brasiliensis*). Along the Santa Ana River, approximately 30 kilometers (21 miles) upriver in the Seven Oaks Canyon, there were flight observations of western pipistrelle (*Pipistrellus hesperus*) and *Myotis* (U.S. Fish and Wildlife Service 1988).

3.5.3 Threatened and Endangered Species

3.5.3.1 Plants

USFWS (1985) noted the potential occurrence in the Prado Basin of two sensitive plant species, the Santa Ana River woollystar (*Eriastrum densifolium* spp. *sanctorum*) and the many-stemmed dudleya (*Dudleya multicaulis*). However, neither the Santa Ana River woolly star, federally listed as endangered, nor suitable habitat were found by USFWS in the Prado Basin. The many-stemmed dudleya, a sensitive species, was located at two sites, the nearest being approximately 3 kilometers (2.5 miles) downstream of the study area. This nearest group, consisting of about 10 plants, was found near the Raadhauge Pheasant Club in the Prado Basin. Habitat for the many-stemmed dudleya consists of dry, stony places below 2,000 feet in elevation, coastal sage scrub, and chaparral (Munz 1974). No dudleya were found during the 1996 surveys. It is therefore likely that the species is not present in the study area.

3.5.3.2 Wildlife

Table 3-2 lists special-status sensitive species that are found or that may be found at the Norco Bluffs. These include state-listed and federally listed species, species that are proposed or are candidates for state or federal listing, and other sensitive species. Of particular interest are the least Bell's vireo and the willow flycatcher, two riparian species federally listed as endangered.

The least Bell's vireo, state-listed and federally listed as endangered, formerly was common to locally abundant from Tehama County, California, to Baja California, Mexico (Grinnell and Miller 1944). The least Bell's vireo is a small, olive-gray migratory songbird that nests in riparian woodlands. These woodlands typically consist of a dense understory of sandbar willow (*Salix hindsiana*), arroyo willow (*S. lasiolepis*), and black willow (*S. goodingii*), as well as mulefat (*Baccharis glutinosa*) and some herbaceous species. Cottonwoods (*Populus fremontii*), western sycamore (*Platanus racemosa*), coastal live oak (*Quercus agrifolia*), and larger willows commonly contribute to the overstory.

The least Bell's vireo has declined as a result of the combined, perhaps synergistic effects of habitat destruction and heavy brood parasitism by the brown-headed cowbird (*Molothrus ater*). (A brood parasite is a bird that lays its eggs in other species' nests, usually causing reproductive failure). The increase in cowbird populations has been caused by the expansion of cattle ranching in California (Franzreb 1989). Another important limiting factor in the decline of the least Bell's vireo is considered to be the destruction and fragmentation of riparian habitat as a result of residential and industrial development, which has increased the demand for water projects in least Bell's vireo habitat (Olson and Gray 1989).

In 1990, 385 pairs of at least 489 territorial males were estimated to exist in the entire range of the least Bell's vireo (Salata and Hays 1991). There has been an overall increase since 1986, when the species was federally listed. In 1986, only 275 pairs of 397 territorial males were estimated to exist (Salata and Hays 1991). In the Prado Basin and contiguous reach of the Santa Ana River, 70 territorial males, scattered at a minimum of eight sites, were observed in 1991 (Pike and Hays 1992). As of June 1995, the number of territorial males was 193 (Pike 1995).

At the Hidden Valley Wildlife Area, three pairs of least Bell's vireo were observed in 1995 (Hays pers. comm.). In the study area, a total of 10 surveys were conducted from March 27 to July 31, 1995. On nearly all visits, a singing male least Bell's vireo was detected in the riparian habitat at the end of Corona Avenue. A female was also observed in the area. During the spring of 1996, three male least Bell's vireos have been detected. Two of these were paired with females as of May 3, 1996. In addition, because of the yearly increase in the least Bell's vireo population over the past several years, and their ability to disperse to other sites, the potential for their use of this area is increasing.

The study area also lies within the boundaries of critical habitat for the least Bell's vireo (59 FR 4845). This critical habitat is a portion of about 15,378 ha (38,000 acres) at 10 localities in six southern California counties. It consists of specific areas within the geographical area occupied by a species on which are found those physical or biological features that (1) are essential to the conservation of the species and (2) may require special management considerations or protection. Once critical habitat is designated, Section 7(a)(2) of the federal Endangered Species Act of 1973, as amended, requires federal agencies to ensure that activities they authorize, fund, or carry out are not likely to destroy or adversely modify critical habitat.

The willow flycatcher (*Empidonax traillii*), another bird associated with riparian habitat, is also known from the Prado Basin. In 1992, five territories were recorded (Hays pers. comm.). The willow flycatchers observed may be the southwestern willow flycatcher, the *extimus* race, a subspecies state-listed and federally listed as endangered (Unitt 1984). Although this bird is threatened by habitat loss (Unitt 1984), its decline may be related to brood parasitism by cowbirds as well (Sedgwick and Knopf 1988). In 1990, an unpaired male willow flycatcher was observed on the Santa Ana River, near the eastern boundary of the City of Norco, just upriver of the study area (Berryman pers. comm.). No willow flycatchers were detected during 1995 and 1996 surveys.

This site is also potential habitat for the western yellow-billed cuckoo, a state-listed endangered species. Surveys in 1995 and 1996 failed to identify any individuals using the site. There is a potential that individuals may migrate through this area in spring and fall.

3.6 AESTHETICS

The visual resources of the Norco Bluffs area are quite diverse: open agricultural lands north of the river, extensive riparian habitat in the river channel, a 20-meter (65.6-foot) bluff along the southern river bank, and the residential area of Norco on top of the bluffs. Vacant lots, horse-boarding facilities, horse trails, public utility lines, major public roads, and I-15 are also in the Norco Bluffs area.

Sensitive viewsheds include the river bottom with its extensive riparian areas, and the open farmland north of the Santa Ana River. The riparian areas are dominated by at least four species of willows: black willow, red willow (*Salix laevigata*), yellow willow (*Salix lasiandra*), and Arroyo willow. Areas of Arundo scrub are also present. The canopy is so dense in some places that little understory exists.

The bluffs are visible from I-15 and appear as an earthen wall between the riverbed and the houses above. Figure 3-2 shows photographs of the study area.

3.7 CULTURAL RESOURCES

A records and literature search for information on cultural resources on the Norco Bluffs portion in the study area was conducted through the Eastern Information Center at the Department of Anthropology, University of California, Riverside. The search indicated that a cultural resources survey had been performed previously on a portion of the area of potential effect (APE) for the NED

Figure 3-2
Views of the Study Area

View of the Study Area Looking Southwest toward I-15

View of the Study Area Looking Southwest toward I-15

Figure 3-2
Continued

View of the Study Area from River Drive Looking Southwest toward I-15

View of the Study Area Looking Northeast toward the Bluffs

Plan Alternative. No historic or prehistoric sites were recorded in the APE of Norco Bluffs. An archaeological survey of the unsurveyed portion of the APE was performed by a staff archaeologist from the Corps in May 1995. No cultural resources were observed during this survey. It was determined that the entire APE (including borrow areas and staging areas) is devoid of cultural resources of any significance.

The proposed borrow areas for soil cement are located in the Prado Dam Flood Control Basin and have been surveyed in the past as a part of Corps projects. Archaeological sites are found in the area. Test excavations have been conducted. Sensitive areas will be avoided and protected.

The Pleistocene nonmarine deposits of the cliff and riverbed have a low to moderate potential for containing paleontological resources. No paleontological sites have been recorded within the study area.

3.8 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTES

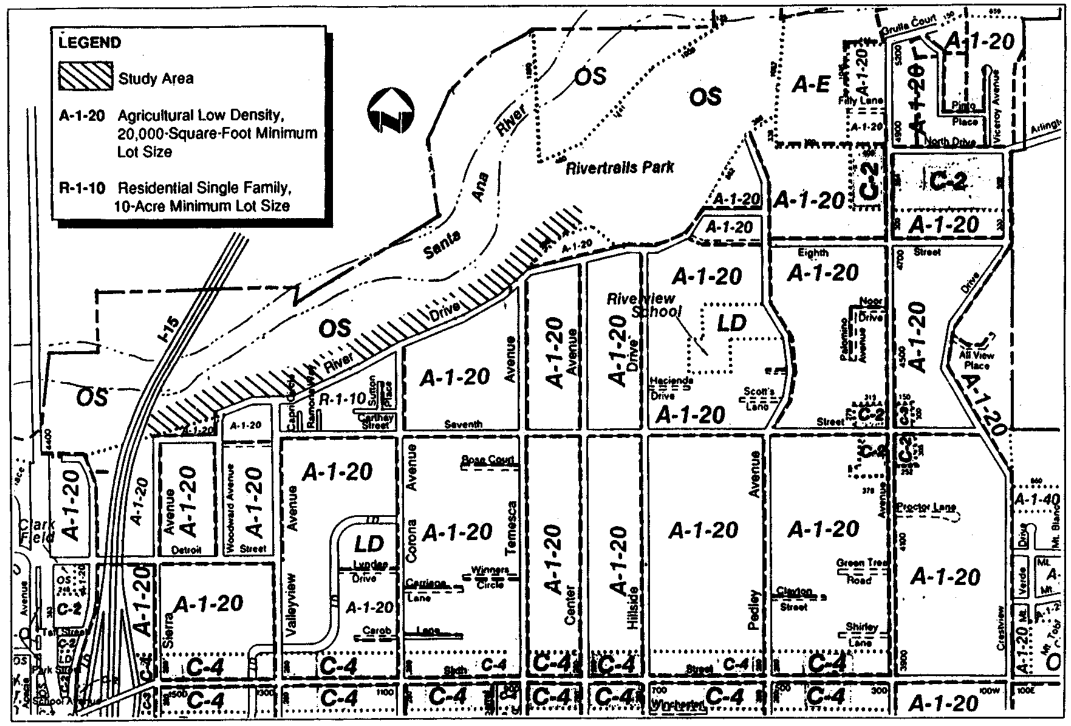
The study area has been used primarily for residential and recreational purposes, with no industrial use that would indicate hazardous waste contamination. Two potential sources of contamination may exist in the area. The most notable is a fill area along the bluffs near Corona Street. A significant quantity of various fill materials has been placed to fill a major washout. The placement of fill was relatively uncontrolled and therefore it is not known whether any hazardous, toxic, or radioactive wastes have been illegally disposed of in the area.

The bed of the Santa Ana River is also a potential area of illegal dumping. Car bodies and other material occasionally are found in the area, and have apparently been pushed off the cliffs.

3.9 LAND USE, POPULATION, AND HOUSING

3.9.1 Land Use

Land uses in the study area are primarily residential with informal recreational uses along River Drive. In the river bottom, uses include flood control and informal recreation. The City of Norco, through its general plan, administers land uses in the study area. Land along River Drive is zoned Open Space (OS), Agricultural-Low Density with a 900-square-meter (20,000-square-foot) minimum lot size requirement (A-1-20), and Residential Single-Family with a 4-ha (10-acre) minimum lot size requirement (R-1-10). Only one parcel is zoned R-1-10 (Figure 3-3) in the study area. There are approximately 139 dwelling units between Pedley Avenue and I-15. Toward the upstream portion of the study area (near Pedley Avenue), homes are located as close as 5 meters (16.4 feet) from the edge of the bluff face (U.S. Army Corps of Engineers 1993). The areas along



Source: City of Norco Official Zoning Map.

Figure 3-3
Land Use and Zoning Designations near the Study Area

the bluff tops, parallel to River Drive and the river, are used as informal or unestablished equestrian trails. Further description of recreation use is presented in Section 3.10 below.

Pedley Avenue is the major access route to the study area. Land uses along this roadway are primarily residential. River View School, a public elementary school, is at the northern end of Pedley Avenue.

3.9.2 Population and Housing

The population of the City of Norco is 24,817 (Mulder pers. comm.). It is projected that in 2010 the population of the city will be approximately 30,000 (City of Norco 1993). The 1990 census recorded a total of 5,785 dwelling units in the city (City of Norco 1995). The average family size in Norco is 3.4; therefore, approximately 472 people reside in the dwelling units between Pedley Avenue and I-15.

3.10 RECREATION

Recreation areas in proximity to the study area include Hidden Valley Wildlife Area downstream of the study area, and Prado Basin Park downstream of the study area. The Hidden Valley Wildlife Area is a passive use area containing trail systems open to equestrians and pedestrians during portions of the year. The least Bell's vireo, an endangered species, nests in the heavy riparian vegetation of the river bottom. During nesting periods, recreational activities in the wildlife area are limited. Prado Basin Park is a regional passive use facility downstream of the study area on the northern bank of the river. These two facilities are part of the Santa Ana River Regional Park system which is in the jurisdiction of the County of Riverside.

The study area is also part of the Santa Ana River Trail regional system. Although the trail is not continuous in the Norco area, future plans include a trail on the north and south sides of the river (west of I-15) and an on-street trail on the south side of the river (east of the I-15). These planned routes include the Wineville Avenue, Pedley Avenue, and La Sierra Trails. In addition to the Santa Ana River Trail regional system, the County of Riverside General Plan identifies a regional trail from the western edge of the Hidden Valley Wildlife Area south past Ingalls Park that will become an access trail to the Santa Ana River Trail regional system. The City of Norco is also considering the establishment of an equestrian trail along River Drive. The exact placement of the trail has not yet been determined.

River Trails Park is a 109.7-ha (271-acre) passive-use park intended primarily for equestrian use. The park is located in the river valley below the bluffs east of Hamner Avenue. Access points into the trail system are at the terminus of Old Hamner Road and Pedley Road on the south side of the river, and Rivertrails Stables on the north side of the river. There are also numerous "informal" equestrian trail heads along the southern side of the river. The areas of extreme bluff erosion, such as those along River Drive, have no trail connection with River Trails Park because of the steepness of the bluffs. The trails through the park are continually changing according to the meandering of the river, the effect of the last floodflow on the vegetation, and the density of the underbrush.

3.11 PUBLIC SERVICES AND UTILITIES

Sanitary sewer and water services within the City of Norco are provided by the city. Electrical service and natural gas service are provided by Southern California Edison Company and Southern California Gas Company, respectively.

A public service issue of particular concern in the study area is the potential for utilities to be damaged by continued bluff retreat. Sanitary sewers are located on the north side of River Drive, and water and gas lines are generally on the south side. Electrical and phone lines are above ground on the south side of the street.

3.12 TRANSPORTATION

The transportation network in the study area includes roadways both north and south of the Santa Ana River. Paved roads crisscross the undeveloped area north of the Santa Ana River mainly along section lines, and asphalt and dirt tracks provide field access for farm vehicles. The area south of the river, within the City of Norco, includes a traditional rectangular street system in the older part of town to the east, and a more modern cul-de-sac street system to the west.

The major transportation route in the study area is I-15, which traverses the area from north to south, just upstream of the Hamner Avenue bridge. Construction of the I-15 bridge required the installation of a riprap toe protection along the base of the bluffs just upstream of the freeway.

The streets adjacent to the study area are River Drive which runs along the bluff top, and the intersecting streets of Woodward, Valleyview, Corona, Temescal, Center, Hillside, and Pedley Avenues. These streets are city maintained and are all fully paved. River Drive is a two-lane road which parallels the bluff in the study area. This road is designated as a local street in the City of Norco Circulation Element Update. No traffic counts are available for the road. The road is blocked off in two locations because of undercutting of the bluff.

Construction access to the site would be from Hamner Avenue near I-15, and from I-15 east along Sixth Street and north to Pedley Avenue. Hamner Avenue is a major six-lane arterial which deadends south of the river. Traffic counts are not available for Hamner Avenue in this area. Sixth Street is classified as a major arterial and a truck route in the City of Norco's Circulation Element Update. It is a four-lane roadway with average daily traffic (ADT) volume of 18,750 and a level of service (LOS) of "C". Pedley Avenue provides the only direct access to the riverbed along a controlled access road. It is a two-lane road classified as a local street in the City of Norco's Circulation Element Update. No traffic counts are available for this road.

3.13 NOISE

Background information on environmental acoustics, terminology of acoustics, and state and federal noise guidelines is provided in Appendix C.

3.13.1 Noise Regulations

The study area is in the City of Norco in Riverside County. Noise levels in Norco are regulated by the City of Norco noise ordinance and the City of Norco General Plan Noise Element. Riverside County noise regulations are not applicable within the City of Norco (Daniels pers. comm.).

The City of Norco noise ordinance states that construction activity, including equipment start-up and use and the unloading and handling of materials, shall not commence before 6:30 a.m., weekdays and Saturday, and on Sundays and any national holidays shall not commence before 8:00 a.m. The noise ordinance does not include recommended times for ending construction activity in the evening (Daniels pers. comm.). The citizens of Norco have opted for a more lenient noise ordinance rather than a more restrictive one because many residents raise animals and do not want unnecessary restrictions placed on that practice, which can result in the generation of noise at unpredictable times of the day (Daniels pers. comm.).

The City of Norco General Plan Noise Element includes limits on day and night outdoor noise levels which, when combined, produce the following outdoor day-night average sound levels (L_{dn}) for several different land uses:

	Day	Night	L_{dn}
■ Residential	55 dB	40 dB	56 dB
■ Commercial	70 dB	55 dB	71 dB
■ Industrial	70 dB	55 dB	71 dB
■ Schools	50 dB	40 dB	53 dB
■ Parks	55 dB	45 dB	58 dB
■ Hospitals	50 dB	40 dB	53 dB

Additionally, the noise element recommends that no instantaneous noise event louder than 110 dBA be allowed at any time (City of Norco 1976).

3.13.2 Existing Noise Conditions

Norco is largely a rural community and therefore experiences a limited amount of traffic-related noise. The main roadways that would be affected by the project are I-15, Sixth Street, Pedley Avenue, and Hamner Avenue because equipment and trucks needed for construction under the NED Plan Alternative would use these roadways to access and exit the construction site. Two access points to the riverbed are anticipated. One would be from Hamner Avenue west of the study area and the other would be from Pedley Avenue east of the study area. It is anticipated that most traffic would be one way. Generally, traffic would enter Hamner Avenue and exit via Pedley Avenue. This flow may be reversed, depending on the location of construction activities. River Drive is also described in this section because it is a major source of noise for residences along the bluff.

I-15 is a six-lane freeway that runs north-south across the Santa Ana River at the western end of the study area and is a major source of traffic noise for sensitive receptors at that end of the study area. Traffic on I-15 generates noise levels of approximately 81 L_{dn} 15 meters (50 feet) from the edge of the freeway and approximately 78 L_{dn} 30 meters (100 feet) from the edge of the freeway.

Sixth Street is a local four-lane road that runs east-west through the project area and is a source of noise for sensitive receptors along Sixth Street. Traffic on Sixth Street generates noise levels of approximately 68 L_{dn} 15 meters (50 feet) from the edge of the roadway and approximately 64L_{dn} 100 feet from the edge of the roadway.

Pedley Avenue is a local two-lane road that runs north-south and is a source of traffic noise for sensitive receptors along Pedley Avenue. Traffic on Pedley Avenue generates noise levels of approximately 50 L_{dn} 15 meters (50 feet) from the edge of the roadway and approximately 46 L_{dn} 30 meters (100 feet) from the edge of the roadway.

Hamner Avenue is a six-lane arterial that runs north-south and is a source of noise for sensitive receptors in the vicinity of Hamner Avenue. Traffic on Hamner Avenue generates noise levels of approximately 67 L_{dn} 15 meters (50 feet) from the edge of the roadway and approximately 64 L_{dn} 30 meters (100 feet) from the edge of the roadway.

River Drive is a local two-lane road that runs along the top edge of the bluffs and is a source of traffic noise for all sensitive receptors in the study area located near the edge of the bluffs. Traffic on River Drive generates noise levels of approximately 47 L_{dn} 15 meters (50 feet) from the edge of the roadway and approximately 44 L_{dn} 30 meters (100 feet) from the edge of the roadway.

Sensitive noise receptors in the study area include residences, four churches, and a Montessori school located along Sixth Street; residences and River View School located along Pedley Avenue; and residences located along River Drive (Daniels pers. comm.).

3.14 AIR QUALITY

3.14.1 Climate and Meteorological Conditions

The study area is located in the Riverside County portion of the South Coast Air Basin (SCAB), which lies within the semi-permanent high pressure zone of the eastern Pacific Ocean. This results in a Mediterranean-type climate with warm dry summers and mild winters with occasional rainfall, along with early morning clouds and fog along the coast. Because the project region is inland, it generally has hot summer afternoons and only occasional fog or cloud cover.

The average annual temperature in the project region is about 18°C (64°F). The coolest months are December, January, and February (average high of 19°C (66°F)) and average low of 6°C (43°F), and the warmest months are July, August, and September (average high of 33°C (92°F)) and average low of 16°C (61°F)). Average rainfall in the study area is approximately 20 centimeters (9 inches) per year, with most of the precipitation occurring between November and April.

Winds in the project region are characterized by westerly and southwesterly onshore winds during the day and easterly or northeasterly offshore winds at night. Wind speeds are normally greater during summer than during the rainy season. However, the highest wind speeds are associated with the Santa Ana winds, which occur predominantly during winter. The project region is subject to frequent temperature inversions, which trap pollutants at the earth's surface, producing high concentrations of pollution during periods of low wind.

3.14.2 Air Quality Standards and Monitoring Data

Ozone is a public health concern because it is a respiratory irritant that also increases susceptibility to respiratory infections. Ozone causes substantial damage to leaf tissues of crops and natural vegetation, and damages many materials by acting as a chemical oxidizing agent. State and federal standards for ozone have been set for a 1-hour averaging time. The state 1-hour ozone standard is 0.09 parts per million (ppm), not to be exceeded at any time. The federal 1-hour ozone standard is 0.12 ppm, not to be exceeded more than three times in any 3-year period. Both the state and federal ozone standards have been violated several times during the last 5 years in the study area region (California Air Resources Board 1991, 1992, 1993, 1994).

Health concerns associated with suspended particles focus on those particles small enough to reach the lungs when inhaled because they can lodge in the lungs and contribute to respiratory problems, including permanent lung damage. Fine particles can also interfere with the body's mechanism for clearing the respiratory tract or by acting as a carrier of an adsorbed toxic substance. Few particles larger than 10 microns in diameter reach the lungs, so particulate matter smaller than 10 microns in diameter (PM10) is the focus of the state and federal standards. State and federal PM10 standards have been set for 24-hour and annual averaging times. The state 24-hour PM10 standard equals 50 micrograms per cubic meter ($\mu g/m^3$) and the federal 24-hour standard is 150 $\mu g/m^3$. The state annual PM10 standard is 30 $\mu g/m^3$, an annual geometric mean, whereas the federal annual PM10 standard is 50 $\mu g/m^3$, an annual arithmetic mean. Federal and state 24-hour PM10 standards may not be exceeded more than 1 day per year, and neither annual standard may be exceeded. Both the state and federal PM10 standards have been violated several times during the last 5 years in the study area region (California Air Resources Board 1991, 1992, 1993, 1994).

3.14.3 Attainment Status and Air Quality Planning

The study area region, located in the Riverside County portion of the SCAB, is classified as an extreme nonattainment area for the state and federal ozone standards, a nonattainment area for the state PM10 standards, and a serious nonattainment area for the federal PM10 standards (Hogo pers. comm.).

The South Coast Air Quality Management District (SCAQMD) is responsible for monitoring air quality and enforcing air quality regulations in the Riverside County portion of the SCAB. In 1994, the SCAQMD prepared an air quality management plan (AQMP) for the air basins in its jurisdiction, including the study area. This AQMP was submitted to the California Air Resources Board (ARB) for review, and the ozone portion of the plan, which will later become the state implementation plan (SIP) for ozone, was forwarded to the U.S. Environmental Protection Agency (EPA) in November 1994. EPA is currently reviewing the ozone portion of the plan and ARB is reviewing the remaining portions of the plan. Additionally, the SCAQMD is revising the 1994 AQMP and the revised version is due to ARB in 1997. The PM10 portion of this revised plan, which will later become the PM10 SIP, is due to EPA in February 1997 (Hogo pers. comm.).

Section 4.0. Environmental Consequences

4.1 INTRODUCTION

This section describes the impacts associated with implementation of each of the alternatives analyzed in detail. Both short- and long-term impacts are described for each of the resource areas for each alternative. For purposes of this project, short-term impacts are considered to be impacts that would occur during the construction period or within 1 year of construction. Additionally, both direct and indirect impacts are considered. Direct impacts are those impacts that would clearly result from implementation of the project. Examples of direct impacts include loss of vegetation as a result of grading, and generation of dust during construction. Indirect impacts are those impacts that may be exacerbated by project activities, or that would occur as a secondary effect of project activities. An example of an indirect impact would be the use of construction access roads for off-road vehicle activities.

Impacts were determined to be significant or less than significant based on impact significance thresholds described for each resource topic. For each impact identified as significant, mitigation measures are proposed that would reduce the impact to a less-than-significant level wherever feasible (except for the No-Action Alternative).

4.2 TOPOGRAPHY

4.2.1 Impact Significance Thresholds

Topographic impacts would be considered significant if grading would result in loss of a major topographic feature or result in substantial alteration of existing topography.

4.2.2 Methodology

Preliminary grading and construction concepts were reviewed to determine potential changes in topography that could result from project implementation.

4.2.3 Toe Protection Only, Using Soil Cement (NED Plan Alternative)

Impacts. Implementation of this alternative would result in fill material being placed near the toe of the slope of the Norco Bluffs. Additionally, grading would be performed in this area. Fill material would be mined to a depth of 1.5 meters (5 feet) in the riverbed. This grading would not result in loss of a major topographic feature or substantially alter existing topography. Therefore, no significant topographic impact is anticipated.

