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112th Congress, 2d Session – – – – – – – – – – – – House Document 112–145

BISCAYNE BAY COASTAL WETLANDS FINAL INTEGRATED PROJECT IMPLEMENTATION REPORT AND ENVIRONMENTAL IMPACT STATEMENT

COMMUNICATION

FROM

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

TRANSMITTING

PROPOSAL FOR THE BISCAYNE BAY COASTAL WETLANDS PHASE 1 PROJECT

VOLUME 5 OF 6

SEPTEMBER 25, 2012.—Referred to the Committee on Transportation and Infrastructure and ordered to be printed

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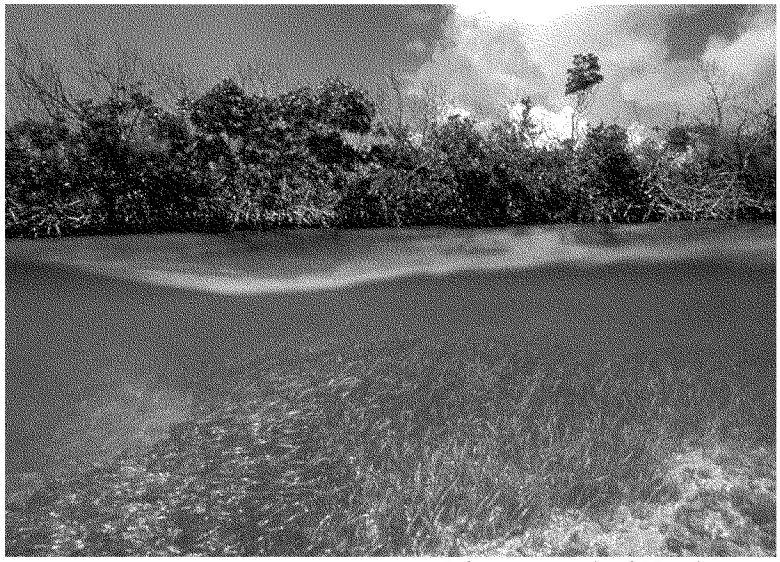
CENTRAL AND SOUTHERN FLORIDA PROJECT
COMPREHENSIVE EVERGLADES RESTORATION PLAN
BISCAYNE BAY COASTAL WETLANDS PHASE 1

FINAL INTEGRATED
PROJECT IMPLEMENTATION REPORT AND
ENVIRONMENTAL IMPACT STATEMENT



Volume 5 – Appendices B-C **July 2011 – revised March 2012**

US Army Corps of Engineers ®

U.S. ARMY CORPS OF ENGINEERS
JACKSONVILLE DISTRICT

SOUTH FLORIDA WATER
MANAGEMENT DISTRICT

(1)

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CENTRAL AND SOUTHERN FLORIDA PROJECT
BISCAYNE BAY COASTAL WETLANDS
PHASE 1

FINAL INTEGRATED
PROJECT IMPLEMENTATION REPORT
AND
ENVIRONMENTAL IMPACT STATEMENT

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JACKSONVILLE DISTRICT

SOUTH FLORIDA WATER
MANAGEMENT DISTRICT

July 2011- revised March 2012

APPENDIX B

COST ESTIMATES

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B.0 COST ESTIMATES

B.1 GENERAL INFORMATION

Corps of Engineers cost estimates for planning purposes are prepared in accordance with the following guidance:

- Engineer Technical Letter (ETL) 1110-2-573, Construction Cost Estimating Guide for Civil Works, 30 September 2008
- Engineer Regulation (ER) 1110-1-1300, Cost Engineering Policy and General Requirements, 26 March 1993
- ER 1110-2-1302, Civil Works Cost Engineering, 15 September 2008
- ER 1110-2-1150, Engineering and Design For Civil Works Projects, 31 August 1999
- ER 1105-2-100, Planning Guidance Notebook, 22 April 2000, as amended
- Engineer Manual (EM) 1110-2-1304 (Tables revised 31 March 2009), Civil Works Construction Cost Index System, 31 March 2000
- CECW-CP Memorandum For Distribution, Subject: Initiatives To Improve The Accuracy Of Total Project Costs In Civil Works Feasibility Studies Requiring Congressional Authorization, 19 Sep 2007
- CECW-CE Memorandum For Distribution, Subject: Application of Cost Risk Analysis Methods To Develop Contingencies For Civil Works Total Project Costs, 3 Jul 2007
- Cost and Schedule Risk Analysis Process, August 2010

The goals of the cost estimating for the Biscayne Bay Coastal Wetlands (BBCW) study are to present a Total Project Cost (construction and non-construction costs) for the Selected Plan at the current price level to be used for project justification/authorization and to project costs forward in time for budgeting purposes. In addition, the costing efforts are intended to produce a final product (cost estimate) that is reliable and accurate and that supports the definition of the Government's and the non-Federal sponsor's obligations. The cost estimating effort for the BBCW study also yielded a series of alternative plan formulation cost estimates for decision making. The final set of plan formulation cost estimates used for plan selection rely on construction feature unit pricing and are prepared in Civil Works Breakdown Structure (CWBS) format to the sub-feature level. The cost estimate supporting the National Ecosystem Restoration plan (Recommended Plan/Selected Alternative Plan) is prepared in MCACES/MII format to the CWBS sub-feature level. This estimate is supported by the preferred labor, equipment, materials and crew/production breakdown. A fully funded (escalated for inflation through project completion) cost estimate, the Baseline Cost Estimate or Total Project Cost Summary, has also been developed. A risk analysis was prepared that addresses uncertainties in and sets contingencies for Selected Alternative Plan cost items. A discussion of the risk analysis is included at the end of this appendix.

B.1.1 Selected Plan

The Selected Plan was chosen by the Project Delivery Team according to Cost Effectiveness/Incremental Cost Analysis procedures and resulted directly from the plan formulation described above. The Economics Appendix fully describes the plan selection. The scope of work for the Selected Alternative Plan is found in Appendix A, Engineering. The MCACES/MII cost estimate for the Selected Alternative Plan (***Section B.3***, below) is based on that scope and is formatted in the CWBS. The notes provided in the body of the estimate detail the estimate parameters and assumptions. These include pricing at the Fiscal Year 2010 price level (1 October 2009-30 September 2010). For project justification purposes, the items in the estimate are first sorted by area, Deering Estate Flowway, Cutler Wetlands and L-31E Wetlands. Finally, the estimate includes both construction and non-construction costs.

The construction costs fall under the following feature codes:

- 09 Channels and Canals
- 13 Pumping Plant
- 14 Recreation Facilities
- 15 Floodway Control-Diversion Structures

The non-construction costs fall under the following feature codes:

- 01 Lands and Damages
- 30 Planning, Engineering and Design
- 31 Construction Management

B.1.2 Construction Cost

Some features of the Selected Alternative Plan for this project were designed and costed by South Florida Water Management District (SFWMD), the project's non-Federal sponsor, under its State Expedited Construction program. The costing of these features by SFWMD's architect/engineer contractors is to comply with Comprehensive Everglades Restoration Program guidance DCM-7, which is not Corps guidance and which may in part deviate from Corps guidance. The costs are incorporated into the MCACES/MII cost estimate for the project based on a three-tiered review, as follows: Tier I, compliance with Corps guidance, Tier II, compliance with DCM-7 and Tier III, comparison with historic pricing. Inclusion of these costs is for project authorization and budgeting only and may bear no significance to crediting. Office of Management and Budget Circular A-87 establishes principles and standards for determining costs for Federal awards carried out through agreements with State and local governments and federally-recognized Indian tribal governments (governmental units). Engineer Circular (EC) 1165-2-208 provides guidance on in-kind contributions. These and other applicable publications and processes will form the basis for determining

crediting as well as all applicable terms under any Project Partnership Agreement that may be executed for the implementation of this project.

Other features are Corps-designed and costed following the preferred labor, equipment and materials method. Historic pricing was applied for the pumping plant. The tables and chart below summarize the historic pricing and show how it was extended to provide costs for this study. ***Table B-1*** is a compilation of award prices for pump stations designed/contracted by Jacksonville District since 2000. ***Figure B-1*** plots these prices and a curve is constructed between them, resulting in a regression equation. ***Table B-2*** uses this regression equation to calculate prices for pump stations at varying capacities, measured in cubic feet per second (cfs.) These are the prices used in the cost estimate.

TABLE B-1: PUMP STATION HISTORIC PRICING

Pump Station	Date Awarded	Total Cost	Cost FY 11$	Pump Size	Total cfs	Cost/cfs FY 11$
361	4/19/2001	$2,170,000	$3,346,868	3e/25 cfs	75	$44,625
9A	9/19/2000	$5,915,495	$9,204,184	2d/175 cfs, 2e/75 cfs	500	$18,408
357	9/20/2005	$10,388,921	$12,495,806	4d/125 cfs,1e/75 cfs	575	$21,732
362	9/30/2000	$29,109,915	$45,293,423	3d/960 cfs, 2d/550 cfs, 2e/110 cfs	4200	$10,784
S-700	4/8/2010	$3,964,337	$4,020,818	1e/50 cfs, 2e/25 cfs	100	$40,208
319	3/30/2000	$27,283,338	$42,451,371	3d/960 cfs, 2d/550 cfs	3980	$10,666
385	5/17/2004	$3,988,583	$5,152,232	4e/40 cfs	160	$32,201
382	9/26/2003	$9,617,529	$14,081,346	3d/160 cfs, 160 cfs, 60 cfs	380	$37,056
383	9/26/2003	$1,012,371	$1,482,247	2e/15 cfs, 25 cfs	40	$37,056

Notes: FY stands for Fiscal Year. 'Cubic feet per second' is abbreviated 'cfs'. Electric is abbreviated 'e'. 'Diesel' is abbreviated as 'd'.

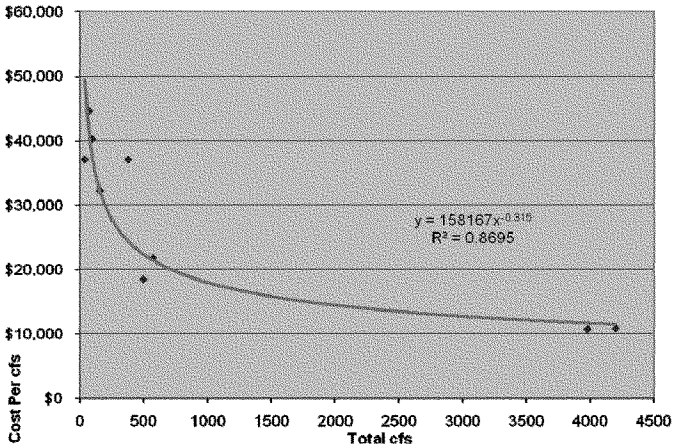

FIGURE B-1: TOTAL CFS VS. COST PER CFS BASED ON HISTORIC PRICING

TABLE B-2: PUMP STATION COSTS BY CFS BASED ON CHART

CFS	$/CFS	Station cost	Rounded
5	$95,267	$476,333	$500,000
10	$76,580	$765,801	$800,000
15	$67,398	$1,010,970	$1,100,000
20	$61,559	$1,231,180	$1,300,000
25	$57,381	$1,434,514	$1,500,000
30	$54,178	$1,625,339	$1,700,000
40	$49,484	$1,979,370	$2,000,000
50	$46,125	$2,306,271	$2,400,000
75	$40,595	$3,044,618	$3,100,000
100	$37,078	$3,707,796	$3,800,000
125	$34,561	$4,320,154	$4,400,000
150	$32,632	$4,894,839	$4,900,000
200	$29,805	$5,961,032	$6,000,000
250	$27,782	$6,945,520	$7,000,000
300	$26,231	$7,869,442	$7,900,000
375	$24,451	$9,169,112	$9,200,000
400	$23,959	$9,583,562	$9,600,000
420	$23,593	$9,909,270	$10,000,000
500	$22,333	$11,166,327	$11,200,000
600	$21,086	$12,651,717	$12,700,000
660	$20,463	$13,505,276	$13,600,000

The MCACES/MII estimate on the Selected Alternative Plan contains contingencies as noted in the estimate (below). These contingencies were determined as a result of the risk analysis. Additional information follows on the risk analysis. Major risk factors are shown in the sensitivity analyses.

B.1.3 Non-construction Cost

Non-construction costs include Real Estate, Planning, Engineering and Design (PED), and Construction Management (Supervision and Administration, S&A). Real Estate costs were provided by Real Estate Division. These costs are best described in the Real Estate Appendix, Appendix D. They include lands costs and administrative costs and are distinguished as non-Federal sponsor costs or government costs. Contingencies for the Real Estate costs were determined during risk analysis and the Real Estate Project Delivery Team sub-team recommended subsequently the application of a contingency across-the-board of 25%. The Real Estate risk analysis is further described below.

Planning, Engineering and Design costs are broken down into Planning, Engineering and Design (PED), or preparation of contract plans and specifications; Engineering During Construction (EDC); and the Project Implementation Report (PIR). PED costs were solicited from Engineering Division via the Project Manager, as suggested by the guidance. Twelve percent of the total construction cost is used as the total rate for engineering costs through construction, as is customary in Jacksonville District's Cost Branch. This consists of ten percent for PED and two percent for EDC. The cost for the PIR was provided to Cost Branch via the Project Manager and represents funds spent to date plus funds expected to be spent through report completion.

Construction Management costs were solicited from Construction-Operations Division via the Project Manager, again as suggested by the guidance. Eight percent is used as the rate for Construction Management costs for the cost estimate for the Selected Alternative Plan. This percentage is based on actual funds spent for construction management on past contracts. When this percentage is calculated by Construction-Operations Division for planning projects it is itemized to show amounts allocated for each task anticipated to occur during construction. Only the gross percentage is shown herein.

The main report details both cost allocation and cost apportionment for the Federal government and the non-Federal sponsor. Also included in the main report are the non-Federal sponsor's obligations (items of local cooperation).

B.1.4 Plan Formulation Cost Estimates

For the plan formulation cost estimates, unit prices for each major or variable construction element were developed in MCACES/MII. These unit prices were

entered into spreadsheets that differentiated each plan by the quantities required to construct the plans. Designs and quantities for the construction elements were provided to Cost Branch by the Engineering Technical Lead (see the Engineering Appendix for construction methods, design assumptions and design data). Preconstruction, Engineering and Design costs and Construction Management costs were calculated using percentages at this level of estimating.

The plan formulation process for this study involved numerous iterations. Since the costs for the plans were calculated via spreadsheet software it was fairly simple to adjust them as time went by (for example, as unit prices increased due to changes in price level), as plan components changed and as plans were added or removed from consideration. Refer to the Economics Section in the Main Report for the final Plan Formulation cost tables.

B.1.5 Construction Schedule

A construction schedule was prepared by the Engineering PDT in conjunction with the Planning Technical Lead and the construction-operations team member that reflected all project construction components, including the State Expedited Construction components. The schedule considered not only durations of individual components but also timing of construction contracts. It is based on single crews with no shift work and no overtime. This schedule was coupled with the project schedule in preparation for the generation of the Total Project Cost Summary as well as for the completion of the risk analysis. The construction schedule will change as design of the project proceeds in the plans and specifications phase and then it will change again when the contract is awarded and the contractor provides his schedule, which may be based on multiple crews with shift work and overtime. Both the construction schedule and the project schedule are provided below. The official schedule is the project schedule and it is given precedence herein wherever a conflict appears between these two schedules.

B.1.6 Total Project Cost Summary

The Total Project Cost Summary includes escalation through project completion. The cost estimate for the Selected Alternative Plan is prepared with an identified price level date. Inflation factors are used to adjust the pricing to the project schedule according to the CWBS. This estimate is known as the Fully Funded Cost Estimate or Total Project Cost Summary. It includes all Federal and non-Federal costs: Lands, Easements, Rights of Way and Relocations; construction features; Preconstruction Engineering and Design; Construction Management; Contingency; and Inflation.

B.2 PLAN FORMULATION COST ESTIMATES

Refer to the Economics Section in the Main Report.

B.3 MCACES COST ESTIMATE

Print Date Mon 21 March 2011
Eff. Date 12/28/2010

U.S. Army Corps of Engineers
Project : Biscayne Bay Coastal Wetlands Restoration - Phase 1

MCACES/MII estimate on the Tentatively Selected Plan

Time 10:48:59

Title Page

Estimated by USACE & SFWMD
Designed by USACE & SFWMD
Prepared by Derek Martin
Preparation Date 12/28/2010
Effective Date of Pricing 12/28/2010
Estimated Construction Time 1,460 Days
This report is not copyrighted, but the information contained herein is For Official Use Only.

Labor ID: LFL2009 EQ ID: EP07R03

Currency in US dollars

TRACES MII Version 3.01

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Print Date Mon 21 March 2011
Eff. Date 12/28/2010

U.S. Army Corps of Engineers
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0603 Fish and Wildlife Facilities 1

13 Pumping Plant 1

1300 Pumping Plant 1

14 Recreation Facilities 1

1400 Recreation Facilities 1

Cutler Wetlands 1

06 Fish and Wildlife Facilities 1

0603 Fish and Wildlife Facilities 1

09 Channels and Canals 1

[0901] Canals 1

[0902] Channels 1

13 Pumping Plant 1

[1300] Pumping Plant 1

Labor ID: LFL3009 EQ ID: EP07R03

Currency in US dollars

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Labor ID: LFL2009 EQ ID: EP07R03 Currency in US dollars TRACES MII Version 3.01

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[0902] Channels 5

13 Pumping Plant 5

[1300] Pumping Plant 5

14 Recreation Facilities 5

1400 Recreation Facilities 5

Labor ID: LFL2009 EQ ID: EP07R03

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0123 A8 Constructn Contract(s) Documnts/Admin Costs 6
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Library Properties Page i

Designed by
USACE & SFWMD

Estimated by
USACE & SFWMD

Prepared by
Derek Martin

Design Document Various
Document Date 3/14/2011
District Jacksonville District
Contact Derek Martin
Budget Year 2011
UOM System Original

Direct Costs
LaborCost
EQCost
MatlCost
SubBidCost

Timeline/Currency
Preparation Date 12/28/2010
Escalation Date 9/30/2010
Eff. Pricing Date 12/28/2010
Estimated Duration 1460 Day(s)

Currency US dollars
Exchange Rate 1.000000

Costbook CB08EB: MII English Cost Book 2008 Florida

Labor LFL2009: LABOR_FLORDIA_2009C

Labor Rates
LaborCost1
LaborCost2
LaborCost3
LaborCost4

Equipment EP07R03: MII Equipment Region 3r 2007
Note: Changed the cost of money, gas price, diesel (off-road and on-road) prices based on the state florida as of 11-15-10.

03 SOUTHEAST	
Sales Tax	7.40
Working Hours per Year	1,530
Labor Adjustment Factor	0.83
Cost of Money	3.13
Cost of Money Discount	25.00
Tire Recap Cost Factor	1.50
Tire Recap Wear Factor	1.80
Tire Repair Factor	0.15
Equipment Cost Factor	1.00
Standby Depreciation Factor	0.50

Fuel	
Electricity	0.068
Gas	2.870
Diesel Off-Road	2.570
Diesel On-Road	3.150

Shipping Rates	
Over 0 CWT	2.08
Over 240 CWT	2.18
Over 300 CWT	2.91
Over 400 CWT	6.59
Over 500 CWT	7.16
Over 700 CWT	5.35
Over 800 CWT	4.68

Labor ID: LFL2009 EQ ID: EP07R03

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Date	Author	Note
7/14/2008	T. Leeser	Biscayne Bay Coastal Wetlands PIR No. 1-Revised after Agency Technical Review.

Scope of Work::

Documents Used as the Basis for this Estimate: 1)South Florida Water Management District's A8 Program document prepared by URS Corporation entitled, "Opinion of Probable Construction Cost, Pre-Final Design Report, Cutler Wetlands C-1 Flow Way", dated April 14, 2008; 2)South Florida Water Management District's A8 Program document prepared by URS Corporation entitled, "Opinion of Probable Construction Cost, Pre-Final Design Report, L-31E Culverts", dated June 1, 2007; 3)South Florida Water Management District's (SFWMD) A8 Program document prepared by URS Corporation entitled, "Opinion of Probable Construction Cost, Pre-Final Design Report, Deering Estate Flow Way", dated October 30, 2007. 4)Pre-Final Plans for BBCW, Phase 1 L-31E Culverts, Sheets 7, 13 and 16 of 16, prepared by URS for SFWMD's A8 program, 5)Preliminary drawings for the planning report prepared by CESAJ-EN-D for the inverted siphon, culverts and spreader canal.

Major Project Features: This project covers three geographic areas, 1)Cutler Wetlands, 2)Deering Estate Flow Way and 3)L-31 Wetlands. The Cutler Wetlands area includes the project features a)Northeastern extension of spreader canal, b)Plug mosquito ditches and c)A8 component pump station. The Deering Estate area includes the project feature A8 component pump station. The L-31 Wetlands area includes the project features a)Spreader canal between C103 and North Canal, b)five pump stations, c)A8 component culverts, d)Culvert in L-31 East between Military Canal and C103, e)Culverts in L-31 East between C102 and Military Canal, f)An inverted siphon, and g)Culverts in L-31 East between C103 and North Canal.

Federal and non-Federal Cost Sharing Requirements: As provided to CESAJ-EN-C from CESAJ-PD via e-mail dated 6/23/08, "Under the Comprehensive Everglades Restoration Program (CERP) Design Agreement, the planning and design phases of all CERP projects are cost shared 50:50 between the Corps and SFWMD. The total of real estate and construction, and OMRRR are also 50:50. This would be recommended in the Preliminary Implementation Report (PIR) and included in the PPA (formerly Project Cooperation Agreement). HTRW remediation is an exception. It would be 100% non-federal."

Volatile Cost Items: Two categories of volatile cost items are fuel (gasoline, on-road diesel and off-road diesel) and materials (e.g., fabrication materials for the pumping equipment, steel, concrete).

Risk Analysis:

Construction Schedule (including date of mid-point of construction): Project approval is scheduled for June 2010. Plans and specifications development is scheduled to culminate with bid opening in January 2013. Construction is scheduled to begin in July 2013 and end in January 2016, lasting 30 months. Mid-point of construction would be at 15 months, or October 2014.

Construction Windows: This information was provided to EN-C by PD-E (B. Tarr) via e-mail dated 7/15/2008: There are no direct construction impacts to threatened and endangered species from the BBCW project. However the Biological Assessment (see PIR, Annex A) states the following: The U.S. Army Corps of Engineers acknowledges the potential usage and occurrence of the previously discussed threatened and endangered species within the Biscayne Bay Coastal Wetlands Increment 1 project boundaries. In recognition of this, disturbance to listed species will be minimized or avoided by limiting construction and other disturbances during critical times. This project will follow the Sea Turtle and Smalltooth Sawfish Construction Conditions dated March 23, 2006. The Corps also proposes to implement the standard manatee, indigo snake, American crocodile, and shorebird protection measures established by the State of Florida Fish and Wildlife Conservation Commission, the Audubon Society, and the U.S. Fish and Wildlife Service.

Escalation: This estimate is priced in FY 2008 dollars. Escalation to mid-point of construction is calculated in the accompanying Total Project Cost Summary. Labor rates used are Bureau of Labor Statistics May 2007 rates for Florida and are based on the State average wage by occupation. Equipment rates (Equipment Book Region III 2005) are repriced using the current Facilities Capital Cost of Money rate as well as current fuel rates. Materials are escalated in this estimate using Civil Works Construction Cost Indexing Factors (composite index for all feature codes), from the mid-point of the Cost Book (taken to be 2005) to the present fiscal year (2008).

Material price increase (escalation) is calculated at 693.30/608.36=1.14. Reference is EM 1110-2-1304, Appendix A.

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General Assumptions:

1. Taxes: Sales tax is applied at 7.0%.
2. FOOH: Applied at 15% of direct costs for prime contractor. This is to allow 10% for FOOH and 5% for mobilization/demobilization.
3. HOOH: Applied at 5% of running costs for prime contractor.
4. Profit: Used Weighted Profit Guidelines to calculate profit for the prime contractor and the subcontractor. Rounded results up to the nearest whole number: 8% for the prime contractor and 9% for the subcontractor.
5. Bond: Used Bond Table and Class B category to calculate bond cost.
6. Price Level: 2008, which is FY 2008, or 10/1/2007-9/30/2008.
7. Productivity/Overtime Usage: Applied at 100 %. Because this is considered a potentially volatile facotr, this percentage was varied in the risk analysis from 80% to 130% and the costs of that variance are incorporated in the contingency resulting from the risk analysis.
8. Contingency: SFWMD's A8 features include contingency at 15%. Recreation costs were provided by SFWMD and are assumed to include contingnecy. Contingencies for construction items, inlcuding PED and S&A but not the development of the Project Implementation Report, were set after the risk analysis was conducted, except for the contingency on the real estate costs, which the RE subteam specified as 25%. No contingency is applied to the real estate costs that are actual acquisition costs.
9. PED costs were provided by the PTL/PM and are calculated at 12% of cost to prime for construction features not constructed under the A8 program. The cost for the Project Implementation Report was also provided by PM and is based on costs incurred to date plus expected costs to complete the report.
10. S&A costs were provided by the PTL/PM and are calculated at 8% of cost to prime for construction features not constructed under the A8 program. This is the rate generally provided by CO for planning-level estimates.

Site Access: The project location is south of Miami, Florida, near Florida City. Specific project feature construction sites are accessible via major highway/local roads/improved roadways.

Borrow Areas: Spreader canal/seepage collection ditch associated with C-711, including the berm and spreader berm-Fill for the berms will come from the adjacent canal/ditch excavation. Cut volume is greater than the fill volume by a factor of approximately 1.4. Some of this cut volume will be unsuitable as fill. Any remaining material might be used as fill for the construction of S-711, the associated pump station.

For C702, including both the A8 and Corps features, and the associated levees, more fill will be needed than will be available. However, there will be excess fill from the Deering Estate feature construction, and with this available for the Cutler Wetlands features, there should be a material balance.

For the mosquito ditches, it is assumed that the fill material will come from the areas adjacent to the ditches.

For the pump stations in the L-31 wetlands, fill material of about 10,000 yards may be needed.

Unusual Conditions (Soil, Water, Weather): Florida has two weather seasons, the rainy season from June 1 to October 31 and the dry season from November 1 to May 31. Weather conditions and their potential impact on project construction is well-handled and documented in Plans and Specifications prepared by Jacksonville District during PED phase.

Unique Construction Techniques: It is anticipated that construction of the inverted siphon will necessitate the experience of a construction firm that has previously completed similar work. All other work is expected to be of a difficulty level such that a prudent, well-equipped contractor can perform the construction.

Equipment and Labor Availability and Distance Traveled: This estimate assumes equipment and labor availability of a prudent and well-equipped contractor, as indicated in Engineer Instructions 01D010, 1 Sep 1997 (Unified Facilities Criteria 3-700-02A, 01 March 2005). Due to the project's location in Homestead, FL, and proximity to Miami, FL, it is assumed that the distance traveled is within a day's commute.

Environmental Concerns During Construction: See note above on Environmental Windows.

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		Acquisition Plan: The A8 features are to be constructed by SFWMD, according to their policy and regulations. The non-A8 features are to be constructed by the Corps. Since the non-A8 features are estimated to cost in the ten of millions of dollars, the acquisition plan may be Invitation For Bid or Request For Proposal, and the acquisition would follow all Corps guidance, including that for subcontracting.
		Sub-contracting Plan: For this estimate, subcontractors have been chosen if needed for the estimate structure and if the item of work is one that might reasonably be subcontracted. The Government is assigned as the contractor if the work is expected to be performed by the Government, such as PED and S&A. A placeholder contractor is assigned if the work is costed according to a sub-bid scheme, where the pricing already includes markups.
		Effective Dates for Labor, Equipment and Material Pricing: FY 2008
		Supporting Databases: National Labor Database dated 2006 with labor rates adjusted to Bureau of Labor Statistics average rates for Florida 2007, MII English Cost Book 2006, MII Equipment Region 3 2005 (with Facilities Capital Cost of Money set at rate of 5.125% for July-December 2008, gasoline at $4.05 per gallon (local observation July 2008), off-road diesel at $4.85 per gallon, and on-road diesel at $5.31 per gallon (both per quote dated 20 June 2008-price is delivered).
12/3/2009	M. Miller	Escalation: This estimate is priced in FY 2007 dollars and escalation to FY 2010 using the EM 1110-2-1304 CWBS indexes dated 30 Sept 2009. The construction costs were escalated by feature code, while the PED and S&A were escalated using the composite indexes as indicated below: 09 Channels & Canals - 679.00/723.64 = 6.59% 13 Pumping Plant - 696.70/696.49 = -.03% 14 Recreation Facilities - 696.70/696.49 = -.03% 15 Floodway Control Structure - 675.58/690.91 = 2.27% 30 PED & 31 S&A - 687.90/703.64 = 2.29%
5/24/2010	T. Leesar	Estimate revised to add monitoring costs and to change recreation costs.
6/3/2010	M. Miller	Project was repiced to 2010 dollars
9/27/2010	A. Saar	Revised Estimate.
12/10/2010	D. Martin	The L-31 Wetlands area includes the project features below:
		a)Spreader canal between C103 and North Canal, b)five pump stations, c)A8 component culverts, d)Culvert in L-31 East between Military Canal and C103, e)Culverts in L-31 East between C102 and Military Canal, f)An inverted siphon, and g)Culverts in L-31 East between C103 and North Canal.
		Risk Analysis:
		Construction Schedule (including date of mid-point of construction): Project approval is scheduled for June 2010. Plans and specifications development is scheduled to culminate with bid opening in January 2013. Construction is scheduled to begin in July 2013 and end in January 2016, lasting 30 months. Mid-point of construction would be at 15 months, or October 2014.
		Escalation: This estimate is priced in FY 2008 dollars. Escalation to mid-point of construction is calculated in the accompanying Total Project Cost Summary. Labor rates used are Bureau of Labor Statistics May 2007 rates for Florida and are based on the State average wage by occupation. Equipment rates (Equipment Book Region III 2005) are repriced using the current Facilities Capital Cost of Money rate as well as current fuel rates. Materials are escalated in this estimate using Civil Works Construction Cost Indexing Factors (composite index for all feature codes), from the mid-point of the Cost Book (taken to be 2005) to the present fiscal year (2008).
		Site Access: The project location is south of Miami, Florida, near Florida City. Specific project feature construction sites are accessible via major highway/local roads/improved roadways.
		Borrow Areas: Spreader canal/seepage collection ditch associated with C-711, including the berm and spreader berm-Fill for the berms will come from the adjacent canal/ditch

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excavation. Cut volume is greater than the fill volume by a factor of approximately 1.4. Some of this cut volume will be unsuitable as fill. Any remaining material might be used as fill for the construction of S-711, the associated pump station.

For C702, including both the A8 and Corps features, and the associated levees, more fill will be needed than will be available. However, there will be excess fill from the Deering Estate feature construction, and with this available for the Cutler Wetlands features, there should be a material balance.

For the mosquito ditches, it is assumed that the fill material will come from the areas adjacent to the ditches.

For the pump stations in the L-31 wetlands, fill material of about 10,000 yards may be needed.

Unusual Conditions (Soil, Water, Weather): Florida has two weather seasons, the rainy season from June 1 to October 31 and the dry season from November 1 to May 31. Weather conditions and their potential impact on project construction is well-handled and documented in Plans and Specifications prepared by Jacksonville District during PED phase.

Unique Construction Techniques: It is anticipated that construction of the inverted siphon will necessitate the experience of a construction firm that has previously completed similar work. All other work is expected to be of a difficulty level such that a prudent, well-equipped contractor can perform the construction.

Equipment and Labor Availability and Distance Traveled: This estimate assumes equipment and labor availability of a prudent and well-equipped contractor, as indicated in Engineer Instructions 01D010, 1 Sep 1997 (Unified Facilities Criteria 3-700-02A, 01 March 2005). Due to the project's location in Homestead, FL, and proximity to Miami, FL, it is assumed that the distance traveled is within a day's commute.

Environmental Concerns During Construction: See note above on Environmental Windows.

Acquisition Plan: The A8 features are to be constructed by SFWMD, according to their policy and regulations. The non-A8 features are to be constructed by the Corps. Since the non-A8 features are estimated to cost in the ten of millions of dollars, the acquisition plan may be Invitation For Bid or Request For Proposal, and the acquisition would follow all Corps guidance, including that for subcontracting.

Sub-contracting Plan: For this estimate, subcontractors have been chosen if needed for the estimate structure and if the item of work is one that might reasonably be subcontracted. The Government is assigned as the contractor if the work is expected to be performed by the Government, such as PED and S&A. A placeholder contractor is assigned if the work is costed according to a sub-bid scheme, where the pricing already includes markups.

Effective Dates for Labor, Equipment and Material Pricing: FY 2008

Supporting Databases: National Labor Database dated 2006 with labor rates adjusted to Bureau of Labor Statistics average rates for Florida 2007, MII English Cost Book 2006, MII Equipment Region 3 2005 (with Facilities Capital Cost of Money set at rate of 5.125% for July-December 2008, gasoline at $4.05 per gallon (local observation July 2008); off-road diesel at $4.85 per gallon, and on-road diesel at $5.31 per gallon (both per quote dated 20 June 2008-price is delivered).

COST DX ATR OF
Central and Southern Florida Project Comprehensive Everglades Restoration Plan "Biscayne Bay Coastal Wetlands Phase 1 ATR Comments by M.P. Jacobs Oct 2010"

18. Estimate -L-31E Wetlands- Methodology for development of the estimate is similar to development of Deering Estate and Cutler wetlands and similar comments are applicable to these estimate folders- recommend review care and diversion of water issues, materials required for construction to include soils adequate to construct swales and berms as well as any line and or filter fabric requirements be included in the estimate.

All requirements for diversion of water and sheetpile have been introduced to this estimate also all material needed for construction is assumed suitabe from onsite sources. We have

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accounted for any unforseen issues for soil needed.

20. Estimate- L31 Wetlands- Floodway Control Diversion Structure- Culvert in L-31 East between Military Canal and C103- S708 – Culvert- In the Clearing and Grading folder, installation of base course CSI task is utilized and has costs for new base course material costs- The notes state that it will be stockpiled and removed---This is small impact but provided for estimator.

This is to remove and stockpile the aggregate roadway on top of the existing levee. Dimensions are approximately 6 inches deep, 14 feet wide and 50 feet long. 14 ft X 50 ft = 700 sf = 78 sy, used 100. (Used higher labor and equipment cost rate/construction area non-ideal and has limited area to work in) Also original (32112330200) was used for this line item. I have changed this line item to the one used above for the COST DX. This item detail doesn't have material included. The intension was to have an aggregate removal line item and stockpile exting material onsite not import new aggregate. This has been fixed.

21. Estimate- L31 Wetlands- Floodway Control Diversion Structure- Culvert in L-31 East between Military Canal and C103- S708 – Culvert- Recommend, sheeting, care and diversion of water costs be considered and added to the estimate.

Sheeting, care and diversion of water costs considered and added to the estimate. I have added this line item for sheet pile. A temporary structure that will serve to divert the water and be used in dewatering practices of the contractor. Also included cost for Pumps for S708 @ 100 Days.

22. Estimate- L31 Wetlands- Floodway Control Diversion Structure- Culvert in L-31 East between Military Canal and C103- S708 – Culvert- Backfill- CSI task used is for Excavating vice backfill and compact.

Concur- This item was used and is not a backfill and compact number. This is actually a cut number and was intended to be an excavation folder. I have deleted the excavation line items and added backfill item detail for all culverts to show same amount of fill being returned and compacted in place.

23. Estimate- L31 Wetlands- Floodway Control Diversion Structure- All Culverts- Same comment as above.

I have deleted the excavation line items and added backfill item detail for all culverts to show same amount of fill being returned and compacted in place that was excavated from the road and side slopes.

24. Estimate- L31 Wetlands- Floodway Control Diversion Structure- Inverted Siphon- Recommend adding care and diversion of water costs to estimate. Recommend re-development of concrete costs to include appropriate, formwork, resteel and placement costs vice using slab on grade CSI task. New Berms- There are no hauling or material costs for construction of the new berms. The methodology is not described for the approach in the notes. Be cautious utilizing RSMeans tasks for drilling and blasting, cofferdams etc, as there may be significant requirements for safety and design not included in the unit cost.

I have added this line item for sheet pile. A temporary structure that will serve to divert the water and be used in dewatering practices of the contractor. Also included cost for Pumpsf for dewatering. Added Line for Hauling of material from onsite excavated areas. Material is to be used for construction of new berms. No loading needed for the trucks. Loading is in separate line item with the excavation line item. Also added formwork placement for concrete work. Put 50% contigency for all drilling and blasting for safety and design cost coverage.