Mitigation. No mitigation measures would be required.

4.2.4 Toe Protection Using Soil Cement with Slope Protection Using Buttress Fill (Locally-Preferred Plan Alternative)

Impacts. Implementation of this alternative would result in impacts similar to those of toe protection only, except that additional areas would be mined in the riverbed under this alternative if it is determined that fill material would be taken from that source. Implementation of this alternative would also result in the contouring, but not the elimination, of the bluff face. No loss of a unique topographic feature or major changes in topography are anticipated. Therefore, no significant topographic impact is anticipated.

Mitigation. No mitigation measures would be required.

4.2.5 No-Action Alternative

Adoption of the No-Action Alternative would not result in any direct impacts on topography from construction-related activities. Erosion and bluff retreat would continue, however, resulting in further receding of the bluff. This indirect impact would be considered significant.

4.3 GEOLOGY

4.3.1 Impact Significance Thresholds

The following significance criteria were developed from Appendices G and I of the State CEQA Guidelines and from professional practice. The project would result in a significant impact on geology if it would:

- cause substantial flooding, erosion, or siltation;
- expose people or structures to major geologic hazards;
- result in unstable earth conditions or changes in geologic substructure; or
- result in an increase in wind or water erosion of soils, either onsite or offsite.

4.3.2 Methodology

The overall characteristics of the designs of the alternative actions were evaluated relative to the geological environment.

4.3.3 Toe Protection Only, Using Soil Cement (NED Plan Alternative)

Impacts. This alternative would protect the toe of the bluffs in the study area from further erosion and undercutting. This would prevent further receding of the bluff, which would be a beneficial geology impact.

Implementation of this alternative would not involve stabilizing the existing face of the bluff that have been undermined and are in danger of further sloughing, and unauthorized people walking on top of the toe protection structure could be exposed to hazardous conditions if sloughing occurred. This situation may therefore constitute a significant impact.

Constructing the toe protection structure and potentially mining material in the riverbed would require the removal of vegetation, resulting in increased potential for water- and wind-related erosion in the area lacking vegetation. This increased erosion potential would also be considered a significant impact.

Mitigation. Mitigation measures to reduce the potential impact of additional sloughing of existing unstable slopes are limited without actual slope stabilization. Warning signs will be placed along the top of the toe protection structure to warn people about the danger of entering the area. However, no mitigation exists to reduce this impact to a less-than-significant level.

Erosion-control measures, described below in Section 4.4.3, will be developed and implemented to reduce erosion impacts to less-than-significant levels.

4.3.4 Toe Protection Using Soil Cement with Slope Protection Using Buttress Fill (Locally-Preferred Plan Alternative)

Impacts. Implementation of this alternative would protect the bluff toe from further erosion and undercutting and would also correct current slope instability. This would be a beneficial impact.

As described for the NED Plan alternative, removal of vegetation and other construction activities would result in potentially significant erosion potential.

Mitigation. Erosion-control measures, described in Section 4.4.4, will be developed and implemented to reduce impacts to less-than-significant levels.

4.3.5 No-Action Alternative

Adoption of the No-Action Alternative would result in continued bluff erosion and collapse of the bluffs. The exact rate of loss in not predictable with any certainty, but bluff retreat could average about 4 meters (13 feet) per year. The long-term bluff retreats would damage homes and other structures on both sides of River Drive in the study area, as well as the roadway itself and the utilities in and near the roadway. This would be considered a significant impact.

4.4 WATER RESOURCES AND WATER QUALITY

4.4.1 Impact Significance Thresholds

The following significance criteria were developed from Appendices G and I of the State CEQA Guidelines and from professional practice. The project would result in a significant impact on water resources and water quality if it would:

- substantially alter drainage patterns or the rate and amount of surface water runoff;
- cause or result in substantial flooding;
- result in substantial degradation of surface water or groundwater quality or contaminate a public water supply; or

- cause exceedances of applicable water quality standards or objectives or cause impairment of beneficial uses.

4.4.2 Methodology

The overall project elements and construction requirements were evaluated to identify potential impacts on surface water resources or water quality. Special emphasis was placed on the analysis of impacts of construction activities.

4.4.3 Toe Protection Only, Using Soil Cement (NED Plan Alternative)

Impacts. Significant impacts on both water resources (hydrology) and water quality could result from implementation of this alternative.

Water Resources. Implementation of this alternative would result in minor changes in the hydraulics of the Santa Ana River. The toe protection structure is designed to protect the toe of the bluffs from erosion but would not significantly change the meandering flow patterns in the river. However, hydraulic characteristics of the river could change as a result of the area being mined for fill material. Up to 3.92 ha (9.68 acres) of riverbed would be excavated to an average depth of 1.5 meters (5 feet) in areas of Arundo near the study area. Hydrological studies have indicated that there would be no significant impacts associated with streamflow and erosion.

Water Quality. Implementation of this alternative would result in the potential for significant water quality impacts during and for a short period following the construction period, as follows:

- **Potential sedimentation impacts resulting from removal of vegetation associated with construction easements, access roads, and potential borrow areas in the riverbed.** A maximum of 3.92 ha (9.68 acres) of riverbed in the Santa Ana River would be disturbed if borrow material is obtained from the river. Such disturbance could result in substantial sedimentation and turbidity until revegetation occurs; this would be considered a significant impact.

- **Potential turbidity impacts associated with dewatering of construction excavations.** Because the groundwater level in the riverbed is high, dewatering may be necessary with implementation of this alternative. Most dewatering efforts would involve direct pumping from excavations and may result in significant turbidity impacts.

- **Potential effect from herbicide application.** The removal of the Arundo will involve the application of a herbicide, most likely "Rodeo" which is registered by the EPA for use in wetlands. The active ingredient in the herbicide has a relatively low toxicity level to wildlife and aquatic species. Nevertheless, discharges of quantities of material, such as a spill, can impact aquatic resources.

  It is envisioned that the initial application of Rodeo will be made once or twice in the late summer and/or fall. This application will be made by a licensed applicator either by boom or possibly helicopter. Subsequent application during the monitoring period will be made on regrowth by on-ground spot application. With only one or two general applications of herbicides made during low flow times in the river (most of the area does not contain flowing water) and given the relatively low toxicity of Rodeo, the impacts to water quality is considered a potentially adverse impact, but not to significant levels. It should also not affect the Basin Plan for the Santa Ana River.

  As with other toxic materials described below, there is the potential for accidental spill of herbicide during application. This is a potentially significant impact.

- **Potential accidental release of toxic materials, such as diesel fuel, from construction vehicles.** Because most construction activities would take place in the riverbed, there is a potential for accidental spill of diesel fuels, lubricating oil, and similar toxic materials associated with Arundo removal and construction. A substantial release of this material would be considered a significant impact.

An erosion control plan will be developed to control sedimentation and turbidity impacts. Key elements of the plan will be to facilitate revegetation of the construction and borrowing areas and to construct sedimentation basins and other temporary structures to prevent erosion. Temporary measures such as sandbags and/or water bars may be used where required. It should be noted, however, that major flows in the Santa Ana River will lead to sedimentation impacts regardless of the installation of structures. This potential impact is significant and unavoidable.

The contractor will be required to obtain a NPDES permit. Turbidity impacts from dewatering will be reduced to less-than-significant levels through construction of settling basins or similar structures prior to release of water back into the river channel. A National Pollutant Discharge Elimination System (NPDES) permit will be obtained before any dewatering activities are performed.

A pollution-prevention and -control plan will be developed to reduce the potential for accidental release of fuels, pesticides and other materials. This plan will include designation of refueling locations and emergency response procedures and definition of reporting requirements for any spill that occurs. Equipment for immediate cleanup, such as cotton batting, will be kept onsite for immediate use. Development and implementation of this plan will reduce potential impacts associated with accidental release of toxic materials to less-than-significant levels.

This plan should also include pesticide application activities including storage and handling of herbicides and application methods.

4.4.4 Toe Protection Using Soil Cement with Slope Protection Using Buttress Fill (Locally-Preferred Plan Alternative)

Impacts. The impacts of this alternative would be the same as those described above for toe protection only, except that up to 15.9 ha (39.4 acres) may be graded if mining occurs in the river.

Mitigation. The mitigation measures described above for toe protection would apply to this alternative.

4.4.5 No-Action Alternative

Water Resources. Because no structures that could change flows would be constructed in the Santa Ana River under this alternative, there would be no changes in water resources. The Santa Ana River would still have a potential to meander at right angles to the toe of the bluffs and cause undermining of the bluffs. This potential impact would be considered significant.

Water Quality. Adoption of the No-Action Alternative would result in no changes in water quality from current conditions.

4.5 BIOLOGICAL RESOURCES

4.5.1 Impact Significance Thresholds

Impacts on botanical resources would be considered significant if the project would result in any of the following:

- loss of substantial amounts of common natural plant communities;
- loss or substantial disturbance of a sensitive vegetation type (e.g., riparian vegetation or wetlands); or

- direct mortality of, permanent loss of habitat for, or substantially lowered reproductive success of:
    - individuals of plant species that are state-listed or federally listed or proposed for listing as threatened or endangered or
    - substantial portions of local populations of candidates for state or federal listing.

Impacts would be considered less than significant if they did not meet one or more of the criteria listed above. Impacts would be considered beneficial if they would create habitat for native plant species or reduce the extent of pest species.

Wildlife impacts would be considered significant if there would be a loss of high-value wildlife habitat, including riparian, freshwater marsh, and coastal sage scrub habitat. Additionally, a project would be considered to have a significant impact if it would affect individuals or critical habitat of a federally listed or state-listed threatened or endangered species.

4.5.2 Methodology

Plant communities within and near the study area were mapped onto 1:500-scale topographic maps using signatures on 1:24,000-scale color aerial photographs and 1:500-scale black-and-white aerial photographs. This coverage was available for all areas except near the I-15 bridge and near Pedley Avenue. In these areas, mapping was conducted visually from the top of the bluffs. Once initial mapping was completed, limited surveying was conducted in the field to verify community types and boundaries. Plant communities were characterized as described in Section 3.4. The areas of potential impact from toe protection activities and from toe protection with slope stabilization were projected onto the topographic maps, and loss of vegetation communities was quantitatively estimated for each alternative.

Potential impacts on wildlife habitat were based on the analysis of loss of vegetation communities. Also, potential loss of wildlife habitat was determined based on preliminary analysis conducted by USFWS.

4.5.3 Toe Protection Only, Using Soil Cement (NED Plan Alternative)

Impacts. Both permanent and temporary vegetation impacts would result from implementation of toe protection. Potential wildlife impacts would be related to changes in habitat and to disturbance from construction noise and construction activities. Potential impacts on threatened and endangered plant and wildlife species are described separately.

Vegetation. Implementation of the NED Plan Alternative would result in both the permanent loss of plant communities from placement of fill material for the toe protection structure and the temporary loss of plant communities from disturbances associated with construction, such as establishment of temporary access roads and the staging area.

It is estimated that 2.0 ha (4.94 acres) of vegetation would be permanently lost as a result of construction of the toe protection structure. This acreage includes approximately 1.3 ha (3.21 acres) acres of cottonwood-willow riparian forest, 0.5 ha (1.23 acres) of cottonwood-willow riparian forest with a significant Arundo scrub component, 0.2 ha (0.5 acre) of marsh, and a minor amount of ornamental/ruderal vegetation. Implementation of this alternative would also result in a temporary loss of approximately 4.5 ha (11.11 acres) of predominantly cottonwood-willow riparian forest along the edge of the toe protection structure; this area could be revegetated when construction is complete. Additionally, placement of a staging area under the I-15 bridge would result in the further disturbance of approximately 1.0 ha (2.5 acre) of primarily disturbed habitat. Construction of the access road from Pedley Avenue to the study area would result in the temporary loss of approximately 0.5 ha (1.2 acres) of predominantly Arundo scrub. Losses of Arundo scrub and ornamental/ruderal vegetation would be considered less than significant because these are common communities that support weedy non-native plant species. Impacts on cottonwood-willow riparian forest and marsh would be significant because these communities are considered sensitive vegetation types.

Wildlife. The loss of cottonwood-willow riparian habitat described above would be considered significant primarily because it would represent loss of habitat of riparian obligate bird species and amphibian species. There may also be impacts on nesting birds if the habitat is removed during their nesting season. The loss of Arundo scrub would be considered beneficial because this community is of poor habitat value.

Construction activities would also indirectly affect wildlife in nearby areas that will not be directly affected. Construction noise may affect nesting species and other wildlife during the 6-month construction period. There may also be indirect impacts on downstream habitat because of potential sedimentation impacts associated with vegetation removal.

Threatened and Endangered Species. No confirmed populations of threatened or endangered plant species or otherwise sensitive plant species would be affected by implementation of this alternative. There is a remote potential that many-stemmed dudleya, a Category 2 candidate for federal listing, may be growing near the toe of the bluffs. This species was not found during 1996 surveys. A small sandy area near the access road from Pedley may be potential habitat for the Santa Ana River woollystar, a state-listed and federally-listed endangered species. Surveys in 1996 did not find any individuals of the Santa Ana River wollystar. No significant impact to sensitive plant species is anticipated.

Implementation of this alternative would result in the permanent or temporary loss of 6.5 ha (16.1 acres) of habitat of the least Bell's vireo. This impact includes direct loss of habitat for two confirmed nesting pair in the wetlands area near Corona Avenue as well as potential disturbance to one other nesting pairs. This would be a significant impact.

High noise levels and activities associated with construction could also disturb any other nesting pairs of the least Bell's vireo that may be present in the study area during the 6 months. This potential disturbance would also be considered a significant impact.

There is also a potential for loss of habitat of or disturbance to other sensitive species that may occur in the area. The site is critical habitat for the willow flycatcher, but none have been recorded in the area. Implementation of this alternative would result in loss of approximately 6.5 ha (16.1) acres of habitat.

Mitigation. A detailed mitigation plan will be developed by the Corps of Engineers and the RCFCWCD prior to implementation of the project. This plan will include delineation of the exact boundaries of the Arundo areas to be removed, methods of removal and monitoring programs and success criteria. The plan will involve the following mitigation measures contained in the Biological Opinion prepared by the U.S. Fish and Wildlife Service on July 15, 1996. This document is contained in Appendix D of the Final EIS/EIR.

- Removal of riparian woodlands for temporary and permanent facilities that are potential nesting habitat for the least Bell's vireo and other migratory species will occur during periods of non-nesting (August 15 through February 29).

- Approximately 20.6 ha (51.5 ac.) of giant reed (*Arundo donax*) will be removed and the site will be monitored for eight years to prevent its regrowth as the riparian vegetation is developing. Monitoring will occur during the first two consecutive years and then every other year for the next eight years. Therefore, monitoring and removal activities will actually occur during five of the eight years.

- Brown-headed cowbird (*malothrus ater*) trapping will occur in areas adjacent to the study area for a period of six years. Trapping shall consist of four daily monitored traps that will be operated from March 15 to July 30. Trapping will be initiated during the initial year of construction and will proceed each year for the next consecutive five years.

- A least Bell's vireo and southwestern willow flycatcher monitoring program will be developed and implemented prior to and during construction. Construction activities will be monitored to assure that construction and vegetation removal only occurs in designated areas. Riparian areas not to be disturbed will be flagged.

Additionally, measures to reduce the potential sedimentation impacts area outlined in Section 4.4 of this document.

4.5.4 Toe Protection Using Soil Cement with Slope Protection Using Buttress Fill (Locally-Preferred Plan Alternative)

Impacts. Impacts of this alternative on vegetation and biological resources would be similar to those described above for toe protection only.

Vegetation. Implementation of this alternative would have the same impacts on riparian vegetation as described above for toe protection only, because the toe protection element of this alternative would be the source of vegetation impacts. Implementation of this alternative therefore would also result in a significant impact on cottonwood-willow riparian forest and marsh.

Additionally, placement of the buttress fill would result in the removal of ornamental/ruderal vegetation on some aspects of the bluff slope. This loss would be considered less than significant because this community is dominated by non-native weedy plant species and is common locally, regionally, and statewide.

Wildlife. Because the loss of habitat is associated with construction of toe protection, the impacts of this alternative would be the same as those described above for toe protection only. The construction period under this alternative would be 3 to 4 months longer than under toe protection only.

Threatened and Endangered Species. The potential impacts on threatened and endangered plant and wildlife species and other sensitive species would be the same as described above for toe protection only.

Mitigation. The mitigation measures described above for toe protection would apply to this alternative as well.

4.5.5 No-Action Alternative

Adoption of the No-Action Alternative would result in no substantial changes to the riparian habitat near the toe of the bluffs. Additionally, there would be no potential impact on the least Bell's vireo or other sensitive riparian obligate bird species. It should be noted that the continued growth of Arundo would be expected to occur in this area further diminishing the value of riparian habitat.

4.6 AESTHETICS

4.6.1 Impact Significance Thresholds

The significance criteria of this issue area were developed from Appendices G and I of the State CEQA Guidelines and from professional practice. Guidelines applicable to visual impacts state that a project would normally have a significant effect on the environment if it would conflict with adopted environmental plans and goals of the community where it is located or have a substantial demonstratable negative aesthetic effect. Visual impacts for this project would be considered significant if the project would:

- substantially reduce the visual quality of existing views from important viewing locations (e.g., residential areas, freeways, and streets that receive high public use and recreation areas, such as parks and golf courses) or

- conflict with stated goals or policies that address protecting visual quality in adopted general plans of the county or city in which the project is located.

4.6.2 Methodology

The degree of a visual impact depends on both the magnitude of change to the visual character and quality of the visual resource and the viewer's responses to and concern for those changes. The general process based on this approach to determining degree of impact is similar for all established procedures for visual assessment (Smardon et al. 1986). The impact analysis follows a standard descriptive approach used by the Federal Highway Administration (1983) for visual analysis.

4.6.3 Toe Protection Only, Using Soil Cement (NED Plan Alternative)

Impacts. Implementation of this alternative would result in the permanent loss of 2.0 ha (4.94 acres) of vegetation and the temporary loss of 4.5 ha (11.11 acres) of vegetation, resulting in the temporary reduction in visual quality from the Santa Ana River looking south toward the study area. However, because the study area is heavily vegetated and this alternative includes removal of Arundo allowing riparian vegetation to re-establish, the change in visual quality would be small and would constitute a less-than-significant impact.

Mitigation. No mitigation would be required.

4.6.4 Toe Protection Using Soil Cement with Slope Protection Using Buttress Fill (Locally-Preferred Plan Alternative)

Impacts. Implementation of this alternative would result in the same effects on the visual character of the study area as described above for toe protection only. The change in visual quality of the area would not constitute a significant impact.

Mitigation. No mitigation would be required.

4.6.5 No-Action Alternative

There would be no significant impact on aesthetic resources as a result of adoption of the No-Action Alternative. The bluff face would continue to recede, but this should not create significant changes in the visual quality of the area.

4.7 CULTURAL RESOURCES

4.7.1 Impact Significance Thresholds

Applicable laws and regulations for historic properties are outlined in Appendix K of the State CEQA Guidelines and California Public Resources Code Section 21083.2. Under CEQA, the impacts of a project on historic and prehistoric resources must be considered. An impact would be considered significant if the project may cause damage to an important or unique cultural resource that:

- is associated with an event or person of recognized significance in California or American history or of scientific importance in prehistory;
- can provide information that is both of demonstratable public interest and useful in addressing archeological or scientifically consequential and reasonable research questions;
- has a special or particular quality as oldest, best example, largest, or last surviving example of its kind;
- is at least 100 years old and possess substantial stratigraphic integrity; or
- involves important research questions that historical research has shown can be answered only with archeological methods.

Because the NED Plan Alternative would receive federal funding, federal significance criteria apply to the project. Cultural resource significance for federal projects is evaluated in terms of eligibility for listing in the National Register of Historic Places (NRHP). Significant impacts can occur when prehistoric or historic archeological sites, structures, or objects listed or eligible for listing in the NRHP are subjected to the following effects:

- physical destruction or alteration of all or part of the property or site;
- isolation of the property from the property's setting or alteration of the property's setting when that character contributes to the property's qualification for listing in the NRHP;
- introduction of visual, audible, or atmospheric elements that are out of character with the property or that alter its setting;
- neglect of a property, resulting in its deterioration or destruction; or
- transfer, lease, or sale of the property (36 CFR 800.9).

4.7.2 Methodology

Corps archeologists conducted a literature review to identify potential prehistoric and historic resources in the study area. This was followed by a field survey of the study area. The potential of the study area to contain paleontological resources was evaluated based on geological maps of formations and a review of the potential for these formations to contain such resources.

4.7.3 Toe Protection Only, Using Soil Cement (NED Plan Alternative)

Impacts. Although previous cultural resource surveys and a record and literature search for information on cultural resources in the study area and test excavations indicate that the entire area of potential effect (APE) is devoid of cultural resources of any significance, buried cultural resources could be present in this area. Construction of the toe protection, access road, staging area and borrow areas would involve grading operations and could disturb buried archeological resources. This potential impact would be considered significant but could be mitigated to a less-than-significant level.

There also exists the possibility that paleontological resources could be disturbed during construction in the riverbed. This potential impact would be significant but could be reduced to a less-than-significant level.

Mitigation. Initial grading in the entire APE (bluffs, staging areas and borrow sites) will be monitored by qualified archeological and paleontological monitors. In the event that cultural or paleontological resources are found, work will be halted in this area until the resources can be evaluated and mitigated if necessary. In addition, archaeologically sensitive areas associated with borrow areas, Prado Basin site 2, will be fenced and a buffer zone created for protection.

4.7.4 Toe Protection Using Soil Cement with Slope Protection Using Buttress Fill (Locally-Preferred Plan Alternative)

Impacts. The impacts of this alternative would be the same as those described above for the toe protection only.

Mitigation. The mitigation measures described above for toe protection would apply to this alternative as well.

4.7.5 No-Action Alternative

Since no historic or prehistoric sites have been identified in the area, no impacts on those resources would be anticipated with adoption of this alternative. Because the area has the potential to contain paleontological resources, adoption of the No-Action Alternative may have the potential to result in a significant impact because the bluff face would continue to recede.

4.8 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTES

4.8.1 Impact Significance Thresholds

The significance criteria of this issue area were developed from Appendices G and I of the State CEQA Guidelines and from professional practice. The project would result in a significant impact related to hazardous, toxic, and radioactive wastes if it would:

- cause a potential health hazard or involve a substantial increase in the use, production, or disposal of hazardous materials in the project area;
- interfere with emergency response plans or emergency evacuation; or
- substantially increase workers' or the public's actual or potential exposure to hazardous materials.

4.8.2 Methodology

Information for this section was derived from physical inspection of the area, review of the existing Comprehensive Environmental Response Compensation and Liability Information System list of known sites in the area, and consultation with the Corps and county officials.

4.8.3 Toe Protection Only, Using Soil Cement (NED Plan Alternative)

Impacts. Implementation of this alternative would not result in disturbance to known hazardous waste sites. The only major area of concern is the fill area near Corona Avenue. This area would not be excavated, and construction would avoid the site to preclude any potential exposure of workers or residents to waste buried at the site. There is a potential that car bodies and other material illegally dumped into the riverbed may contain gasoline or other toxic materials, which could be released by construction activities. Construction activities may also result in accidental release of hazardous or toxic materials, such as diesel fuel, gasoline, and lubricating oils. Release of such materials could result in a significant impact.

Since the herbicide (Rodeo) application will use only chemicals registered for use in wetlands, no significant impacts are anticipated with use of the material. However, as discussed above, potential accidental release of herbicides may create significant impacts.

Mitigation. Prior to initiation of construction, the construction area will be surveyed for hazardous and toxic material. Any potential contamination will be identified and removed prior to the beginning of construction. Section 4.4 defines mitigation measures that would reduce the potential for release of fuels or other materials from construction operations.

4.8.4 Toe Protection Using Soil Cement with Slope Protection Using Buttress Fill (Locally-Preferred Plan Alternative)

Impacts. The impacts of this alternative would be the same as those described above for toe protection only.

Mitigation. The mitigation measures described above for toe protection would apply to this alternative as well.

4.8.5 No-Action Alternative

The fill area near Corona Avenue would remain in place and be unprotected with adoption of the No-Action Alternative. This area would also be prone to erosion in the future by flood flows. Therefore, there is a potential that this area would contain hazardous or toxic wastes. There would also continue to be a potential for illegal dumping of material in the riverbed.

4.9 LAND USE, POPULATION, AND HOUSING

4.9.1 Impact Significance Thresholds

The significance criteria of this issue area were developed from Appendices G and I of the State CEQA Guidelines and from professional practice. The project would result in a significant impact on land use, population, and housing if it would:

- conflict with existing land uses on or adjacent to the project site,
- conflict with zoning or general plan land use designations,
- conflict with applicable policies from relevant planning documents,
- conflict with established open space or convert open space to developed uses, or
- displace a large number of people.

4.9.2 Methodology

To assess the impacts of the NED Plan Alternative and other alternatives on land use, population, and housing, a land use survey was conducted on September 19, 1995. The City of Norco General Plan was also reviewed.

4.9.3 Toe Protection Only, Using Soil Cement (NED Plan Alternative)

Impacts. Implementation of this alternative would result in no impacts on land use, population, or housing because no land use changes would occur. The population would not change, and no housing units would be added or removed.

Mitigation. No mitigation would be required.

4.9.4 Toe Protection Using Soil Cement with Slope Protection Using Buttress Fill (Locally-Preferred Plan Alternative)

Impacts. The impacts of this alternative would be the same as those described above for toe protection only.

Mitigation. No mitigation would be required.

4.9.5 No-Action Alternative

Adoption of the No-Action Alternative would result in no direct impacts on land use, population, or housing. The continued erosion and bluff retreat would have a long-term potential to reduce the extent of residential areas, resulting in loss of housing and population in the area. This would be a significant impact.

4.10 RECREATION

4.10.1 Impact Significance Thresholds

Impacts on recreation resources would be considered significant if they would result in substantial generation of additional recreation demand or in a substantial loss of recreational facilities or resources. An impact would also be considered significant if it would involve a potential threat to the safety of persons using recreation areas.

4.10.2 Methodology

Recreational use and resources were evaluated both using the recreation element of the City of Norco General Plan and through a field inspection of the study area.

4.10.3 Toe Protection Only, Using Soil Cement (NED Plan Alternative)

Impacts. Implementation of this alternative would not create any additional recreational demand or result in any impact on existing formal recreation areas. The riverbed is used for equestrian and other similar activities on an informal basis. Because of safety concerns, construction activity would require that recreation users (hiking and equestrians) avoid the area for approximately

6 months. Because only a portion of the river would be affected, this impact would be considered less than significant.

After construction, an access road for maintenance purposes would be located on the top of the toe protection structure. While this road would not be intended for public use, hikers and equestrians would be able to gain access. Bluff slopes would not be stabilized under this alternative. Thus, implementation of this alternative would result in a public safety issue because people may use the maintenance road under conditions of potential sloughing of portions of the bluffs that are already weakened. This impact would be considered significant.

The City of Norco is considering establishing an equestrian trail on the northern side of River Drive. This alternative may not allow for the establishment of such a trail in this location because of the potential for localized sloughing of the bluffs.

Mitigation. The access road along the toe protection structure will be posted with warning signs in an attempt to discourage equestrians or other persons from using the road.

4.10.4 Toe Protection Using Soil Cement with Slope Protection Using Buttress Fill (Locally-Preferred Plan Alternative)

Impacts. No impacts on recreation resources are anticipated with implementation of this alternative, except that construction activities would preclude use of the construction area for recreation use during the 9-month construction period. Because the slopes would be stabilized under this alternative, no public safety impacts are anticipated from further sloughing of the bluff. There may also be a greater potential for establishment of the equestrian trail along the north side of River Drive with implementation of this alternative, although the Corps is not proposing any federally-funded recreation.

Mitigation. No mitigation would be required.

4.10.5 No-Action Alternative

Adoption of the No-Action Alternative would not directly affect recreation in the riverbed area. Continued bluff erosion may make it infeasible to implement City of Norco plans to establish an equestrian trail along River Drive.

4.11 PUBLIC SERVICES AND UTILITIES

4.11.1 Impact Significance Thresholds

The significance criteria of this issue area were developed from Appendices G and I of the State CEQA Guidelines and from professional practice. The project would result in a significant impact on public services and utilities if it would:

- breach published standards relating to solid waste or litter control; or
- encourage activities requiring large amounts of fuel, water, or energy or use fuel, water, or energy wastefully.
- result in a need for expansion of services.
- create significant damage to the system.

4.11.2 Methodology

Information for this section was obtained from the Corps, the City of Norco and a field visit to ascertain utility locations.

4.11.3 Toe Protection Only, Using Soil Cement (NED Plan Alternative)

Impacts. Implementation of this alternative would reduce the potential for the exposure of sanitary sewer; water; natural gas; and electrical, telephone, and cable television lines to damage from receding of the bluff. A potential may still remain for localized damage to these systems from sloughing of the slopes at currently undermined areas. This impact would be considered less than significant because only localized areas would be affected.

Mitigation. No mitigation would be required.

4.11.4 Toe Protection Using Soil Cement with Slope Protection Using Buttress Fill (Locally-Preferred Plan Alternative)

Impacts. This alternative would virtually eliminate any potential impact on utility systems because the bluff slopes would be stabilized, precluding localized sloughing.

Mitigation. No mitigation measures would be required.

4.11.5 No-Action Alternative

Utility systems along River Drive could be significantly affected by bluff collapse that could occur with adoption of the No-Action Alternative. Utility lines may require periodic repair and potential relocation. There may also be impacts on City of Norco public service agencies such as fire, police, and public works services as a result of routine repair and emergency services that may be necessitated by bluff retreat.

4.12 TRANSPORTATION

4.12.1 Impact Significance Thresholds

The significance criteria of this issue area were developed from Appendices G and I of the State CEQA Guidelines and from professional practice. The project would result in a significant impact on transportation if it would:

- cause a traffic increase that is substantial in relation to existing street traffic load and capacity;
- cause a substantial increase in the use of roads resulting from transportation of materials and crews to the work area;
- substantially increase the traffic delay experienced by drivers;
- substantially alter present patterns of circulation or movement; or
- increase traffic hazards to motor vehicles, bicycles, or pedestrians.

4.12.2 Methodology

Information on the existing transportation system and LOS of affected roadways were obtained from the Updated City of Norco Transportation Element. Construction impacts were determined based on construction-related traffic that would be associates with the NED Plan Alternative or other alternative actions.

4.12.3 Toe Protection Only, Using Soil Cement (NED Plan Alternative)

Impacts. Implementation of this alternative would result in the addition of approximately 95 trips per day to the area roadways if fill material is obtained from the riverbed and 215 total trips per day if fill material is imported (Assumptions on vehicle numbers and trips are presented in Section 4.14, Table 4-3). This construction traffic is expected to last for approximately 6 months. On average, it is expected that half the traffic would enter or leave the construction area via Hamner Avenue and the other half would enter or leave the construction area via Pedley Avenue. Much of this traffic would consist of heavy vehicles. This increase in traffic associated with construction vehicles would be considered a significant impact to area roadways, but would not create a decline in LOS for the affected roadways.

A potential area of concern regarding traffic safety is River View School on Pedley Avenue (refer to Figure 3-3 for location of the school). Construction traffic during school hours may result in a significant safety impact.

Mitigation. Mitigation to reduce traffic impacts on area streets and traffic safety impacts around River View School will include the following:

- use both Hamner and Pedley Avenues to the maximum extent feasible and avoid Pedley Avenue or reduce truck trips during school hours,
- establish a construction traffic speed limit of 15 miles per hour within 100 feet of the school, and
- provide funding for school crossing guards when school is in session and when construction vehicles are using Pedley for ingress or egress.

Implementation of these measures would reduce the projected impacts to less-than-significant levels.

4.12.4 Toe Protection Using Soil Cement with Slope Protection Using Buttress Fill (Locally-Preferred Plan Alternative)

Impacts. Implementation of this alternative would result in impacts similar to those described above for toe protection only, except that a total of 115 vehicle trips per day (see assumptions presented in Section 4.14, Table 4-3) would be associated with construction activities if fill material is taken from the riverbed and a total of 240 vehicle trips per day would be associated with importing of fill material. Construction would last for approximately 9 months under this alternative.

Mitigation. The mitigation measures described above for toe protection would apply to this alternative as well.

4.12.5 No-Action Alternative

No additional traffic would be generated with adoption of the No-Action Alternative. However, River Drive would continue to be blocked in two locations and further bluff collapse may make stretches of this road unusable in the future.

4.13 NOISE

4.13.1 Impact Significance Thresholds

A project will normally have a significant noise-related effect on the environment if it will:

- substantially increase the ambient noise levels for adjoining areas or
- expose people to severe noise levels.

For purposes of this analysis, the project is considered to have a significant impact if it would:

- generate noise that would conflict with local planning criteria or ordinances or
- substantially increase noise levels at noise-sensitive land uses.

It should be noted that research into the human perception of changes in sound-level (Bies and Hansen 1988) indicates the following:

- a 3-dBA change is just perceptible,
- a 5-dBA change is clearly perceptible, and

- a 10-dBA change is perceived as being twice or half as loud.

A 5-dB change is commonly used as the threshold for a substantial sound level increase.

4.13.2 Methodology

Construction activities under the NED Plan Alternative or the Locally-Preferred Plan Alternative would result in the generation of noise levels that could cause temporary impacts to nearby sensitive noise receptors. Two sources of construction-related noise were considered in this analysis: noise generated by construction equipment and noise generated by trucks traveling to the construction site. Noise generated by construction equipment was estimated based on a list of construction equipment expected to be used on the worst-case day of construction. An average noise level for each piece of equipment expected is shown in Figure 4-1; these values were combined to determine the composite construction noise level at nearby sensitive receptors. Table 4-1 shows noise levels generated by construction activity at various distances from the construction site. Noise generated by trucks traveling to the construction site was estimated based on the maximum number of truck trips expected to be generated under construction activities.

4.13.3 Toe Protection Only, Using Soil Cement (NED Plan Alternative)

Fill material needed for construction under this alternative may be obtained either onsite or offsite. Impacts and mitigation measures associated with each of these scenarios are discussed below.

Impacts. Construction under this alternative would increase the exposure of River View School and residences along Pedley Avenue to traffic noise during construction of toe protection. Construction of toe protection using offsite fill material would involve the use of several trucks to transport equipment and materials, including fill material, to the site. Ingress and egress points from the construction are from Hamner Avenue near the I-15 Freeway and from Pedley Avenue via 6th Street. Although Hamner Avenue may be used to a greater extent since the staging area is near Hamner, it has been assumed that traffic will be equally divided between the two sites. Pedley Avenue is the only street that would experience any perceptible increase in noise level caused by the addition of truck traffic because the added trips wouldn't be enough to elevate the existing noise level on the other streets along the truck route. It is expected that construction-related traffic would result in a 4-5 dB change in noise levels at these receptors. Although this increase would be perceptible, it would not exceed 5 dB. Therefore, it is not expected that truck traffic associated with construction of toe protection would substantially increase noise levels at sensitive receptors along Pedley Avenue. Therefore, this impact would be considered less than significant.

Figure 4-1
Construction Equipment Noise Ranges

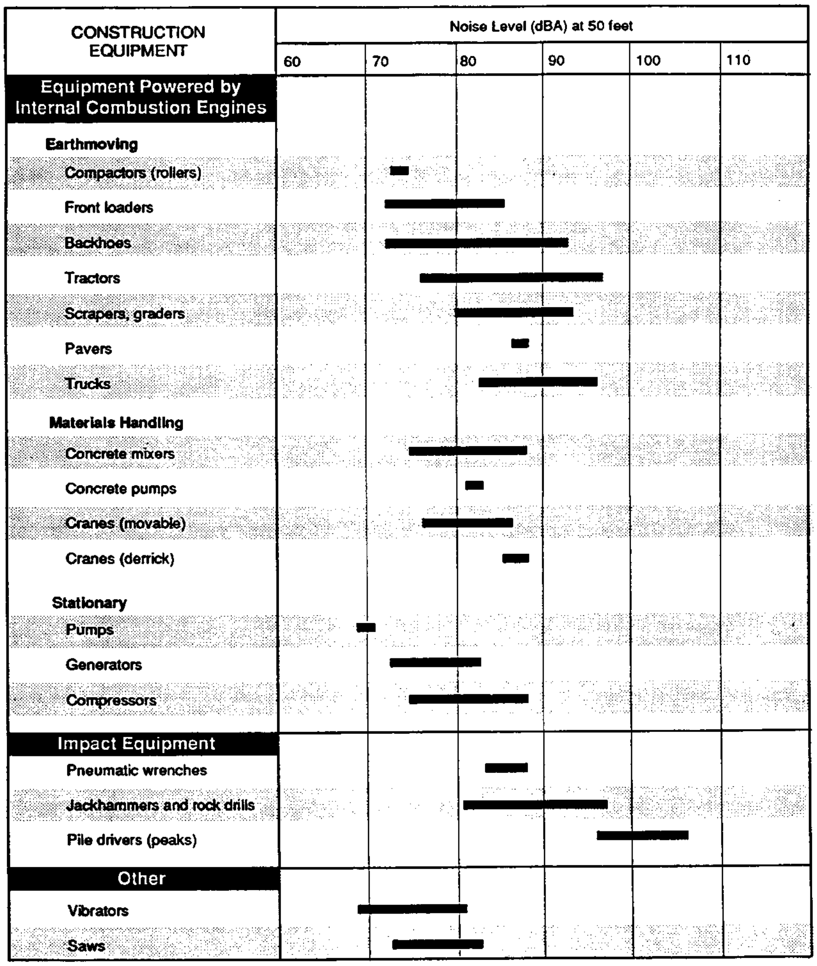


Table 4-1. Estimated Maximum Construction Noise from the Norco Bluffs Stabilization Project

Distance Attenuation		Distance to dB Contours	
Distance to Receptor (feet)	Sound Level at Receptor (dBA)	Sound Level at Contour (dBA)	Distance to Contour (feet)
50	98	95	0
100	92	90	122
200	86	85	214
400	79	80	377
600	76	75	627
800	73	70	1035
1,000	71	65	1605
1,500	66	60	2529
2,000	63	55	3879
2,500	60	50	5229
3,000	58	45	7266
4,000	54	40	7920
5,280	50	35	8634
7,500	43	30	9412

The following assumptions were used:

Equipment source levels at 50 feet:		
Four tractors	**92**	
Two bulldozers	**89**	
Five scrapers/graders	**94.5**	
Two loaders	**81**	
Three rollers/compactors	**78.5**	
Two excavators/crawlers	**83**	
Two cranes	**84**	
One generator	**77**	
One compressor	**81**	
One backhoe	**81**	
Composite equipment source level:	**98**	
Basic sound level dropoff rate:	**6.0**	**dB per doubling of distance**
Atmospheric absorption coefficient:	**0.5**	**dB per 100 meters**
Distance for reference noise level:	**50**	**feet**

Notes:

Construction equipment listed above is for construction of toe protection and slope stabilization using onsite fill material. This list was used because this alternative would require the greatest amount of construction equipment of any of the alternatives. However, reducing the list of equipment to reflect the equipment composition of the less noise-intensive operating scenarios for construction does not result in a substantial reduction of construction-related noise.

Calculations include the effects of atmospheric absorption at a dropoff rate of 0.5 dB/100 meters. The effects of local shielding from buildings and topography are not included and will substantially reduce sound levels.

Except for sounds with highly distinctive tonal characteristics, noise from a particular source will not be identifiable when its noise level is substantially less than background noise levels.

Construction of toe protection would also increase exposure of residences along River Drive to construction noise. Table 4-1 shows noise levels expected to be generated by construction of toe protection at various distances from the construction site. Residences along River Drive would be partially shielded from construction noise because they are on top of the bluffs and therefore are not on the same level as the construction site. Most residences on River Drive are across the road from the edge of the bluffs; however, there are a few residences on a small piece of land at the edge of the bluffs. There would be less of a shielding effect for these residences than for those residences that are farther from the edge of the bluffs. Residences on the edge of the bluffs are approximately 15 meters (50 feet) from the edge of the bluff; for these residences, there would be a noise-level reduction of 8 dBA as a result of shielding effects. Noise levels 15 meters (50 feet) from the construction site would be approximately 98 dBA. Therefore, with shielding effects, these residences could be exposed to construction-related noise levels as high as 90 dBA.

Those residences across the road from the top of the bluffs are approximately 75 feet from the edge of the bluffs; for those residences, there would be a noise-level reduction of approximately 13 dBA resulting from potential shielding effects. Noise levels at a distance of 24 meters (75 feet) from the construction site would be approximately 95 dBA. Therefore, these residences would be exposed to construction-related noise levels as high as 82 dBA. These impacts would be considered adverse, but not significant. This would be a substantial increase in noise levels at these residences, as well as a conflict with City of Norco criteria for residential noise levels. Because of the potential for these noise levels to occur during the night, this impact would be considered significant.

Impacts associated with use of onsite fill material under this alternative would be the same as those described for toe protection using offsite fill material. However, there would be less truck traffic noise with use of onsite fill material than with use of offsite fill material because fewer trucks would be needed if fill material were not being transported to the construction site.

Mitigation. The construction contractor will be required to limit construction activity to weekdays from 7:00 a.m. to 6:00 p.m. throughout the construction period to minimize conflicts with sleeping and other noise-sensitive residential activities. Implementation of this mitigation would reduce the impact of increased noise at residences on River Drive to a less-than-significant level.

4.13.4 Toe Protection Using Soil Cement with Slope Protection Using Buttress Fill (Locally-Preferred Plan Alternative)

Impacts. Impacts associated with this alternative would be the same as those described above for toe protection only. However, construction would take place for 9 or 10 months under this alternative, instead of for 6 months, so noise impacts would occur over a longer period.

Mitigation. The mitigation described above for toe protection would apply to this alternative as well.

4.13.5 No-Action Alternative

There would be no construction activity associated with this alternative. Therefore, no noise impacts would be associated with adoption of this alternative.

4.14 AIR QUALITY

4.14.1 Impact Significance Thresholds

A project will normally have a significant air quality impact on the environment if it will:

- violate any ambient air quality standard,
- expose sensitive receptors to substantial pollutant concentrations, or
- contribute substantially to an existing or projected air quality violation.

For this analysis, significance criteria developed by the SCAQMD were used to determine the significance of air quality impacts that would result from implementation of the NED Plan Alternative and other alternatives. Project-related emissions were considered significant if emissions would exceed the following SCAQMD thresholds (South Coast Air Quality Management District 1993):

- 75 pounds per day (ppd) of reactive organic gases (ROG),
- 100 ppd of nitrogen oxides (NO_x), or
- 150 ppd of PM10.

4.14.2 Methodology

4.14.2.1 Calculation of Construction Emissions

Implementation of the NED Plan Alternative could result in air quality impacts during construction. Two sources of construction-related emissions have been assessed: construction workers' vehicles and construction equipment.

To estimate emissions of ROG, NO_x, and PM10 from vehicles used by construction workers commuting to the study area, the maximum number of trips expected to be made per day by construction workers was multiplied by the average trip length and an emission rate for each pollutant. EMFAC7F, release 1.1, a program created by the California Air Resources Board (ARB), was used to estimate vehicle emission rates. Emissions were calculated based on the maximum number of trips expected to be made during any day of construction to ensure that this would be a worst-case analysis.

To estimate exhaust emissions generated by the operation of construction equipment, the maximum number of hours of operation of each type of equipment expected to be used on the busiest day of construction was multiplied by an emission rate for each pollutant. Emission rates for the various types of construction equipment were taken from Compilation of Air Pollutant Emission Factors (U.S. Environmental Protection Agency 1985). This document contains emission rates for a broad range of pollutant-producing equipment and activities. The maximum number of pieces of equipment and maximum number of hours of equipment operation expected to occur during construction was used to ensure that this would be a worst-case analysis.

To estimate dust emissions generated by operation of construction equipment in unpaved areas, the maximum acreage of land expected to be disturbed in a single day during the construction period was multiplied by a fugitive dust emission rate taken from EPA (1985).

4.14.2.2 Conformity Screening

Projects involving federal funding or federal approval are required to show conformity with EPA's general conformity rule if they would result in emission of more than a certain amount (a threshold level) of nonattainment pollutants. These pollutant threshold levels, called "de minimis" emission levels, vary from pollutant to pollutant and depend on the attainment status of individual air basins. As discussed in Section 3.13.3, pollutants for which the project area is in nonattainment are ozone (formed by ROG and NO_x in the presence of sunlight) and PM10. According to EPA, the applicable de minimis levels for this project are 10 tons per year (tpy) of ROG, 10 tpy of NO_x, and 70 tpy of PM10.

Annual pollutant emissions were estimated for this project using methods described above for the calculation of construction emissions. However, calculations were based on average daily equipment and vehicle use rather than peak equipment and vehicle use. The emissions generated by average daily use were then multiplied by the total number of days in the construction period to estimate total annual emissions that would be generated by construction under the NED Plan Alternative and other alternatives. The construction period for toe protection only would be 6 months and for toe and slope protection would be 9 months.

Table 4-2 shows estimates of annual pollutant emissions that would be generated under the NED Plan Alternative (toe protection only) and under toe protection with slope protection. Construction activities under each alternative would result in the emission of an amount of NO_x that exceeds the de minimis level of 10 tpy. Additionally, toe protection with slope protection, with use of either offsite fill material or onsite fill material, would result in the emission of an amount of PM10 that exceeds the de minimis level of 70 tpy.

Table 4-2. Annual Pollutant Emissions Generated during Construction (in Tons per Year)

Emission Source	Toe Protection Only[a]						Toe Protection and Slope Protection[b]					
	ROG		NO_x		PM10		ROG		NO_x		PM10	
	Using Offsite Fill Material	Using Onsite Fill Material	Using Offsite Fill Material	Using Onsite Fill Material	Using Offsite Fill Material	Using Onsite Fill Material	Using Offsite Fill Material	Using Onsite Fill Material	Using Offsite Fill Material	Using Onsite Fill Material	Using Offsite Fill Material	Using Onsite Fill Material
Construction equipment	0	1	0	18	0	1	1	2	17	29	1	2
Construction vehicles	0	0	0	1	0	0	2	0	8	2	1	0
Construction worker vehicles	0	0	0	0	0	0	0	0	0	0	0	0
Ground disturbance	0	0	6	0	0	60	0	0	0	0	84	90
Total annual emissions	0	2	6	19	0	62	3	3	25	31	86	93

Source: U.S. Environmental Protection Agency 1985.

Notes: Discrepancies in totals are the result of rounding.

The same construction equipment assumptions were used for this analysis as were used to calculate peak daily emissions (see Table 4-3), but fewer hours of operation per day were assumed to estimate average daily emissions. Average daily emissions were multiplied by the total number of days of construction to determine annual emissions. Assumptions regarding construction vehicles, construction workers, and ground disturbance were the same as shown in Table 4-3.

[a] Annual emissions calculated based on 5 working days per week and a 6-month construction-period duration.

[b] Annual emissions calculated based on 5 working days per week and a 9-month construction-period duration.

4.14.3 Toe Protection Only, Using Soil Cement (NED Plan Alternative)

Fill material needed to construct this alternative may be obtained either onsite or offsite. Air quality impacts were assessed for both conditions.

Impacts. Implementation of this alternative would result in a short-term increase in ROG, NO_x, and PM10 emissions during the construction period.

As shown in Table 4-3, approximately 36 ppd of ROG would be emitted during construction of toe protection using offsite fill material, or 37 ppd would be emitted during construction using onsite fill material. This is below the 75 ppd SCAQMD threshold. Therefore, this impact would therefore be considered less than significant.

As shown in Table 4-3, approximately 324 ppd of NO_x would be emitted during construction of toe protection using offsite fill material, or 433 ppd would be emitted during construction using onsite fill material (in the latter case, NO_x emissions would be higher as a result of increased earthmoving activities involved in gathering the onsite fill material). This quantity of NO_x is approximately three to four times as high as the NO_x threshold. Therefore, this impact would be considered significant. Implementation of the mitigation described below would be expected to reduce this impact, but not to a less-than-significant level. This impact would therefore be significant and unavoidable.

As shown in Table 4-3, approximately 1,281 ppd of PM10 would be emitted during construction of toe protection using offsite fill material, or 1,356 ppd would be emitted during construction using onsite fill material (in the latter case, PM10 emissions would be higher as a result of increased earthmoving activities involved in gathering the onsite fill material). This quantity of PM10 is approximately nine times as high as the PM10 threshold. Therefore, this impact would be considered significant. Implementation of the mitigation described below would be expected to reduce this impact, but not to a less-than-significant level. This impact would therefore be significant and unavoidable.

Mitigation. The project proponent will implement the following NO_x -reducing construction practices throughout the construction period through requirements within the construction contract:

- Require injection timing retard of 2 degrees on all diesel vehicles, where applicable.
- Install high-pressure injectors on all vehicles, where feasible.
- Use Caterpillar pre-chamber diesel engines or equivalent, and perform proper maintenance and operation.
- Electrify equipment, where feasible.

Table 4-3. Maximum Pollutant Emissions Generated during Construction (in Pounds per Day)

Emission Source	Toe Protection Only						Toe Protection and Slope Protection					
	ROG		NO_x		PM10		ROG		NO_x		PM10	
	Using Offsite Fill Material	Using Onsite Fill Material	Using Offsite Fill Material	Using Onsite Fill Material	Using Offsite Fill Material	Using Onsite Fill Material	Using Offsite Fill Material	Using Onsite Fill Material	Using Offsite Fill Material	Using Onsite Fill Material	Using Offsite Fill Material	Using Onsite Fill Material
Construction equipment [a]	19	31	249	415	16	33	23	34	291	457	19	37
Construction vehicles [a]	14	3	73	16	11	2	17	4	85	20	13	3
Construction worker vehicles [b]	3	3	3	3	0	0	3	3	3	3	0	0
Ground disturbance [c]	0	0	0	0	1,254	1,320	0	0	0	0	1,254	1,320
Total daily emissions	36	37	324	433	1,281	1,356	42	41	379	480	1,287	1,360

Notes: Discrepancies in totals are the result of rounding.

[a] Emission estimates for construction equipment and construction vehicles are based on the assumption that the following equipment would be used 10 hours per day on a peak construction day:

- **Using offsite fill material:** Three tractors, two bulldozers, one grader, two loaders, one roller, two excavators/crawlers, one generator, one compressor, one backhoe, and one compactor. Additionally, it was assumed that 150 one-way dump truck trips and 25 one-way light truck/pickup trips would be made under the preferred alternative (toe protection only) and that 175 one-way dump truck trips and 25 one-way light truck/pickup trips would be made under construction of toe protection and slope protection.