25. Estimate- L31 Wetlands- Floodway Control Diversion Structure- Inverted Siphon –Remove Existing Levees along canal- Borrow CSI task utilized- contains 22/yd material cost? If we are removing the levee what is the material cost for? No transportation costs appear included.

Material is to be escavated and loaded for use on other part of project where fill is needed. Deleted 312323157070 borrow line item. Per the recommendation of the Cost DX, we have

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		reviewed this line item and added this HNC Item Detail for the excavation and loading of this material. It was the intention of the original estimator to have a material cost included in case the blasted material wasn't sufficient or adequate. This extra material cost would have covered any cost incurred for importation of material needed. The cost of hauling has been addressed in another folder.
		26. Estimate- L31 Wetlands- Floodway Control Diversion Structure- Inverted Siphon- Remove lining from Military Canal- Utilizes CSI task for unreinforced sidewalk- Does the canal liner have resteel? Cost for actual removal most likely will be significantly higher due to resteel- thickness of concrete, and removal and handling of the spoils.
		024113174510 Previously a line item was used for the demolition of the concrete lined canal. This has been removed. The Cost DX recommended that we take another look and cover ourselves for the unforeseen like rebar and or reinforcement. We have changed the item detail and selected a detail that would cover the cost for demolition of concrete to include reinforcement if needed. Cost DX thought that the cost would be significantly higher due to the steel not being accounted for. We are assuming a thickness of 6" to be removed. 024119190300 This cost will handle by the ton if any added cost will be incurred to the contractor. This item should handle all fees associated with the dumping of concrete mix material with steel.
		27. Estimate- L31 Wetlands- Floodway Control Diversion Structure- Inverted Siphon -Install siphon- Avoid use of additional allowances for installation in the wet- cost may be significantly higher than 5k allowance.
		Agreed, The item for additional amounts of funds for installation of the siphon in wet have been removed. We will include this into our risk analysis.
		28. Estimate- L31 Wetlands- Floodway Control Diversion Structure- Inverted Siphon-Rebuild Military Canal levees- Same Borrow CSI Task utilized from removal of existing levees – most likely not appropriate.
		I Agree. I have deleted the preciously used item 312323157070 and added a hauling item backfill and compact line item and water for compaction. The loading will take place at the excavation site and is in another folder.
		29. Estimate- L31 Wetlands- Floodway Control Diversion Structure- Inverted Siphon-Remove Culverts- Quantity error- notes assume 2 quantities in estimate 1. Estimate is LS allowance. Recommend developing scope and estimate for removal.
		Allowed $50,000 each, assumed two. This is a preliminary estimate. I have fixed the estimate quantity to reflect two separate culverts. I do not have an adequate design nor anytime to create an accurate item detail. We used this number as a worst case scenario to cover cost. As we move forward and an actual design is created we will modify and develop a more intricate, accurate scope of work.
		30. Estimate- L31 Wetlands- Floodway Control Diversion Structure- Inverted Siphon-Fill between L31E and Military Canal. No transportation costs appear to be included in the estimate.
		Hauling of material from onsite excavated areas has been added to this folder. Material is to be used for construction for fill between new L31-E & Military Canal . No loading needed for the trucks. Loading is in separate line item with the excavation line item.
		31. Estimate- L31 Wetlands- Floodway Control Diversion Structure- Inverted Siphon- L31 E Wetlands- Recreation facilities- No Scope, no notes, no basis for cost included in estimate.
		Correct. SFWMD the 50/50 Partner on these projects have provided us the cost for the recreation facilities. This line item will be changed when we get more information. I will work closely with them to get more information behind the basis of their pricing.
12/11/2010	A. Saar	The L-31 Wetlands area includes the project features below:

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a)Spreader canal between C103 and North Canal, b)five pump stations, c)A8 component culverts, d)Culvert in L-31 East between Military Canal and C103, e)Culverts in L-31 East between C102 and Military Canal, f)An inverted siphon, and g)Culverts in L-31 East between C103 and North Canal.

Risk Analysis:

Construction Schedule (including date of mid-point of construction): Construction is scheduled to begin in April 2014 and end in November 2016, lasting 33 months. Mid-point of construction would be at 16 months, or July 2015.

Escalation: This estimate is priced in FY 2011 dollars. Escalation to mid-point of construction is calculated in the accompanying Total Project Cost Summary. Labor rates used are Bureau of Labor Statistics 2009 rates for Florida and are based on the State average wage by occupation. Equipment rates (Equipment Book Region III 2007) are repriced using the current Facilities Capital Cost of Money rate as well as current fuel rates.

Site Access: The project location is south of Miami, Florida, near Florida City. Specific project feature construction sites are accessible via major highway/local roads/improved roadways.

Borrow Areas: Spreader canal/seepage collection ditch associated with C-711, including the berm and spreader berm-Fill for the berms will come from the adjacent canal/ditch excavation. Cut volume is greater than the fill volume by a factor of approximately 1.4. Some of this cut volume will be unsuitable as fill. Any remaining material might be used as fill for the construction of S-711, the associated pump station.

For C702, including both the A8 and Corps features, and the associated levees, more fill will be needed than will be available. However, there will be excess fill from the Deering Estate feature construction, and with this available for the Cutler Wetlands features, there should be a material balance.

For the mosquito ditches, it is assumed that the fill material will come from the areas adjacent to the ditches.

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Unusual Conditions (Soil, Water, Weather): Florida has two weather seasons, the rainy season from June 1 to October 31 and the dry season from November 1 to May 31. Weather conditions and their potential impact on project construction is well-handled and documented in Plans and Specifications prepared by Jacksonville District during PED phase.

Unique Construction Techniques: It is anticipated that construction of the inverted siphon will necessitate the experience of a construction firm that has previously completed similar work. All other work is expected to be of a difficulty level such that a prudent, well-equipped contractor can perform the construction.

Equipment and Labor Availability and Distance Traveled: This estimate assumes equipment and labor availability of a prudent and well-equipped contractor, as indicated in Engineer Instructions 01D010, 1 Sep 1997 (Unified Facilities Criteria 3-700-02A, 01 March 2005). Due to the project's location in Homestead, FL, and proximity to Miami, FL, it is assumed that the distance traveled is within a day's commute.

Environmental Concerns During Construction: See note above on Environmental Windows.

Acquisition Plan: The A8 features are to be constructed by SFWMD, according to their policy and regulations. The non-A8 features are to be constructed by the Corps. Since the non-A8 features are estimated to cost in the ten of millions of dollars, the acquisition plan may be Invitation For Bid or Request For Proposal, and the acquisition would follow all Corps guidance, including that for subcontracting.

Sub-contracting Plan: For this estimate, subcontractors have been chosen if needed for the estimate structure and if the item of work is one that might reasonably be subcontracted. The Government is assigned as the contractor if the work is expected to be performed by the Government, such as PED and S&A. A placeholder contractor is assigned if the work is

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		costed according to a sub-bid scheme, where the pricing already includes markups.
		Effective Dates for Labor, Equipment and Material Pricing: FY 2008
		Supporting Databases: National Labor Database dated 2009 with labor rates adjusted to Bureau of Labor Statistics average rates for Florida 2009, MII English Cost Book 2008, MII Equipment Region 3 2007 (with Facilities Capital Cost of Money set at rate of 3.125% for November 2010, gasoline at $2.87 per gallon (November 2010), off-road diesel at $2.57 per gallon (November 2010), and on-road diesel at $3.16 per gallon (November 2010).
		COST DX ATR OF Central and Southern Florida Project Comprehensive Everglades Restoration Plan "Biscayne Bay Coastal Wetlands Phase 1 ATR Comments by M.P. Jacobs Oct 2010" 10. Estimate- Project Items- Deering Estate Flowway-Recreational Facilities- Educational Wetland- Sub Bid Cost $497,543 Notes indicate "May 24, 2010 2:36 PM To: Leeser, Tracy T SAJ Subject: RE: Appx H - Recreation.doc Tracy - As described in the revised text (attached), the $497,543 is for the newly proposed educational wetland at Deering Estate. John Shaffer" Has USACE performed any QC or verification that the costs presented by the local sponsor are correct? What price level is this estimate data at? Note: There is no supporting data or estimate provided to support development of costs. Backup information for the recreational facilities can be found in Appendix H of the PIR.
		12. Estimate-Markups- Cutler Wetlands-Channels and Canals- There is a 14% markup applied to the materials. The items utilized are all R5M costbook items. What is the basis and methodology for determining the 14% markup? The markup has been taken out of the estimate.
		13. Estimate-Project Items- Cutler Wetlands- Channels and Canals- Recommend costs for care and diversion of water be considered and included for the construction of these features. – Silt screen, runoff protection, erosion control, etc. Erosion control was added to Cutler Wetlands.
		14. Estimate-Project Items- Cutler Wetlands- Channels and Canals- All sub-folders- Recommend that sub folders are changed from 1EA to reflect the quantity and UOM for the item of work being performed. Changed the subfolders that were labeled 1EA to LS.
		15. Estimate-Project Items- Cutler Wetlands- Channels and Canals-Canals- Northeastern extension of Spreader Canal- It appears that the methodology is to re-utilize the excavated material to form the edges of the canal. Are the existing soils suitable for use from stockpile without screening and or blending with new material? Is any liner or filter fabric required? With exception of the Box Culvert, the only material costs associated with this item are for disposal fees for clearing and grubbing. Recommend review methodology, include a description in the estimate notes, and verify all scope required is included in the estimate. A new methodology was applied. 18. Estimate -L-31E Wetlands- Methodology for development of the estimate is similar to development of Deering Estate and Cutler wetlands and similar comments are applicable to these estimate folders- recommend review care and diversion of water issues, materials required for construction to include soils adequate to construct swales and berms as well as any line and or filter fabric requirements be included in the estimate.
		All requirements for diversion of water and sheetpile have been introduced to this estimate also all material needed for construction is assumed suitabe from onsite sources. We have accounted for any unforseen issues for soil needed.
		20. Estimate- L31 Wetlands- Floodway Control Diversion Structure- Culvert in L-31 East between Military Canal and C103- S708 – Culvert- In the Clearing and Grading folder, installation of base course C5I task is utilized and has costs for new base course material costs- The notes state that it will be stockpiled and removed---This is small impact but provided for estimator.

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This is to remove and stockpile the aggregate roadway on top of the existing levee. Dimensions are approximately 6 inches deep, 14 feet wide and 50 feet long. 14 ft X 50 ft = 700 sf = 78 sy, used 100. (Used higher labor and equipment cost rate/construction area non-ideal and has limited area to work in) Also original (32112330200) was used for this line item. I have changed this line item to the one used above for the COST DX. This item detail doesn't have material included. The intension was to have an aggregate removal line item and stockpile exting material onsite not import new aggregate. This has been fixed.

21. Estimate- L31 Wetlands- Floodway Control Diversion Structure- Culvert in L-31 East between Military Canal and C103- S708 – Culvert- Recommend, sheeting, care and diversion of water costs be considered and added to the estimate.

Sheeting, care and diversion of water costs considered and added to the estimate. I have added this line item for sheet pile. A temporary structure that will serve to divert the water and be used in dewatering practices of the contractor. Also included cost for Pumps for S708 @ 100 Days.

22. Estimate- L31 Wetlands- Floodway Control Diversion Structure- Culvert in L-31 East between Military Canal and C103- S708 – Culvert- Backfill- CSI task used is for Excavating vice backfill and compact.

Concur- This item was used and is not a backfill and compact number. This is actually a cut number and was intended to be an excavation folder. I have deleted the excavation line items and added backfill item detail for all culverts to show same amount of fill being returned and compacted in place.

23. Estimate- L31 Wetlands- Floodway Control Diversion Structure- All Culverts- Same comment as above.

I have deleted the excavation line items and added backfill item detail for all culverts to show same amount of fill being returned and compacted in place that was excavated from the road and side slopes.

24. Estimate- L31 Wetlands- Floodway Control Diversion Structure- Inverted Siphon- Recommend adding care and diversion of water costs to estimate. Recommend re–development of concrete costs to include appropriate, formwork, resteel and placement costs vice using slab on grade CSI task, New Berms- There are no hauling or material costs for construction of the new berms. The methodology is not described for the approach in the notes. Be cautious utilizing RSMeans tasks for drilling and blasting, cofferdams etc, as there may be significant requirements for safety and design not included in the unit cost.

I have added this line item for sheet pile. A temporary structure that will serve to divert the water and be used in dewatering practices of the contractor. Also included cost for Pumpsf for dewatering. Added Line for Hauling of material from onsite excavated areas. Material is to be used for construction of new berms. No loading needed for the trucks. Loading is in separate line item with the excavation line item. Also added formwork placement for concrete work. Put 50% contigency for all drilling and blasting for safety and design cost coverage.

25. Estimate- L31 Wetlands- Floodway Control Diversion Structure- Inverted Siphon –Remove Existing Levees along canal- Borrow CSI task utilized- contains 22/yd material cost? If we are removing the levee what is the material cost for? No transportation costs appear included.

Material is to be excavated and loaded for use on other part of project where fill is needed. Deleted 312323157070 borrow line item. Per the recommendation of the Cost DX, we have reviewed this line item and added this HNC Item Detail for the excavation and loading of this material. It was the intention of the original estimator to have a material cost included in case the blasted material wasn't sufficient or adequate. This extra material cost would have covered any cost incurred for importation of material needed. The cost of hauling has been addressed in another folder.

26. Estimate- L31 Wetlands- Floodway Control Diversion Structure- Inverted Siphon- Remove lining from Military Canal- Utilizes CSI task for unreinforced sidewalk- Does the canal liner have resteel? Cost for actual removal most likely will be significantly higher due to resteel- thickness of concrete, and removal and handling of the spoils.

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024113174510 Previously a line item was used for the demolition of the concrete lined canal. This has been removed. The Cost DX recommended that we take another look and cover ourselves for the unforeseen like rebar and or reinforcement. We have changed the item detail and selected a detail that would cover the cost for demolition of concrete to include reinforcement if needed. Cost DX thought that the cost would be significantly higher due to the steel not being accounted for. We are assuming a thickness of 6" to be removed.
024119190300 This cost will handle by the ton if any added cost will be incurred to the contractor. This item should handle all fees associated with the dumping of concrete mix material with steel.

27. Estimate- L31 Wetlands- Floodway Control Diversion Structure- Inverted Siphon -Install siphon- Avoid use of additional allowances for installation in the wet- cost may be significantly higher than 5k allowance.

Agreed, The item for additional amounts of funds for installation of the siphon in wet have been removed. We will include this into our risk analysis.

28. Estimate- L31 Wetlands- Floodway Control Diversion Structure- Inverted Siphon-Rebuild Military Canal levees- Same Borrow CSI Task utilized from removal of existing levees – most likely not appropriate.

I Agree. I have deleted the preciously used item 312323157070 and added a hauling item backfill and compact line item and water for compaction. The loading will take place at the excavation site and is in another folder.

29. Estimate- L31 Wetlands- Floodway Control Diversion Structure- Inverted Siphon-Remove Culverts- Quantity error- notes assume 2 quantities in estimate 1. Estimate is LS allowance. Recommend developing scope and estimate for removal.

Allowed $50,000 each, assumed two. This is a preliminary estimate. I have fixed the estimate quantity to reflect two separate culverts. I do not have an adequate design nor anytime to create an accurate item detail. We used this number as a worst case scenario to cover cost. As we move forward and an actual design is created we will modify and develop a more intricate, accurate scope of work.

30. Estimate- L31 Wetlands- Floodway Control Diversion Structure- Inverted Siphon-Fill between L31E and Military Canal. No transportation costs appear to be included in the estimate.

Hauling of material from onsite excavated areas has been added to this folder. Material is to be used for construction for fill between new L31-E & Military Canal . No loading needed for the trucks. Loading is in separate line item with the excavation line item.

31. Estimate- L31 Wetlands- Floodway Control Diversion Structure- Inverted Siphon- L31 E Wetlands- Recreation facilities- No Scope, no notes, no basis for cost included in estimate.

Correct. SFWMD the 50/50 Partner on these projects have provided us the cost for the recreation facilities. This line item will be changed when we get more information. I will work closely with them to get more information behind the basis of their pricing.

33. Estimate-Fish and Wildlife Facilities-Monitoring- Hydrometerological Modeling and Water Quality Folders- LS with no notes or basis of estimate included.
The costs were confirmed by Brad Tarr in the email "BBCW – Monitoring Info"

34. Estimate- Fish and Wildlife Facilities-Monitoring- Ecological Monitoring-Notes indicate a quote was received, but I am unable to decipher the quote.
The costs were confirmed by Brad Tarr in the email "BBCW – Monitoring Info"

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Date	Author	Note
3/14/2011	D. Martin	NOTE, THIS MII ESTIMATE WAS UPDATED AS OF 14 MAR 2011 DUE TO ADDITIONAL VEGETATION CONTROL. ALSO NOTE, THIS ESTIMATED HAD ALREADY BEEN CERTIFIED ON JANUARY 5, 2011. HOWEVER THE ADDITIONAL VEGETATION CONTROL REQUIRES THIS ESTIMATE TO GO BACK TO THE CENTER OF EXPERTISE FOR RE-CERTIFICATION. **********

Conceptual costs were derived for informational purposes only:

Option 1: Soils moved off of the site have to be replaced. It is reasonable to assume that this would not result in additional project costs. (NFS costs would rise though).

Option 2: Grubbing the soils in the wetland area is required only for exotic vegetation control. This is a reasonable assumption for the yet to be investigated soil contamination problems within the freshwater wetland area because the vast majority of the contamination problems identified to date on all of the surveyed lands has been arsenic contamination. It is not likely that the arsenic contamination will exceed the ecological threshold which would require soil removal or isolation. Therefore, grubbing within the freshwater wetlands is what we reasonably expect to require constructing this feature.

An exotics control requirement for scraping is not supported by the available information at this time for the following reasons: 1) The site is surrounded by non-project lands with similar exotic infestation so the risk that this property presents to nearby lands is minimal. 2) Scraping would likely compromise the viability of adjacent desirable vegetation within the freshwater wetland.

An inquiry was made earlier regarding whether exotics control (grubbing / scraping) was included in the original cost estimate. The response was yes. This response was technically correct; however, grubbing/scraping was only included for other project features not the freshwater wetland. Some mechanical (grubbing) control of 40 acres was included in the exotics control write-up; however, this was not directly related to the freshwater wetlands area.

In summary, given the available information and reasonable assumptions, Derek's method of arriving at a cost estimate for the two options by considering only the addition of grubbing 200 acres is reasonable.

1. Corps handles soils up to Industrial exposure limit, WMD handles soils above industrial limit.

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		2. 200 acres to be grubbed. Soils can remain on site and in place because the arsenic concentrations are assumed to be below the ecological limit. No stockpiling necessary. (WMD might have to do so for some limited scraping and stockpiling, but this is outside of cost-share costs at this time.)
		3. 100 acres have arsenic above industrial limit so WMD must do grubbing.
		4. 100 acres have arsenic below industrial limit so Corps can do the grubbing.
3/15/2011	D. Martin	Duration Note:
		The duration is not affected due the contractor being on-site and performing this sow simultaneously as other features are being constructed. Thus, schedule should not be affected.

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Project Cost Summary Report Page 1

Description	Quantity	UOM	ContractCost	Escalation	Contingency	ProjectCost
Project Cost Summary Report			149,992,429	0	0	149,992,429
BBCW	1.00	EA	149,992,429	0	0	149,992,429
Construction Costs	1.00	LS	46,068,417	0	0	46,068,417
Deering Estate Flowway	1.00	LS	5,288,614	0	0	5,288,614
06 Fish and Wildlife Facilities	1.00	LS	1,095,719	0	0	1,095,719
0603 Fish and Wildlife Facilities	1.00		1,095,719	0	0	1,095,719
13 Pumping Plant	1.00	LS	3,694,337	0	0	3,694,337
1300 Pumping Plant	1.00	LS	3,694,337	0	0	3,694,337
14 Recreation Facilities	1.00	LS	498,558	0	0	498,558
1400 Recreation Facilities	1.00	LS	498,558	0	0	498,558
Cutler Wetlands	1.00	LS	20,855,770	0	0	20,855,770
06 Fish and Wildlife Facilities	1.00	LS	1,095,719	0	0	1,095,719
0603 Fish and Wildlife Facilities	1.00		1,095,719	0	0	1,095,719
09 Channels and Canals	1.00	LS	9,096,387	0	0	9,096,387
[0901] Canals	2,500.00	LF	22,715	0	0	22,715
[0902] Channels	1.00	EA	9,073,672	0	0	9,073,672
13 Pumping Plant	1.00	LS	9,379,014	0	0	9,379,014
[1300] Pumping Plant	1.00	LS	9,379,014	0	0	9,379,014
14 Recreation Facilities	1.00	LS	1,284,650	0	0	1,284,650
1400 Recreation Facilities	1.00	LS	1,284,650	0	0	1,284,650
L-31E Wetlands	1.00	LS	19,924,033	0	0	19,924,033
06 Fish and Wildlife Facilities	1.00	LS	1,095,719	0	0	1,095,719
0603 Fish and Wildlife Facilities	1.00		1,095,719	0	0	1,095,719
09 Channels and Canals	1.00	LS	1,864,223	0	0	1,864,223
0902 Canals	1.00	LS	782,052	0	0	782,052
0903 Clearing and Grubbing	200.00	ACR	1,082,171	0	0	1,082,171
13 Pumping Plant	1.00	LS	12,293,113	0	0	12,293,113
1300 Pumping Plant	1.00	LS	12,293,113	0	0	12,293,113
14 Recreation Facilities	1.00	LS	24,867	0	0	24,867
1400 Recreation Facilities	1.00	LS	24,867	0	0	24,867
15 Floodway Control-Diversion Struc	1.00	LS	4,646,110	0	0	4,646,110
1500 Floodway Control-Diversion Struc	1.00	LS	4,646,110	0	0	4,646,110
Non-construction Costs	1.00	LS	103,924,012	0	0	103,924,012
01 Lands and Damages	1.00	LS	61,329,774	0	0	61,329,774
0123 Constructn Contract(s) Documnts/Admin Costs	1.00	LS	601,967	0	0	601,967
Freshwater Wetlands	1.00	LS	178,186	0	0	178,186
Saltwater Wetlands	1.00	LS	423,781	0	0	423,781
0123 A8 Constructn Contract(s) Documnts/Admin Costs	1.00	LS	3,351,119	0	0	3,351,119
Freshwater Wetlands	1.00	LS	605,054	0	0	605,054
Saltwater Wetlands	1.00	LS	2,746,065	0	0	2,746,065
Non-Federal Land Acquisition Costs	1.00	LS	57,376,688	0	0	57,376,688

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Description	Quantity	UOM	ContractCost	Escalation	Contingency	ProjectCost
Freshwater Wetlands	1.00	LS	17,988,614	0	0	17,988,614
Saltwater Wetlands	1.00	LS	39,388,074	0	0	39,388,074
30 Planning, Engineering and Design	1.00	LS	30,323,283	0	0	30,323,283
3023 Constructn Contracts(s) Documnts	1.00	LS	20,220,000	0	0	20,220,000
3023 A8 Constructn Contracts(s) Documnts	1.00	LS	10,103,283	0	0	10,103,283
31 Construction Management	1.00	LS	12,270,955	0	0	12,270,955
3123 Construction Contracts	1.00	LS	3,750,000	0	0	3,750,000
3123 A8 Construction Contracts	1.00	LS	8,520,955	0	0	8,520,955

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Description	Quantity	UOM	Contractor	DirectCost	SubCMU	CostToPrime	PrimeCMU	ContractCost
Contract Cost Summary Report				142,780,892	1,943,661	144,724,553	5,267,876	149,992,429
BBCW	1.00	EA		142,780,892	1,943,661	144,724,553	5,267,876	149,992,429
Construction Costs	1.00	LS		38,856,880	1,943,661	40,800,541	5,267,876	46,068,417
Deering Estate Flowway	1.00	LS	SFWMD	5,288,614	0	5,288,614	0	5,288,614
06 Fish and Wildlife Facilities	1.00	LS	SFWMD	1,095,719	0	1,095,719	0	1,095,719
0603 Fish and Wildlife Facilities	1.00		SFWMD	1,095,719	0	1,095,719	0	1,095,719
13 Pumping Plant	1.00	LS	SFWMD	3,694,337	0	3,694,337	0	3,694,337
1300 Pumping Plant	1.00	LS	SFWMD	3,694,337	0	3,694,337	0	3,694,337
14 Recreation Facilities	1.00	LS	SFWMD	498,558	0	498,558	0	498,558
1400 Recreation Facilities	1.00	LS	SFWMD	498,558	0	498,558	0	498,558
Cutler Wetlands	1.00	LS		15,116,527	1,938,768	17,055,295	3,800,475	20,855,770
06 Fish and Wildlife Facilities	1.00	LS	Government	1,095,719	0	1,095,719	0	1,095,719
0603 Fish and Wildlife Facilities	1.00		Government	1,095,719	0	1,095,719	0	1,095,719
09 Channels and Canals	1.00	LS		6,989,128	4,470	6,993,598	2,102,789	9,096,387
[0901] Canals	2,500.00	LF		14,768	4,470	19,237	3,477	22,715
[0902] Channels	1.00	EA		6,974,360	0	6,974,360	2,099,312	9,073,672
13 Pumping Plant	1.00	LS	Subcontractor	6,196,481	1,681,501	7,877,982	1,501,032	9,379,014
[1300] Pumping Plant	1.00	LS	Subcontractor	6,196,481	1,681,501	7,877,982	1,501,032	9,379,014
14 Recreation Facilities	1.00	LS	Prime Contractor	835,199	252,797	1,087,996	196,654	1,284,650
1400 Recreation Facilities	1.00	LS	Prime Contractor	835,199	252,797	1,087,996	196,654	1,284,650
L-31E Wetlands	1.00	LS		18,451,739	4,893	18,456,632	1,467,401	19,924,033
06 Fish and Wildlife Facilities	1.00	LS	Government	1,095,719	0	1,095,719	0	1,095,719
0603 Fish and Wildlife Facilities	1.00		Government	1,095,719	0	1,095,719	0	1,095,719
09 Channels and Canals	1.00	LS	Prime Contractor	1,432,911	0	1,432,911	431,312	1,864,223
0902 Canals	1.00	LS	Prime Contractor	601,114	0	601,114	180,938	782,052
0903 Clearing and Grubbing	200.00	ACR	Prime Contractor	831,797	0	831,797	250,374	1,082,171
13 Pumping Plant	1.00	LS	Prime Contractor (No Markups)	12,293,113	0	12,293,113	0	12,293,113
1300 Pumping Plant	1.00	LS	Prime Contractor (No Markups)	12,293,113	0	12,293,113	0	12,293,113
14 Recreation Facilities	1.00	LS	Prime Contractor	16,167	4,893	21,060	3,807	24,867
1400 Recreation Facilities	1.00	LS	Prime Contractor	16,167	4,893	21,060	3,807	24,867
15 Floodway Control-Diversion Struc	1.00	LS	Prime Contractor	3,613,828	0	3,613,828	1,032,282	4,646,110
1500 Floodway Control-Diversion Struc	1.00	LS	Prime Contractor	3,613,828	0	3,613,828	1,032,282	4,646,110
Non-construction Costs	1.00	LS		103,924,012	0	103,924,012	0	103,924,012
01 Lands and Damages	1.00	LS		61,329,774	0	61,329,774	0	61,329,774
0123 Constructn Contract(s) Documnts/Admin Costs	1.00	LS	Government	601,967	0	601,967	0	601,967
Freshwater Wetlands	1.00	LS	Government	178,186	0	178,186	0	178,186
Saltwater Wetlands	1.00	LS	Government	423,781	0	423,781	0	423,781

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Description	Quantity	UOM	Contractor	DirectCost	SubCMU	CostToPrime	PrimeCMU	ContractCost
0123 A8 Constructn Contract(s) Documnts/Admin Costs	1.00	LS	SFWMD	3,351,119	0	3,351,119	0	3,351,119
Freshwater Wetlands	1.00	LS	SFWMD	605,054	0	605,054	0	605,054
Saltwater Wetlands	1.00	LS	SFWMD	2,746,065	0	2,746,065	0	2,746,065
Non-Federal Land Acquisition Costs	1.00	LS	SFWMD	57,376,688	0	57,376,688	0	57,376,688
Freshwater Wetlands	1.00	LS	SFWMD	17,988,614	0	17,988,614	0	17,988,614
Saltwater Wetlands	1.00	LS	SFWMD	39,388,074	0	39,388,074	0	39,388,074
30 Planning, Engineering and Design	1.00	LS		30,323,283	0	30,323,283	0	30,323,283
3023 Constructn Contracts(s) Documnts	1.00	LS	Government	20,220,000	0	20,220,000	0	20,220,000
3023 A8 Constructn Contracts(s) Documnts	1.00	LS	SFWMD	10,103,283	0	10,103,283	0	10,103,283
31 Construction Management	1.00	LS		12,270,955	0	12,270,955	0	12,270,955
3123 Construction Contracts	1.00	LS	Government	3,750,000	0	3,750,000	0	3,750,000
3123 A8 Construction Contracts	1.00	LS	SFWMD	8,520,955	0	8,520,955	0	8,520,955

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Project Direct Costs Report Page 5

Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost
Project Direct Costs Report				7,362,199	3,466,140	5,655,976	126,296,577	0	142,780,892
BBCW	1.00	EA		7,362,199	3,466,140	5,655,976	126,296,577	0	142,780,892
Construction Costs	1.00	LS		7,362,199	3,466,140	5,655,976	22,372,565	0	38,856,880
Deering Estate Flowway	1.00	LS	SFWMD	0	0	0	5,288,614	0	5,288,614
06 Fish and Wildlife Facilities	1.00	LS	SFWMD	0	0	0	1,095,719	0	1,095,719
0603 Fish and Wildlife Facilities	1.00		SFWMD	0	0	0	1,095,719	0	1,095,719
13 Pumping Plant	1.00	LS	SFWMD	0	0	0	3,694,337	0	3,694,337
1300 Pumping Plant	1.00	LS	SFWMD	0	0	0	3,694,337	0	3,694,337
14 Recreation Facilities	1.00	LS	SFWMD	0	0	0	498,558	0	498,558
1400 Recreation Facilities	1.00	LS	SFWMD	0	0	0	498,558	0	498,558
Cutler Wetlands	1.00	LS		5,017,814	2,108,648	4,530,280	3,459,784	0	15,116,527
06 Fish and Wildlife Facilities	1.00	LS	Government	0	0	0	1,095,719	0	1,095,719
0603 Fish and Wildlife Facilities	1.00		Government	0	0	0	1,095,719	0	1,095,719
09 Channels and Canals	1.00	LS		2,997,221	1,599,503	2,392,404	0	0	6,989,128
[0901] Canals	2,500.00	LF		11,096	3,672	0	0	0	14,768
[0902] Channels	1.00	EA		2,986,125	1,595,831	2,392,404	0	0	6,974,360
13 Pumping Plant	1.00	LS	Subcontractor	1,838,594	469,386	1,608,436	2,280,065	0	6,196,481
[1300] Pumping Plant	1.00	LS	Subcontractor	1,838,594	469,386	1,608,436	2,280,065	0	6,196,481
14 Recreation Facilities	1.00	LS	Prime Contractor	181,999	39,759	529,440	84,000	0	835,199
1400 Recreation Facilities	1.00	LS	Prime Contractor	181,999	39,759	529,440	84,000	0	835,199
L-31E Wetlands	1.00	LS		2,344,385	1,357,491	1,125,696	13,624,167	0	18,451,739
06 Fish and Wildlife Facilities	1.00	LS	Government	0	0	0	1,095,719	0	1,095,719
0603 Fish and Wildlife Facilities	1.00		Government	0	0	0	1,095,719	0	1,095,719
09 Channels and Canals	1.00	LS	Prime Contractor	780,154	612,275	40,482	0	0	1,432,911
0902 Canals	1.00	LS	Prime Contractor	279,234	281,398	40,482	0	0	601,114
0903 Clearing and Grubbing	200.00	ACR	Prime Contractor	500,920	330,877	0	0	0	831,797
13 Pumping Plant	1.00	LS	Prime Contractor (No Markups)	26,331	3,313	43,469	12,220,000	0	12,293,113
1300 Pumping Plant	1.00	LS	Prime Contractor (No Markups)	26,331	3,313	43,469	12,220,000	0	12,293,113
14 Recreation Facilities	1.00	LS	Prime Contractor	1,552	0	14,614	0	0	16,167
1400 Recreation Facilities	1.00	LS	Prime Contractor	1,552	0	14,614	0	0	16,167
15 Floodway Control-Diversion Struc	1.00	LS	Prime Contractor	1,536,347	741,902	1,027,131	308,448	0	3,613,828
1500 Floodway Control-Diversion Struc	1.00	LS	Prime Contractor	1,536,347	741,902	1,027,131	308,448	0	3,613,828
Non-construction Costs	1.00	LS		0	0	0	103,924,012	0	103,924,012
01 Lands and Damages	1.00	LS		0	0	0	61,329,774	0	61,329,774
0123 Constructn Contract(s)									
Documnts/Admin Costs	1.00	LS	Government	0	0	0	601,967	0	601,967
Freshwater Wetlands	1.00	LS	Government	0	0	0	178,186	0	178,186

Labor ID: LFL2009 EQ ID: EP07R03

Currency in US dollars

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Print Date Mon 21 March 2011
Eff. Date 12/28/2010

U.S. Army Corps of Engineers
Project : Biscayne Bay Coastal Wetlands Restoration - Phase 1

Time 10:48:59

Project Direct Costs Report Page 6

Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost
Saltwater Wetlands	1.00	LS	Government	0	0	0	423,781	0	423,781
0123 AS Constructn Contract(s) Documnts/Admin Costs	1.00	LS	SFWMD	0	0	0	3,351,119	0	3,351,119
Freshwater Wetlands	1.00	LS	SFWMD	0	0	0	605,054	0	605,054
Saltwater Wetlands	1.00	LS	SFWMD	0	0	0	2,746,065	0	2,746,065
Non-Federal Land Acquisition Costs	1.00	LS	SFWMD	0	0	0	57,376,688	0	57,376,688
Freshwater Wetlands	1.00	LS	SFWMD	0	0	0	17,988,614	0	17,988,614
Saltwater Wetlands	1.00	LS	SFWMD	0	0	0	39,388,074	0	39,388,074
30 Planning, Engineering and Design	1.00	LS		0	0	0	30,323,283	0	30,323,283
3023 Constructn Contracts(s) Documnts	1.00	LS	Government	0	0	0	20,220,000	0	20,220,000
3023 AS Constructn Contracts(s) Documnts	1.00	LS	SFWMD	0	0	0	10,103,283	0	10,103,283
31 Construction Management	1.00	LS		0	0	0	12,270,955	0	12,270,955
3123 Construction Contracts	1.00	LS	Government	0	0	0	3,750,000	0	3,750,000
3123 AS Construction Contracts	1.00	LS	SFWMD	0	0	0	8,520,955	0	8,520,955