- **Using onsite fill material:** Four tractors, two bulldozers, four scrapers, one grader, two loaders, one roller, two excavators/crawlers, one generator, one compressor, one backhoe, and one compactor. Additionally, it was assumed that 30 one-way dump truck trips and 25 one-way light truck/pickup trips would be made under the preferred alternative (toe protection only) and that 40 one-way dump truck trips and 25 one-way light truck/pickup trips would be made under construction of toe protection and slope protection.

[b] Emission estimates are based on the assumption that there would be 40 workers coming to the construction site on a peak construction day.

[c] Emission estimates are based on the assumption that 19 acres of unpaved ground would be disturbed on a peak construction day during construction using offsite fill material and that 20 acres of unpaved ground would be disturbed on a peak construction day during construction using onsite fill material.

Source: U.S. Environmental Protection Agency 1985.

- Maintain equipment in tune with manufacturers' specifications, except as otherwise stated above.
- Restrict the idling of construction equipment to 10 minutes.
- Install catalytic converters on gasoline-powered equipment.
- Substitute gasoline-powered for diesel-powered equipment, where feasible.

These practices will be made a condition of the construction contract and shall be enforced through weekly inspection by the project proponent.

The project proponent will implement the following PM10-reducing construction practices throughout the construction period:

- Water active storage piles at least twice daily.
- Cover inactive storage piles.
- Cover haul trucks securely or maintain at least 2 feet of freeboard on all haul trucks when transporting material.
- Water all active construction sites at least twice daily. Frequency should be increased if wind speeds exceed 15 mph.
- Prohibit all grading activities during periods of high wind (i.e., winds greater than 30 miles per hour).
- Apply nontoxic chemical soil stabilizers on inactive construction areas (disturbed lands within construction areas that are unused for at least 4 consecutive days), or water at least twice daily.
- Apply nontoxic binders (e.g., latex acrylic copolymer) to exposed areas after cut-and-fill operations and hydroseed the areas if appropriate for the project location.
- Install wheel washers for all exiting trucks.
- Sweep streets if visible soil material is carried onto adjacent public roads.

These practices will be made a condition of the construction contract and will be enforced through weekly inspection by the project proponent.

4.14.4 Toe Protection Using Soil Cement with Slope Protection Using Buttress Fill (Locally-Preferred Plan Alternative)

Impacts. Impacts associated with this alternative would be the same as those described above for toe protection only. However, emissions would be higher with construction of both toe protection and slope protection.

As shown in Table 4-3, approximately 42 ppd of ROG would be emitted during construction of toe and slope protection using offsite fill material, or 41 ppd would be emitted during construction using onsite fill material. This is below the 75 ppd SCAQMD threshold. Therefore, this impact would be considered less than significant.

As shown in Table 4-3, approximately 379 ppd of NO_x would be emitted during construction of toe and slope protection using offsite fill material, or 480 ppd would be emitted during construction using onsite fill material. This quantity of NO_x is approximately four to five times as high as the NO_x threshold. Therefore, this impact would be considered significant. Implementation of mitigation would reduce this impact, but not to a less-than-significant level. This impact is therefore significant and unavoidable.

As shown in Table 4-3, approximately 1,287 ppd of PM10 would be emitted during construction of toe and slope protection using offsite fill material, or 1,360 ppd would be emitted during construction using onsite fill material. This quantity of PM10 is approximately nine times as high as the PM10 threshold. Therefore, this impact is considered significant. Implementation of mitigation would be expected to reduce this impact, but not to a less-than-significant level. This impact would therefore be significant and unavoidable.

Mitigation. The mitigation described above for toe protection would apply to this alternative as well.

4.14.5 No-Action Alternative

There would be no construction activity associated with this alternative. Therefore, no air quality impacts would result from adoption of this alternative.

Section 5.0. Environmental Commitments

5.1 TOE PROTECTION ONLY, USING SOIL CEMENT (NED PLAN ALTERNATIVE)

The mitigation and environmental commitments listed below will be implemented for construction of this alternative.

- Warning signs will be placed along the toe protection structure warning persons, including equestrians, of potentially unstable slope conditions.
- An erosion control plan will be developed to reduce erosion and sedimentation during construction.
- An NPDES permit will be obtained and measures such as use of settling basins will be employed to control turbidity associated with dewatering.
- A pollution-prevention and -control plan will be developed to reduce the potential of accidental spills during construction and ensure quick response to clean up any spills.
- Water trucks and other standard dust control methods will be used to reduce dust generated by the project.
- Methods for No_x emissions reduction for construction vehicles will be implemented.
- Habitat lost as a result of implementation of the NED Plan Alternative will be replaced through removal of 20.6 ha (51.5 ac.) of Arundo and monitoring of the reestablishment of riparian species for an eight-year period.
- Vegetation removal will not occur from April to July, to reduce potential impacts on nesting bird species and to preclude removal of nesting birds during vegetation removal.
- Biological resources and construction activities will be monitored prior to and during the construction period.
- Development of a Cowbird trapping program for a six-year period.

- Monitoring will be conducted during initial grading to determine whether paleontological resources or prehistoric/historic resources are found. Construction will halt in areas where any materials are found until a qualified paleontologist or archeologist determines the significance of the find and mitigation is completed if needed. The sensitive areas within the entire APE (bank protection borrow pits) will be fenced for protection.

- The project site will be surveyed for hazardous materials before construction begins and any hazardous materials that are found will be removed.

- Where possible, construction traffic will use Hamner Avenue to avoid noise and traffic impacts on Pedley Avenue and construction traffic will be reduced during school hours.

- Reduced speed limits and funding of crossing guards will be instituted when needed near River View School to decrease construction safety impacts.

5.2 TOE PROTECTION USING SOIL CEMENT AND SLOPE STABILIZATION USING BUTTRESS FILL (LOCALLY-PREFERRED PLAN ALTERNATIVE)

The mitigation and environmental commitments listed below will be implemented for construction of this alternative.

- An erosion control plan will be developed to reduce erosion and sedimentation during construction.

- An NPDES permit will be obtained and measures such as use of settling basins will be employed to control turbidity resulting from dewatering.

- A pollution-prevention and -control plan will be developed to reduce the potential of accidental spills during construction and ensure quick response to clean up any spills.

- Water trucks and other standard dust control methods will be used to reduce dust generated by the project.

- Habitat lost as a result of implementation of the NED Plan Alternative will be replaced through removal of 20.6 ha (51.5 ac.) of Arundo and monitoring of the reestablishment of riparian species for an 8-year period.

- Vegetation removal will not occur from April to July, to reduce potential impacts on nesting bird species and to preclude removal of nesting birds during vegetation removal.

- Biological resources and construction activities will be monitored prior to and during the construction period.

- Cowbird trapping will be implemented for a six-year period.

- Monitoring will be conducted during initial grading to determine whether paleontological resources or prehistoric/historic resources are found. Construction will halt in areas where materials are found until a qualified paleontologist or archeologist determines the significance of the find and mitigation is completed if needed. Sensitive areas within the APE will be fenced.

- The project site will be surveyed for hazardous materials before construction begins and any hazardous materials that are found will be removed.

- Where possible, construction traffic will use Hamner Avenue to avoid noise and traffic impacts on Pedley Avenue and construction traffic will be reduced during school hours.

- Reduced speed limits and use of crossing guards will be instituted near River View School to decrease construction traffic safety impacts.

Section 6.0 Cumulative Impacts

6.1 INTRODUCTION

This section presents the cumulative impacts of construction of the NED Plan Alternative (toe protection only) relative to other existing, approved, proposed, or reasonably foreseeable projects in the study area. If the Locally-Preferred Plan Alternative (toe protection with slope protection) were to be implemented, cumulative impacts would be the same as those presented below for the NED Plan Alternative.

Contact was made with the City of Norco Community Development and City Engineering Departments (Daniels, pers. comm) (Shank, pers. comm.) the City of Riverside Planning Department (Swiecki, pers. comm.), the County of Riverside Planning Department and the County Regional Parks Open Space District (Denne and Brewer, pers. comm.), and the Corps to determine the baseline for cumulative impacts. The City of Norco has no development or infrastructure improvement projects planned which would overlap with the NED Plan Alternative. The County of Riverside also has no foreseeable projects in the vicinity of the NED Plan Alternative.

The City of Riverside expects the Rancho La Sierra Specific Plan project to be adopted in January 1996. This mixed-use development project would occupy 760-acres just south of the Santa Ana River, from the City boundary just east of California Avenue east to Tyler Street. The eastern edge of the project would be located approximately 1 mile east of the NED Plan Alternative and most likely access would be from the east off of Arlington Avenue or from the south off of Tyler Street. Construction of this project could begin as early as mid-1997. The Corps' Santa Ana River Mainstem Project in the Prado Basin is the only major Corps' construction project in the area.

6.2 TOPOGRAPHY

No significant topographic impact is expected to result from this or other projects in the study area.

Some landform modification could result from the Rancho La Sierra Specific Plan project, however, this impact is not expected to be cumulatively significant.

6.3 GEOLOGY

The NED Plan Alternative is intended to alleviate the major geological concern of bluff stabilization along the Santa Ana River in Norco. This will be a beneficial impact. However, this project, in combination with other projects in the area, could cumulatively increase erosion potential from both wind and water. This potential cumulative impact would be significant but could be reduced to a less-than-significant level through erosion-control measures on a project-by-project basis.

6.4 WATER RESOURCES AND WATER QUALITY

The NED Plan Alternative along with the Rancho La Sierra Specific Plan project will contribute on a short-term basis to the overall hydraulic and water quality impacts in the area. The greatest concern is increased sedimentation within the river system. This potential impact would be significant but could be mitigated, at least partially, by implementation of erosion-protection measures and sedimentation control for individual projects.

6.5 BIOLOGICAL RESOURCES

Implementing the NED Plan Alternative and the Santa Ana River Mainstem Project, would result in disturbance to riparian vegetation. No other projects that could disturb riparian vegetation along the river have been identified at this time. The loss of habitat would include loss of critical habitat of the endangered least Bell's vireo, and would affect a wide variety of other wildlife species. This is a significant impact that could be mitigated on a project-by-project basis through restoration of riparian habitat and control of Arundo.

Consultation with the USFWS and DFG will also be conducted on each project to determine the need for any additional mitigation.

6.6 AESTHETICS

The Rancho La Sierra Specific Plan project will result in some aesthetic changes to the character of the area along the southern edge of the Santa Ana River. Most of the Rancho La Sierra Project property is zoned Residential Agricultural (minimum 2 ha [5-acre] lots) and Residential Conservation. The 307.6 ha (760-acre) plan area provides for 68.8 ha (170 acres) of undeveloped open space including major hilltops, drainages, and a wildlife corridor. A golf course, and developed open space with community facilities will occupy approximately 155 ha (383 acres). Residential uses will be provided by no more than 162 residential dwellings, located primarily on .4 (1-acre) lots. Agricultural opportunities will be provided at the west end of the project site, and wetland and marsh areas are incorporated into the golf course layout.

The specific plan provides for the retention of an agricultural/residential mix within its proposed design. Neither this Plan nor the NED Plan Alternative would contribute to any significant cumulative aesthetic impact.

6.7 CULTURAL RESOURCES

No cumulatively significant loss of cultural resources in the area is anticipated. Cultural resource surveys will be conducted for each project and mitigation measures will be developed on a project by project basis, if required. Monitoring for prehistoric and paleontological resources in areas of grading is required and is incorporated as part of each project.

6.8 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTES

No significant cumulative impact related to hazardous, toxic, or radioactive wastes is anticipated. For each project, a survey for the potential presence of hazardous, toxic, and radioactive materials will be conducted, and individual remediation plans will be developed if required.

6.9 LAND USE, POPULATION, AND HOUSING

The projects are not expected to have a cumulative impact to land use, population or housing. The proposed Rancho La Sierra Specific Plan project is expected to increase areawide population and housing by a less than significant amount, and changes in land use are not considered significant. Neither the NED Plan Alternative nor the Santa Ana River Mainstem Project would contribute to any significant cumulative impact on land use, population, or housing.

6.10 RECREATION

Implementation of the NED Plan Alternative and other projects may restrict recreation for a short period of time during construction, but no long-term impact on recreation resources is anticipated. Development of the Rancho La Sierra Specific Plan will enhance recreational opportunities in the general area through open space retention, open space development and golf course development. Implementation of the NED Plan Alternative may also result in increased trail and equestrian use along the bluff.

6.11 PUBLIC SERVICES AND UTILITIES

The NED Plan Alternative and other cumulative projects are not anticipated to contribute to any significant cumulative impacts on public services and utilities. Without implementation of the NED Plan Alternative, further erosion of the river bank has the potential to result in exposure and damage to public services and utility systems. However, any impacts are considered to be adverse and not significant as they would affect only localized areas.

6.12 TRANSPORTATION

The NED Plan Alternative and other cumulative projects would contribute cumulatively to the overall traffic in the area. Of primary concern is heavy traffic consisting of trucks carrying materials and fill material to each of the project sites. The NED Plan Alternative and other projects in the area are not anticipated to significantly affect transportation systems because of the short-term nature of the NED Plan Alternative and the Santa Ana River Mainstem projects and because the Rancho La Sierra Project is not expected to result in significant traffic increases at buildout.

Implementation of the NED Plan Alternative may allow for the reopening of River Drive, which is closed in two locations.

6.13 NOISE

The NED Plan Alternative and other projects in the area may create significant localized impacts on the acoustic environment. Impacts will be mitigated on a site-specific basis.

6.14 AIR QUALITY

The NED Plan Alternative would contribute for 6-9 months to the overall air quality impact in a nonattainment area. Together, the NED Plan Alternative, the Santa Ana Mainstem project and the Rancho La Sierra Specific Plan project would cumulatively contribute to air quality deterioration. In particular, construction would primarily contribute particulates (PM10) and NO_x to the area. This would be a significant cumulative impact for the duration of construction activity. No significant impacts would be expected after construction is completed.

Section 7.0 Growth-Inducing Impacts

The purpose of both the NED Plan Alternative and the Locally-Preferred Plan Alternative is to correct current undercutting and retreat of the Norco Bluffs. These actions are intended to correct a current geological condition that is affecting existing homes and the existing utility infrastructure. If either alternative is implemented, there will be no increase of capacity for further development. Therefore, this project is not considered growth inducing.

Section 8.0 Relationship between Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Lead agencies are required to consider the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity (40 CFR 1502.16). Short-term uses that would result from implementation of either the NED Plan Alternative or the Locally-Preferred Plan Alternative include such benefits as prevention of further erosion of the bluffs.

These benefits, however, are associated with both short-term costs and long-term productivity costs. Short-term costs are incurred during construction and include:

- costs of building materials and fossil fuels and
- increased short-term air emissions and noise levels.

The effects of these costs and benefits are analyzed in detail in Section 4 of this document.

"Long-term productivity" refers to valuable uses of the existing environment. Although impacts were associated with the project, valuable uses of the existing environment would not be lost permanently as a result of implementation because the impacts are either temporary and construction related or would be fully offset by proposed mitigation measures.

Section 9.0 Irreversible and Irretrievable Commitments of Resources

Under 40 CFR 1502.16, NEPA documents are required to include a discussion of significant irreversible environmental changes that would result from implementation of a proposed action. Irreversible commitment of resources would occur as a result of implementing either the NED Plan Alternative or the Locally-Preferred Plan Alternative. These resources include the building materials, fossil fuels, labor, and energy required to construct and maintain either the NED Plan Alternative or the Locally-Preferred Plan Alternative.

Section 10.0 Public Involvement

10.1 SCOPING FOR THE DRAFT EIS/EIR

A public workshop was held in the City of Norco in 1993 during preparation of the reconnaissance study for the project. The major issues raised included public concern about bluff erosion and potential for damage to private property and utilities.

A notice of intent (NOI) to prepare an EIS was published by the Corps to solicit comments on the document, and a notice of preparation (NOP) to prepare an EIR was prepared by the RCFCWCD. A single written response to the NOI was received from USFWS. Comments in response to the NOP were received from USFWS, California Regional Water Quality Control Board (Santa Ana Region), California Department of Transportation, and DFG. These letters are published in Appendix A of this document. The major concerns expressed in these responses were regarding the extent of habitat loss, effects on wildlife species, and potential impacts on water quality.

A public scoping meeting was held on September 21, 1995, to obtain comments from the general public concerning the scope and alternatives to be considered in the EIS/EIR. Approximately 35 persons attended the meeting. The meeting included a short presentation by Corps staff members and an opportunity for questions and formal comments.

Most comments centered around the project itself and the timing of construction. Alternative types of toe protection and slope stabilization were also discussed. Major environmental concerns related to the speed of the project and the necessity to mitigate for habitat loss. There was also concern expressed by residents near River Drive concerning plans by the City of Norco to designate an equestrian trail on the south side of the street, forcing on-street parking to the northern side near the bluff face.

10.2 REVIEW OF THE DRAFT EIS/EIR

The Draft EIS/EIR was mailed in early June. The mailing list is provided in Appendix G of this document. The Notice of Availability for the Draft EIS/EIR was published in the Federal Register on June 14, 1996. The Notice of Completion was posted by the State Clearinghouse on June 17, 1996. The close of public comments was on July 29, 1996. A public hearing for the Feasibility Study and the Draft EIS/EIR was held in the Council Chambers of the City of Norco, Civic Center on July 18, 1996.

The transcript of the public hearing and written review comments for the Draft EIS/EIR are provided in Appendix G. Responses to the hearing and written comments are also provided in Appendix G.

10.3 REVIEW OF THE FINAL EIS/EIR

The Final EIS/EIR will be distributed to those agencies and persons commenting on the Draft EIS/EIR. Comments on the document will be received for thirty days after receipt of the document.

Section 11.0 List of Preparers and Contributors

This draft EIR/EIS has been prepared by the Corps, with technical assistance provided by Jones & Stokes Associates and USFWS. The following persons were involved in the preparation of this document:

U.S. ARMY CORPS OF ENGINEERS, LOS ANGELES DISTRICT

Alex Watt	Environmental Coordinator/Project Manager
Jennifer Altergott	Biology
Rod McLean	Archaeology
Ed Louie	Landscape Architect
Bill Burton	Project Description

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

Stephen Stump, P.E.	Review
Kent Allen, P.E.	Review
Randy Sheppeard	HEP Analysis/Review

U.S. FISH AND WILDLIFE SERVICE

Robert James	Wildlife
Art Davenport	Wildlife/Endangered Species Consultation

JONES & STOKES ASSOCIATES

Management Team

John Westermeier	Project Manager
Christine Engel	Project Coordinator
Al Herson	Review

Technical Team

Linda Brody	Quality Assurance, Land Use Cumulative Analysis
Christine Engel	Land Use, Population, and Housing; Public Services; Aesthetics; Cultural Resources
Vicki Lake	Vegetation
Kimberly Pell	Air Quality, Noise
John Westermeier	Topography; Geology; Water Resources and Water Quality; Hazardous, Toxic, and Radioactive Waste; Recreation; Transportation
Ed Whisler	HEP/Wildlife Resources
Chad Beckstrom	Response to Comments

Production Team

Roberta Childers	Lead Editor
Jim Merk	Editor
Tony Rypich	Graphic Artist
Wanda Whiteley	Lead Word Processing Operator

Conflict of Interest and Disclosure Statement

Jones and Stokes Associates has no financial or other interest in the outcome of the project.

(Signature) 8/21/96 (Date)

Section 12.0 Citations

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Appendix F. The Evaluation of the Effects of the Discharge of Dredged or Fill Materials into the Waters of the United States 404b(1) Analysis

I. INTRODUCTION

The following is provided in accordance with Section 404 (b)(1) of the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500) as amended by the Clean Water Act of 1977 (CWA) (Public Law 95-217). Its intent is to succinctly state and evaluate information regarding the effects of discharge of dredged or fill material into the waters of the United States. As such, it is not meant to stand alone and relies heavily upon information provided in the environmental document to which it is attached. Use of the "Documentation" category is for expansion of discussions only when necessary or for references and citations.

It should be noted that there is currently no Corps authorization for this project. In the event no Corps involvement will occur, the Local Sponsor will be required to meet full requirements under Section 404 and 401.

II. PROJECT DESCRIPTION

A. Location: The study area is located along an approximately one-mile stretch of the southern bank of the Santa Ana River in the City of Norco, Riverside County, California. The site begins immediately east of Interstate 15 where it crosses the Santa Ana River. Section 1 of the EIS/EIR provides maps of the study area.

B. General Description: The preferred action (Locally-Preferred Plan Alternative) involves the placement of fill along the toe of the Norco Bluffs and stabilization of the slopes using buttress fill. It is estimated that an area of approximately 2 ha (4.94 ac) will be filled along the toe of the bluffs. An estimated 213,000 cubic meters (277,284 cy) of fill would be required. The preferred action will result in removal of an additional 6.5 ha (16.0 ac) of riparian woodlands and up to 15.9 ha (39.4 ac) of *Arundo donax* woodlands. Material for toe protection slope stabilization will be either obtained from off-site commercial quarries or mined from the river bed in the vicinity of the project area.

C. Authority and Purpose: The U.S. Army Corps of Engineers is conducting a feasibility study of stabilization measures under the following authority of Section 116(b) of the Water Resources Development Act of 1990: "The Secretary shall conduct a feasibility study of bank stabilization measures for Norco Bluffs, California Under the Flood Control Program of the Corps of Engineers".

The purpose of the proposed action is to reduce the potential for slope erosion along the actively eroding portion of the Norco Bluffs. The toe of the Norco Bluffs along the Santa Ana River has undergone extensive erosion, resulting in undercutting and collapse of the slopes. This erosion is greatest when the river changes its course and causes erosion at different locations. Geologic studies have indicated that erosion is extremely rapid at times with bluff-top retreats of up to 15 meters (50 feet) per erosional event. The erosion has resulted in the condemnation and subsequent demolition of one house and undermining of a major residential access street. It is estimated that up to 56 structures as well as roadways and utilities may be at risk during future erosional events.

D. General Description of Dredged or Fill Material: The proposed fill material will be unconsolidated alluvium obtained from the river bed itself. Additionally, soil cement consisting of a mixture of soil and cement will be placed on the outer edge of the fill to harden the material and prevent erosion.

E. Description of the Proposed Discharge Site: The discharge site is approximately 25 meters (82 feet) wide along approximately 1,600 meters (5,249 feet) of the Norco Bluffs. This area is heavily vegetated with riparian woodland forest. Overall area of fill placement is approximately 2 ha (4.94 acres).

F. Description of Disposal Method: Offsite disposal will not be required as no material will be removed from the project. Dewatering during construction may be required, which will require an National Pollution Discharge Elimination System (NPDES) permit.

III. FACTUAL DETERMINATION

A. Disposal Site Physical Substrate Determinations:

1. Substrate Elevation and Slope: The existing substrate is the Santa Ana River bed at the toe of the bluff. Toe protection will raise the ground level approximately 5 meters (15 feet) in order to provide erosion protection. This will require removal of riparian woodland forest vegetation.

2. Sediment Type: Material to be placed at the toe is unconsolidated sediment similar to the type that is already in the river bed. The outer edge of the material will be hardened with soil cement.

3. Dredged/Fill Material Movement: The fill material will be placed on the toe and the slope of the bluff. No movement of the material will occur.

4. Physical Effects on Benthos (burial, changes in sediment type, composition, etc.): The toe protection fill will result in the permanent loss of approximately 2 ha (4.94 ac) of riparian woodland forest and other riparian communities. This habitat will be compensated for by removal of *Arundo donax* in the project area.

5. Other Effects: There will be potential short-term sedimentation and turbidity impacts during construction due to vegetation removal.

6. Action Taken to Minimize Impacts: No construction will occur between November and March to preclude working in areas of free-flowing water. Erosion control measures will also be conducted including contour grading, sedimentation basins, water bars, sediment fences and sand bags as required.

B. Effect on Water Circulation, Fluctuation and Salinity Determinations:

1. Effect on Water: The flow on site is from the Santa Ana River. The preferred action will not change overall flows in the area. The project will provide erosion protection of only the bluff toes.

2. Effect on Current Drainage Patterns and Circulation: No changes in current drainage patterns and circulation are anticipated from project implementation. A hydrological analysis will be conducted to assure no changes from borrowing activities.

3. Effect on Normal Water Level Fluctuations. The proposed project will have no impact on water level fluctuations.

4. Action Taken to Minimize Effects. No measures are required.

C. Suspended Particulate/Turbidity Determinations at the Disposal Site:

1. Expected Change in Suspended Particulate and Turbidity Levels in the Vicinity of Disposal Site: There may be short-term turbidity during the construction period, primarily from dewatering. Mitigation measures such as use of sedimentation basins, strawbales, etc. will reduce this potential impact to less-than-significant levels.

2. Effects (degree and duration) on Chemical and Physical Properties of the Water Column: No significant changes in chemical and physical properties of the water column are anticipated.

3. Effects of Turbidity on Biota: Due to construction during low-flow periods and the mitigation measures to reduce turbidity associated with dewatering, no significant impact to biota is anticipated.

4. Actions Taken to Minimize Impacts: Erosion control measures and measures to reduce turbidity will reduce turbidity impacts to less-than-significant levels.

D. Contamination Determination: An evaluation of the appropriate information above indicates that there is reason to believe the proposed dredged or fill material is not a carrier of contaminants or that levels of contaminants are substantively similar at extraction and disposal sites and not likely to be constraints. The material meets the testing exclusion criteria.

E. Effect on Aquatic Ecosystem and Organism Determination: With erosion control, no significant impact on aquatic ecosystems and organisms is anticipated.

F. Proposed Disposal Site Determinations: Is the mixing zone for each disposal site confined to the smallest practicable zone?

___X___ Yes __________ No

G. Determination of Cumulative Effects of Disposal of Fill on the Aquatic Ecosystem: With implementation of mitigation measures, no significant cumulative effect on the aquatic ecosystem is anticipated.

H. Determination of Indirect Effects of Disposal of Fill on the Aquatic Ecosystem: Mitigation measures will reduce any sedimentation impacts or turbidity impacts on the aquatic ecosystem to less-than-significant levels.

IV. FINDING OF COMPLIANCE

A review of the proposed project indicates that:

1. The discharge represents the least environmentally damaging practicable alternative, and if in a special aquatic site, the activity associated with the discharge must have direct access or proximity to, or be located in the aquatic ecosystem to fulfill its basic purpose.

___X___ Yes ________ No

2. The activity does not appears to: 1) violate applicable state water quality standards or effluent standards prohibited under Section 307 of the CWA; 2) jeopardize the existence of federally listed endangered or threatened species or designated marine sanctuary.

___X___ Yes ________ No

3. The activity will not cause or contribute to significant degradation of waters of the U.S., including adverse effects on human health; life stages of organisms dependent on the aquatic ecosystem; ecosystem diversity; productivity and stability; and recreational, aesthetic, and economic values.

___X___ Yes ________ No

4. Appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem.

___X___ Yes ________ No

Note:

A negative response indicates that the proposed project does not comply with the guidelines.

<u>On the Basis of the Guidelines, the Proposed Disposal Site(s) for the Discharge of Dredged or Fill Material (specify which) Is (select one)</u>:

______ (1) Specified as complying with the requirements of these guidelines; or

__X__ (2) Specified as complying with the requirements of these guidelines, with the inclusion of appropriate and practical conditions to minimize pollution or adverse effects on the aquatic ecosystem; or

______ (3) Specified as failing to comply with the requirements of these guidelines.

Prepared by: ______________________________
John F. Westermeier
Jones & Stokes Associates, Inc.

Date: June, 1996

Appendix G. Finalizing Addendum

Mailing List for Draft EIS/EIR

Honorable Barbara Boxer
U.S. Senator
112 Hart Senate Bldg.
Washington D.C., 20510

Honorable Barbara Boxer
U.S. Senator
1700 Montgomery Street
Suite 240
San Francisco, CA 94111

Janice L. Boyer
1182 River Drive
Norco, CA 91760

Supervisor Bob Buster
Post Office Box 1527
Riverside, CA 92502-1527

California Department of Fish
and Game
Post Office Box 6657
Laguna Niguel, CA 92607

California Department of Fish
and Game
330 Golden Shore
Suite 50
Long Beach, CA 90802

Honorable Ken Calvert
U.S. Congressman
1523 Longworth House
Washington D.C., 20515

Honorable Ken Calvert
U.S. Congressman
3400 Central Ste. 200
Riverside, CA 92506

Honorable Barbara Carmichael
City Council
City of Norco
Post Office Box 428
Norco, CA 91760

Supervisor Kay Cisneros
Post Office Box 1486
Riverside, CA 92502-1486

Corona-Norco Independent
823 S. Main Street
Corona, CA 91720

Corona Public Library
Attention: Nora Jacob
650 South Main Street
Corona, CA 91720

Robert & Mary Cuervo
982 River Drive
Norco, CA 91760

Honorable Larry Cusimano
City Council
City of Norco
Post Office Box 428
Norco, CA 91760

Jim Daniels, Director
Community Development
City of Norco
Post Office Box 428
Norco, CA 91760

Art Davenport
U.S. Fish & Wildlife Services
2730 Loker Avenue West
Carlsbad, CA 92008

Donald & Pamela Ensley
984 River Drive
Norco, CA 91760

Environmental Protection Agency
Office of Federal Activities
(A-104)
401 M Street, SW
Washington, DC 20460

Environmental Protection Agency
(Attn: David Farrel, Chief)
Office of Federal Activities
Mail Code E-3
75 Hawthorne Street
San Francisco, CA 94105

Environmental Protection Agency
Office of Federal Activities (A-104)
401 M Street SW
Washington, DC 20460

Honorable Dianne Feinstein
U.S. Senator
331 Hart Senate Bldg.
Washington D.C., 20510

Honorable Dianne Feinstein
U.S. Senator
750 B Street
Suite 1030
San Diego, CA 92101

John Harper, City Attorney
City of Norco
Post Office Box 428
Norco, CA 91760

Dianna Higdon, City Clerk
City of Norco
Post Office Box 428
Norco, CA 91760

George Lambert, City Manger
City of Norco
Post Office Box 428
Norco, CA 91760

Melodie Lyon
1170 River Drive
Norco, CA 91760

Honorable Richard MacGregor
City Council
City of Norco
Post Office Box 428
Norco, CA 91760

Norco Public Library
3954 Old Hamner Avenue
Norco, CA 91760

Ray Odell, Director
Parks & Recreation
City of Norco
Post Office Box 428
Norco, CA 91760

Director, Office of Environmental
Policy and Compliance
Department of the Interior
Main Interior Building, MS 2340
1849 C Street, NW
Washington, DC 20240

Office of Historic Preservation
Post Office Box 942896
Sacramento, CA 94296

Riverside Public Library
Attention: Government Documents
3581 Mission Inn Avenue
Riverside, CA 92501

State Clearing House
1400 Tenth Street
Sacramento, CA 95814

US Army Corps of Engineers
(Attn: H. Converse, CESPD-ET-P)
333 Market Street
San Francisco, CA 94105-2195

Honorable William Vaughn
Mayor
City of Norco
Post Office Box 428
Norco, CA 91760

Pearl Young
Environmental Protection Agency
401 M. Street, SW
Washington, DC 20460

Eva Phillips
Corona-Norco Independent
823 South Main Street
Corona, CA 91720

George & Anita Saunders
970 River Drive
Norco, CA 91760

Steve Stump
Federal Project Manager
Riverside County Flood Control and
Water Conservation District
1995 Market Street
Riverside, CA 92501-1719

US Army Corps of Engineers
(Attn: D. Fountain, CECW-PW)
Room 7111
20 Massachusetts Avenue, NW
Washington, DC 20314-1000

Supervisor Roy Wilson
Post Office Box 1647
Riverside, CA 92502-1647

Patrick Quaney
400 South Lemon
Anaheim, CA 92805

Joseph Schenk, Director
Public Works
City of Norco
Post Office Box 428
Norco, CA 91760

Supervisor John Tavaglione
Post Office Box 1646
Riverside, CA 92502-1646

US Fish and Wildlife Service
2730 Loker Avenue West
Carlsbad, CA 92008

Honorable Terry Write
City Council
City of Norco
Post Office Box 428
Norco, CA 91760

Comment Letters

1182 River Drive
Norco, Calif. 91760
July 27, 1996

Department Of The Army
Los Angeles District, Corps Of Engineers
P.O. Box 2711
Los Angeles, CAlif. 90053-2325

Attention: Mr. Alex Watt, Col. Michal R. Robinson, Congress of theU.S.

I recently received the Draft Environmental Impact Statement/ Report (DEIS/EIR) regarding streambank stabilization for Norco Bluffs, Calif. Needless to say as a resident of the bluffs since 1964, I was very excited when I received the publication. I of course liked the Locally Preferred Plan and read with great interest and then I reached page 76."C. Recommendation I do not recommend implementation a a plan of bank stabilization for the Norco Bluffs area in Riverside County, California, because no staturory Corps authority exists. Michal R. Robinson, Colonel, Corps of Engineers, District Engineer." I attended a public hearing and heard there that the reason for this is that it is a bank erosion problem and not a flooding problem,. I can't understand how that could be so since I saw the river take out several feet of bluff in front of my home and that of my neighbor overnight. I am told it is a matter of definition, since the river undercut the bank rather than overflowed it, either way the river and nothing else is what is responsible for the loss of bluff in front of my home.

As I read this document I see great concern is given to plants & fish, not to mention the least Bell's vireo. I wonder what happened to these things during the 1969 flooding when everything was washed out and the river bottom was left barren. It would appear to me they must have survived or they wouldn't be there now. To bad the same concern isn't given to the people who are living on River Dr. I personally was not advised of any danger when I purchased my home in 1964. Permission to build them had been given by the County of Riverside since Norco was not yet a City. As I have studied the history of the bluffs since that time I find that the County should have more than been aware of the threat of the river. I have since watched as more homes were permitted to be built in the endangered area with no thought to the safety of those purchasing them. I personally had no reason to be concerned about the River since my home was located on the opposite side of a county street with bluff to spare and the bluff was not sheer. We had room to park our car on the other side of the street. Now the bluff edge is into that street. I am located in Zone 2 at the most effected area. I have pursued for many years the issue writing, calling, and speaking at both City Of Norco meetings and the County Board of Supervisors meeting to no avail. I have watched as enough money to fix the bluffs initally has been spent for various studies, and still we are no closer to a solution.

Once again my hopes have been raised only to be disappointed once more. I understand that the only hope I have left is that this could possibly be added to the 1969 Water Resourses Bill and if passed help could be on the way. I emplore you to do so. For over 25 years I have faced winters wondering if this will be the one in which I lose my home to the river. My children are grown and have moved away, my husband has died, and I am unable to do anything but wait and watch. My home is unsellable land the street is getting narrower. My neighbor has been canceled by her home insurance and we all know how necessary that is.

PLEASE FIND A WAY TO FIX OUR BLUFF AND MAKE OUR HOMES SAFE ONCE AGAIN!

Sincerely,

Janice L. Boyer

Janice L. Boyer

July 25, 1996

To: Norco City, Riverside County, State of Calif., Army Corp., Etc:

Those of us, signed below, are very concerned citizens from Zone 2 in the Bluff Erosian area of Norco California.

Many of us have lived here during the Bluff Erosian of 1979 and 1980. +1969 Some of us have been here during the erosian problems before that time. We have been waiting for sixteen years, and more, for assistance with the severe problems that we have incurred since then.

With the continued erosian predictions we are aware that the gas, water, and sewer lines in the street in front of our homes are in jeopardy. One of our homes only has a one lane street in front of the home, and a sheer drop on the Bluff side of the street. We have also experienced the loss of the ability to sell our homes due to the Bluff Erosian problems. Lenders have disapproved loans, insurance companies have cancelled homeowners insurance, and people have been afraid to buy in our area because of continued erosian dangers.

Environmental dumping to help support damaged, and bluff areas of severe erosian continuation, have been cancelled. The river has been channelled toward our homes for continued recreational purposes. And the responsibility for our urgent need for assistance has been passed along to another party for over 16 years now.

We, the undersigned, request immediate, severely needed, assistance. Would someone who does have an interest in our calamitous misfortune please advise us who we can really rely on? And who, when, and how, can we ever depend on genuine help and assistance from???

MELODIE LYON
1170 RIVER DRIVE
NORCO, CA. 91760
Melodie Lyon

Tamara Gray
1122 River Dr.
Norco, Ca. 91760
Tamara Gray

Joanne Tennant
1134 River Dr
Norco, CA 91760
Joanne Tennant

Janice Boyer
1182 River DR
Norco, CA 91760
Janice Boyer

Lenore Thompson
1194 River DR.
Norco, CA. 91760
Lenore Thompson

Esther B Glass
1206 River Drive
Norco CA 91760
Esther B Glass

LEIF + ANITA OHRBORG
1272 RIVER DRIVE
NORCO, CAL 91760

LARRY G. WENCH
4456 VALLEY VIEW AVE
NORCO CA 91760

William Hall
1232 River Drive
Norco, Calif. 91760-1320
Bill Hall

ADAM WOODS
1330 RIVER DR
NORCO CA 91760
[signature]

BARTE DULIN
1340 River Dr
Norco Ca 91760
Barte Dulin

Maureen Campbell
1360 River Dr
Norco Ca 91760
Maureen Campbell

Bench Crump
910 River Dr.
Norco Ca.

Andrea Foster
1378 River DR
Norco, Ca

Andrea Foster
1378 River DR
Norco, Ca

Shelynbelle Dietrich
1320 River drive
Norco Ca 91760

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

August 5, 1996

Colonel Michael R. Robinson
District Engineer
US Army Corps of Engineers
Los Angeles District
PO Box 2711
Los Angeles CA 90053

ATTN: Mr. Alex Watt

Dear Colonel Robinson:

The U.S. Environmental Protection Agency (EPA) has reviewed the Draft Environmental Impact Statement/Report (DEIS/R) for **NORCO BLUFFS STREAMBANK STABILIZATION, City of Norco, Riverside County, California.** Our comments on the DEIS/R are provided under the National Environmental Policy Act (NEPA), Section 309 of the Clean Air Act, and the Council on Environmental Quality (CEQ) Regulations for Implementing NEPA (40 CFR 1500-1508). The DEIS/R was prepared by the Army Corps of Engineers and the Riverside County Flood Control and Water Conservation District (RCFCWCD).

The document addresses potential environmental impacts and mitigation associated with the proposed stabilization of the Norco Bluffs banks in the City of Norco. The toe of the bluffs has undergone substantial erosion from the Santa Ana River, resulting in collapse of sections of the bluff and endangering 56 structures, roadways and utilities along the bluff. The DEIS/R provides a detailed assessment of two action alternatives as well as No Action. A large number of other action alternatives were briefly discussed, but were eliminated from detailed analysis for technical, environmental and/or economic reasons.

We have rated the DEIS/R as EC-2, Environmental Concerns - Insufficient Information. The EC-2 rating is further defined in the enclosed "Summary of Rating Definitions and Follow-Up Action." We believe that the DEIS/R adequately conveyed the project's purpose and need and considered a wide range of alternatives, clearly stating why most were not evaluated in further detail. To a large degree the DEIS/R satisfactorily identified potential impacts and mitigation measures, including biological resource considerations implicated by the project. However, we have several concerns and comments to offer as the Army Corps and the RCFCWCD develop the Final EIS/R. Our first concern is that the DEIS/R briefly mentions that the use of an herbicide (Rodeo) is an integral element of the project, but did not discuss the reasonably foreseeable impacts that might be associated with using this chemical such as impacts to Federally-listed species (least Bell's vireo) and native fish species. Our second concern regards the protection of water quality and a need to demonstrate consistency with applicable requirements of the Basin Plan, particularly due to the use of herbicides for a number of years. We recommend that your Final EIS/R reflect CEQ's memorandum on incorporating pollution prevention features in NEPA documents and discuss whether the Army Corps intends to undertake a formal air quality conformity determination for the project. Lastly, we recommend that the Final EIS/R contain specific monitoring provisions as noted in our detailed comments (attached).

We appreciate the opportunity to comment on the DEIS/R. Please send one copy of the Final EIS/R to my attention when it is filed with EPA's Washington, D.C. office. If you have any questions, please call me at 415-744-1584 or David Tomsovic of my staff at 415-744-1575.

Sincerely,

David Farrel, Chief
Federal Activities Office

Enclosures: 3
(a) Rating sheet for DEISs
(b) Detailed comments on DEIS
(c) Pollution prevention checklist

cc: Arthur Davenport, F&WS, Carlsbad CA
Stephen Stump, RCFCWCD, Riverside CA

file 002497

SUMMARY OF RATING DEFINITIONS AND FOLLOW-UP ACTION

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 must 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 environmental quality, public health or welfare. 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 recommend 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 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."

Additionally, we recommend that the FEIS/R discuss the applicability of water quality objectives for the Santa Ana River that are found in the applicable Basin Plan. For toxic substances, the Basin Plan's water quality objectives stipulate that:

1. toxic substances shall not be discharged at levels that will bioaccumulate in aquatic resources to levels that are harmful to human health;

2. the concentrations of contaminants in waters which are existing or potential sources of drinking water shall not occur at levels which are harmful to human health; and

3. the concentrations of toxic pollutants in the water column, sediments or biota shall not adversely affect beneficial uses.

The DEIS/R did not contain any reference to the above requirements, which U.S. EPA has approved under provisions of the Clean Water Act. The FEIS/R and Record of Decision should reflect appropriate commitments to protect water quality and beneficial uses as found in the Basin Plan.

Air Conformity Determination Under Clean Air Act: Page 4-29 of the DEIS/R discusses air quality conformity requirements for the project area (a requirement under Section 176 of the Clean Air Act for Federally-sponsored projects). It notes that the applicable de minimus levels for the project are 10 tons per year (tpy) for reactive organic gases, 10 tpy for oxides of nitrogen, and 70 tpy for particulate matter less than 10 microns in diameter. Table 4-2 of the DEIS/R identifies the annual pollutant emissions that are projected to occur during the project's construction in tons per year. It appears that at least five of the annual emissions reported in the "Total annual emissions" line exceed the de minimus levels for the area.

Based upon a discussion between Alex Watt of the Army Corps and David Tomsovic of U.S. EPA, the Army Corps believes that it may be necessary to undertake a conformity determination for the proposed project, which would encompass the total of direct and indirect emissions for any criteria pollutant specifically identified and accounted for in the applicable State Implementation Plan (the conformity determination needs to address construction-related emissions). We recommend that the FEIS/R discuss whether the Army Corps intends to conduct a conformity determination for the proposed project. You may want to refer to an EPA document titled **GENERAL CONFORMITY GUIDANCE: QUESTIONS AND ANSWERS** (U.S. EPA, Office of Air Quality Planning & Standards, Research Triangle Park, N.C., July 13, 1994).

If the Army Corps intends to undertake a conformity determination, we suggest that this analysis be undertaken in conjunction with the 30-day comment review period for the FEIS/R. In this way, comments made on the FEIS/R and the conformity review (including the need for mitigation measures) could be addressed in the Norco Bluffs Record of Decision.

Pollution Prevention: The DEIS/R did not specifically recognize the Council on Environmental Quality (CEQ) memorandum (see January 29, 1993 Federal Register) on incorporating pollution prevention features in NEPA documents. CEQ encouraged Federal agencies to integrate pollution prevention features in their NEPA planning and decision-making. The FEIS/R and Record of Decision should reflect a commitment to implement feasible pollution prevention measures. For your reference I've enclosed a pollution prevention checklist for flood control projects developed by U.S. EPA headquarters. Although the Norco Bluffs project is not flood control per se, a number of items on the pollution prevention checklist may prove feasible for the Norco Bluffs project. Additionally, we note that several items on the checklist are already presented in the DEIS/R (such as provisions for a spill control plan). We encourage the Army Corps and the RCFCWCD to review the checklist to ensure that reasonable pollution prevention features are an integral part of the project's design, construction and operation, in keeping with CEQ's 1993 memorandum.

Monitoring: To assure the public that appropriate monitoring occurs during construction, we recommend that the Army Corps include a statement similar to the following in the FEIS/R:

> "Monitoring by the Army Corps of Engineers or an environmental contractor approved by the Army Corps will be conducted throughout project construction to ensure that all activities strictly adhere to the project's erosion and sediment control and pollution prevention and control plans, and to ensure project compliance with all permit conditions and pollution prevention measures including those attached to Regional Water Quality Control Board's Water Quality Certification (Section 401) and the California Department of Fish and Game Streambed Alteration Agreement (Section 1601). A construction monitoring plan will be developed prior to the start of construction to specifically address the timing and frequency of construction monitoring and the procedure for communicating potential noncompliance issues to the Army Corps, the project sponsor(s) and the construction contractor(s)."

The Corps' Record of Decision should provide a commitment to undertake such monitoring.

<u>Editorial Comments</u>

1. <u>Table S-1, p. S-6</u>. In the Land Use, Population and Housing section the following appears twice: "Mitigation - no impact required." We believe it should read "Mitigation - no mitigation required."

2. <u>Table S-2, p. S-10</u>. This page contains a statement that, under the Clean Air Act, "[t]he South Coast Air Quality Management District (SCAQMD) is the agency with jurisdiction to enforce the Clean Air Act in this area." We recommend that the wording in the FEIS/R be modified to read "the South Coast Air Quality Management District (SCAQMD) has jurisdiction to enforce the Clean Air Act in this area; U.S. EPA also retains authority to enforce provisions of the Federal Clean Air Act for criteria air pollutants as well as hazardous air pollutants."

3. <u>Table S-2, p. S-10</u>. Under the entry for the Resource Conservation and Recovery Act of 1976, it states that "[c]hemical and pesticide use will be in conformance with this law." Table S-2 should be amended to acknowledge the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), which regulates the use of herbicides. Additionally, the FEIS/R should recognize the applicability of State of California requirements concerning the use of herbicides.

4. <u>Table 1-1, p. 1-7</u>. The table lists 16 different requirements for environmental documents prepared under NEPA and the California Environmental Quality Act (CEQA), indicting the applicable sections of NEPA and CEQA where such requirements may be found. For "Growth Inducing Impacts," it indicates that it is "Not Applicable" (N/A) under NEPA, i.e., that NEPA has no section concerning growth inducing impacts.

I'd like to direct your attention to the discussion in 40 CFR 1508.8 on indirect effects which need to be addressed in EISs. In this section the CEQ states that "[i]ndirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate..." We believe it is incorrect for the DEIS/R to have stated that NEPA has no requirement on growth inducing effects. The entry on growth inducing effects should be amended to recognize 40 CFR 1508.8.

5. <u>Page 2-5</u>: This page states that Rodeo is "approved" by U.S. EPA for use in wetlands. We suggest that the word "approved" be replaced by "registered" since U.S. EPA does not approve pesticides or herbicides but instead "registers" them.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR FLOOD CONTROL PROJECTS

How Can Flood Control Projects Affect the Environment?

Flood control projects can include channelization and channel modification activities and levee construction. Such activities can change the ability of natural systems to filter pollutants from surface waters; alter the rates and paths of sediment erosion, transport, and deposition; increase the movement of pollutants from the upper reaches of watersheds into coastal waters; lower dissolved oxygen levels; increase salinity in marshes; reduce freshwater availability; and accelerate the delivery rate of pollutants to downstream sites. Pollution prevention techniques can reduce or eliminate some environmental effects.

Also see checklists on Ecosystem Preservation and Protection, Siting, Building/Housing Construction, Dredging Projects, Dams, Hydropower, and Water Supply Reservoirs.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Ecosystem Concerns

- Has the use of alternatives involving levee setbacks or the use of floodways been considered?
- Will the flood control project lead to land use changes in the watershed, particularly those changes that result in increased surface water runoff and nonpoint source pollution?
- Have modifications to existing flood control structures been evaluated to determine if they can eliminate the need for the new channelization or channel modification project?
- Have all environmentally sensitive areas been characterized? Have attempts been made to avoid construction in environmentally sensitive areas? *
- Does the project minimize construction parallel to rivers or streams to reduce the potential for direct runoff discharge from the roadway?
- Does the project make use of existing roadway alignments (if possible) to reduce the amount of waste generated as a result of clearing and construction activities?
- Has the project incorporated mitigation measures to reduce the impact of pollution runoff from the roadway? These measures may include stabilizing cut and fill slopes, shoulders, and medians with perennial vegetation and non-erosive materials, such as rip-rap or geotextiles, or establishing permanently controlled discharge points for storm water.
- Does the plan include native plant revegetation of areas disturbed by construction to minimize erosion and sedimentation?
- Have safe wildlife crossing structures and appropriate fencing been incorporated into the project to accommodate the movements and needs of resident wildlife and mitigate habitat fragmentation? *

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* Indicates an environmental impact reduction opportunity.

Project Design and Planning. Flood control projects can affect the physical characteristics of surface waters and modify in-stream and riparian habitat.

- Have alternatives, such as upstream watershed management and floodplain widening, been considered? *
- Are land use and agricultural practices, as well as their potential for contributing pollutants to surface waters, considered in channel design? *
- Will building be prohibited within a defined distance from the streambed to protect the streambank?
- Are streambank protection measures, such as stone riprap, vegetation, erosion control fabrics, cellular concrete blocks, and gabions, included in the design?
- Will levees and flood walls be sited outside riparian areas and wetlands?
- Are channel slopes graded so that animals can crawl or climb out? *

Construction. Construction activities for channel modification include vegetation clearing, soil and rock excavation and placement, equipment operations, and energy, water, and hazardous materials use, all of which can cause pollution. Effects on river and coastal area ecology from increased sediment loads and the release of hazardous constituents can occur during construction. Pollution prevention techniques can reduce or eliminate some pollutants.

- Will measures be taken to prevent surface water from entering construction areas?
- Will construction take place during dry seasons?
- Will site access routes and equipment storage areas be planned and located to minimize erosion potential? Will existing roadways be used to gain site access?
- Will construction workers be required to limit activities to designated, controlled areas to prevent vegetation destruction and soil disturbance? *
- Will secondary containment be provided in equipment fueling areas to control fuel spills? Is a spill control plan specified?
- Will access to materials and equipment storage areas be controlled and limited? Will material storage areas be covered? Will materials be ordered only when necessary to prevent inventory from expiring?
- Will the cleaning of construction equipment be conducted in a controlled area away from surface water? Will the washwater be prevented from entering the stream?

* Indicates an environmental impact reduction opportunity.

- Will reclaimed and/or recycled construction materials be used, including aggregate, rebar, lumber, and asphalt? *

- Are alternative materials available to reduce hazardous and toxic materials use during construction?

- Will construction and storage areas be sited away from critical habitats? *

- Will biotechnical methods, such as vegetated gabions, be used to stabilize levee and channel banks?

Maintenance. Pollution prevention can reduce or eliminate the environmental effects of flood control project maintenance. Maintenance generally consists of vegetation management, burrowing animal control, upkeep of recreational areas, and levee repairs. In-stream and riparian habitats, which provide soil erosion protection, and pollutant filtering can be affected by maintenance activities.

- Will vegetation removal methods that use chemicals, grazing, or burning be prohibited? Chemical herbicide residuals and animal wastes can be washed into waterways during rainy periods. Burning can negatively affect air quality.

- Will burrowing animals be controlled by non-chemical means? Burrowing animals can affect the integrity of structures, leading to significant reconstruction requirements.