Labor ID: LFL2009 EQ ID: EP07R03

Currency in US dollars

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B.4 SCHEDULE

B.4.1 Project Schedule

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Activity ID	Activity Name	Original Duration	Start	Finish	Milestone - Civil Works	Milestone - Const	Predece...	Success...
113846 C&SF:CERP:BBCW		2120.0d	09-01-09 A	02-14-18				
113846.1 PROJECT MANAGEMENT PLAN (PMP)		333.0d	09-01-09 A	12-30-10				
J114	C&SF:CERP: BBCW PMP IN-KIND FY01-FY07 (SFWMD)	333.0d	09-01-09 A	12-30-10				
113846.2 PROJECT IMPLEMENTATION REPORT (PIR)		844.0d	09-01-09 A	03-28-12				
J115	C&SF:CERP: BBCW PIR IN-KIND FY01-FY07 (SFWMD)	333.0d	09-01-09 A	12-30-10			28-L010	
N100	C&SF: CERP: BBCW PIR - DR (FY11)	251.0d	10-01-10 A	09-30-11			K104	
N101	C&SF: CERP: BBCW PIR - EN (FY11)	251.0d	10-01-10 A	09-30-11			K105	
N103	C&SF: CERP: BBCW PIR - OC (FY11)	251.0d	10-01-10 A	09-30-11			K106	
N102	C&SF: CERP: BBCW PIR - PD (FY11)	251.0d	10-01-10 A	09-30-11			K107	
N104	C&SF: CERP: BBCW PIR - OD (FY11)	251.0d	10-01-10 A	09-30-11			K102	
N106	C&SF: CERP: BBCW PIR (NL) NWW	251.0d	10-01-10 A	09-30-11			K104	
N107	C&SF: CERP: BBCW PIR (NL) FWS (FY11)	251.0d	10-01-10 A	09-30-11			K104	
N105	C&SF: CERP: BBCW PIR - RE (FY11)	251.0d	10-01-10 A	09-30-11			K108	
113846.2.1 Project Management		272.0d	10-01-10 A	09-30-11				
28-89360	FY11 - Non Labor	251.0d	10-01-10 A	09-30-11			28-89200	28-H2615
28-89400	FY11 - Labor	251.0d	10-01-10 A	09-30-11			28-89240	
28-89690	FY11 FWS	251.0d	10-01-10 A	09-30-11				
28-89740	FY11 - Labor PD (PDT Meetings)	251.0d	10-01-10 A	09-30-11				
28-89661	FY11 - Project Management	251.0d	10-01-10 A	09-30-11				
28-10646	FY11 Travel - PD	251.0d	10-01-10 A	09-30-11				
28-10647	FY11 Travel - EN	251.0d	10-01-10 A	09-30-11				
28-10648	FY11 Travel - OC	251.0d	10-01-10 A	09-30-11				
28-89205	FY11 Travel - DR	251.0d	10-01-10 A	09-30-11				
113846.2.8 Draft PIR Review and Comment		83.0d	10-01-10 A	02-02-11				
28-89366	PIR for NAB (FY11)	83.0d	10-01-10 A	02-02-11			28-89361	
113846.2.9 PIR Approval		466.0d	05-17-10 A	03-28-12				
113846.2.9.11	Federal Approval Process	157.0d	06-01-10 A	02-16-11				
28-89720	Ag Chemical/HTRW FPIR Modifications - Print PIR for SAD Review	1.0d	12-17-10	12-17-10			28-89755	28-89585, 28-89746
28-89730	Mil Cost Estimate Summary, PCX Review and Certification	48.0d	10-08-10 A	12-17-10			28-89725, 28-89735	28-89700, 28-89746
28-89755	Resolution of AgChem/HTRW Concerns	139.0d	06-01-10 A	12-17-10			28-89500	28-89720
28-89746	Transmit SAD Review of Final PIR	11.0d	12-17-10*	01-04-11			28-89450, 28-1970, 28-89720, [illegible]	28-89695
28-89695	Resolution of SAD Comments on FPIR	3.0d	01-05-11	01-07-11			28-89746	28-89700, 28-89415

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Activity ID	Activity Name	Original Duration	Start	Finish	Milestone - Civil Works	Milestone - Cost	Predece...	Success...
28-89405	Brief Division Engineer on Final PIR/NEPA (FY11)	1.0d	01-13-11*	01-13-11				28-89485
28-89485	MSC Commander's Public Notice (Complete PIR) / DE Transmittal Letter	0.0d		01-13-11	CW260		28-89405	28-1836
28-89700	Modify FPIR and Print - HQ and SAD Changes	10.0d	01-10-11	01-24-11			28-89695, 28-89730	28-9215
28-89415	NFS Letter of Support and Financial Capability Statement (FY11)	24.0d	01-10-11*	02-11-11			28-89695	28-89455
28-89455	Sponsor's Letter of Intent Received	0.0d		02-11-11			28-89415	28-9215
28-1836	HQ Review of DE Transmit/Report	20.0d	01-14-11	02-11-11			28-89485	28-1837
28-9215	Prepare Final PIR for Submittal to MSC (FY11)	1.0d	02-14-11	02-14-11			28-89455, 28-89700	28-89480, 28-89410
28-89480	Submit Final PIR/NEPA Report to MSC (165)	0.0d		02-14-11	CW160		28-9215	28-1837
28-89410	Prepare CWRB Report & DE's Transmittal Letter (FY11)	1.0d	02-15-11	02-15-11			28-9215	
28-1837	CWRB Briefing with DE and MSC	1.0d	02-15-11	02-15-11			28-89480, 28-1836	28-1842
28-1842	CWRB Complete	0.0d		02-15-11	CW245		28-1837	28-500, 28-1838, 28-5010
28-1838	Revise FPIR per CWRB Comments	1.0d	02-16-11	02-16-11			28-1842	28-89530, 28-89635
113846.2.9.10	Washington Level Review	282.0d	02-14-11	03-28-12				
28-89530	State and Agency Letters Signed and Received by District	1.0d	02-17-11	02-17-11			28-1838	28-89535
28-89535	Mail Letters and Draft Final Report	4.0d	02-14-11	02-17-11			28-89530	28-2250
28-89595	Final PIR/NEPA Report Published in the Federal Register	0.0d		02-17-11	CW250		28-89635	28-89600
28-89635	Mail Letters and Draft Final Report	1.0d	02-17-11	02-17-11			28-1838	28-89595
28-89515	Washington Level Agency and Public Review Complete	0.0d		02-18-11	CW170		28-89600	28-89605
28-89600	State, Agency and Public Review	1.0d	02-18-11	02-18-11			28-89595	28-89515
28-2250	FDEP Review (1501)	43.0d	02-18-11	04-20-11			28-89535	28-89605
28-89590	Response to Public Comments on Final PIR/NEPA Complete	0.0d		04-21-11			28-89605	28-89620
28-89605	Respond to State, Agency and Public Comments	1.0d	04-21-11	04-21-11			28-89515, 28-2250	28-89590, 28-89610
28-89610	HQ/MSC Review Conference	1.0d	04-22-11	04-22-11			28-89605	28-89620
28-89620	Policy Review Documentation	5.0d	04-25-11	04-29-11			28-89590, 28-89610	28-89585
28-89585	Filing of Final PIR/NEPA Document	1.0d	05-02-11	05-02-11			28-89620, 28-89520, 28-89645, [illegible]	28-89615
28-89615	Filing of Final EIS	0.0d		05-02-11			28-89585	28-89540
28-89540	Chief's Report	1.0d	05-03-11	05-03-11			28-89615	28-2132, 28-41110
28-2132	Submit Chief's Report	0.0d		05-03-11	CW270		28-89540	28-2134

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Activity ID	Activity Name	Original Duration	Start	Finish	Milestone - Civil Works	Milestone - Const	Predece...	Success...
28-2134	Submit Chief's Report to ASA (CW)	15.0d	05-04-11	05-24-11			28-2132	28-89545, 28-89580
28-89545	ASA(CW) Review (FY11)	30.0d	05-25-11	07-07-11			28-2134	28-89580
28-89525	ASA (CW) Memorandum to OMB Finished	0.0d		07-21-11			28-89580	28-89550
28-89580	ASA (CW) Memorandum to OMB	10.0d	07-08-11	07-21-11			28-89545, 28-2134	28-89525
28-89550	OMB Review	50.0d	07-22-11	09-30-11			28-89525	28-89575, 28-89570
28-89570	ROD Signed	1.0d	10-03-11	10-03-11			28-89550	28-89625
28-89625	Record of Decision ROD Signed	0.0d		10-03-11			28-89570	28-89555
28-89575	ASA (CW) Letter Submitted to Congress	15.0d	10-03-11	10-24-11			28-89550	28-89630
28-89630	ASA (CW) Report Submitted to Congress	0.0d		10-24-11			28-89575	28-89555
28-89555	Congressional Review	70.0d	10-25-11	02-06-12			28-89625, 28-89630	28-89565
28-2075	PIR Fiscal Closeout	0.0d		03-08-12			28-89565	28-89560
28-89565	Congressional Authorization	22.0d	02-07-12	03-08-12			28-89555	28-2075, 28-89560, 28-9880
28-2210	President Signs Authorization	0.0d		03-28-12			28-89560	28-9910
28-89560	President Signs WRDA	14.0d	03-09-12	03-28-12			28-2075, 28-89565	28-2210
113846.2.9.1	State Approval Process	189.0d	05-17-10 A	02-18-11				
28-89640	State 1501 Review (Reasonable Certainty)	185.0d	05-17-10 A	02-10-11			28-89660, 28-89665	28-89645, 28-89655
28-89655	FS 1501 DEP Approval	0.0d		02-10-11			28-89640	
28-89645	Incorporate State Comments	6.0d	02-11-11	02-18-11			28-89640	28-89585
113846.4	**WATER RESERVATIONS**	208.0d	04-01-10 A	01-28-11				
113846.4.1	**Water Reservation Rule Making of PIR#1**	208.0d	04-01-10 A	01-28-11				
28-9390	Water Reservation Process for PIR #1	208.0d	04-01-10 A	01-28-11			28-41110	28-9400
28-9400	Water Reservation Process for PIR #1 Complete	0.0d		01-28-11			28-9390	28-9910, 28-300
113846.5	**PLANS & SPECIFICATIONS (P&S)**	766.0d	10-01-10 A	10-21-13				
113846.5.1	**Project Management**	674.0d	02-16-11	10-21-13				
28-5010	Project Management (Design)	21.0d	02-16-11	03-17-11			28-1842	
28-5330	Develop FEDBiz Synopsis & Solicitation Package	18.0d	09-25-13	10-21-13			28-5325, 28-780, 28-5326	28-8000
113846.5.2	**Advanced Planning / Field Work**	297.0d	02-15-11	04-20-12				

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Activity ID	Activity Name	Original Duration	Start	Finish	Milestone - Civil Works	Milestone - Const	Predece...	Success...
113846.5.2.1	Initiate Technical Document (TD) Development	297.0d	02-15-11	04-20-12				
28-400	Technical Document (TD) Development Initiated	0.0d		02-15-11			28-500	28-53110
28-500	P&S Initiated	0.0d		02-15-11*	CW300		28-1842	28-2504, 28-400
28-2504	Obtain ROE & Start Cultural Resources Survey for PIR #1 features for PIR #1	22.0d	02-16-11	03-18-11			28-500	28-2506, 28-53110
28-5000	Permitting Activities Initiated	0.0d		09-22-11			28-53170	28-52110, 28-57100
28-300	Permitting Activities Completed	0.0d		04-20-12*	CW220		28-57126, 28-10000, 28-9400	28-8000
113846.5.3	Preliminary P&S	251.0d	10-01-10 A	09-30-11				
113846.5.3.1	30% Plans & Specification Development	251.0d	10-01-10 A	09-30-11				
28-53110	30% Plans & Specifications Development for PIR #1 Started	0.0d		03-18-11			28-2504, 28-400	28-53112, 28-53130, 28-5105,
28-53135	Drilling, Site Testing and Lab Testing (EN-G)	1.0d	03-21-11	03-21-11			28-53112	
28-5105	Perform Topographic Surveys & Design Field Work for PIR #1 (FY11)	11.0d	03-21-11	04-04-11			28-53110	28-5205
28-5110	Perform Section Corner Survey for PIR #1	20.0d	03-21-11	04-15-11			28-3840, 28-53110	28-5205
28-5205	Submittal of 30% Plans & Specifications for PIR #1	0.0d		07-12-11			28-5105, 28-53130, 28-5110	28-5210
28-53130	30% Plans & Specifications Development for PIR #1	80.0d	03-21-11	07-12-11			28-53110	28-5205
28-5210	Review & Comment on 30% Plans & Specifications for PIR #1	1.0d	07-13-11	07-13-11			28-5205	28-53150
28-53112	Geotechnical Investigation Activities	120.0d	03-21-11	09-07-11			28-53110	28-53150, 28-53135
28-53150	Submittal of Comments on 30% Plans & Specifications for PIR #1	0.0d		09-07-11			28-53112, 28-5210	28-53160, 28-5215
28-53160	Review of 30% Design Comments by Designer for PIR #1	10.0d	09-08-11	09-21-11			28-53150	28-53170
28-53170	Conference with Designer on 30% Design Comments for PIR #1	1.0d	09-22-11	09-22-11			28-53160	28-5000
N108	C&SF: CERP: BBCW P&S - EN	251.0d	10-01-10 A	09-30-11				N109, N110, N111,
N109	C&SF: CERP: BBCW P&S - PD	251.0d	10-01-10 A	09-30-11			N108	
N110	C&SF: CERP: BBCW P&S - CT	251.0d	10-01-10 A	09-30-11			N108	
N111	C&SF: CERP: BBCW P&S (NL) SAS	251.0d	10-01-10 A	09-30-11			N108	
N112	C&SF: CERP: BBCW P&S (NL) EN-D AESVCS	251.0d	10-01-10 A	09-30-11			N108	
N113	C&SF: CERP: BBCW P&S (NL) EN-G AESVCS	251.0d	10-01-10 A	09-30-11			N108	

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Activity ID	Activity Name	Original Duration	Start	Finish	Milestone - Civil Works	Milestone - Const	Predece...	Success...
113846.5.4	Intermediate P&S	111.0d	09-08-11	02-17-12				
113846.5.4.1	60% Plans & Specification Development	111.0d	09-08-11	02-17-12				
28-5215	60% Plans & Specifications Development for PIR #1	80.0d	09-08-11	01-04-12			28-53150	28-5220
28-5220	Submittal of 60% Plans & Specifications for PIR #1	0.0d		01-04-12			28-5215	28-54140
28-9980	Submittal of Comments on 60% Design	0.0d		02-02-12			28-54140	28-5115
28-54140	Review & Comment on 60% Design	20.0d	01-05-12	02-02-12			28-5220	28-9980
28-5115	Review of 60% Design Comments by Designer for PIR #1	10.0d	02-03-12	02-16-12			28-9980	28-54160
28-54160	Conference with Designer on 60% Design Comments for PIR #1	1.0d	02-17-12	02-17-12			28-5115	28-5005, 28-5225, 28-5305,
113846.5.5	Final P&S	135.0d	02-21-12	08-29-12				
113846.5.5.1	100% Plans & Specifications Development	135.0d	02-21-12	08-29-12				
28-5225	In-Progress Review (IPR) with CESAD and HQ USACE for PIR #1	1.0d	02-21-12	02-21-12			28-54160	28-5125
28-5005	Total Design Costs	13.0d	02-21-12*	03-08-12			28-54160	28-55140
28-5125	100% Plans & Specifications Development for PIR #1	80.0d	02-22-12	06-13-12			28-5225	28-5230
28-5230	Submittal of 100% Plans & Specifications for PIR #1	0.0d		06-13-12			28-5125	28-5250
28-5250	Review & Comment on 100% Plans & Specifications for PIR #1	10.0d	06-14-12	06-27-12			28-5230	28-55120
28-55120	Submittal of Comments on 100% Plans & Specifications for PIR #1	0.0d		06-27-12			28-5250	28-55130
28-55130	Review of 100% Design Comments by Designer for PIR #1	10.0d	06-28-12	07-12-12			28-55120	28-55140
28-55140	Conference with Designer on 100% Design Comments for PIR #1	1.0d	07-13-12	07-13-12			28-55130, 28-5005	28-5235
28-5235	BCOE Review of 100% Plans & Specifications for PIR #1	20.0d	07-16-12	08-10-12			28-55140	28-9077, 28-55150
28-9077	BCOE Certification of 100% Plans & Specifications for PIR #1	0.0d		08-10-12	CW320		28-5235	28-5240
28-55150	Value Engineering Review of 100% Plans & Specifications for PIR #1	5.0d	08-13-12	08-17-12			28-5235	28-55170
28-55170	Value Engineering Certification of 100% Plans & Specifications for PIR...	0.0d		08-17-12			28-55150	28-5240
28-5240	Independent Technical Review of 100% Plans & Specifications for PIR #1	1.0d	08-20-12	08-20-12			28-55170, 28-9077	28-55180
28-55180	ITR Concurrence with 100% Plans & Specifications for PIR #1	0.0d		08-20-12			28-5240	28-485
28-485	Approval of 100% Plans & Specifications for PIR #1	2.0d	08-21-12	08-22-12			28-55180	28-10330, 28-590
28-590	Development, Review, Approval of PIR #1 Plans & Specifications - Complete	0.0d		08-29-12*	CW330		28-10330, 28-485, 28-58210	28-8000
28-10330	Printing of 100% Plans & Specification Documents for PIR #1	5.0d	08-23-12	08-29-12			28-485	28-590
113846.5.6	Construction Pre-Award	71.0d	02-21-12	05-30-12				
113846.5.6.1	Contract Acquisition Strategy	71.0d	02-21-12	05-30-12				
28-5305	Contract Acquisition Strategy Meeting	1.0d	02-21-12	02-21-12			28-54160	28-5310

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Activity ID	Activity Name	Original Duration	Start	Finish	Milestone - Civil Works	Milestone - Const	Predece...	Success...
28-5310	Development of Source Selection Plan for PIR #1	60.0d	02-22-12	05-15-12			28-5305	28-5315
28-5315	Source Selection Plan Submittal for PIR #1	0.0d		05-15-12			28-5310	28-56110
28-5320	Source Selection Plan Approval for PIR #1	0.0d		05-30-12			28-56110	28-58210
28-56110	Source Selection Plan Review for PIR #1	10.0d	05-16-12	05-30-12			28-5315	28-5320
113846.5.7	Permits/WQ Cert.	275.0d	03-21-11	04-20-12				
113846.5.7.1	Permitting Actions	275.0d	03-21-11	04-20-12				
113846.5.7.1.A	1502 Water Quality Permit Activities	136.0d	09-23-11	04-10-12				
28-521	Initiate 1502 WQ Permit Process	1.0d	09-23-11*	09-23-11			28-5000	28-54120
28-541	Develop Draft 1502 WQ Permit Application	40.0d	09-26-11	11-22-11			28-52110	28-10010
28-100	PDT Review/Revision of Draft 1502 WQ Permit Application	20.0d	11-23-11	12-21-11			28-54120	28-9670
28-9670	Submit Draft 1502 WQ Permit Application to FLA	1.0d	12-22-11	12-22-11			28-10010	28-10020
28-100	Publish Notice of Intent to Permit	1.0d	12-23-11	12-23-11			28-9670	28-10022
28-100	FLA Review Draft 1502 WQ Permit Application	40.0d	12-27-11	02-23-12			28-10020	28-10024
28-100	Meeting to Discuss FLA Comments to Draft 1502 WQ Permit Application	1.0d	02-24-12	02-24-12			28-10022	28-9990
28-9990	Develop Final 1502 WQ Permit Application	10.0d	02-27-12	03-09-12			28-10024	28-9680
28-9680	Submit Final 1502 WQ Permit Application	1.0d	03-12-12	03-12-12			28-9990	28-9682
28-9682	FLA Review Final Draft 1502 WQ Permit Application	20.0d	03-13-12	04-09-12			28-9680	28-10030
28-100	1502 WQ Permit - Complete	0.0d		04-10-12			28-10030	28-300
28-100	FLA Approval of 1502 WQ Permit	1.0d	04-10-12	04-10-12			28-9682	28-10000
113846.5.7.1.B	Cultural Resources Permit Activities	275.0d	03-21-11	04-20-12				
28-2506	Perform Cultural Resources Survey for PIR #1 features	120.0d	03-21-11	09-07-11			28-2504, 28-2505	28-57100
28-5710	Cultural Resources Permit Process Initiated	0.0d		09-22-11			28-2506, 28-5000	28-57102
28-571	Develop Draft Cultural Resources Permit Application (FY11)	40.0d	09-23-11	11-21-11			28-57100	28-57104
28-571	PDT Review/Revision of Draft Cultural Resources Permit Application	20.0d	11-22-11*	12-20-11			28-57102	28-54130
28-541	Submit Draft Cultural Resources Permit Application to FLA	1.0d	12-21-11	12-21-11			28-57104	28-54132
28-541	FLA Review of Draft Cultural Resources Permit Application	40.0d	12-22-11	02-21-12			28-54130	28-54134
28-5413	Meeting to Discuss FLA Comments to Draft Cultural Resources Permit Application	1.0d	02-22-12	02-22-12			28-54132	28-57110
28-571	Develop Final Cultural Resources Permit Application	20.0d	02-23-12	03-21-12			28-54134	28-57120
28-571	Submit Final Cultural Resources Permit Application	1.0d	03-22-12	03-22-12			28-57110	28-57122
28-571	FLA Review Final Cultural Resources Permit Application	20.0d	03-23-12	04-19-12			28-57120	28-57124
28-571	FLA Approval of Final Cultural Resources Permit - Complete	0.0d		04-20-12			28-57124	28-300
28-571	FLA Approval of Final Cultural Resources Permit/Receive SHPO Letter	1.0d	04-20-12	04-20-12			28-57122	28-57126
113846.5.8	SOW Package	67.0d	05-31-12	09-04-12				
113846.5.8.1	SOW Package Development	67.0d	05-31-12	09-04-12				

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Activity ID	Activity Name	Original Duration	Start	Finish	Milestone - Civil Works	Milestone - Const	Predece...	Success...
28-58210	Develop Scope of Work for Construction	10.0d	05-31-12	06-13-12			28-5320	28-58220, 28-590
28-58220	Develop Technical Approach for Construction	20.0d	06-14-12	07-12-12			28-58210	28-58230
28-58230	Develop IGCE for Construction	10.0d	07-13-12	07-26-12			28-58220	28-58240
28-58240	Develop Project Schedule	10.0d	07-27-12	08-09-12			28-58230	28-58250
28-58250	Review of SOW Package	10.0d	08-10-12	08-23-12			28-58240	28-58260
28-58260	Revision of SOW Package	6.0d	08-24-12	08-31-12			28-58250	28-5325
28-5325	Approval of SOW Package - Transmittal to CT	1.0d	09-04-12	09-04-12			28-58260	28-5330, 28-8000, 28-5326
28-5326	SOW Package Received	0.0d		09-04-12			28-3005, 28-5325	28-5330, 28-8000
113846.6 PROJECT PARTNERSHIP AGREEMENT (PPA)		207.0d	03-09-12	01-03-13				
28-9910	PPA Initiated (L400)	0.0d		03-28-12	CW070		28-9400, 28-2210	28-6005
28-6005	Prepare Draft PPA	80.0d	03-29-12	07-20-12			28-9910	28-6010
28-6010	Review PPA	20.0d	07-23-12	08-17-12			28-6005	28-6015
28-6015	Revise PPA	20.0d	08-20-12	09-17-12			28-6010	28-6020
28-6020	Submit PPA for Approval	1.0d	09-18-12	09-18-12			28-6015	28-9340
28-9340	PPA Submitted to CESAD & HQ USACE for Approval	0.0d		11-15-12	CW080		28-6020, 28-9880	28-6027, 28-10040
28-9880	Congressional Appropriation Enacted	175.0d	03-09-12	11-15-12			28-89565	28-9340
28-10040	PPA Review by CESAD & HQ USACE	14.0d	11-16-12	12-06-12			28-9340	28-10050
28-10050	PPA Approved by CESAD & HQ USACE	0.0d		12-06-12	CW090		28-10040	28-10060
28-10060	Submit PPA Financing Plan to ASA(CW)	1.0d	12-07-12	12-07-12			28-10050	28-10070
28-10070	PPA Financing Plan submitted to ASA(CW) MS640	0.0d		12-07-12	CW090		28-10060	28-10080
28-10080	ASA(CW) Review PPA Financing Plan	13.0d	12-10-12	12-27-12			28-10070	28-6027
28-6027	PPA Approved (MS 650)	0.0d		12-27-12	CW100		28-10080, 28-9340	28-6025
28-6025	Execute PPA	4.0d	12-28-12	01-03-13			28-6027	28-9073
28-9073	PPA Executed	0.0d		01-03-13	CW130		28-6025	28-7020, 28-7015, 28-8000
113846.7 REAL ESTATE (RE)		470.0d	02-17-12	01-02-14				
113846.7.2 Acquisition		403.0d	02-17-12	09-24-13				
28-760	RE Acquisition Initiated	0.0d		02-17-12	CW340		28-54160	28-7005
28-761	CW350 Notify LS of RE Requirements	0.0d		02-17-12	CW350		28-54160	28-7005

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Activity ID	Activity Name	Original Duration	Start	Finish	Milestone - Civil Works	Milestone - Const	Predece...	Success...
28-7015	Contract Offers (willing sellers)	59.0d	01-04-13	03-29-13			28-7010, 28-9073	28-7020
28-7020	Governing Board Approval of RE Acquisition	1.0d	04-01-13	04-01-13			28-9073, 28-7015	28-7025, 28-7030
28-7030	Land Acquisition for Operations	122.0d	04-02-13	09-23-13			28-7020	28-780
28-7025	Land Acquisition for Construction	122.0d	04-03-13	09-24-13			28-7020	28-780
28-780	RE Acquisition Complete	0.0d		09-24-13	CW360		28-7030, 28-7025	28-9075, 28-5330
113846.7.3	Land Certification & Credit	470.0d	02-21-12	01-02-14				
28-7005	Title Search	59.0d	02-21-12	05-11-12			28-760, 28-761	28-7010
28-7010	Appraisals	99.0d	05-14-12	10-02-12			28-7005	28-7015
28-9075	Certify Real Estate	1.0d	09-25-13	09-25-13			28-780	28-9074
28-9074	Complete Real Estate Certification	66.0d	09-26-13	01-02-14			28-9075	28-H2613, 28-8000
113846.8	CONSTRUCTION (CONS)	753.0d	01-03-14	01-03-17				
113846.8.2	Solicitation Award	719.0d	01-03-14	11-10-16				
28-8000	Advertise Contract	32.0d	01-03-14	02-19-14			28-5330, 28-590, 28-300, [illegible]	28-950
28-950	Construction Contract Advertised	0.0d		02-19-14	CW420		28-8000	28-8020
28-8020	Bid Opening	1.0d	02-20-14	02-20-14			28-950	28-8030
28-8030	Award Construction Contract	22.0d	02-21-14	03-24-14			28-8020	28-8035
28-8035	Construction Contract Awarded	0.0d		03-24-14		CC800	28-8030	28-8040
28-8040	NTP	22.0d	03-25-14	04-23-14			28-8035	28-82200, 28-83110
113846.8.2.2	Construction Contract Administration	642.0d	04-24-14	11-10-16				
28-82200	Contract Administration	642.0d	04-24-14	11-10-16			28-8040	28-89120
113846.8.3	Construction Contract	646.0d	04-23-14	11-17-16				
28-83110	Construction Activities Initiated	0.0d		04-23-14			28-8040	28-8050
28-8050	Construct Project	646.0d	04-24-14	11-17-16			28-83110	28-970
28-970	Construction Contract Physically Complete	0.0d		11-17-16		CC840	28-8050, 28-9130	28-89110
113846.8.9	Contract Close-Out	30.0d	11-17-16	01-03-17				
113846.8.9.1	Construction Contract Closeout	30.0d	11-17-16	01-03-17				
28-89110	Contract Closeout Started	0.0d		11-17-16			28-970	28-89120
28-89120	Closeout Contract	30.0d	11-18-16	01-03-17			28-89110, 28-82200	28-H2618

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Activity ID	Activity Name	Original Duration	Start	Finish	Milestone - Civil Works	Milestone - Const	Predece...	Success...
113846.C	**PROJECT CLOSEOUT**	280.0d	01-04-17	02-14-18				
113846.C.1	**Fiscal Closure**	10.0d	01-04-17	01-18-17				
28-H2618	Construction Contract Fiscal Closeout Process	10.0d	01-04-17	01-18-17			28-89120	28-H2652
28-H2652	Construction Contract Fiscally Complete	0.0d		01-18-17		CC880	28-9700, 28-H2618	28-H2612
113846.C.3	**Transfer**	270.0d	01-18-17	02-14-18				
28-H2612	Beneficial Occupancy Date	0.0d		01-18-17		CC850	28-H2652	28-H2613
28-H2613	Acceptance by Customer (Transfer O&M Authority)	10.0d	01-19-17	02-01-17			28-9074, 28-H2612	28-H2614
28-H2614	Transfer Document Date	0.0d		02-01-17		CC890	28-H2613	28-H2615
28-H2615	Follow On O&M	260.0d	02-02-17	02-14-18			28-H2614, 28-10302, 28-89360	
113846.BY12	**FY12 BUDGET (DR-EF USE ONLY)**	250.0d	10-03-11	09-28-12				
FY12 BBCW PF	FY12 BISCAYNE BAY COASTAL WETLANDS - EXECUTE PPA	250.0d	10-03-11*	09-28-12				

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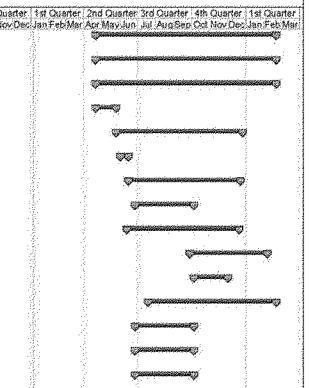
B.4.2 Construction Schedule

DEERING ESTATE FLOW WAY

ID		Task Name	Duration	Start	Finish	Predecessors
1		DEERING ESTATE FLOW WAY	217 days	Thu 4/21/11	Tue 2/21/12	
2		Pumping Plant	217 days	Thu 4/21/11	Tue 2/21/12	
3		State Expedited Features	217 days	Thu 4/21/11	Tue 2/21/12	
4		MOBILIZATION	25 days	Thu 4/21/11	Wed 5/25/11	
9		EROSION CONTROL	151 days	Thu 5/26/11	Mon 12/26/11	
15		CLEARING & SITE PREP	10 days	Thu 6/2/11	Wed 6/15/11	
20		FLOW WAY CHANNEL	135 days	Thu 6/16/11	Thu 12/22/11	
27		EDUCATIONAL WETLAND	71 days	Mon 6/27/11	Tue 10/4/11	
32		PUMP STATION	136 days	Mon 6/13/11	Tue 12/20/11	
51		CONTROL BUILDING	94 days	Wed 8/28/11	Mon 2/6/12	
87		OUTFALL PIPING	42 days	Wed 10/5/11	Thu 12/1/11	
120		SITE IMPROVEMENTS	156 days	Tue 7/19/11	Tue 2/21/12	
130		Recreation Facilities	71 days	Mon 6/27/11	Tue 10/4/11	
131		EDUCATIONAL WETLAND	71 days	Mon 6/27/11	Tue 10/4/11	
132		Wetland Hammock	71 days	Mon 6/27/11	Tue 10/4/11	



Project: DEERING ESTATE FLOW W.
Date: Wed 1/5/11

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

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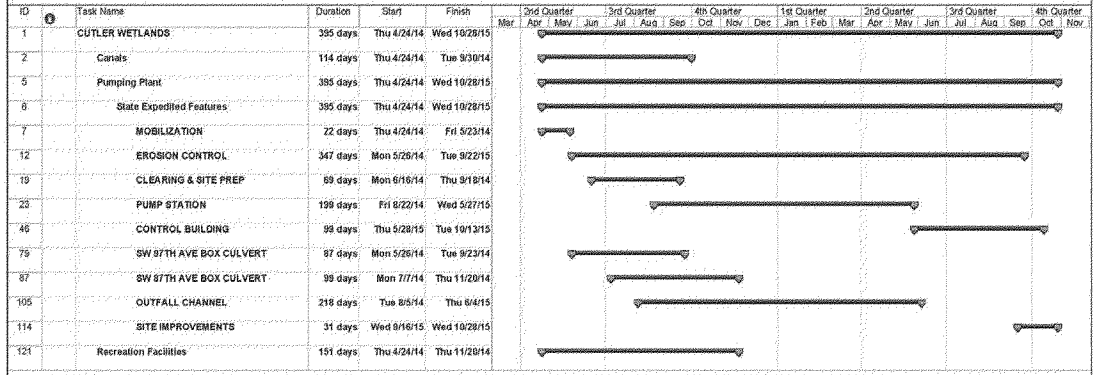
CUTLER WETLANDS

ID	Task Name	Duration	Start	Finish
1	CUTLER WETLANDS	395 days	Thu 4/24/14	Wed 10/28/15
2	Canals	114 days	Thu 4/24/14	Tue 9/30/14
5	Pumping Plant	395 days	Thu 4/24/14	Wed 10/28/15
6	State Expedited Features	395 days	Thu 4/24/14	Wed 10/28/15
7	MOBILIZATION	22 days	Thu 4/24/14	Fri 5/23/14
12	EROSION CONTROL	347 days	Mon 5/26/14	Tue 9/22/15
19	CLEARING & SITE PREP	69 days	Mon 6/16/14	Thu 9/18/14
23	PUMP STATION	199 days	Fri 8/22/14	Wed 5/27/15
46	CONTROL BUILDING	99 days	Thu 5/28/15	Tue 10/13/15
79	SW 87TH AVE BOX CULVERT	87 days	Mon 5/26/14	Tue 9/23/14
87	SW 87TH AVE BOX CULVERT	99 days	Mon 7/7/14	Thu 11/20/14
105	OUTFALL CHANNEL	218 days	Tue 8/5/14	Thu 6/4/15
114	SITE IMPROVEMENTS	31 days	Wed 9/16/15	Wed 10/28/15
121	Recreation Facilities	151 days	Thu 4/24/14	Thu 11/20/14



Project: CUTLER WETLANDS C-1 FL
Date: Wed 1/5/11

Task | Split | Progress | Milestone | Summary | Project Summary | External Tasks | External Milestone | Deadline

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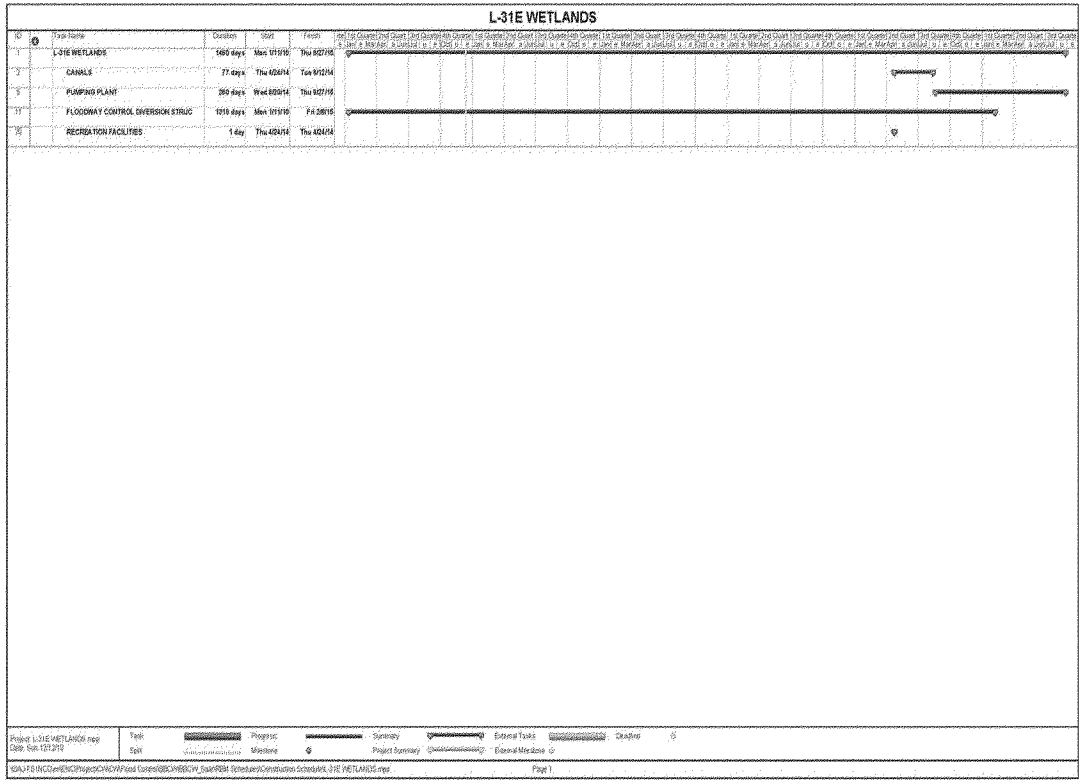

L-31E WETLANDS
ID
Task Name
Duration
Start
Finish
1 L-31E WETLANDS 1480 days Mon 1/11/10 Thu 8/27/15
2 CANALS 77 days Thu 4/24/14 Tue 8/12/14
9 PUMPING PLANT 269 days Wed 8/20/14 Thu 8/27/15
11 FLOODWAY CONTROL DIVERSION STRUC 1018 days Mon 1/11/10 Fri 3/6/15
16 RECREATION FACILITIES 1 day Thu 4/24/14 Thu 4/24/14
Project: L-31E WETLANDS.mpp
Date: Sun 12/1/2019
Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline
Page 1

B.5 RISK AND UNCERTAINTY ANALYSIS

B.5.1 Risk Analysis Methods

The risk analysis was conducted according to the procedure outlines in the manual entitled, 'Cost and Schedule Risk Analysis Process,' dated March 2008 and downloaded from the Corps' Cost Center of Expertise website. First, members of the PDT met to identify risk items, in both the construction cost estimate and the construction schedule. Then, the Risk Register was completed. After that, the Risk Model was customized using commercially available 'Crystal Ball' software. 'Most likely,' 'high,' and 'low' values were assigned to estimate items using the software's 'Assumption' function and the triangular distribution. 'Forecasts' were defined and the model run.