- Will native plant species be used for revegetation of disturbed areas? *

- Will marina fueling areas be regularly maintained and checked for leaks? Will boat owners be required to remove their craft from waterways before conducting engine and other boat repairs using hazardous materials?

- Will measures be taken to prevent downstream sediment loading during dredging operations?

- Will dredging spoils be evaluated for nutrient and contaminant content before they are applied to land areas? *

Other References

Federal Interagency Floodplain Management Review Committee. August 1994. "Sharing the Challenge: Floodplain Management into the 21st Century."

Federal Interagency Floodplain Management Task Force. 1992. "Floodplain Management in the United States: An Assessment Report."

U.S. EPA, Office of Water. January 1993. *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters.* 840-B-92-002.

* Indicates an environmental impact reduction opportunity.

CITY of NORCO

CITY HALL 2870 CLARK AVENUE ● (909) 735-3900, FAX (909) 270-5622 ● P.O. BOX 428, NORCO, CA 91760

July 18, 1996

Mr. Alex Watt
Department of the Army
Los Angeles District, Corps of Engineers
P.O. Box 2711
Los Angeles, CA 90053-2325

RE: Stabilization for Norco Bluffs and the Draft Environmental Impact Statement/Report (DEIS/EIR)

Dear Mr. Watt:

The City of Norco has reviewed the Draft Environmental Impact Statement/Report (DEIS/EIR) for the proposed stabilization for Norco Bluffs along a portion of the Santa Ana River in the City of Norco. The City concurs with the conclusions of the DEIS/EIR and the recommended mitigations for all of the identified impacts associated with the two alternatives that were evaluated in addition to the "No Action" alternative. The City, however, DOES NOT CONCUR with the conclusion of the U.S. Army Corps of Engineers regarding its involvement in the project. That conclusion states that the project is not within the statutory authority of the Corps of Engineers because it is primarily erosion control, and that therefore, there should be no federal involvement with the project. The City strongly encourages the Corps of Engineers to reconsider its position since it is apparent that historically, most of the significant damage that has occurred to the bluffs has been associated with a significant storm.

On page 7 of the Main Report under "Problems and Opportunities" it states that "the problem affecting Norco Bluffs is retreat of the bluffs indirectly caused by lateral migration of the Santa Ana River during significant storm events. Lateral migration of the river causes erosional undercutting of the toe of the bluffs which leads to destabiliztion of the bluff face". The undercutting causes the buffs to steepen into unstable, verticle profiles. North of River Drive between Hamner Avenue and Temescal Avenue the problem is extensive, affecting approximately 60% of a 6 kilometer area. "In 1969, flood flows in the Santa Ana River actively undercut more than 75% of the bluff length, with approximately 25% of the bluff length severely affected. Severe damages again occurred in 1980, primarily along River Drive between Sierra and Valleyview Avenues, and behind homes along the north side of Alhambra Street" as a result of flood impacts.

In discussing hydraulics in the "Without Project Condition" scenario (p.12, Mian Report) the entire bluff was discussed, divided into five different zones. A correlation was made between a non-damaging event and a flood event to determine how much erosion occurs during a flood condition as compared to normal conditions. The conclusion was that erosion is totally unrelated to flood frequency, and that the amount of retreat ranges from minor to substantial in a discontinuous manner. The explanation was that there are other interdependent factors that cause erosion of the bluff to occur:

1. Slope of the bluff: where the slope is mild and stable it can withstand substantial amounts of erosion from relatively large events without retreat from the top of the bluff. Conversely, where the bluff is steep and therefor unstable, it can suffer significant retreat of the top of the bluff from relatively minor flows.

<u>Response</u>: While the slope of the bluff may increase or decrease the potential for undercutting and retreat of the bluff, Alternatives 1 or 2 (toe-protection only, or toe and slope protection) would stop progression of the bluff retreat which has been documented to increase significantly from large storm flows. By the documents own admission, the determination of slope, and its impact on natural erosion, could not be relied upon because of the difficulty in identifying the toe slopes, and how they changed over time, in the photographs.

2. Location of flows: the location of flows attacking the toe of the bluff can change between flood events and even within a single flood.

   <u>Response</u>: The photos included within the document, and the data regarding the damage that occurred during previous floods, shows that the particular area in question is highly susceptible to bluff retreat during flood flows, regardless of how the rest of the bluffs are able to withstand the attack.

3. Human intervention: a considerable amount of refuse and rubble has been dumped to prevent further erosion. Also, downstream of the freeway the bluffs were modified in conjunction with a residential development to modify the rate of erosion.

   <u>Response</u>: The human intervention that has occurred within the subject area has done little to stop the retreat of the bluffs which is documented to increase significantly during high flood flows.

In addition to the above, the DEIS/EIR has identified significant environmental impacts that will occur without protection measures taken to stabilize the slopes:

Biological:
Environmental damages due to excessive sedimentation may also occur for migration of the channel bed, bank sloughing, and debris flow. Poor water quality and excessive sedimentation from bluff sloughing could produce adverse effects on the extensive vireo habitat that exists below the bluffs (p. 9, Main Report).

Topography:
No action to stabilize the slopes would allow erosion and bluff retreat would continue, resulting in further receding of the bluff. This indirect impact would be considered significant (p. 4-2, DEIS/EIR).

Geology:
No action would result in continued bluff erosion and collapse of the bluffs. This would be considered a significant impact (p. 4-4, DEIS/EIR).

Public Services and Utilities:
Utility systems along River Road could be significantly affected by bluff collapse that could occur with adoption of a No-Action Alternative. Utility lines may require periodic repair and relocation and there may also be impacts on fire, police, and public works services.

Transportation:
River Drive would continue to be blocked and further bluff collapse may make stretches unusable in the future.

Land Use, Population, and Housing:
The "No-Action" alternative would result in continued erosion and bluff retreat reducing the extent of residential areas, resulting in the loss of housing and population in the area. This would be a significant impact.

The City of Norco urges the Corps of Engineers to re-evaluate their role in the bluff stabilization project, in that we believe the problem to be a flood control problem and not just an erosion concern.

Sincerely,

William T. Vaughan

William T. Vaughan
Mayor

DAVID P. ZAPPE
General Manager-Chief Engineer

1995 MARKET STREET
RIVERSIDE, CA 92501
909/275-1200
909/788-9965 FAX

9282.1

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

August 8, 1996

Mr. Robert S. Joe
Chief, Planning Division
U.S. Army Corps of Engineers
Post Office Box 2711
Los Angeles, CA 90053-2325

Dear Mr. Joe:

Re: Norco Bluffs
Draft Feasibility
Study and EIS/EIR
Project No. 2-0-0100

We have reviewed the June 1996 Draft Feasibility Study and accompanying draft EIS/EIR for the Norco Bluffs and offer the following comments:

1. Main Report, Page 39, *Biological Impacts* - <u>Threatened and Endangered Species Impacts</u>

   The mitigation measures outlined as "in addition to removal of *Arundo*" should be removed. This discussion offers measures (revegetation of 15.9 hectares) that exceed the mitigation outlined in the EIR/EIS.

2. Main Report, Page 39 - 40, *Recreational Resources*

   Safety concerns are noted. On Page 40, the text "the local sponsor" should be changed to "a recreation local sponsor" since recreation is outside of the District's legal authority.

3. Main Report, Section G-Plan Selection

   It is our opinion that the only final alternatives that should be selected for detailed analysis should be those which provide for slope stabilization. We believe that the toe protection only plan is deficient in as much as it would allow the continued presence of nearly-vertical bluffs which would pose an ongoing safety risk to facility maintenance workers and to the general public. It is apparent that the geotechnical review in the study shares this view in that the report recommends trimming the cliff face to a stable slope (Geotechnical Section 11.2) and that a stable slope for the bluff materials is 1.5H on 1V or flatter (Section 9.4). Since trimming all the way back to a stable slope is not feasible (where there are street improvements at the top), a buttress fill is necessary to provide a bluff slope that is stable and that would not pose a safety problem.

In reviewing the project cost estimates, a minor savings can be identified for the final alternatives studied if the Real Estate Plan presented, which is primarily administrative work, is given a more reasonable cost estimate of $12,000,

4. EIS/EIR - Description of Alternatives

The environmental documentation should address operation and maintenance of the facility. We are concerned that there may be Clean Water Act Section 404 issues associated with some of the standard maintenance provisions that the COE OMRR&R manuals require. Specifically, the "Basis for Recommending Repairs" section of the "generic" OMRR&R manual requires that earth channel bottoms design line and grade be maintained. If this type of work is regulated by Section 404, addressing maintenance in the environmental document will assist in getting the permit issued for maintenance of the facility.

Overall the study is a good in-depth treatment of several plausible alternatives and we believe that it has thoroughly examined the Norco Bluffs problem. We are in agreement with your conclusions that the 100 year toe protection with buttress fill plan is the first choice for selection as the recommended plan, and should Congressional authorization for the project be attained, look forward to our partnership in constructing this important project. Questions concerning our comments may be directed to me at 909/275-1299.

Very truly yours,

Stephen E. Stump

STEPHEN E. STUMP
Federal Projects Coordinator
Senior Civil Engineer

Enclosures

c: USACOE
Attn: Bill Burton
Ed Andrews

State of California

GOVERNOR'S OFFICE OF PLANNING AND RESEARCH
1400 TENTH STREET
SACRAMENTO 95814

PETE WILSON
GOVERNOR

LEE GRISSOM
DIRECTOR

RECEIVED
AUG 05 1996
RIVERSIDE COUNTY FLOOD CONTR
& WATER CONSERVATION DIST.

August 1, 1996

STEPHEN STUMP
RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERV.
1995 MARKET STREET
RIVERSIDE, CA 92501

Subject: NORCO BLUFFS BANK STABILIZATION MEASURES SCH #: 96061044

Dear STEPHEN STUMP:

The State Clearinghouse submitted the above named environmental document to selected state agencies for review. The review period is closed and none of the state agencies have comments. 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 call at (916) 445-0613 if you have any questions regarding the environmental review process. When contacting the Clearinghouse in this matter, please use the eight-digit State Clearinghouse number so that we may respond promptly.

Sincerely,

Antero A. Rivasplata

ANTERO A. RIVASPLATA
Chief, State Clearinghouse

96061044

Notice of Completion

SCH # 96061044

Project Title: Draft EIS/EIR for [illegible] Bluffs Bank Stabilization Measures

Lead Agency: Riverside County Flood Control & Water Conservation District

Street Address: [illegible] Market Street

City: Riverside, CA Zip: 92501

Contact Person: [illegible]

Phone: [illegible]

County: Riverside

Project Location

County: Riverside

City/Nearest Community: City of Norco

Cross Street: I-15 and Santa Ana River

Zip Code: N/A

Total Acres: Approx. 200

Assessor's Parcel No.: N/A

Within 2 Miles: State Hwy #: I-15

Waterways: Santa Ana River

Document Type

CEQA: X Draft EIR

NEPA: X Draft EIS

Other: X Joint Document

Project Description:

The project involves stabilization of approximately [illegible] of the bluff along the Santa Ana River in the City of Norco. The project is required to prevent further erosion that is endangering houses, roadways and public utilities.

State Clearinghouse Contact: Mr. Chris Belsky (916) 445-0613

State Review Began: 6.17.96

Dept. Review to Agency 7.25

Agency Rev to SCH 7.30

SCH COMPLIANCE 8.1

Please note SCH Number on all Comments

96061044

Please forward late comments directly to the Lead Agency

AQMD/APCD 33 (Resources: 6.21)

Project Sent to the following State Agencies

X Resources

Boating

Coastal Comm

Coastal Consv

Colorado Rvr Bd

X Conservation

X Fish & Game # 5

Delta Protection

Forestry

X Parks & Rec/OHP

Reclamation

BCDC

X DWR

OES

Bus Transp Hous

Aeronautics

CHP

X Caltrans # 8

Trans Planning

Housing & Devel

Health & Welfare

Drinking H2O

Medical Waste

State/Consumer Svcs

General Services

Cal/EPA

ARB

CA Waste Mgmt Bd

SWRCB: Grants

SWRCB: Delta

X SWRCB: Wtr Quality

SWRCB: Wtr Rights

X Reg. WQCB # 8

DTSC/CTC

Yth/Adlt Corrections

Corrections

Independent Comm

Energy Comm

X NAHC

PUC

Santa Mn Mtns

State Lands Comm

Tahoe Rgl Plan

X Other: [illegible]

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
600 Harrison Street, Suite 515
San Francisco, California 94107-1576

July 22, 1996

ER 96/392

Mr. William R. Burton
Corps of Engineers, Los Angeles District
Planning Division, Water Resources Branch
P.O. Box 2711
Los Angeles, CA 90053-2352

Dear Mr. Burton:

The Department of the Interior has reviewed the Draft Environmental Impact Statement (DEIS/DEIR) for the Streambank Stabilization for Norco Bluffs, Riverside County, California, and has no comments to offer.

Thank you for the opportunity to comment on this document.

Sincerely,

Patricia S Port

Patricia Sanderson Port
Regional Environmental Officer

Public Hearing Transcript

CITY OF NORCO

RIVERSIDE COUNTY

Public Comment Pertaining to
Norco Bluffs

Date:	Thursday, July 18, 1996
Commenced at:	7:00 p.m.
Concluded at:	8:40 p.m.
Place:	Civic Center Council Chambers 2820 Clark Avenue Norco, California
Reporter:	Connie Mardon

Page 2

APPEARANCES:

Hearing Panel:

COLONEL MICHAL ROBINSON
JOHN F. TAVAGLIONE
BILL BURTON

Jones & Stokes Associates, Inc.
JOHN F. WESTERMEIER
Manager Southern California Operations
2151 Michelson Drive, Suite 236
Irvine, California 92715-1312
(714) 260-1080

Page 3

Norco, California, Thursday, July 18, 1996

MR. TAVAGLIONE: Good evening. I'm John Tavaglione. I'm your member of the County Board of Supervisors. And as part of my duty on the Board of Supervisors, I'm also Chairman of the Riverside County Flood Control and Water Conservation District. And, of course, not only as a representative of the Second District, but as a representative in the Flood Control District.

I'm here tonight to help with the Core of Engineers and our Riverside County Flood District in explaining to you the Project Feasibility and Stability Stabilization Program that is now in the process and is -- is it completed as of yet? The Feasibility Study is completed.

We hope to go through this in a relatively reasonable period of time, and then, of course, after the presentation, give you some opportunity to express some of your concerns and express any questions that you may have.

As you probably know, Riverside County Flood Control with the Core of Engineers has taken this issue very seriously, and have been working together for quite a few years. And at our last public forum, I believe it was in November of 1994, at that time we heard concerns from

Page 4

you. And we have been working towards this Feasibility Study. Both the Core and the County share in the study 50/50.

We are very pleased to say that the Feasibility Study is completed five months early. That gives us an opportunity to hopefully take it to Congress before their session is adjourned. And if that is -- if we're able to do that, we're also hopeful that we can receive the approval and the funding necessary so that we can move forward on the actual work needed to stabilize the bluffs.

Tonight we have, of course, the Mayor Pro Tem Rob Koziel; City Manager for the City of Norco Gerald Johnson. We would like to thank you for opening up your beautiful building tonight, and allowing us to use this.

On my right, a man who I have a tremendous amount of respect for, who I have just had the opportunity to work with since taking office here, and that is Colonel Mike Robinson who is in charge of The Core of Engineers for the Western --

COLONEL ROBINSON: It's actually called the Los Angeles District.

MR. TAVAGLIONE: He has been a tremendous asset to us in the County, and a great resource.

To his right, Bill Burton. Also to my left,

Page 5

I have Steve Stump -- he's in the audience -- who is with our County Flood Control District. He's a Senior Civil Engineer, and works on special projects like the bluffs. One of his associates, Kent Allen. And then the man who tells them all what to do, is the Assistant Director of our Flood Control District, and that's Frank Peairs.

And I would also like to introduce -- before turning the mike over to Colonel Robinson -- his assistant and Deputy Director for the Core of Engineers, Los Angeles District, and that's Lieutenant Colonel Wiley Era (phonetic).

Welcome to all of you, and we look forward to an informative evening.

And at this moment, I would like to turn it over to Colonel Robinson.

COLONEL ROBINSON: Great. Thank you. Well, that was quite a welcome, John. I appreciate your kind remarks.

I'm going to try something for a moment. I'm going to try to speak without the mike. If I start to trail off and get a little weak here, please help me. I'm excited about the work that we've done here, the stud that we have done, and I want you all to hear all about it. And so let me know if I get weak on that.

Can we turn the lights down, just a tad?

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hard over there. These court reporters are just amazing people. I don't know how they do what they do. Even when we mumble, they hear us carefully, clearly, and transcribe our comments. So nothing is going to miss Connie. She's going to have it all down. So if you mumble, she's going to get a mumble. So watch what you say.

Now, before I present the study results, I would like to just give you an update on a couple of other activities, that I mentioned earlier, that the Core is involved with here in your area. We're involved in extensive work all along the Santa Ana River.

Of course, Prado Dam, we have been looking at raising the Dam and the spillway, and expanding the flood pool. This effort has been delayed somewhat by funding restraints, principally by Orange County, which was in bankruptcy. I am happy to report as of about three weeks ago, they are no longer in bankruptcy. They are seeking legislative relief that may help them out with some of those fundings. So we're hopeful that we will see that project at Prado Dam. And we'll talk a little bit about how it impacts part of the Norco bluffs.

Another activity in your area involves the upgrading of State Route 71 by Caltrans. A portion of the highway in Riverside County is still in the planning and design stages, with construction expected to start next

Page 11

year in '97. And as a part of that effort, the highway will need to be elevated as it passes Prado Dam. So we're involved in that activity.

And, of course, because of my regulatory authority, I get involved in a lot of projects that really have nothing to do with the Core of Engineers, but involve the wetlands and the waters of the United States. So we're involved in that regard, also, on the State Route 71.

Now, in 1992, the Core completed a Feasibility Report and Environmental Impact Statement, allowing water conservation in the Prado Basin. That was a boom to this area by providing additional water to the area. And we also did some great things for the environment, there, by funding through the Flood Control, the Water Conservation District, by the removal of Arundo, which is an invasive weed. That's not good for a lot of the critters that inhabit our area.

We are now holding water behind Prado Dam every year between March the 1st and August the 30th. So that was another example where the Core is trying to provide more bang for the buck. That project, which was initially just for flood control, we now have included water conservation as well. We're looking at doing that up in the Seven Oaks Dam as well.

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Another project in the Prado area is a Recreation Master Plan, which we will release for public comment early next year. I'm not sure that we will have a public hearing for that. It may just be available to the public. But in any case, that will be issued early next year.

With that background, let's focus, now, on how we addressed the bluff problem here in Norco.

As part of the civil works process, there are several steps required for project implementation. These include identification of the problem, a request from local officials for Corps participation, and then the study itself. We do the study. And then we review the report, and there's approval involved in that as well. That's where we are right now, reviewing the reports and seeking approval.

Then there's congressional authorization, we hope, for construction, and finally project implementation. After you build it, you're going to operate it, whether it's a flood control project or water conservation project, whatever, you have to use it.

Now, your local community, working with Riverside County and your Congressional Delegation, formally Mr. McCandles and now Mr. Ken Calvert, had provided the Core with congressional authority to conduct

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this study in the Water Resources Development Act of 1990.

Now, this chart shows the study area as part of the Santa Ana River graded area. Most of you are familiar with this area.

How many of you have lived here all of your lives? Anybody lived here all your life? How many of you have lived here at least ten years? So you know more about this area than I do.

The study area is located in the City of Norco, along the south bank of the Santa Ana River. And some of the things I am saying, you know already, but for the court record, we want to get them into our report. The purpose of this study is to investigate the feasibility of the bluff stabilization through an evaluation of the costs, the benefits, the environmental impacts, local concerns and preferences, current policies, and then budgetary priorities related to solving the bluff erosion problem.

The bluffs in the study area are subject to retreat caused by lateral migration of the river and subsequent erosion of the bluff toe. It's a very short description of this problem. The undercutting of the toe causes destabilization of the bluff face. The retreat of the bluffs threatens public and private property, as well as utilities located along the top of the bluff.

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We looked at groins, similar to a low levee with fill and rock to deflect the flow of the river. As it comes down, it is deflected away from the toe. This was also technically and economically infeasible; too expensive.

We looked at semi-permeable barriers, or jetties, which are devices that are designed to train the river; to get the river to learn to move away from the bluffs. And this was also costly and economically infeasible due to the hydraulic characteristics and the geography.

We looked at riprap, stone or toe nested along the toe. And this was also technically and economically infeasible.

We looked at a nonstructure plan, which would involve relocating all the homes in the threatened area. A lot of people thought this was a great idea, except the people in the homes. This was really very expensive as well. And, of course, not locally acceptable.

And then there was a no-action alternative. This resulted in the continuation of the bluff's instability, including continued erosion and damage to the homes, roadways, and utilities along the bluff. This no-action alternative was indeed carried forward for

Page 19

further analysis.

We looked at a locally preferred plan. Such a plan was identified by the local sponsor, the Flood Control District, as a combination of toe protection and slope stabilization.

We also looked at a channelization plan, which was unfortunately economically and technically -- or rather environmentally infeasible.

We looked -- the final array of alternatives consisted of the following: soil cement toe protection, no action, and then a combination of slope stabilization and toe protection. Those were the three winners. As part of our economic evaluation of these alternatives, we considered a number of potential benefits, which would result in stabilizing the bluffs.

The slide on the screen describes the benefit categories, which we identified and analyzed. And these categories -- just review them very quickly -- damages prevented to structures and land; avoidance of the necessity of monitoring the river and the safety costs; elimination of emergency requirements; extension of the road life; prevention of relocation and demolition costs. These were all the benefits to solving the problem.

We also needed to address the impact of any project on environmental issues, such as threatened and

Page 20

endangered species, and local wetland, and riparian habitat. Riparian means that which grows and lives along the river.

I'm pleased to inform you that as a result of the intensive study effort, we have identified a solution, which is technically feasible, economically justified, and for which we can effectively mitigate any environmental impacts. This is what we called the "NED" or "National Economic Development Plan." We called it "NED" because it maximizes the net benefits to the nation.

In addition, Riverside County has recommended a locally preferred plan, which would provide an even higher level of protection.

But first of all, let's discuss the NED plan. The NED plan would involve the placement of fill material to a level just above the 25-year floodplain, for a length of approximately one mile, starting just above the Interstate 15 bridge to an area roughly below Center Avenue. So this is the fill.

The outer edge of Riverside would be protected by about eight feet of soil cement. Soil cement, as I mentioned earlier, is a mixture of soil, water, and cement. This mixture dries to a concrete-like hardness.

The local sponsor to the Riverside County

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Flood Control and Water Conservation District has recommended a plan which would augment this toe with fill at the top of the bluff along the same area. And this shows their plan with the fill.

Now, next I will show what the area looks like now, and what it would look like with the national economic toe protection in place; how we think it would look with a computer graphic. And then let's look at it with the locally preferred option. It's very much the same. You notice the fill is the principal difference.

Now, as a part of our analysis, we looked at a variety of levels of protection. This slide provides a display of all the annual costs and benefits associated with both plans. We figure out how much it will cost, and then annualize those costs over the life of the project, which is a hundred-year life, fifty years.

The Corps NED plan of the 25-year protection is the one which maximizes the net benefits as determined in our economic analysis. So if you look at the net benefits here, you'll see that a hundred and 23 million is the biggest of all of those levels.

The cost of construction for each of the alternatives is displayed on this slide. This is jus the base construction cost for each of the levels that we looked at. First we have the toe protection alternatives.

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retreat, which has been documented to increase significantly from storm flows. The particular area in question is highly susceptible to bluff retreat during flood flows, regardless of how the rest of the bluffs are able to withstand attack.

There was comment made in the report about human intervention being a factor here. And we would point out that human intervention has occurred within the subject area. And it has done little to stop the retreat of the bluffs, again, which is documented to increase significantly during high flood flows.

There are also going to be significant environmental impacts that will occur unless protection measures are taken to stabilize the slopes; among those being biologically due to significant sedimentation, decrease in sedimentation. Topographical changes, as a result of the slope destabilization, geological changes, affect some public utilities and services. And, of course, transportation, with the probable effect of the loss of River Drive, the effect of further erosion resulting from flooding due to -- which would result in the loss of housing and population in the area.

To summarize, the City urges the Corps of Engineers to reevaluate their role in the Bluff Stabilization Project; that we believe the problem to be a

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flood control problem, and not just an erosion problem.

Regardless of action taken on that reconsideration, we welcome the opportunity to work with the Corps in seeking appropriate authority from the Congress. And we look forward to working with you on that.

COLONEL ROBINSON: Thank you for your very well-spoken comments.

Are there any other representatives from the City who would like to speak at this time? Okay.

The first card, then, I would like to call upon Leannah Bradley, please. Leannah, would you like to make a comment?

MR. BURTON: As I understand, you're an aide to Senator Boxer's office?

MS. BRADLEY: I am. My name is Leannah Bradley. And I'm from Senator Boxer's office. I'm here to hear what you have to say and what all of these people have to say.

COLONEL ROBINSON: Welcome. Please give my regards to Senator Boxer. I remember fondly when I presented her with our district logo pin, and I have enjoyed working with her and her staff in Washington and locally. Welcome.

MS. BRADLEY: Thank you.

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COLONEL ROBINSON: You know I meant to mention Carolyn Morse earlier. Carolyn, where are you? Carolyn is with the Corona/Norco Independent. So the 5th of State is here tonight.

Did you wish to make any comments, or did you have any questions?

MS. MORSE: No, I don't at this point.

COLONEL ROBINSON: We would be glad to talk to you later in the evening. Always glad to have the media here.

MS. MORSE: Thank you.

COLONEL ROBINSON: We have a speaker here, Melodie Lyon.

MS. LYON: Excuse me. I don't know if this is rude, but I would just as soon not have my back --

COLONEL ROBINSON: That's fine.

MS. LYON: Okay. I think I represent some of my neighbors here also, because -- well, first of all, I want to thank two people: Colonel Robinson is one. I think he helped share with me the concept tonight that maybe our City of Norco is not at war against the army. And we both are trying to protect our own country, and just our Norco part of that country.

And I also want to thank Steve Stump for being here. I have talked with him a few weeks ago on the telephone about some concerns I had with my particular

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home, because very frankly, I think my home is maybe one of the most endangered homes of bluff erosion. And it is in what we called Zone 2, as I understand it.

And for those of you, my neighbors that I don't know personally, there is a roadblock on River Drive in between Valley View and Corona. My house is right at that roadblock. And if you recognize it, you know when you ride your horses through, you're going to have to go in from a two-way street into a one-way street before you can go over that blockade.

The problems that I've run into is that I'm the only house on River Drive with a one-lane street in front of it. Now, why is there a one-lane street? Because the road has been eroded, and there is not a two-way street in front of my house anymore. 16 years ago, 17 years ago, when I bought that home, there was a two-way street there.

Anyway, now I have a singular lane that is very hard to go back out of the driveway without going into a chain link fence. Has that caused any problems? I would say it certainly has.

About two years ago I was in a very serious horse accident. I was in the hospital for about two and a half months after being in a coma for six weeks. So when I came home, it was my thought, then, what I need to do

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you couldn't believe it unless you saw it.

That river is amazing. I understand from the research I've done, that it's the wildest river west of the Mississippi. We're up against it where we are because it changes course. And it likes to change course into the bluff between Corona Avenue and up through the I-15. It's its favorite path to jog off to.

I watched in 1980 as more of my neighbors lost land. The Warner home, which was torn down in 1980 or '81, I had previously carried a petition requesting they sign it for relief for our section of the bluff.

The people living there at that time laughed at me, because they felt there was no danger from that river that they were enjoying so much that day. It wasn't that many years longer when their home was lost due to the river, not erosion.

I have talked for many years. I've become very emotional at times. Like Melodie, I am now a single homeowner because my husband passed away. I can't sell my home. I knew that before my husband passed away because we tried. We had a buyer. The house was sold. We were within two weeks of moving. And we were informed that the lender would not lend on the property due to the bluff erosion problem, which is indeed a flood problem.

I know, myself, I don't worry about the

Page 35

erosion. But I do worry every winter. When we get storms coming in, it's terrifying. More than once, it looked like we were going to be hit again in the bluff. The river had moved in. Fortunately oncoming storms didn't hit, and our property survived.

I have read a good share of the book that was sent me. And my first reaction when I received it and I looked at it was like, "Wow, they're going to do something. We're on the move." Then I read and I saw where it was rejected due to the fact that they felt it was due to an erosion problem. It blew my mind away, because I just can't imagine how you can persist when history shows it's the river.

We're looking at protection. Myself, I like the locally preferred plan. In fact, I think it's a necessary plan, because over the years I've heard people in different offices that I have spoke to refer to the fact that we have a hundred-year flood coming. And that's going to be pretty devastating for our area.

I hope that is what will eventually take place, because I feel that probably anything less than that will fall short of doing the job it's intended to do. And it will be a waste of the taxpayer money.

I understand right now our only alternative as residents of this street is to write our congressmen,

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talk to our elected officials. And I'm going to ask you to do all you can to bring about a solution to this bluff, because it's totally unfair when -- it would be one thing if when you moved into a home you knew the problem existed. But I wasn't told that the river flooded. I wasn't told that they have been doing studies -- probably before then -- but at least since 1938 on that river and the problem that was there.

I bought in good faith, and I've been really let down by, I feel, government all of the way around. And you can't say it's for lack of trying. Because I have tried since 1971 to get somebody to do something about our bluffs.

Thank you.

COLONEL ROBINSON: Thank you, Janice. Thank you for sharing your comments with us tonight.

Next, I would like to call on Mr. Don Ensley.

MR. ENSLEY: My name is Don Ensley. I live at 94 River Drive; that is in Zone 2. Speaking of Bosnia, there's two points I would like to make. First I would like to thank the Corps and the people from the County that have come to our rescue. It's a lot of people, a lot of horsepower on white horses.

First thing, just to reiterate what a couple

Page 37

of people have already said. We bought our home about 30 years now. We came in '66. I have seen that the erosion is real. It's an insidious thing, and it's moving back slowly. It's probably moved two feet since I've been there in the 30-year period. At that rate, in a hundred years, that will be a significant problem.

I have also seen the river come through. And you can count in minutes, the way the bluff recedes, when the river is up. So it's ludicrous to say that the problem is erosion and not flood control. It's a water problem, not an erosion problem.

The other part I would like to make -- if you have looked at the river upstream, they have channelized it in a lot of places to cause it to control the river. If you look down the stream in Orange County, they have completely -- they use it as a settling basin. They put the tractors down in there. There's one place that's a parking lot. The only place that there's an environmental concern, it seems to be in our area. Above and below it, it doesn't seem to be a problem.

The City of Norco tried to just keep the river in its current location by sandbagging that area and the City was fined for that. I don't see why we can't, in some method, cause the river to be controlled. If you look at the recreational potential down there, it's

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And Mary Cuervo?

MS. CUERVO: I put "maybe," because I'm not quite sure.

I'm Mary Cuervo, and I live at 982 River Drive. And two years ago I called the Army Corps of Engineers on an emergency basis, because the City was out with pickaxes to drain the road, and we were told the City was told they shouldn't do that. And they were doing it again. And I took Geology 101, and I know better than to be taking a pickaxe to the top of the bluff.

And a man came out and said, "Oh, no. Here comes another one." And they stopped for a second. So I just didn't think that was too good of a practice to drain the road.

COLONEL ROBINSON: I'll talk to the City about that.

MS. CUERVO: Thank you.

COLONEL ROBINSON: We'll talk about that.

Mike and Chris Clothier?

MR. CLOTHIER: I think most of my questions were answered.

COLONEL ROBINSON: Pam Ensley.

MS. ENSLEY: I'm Pam Ensley, 984 River Drive in Norco.

I just wanted to ask if there is any

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recourse for the current recommendation for the Army Corps of Engineers. They indicate that they are -- they don't support -- or that the statutory authority doesn't support a recommendation because it's erosion.

Would you comment on that?

COLONEL ROBINSON: I certainly will. Thank you very much, Pam.

The reason Mr. Joe tries to slide in quietly is so that I might not notice he's here, and I wouldn't pass the really tough questions to him.

But see, you've been discovered, Robert. I'm going to ask the Chief of Planning to address that issue, because I know it's on the minds of many of you.

MR. JOE: Your boss calls, you come up to speak. We have a certain mission. That mission is to provide flood control. Now, in this case we do do some stream-bank protection. But our limit for stream-bank protection is $500,000.

This project still recognizes -- the review process back in Washington, and et al., recognizes that stream-bank protection is still an erosion problem. So they have categorized that the stream-bank protection project, with the Corps' authority, is up to $500,000. Therefore, we have no authority to recommend it to Congress because Congress never gave us the authority to

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go at a larger amount and to recommend stream-bank protection beyond the 500,000.

But what had happened, and I -- sure there's nothing right now that we could do, but the County was very successful in asking the Corps to do this study. And it's called the Feasibility Study. If that didn't take place, we wouldn't even be here today. And I think what we have done is at least recommend it from the standpoint -- from an engineering standpoint that it is engineeringly sound and environmentally qualified.

And hopefully, with the economics -- even though we don't meet the requirements, the economics are there. That goes to Congress, that report, because since Congress asked us to present and do the study, we're now required to report to Congress for their information, with that recommendation.

But the conclusions are pretty sound. So you got -- as you use the term "kiss your sister," something like that, you have at least something solid from the standpoint of conclusions, but our federal recommendation at this time cannot recommend it to Congress as a federal project. We just don't have the authority to do that.

In the meantime, the County can -- and I know they have been working on the most recent water

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resources bill that, hopefully, might be passed this year with some planning in there, saying that if this project is approved, they should be authorized by Congress.

Now, if that makes it, and the bill is passed, then when the report comes up, it will be recommended as an authorization. So it's a two-, three-prong effort that I'm trying to explain here. And I don't think it's hopeless. But from our standpoint and the administrative standpoint, we have certain rules and regulations.

But what the locals are doing is working very closely with Congress, and it could happen. We have the first process; that is, we're here doing the study. And I think that's very important.

UNIDENTIFIED SPEAKER: Has that been assigned a name and number?

COLONEL ROBINSON: The question is, does that report have a name or a number, the bill in Congress? And that's the Water Resources Development Act of 1996.

MR. JOE: Right. And that bill right now is in the sub-committee. And it could go to the floor within a month, or two months, or whatever.

COLONEL ROBINSON: Okay. Good. Thank you, Robert.

Mr. Tavaglione.

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studies?

COLONEL ROBINSON: The question is by Anita Saunders. How long will it take? The time required to actually construct the project, I guess, would be a year and a half or so.

MR. BURTON: Actually, we're planning -- if it's a total project, probably construction is only six months. If it's a locally preferred plan, I don't know, maybe 9 or 12 or 15 months depending on weather conditions and the rains and whatnot. But the longest situation would be, of course, the locally preferred. Best scenario, should be able to do it in 9 or 12 months.

COLONEL ROBINSON: So let's just look ahead a little bit, crystal ball it so to speak. Let's assume that Water Resource Development Act of '96 called for such a project, then they could -- the administration could then include it in the '98 budget, the '97 budget. Or could it be included in the '97 budget?

MR. KOZIEL: No. We have money in the budget on the administration side for design, but not construction, because we need to get the project authorized by Congress before we could recommend any funds on the project.

COLONEL ROBINSON: So that could happen in '98, and as Bill said, it could take around a year or less to build it. We could do this in 1998. Of course that,

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again, requires legislative action.

Any other comments or questions?

UNIDENTIFIED SPEAKER: You had 10 years, 25 years 50 years, and so forth on project time. Could you address the significance of that? You said the 25 years was the most economically feasible. Are you saying that we are only protected for 25 years?

COLONEL ROBINSON: No. That's the level of protection. That would provide protection against what we call the 25-year event, if I'm not mistaken. In other words, an event that has a likelihood of occurring four out of a hundred, or one out of twenty-five years. That's what the 25-year level implies.

UNIDENTIFIED SPEAKER: So statistically, a 50-year period, that would not be sufficient protection?

COLONEL ROBINSON: A 50-year event, that would not protect you against that; that is correct.

MS. BOYER: I would like to know --

COLONEL ROBINSON: Just for the record, your name, please.

MS. BOYER: Janice Boyer.

I was wondering, at the beginning of this study you had predicted, or had an idea, of how things were going to be going about as a result of the study. Are we basically where you thought we would

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be? Has this been completed, needing approval from Congress, or --

COLONEL ROBINSON: Yes. This is exactly how the process works. There is a subjective issue. We have discussed this issue of whether it is actually flood protection or erosion protection. And we have had help in answering that particular issue. So there was always some question about that. But we're really right where we thought we would be. And we're ahead of the game by a number of months.

So there is a possibility that Congress, at least, has the option now of acting. Normally this report would not have been out in time for this to be included in the Water Resource Development Act of 1996. We don't know that it will even be so. But at least there's the possibility, and it depends on Congress now.

UNIDENTIFIED SPEAKER: As a homeowner, what can we do to help facilitate the passing?

COLONEL ROBINSON: You can do what you've been doing by using the legislative process and the representatives of the city and the county and the state and the federal level to represent you and to voice your concerns. You have been doing that well.

Other questions or comments? I think we're getting towards the end.

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MS. LYON: Melodie Lyon. And I'm a homeowner. And I'm a little bit confused as far as the project is concerned. Is it going to do anything about the property in front of our house separate from the erosion or river problems?

COLONEL ROBINSON: Conceptually, the project, as we have reported on it, would be to prevent further erosion. It would not restore erosion to date.

MS. LYON: So the road in front of my house may never be a two-way road. It may just stay a one-lane street?

COLONEL ROBINSON: Well, that's conceivable. Of course, if we succeed in stopping the erosion, then it gives you some options about what you can do with that road. Two lanes can become one lane, which become shortly no lane. So you know, it's good news, but not maybe great news. Now you can move it over a little bit if we can stop the erosion.

Other questions?

UNIDENTIFIED SPEAKER: Mr. Joe indicated there was some money that was set aside for the design of the project.

At this point will we be moving ahead further with design?

COLONEL ROBINSON: I'll refer to Bob who's the

Appendix G. Finalizing Addendum

WRITTEN COMMENTS

1. State Office of Planning & Research - Antero A. Rivasplata, Chief, State Clearinghouse.

2. Riverside County Flood Control and Water Conservation District - Stephen E. Stump, Federal Projects Coordinator, Senior Civil Engineer.

3. City of Norco - William T. Vaughan, Mayor.

4. United States Environmental Protection Agency, Region IX - David Farrel, Chief, Federal Activities Office.

5. Janice L. Boyer, Norco resident.

6. United States Department of the Interior - Patricia Sanderson Port, Regional Environmental Officer

7. Concerned citizens of the City of Norco, including:

   - Melodie Lyon
   - Janice Boyer
   - Leif & Anita Ohrborg
   - Tamara Gray
   - Lenore Thompson
   - Larry G. Wench
   - Joanne Tennant
   - Esther B. Glass
   - William Hall
   - Adam Woods
   - Bart E. Oulin
   - Mauren Campbell
   - Andrea Foster
   - Elizabeth Dretsch
   - Brenda Crump

PUBLIC HEARING COMMENTS - PROCEEDINGS, 7//18/96

1. Gerald Johnson, Norco City Manager
2. *Leannah Bradley, Aide to Senator Barbara Boxer
3. Melodie Lyon, Norco resident - Zone 2
4. *Curtis Frizzell
5. Janice Boyer, Norco resident
6. Don Ensley, Norco resident - Zone 2
7. Patrick Quaney, retaining wall manufacturer
8. Tom Ameduri, Norco resident - Zone 4
9. *Elmer Fish
10. *Robert Cuervo
11. *Mary Cuervo
12. *Mike & Chris Clothier
13. Pam Ensley, Norco resident
14. *Anita Saunders
15. Joe Schenk, Norco Public Works Director

* Indicates person(s) did not speak at the hearing

WRITTEN COMMENTS

Written comments from: Antero A. Rivasplata
Chief, State Clearinghouse
State of California
Governor's Office of Planning and Research

"The State Clearinghouse submitted the environmental document to selected state agencies for review. The review period is closed and none of the state agencies have comments. This letter acknowledges that you have complied with the State Clearninghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act."

Response: Comments from the State Clearinghouse have been acknowledged; no response required.

Written comments from: Stephen Stump
Federal Projects Coordinator
Riverside County Flood Control and Water Conservation District

Main Report, Page 39, Biological Impacts - Threatened and Endangered Species Impacts

"The mitigation measures outlined as "in addition to removal of Arundo" should be removed. This discussion offers measures (revegetation of 15.9 hectares) that exceed the mitigation outlined in the EIR/EIS."

Response: The main report has been modified. No revegetation is part of the project. Arundo removal with monitoring to prevent regrowth is proposed.

Main Report, Page 39 - 40, Recreational Resources

"Safety concerns are noted. On Page 40, the text "the local sponsor" should be changed to "a recreation local sponsor" since recreation is outside of the District's legal authority."

Response: This change has been made on the main report.

Main Report, Section G-Plan Selection

"It is our opinion that the only final alternatives that should be selected for detailed analysis should be those which provide for slope stabilization. We believe that the toe protection only plan is deficient in as much as it would allow the continued presence of nearly-vertical bluffs which would pose an ongoing safety risk to facility maintenance workers and to the general public. It is apparent that the geotechnical review in the study shares this view in that the report recommends trimming the cliff face to a stable slope (Geotechnical Section 11.2) and that a stable slope for the bluff materials is 1.5H on 1V or flatter (Section 9.4). Since trimming all the way back to a stable slope is not feasible (where there are street improvements at the top), a buttress fill is necessary to provide a bluff slope that is stable and that would not pose a safety problem."

Response: Undercutting of the toe of the bluffs is the initiating factor which leads to instability of the bluffs and subsequent slabbing and soil falls. The toe protection's only alternative would substantially reduce the average rate of erosion and falling materials during the life of the project. Under this alternative, material would continue to erode and fall from the bluffs, but at a reduced rate until a stable slope is obtained. We concur with your statement that the Locally Preferred Project Plan Alternative has a lower level of safety concerns than the NED plan. Fencing and an offset of the toe protection in those areas of near vertical bluffs were part of the effort to minimize safety concerns in the NED plan. The NED plan selection process is based upon maximum net economic benefit calculations for different levels of protection for technically and environmentally acceptable plans. This NED plan, while reducing further damages over the "No Action" alternative, stillcreates the potential for residual damages and other concerns, such as a greater safety risk than the Locally Preferred Project Plan alternative.

EIS/EIR - Description of Alternatives

"The environmental documentation should address operation and maintenance of the facility. We are concerned that there may be Clean Water Action Section 404 issues associated with some of the standard maintenance provisions that the COE OMRR&R manuals require. Specifically, the "Basis for Recommending Repairs" section of the "generic" OMRR&R manual requires that earth channel bottoms design line and grade be maintained. If this type of work is regulated by Section 404, addressing maintenance in the environmental document will assist in getting the permit issued for maintenance of the facility."

Response: Because of the sensitivity of the habitat below the toe protection structure, it is not anticipated that any regular maintenance will be required. In the event that repair of the structure may be required in the future, the Corps of Engineers will assist the District in obtaining 404 permits. It should also be noted that consultation with the Fish and Wildlife Service would also be required due to the endangered species issues.

Written comments from: William T. Vaugh
Mayor
City of Norco

"The City concurs with the conclusions of the DEIS/EIR and the recommended mitigations for all of the identified impacts associated with the two alternatives that were evaluated in addition to the "No Action" alternative.

Response: No adequacy issues of the EIS/EIR were raised; therefore no response is required.

Written comments from: David Farrel
Chief, Federal Activities Office
United State Environmental Protection Agency

"The DEIS/R (p. 2-5) states that Arundo (an invasive exotic species) will be chemically treated with Rodeo, both initially and for subsequent regrowth. The application of Rodeo would be under "supervision of a licensed applicator." However, there was no discussion in the DEIS/R concerning potential impacts associated with using Rodeo or other herbicides in connection with the proposed project.

For example, the DEIS/R did not discuss potential impacts to fish and wildlife from using this herbicide, nor did it discuss impacts to fish and wildlife should improper application or an herbicide spill occur. We are particularly concerned that the DEIS/R did not discuss potential impacts to Federally-listed species (e.g., least Bell's vireo) or the four native fish species mentioned in the DEIS.

We believe that the herbicide's potential effects on fish and wildlife is a direct effect under the NEPA regulations. Because the EIS/R is a public enclosure document under NEPA, we recommend that the FEIS/R discuss in greater detail potential impacts associated with use of the herbicide on fish and wildlife resources. The FEIS/R discus in greater detail potential impacts associated with use of the herbicide on fish and wildlife resources. The FEIS/R should discuss potential water quality impacts associated with use of the herbicide (see water quality comment im[illegible]ately below). A[illegible]onally, the FEIS/R and Record of Decision should reflect any herbicide-rel[illegible] mitigation meas[illegible] that the Army Corps and Riverside County Flood Control and Water Conservation District (RCFCWCD) intend to adopt.

Response: Sections 4.4 and 4.5 have been revised to further discuss the use of herbicides for Arundo control. It is envisioned that one or two applications of Rodeo in the late summer or early fall will be required with spot applications in subsequent years for any new vegetation growth. The Arundo areas of concern are generally out of the areas of ponded or flowing water and will be applied by a licensed applicator. No significant impact from this application is anticipated.

Page 2-7 indicates that a pollution prevention and control plan will be developed to reduce the potential for accidental spills during construction and ensure a quick response in cleaning up spills. We commend the Army Corps and the RCFCWCD for including such language in the document. However, in terms of the pollution prevention plan, the DEIS/R did not specifically address the possibility of an herbicide spill along or in the Santa Ana River (which could adversely affect native fish species and/or degrade water quality). We recommend that the pollution prevention plan include a provision for appropriate management and control of Rodeo and other herbicides which may be used during the life of the project.

Response: Additional language has been added to mitigation measures in Section 4.4 of the document that includes pesticides as a category that will be covered in the pollution prevention and control plan.

We note the discussion of pp. 3-8 and 3-9 of the DEIS/R regarding the Prado Basin's native ichthyofauna. Page 3-9 states that three native species (Santa Ana sucker, speckled dace, arroyo chub) may be in the study area's floodplain water and ephemeral pools. We consider it very important to ensure that native fish species are not adversely affected by the misapplication or accidental discharge of Rodeo or other herbicides that may be used in the project.

Response: Measures have been added for the protection of these species. Most of the herbicide application will be away from open and ponded water.

Additionally, we recommend that the FEIS/R discuss the applicability of water quality objectives for the Santa Ana River that are found in the applicable Basin Plan. For toxic substances, the Basin Plan's water quality objectives stipulate that:

1. toxic substances shall not be discharged at levels that will bioaccumulate in aquatic resources to levels that are harmful to human health;

2. The concentrations of contaminants in waters which are existing or potential sources of drinking water shall not occur at levels which are harmful to human health; and

3. The concentrations of toxic pollutants in the water column, sediments or biota shall not adversely affect beneficial uses.

The DEIS/R did not contain any reference to the above requirements, which U.S. EPA has approved under provisions of the Clean Water Act. The FEIS/R and Record of Decision should reflect appropriate commitments to protect water quality and beneficial uses as found in the Basin Plan.

Response: The implications of the proposed action relative to the Basin Plan has been discussed in Section 4.4. No significant impact is anticipated due to the use of the pesticide as described above.

Page 4-29 of the DEIS/R discusses air quality conformity requirements for the project area (a requirement under Section 176 of the Clean Air Act for Federally-sponsored projects). It notes that the applicable de minimus levels for the project are 10 tons per year (tpy) for reactive organic gases, 10 tpy for oxides of nitrogen, and 70 tpy for particulate matter less than 10 microns in diameter. Table 4-2 of the DEIS/R identifies the annual pollutant emissions that are projected to occur during the project's construction on tons per year. It appears that at lease five of the annual emissions reported in the "Total annual emission" line exceed the de minimus levels for the area.

Based upon a discussion between Alex Watt of the Army Corps and David Tomsovic of the U.S. EPA, the Army Corps believes that it may be necessary to undertake a conformity determination for the proposed project, which would encompass the total of direct and indirect emissions for any criteria pollutant specifically identified and accounted for in the applicable State Implementation Plan (the conformity determination needs to address co[illegible]ction-related emission). We recommend that the FEIS/R discuss whether the Army Corps inte[illegible] conduct a conformity determination for the proposed project. You may want to refer to an EPA document titled **GENERAL CONFORMITY GUIDANCE: QUESTIONS AND ANSWERS** (U.S. EPA, Office of Air Quality Planning & Standards, Research Triangle Park, N.C., July 13, 1994). If the army Corps intends to undertake a conformity determination, we suggest that this analysis be undertaken in conjunction with the 30-day comment review period for the FEIS/R. In this way, comments made on the FEIS/R and the conformity review (including the need for mitigation measures) could be addressed in the Norco Bluffs Record of Decision.

Response: The Main Report of feasibility study recommends that the No Action Alternative be implemented since the Corps of Engineers does not have jurisdiction to approve an erosion control project. Therefore, it is not clear that the project will be implemented unless Congressional action is implemented. The conformity issues may be postponed until a decision is made as to whether the project will be implemented.

The DEIS/R did not specifically recognize the Council on Environmental Quality (CEQ) memorandum (see January 29, 1993 Federal Register) on incorporating pollution prevention features in NEPA documents. CEQ encouraged Federal agencies to integrate pollution prevention features in their NEPA planning and decision-making. The FEIS/R and Record of Decision should reflect a commitment to implement feasible pollution prevention measures. For your reference I've enclosed a pollution prevention checklist for flood control projects developed by U.S. EPA headquarters. Although the Norco Bluffs project is not flood control per se, a number of items on the pollution prevention checklist may prove feasible for the Norco Bluffs project. Additionally, we note that several items on the checklist are already presented in the DEIS/R (such as provisions for a spill control plan). We encourage the Army Corps and the RCFCWD to review the checklist to ensure that reasonable pollution prevention features are an integral part of the project's design, construction and operation, in keeping with CEQ's 1993 memorandum.

Response: The Corps and the RCFCWCD have incorporated pollution prevention as a requirement of the study. These mitigation measures will be integrated into construction documents and monitored by the Corps.

To assure the public that appropriate monitoring occurs during construction, we recommend that the Army Corps include a statement similar to the following in the FEIS/R:

> "Monitoring by the Army Corps of Engineers or an environmental contractor approved by the Army Corps will be conducted throughout project construction to ensure that all activities strictly adhere to the project's erosion and sediment control and pollution prevention and control plans, and to ensure project compliance with all permit conditions and pollution prevention measures including those attached to Regional Water Quality Control Board's Water Quality Certification (Section 401) and the California Department of Fish and Game Streambed Alteration Agreement (Section 1601). onstruction monitoring plan will be developed prior to the start of construction to speci ly address the timing and frequency of construction monitoring and the procedure for communicating potential noncompliance issues to the Army Corps, the project sponsor(s) and the construction contractor(s)."