For the features costed by the Corps it is assumed that the work will be performed by a prudent contractor at a fair and reasonable cost. While the cost estimate analyzed in the risk analysis may contain adjustments due to quotations on direct and indirect costs, it contains no separate adjustment due to competitiveness or bid strategies (ETL 1110-2-573, 30 Sep 2008). Market conditions such as the current price of fuel are included in the estimate.

After the model was run the results were documented by extracting the sensitivity chart, the forecast chart and the percentiles table for major items. The percentiles were used to determine the contingency at the 80% confidence level. At this time, risk reduction efforts were discussed within the Engineering PDT for further discussion.

The appropriate contingencies were then applied to the MCACES/MII estimate, producing the 'After Risk Analysis' cost estimate contained herein. Upon completion of this estimate the Total Project Cost Summary was prepared.

B.5.2 Risk Analysis Results

Results of the risk analysis are shown below. First, the risk register is presented. Then, project contingency development, sensitivity, and probability charts are presented.

Biscayne Bay Coastal Wetlands- PDT Risk Register (Draft)

Risk Level

Likelihood of Occurrence	Negligible	Marginal	Significant	Critical	Crisis
Very Likely	Low	Moderate	High	High	High
Likely	Low	Moderate	High	High	High
Unlikely	Low	Low	Moderate	Moderate	High
Very Unlikely	Low	Low	Low	Low	High

Impact or Consequence of Occurrence

Overall Project Scope

Cost Impacts
For the BBCW Project, any cost impact of $10 Million or higher should be considered at least "Significant."
Anything over $4 Million should be considered at least "Marginal."

Schedule Impacts
For the BBCW Project, any schedule impact of 6 months or greater should be considered at least "Significant."
Anything over 3 months should be considered at least "Marginal."

Biscayne Bay Coastal Wetlands- PDT Risk Register (Draft)

Risk No.	Risk/Opportunity Event	Discussion and Concerns	Project Cost				Project Schedule				Variance Distribution	Correlation to Other(s)	Responsibility/POC	Affected Project Component
			Likelihood*	Impact*	Risk Level*	Rough Order Impact ($)	Likelihood*	Impact*	Risk Level*	Rough Order Impact (mo)				
Current Risks (except Risk items are those that are generated, closed, or underflow within our PDT's span of influence)														
PROJECT & PROGRAM RISKS														
PPM-1	Project Review and Authorization delays	-	-	-	-	-	Likely	Critical	LOW	6			Project Manager	Project Schedule
PPM-2	Pressure to achieve an aggressive schedule	We believe is most an aggressive to unrealistic schedule that cause delays to milestones and increase cost	Likely	Negligible	LOW	$500,000	Likely	Significant	HIGH	6			Project Manager	Project Schedule
PPM-3	Unresolved and Changing Policy Issues	-	Unlikely	Significant	MODERATE	$750,000	Unlikely	Significant	MODERATE	6			Project Sponsor(s)	Project Cost & Schedule
PPM-4	Funding Stream	Concern for funding in the future. The oil spill fund could likely be absorbed by taxpayer dollars. Budget cuts could eliminate funding for the project	-	-	-	-	Very Unlikely	Critical	LOW	12				
PPM-5	National Environmental Priority Changes	External environmental policy changes could keep the project from being implemented	-	-	-	-	Unlikely	Crisis	HIGH					
PPM-6	Staff Turnover	Large scale projects are conducive to high staff turnovers	Very Unlikely	Negligible	LOW		Very Unlikely	Negligible	LOW					
PPM-7	Priorities of Program within CERP	The national priority and policy could affect the priorities and goals of CERP leading to its demise	-	-	-	-	Very Unlikely	Critical	LOW					
CONTRACT ACQUISITION RISKS														
CA-1	Market Conditions and Bidding Competition (AB)	The current conditions suggest linear bids for construction may be received. If competition is good, contractor bids could potentially be so low should lower than the government estimate of construction cost	Likely	Marginal	MODERATE	$15,000,000	-	-	-	-				
CA-2	Possibility for Separate Contracts	Separating into different contracts would increase the overall cost of the project. Typically speaking, splitting a single contract into two can cause an increase of 10 to 15% of the overall project cost	Likely	Critical	HIGH	$10,000,000	-	-	-	-				
TECHNICAL RISKS														
TL-1	Preliminary Design	The technical basis for design of BBCW uses a lot of assumptions. There is no survey, limited Geotech investigations and existing site features that could impact the cost of the project	Very Likely	Significant	HIGH	$6,000,000	-	-	-	-			Geotechnical/Civil Design	
TL-2	Borrow Sites Secured	Borrow sites have not been identified and secured. It was assumed that all material would come from offsite locations. If the borrow sites were closer than assumed, it would be a small cost benefit	Likely	Negligible	LOW	$500,000	-	-	-	-			Geotechnical/Civil Design	
TL-3	Incomplete Hydrologic Studies	Project currently serving areas west of L-31N where stages are going to raise and discharges reduced, were identified, but the report says that the impacts to offsite drainage needed to be studied point time with no indication of when				$200,000				9				
REGULATORY, PLANNING AND ENVIRONMENTAL RISKS														

RE-1	Environmental Monitoring	Uncertainties in the species within the project funds that require environmental monitoring. Currently this cost is covered under Recover as a part of the Monitoring and Assessment Plan (MAP). There is a ongoing issue of yearly budget cuts to Recovery and the possible Recover mission may not have funding by the time construction starts. Since this has not been an issue before and Recover has had money, No one is sure who will have to absorb the monitoring costs, therefore it is assumed the project will.	Likely	Significant	HIGH	$6,500,000	Unlikely	Negligible	LOW	7			Environmental	Project Cost
RE-2	Permit delays	Systematic permitting delays may occur if there are significant environmental mitigation ATWAT issues or political opposition	Likely	Negligible	LOW	$100,000	Likely	Marginal	MODERATE	3			Environmental	
RE-3	Ag Chemicals	Substantial delays may occur if food and agriculture environmental issues associated with the ag chemicals. Chemical and special precautions may be taken to ensure the contaminants do not become bio accessible. Special conditions, testing and handling.	Very Likely	Marginal	MODERATE	$10,000,000	Likely	Significant	HIGH	24			Environmental	Project Cost & Schedule
RE-4	Birds near airport	Concern was mentioned by air Force at the Homestead Air Force Base. They have been bothered by birds flitting over planes in the past. The AF has concerned that restoration may produce more bird and pose a problem. However, restoration could also have a beneficial impact by providing birds with alternate habitat away from the airport.	Likely	Marginal	MODERATE	-	Unlikely	Marginal	LOW	3			Environmental	Project Cost
RE-5	Competition w/ Other Projects	When PRs go to HQ they are in competition with other projects for funding and priority and sometimes unresolved policy issues	-	-	-	-	Unlikely	Marginal	LOW	2			Environmental	Project Schedule
RE-6	Sea Level Rise	The implementation of estimating sea level rise in the design life of all ACOE projects could affect the project cost. This risk could be eliminated during the design phase if the is accounted for. Also, there is concern that sea level rise could cause the project to lose some of its benefits.	Likely	Marginal	MODERATE		-	-	-	-				
RE-7	Implementation of AM	The lack of project benefits achieved due to inadequate water during the dry seasons or other net fresh water issues	Unlikely	Critical	MODERATE		-	-	-	-				
RE-8	Flood Control Restrictions	Operation of the system could be restricted due to policy	Unlikely	Marginal	LOW		Very Unlikely	Marginal	LOW					
RE-9	Permit conditions	Special permit conditions must be met and can change by the implementation of the project	Unlikely	Negligible	LOW		Likely	Negligible	LOW					
CONSTRUCTION RISKS														
CON-1	Challenging and Innovative Construction	The inverted siphon feature is difficult to construct and bulky and may require special handling and innovative methods. No difficulty would occur on the construction	Unlikely	Negligible	LOW	$1,500,000	-	-	-	-			Construction	Project Cost
CON-2	Change Orders During Construction	-	Likely	Marginal	MODERATE	$3,000,000	Unlikely	Marginal	LOW	2			Construction	Project Cost & Schedule
CON-3	Safety Issues	Serious injuries could stop the project	Likely	Significant	HIGH	$10,000,000	Unlikely	Marginal	LOW	2			Construction	Project Cost & Schedule
CON-4	Staging Areas	Construction areas are sometimes not close enough to the site. This can cause ROW issues, environmental involvement and access issue problems.	Very Likely	Critical	HIGH	$12,000,000	Likely	Significant	HIGH	6			Construction	Project Cost & Schedule
CON-5	Subcontractor Capabilities	-	Unlikely	Significant	MODERATE	$10,000,000	Unlikely	Marginal	LOW	1			Construction	Project Cost
CON-6	Claims	-	Very Likely	Critical	HIGH	$12,000,000	Very Likely	Significant	HIGH	6				
ESTIMATE AND SCHEDULE RISKS														
EST-1	Quantity Estimate	The quantity of materials calculated is wrong and does not match the actual quantity resulting in a claim. The quantity calculation is now constantly changing as not a complete site survey or final design available for appropriate quantity takeoffs. An underestimation would result in higher project costs and increased construction time.	Likely	Marginal	MODERATE	$2,500,000	Likely	Marginal	MODERATE	3			Cost Engineering	Project Cost & Schedule
EST-2	Material Availability	The materials for the project are readily available and close by. Since all project features have not been identified it is a significant risk	Likely	Significant	HIGH		Likely	Negligible	LOW	1			Cost Engineering	Project Cost
EST-3	Fuel Costs	The unreliability of fuel costs could add to the cost of construction	Likely	Marginal	MODERATE		-	-	-	-				
EST-4	Production Estimates	The estimates may not reflect the actual rates achieved by the contractor	Unlikely	Marginal	LOW		Very Unlikely	Negligible	LOW					
EST-5	Equipment Availability	The need for specialized equipment could drive the cost of the project up or affect the schedule as it is not available or has to be mobilized from a great distance. Potential specialized equipment is not required for this project	Very Unlikely	Significant	LOW		Very Unlikely	Significant	LOW					
EST-6	Labor Rates	The effect of a change in national labor rates	Very Unlikely	Marginal	LOW		-	-	-	-				

EST-7	Pump Station Historical Pricing	The 4 different pump stations on L-31E are still in the feasibility stage due to the PIR. A pump station historical pricing spreadsheet was used to determine what the costs will most likely be for the four different pump stations. When the seven pricing sets are, they could be higher or lower than the values indicated by the spreadsheet	Likely	Marginal	MODERATE		-	-	-	-			Cost Engineering	Project Cost
REAL ESTATE AND LEGAL RISKS															
REL-1	Cooperative Agreements	Negotiation of cooperative and supplemental agreements with state and local government entities in conformity with the master agreement	Very Likely	Marginal	MODERATE	$500,000	Very Unlikely	Negligible	LOW	0			Office of Counsel	Project Cost
REL-2	Project Partnership Agreement	Successful negotiation of PPA with sponsor(s)	Very Likely	Marginal	MODERATE	$100,000	Very Unlikely	Crisis	HIGH	6			Office of Counsel	Project Cost & Schedule
REL-3	Condemnations	Popular name condemn. Takes from private land owners.	Very Likely	Critical	HIGH	$2,000,000	Likely	Critical	HIGH	9			Office of Counsel	Project Cost
REL-4	Property Values	The anticipated values of property are constantly changing and considering the condition of the economy at the time, prices are constantly changing. It could have a positive or negative effect on the project. LED Estimates could also be flawed. Historically speaking, they are usually underestimated	Likely	Crisis	HIGH	$50,000,000	Unlikely	Negligible	LOW	0			Real Estate	Project Cost
REL-5	Land Acquisition Delays	SFWMD has acquired some land and still working on acquiring the remainder. Depends on willing seller, willing buyer in coordination.	Likely	Critical	HIGH	$2,000,000	Likely	Critical	HIGH	6			Real Estate	Project Cost & Schedule
REL-6	Objections to Appraisals	Objections to appraisals are very common and the owners attorney fees and appraiser fees contribute to additional costs. Project land not acquired could keep the project from going to construction	Very Likely	Significant	HIGH	$2,000,000	Likely	Significant	HIGH	6			Real Estate	Project Cost & Schedule
REL-7	Known and unknown utility impacts	Utility locations can be easily identified. However, even in the begin work of the project it is likely there will be unknowns and unprecedented utilities within the project site. The impacts can be significant	Likely	Significant	HIGH	$1,000,000	Likely	Significant	HIGH	6			Real Estate	Project Cost & Schedule
REL-8	Land Certification Delay	Land certification depends on much coordination with SFWMD. Communication challenges and changes can hinder the schedule. Work can't be advanced until PPA is signed	Likely	Negligible	LOW	-	Likely	Critical	HIGH	6			Real Estate	Project Schedule
REL-9	Inverse Condemnation Actions	Having a landowner sue the government for unjust compensation for property	Very Likely	Critical	HIGH		Likely	Significant	HIGH					
REL-10	Court Injunctions	-	Unlikely	Significant	MODERATE		Unlikely	Crisis	HIGH					
REL-11	Condemnations	-	Very Likely	Critical	HIGH		Likely	Critical	HIGH					
REL-12	Quality of L&D Estimates	L&D Estimates could be flawed. Historically speaking, they are usually underestimated, but no matter the budget, it is a big uncertainty	Likely	Critical	HIGH		Very Likely	Critical	HIGH					
REL-13	SFWMD regulatory permits	Land owners and developers have been issued permits by SFWMD. Their permit conditions will change and can impact their projects as the SRCW project is implemented	Unlikely	Negligible	LOW	-	Unlikely	Marginal	LOW	1			Real Estate	Project Schedule
Programmatic Risks (Cross-cutting items are those that are common or applicable to multiple risk factors or areas of influence)															
PR-1	Funding Stream	Concern for funding in the future. The no-split bid not must likely be disturbed by budget delays. Budget cuts could eliminate funding for the project or delayed in the out FY	-	-	-	-	Very Unlikely	Crisis	HIGH	10			Project Manager	Project Schedule
PR-2	National Environmental Priority Changes	National environmental policy changes could keep the project from being implemented	-	-	-	-	Very Unlikely	Crisis	HIGH	Indefinitely			Project Manager	Project Schedule
PR-3	Market Condition and Bidding Competition (All)	The current competitive bidding climate by construction firms be moderate. If competition is good, contractor bids could approach that to be certain lower than the government estimate of construction cost	Likely	Marginal	MODERATE	$15,000,000	-	-	-	-			Cost Engineering	
PR-4	Inverse Condemnation Actions	Having a landowner sue the government for a taking of the property without payment of just compensation	Very Likely	Marginal	MODERATE	$2,000,000	Likely	Significant	HIGH	6			Office of Counsel	Project Cost & Schedule
PR-5	Court Injunctions	State or federal courts enjoin construction of the project	Unlikely	Negligible	LOW	$50,000	Unlikely	Significant	MODERATE	0			Office of Counsel	Project Schedule
PR-6	Property Values	The anticipated values of property are constantly changing and considering the condition of the economy at the time, prices are constantly changing. It could have a positive or negative effect on the project. L&D Estimates could also be flawed. Historically speaking, they are usually underestimated	Likely	Crisis	HIGH	$50,000,000	Unlikely	Negligible	LOW	0			Real Estate	Project Cost
PR-7	Land Acquisition Delays	SFWMD has acquired some land and still working on acquiring the remainder. Depends on willing seller, willing buyer in coordination	Likely	Marginal	MODERATE	$2,000,000	Likely	Significant	HIGH	6			Real Estate	Project Cost & Schedule
PR-8	Objections to Appraisals	Objections to appraisals are very common and the owners attorney fees and appraiser fees contribute to additional costs. Project land not acquired could keep the project from going to construction	Very Likely	Marginal	MODERATE	$2,000,000	Likely	Significant	HIGH	6			Real Estate	Project Cost & Schedule
PR-9	Claims	-	Very Likely	Critical	HIGH	$10,000,000	Very Likely	Significant	HIGH	6			Construction	Project Cost & Schedule

PR-10	Staff Turnover	Large scale projects are conducive to high staff turnovers while funded and time required for new employees to be "hard at" would be some component to overall project cost	Very Unlikely	Negligible	LOW	MODIFY	Very Unlikely	Negligible	LOW	6.5			Project Manager	Project Schedule
PR-11	Priorities of Program within CERP	The external priority and policy could affect the priorities and goals of CERP needing to be revised	-	-	-	-	Very Unlikely	Critical	LOW	Indefinitely			Project Manager	Project Schedule
PR-12	Competition w/ Other Projects	Votes Pitts go to HIS they are in competition with other projects for funding and priority and sometimes unrealized policy issues	-	-	-	-	Unlikely	Marginal	LOW	2			Environmental	Project Schedule
PR-13	Fuel Costs												Cost Engineering	

1. Risk/Opportunity identified with reference to the Risk Identification Checklist and through deliberation and study of the PDT.
2. Discussions and Concerns elaborates on Risk/Opportunity Events and includes any assumptions or findings (should contain information pertinent to overview study and analysis of event's impact to project).
3. Likelihood is a measure of the probability of the event occurring – **Very Unlikely**, **Unlikely**, **Moderately Likely**, **Likely**, **Very Likely**. The likelihood of the event will be the same for both Cost and Schedule, regardless of impact.
4. Impact is a measure of the event's affect on project objectives with relation to scope, cost, and/or schedule – Negligible, Marginal, Significant, Critical, or Crisis. Impacts on Project Cost may vary in severity from impacts on Project Schedule.
5. Risk Level is the resultant of Likelihood and Impact Low, **Moderate**, or **High**. Refer to the matrix located at top of page.
6. Variance Distribution refers to the behavior of the individual risk item with respect to its potential affects on Project Cost and Schedule. For example, an item with clearly defined parameters and a solid most likely scenario would probably follow a triangular or normal distribution. A risk item for which the PDT has little data or probability of modeling with respect to effects on cost or schedule (i.e. "anyone's guess") would probably follow a uniform or discrete uniform distribution.
7. The responsibility or POC is the entity responsible as the Subject Matter Expert (SME) for action, monitoring, or information on the PDT for the identified risk or opportunity.
8. Correlation recognizes those risk events that may be related to one another. Care should be given to ensure the risks are handled correctly without a "double counting."
9. Affected Project Component identifies the specific item of the project to which the risk directly or strongly correlates.
10. Project Implications identifies whether or not the risk item affects project cost, project schedule, or both. The PDT is responsible for conducting studies for both Project Cost and for Project Schedule.
11. Results of the risk identification process are studied and further developed by the Cost Engineer, then analyzed through the Monte Carlo Analysis Method for Cost (Contingency) and Schedule (Escalation) Growth.

Likelihood of Occurrence	
Very Likely	75-100%
Likely	45-75%
Unlikely	15-45%
Very Unlikely	0-15%

Impact of Consequence of Occurrence			
Negligible	<1%	<1.8 M	<1 mo.
Marginal	1-5%	1.8 M to 9	1 - 5 mos.
Significant	5-7%	9 M to 12.6	5 - 7 mos.
Critical	7-10%	12.6 to 18	7 - 10 mos.
Crisis	>10%	>18	>10 mos.

USACE Jacksonville District
Biscayne Bay Coastal Wetlands
Biscayne Bay, FL

Initial Risk Register Development Meeting

Date

No.	Name	Section	Title
1	Jim Burch	RE-S	
2	Brad Cox	RE-S	
3	Eunice Ford	DR-PO	
4	Bill Gallagher	PD-PW	
5	Ryan Grove	EN-WM	
6	Karen Martin	DR-H	
7	Robert Medlock	DR-PO	
8	Mike Miller	EN-C	
9	Steve Myers	EN-GG	
10	Don Nelson	OC	
11	Mark Shafer	PD-EQ	
12	Brad Tarr	PD-ES	
13	Frank zepka	EN-GE	
14	Rudy Wynn	DR-EPJV	
15	Elizabeth Palmer	DR-EPJV	
16			
17			
18			
19			

Follow-Up Discussions

Dates

No.	Name	Section	Title
1	Rudy Wynn	DR-EPJV	
2	Don Nelson	OC	
3			
4			

Contingency on Base Estimate	80% Confidence Project Cost
Baseline Estimate Cost (Most Likely) ->	$149,992,428
Baseline Estimate Cost Contingency Amount ->	$42,854,924
Baseline Estimate Construction Cost (80% Confidence) ->	$192,847,352

Contingency on Schedule	80% Confidence Project Schedule
Project Schedule Duration (Most Likely) ->	83.5 Months
Schedule Contingency Duration ->	52.9 Months
Project Schedule Duration (80% Confidence) ->	136.4 Months
Project Schedule Contingency Amount (80% Confidence) ->	$9,884,938

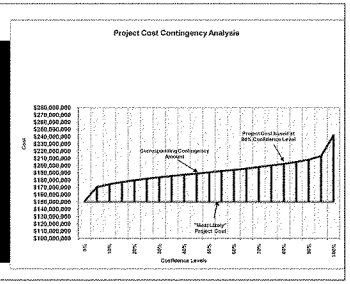
Project Contingency	80% Confidence Project Cost
Project Contingency Amount (80% Confidence) ->	$52,369,458
Project Contingency Percentage (80% Confidence) ->	35%

Project Cost (80% Confidence) ->	$202,341,885

- PROJECT CONTINGENCY DEVELOPMENT -

Contingency Analysis

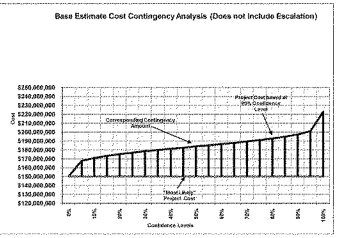
Most Likely Cost Estimate	$149,992,428		
Confidence Level	Project Cost	Contingency	Contingency %
0%	$150,665,908	$673,480	0.45%
5%	$170,543,581	$20,551,153	13.70%
10%	$174,573,778	$24,581,350	16.39%
15%	$177,478,001	$27,485,573	18.32%
20%	$179,685,476	$29,693,048	19.97%
25%	$182,033,959	$32,041,531	21.36%
30%	$183,991,016	$33,998,588	22.67%
35%	$185,831,968	$35,839,480	23.89%
40%	$187,524,631	$37,532,203	25.02%
45%	$189,108,203	$39,115,775	26.08%
50%	$190,580,601	$40,588,173	27.25%
55%	$192,589,428	$42,567,010	28.38%
60%	$194,196,910	$44,204,082	29.47%
65%	$195,996,201	$46,003,773	30.67%
70%	$197,843,150	$47,850,722	31.97%
75%	$200,122,483	$50,130,055	33.42%
80%	$202,341,885	$52,349,458	34.90%
85%	$205,011,958	$55,019,530	36.68%
90%	$208,463,786	$58,471,358	38.94%
95%	$213,892,613	$63,900,185	42.40%
100%	$241,814,872	$91,822,344	61.22%



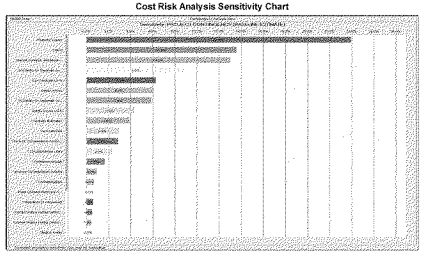
- BASE CONTINGENCY DEVELOPMENT -

Contingency Analysis

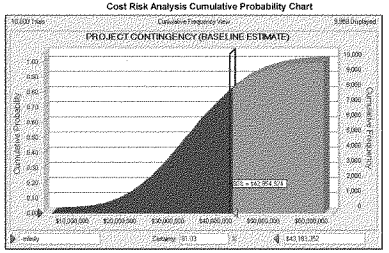
Most Likely Cost Estimate	$149,992,428		
Confidence Level	Project Cost	Contingency	Contingency %
0%	$150,418,005	$425,577,10	0.28%
5%	$167,827,046	$17,834,618.10	11.78%
10%	$170,936,788	$20,944,359.71	13.96%
15%	$173,384,368	$23,273,380.28	15.52%
20%	$175,235,389	$25,232,961.19	16.92%
25%	$176,526,482	$26,834,034.35	17.96%
30%	$178,476,543	$28,485,814.95	18.99%
35%	$179,542,841	$29,950,413.39	19.97%
40%	$181,279,166	$31,286,879.60	20.86%
45%	$182,602,154	$32,599,726.00	21.67%
50%	$183,921,758	$33,928,330.22	22.62%
55%	$185,267,973	$35,275,244.72	23.52%
60%	$186,640,780	$36,648,271.81	24.37%
65%	$187,864,186	$37,861,727.89	25.31%
70%	$189,482,237	$39,489,308.91	26.31%
75%	$191,160,928	$41,168,000.61	27.45%
80%	$192,847,352	$42,854,923.60	28.57%
85%	$194,871,139	$44,878,710.56	29.92%
90%	$197,413,134	$47,420,705.71	31.62%
95%	$201,328,887	$51,336,469.04	34.22%
100%	$222,084,586	$72,312,078.48	48.54%



Cost Risk Analysis Sensitivity Chart



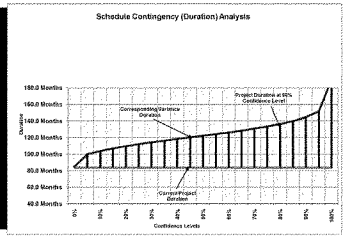
Cost Risk Analysis Cumulative Probability Chart



- SCHEDULE CONTINGENCY (DURATION) DEVELOPMENT -

Contingency Analysis

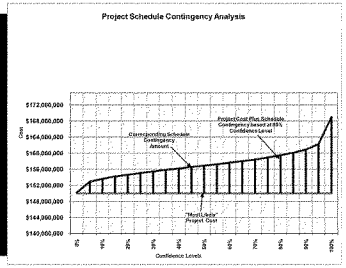
Most Likely Schedule Duration	92.5 Months		
Confidence Level	Project Duration	Contingency	Contingency %
0%	84.9 Months	1.4 Months	1.65%
5%	99.7 Months	16.3 Months	19.44%
10%	103.7 Months	20.2 Months	24.28%
15%	106.9 Months	23.4 Months	28.08%
20%	109.4 Months	25.9 Months	31.07%
25%	111.9 Months	28.4 Months	34.05%
30%	114.2 Months	30.7 Months	36.75%
35%	116.3 Months	32.8 Months	39.26%
40%	118.3 Months	34.8 Months	41.64%
45%	120.3 Months	36.8 Months	44.04%
50%	122.1 Months	38.6 Months	46.26%
55%	124.1 Months	40.6 Months	48.61%
60%	126.1 Months	42.6 Months	51.04%
65%	128.3 Months	44.8 Months	53.62%
70%	130.7 Months	47.2 Months	56.58%
75%	133.4 Months	49.9 Months	59.78%
80%	136.6 Months	52.9 Months	63.39%
85%	139.9 Months	56.4 Months	67.61%
90%	144.7 Months	61.2 Months	73.27%
95%	151.8 Months	68.3 Months	81.76%
100%	169.3 Months	105.8 Months	126.74%



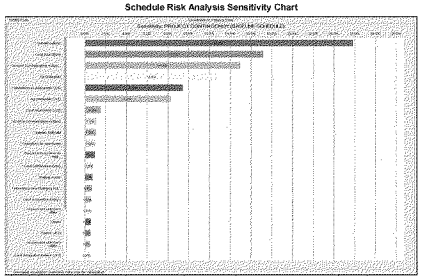
- SCHEDULE CONTINGENCY (AMOUNT) DEVELOPMENT -

Contingency Analysis

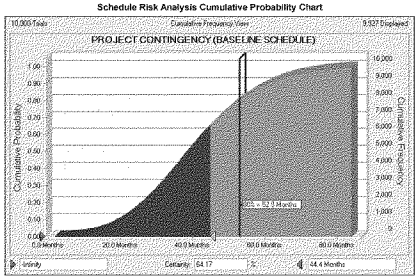
Most Likely Cost Estimate	$149,992,428		
Confidence Level	Project Cost	Contingency	Contingency %
0%	$150,240,391	$247,963	0.17%
5%	$152,908,942	$2,916,514	1.94%
10%	$153,629,419	$3,636,991	2.42%
15%	$154,204,120	$4,211,692	2.81%
20%	$154,662,615	$4,670,187	3.11%
25%	$155,099,934	$5,107,506	3.41%
30%	$155,505,201	$5,512,773	3.68%
35%	$155,891,494	$5,899,066	3.93%
40%	$156,237,952	$6,245,524	4.16%
45%	$156,590,477	$6,598,049	4.40%
50%	$156,931,271	$6,938,843	4.63%
55%	$157,284,194	$7,291,766	4.86%
60%	$157,848,239	$7,855,810	5.10%
65%	$158,034,473	$8,042,045	5.36%
70%	$158,473,341	$8,480,913	5.65%
75%	$158,883,983	$8,891,555	5.97%
80%	$159,486,983	$9,494,555	6.33%
85%	$160,132,247	$10,140,819	6.76%
90%	$160,983,080	$10,990,652	7.33%
95%	$162,206,146	$12,213,718	8.18%
100%	$169,002,394	$19,010,166	12.67%

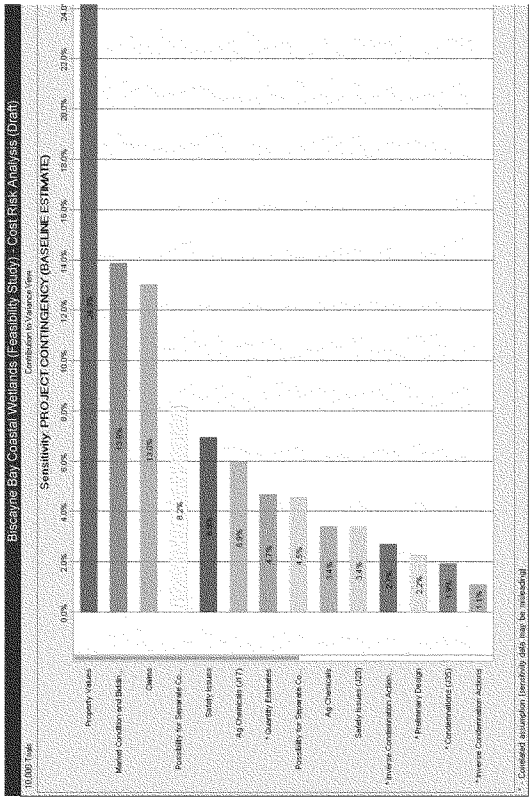


Schedule Risk Analysis Sensitivity Chart



Schedule Risk Analysis Cumulative Probability Chart




Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost Risk Analysis (Draft)
Contribution to Variance View
Sensitivity: PROJECT CONTINGENCY (BASELINE ESTIMATE)
10,000 Trials
0.0%
2.0%
4.0%
6.0%
8.0%
10.0%
12.0%
14.0%
16.0%
18.0%
20.0%
22.0%
24.0%
Property Values
Market Condition and Bidder
Claims
Possibility for Separate Co...
Safety Issues
Ag Chemicals (J17)
* Quantity Estimates
Possibility for Separate Co...
Ag Chemicals
Safety Issues (J23)
* Inverse Condemnation Action...
* Preliminary Design
* Condemnations (J35)
* Inverse Condemnation Actions
* Correlated assumption (sensitivity data may be misleading)

Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost Risk Analysis Model (Draft)

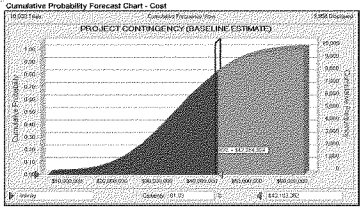
Risk No.	Risk/Opportunity Event	Project Cost: Likelihood*	Project Cost: Impact*	Project Cost: Risk Level*	Crystal Ball Simulation: Variance Distribution	Correlation to Other(s)	Probability of Occurrence	Expected Values ($$): Low	Expected Values ($$): Most Likely	Expected Values ($$): High	Contingency Model	Notes	Expected Values (%): Low	Expected Values (%): Most Likely	Expected Values (%): High
Internal Risks (Internal Risk items are those that are generated, caused, or controlled within the PDT's sphere of influence.)															
PROJECT & PROGRAM RISKS															
PPM-3	Unresolved and Changing Policy Issues	Unlikely	Significant	MODERATE	Yes-NotUniform	N/A	25%	$0	$0	$250,000	$0		0.00%	0.00%	0.00%
CONTRACT ACQUISITION RISKS															
CA-1	Market Condition and Bidding Competition (All)	Likely	Marginal	MODERATE	Triangular	N/A	100%	(17,557,450)	$0	$2,870,400	$0		-4.24%	0.00%	4.55%
CA-2	Possibility for Separate Contracts	Likely	Critical	HIGH	Yes-NotUniform	N/A	95%	$0	$0	$12,288,346	$0		0.00%	0.00%	6.20%
TECHNICAL RISKS															
TL-1	Preliminary Design	Very Likely	Significant	HIGH	Triangular	EST-1	100%	(8,100,000)	$0	$1,470,000	$0	*Correlated to EST-1 by factor of 0.5*	-0.49%	0.00%	0.89%
REGULATORY AND ENVIRONMENTAL RISKS															
RE-1	Environmental Monitoring	Likely	Significant	HIGH	Yes-NotUniform	N/A	85%	$0	$0	$3,780,419	$0		0.00%	0.00%	2.29%
RE-3	Ag Chemicals	Very Likely	Marginal	MODERATE	Yes-NotUniform	N/A	85%	$0	$0	$10,000,000	$0		0.00%	0.00%	6.07%
RE-4	Birds near airport	Likely	Marginal	MODERATE	Triangular	N/A	100%	$0	$0	$25,000	$0		0.00%	0.00%	0.02%
RE-6	Sea Level Rise	Likely	Marginal	MODERATE	Triangular	N/A	100%	$0	$0	$95,000	$0		0.00%	0.00%	0.06%
RE-7	Implementation of RM	Unlikely	Critical	MODERATE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	*This risk is a cross-cutter. Therefore, it was not applied for cost impacts.*	N/A	N/A	N/A
CONSTRUCTION RISKS															
CON-2	Change Orders During Construction	Likely	Marginal	MODERATE	Yes-NotUniform	N/A	85%	$0	$0	$3,000,000	$0		0.00%	0.00%	2.40%
CON-3	Safety Issues	Likely	Significant	HIGH	Yes-NotUniform	N/A	85%	$0	$0	$10,000,000	$0		0.00%	0.00%	7.20%
CON-4	Staging Areas	Very Likely	Critical	HIGH	Triangular	N/A	100%	$0	$0	$1,767,000	$0		0.00%	0.00%	1.16%
CON-5	Subcontractor Capabilities	Unlikely	Significant	MODERATE	Triangular	N/A	100%	(3,000,000)	$0	$2,500,000	$0		-0.28%	0.00%	1.87%
CON-6	Claims	Very Likely	Critical	HIGH	Uniform	N/A	100%	$0	$0	$12,000,000	$0		0.00%	0.00%	8.48%
ESTIMATE AND SCHEDULE RISKS															
EST-1	Quantity Estimates	Likely	Marginal	MODERATE	Triangular	TL-1	100%	(3,174,000)	$0	$6,000,000	$0	*Correlated to TL-1 by factor of 0.5*	-2.01%	0.00%	4.04%
EST-2	Material Availability	Likely	Significant	HIGH	Triangular	N/A	100%	(2,143,000)	$0	$1,037,182	$0		-0.35%	0.00%	0.70%
EST-3	Fuel Costs	Likely	Marginal	MODERATE	Triangular	N/A	100%	(3,000,000)	$0	$1,020,000	$0		-0.35%	0.00%	0.67%
EST-7	Pump Stations Historical Pricing	Likely	Marginal	MODERATE	Triangular	N/A	100%	(11,100,000)	$0	$2,440,000	$0		-0.78%	0.00%	1.60%
REAL ESTATE AND LEGAL RISKS															
REL-1	Compensation Agreements	Very Likely	Marginal	MODERATE	Uniform	N/A	100%	$0	$0	$96,000	$0		0.00%	0.00%	0.02%
REL-2	Project Partnership Agreements	Very Likely	Marginal	MODERATE	Uniform	N/A	100%	$0	$0	$150,000	$0		0.00%	0.00%	0.07%
REL-3	Condemnations	Very Likely	Critical	HIGH	Yes-NotUniform	N/A	85%	$0	$0	$2,000,000	$0		0.00%	0.00%	1.20%
REL-4	Property Values	Likely	Crisis	HIGH	Triangular	N/A	100%	(51,000,000)	$0	$20,000,000	$0		-13.39%	0.00%	13.39%
REL-5	Land Acquisition Delays	Likely	Critical	HIGH	N/A	N/A	N/A	N/A	N/A	N/A	N/A	*Good risk captured by REL-4. This issue is primarily a schedule risk.*	N/A	N/A	N/A
REL-6	Objections to Appraisals	Very Likely	Significant	HIGH	Yes-NotUniform	N/A	85%	$0	$0	$2,000,000	$0		0.00%	0.00%	1.20%
REL-7	Known and unknown utility impacts	Likely	Significant	HIGH	Triangular	N/A	100%	$0	$0	$600,000	$0		0.00%	0.00%	0.58%
REL-9	Inverse Condemnation Actions	Very Likely	Critical	HIGH	Yes-NotUniform	REL-3/REL-6	85%	$0	$0	$6,000,000	$0	*Correlated to REL-3 by a factor of 0.75 and REL-6 by a factor of 0.25*	0.00%	0.00%	3.59%
REL-12	Quality of L&D Estimates	Likely	Critical	HIGH	N/A	N/A	N/A	N/A	N/A	N/A	N/A	*This risk is already captured by REL-4*	N/A	N/A	N/A
Programmatic Risks (Internal Risk items are those that are generated, caused, or controlled within the PDT's sphere of influence.)															
PR-3	Market Condition and Bidding Competition (All)	Likely	Marginal	MODERATE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	*This risk is already captured by CA-1*	N/A	N/A	N/A
PR-4	Inverse Condemnation Actions	Very Likely	Marginal	MODERATE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	*This risk is already captured by REL-9*	N/A	N/A	N/A
PR-6	Property Values	Likely	Crisis	HIGH	N/A	N/A	N/A	N/A	N/A	N/A	N/A	*This risk is already captured by REL-4*	N/A	N/A	N/A

Percentages are calculated as the variance from the assumption value to facilitate depiction of the model should the cost values change throughout the project phase. Uniform distribution percentages reflect variation from the total project cost.

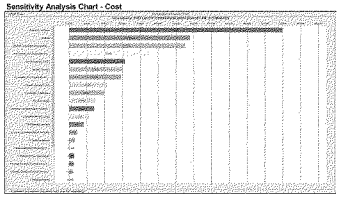
PR-7	Land Acquisition Delays	Likely	Marginal	MODERATE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	This risk is already captured by ARL-4	N/A	N/A	N/A
PR-8	Objections to Appraisals	Very Likely	Marginal	MODERATE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	This risk is already captured by ARL-4	N/A	N/A	N/A
PR-9	Claims	Very Likely	Critical	[illegible]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	This risk is already captured by CON-9	N/A	N/A	N/A

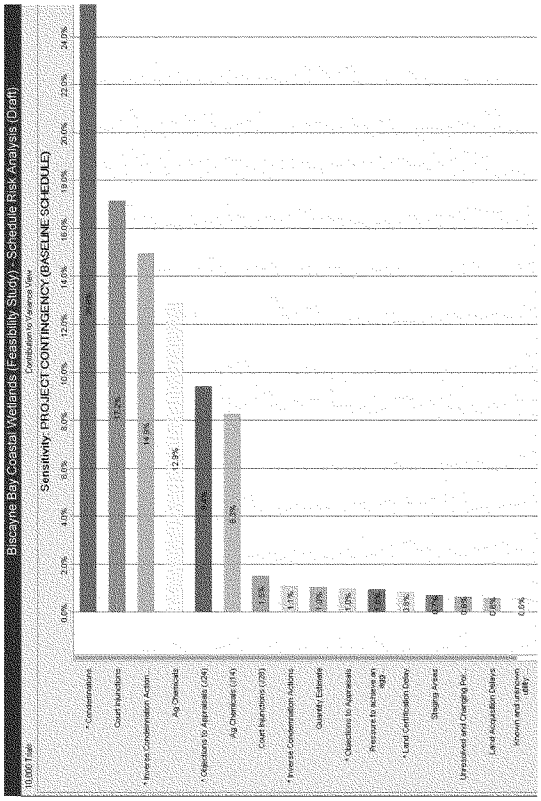
PROJECT CONTINGENCY (BASELINE ESTIMATE)	Percentile	Baseline TPC	Contingency Amount	Baseline w/ Contingency	Contingency %
	0%	$149,992,428	$425,277	$150,418,699	0.28%
	5%	$149,992,428	$17,634,616	$167,627,046	11.76%
	10%	$149,992,428	$20,844,360	$170,836,788	13.96%
	15%	$149,992,428	$23,271,880	$173,266,308	15.52%
	20%	$149,992,428	$25,233,861	$175,226,289	16.82%
	25%	$149,992,428	$26,934,024	$176,926,452	17.96%
	30%	$149,992,428	$28,455,815	$178,448,243	18.98%
	35%	$149,992,428	$29,950,413	$179,942,841	19.97%
	40%	$149,992,428	$31,285,680	$181,278,108	20.86%
	45%	$149,992,428	$33,526,726	$183,503,154	21.87%
	50%	$149,992,428	$33,525,330	$183,521,758	22.42%
	55%	$149,992,428	$35,275,245	$185,267,673	23.52%
	60%	$149,992,428	$35,948,277	$185,940,705	24.17%
	65%	$149,992,428	$37,961,708	$187,954,136	25.31%
	70%	$149,992,428	$39,469,809	$189,462,237	26.31%
	75%	$149,992,428	$41,168,501	$191,160,929	27.49%
	80%	$149,992,428	$42,654,924	$192,647,352	28.57%
	85%	$149,992,428	$44,678,711	$194,671,139	29.92%
	90%	$149,992,428	$47,420,706	$197,413,134	31.62%
	95%	$149,992,428	$51,136,469	$201,128,897	34.12%
	100%	$149,992,428	$72,972,076	$222,964,504	48.60%

Cumulative Probability Forecast Chart - Cost



Sensitivity Analysis Chart - Cost




Biscayne Bay Coastal Wetlands (Feasibility Study) - Schedule Risk Analysis (Draft)
Sensitivity: PROJECT CONTINGENCY (BASELINE SCHEDULE)
10,000 Trials
Contribution to Variance Value
0.0%
2.0%
4.0%
6.0%
8.0%
10.0%
12.0%
14.0%
16.0%
18.0%
20.0%
22.0%
24.0%
* Condemnations
Court Injunctions
* Inverse Condemnation Action
Ag Chemicals
* Objections to Appraisals (J24)
Ag Chemicals (J14)
Court Injunctions (J29)
* Inverse Condemnation Actions
Quantity Estimate
* Objections to Appraisals
Pressure to achieve an agg
* Land Certification Delay
Staging Areas
Unresolved and Changing Pol
Land Acquisition Delays
Known and unknown utility
15.2%
14.9%
12.9%
9.4%
8.3%
1.5%
1.1%
1.0%
1.0%
0.8%
0.6%
0.6%
0.6%
0.6%

Biscayne Bay Coastal Wetlands (Feasibility Study) - Schedule Risk Analysis Model (Draft)

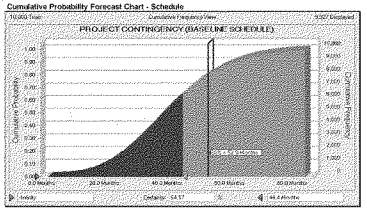
Risk No.	Risk/Opportunity Event	Project Schedule: Likelihood[a]	Project Schedule: Impact[a]	Project Schedule: Risk Level[a]	Variance Distribution	Correlation to Other(s)	Probability of Occurrence	Crystal Ball Simulation: Expected Values (Months): Low	Most Likely	High	Contingency Model	Notes	Expected Values (%): Low	Most Likely	High
Internal Risks (internal risk items are those that are generated, caused, or controlled within the PDT's sphere of influence)															
PROJECT & PROGRAM MGMT															
PPM-1	Project Review and Authorization delays	Likely	Critical	HIGH	Triangular	N/A	100%	0.0 Months	0.0 Months	4.0 Months	0.0 Months		0.00%	0.00%	4.10%
PPM-2	Pressure to achieve an aggressive schedule	Likely	Significant	HIGH	Uniform	N/A	100%	-6.0 Months	0.0 Months	0.0 Months	0.0 Months		7.19%	0.00%	0.00%
PPM-3	Unassessed and Changing Policy Issues	Unlikely	Significant	MODERATE	Yes-Not Uniform	N/A	25%	0.0 Months	0.0 Months	6.0 Months	0.0 Months		0.00%	0.00%	7.19%
REGULATORY AND ENVIRONMENTAL RISKS															
RE-2	Permit delays	Likely	Marginal	MODERATE	Yes-Not Uniform	N/A	85%	0.0 Months	0.0 Months	3.0 Months	0.0 Months		0.00%	0.00%	3.59%
RE-3	Leg Challenges	Likely	Significant	HIGH	Yes-Not Uniform	N/A	60%	0.0 Months	0.0 Months		0.0 Months		0.00%	0.00%	0.00%
CONSTRUCTION RISKS															
CON-4	Staging Areas	Likely	Significant	HIGH	Triangular	N/A	100%	0.0 Months	0.0 Months	0.0 Months	0.0 Months		0.00%	0.00%	7.19%
CON-5	Claims	Very Likely	Significant	HIGH	Yes-Not Uniform	N/A	40%	0.0 Months	0.0 Months	0.0 Months	0.0 Months		0.00%	0.00%	7.19%
ESTIMATE AND SCHEDULE RISKS															
EST-1	Quantity Estimate	Likely	Marginal	MODERATE	Triangular	T_{-1}	100%	-2.0 Months	0.0 Months	5.0 Months	0.0 Months	*Correlated to T_{-1} by factor of 0.5*	2.08%	0.00%	8.98%
REAL ESTATE AND LEGAL RISKS															
REL-2	Project Partnership Agreement	Very Unlikely	Crisis	HIGH	Yes-Not Uniform	REL-6	5%	0.0 Months	0.0 Months	6.0 Months	0.0 Months	*Correlated to REL-9 by a factor of 0.4*	0.00%	0.00%	7.19%
REL-3	Condemnations	Likely	Critical	HIGH	Uniform	REL-6	100%	0.0 Months	0.0 Months	24.0 Months	0.0 Months	*Correlated to REL-9 by factor of 0.3*	0.00%	0.00%	28.78%
REL-5	Land Acquisition Delays	Likely	Critical	HIGH	Yes-Not Uniform	N/A	85%	0.0 Months	0.0 Months	6.0 Months	0.0 Months		0.00%	0.00%	7.19%
REL-6	Objections to Appraisals	Likely	Significant	HIGH	Yes-Not Uniform	REL-3	85%	0.0 Months	0.0 Months	6.0 Months	0.0 Months	*Correlated to REL-3 by a factor of 0.4*	0.00%	0.00%	7.19%
REL-7	Known and unknown utility impacts	Likely	Significant	HIGH	Yes-Not Uniform	N/A	85%	0.0 Months	0.0 Months	6.0 Months	0.0 Months		0.00%	0.00%	7.19%
REL-8	Land Certification Delay	Likely	Critical	HIGH	Triangular	REL-2	100%	0.0 Months	0.0 Months	5.0 Months	0.0 Months	*0*	0.00%	0.00%	7.19%
REL-9	Inverse Condemnation Actions	Likely	Significant	HIGH	Yes-Not Uniform	REL-3/REL-6	85%	0.0 Months	0.0 Months	6.0 Months	0.0 Months	*Correlated to REL-3 by a factor of 0.75 and REL-6 by a factor of 0.25*	0.00%	0.00%	7.19%
REL-10	Court Injunctions	Unlikely	Crisis	HIGH	Yes-Not Uniform	N/A	25%	0.0 Months	0.0 Months	36.0 Months	0.0 Months		0.00%	0.00%	43.17%
									0.0 Months						

Percentages are calculated on the variance from the assumption value to facilitate iteration of the model should the cost values change throughout the project phases. Uniform distribution percentages reflect variation from the total project cost.

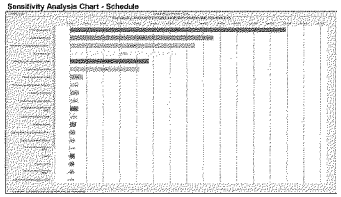
Contingency Summary Table - Schedule

PROJECT CONTINGENCY (BASELINE SCHEDULE)	Percentile	Baseline TPC	Contingency Amount	Baseline w/ Contingency	Contingency %
	5%	83.5 Months	1.4 Months	84.9 Months	1.68%
	10%	83.5 Months	16.2 Months	99.7 Months	19.44%
	15%	83.5 Months	20.2 Months	103.7 Months	24.23%
	20%	83.5 Months	23.4 Months	106.9 Months	28.08%
	25%	83.5 Months	25.9 Months	109.4 Months	31.07%
	30%	83.5 Months	28.4 Months	111.9 Months	34.06%
	35%	83.5 Months	30.7 Months	114.2 Months	36.78%
	40%	83.5 Months	32.8 Months	116.3 Months	39.26%
	45%	83.5 Months	35.3 Months	118.8 Months	41.64%
	50%	83.5 Months	37.5 Months	121.0 Months	44.29%
	55%	83.5 Months	38.8 Months	122.3 Months	46.26%
	60%	83.5 Months	40.6 Months	124.1 Months	48.61%
	65%	83.5 Months	42.0 Months	125.5 Months	51.34%
	70%	83.5 Months	43.8 Months	127.3 Months	53.41%
	75%	83.5 Months	44.8 Months	128.3 Months	55.54%
	80%	83.5 Months	46.7 Months	130.2 Months	57.81%
	85%	83.5 Months	47.9 Months	131.4 Months	59.75%
	90%	83.5 Months	49.8 Months	133.4 Months	61.90%
	95%	83.5 Months	52.9 Months	136.4 Months	63.39%
	100%	83.5 Months	55.5 Months	139.0 Months	67.81%
	105%	83.5 Months	58.2 Months	141.7 Months	69.75%
	110%	83.5 Months	61.2 Months	144.7 Months	73.27%
	115%	83.5 Months	64.3 Months	147.8 Months	76.98%
	120%	83.5 Months	67.5 Months	151.0 Months	81.16%
	125%	83.5 Months	70.8 Months	154.3 Months	84.78%
	130%	83.5 Months	74.4 Months	157.9 Months	88.91%
	135%	83.5 Months	77.9 Months	161.4 Months	93.32%
	140%	83.5 Months	81.6 Months	165.1 Months	97.75%
	145%	83.5 Months	85.3 Months	168.8 Months	102.20%
	150%	83.5 Months	89.1 Months	172.6 Months	106.67%
	155%	83.5 Months	92.9 Months	176.4 Months	111.15%
	160%	83.5 Months	96.7 Months	180.2 Months	115.64%
	165%	83.5 Months	100.5 Months	184.0 Months	120.14%
	170%	83.5 Months	104.3 Months	187.8 Months	124.64%
	175%	83.5 Months	108.1 Months	191.6 Months	129.14%
	180%	83.5 Months	111.9 Months	195.4 Months	133.64%
	185%	83.5 Months	115.7 Months	199.2 Months	138.14%
	190%	83.5 Months	119.5 Months	203.0 Months	142.64%
	195%	83.5 Months	123.3 Months	206.8 Months	147.14%
	200%	83.5 Months	127.1 Months	210.6 Months	151.64%

Cumulative Probability Forecast Chart - Schedule



Sensitivity Analysis Chart - Schedule



Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)	
Enter Estimated Total Project Cost (Price Level)	$149,992,428
Max. Anticipated Annual Amount	$21,568,793
Enter Current OMB Escalation Rate	1.80%
Enter Current Project Location Escalation Rate	1.80%
Enter Assumed Hotel Rate	10.00%

	Date	Escalation Delta Amount	Hotel Amount	Total Schedule Contingency
Enter Current Project Start	3-Mar-11			
Enter Baseline Project Completion	14-Feb-18			
Project Completion at 0% Confidence	27-Mar-18		$247,902.68	$247,902.68
Project Completion at 5% Confidence	22-Jun-19		$2,916,534.47	$2,916,534.47
Project Completion at 10% Confidence	22-Oct-19		$3,636,990.67	$3,636,990.67
Project Completion at 15% Confidence	26-Jan-20		$4,211,692.23	$4,211,692.23
Project Completion at 20% Confidence	13-Apr-20		$4,660,187.22	$4,660,187.22
Project Completion at 25% Confidence	27-Jun-20		$5,107,506.24	$5,107,506.24
Project Completion at 30% Confidence	4-Sep-20		$5,512,773.08	$5,512,773.08
Project Completion at 35% Confidence	7-Nov-20		$5,889,066.50	$5,889,066.50
Project Completion at 40% Confidence	6-Jan-21		$6,245,523.79	$6,245,523.79
Project Completion at 45% Confidence	8-Mar-21		$6,606,049.47	$6,606,049.47
Project Completion at 50% Confidence	4-May-21		$6,938,843.10	$6,938,843.10
Project Completion at 55% Confidence	2-Jul-21		$7,291,765.73	$7,291,765.73
Project Completion at 60% Confidence	2-Sep-21		$7,655,610.48	$7,655,610.48
Project Completion at 65% Confidence	6-Nov-21		$8,042,044.78	$8,042,044.78
Project Completion at 70% Confidence	20-Jan-22		$8,460,912.91	$8,460,912.91
Project Completion at 75% Confidence	11-Apr-22		$8,961,554.59	$8,961,554.59
Project Completion at 80% Confidence	10-Jul-22		$9,494,534.85	$9,494,534.85
Project Completion at 85% Confidence	28-Oct-22		$10,140,819.17	$10,140,819.17
Project Completion at 90% Confidence	21-Mar-23		$10,990,652.34	$10,990,652.34
Project Completion at 95% Confidence	22-Oct-23		$12,283,716.15	$12,283,716.15
Project Completion at 100% Confidence	8-Dec-26		$19,010,165.65	$19,010,165.65

Entry Required

Do Not Overwrite

Summary Data -- Do Not Overwrite

Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

Cost

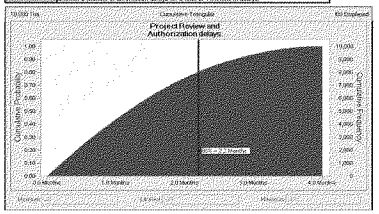
Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
PPM-1	Project Review and Authorization delays.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Schedule

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
PPM-1	Project Review and Authorization delays.	Likely	Critical	High	Triangular	N/A	N/A	0.0 Months	0.0 Months	4.0 Months	

Description	This item captures the risk of delays that may be experienced through project review and authorization.
Development of Low Values	This best case scenario is no change to the most likely.
Development of High Values	The worst case scenario is that project is delayed by HQ for a month, SAD for a month, and another 2 months of unforeseen delays for a total of 4 months in delays.

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%		0.0 Months
10%		0.2 Months
20%		0.4 Months
30%		0.7 Months
40%		0.9 Months
50%		1.2 Months
60%		1.5 Months
70%		1.8 Months
80%		2.2 Months
90%		2.7 Months
100%		4.0 Months



Biscayne Bay Coastal Wetlands (Feasibility Study) – Cost and Schedule Risk Analysis (Draft)

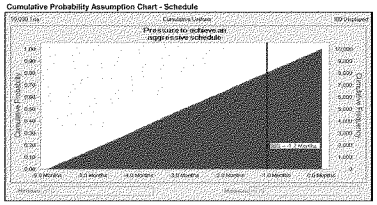
	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Cost	PPM-2	Pressure to achieve an aggressive schedule	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Schedule	PPM-2	Pressure to achieve an aggressive schedule	Likely	Significant	Critical	Uniform	N/A	N/A	-6.0 Months	0.0 Months	6.0 Months	

Description	This item captures the risk that the inability to meet an aggressive or unrealistic schedule will cause delays in milestones
Development of Low Values	The best case scenario is that because of the aggressive schedule, the work will get done faster up to 6 months faster because the crews are working as fast as they can
Development of High Values	The worst case scenario is that the aggressive schedule does not save any time on the project

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
5%		-6.0 Months
10%		-5.4 Months
20%		-4.8 Months
30%		-4.2 Months
40%		-3.6 Months
50%		-3.0 Months
60%		-2.4 Months
70%		-1.8 Months
80%		-1.2 Months
90%		-0.6 Months
100%		0.0 Months

Cumulative Probability Assumption Chart - Schedule



Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

Cost

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
PPR-3	Unresolved and Changing Policy Issues	Unlikely	Significant	MODERATE	Yes:NoUniform	N/A	N/A	$0	$0	$750,000	

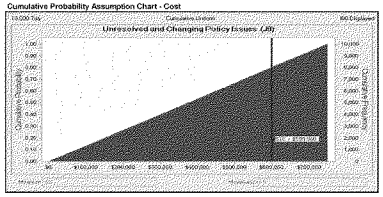
Schedule

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
PPR-3	Unresolved and Changing Policy Issues	Unlikely	Significant	MODERATE	Yes:NoUniform	N/A	N/A	0.0 Months	0.0 Months	6.0 Months	

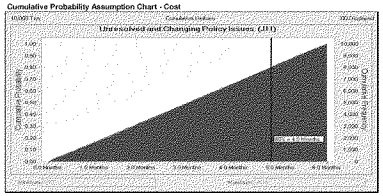
Description	This item captures the risk that unresolved and changing policy issues may cause a variance to project cost. This risk has no direct impact to project schedule. There is a risk that an unresolved and changing policy issue could increase the duration.
Development of Low Values	The best case scenario is no change to the current working estimate.
Development of High Values	The worst case (according to the PDT) is that policy issues may cause up to $750,000 and according to the PDT) extend the project 6 months.

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%	$35	0.0 Months
15%	$76,142	0.6 Months
25%	$150,129	1.2 Months
35%	$228,422	1.8 Months
45%	$304,897	2.4 Months
55%	$383,640	3.0 Months
65%	$450,889	3.6 Months
75%	$537,489	4.2 Months
85%	$596,865	4.8 Months
95%	$675,841	5.4 Months
100%	$749,962	6.0 Months

Cumulative Probability Assumption Chart - Cost



Cumulative Probability Assumption Chart - Cost



Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

Cost

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
PPM-8	National Environmental Priority Changes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Schedule

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
PPM-8	National Environmental Priority Changes	Unlikely	Critical	High	N/A	N/A	N/A	N/A	N/A	N/A	This risk is a show-stopper. Therefore, it was not studied for cost impacts.

Description	This item captures the risk that external environmental policy changes could keep the project from being implemented.
Development of Low Values	
	The best case scenario is
Development of High Values	
	The worst case scenario is

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
5%		
10%		
20%		
30%		
40%		
50%		
60%		
70%		
80%		
90%		
100%		

Cumulative Probability Assumption Chart - Cost

Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

Cost

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
CA-1	Market Condition and Bidding Competition (All)	Likely	Critical	[illegible]	Triangular	N/A	N/A	($7,882,686)	$0	$9,878,480	

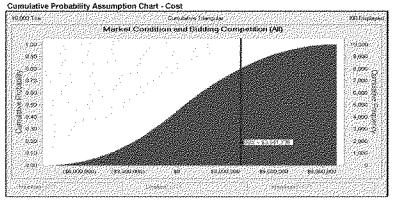
Schedule

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
CA-1	Market Condition and Bidding Competition (All)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Description	This item captures the risk that the market condition will vary, either up or down, between now and advertisement.
Development of Low Values	The best case scenario is that in 3 years, when the project goes to advertisement, the market condition will improve (bringing more bidders) and in turn reducing the project cost by as much as 20%.
Development of High Values	The worst case scenario is that in 3 years, when the project goes to advertisement, the market condition will have worsened (reducing the number of bidders) and in turn increasing the project cost by as much as 25%.

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%	($7,882,686)	
10%	($4,150,368)	
20%	($1,355,785)	
30%	($1,445,480)	
40%	($417,217)	
50%	$493,783	
60%	$1,473,202	
70%	$2,823,472	
80%	$3,841,735	
90%	$5,924,092	
100%	$9,827,111	

Cumulative Probability Assumption Chart - Cost



Cumulative Probability Assumption Chart - Schedule

Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

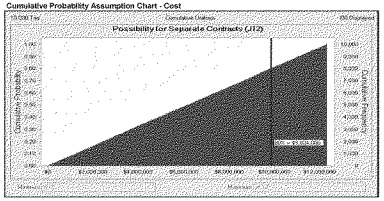
	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Cost	CA-2	Possibility for Separate Contracts	Likely	Critical	[illegible]	Yes-Not-Uniform	N/A	N/A	$0	$0	$12,299,306	

	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Schedule	CA-2	Possibility for Separate Contracts	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Description	This item captures the risk that this project may be divided into two rather than one contracts, causing a variance from the current working estimate.
Development of Low Values	The best case scenario is no change in the current working estimate.
Development of High Values	The worst case scenario is that there could be two contracts rather than one. Assume the worst case would be a 30% increase in PED ($0 account), 50% increases in CM ($1 account) and 10% increase in construction costs (due to loss of efficiencies and potential increased markups).

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%	$716	
10%	$1,255,899	
20%	$2,427,757	
30%	$3,692,651	
40%	$4,645,819	
50%	$6,101,665	
60%	$7,294,312	
70%	$8,598,826	
80%	$9,824,080	
90%	$11,263,081	
100%	$12,295,081	

Cumulative Probability Assumption Chart - Cost



Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

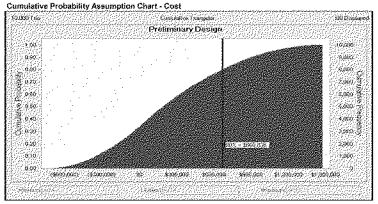
	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Cost	TL-1	Preliminary Design	Very Likely	Significant	[illegible]	Triangular	SSI-1	0.99	(3,722,887)	$0	$1,475,000	Correlated to EST-1 by factor of 0

	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Schedule	TL-1	Preliminary Design	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Description	This item captures the risk that there are many assumptions that are involved in the preliminary design and lack of data. The assumptions and lack of data could result in unforeseen issues in the design phase causing the project cost to increase.
Development of Low Values	The best case scenario is that the preliminary design saves 10% in the total cost for PED.
Development of High Values	The worst case scenario is that when more data is collected to complete the PED phase, issues might arise (needing more engineering and construction) causing the cost for PED to increase by up to 20%.

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
5%	(3,722,887)	
10%	(3,311,670)	
20%	(3,167,328)	
30%	(216,480)	
40%	$72,880	
50%	$193,447	
60%	$327,012	
70%	$480,514	
80%	$665,638	
90%	$909,553	
100%	$1,497,269	

Cumulative Probability Assumption Chart - Cost



Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

Cost

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
RE-1	Environmental Monitoring	Likely	Significant	Significant	Yes-Not Uniform	N/A	N/A	$0	$0	$1,185,418	

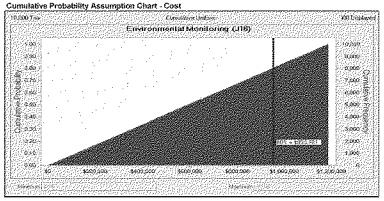
Schedule

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
RE-1	Environmental Monitoring	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Description	This item captures the risk that there will be a need for environmental monitoring (Adaptive Management).
Development of Low Values	The best case scenario is that there is no need for environmental monitoring.
Development of High Values	The worst case scenario is that environmental monitoring is required. Assume worst case is not to exceed mitigation fees of not greater than 3% of the construction costs.

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%	$61	
10%	$115,984	
20%	$231,546	
30%	$357,344	
40%	$474,832	
50%	$590,873	
60%	$713,284	
70%	$829,917	
80%	$950,561	
90%	$1,070,496	
100%	$1,185,176	

Cumulative Probability Assumption Chart - Cost



Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

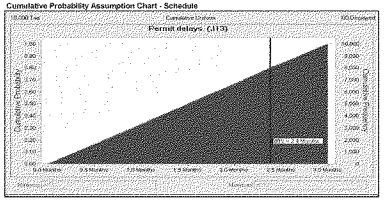
	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Cost	RE-2	Permit delays.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Schedule	RE-2	Permit delays.	Likely	Marginal	MODERATE	Yes-No-Uniform	N/A	N/A	0.0 Months	0.0 Months	3.0 Months	

Description	This item captures the risk that there could be delays due to permitting issues.
Development of Low Values	The best case scenario is there are no permitting issues
Development of High Values	The worst case scenario is that due to permitting issues the project is delayed up to 3 months.

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%		0.0 Months
10%		0.3 Months
20%		0.6 Months
30%		0.9 Months
40%		1.2 Months
50%		1.5 Months
60%		1.8 Months
70%		2.1 Months
80%		2.4 Months
90%		2.7 Months
100%		3.0 Months

Cumulative Probability Assumption Chart - Schedule



Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

Cost

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
RE-9	Ag Chemicals	Very Likely	Marginal	MODERATE	Yes-NotUniform	N/A	N/A	$0	$0	$10,000,000	

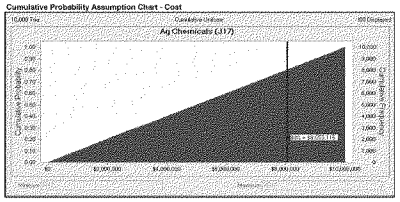
Schedule

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
RE-3	Ag Chemicals	Likely	Significant	[illegible]	Yes-NotUniform	N/A	N/A	0.0 Months	9.0 Months	24.0 Months	

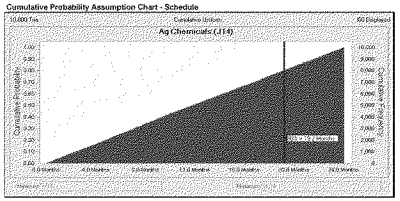
Description	This item captures the risk that in the case that there are significant environmental issues associated with the Ag chemicals, there would be a need to isolate and test the material.
Development of Low Values	The best case scenario is that there is no need to isolate and test the material and that normal construction procedure would ensue.
Development of High Values	The worst case scenario is that there are significant environmental issues associated with the Ag chemicals and there would be a need to isolate and test the material. Per input from the PDT, the maximum increase in cost would be up to $10 Million and a delay in schedule of up to 24 month. South Florida would have to pick up cost shared portions of work but ultimately have to pay for remediation to hand over clean lands.

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%	$800	0.0 Months
10%	$1,000,300	2.3 Months
20%	$1,978,529	4.7 Months
30%	$2,976,256	7.1 Months
40%	$4,009,897	9.3 Months
50%	$5,043,711	11.8 Months
60%	$6,040,991	14.3 Months
70%	$7,025,309	16.8 Months
80%	$8,065,118	19.2 Months
90%	$9,019,431	21.6 Months
100%	$9,996,775	24.0 Months

Cumulative Probability Assumption Chart - Cost



Cumulative Probability Assumption Chart - Schedule



Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

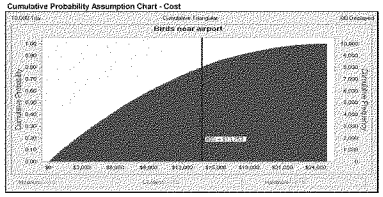
	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Cost	RE-4	Birds near airport	Likely	Marginal	MODERATE	Triangular	N/A	N/A	$0	$0	$25,000	

	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Schedule	RE-4	Birds near airport	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Description	This item captures the risk that the Homestead Airforce Base's air traffic would be affected by the increase in birds due to project construction
Development of Low Values	The best case scenario is no change to this most likely.
Development of High Values	The worst case scenario is that although the species of birds would not impact the Air Force, a nominal amount may be required for agency level of effort to deal with this issue. Worst case is project manager (80 hours), engineering technical lead (100 hours), and front office management time (24 hours) – assume average labor cost of $110/hour – $25,000.

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%	$1	
10%	$1,219	
20%	$2,574	
30%	$3,896	
40%	$5,874	
50%	$7,226	
60%	$9,008	
70%	$11,360	
80%	$15,753	
90%	$17,009	
100%	$24,313	

Cumulative Probability Assumption Chart - Cost



Cumulative Probability Assumption Chart - Schedule

Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

Cost

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
RE-4	Sea Level Rise	Likely	Marginal	MODERATE	Triangular	N/A	N/A	50	50	$85,000	

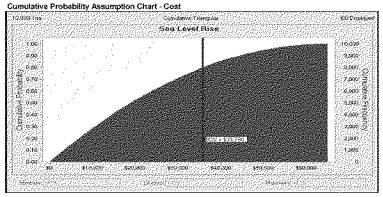
Schedule

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
RE-4	Sea Level Rise	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Description	This item captures the risk that the need to do sea level rise study on the project could increase the PED cost.
Development of Low Values	The best case scenario is no change to the most likely.
Development of High Values	The worst case scenario is that although the risk will not affect implementation costs, a nominal amount may be required for agency level of effort to address this concern. Worst case is project manager (40 hours), engineering technical lead (100 hours), staff PDT time (400 hours) and front office management time (40 hours) -- assume average labor cost of $110/hour = $55,000.

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%	$2	
10%	$3,453	
20%	$7,605	
30%	$10,718	
40%	$14,572	
50%	$19,021	
60%	$23,939	
70%	$28,553	
80%	$35,786	
90%	$44,571	
100%	$64,242	

Cumulative Probability Assumption Chart - Cost



Cumulative Probability Assumption Chart - Schedule

Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

Cost

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
RE-7	Implementation of AM	Unlikely	Critical	MODERATE	N/A	N/A	N/A	N/A	N/A	N/A	This risk is a show stopper. Therefore, it was not studied for cost impacts.

Schedule

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
RE-7	Implementation of AM	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Description	This item captures the risk that there is not much benefit from the project due to a lack of water during the dry seasons.
Development of Low Values	The total cost scenario is that
Development of High Values	The overall cost scenario is that

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%		
10%		
20%		
30%		
40%		
50%		
60%		
70%		
80%		
90%		
100%		

Cumulative Probability Assumption Chart - Cost

Cumulative Probability Assumption Chart - Schedule

Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

Cost

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
CON-2	Change Orders During Construction	Likely	Marginal	MODERATE	Yes-NoUniform	N/A	N/A	$0	$0	$3,800,000	

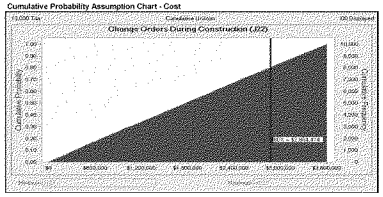
Schedule

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
CON-2	Change Orders During Construction	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Description	This item captures the risk that there may be change orders during construction.
Development of Low Values	The best case scenario is that there are no change orders during construction.
Development of High Values	The worst case scenario is that is that there is cost growth due to the nature of this work due to cost modifications. Per the PDT, this could increase the costs by up to $3.8 billion.

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%	$0	
10%	$358,290	
20%	$668,436	
30%	$1,043,643	
40%	$1,423,671	
50%	$1,777,195	
60%	$2,151,623	
70%	$2,492,149	
80%	$2,864,474	
90%	$3,208,089	
100%	$3,809,771	

Cumulative Probability Assumption Chart - Cost



Cumulative Probability Assumption Chart - Schedule

Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

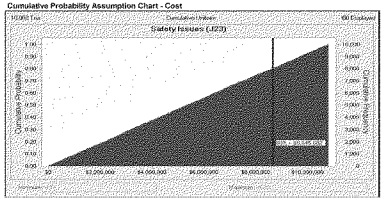
	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Cost	CON-3	Safety Issues	Likely	Significant	[illegible]	Yes-No-Uniform	N/A	N/A	$0	$0	$10,800,000	

	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Schedule	CON-3	Safety Issues	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Description	This item captures the risk that serious injuries on the job could stop the project.
Development of Low Values	The best case scenario is that there are no safety issues.
Development of High Values	The worst case scenario is that there is a serious safety infraction that occurs on the project. Per the PDT, settlement fees could be up to $10.8 Million.

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%	$250	
10%	$1,035,659	
20%	$2,156,772	
30%	$3,156,773	
40%	$4,273,857	
50%	$5,345,287	
60%	$6,450,838	
70%	$7,496,829	
80%	$8,645,882	
90%	$9,704,621	
100%	$10,799,604	

Cumulative Probability Assumption Chart - Cost



Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

Cost

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
CON-4	Staging Areas	Very Likely	Critical	[illegible]	Triangular	N/A	N/A	$0	$0	$1,757,958	

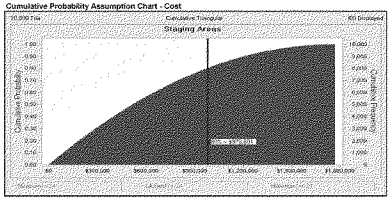
Schedule

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
CON-4	Staging Areas	Likely	Significant	[illegible]	Triangular	N/A	N/A	0.0 Months	0.0 Months	6.0 Months	

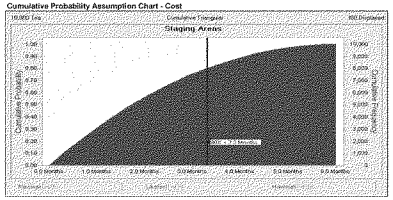
Description	This item captures the risk that not having adequate staging areas could impact the ROW management and site access issues.
Development of Low Values	The best case scenario is that staging area issues have no impact to the project.
Development of High Values	The worst case scenario is that staging area limitations affect the project construction (site access and efficiency issues). Assume the worst case is up to 20% loss of productivity. According to the PST there could be loss of up to 6 months due to this issue.