The Corp's Record of Decision should provide a commitment to undertake such monitoring.

Response: This language has been incorporated into mitigation measures in the Executive Summary and Section 2 of the document.

Editorial Comments

1. Table S-1, p. S-6. In the Land Use. Population and Housing section the following appears twice: "Mitigation - no impact required." We believe it should read "Mitigation - no mitigation required."

Response: The FEIS/FEIR has been modified to incorporate the comment and the statement in question now reads, "Mitigation - no mitigation required."

2. Table S-2, p. S-10. This page contains a statement that, under the Clean Air Act, "[t]he South Coast Air Quality Management District (SCAQMD) is the agency with jurisdiction to enforce the Clean Air Act in this area 'e recommend that the wording in the FEIS/R be modified to read "the South Coast Air Quality agement District (SCAQMD) has jurisdiction to enforce the Clean Air Act in this area; U.S. EPA also retains authority to enforce provisions of the Federal Clean Air Act for criteria air pollutants as well as hazardous air pollutants."

Response: The wording in the FEIS/FEIR has been modified to reflect the alteration to the statement resulting in the following: "the South Coast Air Quality Management District (SCAQMD) has jurisdiction to enforce the Clean Air Act in this area; U.S. EPA also retains authority to enforce provisions of the Federal Clean Air Act for criteria air pollutants as well as hazardous air pollutants."

3. Table S-2, p. S-10. Under the entry for the Resource Conservation and Recovery Act of 1976, it states that "[c]hemical and pesticide use will be in conformance with this law." Table S-2 should be amended to acknowledge the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), which regulates the use of herbicides. Additionally, the FEIS/R should recognize the applicability of State of California requirements concerning the use of herbicides.

Response: The FEIS/FEIR has been amended to acknowledge the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), which regulates the use of herbicides. In addition, the FEIS/FEIR has been modified to recognize the applicability of State of California requirements concerning the use of herbicides.

4. Table 1-1, p. 1-7. The table lists 16 different requirements for environmental documents prepared under NEPA and the California Environmental Quality Act (CEQA), indicating the applicable section of NEPA and CEQA where such requirements may be found. For "Growth Inducing Impacts," it indicates that it is "Not Applicable" (N/A) under NEPA, i.e., that NEPA has no section concerning growth inducing impacts.

I'd like to direct your attention to the discussion in 40 CFR 1508.8 on indirect effects which need to be addressed in EISs. In this section the CEQ states that "[i]ndirect effects may include growth inducting effects and other effects related to induced changes in the pattern of land use, population density or growth rate . . ." We believe it is incorrect for the DEIS/R to have stated that NEPA has no requirement on growth inducing effects. The entry on growth inducing effects should be amended to recognize 40 CFR 1508.8.

Response: The entry on growth inducing impacts has been amended to recognize 40 CFR 1508.8.

5. Page 2-5. This page states that Rodeo is "approved" by U.S. EPA for use in wetlands. We suggest that the word "approved" be replaced by "registered" since U.S. EPA does not approve pesticides or herbicides but instead "registers" them."

Response: The FEIS/FEIR has been modified to incorporate the comment and has replaced "approved" with the word "registered".

Written comments from: Janice Boyer
Homeowner

"I, of course, liked the Locally Preferred Plan and read with great interest and then I reached page 76, "C Recommendation -- I do not recommend implementation of a plan of bank stabilization for the Norco Bluffs area in Riverside County, California, because no statutory Corps authority exists. Michael R. Robinson, Colonel, Corps of Engineers, District Engineer." I attended a public hearing and heard there that the reason for this is that it is a bank erosion problem and not a flooding problem, I can't understand how that could be so since I saw the river take out several feet of bluff in front of my home and that of my neighbor overnight. I am told it is a matter of definition, since the river undercut the bank rather than overflowed it, either way the river and nothing else is what is responsible for the loss of bluff in front of my home.

As I read this document, I see great concern is given to plants and fish, not to mention the least Bell's vireo. I wonder what happened to these things during the 1969 flooding when everything was washed out and the river bottom was left barren. It would appear to me they must have survived or they wouldn't be there now. Too bad the same concern isn't given to the people who are living on River Drive.

. . . I personally had no reason to be concerned about the River since my home was located on the opposite side of a county street with bluff to spare and the bluff was not sheer. We had room to park our car on the other side of the street. Now the bluff edge is into that street. I am located in Zone 2 at the most effected area.

For over 25 years, I have faced winters wondering if this will be the one in which I lose my home to the river. My children are grown and have moved away, my husband has died, and I am unable to do anything but wait and watch. My home is unsellable land and street is getting narrower. My neighbor has been canceled by her home insurance and we all know how necessary that is.

PLEASE FIND A WAY TO FIX OUR BLUFF AND MAKE OUR HOMES SAFE ONCE AGAIN!"

Response: Thank you for your comments on the DEIS/DEIR for the Norco Bluff Stabilization Project. Your comments have been acknowledged in the consideration of the project. However, no adequacy issues in regards to the EIS/EIR were discussed and therefore no response is required.

Written comments from: Patricia Sanderson Port
Regional Environmental Officer
United States Department of the Interior

"The Department of the Interior has reviewed the Draft Environmental Impact Statement (DEIS/DEIR) for the Streambank Stabilization for Norco Bluffs, Riverside County, California, and has no comments to offer."

Response: No adequacy issues were raised in regards to the EIS/EIR for the Norco Bluffs Stabilization Project; therefore, no response is required.

Written comments from the following group of concerned citizens:
Melodie Lyon, Tamara Gray, Joanne Tennant, Janice Boyer, Lenore Thompson, Esther Glass, Larry G. Wench, Leif and Anita Ohrborg, William Hall, Adam Woods, Bart E. Dulin, Maureen Campbell, Brenda Crump, Andrea Foster, and Elizabeth Dretsch

"With the continued erosion predictions we are aware that the gas, water, and sewer lines in the street in front of our homes are in jeopardy. One of our homes only has a one lane street in front of the home, and a sheer drop on the Bluff side of the street. We have also experienced the loss of the ability to sell our homes due to the Bluff erosion problems. Lenders have disapproved loans, insurance companies have canceled homeowners insurance, and people have been afraid to buy in our area because of continued erosion dangers.

Environmental dumping to help support damaged, and bluff areas of severe erosion continuation, have been canceled. The river has been channeled toward our homes for continued recreational purposes. And the responsibility for our urgent need for assistance has been passed along to another party for over 16 years now.

We, the undersigned, request immediate, severely needed, assistance. Would someone who does have an interest in our calamitous misfortune please advise us who we can really rely on? An who, when, and how can we ever depend on genuine help and assistance from???"

Response: Thank you for your comments regarding the Norco Bluffs Stabilization Project. Your concerns are shared by many and the problems have been acknowledged. The proposed project has been designed to address these concerns, and if approved, will ideally resolve the current and projected dilemmas. However, no comments were presented regarding adequacy of the EIS/EIR; therefore, no response required.

ORAL COMMENTS RECEIVED AT PUBLIC HEARING

Comment from: Jerry Johnson
City Manager for the City of Norco

"One, we're kind of in this odd position where we concur with the conclusions reached with the Draft Environmental Impact Statement, and Environmental Report, and the recommended mitigation for all the identified impacts associated with the two alternatives.

However, we don't concur with the conclusion that the Army Corps -- regarding the Army Corps' involvement in the project. We would hope that there would be some reconsideration of that. And the reason I say that is, it appears as though that conclusion came from the fact that this was not a flood control project, but a soil erosion project. And we would take exception to that in that, historically, the soil of the erosion the bank destabilization, has occurred during flooding events.

Quoting from the study, "In 1969 flood flows in the Santa Ana River actively undercut more than 75 percent of the bluff length, with approximately 25 percent of the bluff length severely affected. Severe damages, again, occurred in 1980, primarily along River Drive, and behind homes along the north side of Alhambra Street as a result of flood impacts."

We would also point out that in making this argument, that both alternatives, toe protection and toe and slope protection, would stop progression of the bluff retreat, which has been documented to increase significantly from stormflows. The particular area in question is highly susceptible to bluff retreat during flood flows, regardless of how the rest of the bluffs are able to withstand attack.

There was comment made in the report about human intervention being a factor here. And we would point out that human intervention has occurred within the subject area. And it has done little to stop the retreat of the bluffs, again, which is documented to increase significantly during high flood flows.

There are also going to be significant environmental impacts that will occur unless protection measures are taken to stabilize the slopes; among those being biologically due to sedimentation, decrease in sedimentation. Topographic changes, as a result of the slope destabilization, geological changes, affect some public utilities and services. And, of course, transportation, with the probable effect of the loss of River Drive, the effect of further erosion resulting from flooding due to -- which would result in the loss of housing and population in the area.

To summarize, the City urges the Corps of Engineers to reevaluate their role in the Bluff Stabilization Project; that we believe the problem to be a flood control problem, and not just an erosion problem.

Response: Thank you for your comments regarding the Norco Bluffs Stabilization Plan. Mr. Joe addressed the comment at the public hearing and stated that the review process in Washington recognizes streambank protection is an erosion problem and the Corps does not have authority to recommend to Congress a streambank protection above $500,000. However, the Corps has recommended the project from an engineering standpoint following the feasibility study. Certain rules and regulations preclude the Corps from recommending the project to Congress, however, locals are working with Congress closely, which could get the project passed if it is approved. Conclusively, the project is not hopeless with the current recommendation from the Corps. No comments regarding the adequacy of the EIS/EIR were discussed; therefore, no further response is required.

Comment from: Melodie Lyon
Homeowner

I think my home is maybe one of the most endangered homes of bluff erosion. And it is in what we called Zone 2, as I understand it.

And for those of you, my neighbors that I don't know personally, there is a roadblock on River Drive in between Valley View and Corona. My house is right at that roadblock. And if you recognize it, you know when you ride your horses through, you're going to have to go in from a two-way street into a one-way street before you can go over that blockade.

The problems that I've run into is that I'm the only house on River Drive with a one-lane street in front of it. Now, why is there a one-lane street? Because the road has been eroded, and there is not a two-way street in front of my house anymore. 16 years ago, 17 years ago, when I bought that home, there was a two-way street there.

Anyway, now I have a singular lane that is very hard to go back out of the driveway without going into a chain link fence. Has that caused any problems? I would say it certainly has.

About two years ago, I was in a very serious horse accident. I was in the hospital for about two and a half months after being in a coma for six weeks. So when I came home, it was my thought, then, what I need to do just for my daughter's and my survival is sell my home, and I could use that income for the next year while I was rehabilitating. .

I tried to sell my home. And there was a problem. I had interested people that liked the house. They would back out of my driveway into that fence, and then they would come back and say, "Wait a minute. How come you only have a one-lane street in front of your house? And what are they doing about it?"

And I could not give them an answer. They would say, "How long has it been like that?" Nobody wanted to hear it, "16 years." So any potential buyers for my home backed off. They said, "No. If you can tell us that your road is going to be improved and that erosion is not going to be a concern for our children, then we would be very interested in your home."

That doesn't leave me with too many options. Then about 30 day ago -- I think I mentioned this to Steve -- my insurance was canceled, and so was my neighbor's, who lives about four houses down from me. Her insurance was canceled. Now why? For two reasons they gave: One was potential fire hazards from the river. But that wasn't the real one. The other one was erosion problems. After the earthquake, now insurance companies are looking at other potential hazards, and they do not want to insure those properties anymore. So I have had a devil of a time trying to find an insurance company to insure my home.

So if I don't have insurance, can I sell my home? No. I would just say that after my concern -- and then I did have a concern, too, because right down towards Corona, we had at least been having environmental dumping going on. Now, I understand from Steve, some neighbors called and complained about dust. Well, I think that is a resolvable problem.

But my bigger concern was about thee blocks down the street, towards Center Street, now we have all kinds of dumping going on. And it wasn't an area as big of a concern as the Zone 2 area was. So I question, who is that really helping? It appears to be only helping the homeowner who is extending his property. Not a serious bluff problem. But they had signs up on our street that said, "No dumping."

So now my concern is -- and I will ask this too of you, Colonel Robinson, I understand you did a very nice job of displaying some of the possible resolutions. And you had a nice photograph of -- if the resolutions were in place -- what the river would look like. But what I didn't see is what does the upper level look like? Will our roads be repaired? Will our property in front of our house be extended, or do I have to wait 25 years to expect anything more than I have already waited 16 years for?

That's my questions. Thank you.

ANSWER: The locally preferred option does provide some fill, but I'm not sure that the extent of that fill would actually replace that -- all of the erosion that has taken place to date.

The design, as it is now, does not include specifics in terms of individuals lots, of pieces of the roads, and whatnot. As reading into the detail plan and specification, this is something that we would work with Riverside County and local authorities here. But as it stands now, we have only addressed the fill. The top and specific details all long the house and roads is not addressed.

Response: Thank you for your comments regarding the Norco Bluffs Stabilization Plan. Your concern is well justified and was addressed to some extent at the hearing by Colonel Robinson and Mr. Burton. However, no discussion of the adequacy of the EIS/EIR was observed and therefore no further response is required.

Comment from: Janice Boyer
Homeowner

I bought my home on River Drive in 1964, and I have to agree with Jerry Johnson when he says that this is not simply an erosion problem. I watched as the river took away huge sections of our home. Melodie's home -- which she refers to as a half a lane now -- the people living there at the time parked a semitruck with trailer across the street, and -- not in the street, across the street -- we had two-way traffic at the time. That went just -- I mean, you couldn't believe it unless you saw it.

The river is amazing. In understand from the research I've done, that it's the wildest river west of the Mississippi. We're up against it where we are because it changes course. And it likes to change course into the bluff between Corona Avenue and up through the I-15. It's its favorite path to jog off to.

I watched in 1980 as more of my neighbors lost land. The Warner home, which was torn down in 1980 or '81, I had previously carried a petition requesting they sign it for relief for our section of the bluff.

The people living there at that time laughed at me, because the felt there was no danger from that river that they were enjoying so much that day. It wasn't that many years longer when their home was lost due to the river, not erosion.

I have talked for many ears. I've become very emotional at times. Like Melodie, I am now a single homeowner because my husband passed away. I can't sell my home. I knew that before my husband passed away because we tried. We had a buyer. The house was sold. We were within two weeks of moving. And we were informed that the lender would not lend on the property due to the bluff erosion problem, which is indeed a flood problem.

I know, myself, I don't worry about the erosion. But I do worry every winter. When we get storms coming in, it's terrifying. More than once, it looked like we were going to be hit again in the bluff. The river had moved in. Fortunately oncoming storms didn't hit, and our property survived.

I have read a good share of the book that was sent me. And my first reaction when I received it and I looked at it was like "Wow, they're going to do something. We're on the move" Then I read and saw where it was rejected due to the fact that they felt it was due to an erosion problem. It blew my mind away, because I just can't imagine how you can persist when history shows it's the river.

We're looking at protection. Myself, I like the locally preferred plan. In fact, I think it's a necessary plan, because over the years I've head people in different offices that I have spoke to refer to the fact that we have a hundred-year flood coming. And that's going to be pretty devastating for our area.

I hope that is what will eventually take place, because I feel that probably anything less than that will fall short of doing the job it's intended to do. And it will be a waste of the taxpayer money.

I understand right now our only alternative as residents of this street is to write our congressmen, talk to our elected official, and I'm going to ask you to do all you can to bring about a solution to this bluff, because it's totally unfair when -- it would be one thing if when you moved into a home you know the problem existed. But I wasn't told that the river flooded. I wasn't told that they have been doing studies -- probably before the -- but at least since 1938 on that river and the problem that was there.

I bought in good faith, and I've been really let down, by, I feel, government all the way around. And you can't say it's for lack of trying. Because I have tried since 1971 to get somebody to do something about our bluffs.

Response: Thank you for your comments regarding the Norco Bluffs Stabilization Plan. The problem you have experienced in attempting to sell your home is shared by many residents of River Drive. The proposed project is an effort by several government agencies, local, state, and federal to attempt to resolve the problems and address the concerns of citizens. If approved, the result will be just that. No issues relating to the adequacy of the EIR/ EIS have been discussed; therefore, no further response is required.

Comment from: Don Ensley
Homeowner

I live at 94 River Drive; that is in Zone 2. First thing, just to reiterate what a couple of people have already said. We bought our home about 30years now. We came in '66. I have seeen that the erosion is real. It's an insidious thing, and it's moving back slowly. It's probably moved two feet since I'be been there in the 30-yar period. At rate, in a hundred years, that will be a significant problem.

I have also seen the river come through. And you can count in minutes, the way the bluff recedes, when the river is up. So it's ludicrous to say that the problem is erosion and not flood control. It's a water problem, not an erosion problem.

The other part I would like to make -- if you have looked at the river upstream, they have channelized it in a lot of places to cause it to control the river. If you look down the stream in Orange, they have completely -- they use it as a settling basin. They put the tractors down in there. There's one place that's a parking lot. The only place that there's an environmental concern, it seems to be in our area. Above and below it, it doesn't seem to be a problem.

The City of Norco tried to just keep the river in its current location by sandbagging that area, and the City was fined for that. I don't see why we can't, in some method, cause the river to be controlled. If you look at the recreational potential down there, it's significant. But each time the water goes out of its bank the horse trails are destroyed. It's pretty unusual for a period of months after that.

If it could be channelized -- if it could be controlled, then that whole area could be used for recreational purposes all the time.

Thank you.

Response: Thank you for your comments in regards to the Norco Bluffs Stabilization Plan. Your concerns have been taken into consideration in the decision of the proposed project. However, the project is considered an erosion problem and not a flood control problem by definition. This does not automatically preclude it from being carried out to the best extent feasible. Several people and agencies are pushing this project through its course towards construction in attempts to resolve the problems and concerns of local citizens. No issues regarding the adequacy of the EIS/EIR were discussed; therefore, no further response is required.

Comment from: Patrick Quaney

I represent the company that manufactures retaining walls. We were included on your earthlock with the criblock. And we appreciate the opportunity to be considered on this very important project. And I have been up here before and spoke with several people, and I have talked to some of the people in the Army Corps of Engineers.

And I think that the report that you put out, that we just got about two and a half weeks ago, is very good. It's very readable; a lot of information. But one of the things that we found in the report is that we were lumped together with the crib. You have crib and earthlock. And the crib wall is a concrete crib. It's in there at 9.4 million dollars. We could do that for about 4.2 million with recycled plastic. We can make a retaining wall out of plastic.

And I would like to correct the record, because the 4.2 million is aobut what you're going to spend for the buttress fill, which will wash away if there is any water runoff there. And we think our product is very much superior to that. We would like the opportunity to still be effective here, and work with anybody in the Army corps of Engineers. I'm an engineer by degree myself. I would be happy to sit down and show you our product -- and we've distributed some of that -- and show you our calculations and were we stand, and what have you.

But I think that we can do a better job and give these people a much better product for about the same amount of money. And that's why I'm here this evening. I have written a letter to Mr. Burton, and sent a copy ot Mr. Stump, and also Mr. Johnson.

And I would be happy to meet with anybody and talk with anybody, and lay the engineering figures out. Our calcuations are based on UCB, a method of calculating retaining walls for sliding out and overturning. And we have test reports and everything. I have given a copy of this to Mr. Burton, as a matter of fact, today. This is our package. I don't know whether you want a copy or not.

Response: Thank you for your comments regarding the Norco Bluffs Stabilization Project. Your proposal in regards to the construction of the retaining walls has been taken into account and is appreciated as an alternative to the proposed project. Further correspondence in the construction of the project is the responsibility of the Corps of Engineers if your proposal is considered. No comments related to the adequacy of the EIS/EIR were provided; therefore, no further response is required.

Comment from: Tom Ameduri
Homeowner

I was here mainly because our area is the Orange County side of Zone 4. And I was wondering how I get more information on what's going on with that?

Response: Thank you for your comments regarding the Norco Bluffs Stabilization Plan. Your concern regarding Zone 4 could potentially be addressed by the Prado project, as Zone 4 was to be incorporated into that plan. Ed Andrews was to contact you to address your concern. No further comments regarding the adequacy of the EIS/EIR and therefore no further response is required.

Comment from: Mary Cuervo
Homeowner

I'm Mary Cuervo, and I live at 982 River Drive. And two years ago I called the Army Corps of Engineers on a emergency basis, because the City was out with pickaxes to drain the road, and we were told the City was told they shouldn't do that. And they were doing it again. And I took Geology 101, and I know better than to be taking a pickaxe to the top of the bluff.

And a man came out and said, "Oh, no. Here comes another one." And they stopped for a second. So I just didn't think that was too good of a practice to drain the road.

Response: Thank you for your comments regarding the Norco Bluffs Stabilization Plan. Your concerns have been taken into account by the Corps of Engineers. If approved, this plan would eliminate activities that have concerned you. No discussion of the adequacy of the EIS/EIR was presented; therefore, no further response is required.

Comment from: Pam Ensley
Homeowner

I'm Pam Ensley, 984 River Drive in Norco.

I just wanted to ask if there is any recourse for the current recommendation for the Army Corps of Engineers. They indicate that they are -- they don't support -- or that the statutory authority doesn't support a recommendation because it's erosion.

Would you comment on that?

Response: Thank you for your concerned comments regarding the Norco Bluffs Stabilization Plan. Mr. Joe addressed the comment at the public hearing and stated that the review process in Washington recognizes streambank protection is an erosion problem and the Corps does not have authority to recommend to Congress a streambank protection above $500,000. However, the Corps has recommended the project from an engineering standpoint following the feasibility study. Certain rules and regulations preclude the Corps from recommending the project to Congress, however, locals are working with Congress closely, which could get the project passed if it is approved. Conclusively, the project is not hopeless with the current recommendation from the Corps. No comments regarding the adequacy of the EIS/EIR were discussed; therefore, no further response is required.

Comment from: Anita Saunders
Homeowner

How long will it take if this goes through and it's authorized? How long a time period are we saying it's going to take to do either one of those studies?

ANSWER: It it's a total project, probably constuction is only 6 months. It it's a locally preferred plan, I don't know, maybe 9 or 12 or 15 months depending on weather conditions and the rains and what not. But the longest situation would be, of course, the locally preferred. Best scenario, should be able to do it in 9 or 12 months.

Response: Thank you for your comments on the Norco Bluffs Stabilization Plan. The posed question was answered at the hearing by Mr. Burton and the above answer was given as the response. No discussion of the adequacy of the EIS/EIR was presented; therefore, no further response is required.

Comment from: Unidentified Speaker

You had 10 years, 25 years 50 years, and so forth on project time. Could address the significance of that? You said the 25 years was the most economically feasible. Are you saying that we are only protected for 25 years?

ANSWER: That's the level of protection. That would provide protection against what we call the 25-year event, if I'm not mistaken. In other words, an event that has a likelihood of occurring four out of a hundred, or one out of twenty-five years. That's what the 25-year level implies.

Response: Thank you for your comments regarding the Norco Bluffs Stabilization Plan. The question in regards to the level of protection that the plan will provide (25 year event) was answered by Colonel Robinson of the Corps as stated above. No discussion of the adequacy of the EIS/EIR was presented; therefore, no further response is required.

Comment from: Janice Boyer
Homeowner

I was wondering, at the beginning of this study you had predicted, or had an idea, of how things were going to be going about as a result of the study.

Are we basically where you thought we would be? Has this been completed, needing approval from Congress, or --

Response: Thank you for your comments regarding the Norco Bluffs Stabilization Plan. Colonel Robinson addressed the above question at the public hearing and stated that the project is right where they expected it to be in the process and actually "ahead of the game by a number of months". No discussion of the adequacy of the EIS/EIR was presented; therefore, no further response is required.

Comment from: Melodie Lyon
Homeowner

And I'm a homeowner. And I'm a little bit confused as far as the project is concerned. Is it going to do anything about the property in front of our house separate from the erosion or river problems?

COLONEL ROBINSON: Conceptually, the project, as we have reported on it, would be to prevent further erosion. It would not restore erosion to date.

MS. LYON: So the road in front of my house may never be a two-way road. It may just stay a one-lane street?

COLONEL ROBINSON: Well, that's conceivable. Of course, if we succeed in stopping the erosion, then it gives you some option about what you can do with that road. Two lanes can become one lane, which become shortly no lane. So you know, it's good news, but not maybe great news. Now you can move it over a little bit if we can stop the erosion.

Response: Thank you for your comments in regards to the Norco Bluffs Stabilization Plan. The concerns posed by this question have been addressed and answered (as stated above) by Colonel Robinson of the Corps of Engineers. No discussion of the adequacy of the EIS/EIR was presented; therefore, no further response is required.

Comment from: Joe Schenk
Public Works Director, City of Norco

I'm the Public Works Director for the City.

And I waited kind of until the end because my question deals with Zone 4. And I know most of these folks all live in and reside in Zone 2.

That option are there for the folks that live in Zone 4 if Orange County does not proceed with the work that they have projected that they would do? Is the Corps involved with Orange County in trying to do that?

Response: Thank you for your comments in regards to the Norco Bluffs Stabilization Plan. The concern of what will happen if Orange County does not proceed with proposed work on the Prado Project incorporating Zone 4 was addressed by Colonel Robinson. The Corps is involved with the Prado project and is attempting to overcome problems with local funding in Orange County, who would like to proceed with the project, but believe that they cannot afford it. Legislative relief has been sought to provide monetary assistance to make the project more affordable for Orange County and possibly see some action in the Water Resources Development Act of 1996. No discussion of the adequacy of the EIS/EIR was presented; therefore, no further response is required.