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%	$70	0.0 Months
10%	$93,330	0.5 Months
20%	$187,402	0.6 Months
30%	$292,362	1.0 Months
40%	$405,003	1.3 Months
50%	$519,196	1.7 Months
60%	$651,959	2.2 Months
70%	$798,082	2.7 Months
80%	$978,601	3.3 Months
90%	$1,297,487	4.1 Months
100%	$1,757,958	6.0 Months

Cumulative Probability Assumption Chart - Cost



Cumulative Probability Assumption Chart - Cost



Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

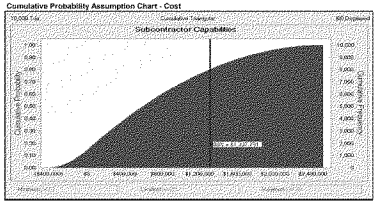
	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Cost	CON-5	Subcontractor Capabilities	Unlikely	Significant	MODERATE	Triangular	N/A	N/A	(4416,250)	$0	$2,509,580	

	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Schedule	CON-5	Subcontractor Capabilities	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Description	This item captures the risk that subcontractor capabilities could affect the ultimate project costs.
Development of Low Values	The best case scenario is that subcontractor capabilities are more favorable than expected, creating efficiencies that save on project costs. Assume up to 5% decrease in the costs of work performed by the subcontractor.
Development of High Values	The worst case scenario is that subcontractor capabilities are limited, making their work come at a premium translating to a 30% increase in construction costs performed by subcontractor.

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
5%	(2407,328)	
10%	(875,500)	
20%	$91,800	
30%	$247,411	
40%	$415,948	
50%	$597,225	
60%	$794,095	
70%	$1,031,188	
80%	$1,307,791	
90%	$1,963,987	
100%	$2,476,664	

Cumulative Probability Assumption Chart - Cost



Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

Cost

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
CON-4	Claims	Very Likely	Critical	[illegible]	Uniform	N/A	N/A	$0	$0	$12,600,000	

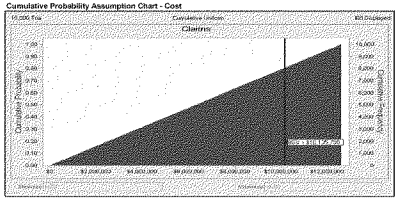
Schedule

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
CON-5	Claims	Very Likely	Significant	[illegible]	Yes-No/Uniform	N/A	N/A	0.0 Months	0.0 Months	6.0 Months	

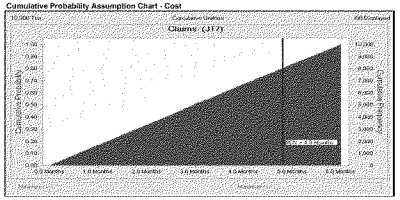
Description	This item captures the risk that claims could increase the ultimate project costs.
Development of Low Values	The best case scenario is no change in the most likely.
Development of High Values	The worst case scenario is that claims increase the costs by up to $12.6 million and increase the schedule by up to 6 months (per the PDT).

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%	$517	0.0 Months
10%	$1,363,970	0.6 Months
20%	$2,551,138	1.2 Months
30%	$3,840,336	1.8 Months
40%	$5,195,470	2.4 Months
50%	$6,392,308	3.0 Months
60%	$7,580,853	3.6 Months
70%	$8,841,947	4.2 Months
80%	$10,133,798	4.8 Months
90%	$11,305,959	5.4 Months
100%	$12,597,949	6.0 Months

Cumulative Probability Assumption Chart - Cost



Cumulative Probability Assumption Chart - Cost



Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

Cost

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
EST-1	Quantity Estimate	Likely	Marginal	MODERATE	Triangular	TL-1	0.50	-$2,016,800	$0	$6,000,000	Correlated to TL-1 by factor of 0.5

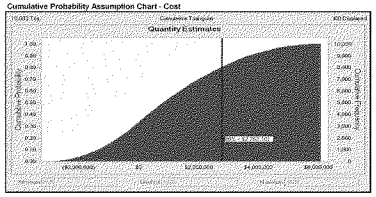
Schedule

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
EST-1	Quantity Estimate	Likely	Marginal	MODERATE	Triangular	TL-1	0.50	-2.3 Months	0.0 Months	5.0 Months	Correlated to TL-1 by factor of 0.5

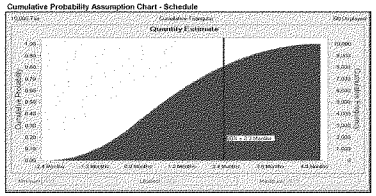
Description	This item captures the risk that variation in estimated quantity may cause a variance to project cost and schedule.
Development of Low Values	The best case scenario is that the quantities vary by up to 15% of the estimated quantities (per FAR clause 52.211-18).
Development of High Values	The worst case scenario is that the quantities vary by up to 30%.

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
2%	($2,016,800)	-2.5 Months
10%	($1,356,198)	-1.1 Months
20%	(891,794)	-0.6 Months
30%	(542,287)	-0.1 Months
40%	$312,050	0.3 Months
50%	$618,209	0.7 Months
60%	$1,389,467	1.4 Months
70%	$2,077,492	1.7 Months
80%	$2,952,101	2.3 Months
90%	$3,967,283	3.1 Months
100%	$5,366,368	4.9 Months

Cumulative Probability Assumption Chart - Cost



Cumulative Probability Assumption Chart - Schedule



Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

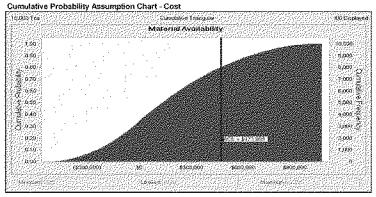
	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Cost	EST-2	Material Availability	Likely	Significant	[illegible]	Triangular	N/A	N/A	($528,555)	$0	$1,057,192	

	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Schedule	EST-2	Material Availability	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Description	This item captures the risk that the materials for the project are not readily available and close by. Since all project features have not been identified it is a significant risk.
Development of Low Values	The best case scenario is that the materials are readily available and close by and maybe even closer and easier to access than originally thought. This could potentially amount to a savings of up to 10% of estimated material costs.
Development of High Values	The worst case scenario is that the material are not readily available and close by. This could increase the material costs by up to 20%.

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%	($528,555)	
10%	($242,477)	
20%	($122,976)	
30%	($39,313)	
40%	$46,887	
50%	$138,243	
60%	$239,251	
70%	$340,449	
80%	$472,859	
90%	$645,787	
100%	$1,019,765	

Cumulative Probability Assumption Chart - Cost



Cumulative Probability Assumption Chart - Schedule

Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

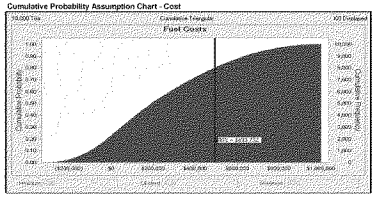
Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
EST-3	Fuel Costs	Likely	Marginal	MODERATE	Triangular	N/A	N/A	($[illegible])	$0	$1,000,000	

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
EST-3	Fuel Costs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Description	This item captures the risk that prices of fuel fluctuate and can increase or decrease the cost of construction.
Development of Low Values	The best case scenario is that the price of fuel could decrease 20%
Development of High Values	The worst case scenario is that the price of fuel increases 60%

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%	($[illegible])	
10%	($[illegible])	
20%	($[illegible])	
30%	$31,149	
40%	$115,072	
50%	$197,232	
60%	$[illegible]	
70%	$351,776	
80%	$493,732	
90%	$640,146	
100%	$997,456	

Cumulative Probability Assumption Chart - Cost



Cumulative Probability Assumption Chart - Schedule

Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

Cost

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
EST-7	Pump Station Historical Pricing	Likely	Marginal	MODERATE	Triangular	N/A	N/A	($1,150,142)	$0	$2,449,000	

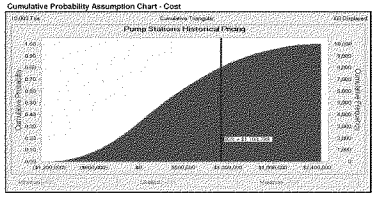
Schedule

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
EST-7	Pump Station Historical Pricing	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Description	The 4 different pump stations on L-31E are still in the feasibility stage (little to no P&S). A pump station historical pricing spreadsheet was used to determine what the costs will most likely be for the four different pump stations. When the award prices come in, they could be higher or lower than the values indicated by the spreadsheet.
Development of Low Values	The best case scenario is that the award prices could come in as much as 10% lower than the prices used from the pump station historical pricing spreadsheet.
Development of High Values	The worst case scenario is that the award prices could come in as much as 20% higher than the prices used from the pump station historical pricing spreadsheet.

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%	($1,150,142)	
10%	($542,394)	
20%	($267,550)	
30%	($47,376)	
40%	$146,964	
50%	$348,605	
60%	$552,850	
70%	$814,311	
80%	$1,103,289	
90%	$1,492,561	
100%	$2,361,568	

Cumulative Probability Assumption Chart - Cost



Cumulative Probability Assumption Chart - Schedule

Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

Cost

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
REL-1	Cooperative Agreements	Very Likely	Marginal	MODERATE	Uniform	N/A	N/A	$0	$0	$35,000	

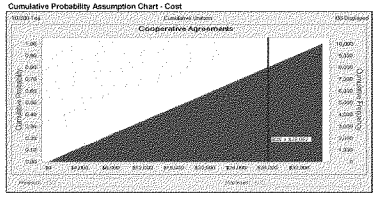
Schedule

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
REL-1	Cooperative Agreements	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Description	This item captures the risk that the negotiation of cooperative agreements and supplemental agreements could cause a variance in the project costs.
Development of Low Values	The best case scenario is no change to the most likely.
Development of High Values	The worst case scenario is that a significant level of effort is required for the negotiation of cooperative agreements. Assume one district attorney for 60 hours at $120/hour, assistant district counsel for 20 hours at $100/hour, real estate specialist for 60 hours at $110/hour, engineering technical lead for 40 hours at $110/hour, biological specialist for 40 hours at $90/hour, and environmental compliance specialist for 40 hours at $110/hour (~$35,000).

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%	$0	
10%	$3,428	
20%	$6,984	
30%	$10,538	
40%	$14,071	
50%	$17,608	
60%	$21,114	
70%	$24,583	
80%	$28,062	
90%	$31,600	
100%	$34,997	

Cumulative Probability Assumption Chart - Cost



Cumulative Probability Assumption Chart - Schedule

Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

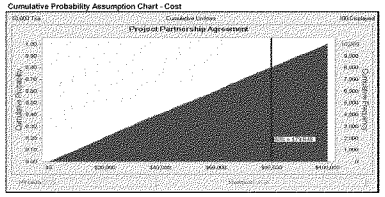
	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Cost	REL-2	Project Partnership Agreement	Very Likely	Marginal	MODERATE	Uniform	N/A	N/A	$0	$0	$100,000	

	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Schedule	REL-2	Project Partnership Agreement	Very Likely	Cities	[illegible]	Yes-Nonuniform	REL-8	0.5	0.0 Months	0.0 Months	6.0 Months	Correlated to REL-8 by a factor of 0.5

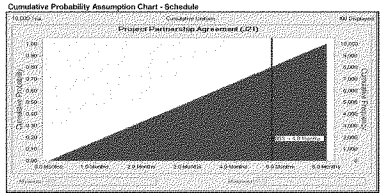
Description	This item captures the risk that are enrolled with the negotiation of the project partnership agreement with the sponsor.
Development of Low Values	The best case scenario is no change to the target likely.
Development of High Values	The worst case scenario is that this could increase costs by up to $100,000 and the schedule by up to 6 months (per the PDT).

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%	$25	0.0 Months
10%	$10,156	0.6 Months
20%	$19,512	1.2 Months
30%	$29,325	1.8 Months
40%	$38,086	2.4 Months
50%	$49,509	3.0 Months
60%	$60,073	3.6 Months
70%	$69,458	4.2 Months
80%	$79,548	4.8 Months
90%	$89,841	5.4 Months
100%	$99,595	6.0 Months

Cumulative Probability Assumption Chart - Cost



Cumulative Probability Assumption Chart - Schedule



Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

Cost

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
REL-3	Condemnations	Very Likely	Critical	[illegible]	Yes-Not-Uniform	REL-6	0.50	$0	$0	$2,000,000	Correlated to REL-6 by factor of 0.5

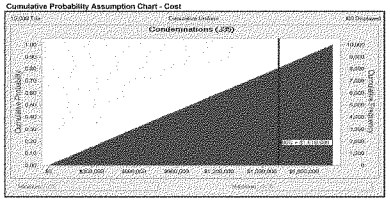
Schedule

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
REL-3	Condemnations	Likely	Critical	[illegible]	Yes-Not-Uniform	REL-6	0.50	0.0 Months	0.0 Months	24.0 Months	Correlated to REL-6 by factor of 0.5

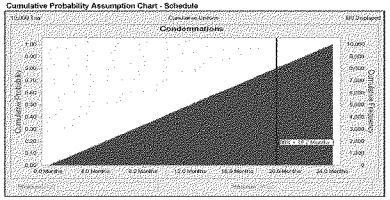
Description	This item captures the risk that the sponsor has to condemn lands from private land owners.
Development of Low Values	The best case scenario is that the sponsor does not have to condemn any lands from private land owners.
Development of High Values	The worst case scenario is that the sponsor has to acquire lands from private land owners.The worst case (according to the PDT) is that acquiring of lands may cost up to $2,000,000 and increase the schedule by as much as 2 years. The worst case scenario for the schedule is that it could take two months for the market appraisal, 6 months for negotiations, 6 months attorneys and processing, and another 12 months for the actual condemnation for a total of 24 months.

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%	$100	0.0 Months
10%	$200,262	2.5 Months
20%	$398,524	5.0 Months
30%	$594,143	7.3 Months
40%	$795,213	9.7 Months
50%	$1,012,732	12.0 Months
60%	$1,202,990	14.3 Months
70%	$1,414,422	16.9 Months
80%	$1,616,568	19.2 Months
90%	$1,808,560	21.7 Months
100%	$1,999,780	24.0 Months

Cumulative Probability Assumption Chart - Cost



Cumulative Probability Assumption Chart - Schedule



Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

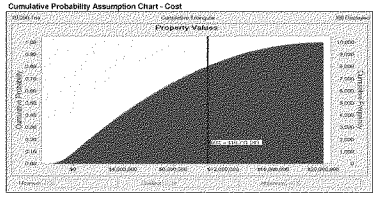
	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Cost	REL-4	Property Values	Likely	Gross	[illegible]	Triangular	N/A	N/A	$1,500,000	$0	$20,000,000	

	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Schedule	REL-4	Property Values	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

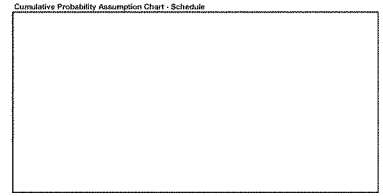
Description	This item captures the risk that values of property are constantly changing. This could have a negative or positive impact on the project cost.
Development of Low Values	The best case scenario is that property values drop in the next 2 years. Since property values are at an all time low, if they do decrease, they will probably only go down by as much as 10%.
Development of High Values	The worst case scenario is that property values increase in the next 2 years. The worst case (according to the PDT) is that the increase in property value may cost up to $20,000,000.

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%	$1,500,000	
10%	$120,481	
20%	$1,254,485	
30%	$2,539,863	
40%	$3,895,579	
50%	$5,372,284	
60%	$6,934,502	
70%	$8,759,881	
80%	$10,731,943	
90%	$13,368,256	
100%	$19,749,732	

Cumulative Probability Assumption Chart - Cost



Cumulative Probability Assumption Chart - Schedule



Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Cost	REL-3	Land Acquisition Delays	Likely	Critical	HIGH	N/A	N/A	N/A	N/A	N/A	N/A	Cost risk captured by REL-4. This issues is primarily a schedule risk.

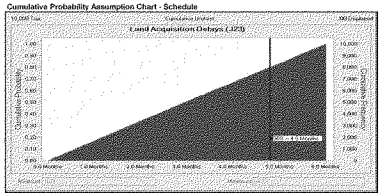
	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Schedule	REL-3	Land Acquisition Delays	Likely	Critical	HIGH	Yes-Not Uniform	N/A	N/A	0.0 Months	0.0 Months	6.0 Months	

Description	This item captures the risk that land acquisition delays affect the project schedule. As the costs associated with this risk are already captured by Risks REL-3 and REL-4, this is primarily a schedule risk.
Development of Low Values	The best case scenario is an change to the most likely.
Development of High Values	The worst case scenario is that the project is delayed by up to 6 months (according to the POT).

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%		0.0 Months
10%		0.8 Months
20%		1.2 Months
30%		1.8 Months
40%		2.4 Months
50%		3.0 Months
60%		3.6 Months
70%		4.2 Months
80%		4.8 Months
90%		5.4 Months
100%		6.0 Months

Cumulative Probability Assumption Chart - Cost

Cumulative Probability Assumption Chart - Schedule



Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

Cost

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
REL-4	Objections to Appraisals	Very Likely	Significant	[illegible]	Yes-No/Uniform	REL-3	0.50	$0	$2	$2,000,000	Correlated to REL-3 by a factor of 0.5

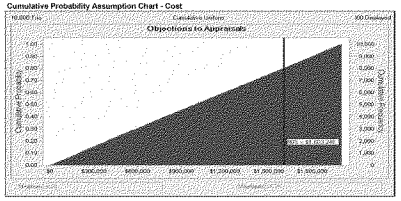
Schedule

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
REL-4	Objections to Appraisals	Likely	Significant	[illegible]	Yes-No/Uniform	REL-3	0.50	0.0 Months	0.0 Months	6.0 Months	Correlated to REL-3 by a factor of 0.5

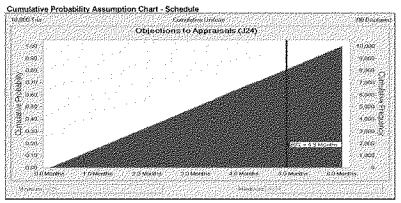
Description:	This item captures the risk that objections of real estate appraisal values cause a variance in the project cost and schedule.
Development of Low Values:	The best case scenario is no change to the most likely.
Development of High Values:	The worst case scenario is that there are significant objections to appraisals, leading to increase in costs due to fees, appraisals, and management costs. Per the PDT, this could be up to $2 Million and increase the schedule by up to 6 months.

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%	$0	0.0 Months
10%	$199,969	0.6 Months
20%	$392,232	1.2 Months
30%	$590,044	1.8 Months
40%	$797,719	2.4 Months
50%	$997,842	3.0 Months
60%	$1,194,408	3.6 Months
70%	$1,402,199	4.2 Months
80%	$1,603,346	4.8 Months
90%	$1,801,439	5.4 Months
100%	$1,998,987	6.0 Months

Cumulative Probability Assumption Chart - Cost



Cumulative Probability Assumption Chart - Schedule



Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

Cost

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
REL-7	Known and unknown utility impacts	Likely	Significant	High	Triangular	N/A	N/A	$0	$0	$883,973	

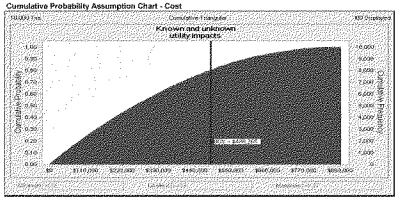
Schedule

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
REL-7	Known and unknown utility impacts	Likely	Significant	High	Yes-No/Uniform	N/A	N/A	0.0 Months	0.0 Months	6.0 Months	

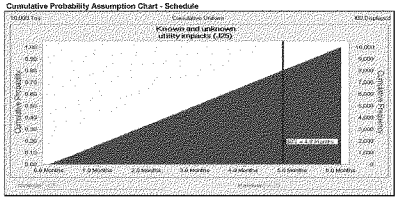
Description:	This item captures the risk that known and unknown utility impacts will cause a variance in the project cost and schedule.
Development of Low Values:	The best case scenario is no change to the most likely.
Development of High Values:	The worst case scenario is that impacts due to known and unknown utilities could impact the overall construction productivity by up to 10%. This could increase the project schedule by up 6 months (according to the PDT).

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%	$122	0.0 Months
10%	$43,096	0.6 Months
20%	$85,955	1.2 Months
30%	$141,920	1.8 Months
40%	$197,737	2.4 Months
50%	$257,284	3.0 Months
60%	$325,332	3.6 Months
70%	$398,740	4.2 Months
80%	$488,268	4.8 Months
90%	$588,253	5.4 Months
100%	$873,730	6.0 Months

Cumulative Probability Assumption Chart - Cost



Cumulative Probability Assumption Chart - Schedule



Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Cost	REL-8	Land Certification Delay	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

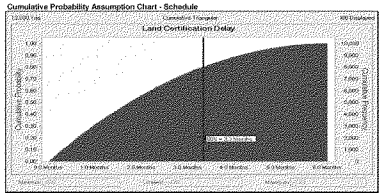
	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Schedule	REL-8	Land Certification Delay	Likely	Critical	[illegible]	Triangular	REL-2	0.0	0.0 Months	0.0 Months	5.9 Months	

Description	This item captures the risk that there could be a delay in the certification of the land
Development of Low Values	The land corp scenario is no change to the most likely
Development of High Values	The worst case scenario is that the delays due to the land certification will take up to 8 months (according to POT).

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%		0.0 Months
10%		0.3 Months
20%		0.6 Months
30%		1.0 Months
40%		1.3 Months
50%		1.7 Months
60%		2.2 Months
70%		2.7 Months
80%		3.3 Months
90%		4.2 Months
100%		5.9 Months

Cumulative Probability Assumption Chart - Cost

Cumulative Probability Assumption Chart - Schedule



Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

Cost

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
REL-9	Inverse Condemnation Actions	Very Likely	Critical	Extremely High	Yes-NoUniform	REL-3/REL-6	0.75/0.25	$0	$0	$5,000,000	Correlated to REL-3 by a factor of 0.75 and REL-6 by a factor of 0.25

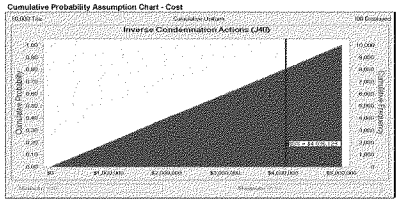
Schedule

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
REL-9	Inverse Condemnation Actions	Likely	Significant	High	Yes-NoUniform	REL-3/REL-6	0.75/0.25	0.0 Months	0.0 Months	5.0 Months	Correlated to REL-3 by a factor of 0.75 and REL-6 by a factor of 0.25

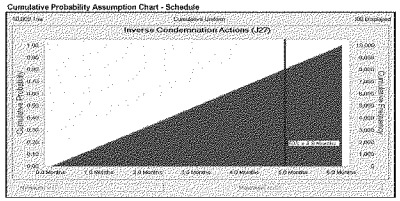
Description	This item captures the risk that land owners could sue the federal government over condemnations.
Development of Low Values	The best case scenario is no change to the most likely.
Development of High Values	The worst case scenario is that multiple landowners sue the government over condemnations, increasing costs due to settlements by up to $5 million. The schedule could be increased by up to 6 months (according to the PDT).

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%	$442	0.0 Months
10%	$512,582	0.6 Months
20%	$1,016,667	1.2 Months
30%	$1,580,891	1.8 Months
40%	$1,969,904	2.5 Months
50%	$2,514,252	3.0 Months
60%	$3,028,914	3.8 Months
70%	$3,538,984	4.2 Months
80%	$4,086,126	4.8 Months
90%	$4,513,546	5.4 Months
100%	$4,999,258	6.0 Months

Cumulative Probability Assumption Chart - Cost



Cumulative Probability Assumption Chart - Schedule



Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Cost	REL-16	Court Injunctions	Unlikely	Significant	MODERATE	N/A	N/A	N/A	N/A	N/A	N/A	This is primarily a schedule risk.

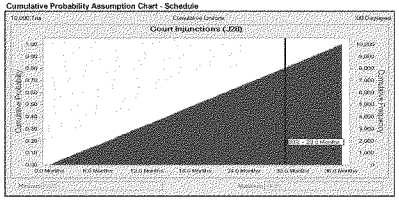
	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Schedule	REL-16	Court Injunctions	Unlikely	Crisis	[illegible]	Yes-Nb-Uniform	N/A	N/A	0.0 Months	3.0 Months	36.0 Months	

Description	This item captures the risk that court injunction could delay the project schedule. This is primarily a schedule risk, as if an injunction occurred, work would stop.
Development of Low Values	The best case scenario is no change to the most likely.
Development of High Values	The worst case scenario is that the project gets delays by as much as 3 years because of law suits filed by attorneys against the SFWMD or the Corps.

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%		0.0 Months
10%		3.5 Months
20%		7.3 Months
30%		10.6 Months
40%		14.5 Months
50%		18.0 Months
60%		21.7 Months
70%		25.5 Months
80%		29.0 Months
90%		32.6 Months
100%		36.0 Months

Cumulative Probability Assumption Chart - Cost

Cumulative Probability Assumption Chart - Schedule



Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

Cost

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
REL-11	Condemnations	Very Likely	Critical	Major	N/A	N/A	N/A	N/A	N/A	N/A	This risk is already captured by REL-3.

Schedule

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
REL-11	Condemnations	Likely	Critical	Significant	N/A	N/A	N/A	N/A	N/A	N/A	This risk is already captured by REL-3.

Description	This item captures the risk that
Development of Low Values	The best case scenario is that
Development of High Values	The worst case scenario is that

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%		
10%		
20%		
30%		
40%		
50%		
60%		
70%		
80%		
90%		
100%		

Cumulative Probability Assumption Chart - Cost

Cumulative Probability Assumption Chart - Schedule

Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

Cost

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
REL-13	Quality of L&D Estimates	Likely	Critical	[illegible]	N/A	N/A	N/A	N/A	N/A	N/A	This risk is already captured by REL-4.

Schedule

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
REL-12	Quality of L&D Estimates	Very Likely	Critical	[illegible]	N/A	N/A	N/A	N/A	N/A	N/A	This risk is already captured by REL-4.

Description:	This item captures the risk that
Development of Low Values:	The best case scenario is that
Development of High Values:	The worst case scenario is that

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%		
10%		
20%		
30%		
40%		
50%		
60%		
70%		
80%		
90%		
100%		

Cumulative Probability Assumption Chart - Cost

Cumulative Probability Assumption Chart - Schedule

Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

Cost

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
PR-1	Funding Stream	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	This risk is already captured by PR8-4.

Schedule

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
PR-1	Funding Stream	Very Unlikely	Crisis	Insignificant	N/A	N/A	N/A	N/A	N/A	N/A	This risk is already captured by PR8-4.

Description	This item captures the risk that
Development of Low Values	The best case scenario is
Development of High Values	The worst case scenario is

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%		
10%		
20%		
30%		
40%		
50%		
60%		
70%		
80%		
90%		
100%		

Cumulative Probability Assumption Chart - Cost

Cumulative Probability Assumption Chart - Schedule

Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Cost	PR-2	National Environmental Priority Changes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	This risk is already captured by PPM-5.

	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Schedule	PR-2	National Environmental Priority Changes	Very Unlikely	Crisis	[illegible]	N/A	N/A	N/A	N/A	N/A	N/A	This risk is already captured by PPM-5.

Description	This item captures the risk that
Development of Low Values	The best case scenario is
Development of High Values	The worst case scenario is

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%		
10%		
20%		
30%		
40%		
50%		
60%		
70%		
80%		
90%		
100%		

Cumulative Probability Assumption Chart - Cost

Cumulative Probability Assumption Chart - Schedule

Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

Cost

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
PR-3	Market Condition and Bidding Competition (All)	Likely	Marginal	MODERATE	N/A	N/A	N/A	N/A	N/A	N/A	This risk is already captured by CA-1

Schedule

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
PR-3	Market Condition and Bidding Competition (All)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	This risk is already captured by CA-1

Description	This item captures the risk that market conditions and bidding.
Development of Low Values	The best case scenario is
Development of High Values	The worst case scenario is

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%		
10%		
20%		
30%		
40%		
50%		
60%		
70%		
80%		
90%		
100%		

Cumulative Probability Assumption Chart - Schedule

Biscayne Bay Coastal Wetlands (Feasibility Study) – Cost and Schedule Risk Analysis (Draft)

Cost

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
PR-4	Inverse Condemnation Actions	Very Likely	Marginal	MODERATE	N/A	N/A	N/A	N/A	N/A	N/A	This risk is already captured by REL-8

Schedule

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
PR-4	Inverse Condemnation Actions	Likely	Significant	SERIOUS	N/A	N/A	N/A	N/A	N/A	N/A	This risk is already captured by REL-6

Description	This item captures the risk that
Development of Low Values	The best case scenario is that
Development of High Values	The worst case scenario is that

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
5%		
10%		
20%		
30%		
40%		
50%		
60%		
70%		
80%		
90%		
100%		

Cumulative Probability Assumption Chart - Cost

Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

Cost

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
PR-6	Court Injunctions	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	This risk is already captured by REL-10

Schedule

Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
PR-6	Court Injunctions	Unlikely	Significant	MODERATE	N/A	N/A	N/A	N/A	N/A	N/A	This risk is already captured by REL-10

Description	This item captures the risk that
Development of Low Values	The best case scenario is that
Development of High Values	The worst case scenario is that

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%		
10%		
20%		
30%		
40%		
50%		
60%		
70%		
80%		
90%		
100%		

Cumulative Probability Assumption Chart - Schedule

Biscayne Bay Coastal Wetlands (Feasibility Study) – Cost and Schedule Risk Analysis (Draft)

	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Cost	PR-4	Inverse Condemnation Actions	Very Likely	Marginal	MODERATE	N/A	N/A	N/A	N/A	N/A	N/A	This risk is already captured by REL-8

	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Schedule	PR-4	Inverse Condemnation Actions	Likely	Significant	SERIOUS	N/A	N/A	N/A	N/A	N/A	N/A	This risk is already captured by REL-6

Description	This item captures the risk that
Development of Low Values	The best case scenario is that
Development of High Values	The worst case scenario is that

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
5%		
10%		
20%		
30%		
40%		
50%		
60%		
70%		
80%		
90%		
100%		

Cumulative Probability Assumption Chart - Cost

Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Cost	PR-7	Land Acquisition Delays	Likely	Marginal	MODERATE	N/A	N/A	N/A	N/A	N/A	N/A	This risk is already captured by REL-5

	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Schedule	PR-7	Land Acquisition Delays	Likely	Significant	HIGH	N/A	N/A	N/A	N/A	N/A	N/A	This risk is already captured by REL-5

Description	This item captures the risk that
Development of Low Values	The best case scenario is that
Development of High Values	The worst case scenario is that

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%		
10%		
20%		
30%		
40%		
50%		
60%		
70%		
80%		
90%		
100%		

Cumulative Probability Assumption Chart - Schedule

Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Cost	PR-8	Objections to Appraisals	Very Likely	Marginal	MODERATE	N/A	N/A	N/A	N/A	N/A	N/A	This risk is already captured by RE-6

	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Schedule	PR-8	Objections to Appraisals	Likely	Significant	HIGH	N/A	N/A	N/A	N/A	N/A	N/A	This risk is already captured by RE-6

Description	This item captures the risk that
Development of Low Values	The best case scenario is that
Development of High Values	The worst case scenario is that

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%		
10%		
20%		
30%		
40%		
50%		
60%		
70%		
80%		
90%		
100%		

Cumulative Probability Assumption Chart - Cost

Cumulative Probability Assumption Chart - Schedule

Biscayne Bay Coastal Wetlands (Feasibility Study) - Cost and Schedule Risk Analysis (Draft)

	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Cost	PR-9	Claims	Very Likely	Critical	[illegible]	N/A	N/A	N/A	N/A	N/A	N/A	This risk is already captured by CON-6

	Risk Reference No.	Risk Event	Likelihood	Impact	Risk Level	Distribution	Correlation	Correlation Factor	Low	Most Likely	High	Notes
Schedule	PR-9	Claims	Very Likely	Significant	[illegible]	N/A	N/A	N/A	N/A	N/A	N/A	This risk is already captured by CON-6

Description	This item captures the risk that
Development of Low Values	The best case scenario is that
Development of High Values	The worst case scenario is that

Confidence Percentile	Assumption values (in dollars)	Assumption values (in months)
0%		
10%		
20%		
30%		
40%		
50%		
60%		
70%		
80%		
90%		
100%		

Cumulative Probability Assumption Chart - Cost

Cumulative Probability Assumption Chart - Schedule

B.6 TOTAL PROJECT COST SUMMARY

The Total Project Cost Summary (TPCS) addresses inflation through project completion (accomplished by escalation to mid-point of construction per ER 1110-2-1302, Appendix C, Page C-2). It is based on the scope of the SAP and the official project schedule. The TPCS includes Federal and non-Federal costs for lands and damages, all construction features, PED, and S&A, along with the appropriate contingencies and escalation associated with each of these activities. The TPCS is formatted according to the WBS and uses Civil Works Construction Cost Indexing System factors for escalation (EM 1110-2-1304) of construction costs and Office of Management and Budget (EC 11-2-18X, 20 Feb 2008) factors for escalation of PED and S&A costs.

The Total Project Cost Summary prepared using the MCACES/MII cost estimate on the Recommended Plans with contingencies set by the risk analysis (and the exceptions as described above) and the official project schedule. In performing the risk analysis by meeting with the PDT to discuss the construction schedule to prepare the risk register, a schedule was derived that is slightly different from the official schedule in that it has slightly shorter construction duration. A risk analysis was run on that schedule taking into consideration variations in construction duration, authorization date and appropriation date, and yet a third schedule developed, this one based on the risk analysis results at the 80% confidence level. A TPCS (***Section B.7***) was prepared using this schedule as well. These timelines and costs are summarized in ***Section B.4.2*** and ***Section B.7***. They show the impact of delayed authorization and appropriation on the fully funded cost despite a slightly shorter construction duration.

The Cost Risk Analysis based total project contingency of 35 percent determined under the External Risk analysis was applied to the Total Project Cost Summary along with the contingency adjusted total project schedule presented in ***Section B.5.2***.

B.7 TOTAL PROJECT COST SUMMARY WITH COST RISK ANALYSIS, CONTINGENCY AND SCHEDULE ANALYSIS ESCALATION

PROJECT: Biscayne Bay Coastal Wetlands
LOCATION: Miami-Dade County, FL
DISTRICT: SAJ
POC: CHIEF, COST ENGINEERING, Tracy T. Leeser, P.E.
PREPARED: 24-Mar-10

This Estimate reflects the scope and schedule in report; INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT

Program Year (Budget EC): 2013
Effective Price Level Date: 1 OCT 12

WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FULLY FUNDED PROJECT ESTIMATE Spent Thru: 10-Dec-10 ($K)	COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J	K L	M	N	O
06	FISH & WILDLIFE FACILITIES	3,287	877	27%	4,164	2.2%	3,356	901	4,256		3,512	955	4,467
09	CHANNELS & CANALS	10,961	3,836	35%	14,797	3.1%	11,303	3,956	15,259		11,594	4,058	15,651
13	PUMPING PLANT	25,367	7,955	31%	33,321	2.7%	26,044	8,192	34,236		26,866	8,480	35,346
14	RECREATION FACILITIES	1,808	508	28%	2,316	2.4%	1,849	523	2,372		1,884	535	2,419
15	FLOODWAY CONTROL & DIVERSION STRU	4,646	1,626	35%	6,272	3.1%	4,792	1,677	6,469		4,977	1,742	6,719
	CONSTRUCTION ESTIMATE TOTALS:	46,069	14,802		**60,871**	2.8%	47,343	15,248	62,592		48,833	15,769	**64,602**
01	LANDS AND DAMAGES	61,330	19,656	32%	80,985	2.8%	63,021	20,247	83,269		64,326	20,704	85,030
30	PLANNING, ENGINEERING & DESIGN	7,374	2,581	35%	9,955	7.2%	7,904	2,766	10,670	22,948.3	8,301	2,905	34,154
31	CONSTRUCTION MANAGEMENT	12,271	3,941	32%	16,212	6.5%	13,051	4,214	17,266	47.2	14,043	4,561	18,651
	PROJECT COST TOTALS:	127,044	40,980	32%	**168,023**	3.4%	131,320	42,476	173,796	22,995.5	135,502	43,940	202,438

CHIEF, COST ENGINEERING, Tracy T. Leeser, P.E.
PROJECT MANAGER, Stephen Baisden, P.E.
CHIEF, REAL ESTATE, Sharon W. Conklin
CHIEF, PLANNING,xxx
CHIEF, ENGINEERING, xxx
CHIEF, OPERATIONS, xxx
CHIEF, CONSTRUCTION, xxx
CHIEF, CONTRACTING,xxx
CHIEF, PM-PB, xxxx
CHIEF, DPM, xxx

ESTIMATED FEDERAL COST: **101,219**
ESTIMATED NON-FEDERAL COST: **101,219**
ESTIMATED TOTAL PROJECT COST: 202,438

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****** CONTRACT COST SUMMARY ******

PROJECT: Biscayne Bay Coastal Wetlands
LOCATION: Miami-Dade County, FL
This Estimate reflects the scope and schedule in report: INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT

DISTRICT: SAJ
POC: CHIEF, COST ENGINEERING, Tracy T. Leeser, P.E.
PREPARED: 24-Mar-10

Estimate Prepared: 14-Mar-11
Effective Price Level: 1 OCT 10

Program Year (Budget EC): 2013
Effective Price Level Date: 1 OCT 12

FULLY FUNDED PROJECT ESTIMATE

WBS NUMBER A	Civil Works Feature & Sub-Feature Description B	COST ($K) C	CNTG ($K) D	CNTG (%) E	TOTAL ($K) F	ESC (%) G	COST ($K) H	CNTG ($K) I	TOTAL ($K) J	Mid-Point Date P	ESC (%) L	COST ($K) M	CNTG ($K) N	FULL ($K) O
	DEERING ESTATE FLOWWAY*													
06	FISH & WILDLIFE FACILITIES	$ 1,096	$ 110	10%	$ 1,205		1,096	110	1,205			1,096	110	1,205
09	CHANNELS & CANALS	$ -	$ -		$ -									
13	PUMPING PLANT	$ 3,694	$ 369	10%	$ 4,064		3,694	369	4,064			3,694	369	4,064
14	RECREATION FACILITIES	$ 499	$ 50	10%	$ 548		499	50	548			499	50	548
15	FLOODWAY CONTROL & DIVERSION STRU	$ -	$ -		$ -									
	* Contract Awarded by State in FY11													
	CONSTRUCTION ESTIMATE TOTALS:	5,289	529	10%	**5,817**		5,289	529	5,817			5,289	529	5,817
01	LANDS AND DAMAGES	$ 7,240	$ 724	10%	$ 7,963		7,240	724	7,963			7,240	724	7,963
30	PLANNING, ENGINEERING & DESIGN													
	Project Management		$ -											
	Planning & Environmental Compliance		$ -											
	Engineering & Design		$ -											
	Engineering Tech Review ITR & VE		$ -											
	Contracting & Reprographics		$ -											
	Engineering During Construction		$ -											
	Planning During Construction		$ -											
	Project Operations		$ -											
31	CONSTRUCTION MANAGEMENT													
	Construction Management	1,414	$ 141	10%	1,556		1,414	141	1,556			1,414	141	1,556
	Project Operation:		$ -											
	Project Management		$ -											
	CONTRACT COST TOTALS:	13,942	1,394		**15,337**		13,942	1,394	15,337			13,942	1,394	**15,337**

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****** CONTRACT COST SUMMARY ******

PROJECT: Biscayne Bay Coastal Wetlands
LOCATION: Miami-Dade County, FL
This Estimate reflects the scope and schedule in report; INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT

DISTRICT: SAJ
POC: CHIEF, COST ENGINEERING, Tracy T. Leeser, P.E.
PREPARED: 24-Mar-10

Estimate Prepared: 14-Mar-11
Effective Price Level: 1 OCT 10

Program Year (Budget EC): 2013
Effective Price Level Date: 1 OCT 12

FULLY FUNDED PROJECT ESTIMATE

WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J	P	L	M	N	O
	CUTLER WETLANDS													
06	FISH & WILDLIFE FACILITIES	$ 1,096	$ 384	35%	$ 1,479	3.1%	1,130	395	1,525	2018Q3	10.0%	1,242	435	1,677
09	CHANNELS & CANALS	$ 9,097	$ 3,184	35%	$ 12,280	3.1%	9,381	3,283	12,664	2014Q3	2.6%	9,622	3,368	12,990
13	PUMPING PLANT	$ 9,379	$ 3,283	35%	$ 12,662	3.1%	9,672	3,385	13,058	2015Q1	3.4%	10,004	3,501	13,506
14	RECREATION FACILITIES	$ 1,285	$ 450	35%	$ 1,734	3.1%	1,325	464	1,789	2014Q3	2.6%	1,359	476	1,834
15	FLOODWAY CONTROL & DIVERSION STRU	$ -	$ -		$ -									
	CONSTRUCTION ESTIMATE TOTALS:	20,856	7,300	35%	**28,156**		21,508	7,528	29,036			22,227	7,780	30,007
01	LANDS AND DAMAGES	$ 28,550	$ 9,992	35%	$ 38,542	3.1%	29,443	10,305	39,748	2014Q2	2.1%	30,071	10,525	40,596
30	PLANNING, ENGINEERING & DESIGN													
	Project Management		$ -											
	Planning & Environmental Compliance		$ -											
	Engineering & Design	3,874	$ 1,356	35%	5,230	7.2%	4,152	1,453	5,606	2014Q2	5.0%	4,361	1,526	5,887
	Engineering Tech Review ITR & VE		$ -											
	Contracting & Reprographics		$ -											
	Engineering During Construction		$ -											
	Planning During Construction		$ -											
	Project Operations		$ -											
31	CONSTRUCTION MANAGEMENT													
	Construction Management	5,578	$ 1,952	35%	7,530	7.2%	5,979	2,092	8,071	2015Q1	8.0%	6,459	2,261	8,719
	Project Operation:		$ -											
	Project Management		$ -											
	CONTRACT COST TOTALS:	58,858	20,600		**79,458**		61,082	21,379	82,461			63,118	22,091	**85,209**

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PROJECT: Biscayne Bay Coastal Wetlands
LOCATION: Miami-Dade County, FL
This Estimate reflects the scope and schedule in report; INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT

DISTRICT: SAJ PREPARED: 24-Mar-10
POC: CHIEF, COST ENGINEERING, Tracy T. Leeser, P.E.

Estimate Prepared: 14-Mar-11
Effective Price Level: 1 OCT 10

Program Year (Budget EC): 2013
Effective Price Level Date: 1 OCT 12

FULLY FUNDED PROJECT ESTIMATE

WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J	P	L	M	N	O
	L-31E WETLANDS													
06	FISH & WILDLIFE FACILITIES	$ 1,096	$ 384	35%	$ 1,479	3.1%	1,130	395	1,525	2015Q2	3.9%	1,174	411	1,585
09	CHANNELS & CANALS	$ 1,864	$ 652	35%	$ 2,516	3.1%	1,922	673	2,595	2014Q3	2.6%	1,972	690	2,662
13	PUMPING PLANT	$ 12,293	$ 4,303	35%	$ 16,596	3.1%	12,677	4,437	17,114	2015Q2	3.9%	13,168	4,609	17,777
14	RECREATION FACILITIES	$ 25	$ 9	35%	$ 34	3.1%	26	9	35	2015Q2	3.9%	27	9	36
15	FLOODWAY CONTROL & DIVERSION STRL	$ 4,646	$ 1,626	35%	$ 6,272	3.1%	4,792	1,677	6,469	2015Q2	3.9%	4,977	1,742	6,719
	CONSTRUCTION ESTIMATE TOTALS:	19,924	6,973	35%	**26,897**		20,547	7,191	27,738			21,317	7,461	28,778
01	LANDS AND DAMAGES	$ 25,540	$ 8,939	35%	$ 34,479	3.1%	26,339	9,219	35,557	2014Q3	2.6%	27,016	9,455	36,471
30	PLANNING, ENGINEERING & DESIGN													
	Project Management		$ -											
	Planning & Environmental Compliance		$ -											
	Engineering & Design	3,500	$ 1,225	35%	4,725	7.2%	3,752	1,313	5,065	2014Q2	5.0%	3,940	1,379	5,319
	Engineering Tech Review ITR & VE		$ -											
	Contracting & Reprographics		$ -											
	Engineering During Construction		$ -											
	Planning During Construction		$ -											
	Project Operations		$ -											
31	CONSTRUCTION MANAGEMENT													
	Construction Management	5,279	$ 1,848	35%	7,127	7.2%	5,658	1,980	7,639	2015Q2	9.0%	6,170	2,159	8,329
	Project Operation:		$ -											
	Project Management		$ -											
	CONTRACT COST TOTALS:	54,243	18,985		**73,228**		56,296	19,703	75,999			58,442	20,455	**78,897**

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B.8 COST DX TPCS CERTIFICATION

Central and Southern Florida Project Comprehensive Everglades Restoration Plan
Biscayne Bay Coastal Wetlands Phase 1
Final Integrated Project Implementation Report and Environmental Impact Statement
USACE JACKSONVILLE DISTRICT

COST ENGINEERING DX -TPCS ATR CERTIFICATION

The Biscayne Bay Coastal Wetlands Phase 1 Final Project Implementation Report and Environmental Impact Statement has undergone a successful Cost Agency Technical Review (ATR), performed by the Wall Walla Cost Dx representatives. The Cost ATR included study of the project scope, report, cost estimates, schedules, escalation, and risk-based contingencies in accordance with ER 1110-2-1150 Engineering and Design for Civil Works Projects and ER 1110-2-1302 Civil Works Cost Engineering.

As of 30 March2011, the Walla Walla District, Cost Engineering Directory of Expertise (DX) for Civil Works, certifies the estimated total project cost of the Biscayne Bay Coastal Wetlands Phase 1 Final Project Implementation Report and Environmental Impact Statement estimated values of:

2013 Budget Amount:	$173,796,000
Fully Funded Amount:	$202,438,000 including spent costs

It is the responsibility of the Jacksonville District to correctly reflect these cost values within the Final Report.

30 MAR 2011
Date:

Kim Callan, PE, CCE, PM1
Chief, Cost Engineering Dx
Walla Walla District

****** TOTAL PROJECT COST SUMMARY ******

PROJECT: Biscayne Bay Coastal Wetlands
LOCATION: Miami-Dade County, FL

DISTRICT: SAJ
POC: CHIEF, COST ENGINEERING, Tracy T. Leeser, P.E.

PREPARED: 24-Mar-10

This Estimate reflects the scope and schedule in report: INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT

Program Year (Budget EC): 2013
Effective Price Level Date: 1 OCT 12

WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FULLY FUNDED PROJECT ESTIMATE Spent Thru: 10-Dec-10 ($K)	COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J	K L	M	N	O
06	FISH & WILDLIFE FACILITIES	3,297	877	27%	4,164	2.2%	3,356	901	4,256		3,512	955	4,467
09	CHANNELS & CANALS	10,961	3,836	35%	14,797	3.1%	11,303	3,956	15,259		11,594	4,058	15,651
13	PUMPING PLANT	25,367	7,955	31%	33,321	2.7%	26,044	8,192	34,236		26,866	8,480	35,346
14	RECREATION FACILITIES	1,808	508	28%	2,316	2.4%	1,849	523	2,372		1,884	535	2,419
15	FLOODWAY CONTROL & DIVERSION STRL	4,646	1,626	35%	6,272	3.1%	4,792	1,677	6,469		4,977	1,742	6,719
	CONSTRUCTION ESTIMATE TOTALS:	46,069	14,802		**60,871**	2.8%	47,343	15,248	62,592		48,833	15,769	64,602
01	LANDS AND DAMAGES	61,330	19,656	32%	80,985	2.8%	63,021	20,247	83,269		64,326	20,704	85,030
30	PLANNING, ENGINEERING & DESIGN	7,374	2,581	35%	9,955	7.2%	7,904	2,766	10,670	22,948.3	8,301	2,905	34,154
31	CONSTRUCTION MANAGEMENT	12,271	3,941	32%	16,212	6.5%	13,051	4,214	17,266	47.2	14,043	4,561	18,651
	PROJECT COST TOTALS:	127,044	40,980	32%	**168,023**	3.4%	131,320	42,476	173,796	22,995.5	135,502	43,940	202,438

CHIEF, COST ENGINEERING, Tracy T. Leeser, P.E.

PROJECT MANAGER, Stephen Baisden, P.E.

CHIEF, REAL ESTATE, Sharon W. Conklin

CHIEF, PLANNING,xxx

CHIEF, ENGINEERING, xxx

CHIEF, OPERATIONS, xxx

CHIEF, CONSTRUCTION, xxx

CHIEF, CONTRACTING,xxx

CHIEF, PM-PB, xxxx

CHIEF, DPM, xxx

ESTIMATED FEDERAL COST: **101,219**
ESTIMATED NON-FEDERAL COST: **101,219**
ESTIMATED TOTAL PROJECT COST: 202,438

Filename: TPCS-Biscayne Bay Coastal Wetlands 03-25-11.xlsx
TPCS

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**** TOTAL PROJECT COST SUMMARY ****

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**** CONTRACT COST SUMMARY ****

PROJECT: Biscayne Bay Coastal Wetlands
LOCATION: Miami-Dade County, FL
This Estimate reflects the scope and schedule in report: INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT

DISTRICT: SAJ
POC: CHIEF, COST ENGINEERING, Tracy T. Leeser, P.E.
PREPARED: 24-Mar-10

Estimate Prepared: 14-Mar-11
Effective Price Level: 1 OCT 10

Program Year (Budget EC): 2013
Effective Price Level Date: 1 OCT 12

FULLY FUNDED PROJECT ESTIMATE

WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J	P	L	M	N	O
	DEERING ESTATE FLOWWAY*													
06	FISH & WILDLIFE FACILITIES	$ 1,096	$ 110	10%	$ 1,205		1,096	110	1,205			1,096	110	1,205
09	CHANNELS & CANALS	$ -	$ -		$ -									
13	PUMPING PLANT	$ 3,694	$ 369	10%	$ 4,064		3,694	369	4,064			3,694	369	4,064
14	RECREATION FACILITIES	$ 499	$ 50	10%	$ 548		499	50	548			499	50	548
15	FLOODWAY CONTROL & DIVERSION STRC	$ -	$ -		$ -									
	* Contract Awarded by State in FY11													
	CONSTRUCTION ESTIMATE TOTALS:	5,289	529	10%	**5,817**		5,289	529	5,817			5,289	529	5,817
01	LANDS AND DAMAGES	$ 7,240	$ 724	10%	$ 7,963		7,240	724	7,963			7,240	724	7,963
30	PLANNING, ENGINEERING & DESIGN													
	Project Management		$ -											
	Planning & Environmental Compliance		$ -											
	Engineering & Design		$ -											
	Engineering Tech Review ITR & VE		$ -											
	Contracting & Reprographics		$ -											
	Engineering During Construction		$ -											
	Planning During Construction		$ -											
	Project Operations		$ -											
31	CONSTRUCTION MANAGEMENT													
	Construction Management	1,414	$ 141	10%	1,556		1,414	141	1,556			1,414	141	1,556
	Project Operation:		$ -											
	Project Management		$ -											
	CONTRACT COST TOTALS:	13,942	1,394		**15,337**		13,942	1,394	15,337			13,942	1,394	**15,337**

Filename: TPCS-Biscayne Bay Coastal Wetlands 03-25-11.xlsx
TPCS

**** TOTAL PROJECT COST SUMMARY ****

Printed:3/30/2011
Page 3 of 4

*** CONTRACT COST SUMMARY ***

PROJECT: Biscayne Bay Coastal Wetlands
LOCATION: Miami-Dade County, FL
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DISTRICT: SAJ
POC: CHIEF, COST ENGINEERING, Tracy T. Leeser, P.E.
PREPARED: 24-Mar-10

Estimate Prepared: 14-Mar-11
Effective Price Level: 1 OCT 10

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FULLY FUNDED PROJECT ESTIMATE

WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J	P	L	M	N	O
	CUTLER WETLANDS													
06	FISH & WILDLIFE FACILITIES	$ 1,098	$ 384	35%	$ 1,479	3.1%	1,130	395	1,525	2018Q3	10.0%	1,242	435	1,677
09	CHANNELS & CANALS	$ 9,097	$ 3,184	35%	$ 12,280	3.1%	9,381	3,283	12,664	2014Q3	2.6%	9,622	3,368	12,990
13	PUMPING PLANT	$ 9,379	$ 3,283	35%	$ 12,662	3.1%	9,672	3,385	13,058	2015Q1	3.4%	10,004	3,501	13,506
14	RECREATION FACILITIES	$ 1,285	$ 450	35%	$ 1,734	3.1%	1,325	464	1,789	2014Q3	2.6%	1,359	476	1,834
15	FLOODWAY CONTROL & DIVERSION STRU	$ -	$ -		$ -									
	CONSTRUCTION ESTIMATE TOTALS:	20,856	7,300	35%	**28,156**		21,508	7,528	29,036			22,227	7,780	30,007
01	LANDS AND DAMAGES	$ 28,550	$ 9,992	35%	$ 38,542	3.1%	29,443	10,305	39,748	2014Q2	2.1%	30,071	10,525	40,596
30	PLANNING, ENGINEERING & DESIGN													
	Project Management		$ -											
	Planning & Environmental Compliance		$ -											
	Engineering & Design	3,874	$ 1,356	35%	5,230	7.2%	4,152	1,453	5,606	2014Q2	5.0%	4,361	1,526	5,887
	Engineering Tech Review ITR & VE		$ -											
	Contracting & Reprographics		$ -											
	Engineering During Construction		$ -											
	Planning During Construction		$ -											
	Project Operations		$ -											
31	CONSTRUCTION MANAGEMENT													
	Construction Management	5,578	$ 1,952	35%	7,530	7.2%	5,979	2,092	8,071	2015Q1	8.0%	6,459	2,261	8,719
	Project Operation:		$ -											
	Project Management		$ -											
	CONTRACT COST TOTALS:	58,858	20,600		**79,458**		61,082	21,379	82,461			63,118	22,091	**85,209**

Filename: TPCS-Biscayne Bay Coastal Wetlands 03-25-11.xlsx
TPCS

****** TOTAL PROJECT COST SUMMARY ******

PROJECT: Biscayne Bay Coastal Wetlands
LOCATION: Miami-Dade County, FL
This Estimate reflects the scope and schedule in report: INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT

DISTRICT: SAJ
POC: CHIEF, COST ENGINEERING, Tracy T. Leeser, P.E.
PREPARED: 24-Mar-10

Estimate Prepared: 14-Mar-11
Effective Price Level: 1 OCT 10

Program Year (Budget EC): 2013
Effective Price Level Date: 1 OCT 12

WBS NUMBER A	Civil Works Feature & Sub-Feature Description B	COST ($K) C	CNTG ($K) D	CNTG (%) E	TOTAL ($K) F	ESC (%) G	COST ($K) H	CNTG ($K) I	TOTAL ($K) J	FULLY FUNDED PROJECT ESTIMATE Mid-Point Date P	ESC (%) L	COST ($K) M	CNTG ($K) N	FULL ($K) O
	L-31E WETLANDS													
06	FISH & WILDLIFE FACILITIES	$ 1,096	$ 384	35%	$ 1,479	3.1%	1,130	395	1,525	2015Q2	3.9%	1,174	411	1,585
09	CHANNELS & CANALS	$ 1,864	$ 652	35%	$ 2,516	3.1%	1,922	673	2,595	2014Q3	2.6%	1,972	690	2,662
13	PUMPING PLANT	$ 12,293	$ 4,303	35%	$ 16,596	3.1%	12,677	4,437	17,114	2015Q2	3.9%	13,168	4,609	17,777
14	RECREATION FACILITIES	$ 25	$ 9	35%	$ 34	3.1%	26	9	35	2015Q2	3.9%	27	9	36
15	FLOODWAY CONTROL & DIVERSION STRU	$ 4,646	$ 1,626	35%	$ 6,272	3.1%	4,792	1,677	6,469	2015Q2	3.9%	4,977	1,742	6,719
	CONSTRUCTION ESTIMATE TOTALS:	19,924	6,973	35%	**26,897**		20,547	7,191	27,738			21,317	7,461	28,778
01	LANDS AND DAMAGES	$ 25,540	$ 8,939	35%	$ 34,479	3.1%	26,339	9,219	35,557	2014Q3	2.6%	27,016	9,455	36,471
30	PLANNING, ENGINEERING & DESIGN													
	Project Management		$ -											
	Planning & Environmental Compliance		$ -											
	Engineering & Design	3,500	$ 1,225	35%	4,725	7.2%	3,752	1,313	5,065	2014Q2	5.0%	3,940	1,379	5,319
	Engineering Tech Review ITR & VE		$ -											
	Contracting & Reprographics		$ -											
	Engineering During Construction		$ -											
	Planning During Construction		$ -											
	Project Operations		$ -											
31	CONSTRUCTION MANAGEMENT													
	Construction Management	5,279	$ 1,848	35%	7,127	7.2%	5,658	1,980	7,639	2015Q2	9.0%	6,170	2,159	8,329
	Project Operation:		$ -											
	Project Management		$ -											
	CONTRACT COST TOTALS:	54,243	18,985		**73,228**		56,296	19,703	75,999			58,442	20,455	**78,897**

Filename: TPCS-Biscayne Bay Coastal Wetlands 03-25-11.xlsx
TPCS

APPENDIX B-2A

PROJECT COST AND SCHEDULE RISK ANALYSIS REPORT

US Army Corps
of Engineers®

Biscayne Bay Coastal Wetlands
Miami South-Dade, Florida
Feasibility Study
Project Cost and Schedule Risk Analysis Report

Prepared for:

U.S. Army Corps of Engineers,
Jacksonville District

Prepared by:

U.S. Army Corps of Engineers
SAJ Cost Engineering, Jacksonville

December 28, 2010

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APPENDIX

APPENDIX A includes

Detailed Risk Analysis
RISK REGISTER SUMMARY
SENSITIVITY CHARTS
TOTAL PROJECT COST PRESENTATION
PROJECT CONFIDENCE CURVES

EXECUTIVE SUMMARY

Under the auspices of the U.S. Army Corps of Engineers (USACE), Jacksonville District, this report presents a recommendation for the total project cost and schedule contingencies for the Biscayne Bay Coastal Wetlands. In compliance with Engineer Regulation (ER) 1110-2-1302 CIVIL WORKS COST ENGINEERING, dated September 15, 2008, a formal risk analysis study was conducted for the development of contingency on the total project cost. The purpose of this risk analysis study was to establish project contingencies by identifying and measuring the cost and schedule impact of project uncertainties with respect to the estimated total project cost.

Specific to the Biscayne Bay Coastal Wetlands project, the most likely total project cost is estimated at approximately $149.9 Million. Based on the results of the analysis, the SAJ Cost Engineering recommends a contingency value of $52.4 Million, or 35%.

The Project Delivery Team (PDT) conducted a series of brainstorming sessions in June 2010 to identify the risks associated with the project. The expert judgment of the estimator and the risk analyst also helped to identify and define the risks. SAJ Cost Engineering performed risk analysis using the Monte Carol technique, producing the aforementioned contingencies and identifying key risk drivers.

The following ***Table ES-1*** portrays the development of contingencies for the project. The contingency is based on an 80% confidence level, as per accepted USACE Civil Works guidance.

Table ES-1: Contingency Development Summary

Contingency on Base Estimate	80% Confidence Project Cost
Baseline Estimate Cost (Most Likely) ->	**$149,992,428**
Baseline Estimate Cost Contingency Amount ->	$42,854,924
Baseline Estimate Construction Cost (80% Confidence) ->	**$192,847,352**

Contingency on Schedule	80% Confidence Project Schedule
Project Schedule Duration (Most Likely) ->	**83.5 Months**
Schedule Contingency Duration ->	52.9 Months
Project Schedule Duration (80% Confidence) ->	**136.4 Months**
Project Schedule Contingency Amount (80% Confidence) ->	**$9,494,535**

Project Contingency	80% Confidence Project Cost
Project Contingency Amount (80% Confidence) ->	**$52,349,458**
Project Contingency Percentage (80% Confidence) ->	**35%**

Project Cost (80% Confidence) ->	**$202,341,886**

KEY FINDINGS/OBSERVATIONS RECOMMENDATIONS

The key cost risk drivers identified through sensitivity analysis are External Risk REL-4 (Property Values), CON-6 (Claims), CA-1 (Market Conditions and Bidding Competition), CA-2 (Possibility for Separate Contracts), and CON-3 (Safety Issues) which together contribute nearly 80 percent of the statistical cost variance.

The key schedule risk drivers identified through sensitivity analysis are External Risk REL-3 (Condemnations), REL-9 (Inverse Condemnation Actions), REL-10 (Court Injunctions), and REL-6 (Objections to Appraisals) which together contribute over 80 percent of the statistical schedule variance.

Recommendations, as detailed within the main report, include the implementation of contingencies, further iterative study of risks throughout the project life-cycle, potential mitigation throughout the PED phase, and proactive monitoring and control of risks identified in this study.

Table ES-2: Contingency Analysis Table

Most Likely Cost Estimate	$149,992,428		
Confidence Level	Project Cost	Contingency	Contingency %
0%	$150,665,908	$673,480	0.45%
5%	$170,543,581	$20,551,153	13.70%
10%	$174,573,778	$24,581,350	16.39%
15%	$177,478,001	$27,485,573	18.32%
20%	$179,885,476	$29,893,048	19.93%
25%	$182,033,959	$32,041,531	21.36%
30%	$183,991,016	$33,998,588	22.67%
35%	$185,831,908	$35,839,480	23.89%
40%	$187,524,631	$37,532,203	25.02%
45%	$189,108,203	$39,115,775	26.08%
50%	$190,860,601	$40,868,173	27.25%
55%	$192,559,438	$42,567,010	28.38%
60%	$194,196,510	$44,204,082	29.47%
65%	$195,996,201	$46,003,773	30.67%
70%	$197,943,150	$47,950,722	31.97%
75%	$200,122,483	$50,130,055	33.42%
80%	$202,341,886	$52,349,458	34.90%
85%	$205,011,958	$55,019,530	36.68%
90%	$208,403,786	$58,411,358	38.94%
95%	$213,592,613	$63,600,185	42.40%
100%	$241,814,672	$91,822,244	61.22%

Risk is comprised of cost and schedule risk elements. This analysis considers schedule elements only in terms of significant "Hotel" costs, as this project is not susceptible to un-captured escalation. The following tables tabulate the results of the risk analysis currently identified as 35%.

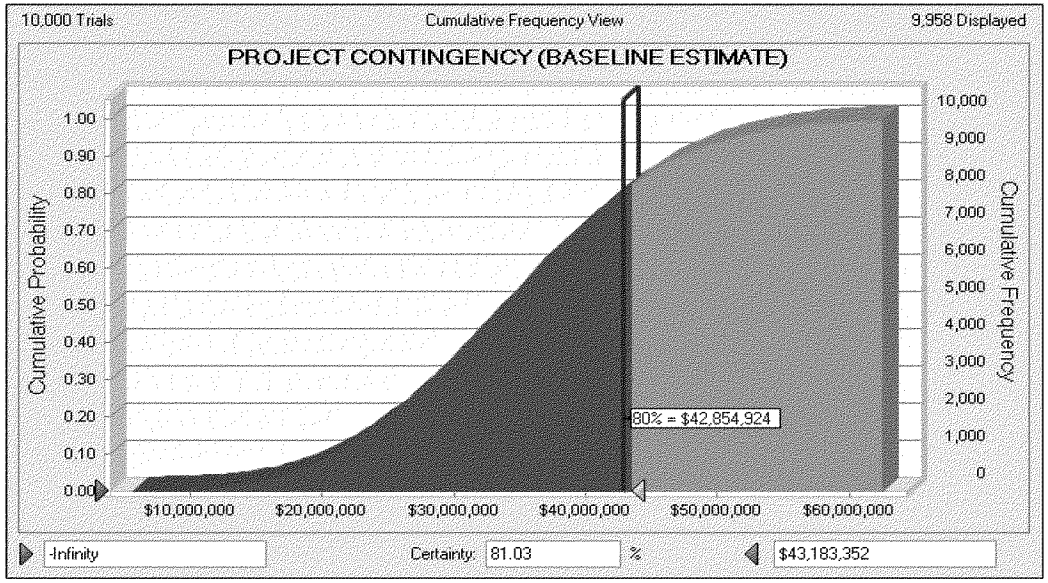

FIGURE ES-1: CUMULATIVE FREQUENCY CHART (COST)

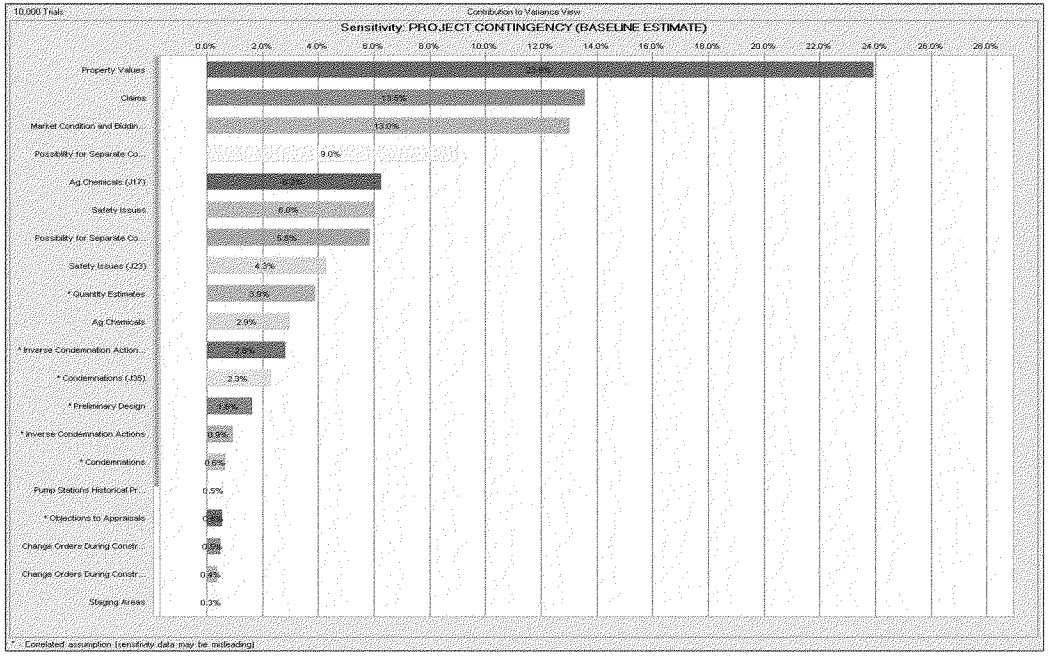

FIGURE ES-2: SENSITIVITY CHART (COST)

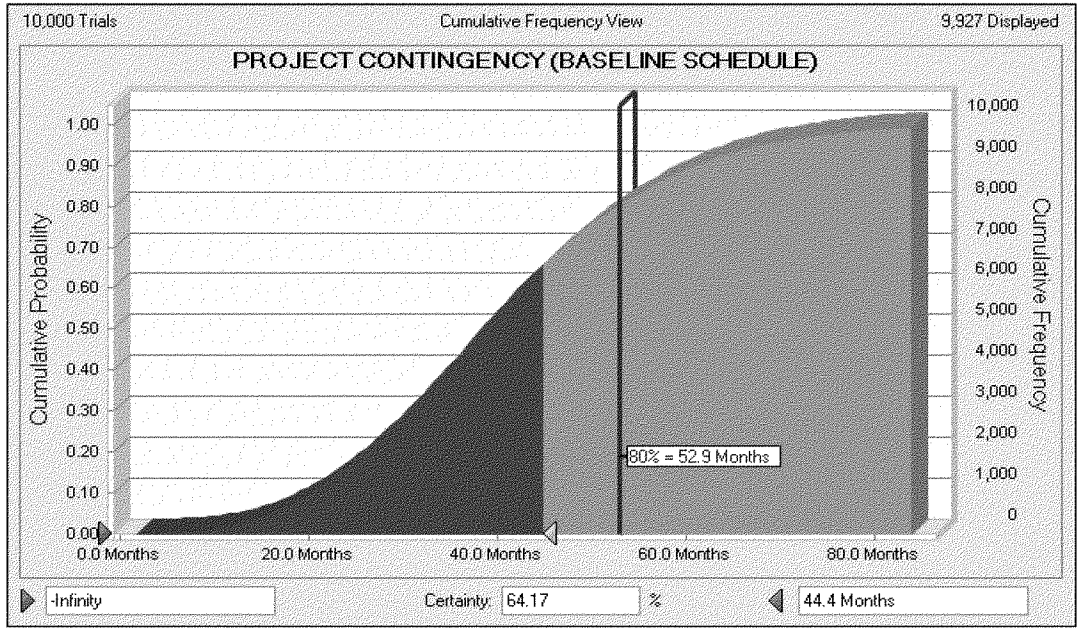

FIGURE ES-3: CUMULATIVE FREQUENCY CHART (SCHEDULE)

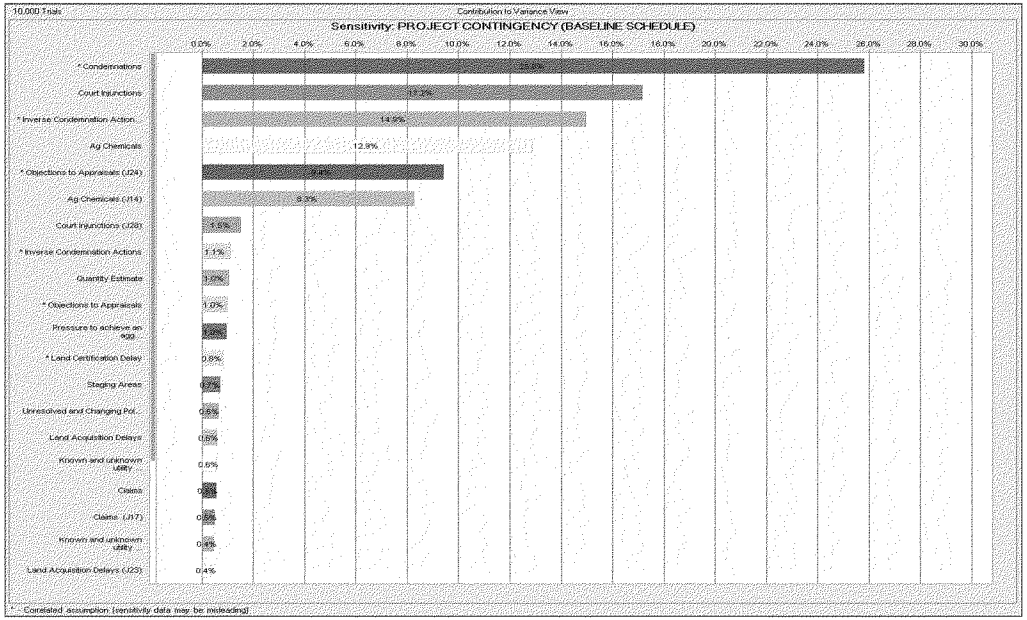

FIGURE ES-4: SENSITIVITY CHART (SCHEDULE)

B.1 PURPOSE

This Risk Analysis is based on Biscayne Bay Coastal Wetlands. The purpose for a cost and schedule risk analysis (CSRA) is to briefly present discussion of the studied elements related to cost and schedule with an outcome contingency calculation at the recommended confidence level for both cost and schedule that are measured in terms of dollars. The most common and recommended contingency has been established at 80% confidence.

B.2 BACKGROUND

Alternative O Phase 1 – Reflects a standalone increment of Alternative O that provides a meaningful first step towards restoration in the study area and provides opportunity to reduce uncertainty for subsequent features. Alternative O Phase 1 includes a footprint of roughly 3,761 acres of land, seven pump stations, approximately 10 culverts reconnecting wetlands, approximately 3 miles of spreader canals, and plugging 2,500 feet of mosquito control ditches.

B.3 REPORT SCOPE

The scope of the risk analysis report is to calculate and present the cost and schedule contingencies at the 80 percent confidence level using the risk analysis processes, as mandated by U.S. Army Corps of Engineers (USACE) Engineer Regulation (ER) 1110-2-1150, Engineering and Design for Civil Works, ER 1110-2-1302, Civil Works Cost Engineering, and Engineer Technical Letter 1110-2-573, Construction Cost Estimating Guide for Civil Works. The report presents the contingency results for cost risks for all project features. The study and presentation does not include consideration for operation and maintenance or life cycle costs.

B.4 PROJECT SCOPE

The scope of this study addresses the identification of problems, needs, opportunities and potential solutions that are viable from an economic, environmental, and engineering viewpoint.

B.5 USACE RISK ANALYSIS PROCESS

The risk analysis process follows the USACE Headquarters requirements as well as the guidance provided by the Cost Engineering Directory of Expertise for Civil Works (Cost Dx). The risk analysis process reflected within the risk analysis report uses probabilistic cost and schedule risk analysis methods within the framework of the Crystal Ball software. The risk analysis results are intended to serve several functions – one being the establishment of reasonable contingencies reflective of an 80 percent confidence level to successfully

accomplish the project work within that established contingency amount. Furthermore, the scope of the report includes the identification and communication of important steps, logic, key assumptions,

limitations, and decisions to help ensure that risk analysis results can be appropriately interpreted.

Risk analysis results are also intended to provide project leadership with contingency information for scheduling, budgeting, and project control purposes, as well as provide tools to support decision making and risk management as the project progresses through planning and implementation. To fully recognize its benefits, cost and schedule risk analyses should be considered as an ongoing process conducted concurrent to, and iteratively with, other important project processes such as scope and execution plan development, resource planning, procurement planning, cost estimating, budgeting, and scheduling.
In addition to broadly defined risk analysis standards and recommended practices, the risk analysis is performed to meet the requirements and recommendations of the following documents and sources:

- Cost and Schedule Risk Analysis Process guidance prepared by the USACE Cost Dx.
- Memorandum from Major General Don T. Riley (US Army Director of Civil Works), dated July 3, 2007.
- Engineering and Construction Bulletin issued by James C. Dalton, P.E. (Chief, Engineering and Construction, Directorate of Civil Works), dated September 10, 2007.
- Engineering Regulation ER 1110-2-1150 dated August 31, 1999.
- Engineering Regulation ER 1110-2-1302 dated September 15, 2008.
- Engineering Technical Letter 1110-2-573 dated September 30, 2008.

B.6 METHODOLOGY/PROCESS

The SAJ Cost Engineering assembled a team consisting one senior civil cost engineer from the Cost DX, one estimator from Jacksonville, and also project management and the assigned project delivery team (PDT) for coordination support.

The risk analysis process for this study is intended to determine the probability of various cost outcomes and quantify the required contingency needed in the cost estimate to achieve any desired level of cost confidence.

In simple terms, contingency is an amount added to an estimate to allow for items, conditions or events for which the occurrence or impact is uncertain and that experience suggests will likely result in additional costs being incurred or additional time being required. The amount of contingency included in project

control plans depends, at least in part, on the project leadership's willingness to accept risk of project overruns. The less risk that project leadership is willing to accept the more contingency should be applied in the project control plans. The risk of overrun is expressed, in a probabilistic context, using confidence levels.

The Cost Dx guidance for cost and schedule risk analysis generally focuses on the 80-percent level of confidence (P80) for cost contingency calculation. It should be noted that use of P80 as a decision criteria is a risk averse approach (whereas the use of P50 would be a risk neutral approach, and use of levels less than 50 percent would be risk seeking). Thus, a P80 confidence level results in greater contingency as compared to a P50 confidence level. The selection of contingency at a particular confidence level is ultimately the decision and responsibility of the project's District and/or Division management.

The risk analysis process uses *Monte Carlo* techniques to determine probabilities and contingency. The *Monte Carlo* techniques are facilitated computationally by a commercially available risk analysis software package (Crystal Ball) that is an add-in to Microsoft Excel. Cost estimates are packaged into an Excel format and used directly for cost risk analysis purposes. The level of detail recreated in the Excel-format schedule is sufficient for risk analysis purposes that reflect the established risk register, but generally less than that of the native format.

The primary steps, in functional terms, of the risk analysis process are described in the following subsections. Risk analysis results are provided in section 6.

B.7 IDENTIFY AND ASSESS RISK FACTORS

Identifying the risk factors via the PDT is considered a qualitative process that results in establishing a risk register that serves as the document for the quantitative study using the Crystal Ball risk software. Risk factors are events and conditions that may influence or drive uncertainty in project performance. They may be inherent characteristics or conditions of the project or external influences, events, or conditions such as weather or economic conditions. Risk factors may have either favorable or unfavorable impacts on project cost and schedule.

Checklists or historical databases of common risk factors are sometimes used to facilitate risk factor identification. However, key risk factors are often unique to a project and not readily derivable from historical information. Therefore, input from the entire PDT is obtained using creative processes such as brainstorming or other facilitated risk assessment meetings. In practice, a combination of professional judgment from the PDT and empirical data from similar projects is desirable and is considered.

Formal PDT meetings are held for the purposes of identifying and assessing risk factors. The meetings should include capable and qualified representatives from multiple project team disciplines and functions, for example:

- Project/Program managers
- Contracting/acquisition
- Real Estate
- Relocations
- Environmental
- Civil and Coastal Design
- Cost and schedule engineers
- Construction
- Key Sponsors

The initial formal meetings should focus primarily on risk factor identification using brainstorming techniques, but also include some facilitated discussions based on risk factors common to projects of similar scope and geographic location. Subsequent meetings should focus primarily on risk factor assessment and quantification.

Additionally, numerous conference calls and informal meetings are conducted throughout the risk analysis process on an as-needed basis to further facilitate risk factor identification, market analysis, and risk assessment.

B.8 QUANTIFY RISK FACTOR IMPACTS

The quantitative impacts of risk factors on project plans are analyzed using a combination of professional judgment, empirical data, and analytical techniques. Risk factor impacts are quantified using probability distributions (density functions), because risk factors are entered into the Crystal Ball software in the form of probability density functions.

Similar to the identification and assessment process, risk factor quantification involves multiple project team disciplines and functions. However, the quantification process relies more extensively on collaboration between cost engineering, designers, and risk analysis team members with lesser inputs from other functions and disciplines.

The following is an example of the PDT quantifying risk factor impacts by using an iterative, consensus-building approach to estimate the elements of each risk factor:

- Maximum possible value for the risk factor.
- Minimum possible value for the risk factor.
- Most likely value (the statistical mode), if applicable.

- Nature of the probability density function used to approximate risk factor uncertainty.
- Mathematical correlations between risk factors.
- Affected cost estimate and schedule elements.

The resulting product from the PDT discussions is captured within a risk register as presented in section 6 for both cost and schedule risk concerns. Note that the risk register records the PDT's risk concerns, discussions related to those concerns, and potential impacts to the current cost and schedule estimates. The concerns and discussions are meant to support the team's decisions related to event likelihood, impact, and the resulting risk levels for each risk event.

B.9 ANALYZE COST ESTIMATE AND SCHEDULE CONTINGENCY

Contingency is analyzed using the Crystal Ball software, an add-in to the Microsoft Excel format of the cost estimate and schedule. *Monte Carlo* simulations are performed by applying the risk factors (quantified as probability density functions) to the appropriate estimated cost and schedule elements identified by the PDT. Contingencies are calculated by applying only the moderate and high level risks identified for each option (i.e., low-level risks are typically not considered, but remain within the risk register to serve historical purposes as well as support follow-on risk studies as the project and risks evolve).

For the cost estimate, the contingency is calculated as the difference between the P80 cost forecast and the baseline cost estimate. Each option-specific contingency is then allocated on a civil works feature level based on the dollar-weighted relative risk of each feature as quantified by *Monte Carlo* simulation. Standard deviation is used as the feature-specific measure of risk for contingency allocation purposes. This approach results in a relatively larger portion of all the project feature cost contingency being allocated to features with relatively higher estimated cost uncertainty.

B.10 PROJECT ASSUMPTIONS

The following data sources and assumptions were used in quantifying the costs associated with the with- and without-project conditions at Biscayne Bay Coastal Wetlands.

a. The risk of multiple contracts increasing the duration and total project cost is taken into account in the contingency developed in the CSRA.

b. Historical data was used to determine the pump-station durations for L-31E.

c. The cost comparisons and risk analyses performed and reflected within this report are based upon design scope and estimates that are considered to be fairly well developed and designed.

d. The schedule was analyzed for impact to the total project cost only in terms of "Hotel" costs (unavoidable fixed contract costs and/or languishing federal administration costs incurred continuously throughout delay). The local market at the project location is not susceptible to uncaptured escalation (local market inflation notably higher than national average).

e. The Cost Dx guidance generally focuses on the eighty-percent level of confidence (P80) for cost contingency calculation. For this risk analysis, the eighty-percent level of confidence (P80) was used. It should be noted that the use of P80 as a decision criteria is a moderately risk averse approach, generally resulting in higher cost contingencies. However, the P80 level of confidence also assumes a small degree of risk that the recommended contingencies may be inadequate to capture actual project costs.

f. Only high and moderate risk level impacts, as identified in the risk register, were considered for the purposes of calculating cost contingency. Low level risk impacts should be maintained in project management documentation, and reviewed at each project milestone to determine if they should be placed on the risk "watch list" for further monitoring and evaluation.

B.11 RISK ANALYSIS RESULTS

The following table summarizes the results of the risk analysis currently identified as a 35% contingency amount based on 80% confidence level. The complete list of tables and figures are included within Appendix A.

Table 1: Contingency Development Summary

Contingency on Base Estimate	80% Confidence Project Cost
Baseline Estimate Cost (Most Likely) ->	**$149,992,428**
Baseline Estimate Cost Contingency Amount ->	$42,854,924
Baseline Estimate Construction Cost (80% Confidence) ->	**$192,847,352**

Contingency on Schedule	80% Confidence Project Schedule
Project Schedule Duration (Most Likely) ->	**83.5**
Schedule Contingency Duration ->	52.9
Project Schedule Duration (80% Confidence) ->	**136.4 Months**
Project Schedule Contingency Amount (80% Confidence) ->	**$9,494,535**

Project Contingency	80% Confidence Project Cost
Project Contingency Amount (80% Confidence) ->	**$52,349,458**
Project Contingency Percentage (80% Confidence) ->	**35%**

Project Cost (80% Confidence) ->	**$202,341,886**

B.12 RISK REGISTER

A risk register is a tool commonly used in project planning and risk analysis. The actual risk register is provided in Appendix A. The complete risk register includes low level risks, as well as additional information regarding the nature and impacts of each risk.

It is important to note that a risk register can be an effective tool for managing identified risks throughout the project life cycle. As such, it is generally recommended that risk registers be updated as the designs, cost estimates, and schedule are further refined, especially on large projects with extended schedules. Recommended uses of the risk register going forward include:

- Documenting risk mitigation strategies being pursued in response to the identified risks and their assessment in terms of probability and impact.
- Providing project sponsors, stakeholders, and leadership/management with a documented framework from which risk status can be reported in the context of project controls.
- Communicating risk management issues.
- Providing a mechanism for eliciting risk analysis feedback and project control input.

- Identifying risk transfer, elimination, or mitigation actions required for implementation of risk management plans.

B.13 COST RISK ANALYSIS – PROJECT COST CONTINGENCY RESULTS

Table 2 provides the construction cost contingencies calculated for the P80 confidence level and rounded to the nearest thousand. The construction cost contingencies for the P50 and P100 confidence levels are also provided for illustrative purposes.

Contingency was quantified as approximately $52.4 Million at the P80 confidence level (about 35% of the base cost estimate). For comparison, the cost contingency at the P50 and P100 confidence levels was quantified as 28% and 62% of the baseline cost estimate, respectively.

Table 2: Total Project Cost Contingency Summary

Risk Analysis Forecast	Base Estimate	Total Contingency[1] ($)	Total Contingency (%)
50% Confidence Level			
Total Project Cost	$190,860,601	$40,868,173	27.25%
80% Confidence Level			
Total Project Cost	$202,341,886	$52,349,458	34.90%
100% Confidence Level			
Total Project Cost	$241,814,672	$91,822,244	61.22%

Note: These figures combine uncertainty in the baseline cost estimate and schedule (in terms of "Hotel" costs only).

B.14 SCHEDULE RISK ANALYSIS – TOTAL PROJECT DURATION CONTINGENCY RESULTS

Table 3 provides the schedule duration contingencies calculated for the P80 confidence level. The schedule duration contingencies for the P50 and P100 confidence levels are also provided for illustrative purposes.

Schedule duration contingency was quantified as 52.9 months based on the P80 level of confidence. These contingencies were used to calculate the projected "Hotel" cost impact of project delays that are included in the Tables 1 and 2 presentation of total cost contingency. The schedule contingencies were calculated by applying the high level schedule risks identified in the risk register for each option to the durations of critical path and near critical path tasks.

The schedule was not resource loaded and contained open-ended tasks and non-zero lags (gaps in the logic between tasks) that limit the overall utility of the schedule risk analysis. These issues should be considered as limitations in the

utility of the schedule contingency data presented. Schedule contingency impacts presented in this analysis are based solely on projected "Hotel" costs. Resource impacts related to potential schedule delays could not be evaluated. See Appendix A for detailed tables and charts.

Table 3: Schedule Duration Contingency Summary

Risk Analysis Forecast	Base Schedule Duration (months)	Contingency[1] (months)	Contingency (%)
50% Confidence Level			
Total Project Duration	122.1	38.6	46.26%
80% Confidence Level			
Total Project Duration	136.4	52.9	63.30%
100% Confidence Level			
Total Project Duration	189.3	105.8	126.74%

Note: The schedule was not resource loaded and contained open-ended tasks and non-zero lags (gaps in the logic between tasks) that limit the overall utility of the schedule risk analysis. These issues should be considered as limitations in the utility of the schedule contingency data presented in Table 3.

B.15 MITIGATION RECOMMENDATIONS

Risk Management is an all-encompassing, iterative, and life-cycle process of project management. The Project Management Institute's (PMI) *A Guide to the Project Management Body of Knowledge (PMBOK® Guide), 4th edition*, states that "project risk management includes the processes concerned with conducting risk management planning, identification, analysis, responses, and monitoring and control on a project." Risk identification and analysis are processes within the knowledge area of risk management. Its outputs pertinent to this effort include the risk register, risk quantification (risk analysis model), contingency report, and the sensitivity analysis.

The intended use of these outputs is implementation by the project leadership with respect to risk responses (such as mitigation) and risk monitoring and control. In short, the effectiveness of the project risk management effort requires that the proactive management of risks not conclude with the study completed in this report.

This section provides a list of recommendations for continued management of the risks identified and analyzed in this study. Whereas the developed contingency, itself, is a response to the potential for these risks, these risks warrant consideration of other potential responses and proactive monitoring and control. Note that this list is not all-inclusive.

1. Key Cost Risk Drivers: The key cost risk drivers identified through sensitivity analysis are External Risk CA-1 (Market Conditions and Bidding

Competition), REL-4 (Property Values), CA-2 (Possibility for Separate Contracts), and CON-6 (Claims) which together contribute nearly 80 percent of the statistical cost variance.

a) Market Conditions and Bidding Competition: With respect to Market Conditions and Bidding Competition (Risk CA-1), SAJ Cost Engineering recommends continuous monitoring of the price fluctuations and behaviors in the regional industry in the PDT's ongoing market research. Project leadership should craft the acquisition strategy with respect to the market trends to minimize the impact of industry contraction or saturation and to maximize competition.

b) Property Values: With respect to Property Values (Risk REL-4), SAJ Cost Engineering recommends that the PDT (Real Estate) continues to monitor the real estate market and the fluctuations in the property values.

c) Possibility for Separate Contracts: With respect to Possibility for Separate Contracts (Risk CA-2), SAJ Cost Engineering recommends that the PDT communicate during the development of plans and specs, as more details become known, to consider the possibility of separate contracts and the impact that it would have on the project schedule and total cost.

d) Claims: With respect to Claims (Risk CON-6), SAJ Cost Engineering recommends that the PDT monitors this issue closely.

2. Key Schedule Risk Drivers: The key schedule risk drivers identified through sensitivity analysis are External Risk REL-3 (Condemnations), REL-9 (Inverse Condemnation Actions), PR-5 (Court Injunctions), and REL-6 (Objections to Appraisals) which together contribute over 80 percent of the statistical schedule variance.

a) Condemnations: With respect to Condemnations (Risk REL-11), SAJ Cost Engineering recommends proactive communication and action with the local land owners and the community. It is recommended that the community is kept involved with the project and their opinions and suggestions about the project considered.

b) Inverse Condemnation Actions: With respect to Inverse Condemnation Actions (Risk REL-9), SAJ Cost Engineering recommends proactive communication and action with the local land owners and the community. It is recommended that the community is kept involved with the project and their opinions and suggestions about the project considered.

c) Court Injunctions: With respect to Court Injunctions (Risk REL-10), SAJ Cost Engineering recommends that any type of law suits against the Corps or SFWMD are closely monitored.

d) Objections to Appraisals: With respect to Objections to Appraisals (Risk REL-6), SAJ Cost Engineering recommends that the community is kept well informed of the project.

3. Risk Management: SAJ Cost Engineering recommends use of the outputs created during the risk analysis effort as tools in future risk management processes. The risk register should be updated at each major project milestone. The results of the sensitivity analysis may also be used for response planning strategy and development. These tools should be used in conjunction with regular risk review meetings, as discusses in section 6.1.

4. Risk Analysis Updates: Project leadership should review risk items identified in the original risk register and add others, as required, throughout the project life-cycle. Risks should be reviewed for status and reevaluation (using qualitative measure, at a minimum) and placed on risk management watch lists if any risk's likelihood or impact significantly increases. Project leadership should also be mindful of the potential for secondary (new risks created specifically by the response to an original risk) and residual risks (risks that remain and have unintended impact following response).

APPENDIX C

ENVIRONMENTAL INFORMATION

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C.0 ENVIRONMENTAL INFORMATION

C.1 CRITERIA BASED ECOLOGICAL EVALUATION MATRIX INFORMATION

C.1.1 Description of Criteria Based Ecological Evaluation Performance Measure Calculations

C.1.1.1 Introduction

The Criteria Based Ecological Evaluation Matrix (CBEEM) spreadsheet was used by the Biscayne Bay Coastal Wetlands project team to evaluate performance metrics and estimate habitat lift for three ecozones (nearshore, saltwater wetlands, freshwater wetlands). The CBEEM methodology is a hybrid method for ecological restoration benefit assessment that incorporates hydrologic/hydraulic simulation results with geographical information system (GIS) analysis as well as best professional judgment. The CBEEM spreadsheet tool was developed specifically for the Biscayne Bay Coastal Wetlands project. Given that the diversion of water from the Biscayne Bay Coastal Waters project area canals into wetland habitats will cause the greatest project related ecological change, the majority of performance metrics used in CBEEM to evaluate the project alternatives are directly linked to changes in hydrology. Performance measures are described in detail at the end of this appendix in ***Attachment 1***. The CBEEM tool was been reviewed by the Planning Center of Expertise (PCX) in the Spring of 2009 and suggested revisions were subsequently incorporated into this final version.

The CBEEM tool integrates multiple performance metrics into a single value to represent the habitat enhancement provided by each alternative. The Project Delivery Team (PDT) considered several options for weighting the evaluation metrics and performance measures prior to applying ecological benefits indices to the acreages in the various ecological zones of the project. These options included weighting performance measures applicable to a given objective and weighting objectives applicable to a given region. However, treating the evaluation metrics, performance measures, and objectives with equal weighting provided the best separation between alternatives. A description of the data, assumptions, and calculations used to estimate restoration benefits for the three ecozones is provided below.

C.1.1.2 Freshwater Wetland Performance Evaluation

The estimation of freshwater wetland restoration benefits incorporates two aspects of restoration, the rehydration of wetlands and the removal/control of exotic species from the wetlands.

C.1.1.2.1 Wetlands with Sufficient Water

This metric addresses Performance Measure #4. There are several methods of estimating the ecological benefits of wetland rehydration. In other south Florida restoration projects, wetland rehydration benefits are typically estimated using hydrologic models that predict the change in the number of days in which a given area has standing water. This method was used in the original Comprehensive Everglades Restoration Plan (CERP) Restudy modeling done with the South Florida Water Management Model (SFWMM). Using the Restudy as an example, the Biscayne Bay Coastal Wetlands PDT initially used WASH123D output to do a similar assessment of project related wetland rehydration benefits (See Engineering ***Appendix A*** for description of the WASH123D model). The WASH123D wetland rehydration benefits were calculated by determining the net increase in the number of acres of wetlands that experienced groundwater stages between -0.5 feet below to 2.0 feet above ground surface elevation for at least 120 days per year. The net wetland rehydration benefits as predicted by the WASH123D model were generally on the order of 100 to 200 acres of functional lift. The PDT felt that these predictions were significantly lower than expected given the volume of water being applied by the various project alternatives.

The most likely reasons for the low wetland lift predictions were that: 1) the wetland benefit performance measure was tied to a fixed elevation which required greater accuracy than the six-inch vertical accuracy provided by a state of the art surface/subsurface water flow numerical model such as WASH123D, 2) the limited spatial detail of near surface hydrogeology in the Biscayne Bay Coastal Wetlands WASH-123D model resulted in over prediction of near surface seepage rates and 3), the benefit calculation method only considered the groundwater stage elevation and did not take into account that unsaturated near surface soils that are kept wet will support wetland vegetation.

Faced with WASH123D output that appeared to underestimate wetland impacts, the PDT investigated replacing the Biscayne Bay Coastal Wetlands WASH123D model with another numerical model. However, the team determined that given limited time and money, it was not possible to develop a more robust numerical simulation model to predict wetland rehydration given the very flat nature of the study area, the non-homogeneity of the near surface hydrogeology, and the very porous nature of the underlying Biscayne Aquifer. With this in mind, the team developed the simplified method for estimating wetland benefits.

The simplified method used to account for wetland benefits associated with wet but not saturated soils relies upon the assumption that an acre of land is sufficiently hydrated to support wetland vegetation if the quantity of surface water applied on a given day at least equals the expected seepage losses to the

groundwater system. In other words, wetland lift is proportional to the volume of water applied and inversely proportional to the rate at which surface water is lost to the groundwater system. This method does not consider groundwater stage to determine whether wetland acreage is inundated; however, it is reasonable to apply in this case since excessive groundwater seepage rates in southern Miami-Dade County limit the duration in which water ponds in wetland restoration projects. The equation used here to estimate wetland lift is:

$$L = Q / (S*CF)$$

Where:

L = Wetland lift (acres of lift)
Q = Flow diverted into wetland (cubic feet per second)
S = Seepage rate (feet/hour)
CF = Conversion factor (86400 seconds/day/43560 ft^2/acre)

For example, a volume of water equal to 100 cubic feet per second (cfs) diverted into a wetland where seepage losses are equal to 0.5 feet per hour, will generate net wetland lift of 165 acres ([100 ft^3/sec]/[0.5 ft/hr*24 hours/day *86400 seconds/day / 43560 ft^2/acre] = 165 acres).

One source of data for the recession rate in southern Miami-Dade County constructed wetlands comes from the S-332B, S-332C, and S-332D detention areas constructed along L-31N and L-31W canal/levees in western Dade County. ***Figure C-1*** shows recession rate as a function of depth of inundation at the S-322C pond. The estimated recession rate is between 0.3 to 1.2 feet per day for the range of depth between 0.5 and 1.5 ft for the S-332C site. Another source of data used to estimate the recession rate in South Dade wetlands comes from the Miami-Dade Department of Environmental Protection (DERM) demonstration stormwater treatment area (STA) located just northwest of the intersection of the L-31E borrow canal and Military Canal. Test pumping operations were conducted at this 80 acre STA impoundment in March and June of 2008. ***Figure C-2*** shows the pond stage as a function of time during the March 2008 pumping test. Using the available data from this site, the recession rate for the DERM demonstration STA is estimated to be approximately 0.14 ft/day. This rate was calculated using a method that ignored rainfall and evapotranspiration since they are much less than losses through the soil. The lower recession rate at the DERM demonstration STA is expected since the topsoil at the S-332C pond site was stripped while at the DERM demonstration STA the marl topsoil was left in place. While the S-332C pond provides an upper bound for the estimate of the recession rate, the DERM demonstration STA provides the most appropriate recession rate estimate for the BBCW freshwater wetland since the marl soils in the targeted wetlands would be left in place.

To calculate the daily number of freshwater wetland functional lift acres, the quantity of water diverted within each basin for each alternative is computed using the pump diversion capacity. The daily diverted volume is multiplied by the seasonal recession constant (acres/cfs) which is calculated based on estimated recession rates from the Miami-Dade demonstration STA impoundment. The average freshwater wetland functional lift is calculated by taking an average of the daily functional lift over the period of record. The total for each alternative is computed by adding together the lift from each basin. The estimated lift from reuse water for each alternative is calculated by assuming a constant daily volume of water applied to the freshwater wetlands and multiplying it by the recession constant to compute rehydrated acreage.

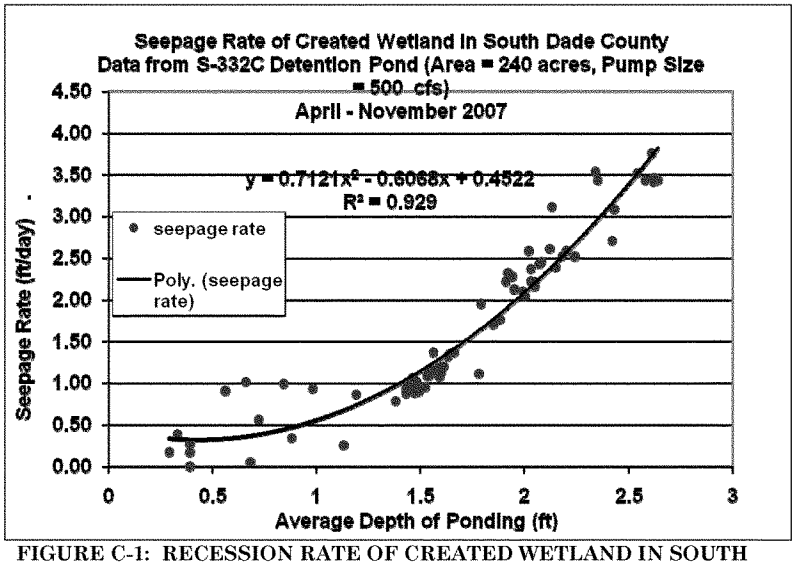

FIGURE C-1: RECESSION RATE OF CREATED WETLAND IN SOUTH MIAMI-DADE COUNTY, APRIL-NOVEMBER 2007

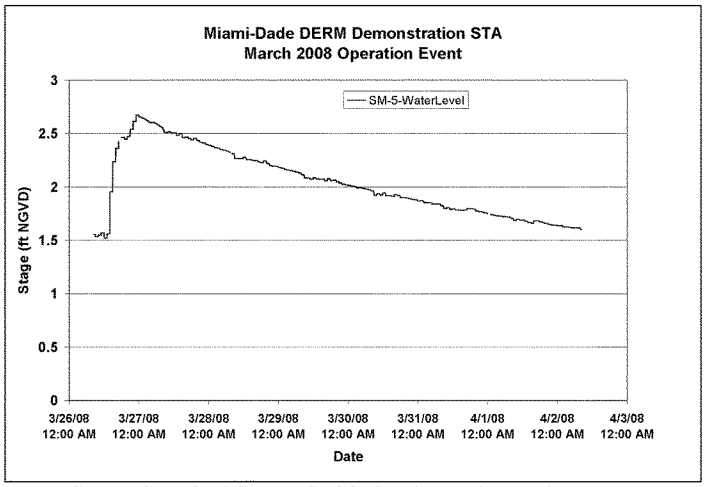

FIGURE C-2: STAGE RECESSION AT MIAMI-DADE DERM DEMONSTRATION STORMWATER TREATMENT AREA (MARCH 2008)

In the C-1 and C-100 basins, the freshwater diversion pump capacity for all of the alternatives exceeds the available freshwater wetland acres when the recession rate is estimated to be 0.6 feet/day. For the C-102 and C-103 basins, the available wetland acreage may not all be rehydrated even at peak diversion rates for any of the alternatives. To ensure that the acreage estimates for each basin cannot exceed the available acreage regardless of the recession rate assumed, all of the wetland rehydration acreage equations are set up to check to see if the available acreage is exceeded. The available freshwater acreages are specified by alternative and basin on the input page of the spreadsheet.

The results of the freshwater wetland lift calculations are shown in ***Table C-4***. To compute the percentage of lift achieved, the net freshwater wetland lift achieved for each alternative is divided by the available lift which is computed as the total number of acres available within the study area multiplied by one minus the existing wetland function (Available FW Lift = Total FW Acres X [1 – Functional Value]).

It is important to note that this simple method of estimating wetland lift provides a means of discriminating between alternatives using relative comparisons. The risk that using this method will result in the incorrect ranking of ability of the alternatives to rehydrate freshwater wetlands is very

small since the methodology relies heavily upon known critical factors such as available land and water for each alternative. Another freshwater wetland rehydration benefits estimation tool is described in the risk and uncertainty portion of Section 6 of this report.

C.1.1.3 Reduce Nuisance Vegetation from Freshwater Wetlands

This metric addresses Performance Measure #7. The metric assumes that all non-native vegetation within the footprint of a given alternative would be controlled or eliminated by changes in hydrology resulting from the project and other means, if necessary (e.g., mechanical and/or chemical removal). Using the vegetation map created by the U.S. Fish and Wildlife Service (FWS) (FWS, 2005) and the 1999 Florida Land Use, Cover and Forms Classification System (FDOT, 1999) map and 2004-05 data from the South Florida Water Management District (SFWMD, 2005), the total area of non-native vegetation lying within the projected footprint of each alternative was determined. Both maps were required because the FWS map (the most accurate and current) did not cover all of the project area. The Florida Land Use, Cover and Forms Classification System map was used in the region that the FWS map did not cover, which was most of the Model Lands area.

Since wetland lift is dependent upon both rehydration and the removal, and control, of exotic and nuisance species, the overall freshwater wetland restoration lift was calculated as the average of the two freshwater wetland metrics. Averaging the two metric outputs was determined by the PDT to provide the best estimate of overall freshwater wetland lift.

C.1.1.4 Saltwater Wetland Performance Evaluation

The estimation of saltwater wetland restoration benefits incorporates two performance metrics. One metric utilizes the fraction of water diverted to the saltwater wetlands and the other uses the Biscayne Bay TABS-MDS results to estimate relative lift. (A description of the TABS-MDS model is found in ***Appendix A - Engineering***.)

C.1.1.4.1 Potential Percent of Surface Water Diverted to Saltwater Wetlands

This metric directly addresses Performance Measure #4. This calculation of this metric is based on the fraction of available water diverted to saltwater wetlands. The percent of canal discharge diverted to saltwater wetlands is calculated using the capacity of pumps that divert water into saltwater wetland areas and the daily time series of coastal structure discharges provided either by the historic measurement record or by simulation results from the SFWMM 2x2. The four coastal structures of interest are: S-123 on the C-100 Canal, S-21 on the C-1 Canal, S-21A on the C-102 Canal, and S-20F on the C-103 Canal. The saltwater

wetland diversion pump capacities for each of the alternative are shown in ***Table C-2.*** The division of pump capacity between freshwater and saltwater wetlands was previously discussed in the Freshwater Wetland Reduced Canal Discharge calculations.

To calculate the volume of water that could be diverted from the canal into saltwater wetlands on a given day, the following logic statement was used in the calculation spreadsheet:

> *If the Daily Structure flow (Q) is less than or equal to saltwater pump size (P_{SW}), then saltwater diversion quantity is equal to Q * P_{SW} / P_{TPC}. If Q is greater than P_{TPC}, then a volume equal to P_{SW} is diverted and the remainder is released to tide or pumped by the P_{FW}. Where P_{SW} is Pump Capacity for freshwater wetlands, and P_{TPC} is the total diversion pump capacity for the basin. As an Excel function this equation is written as:*
>
> *=if(Q<=Tot_Pump_Cap,Q*SW_Pump_Cap/Tot_Pump_Cap, SW_Pump_Cap).*

The percent flow diverted to wetlands is then calculated by dividing the total volume diverted over the period of record by the total available volume. The daily available water volume in this case is determined by the measured flow at each coastal structure as recorded in the South Florida Water Management District's (SFWMD's) DBHYDRO database. For each of the alternatives considered, 50 cfs of the total 200 cfs of reuse water available is diverted directly to the saltwater wetlands. The results of the diversion calculations for the DBHYDRO flow records are shown in ***Table C-5.***

C.1.1.4.2 Tidal Wetland Acres Meeting Salinity Target

This performance metric addresses Performance Measure #4. The acres of tidal wetlands with salinity below 20 practical salinity units (psu) was estimated using output from the Biscayne Bay Coastal Wetlands TABS-MDS model developed specifically for this project. ***Table C-1*** contains the available acres of saltwater wetlands for five sub-areas of the project area as determined by the TABS-MDS mesh. (Note this acreage differs somewhat from the GIS based estimate of saltwater wetland acreage due to the set up of the TABS-MDS mesh). The zones were Shoal Point (Deering), Cutler North, Cutler South, Homestead North, Homestead South, and Card Point.

TABLE C-1: AVAILABLE ACRES OF TIDAL WETLANDS

Area	Acres
Shoal Point	151
Cutler North	842
Cutler South	1,599
Homestead North	1,462
Homestead South	1,000
Card Point	15,981
Total Acres	21,035

The estimated tidal wetland salinity benefit was calculated by determining the average daily Area (acres) where salinity was less than 20 psu during the critical June through January period. The salinity output from the TABS model runs was post-processed by identifying the model elements where the average daily salinity was less than or equal to 20 psu, adding the area of those model elements to compute the daily acreage of tidal wetlands with salinity meeting the criteria. The percent of target achieved was then calculated by dividing the average daily acreage by the total available acreage. The estimated tidal wetland acreages meeting the 20 psu salinity criteria are shown in ***Table C-6***. The original modeling and evaluation plan was to have TABS results available for three versions of each alternative (average, wet, and dry conditions) and then take an average of these results. However, because of time limitations, it was not possible to run several of the alternatives using TABS under average and dry conditions. With this constraint, the "average" tidal wetland benefits presented at the bottom of ***Table C-6*** for Alternative M, and Alternative Q are estimated based upon the results of the wet conditions model runs; or in the case of the Yellow Book (YB), based upon the most similar alternative (Alternative Q). Though this method of estimation is not as desirable as having modeling results, it presents little risk of skewing the overall evaluation of the alternatives since the metric represents less than 15 percent of the overall score and the differences in values calculated for this performance metric area not great.

The overall saltwater wetland habitat benefit is computed by taking the average percent target achieved for the two metrics and multiplying it by the total available saltwater wetland acreage within the project area. During the development of the CBEEM methodology for evaluating saltwater wetland benefits, the PDT discussed using either the TABS dependant metric or the water diversion metric. The PDT determined that the output of the TABS model which showed little difference between project alternatives probably does not realistically demonstrate the true difference in saltwater wetland lift afforded by

the different alternative plans. While the water diversion metric does show reasonable differences between the capabilities of each of the alternatives to provide saltwater wetland lift, the PDT recognized that this metric was not strongly linked to an ecological indicator. The PDT determined that an average of the two metrics provides the most reliable estimate available given the available tools.

C.1.1.5 Nearshore Performance Evaluation

The nearshore restoration benefits are estimated using four performance metrics. The first metric deals with reducing salinity swings, the second and third metrics address water quality, and the fourth method addresses the maintenance of beneficial salinity regimes within 500 meters of shore. Each of these metrics requires an estimate of the amount of water that will be diverted from the canals.

C.1.1.5.1 Percent Canal Water Diverted from Canals

This metric addresses Performance Measure #3. The reduced canal discharge metric for the nearshore ecological zone is calculated as a percent of the available water that is diverted by project features into freshwater or saltwater wetland areas. The logic of this performance measure is that harmful salinity swings at the mouths of the canals will be moderated by the diversion of canal discharge into both freshwater and saltwater wetland areas and that the reduction in such salinity swings is proportional to the percent of available water diverted. It is calculated using the total capacity of pumps in each basin that divert water from the canals and the time series of daily coastal structure discharges provided by the historic measurement record (DBHYDRO database). The four coastal structures of interest are: S-123 on the C-100 Canal, S-21 on the C-1 Canal, S-21A on the C-102 Canal, and S-20F on the C-103 Canal. To calculate the volume of water that could be diverted from the canal into saltwater wetlands on a given day, the following logic statement was used in the calculation spreadsheet:

> *If the Daily Structure flow (Q) is less than or equal to total pump capacity (P_{TPC}), then the diversion quantity is equal to Q. If Q is greater than P_{TPC}, then a volume equal to P_{TPC} is diverted and the remainder is released to tide. Where P_{TPC} is the total pump capacity for the basin. As an Excel function this equation is written as:*
>
> *=if(Q<=Tot_Pump_Cap, Q, Tot_Pump_Cap).*

Table C-7 shows the results of this performance measure calculated using DBHYDRO and D13R flow records.

C.1.1.6 Reduced Contaminant Concentrations and Loads

The Biscayne Bay Coastal Wetlands Project would reduce nitrate loading to Biscayne Bay and reduce the incidence of peak phosphorus concentration discharges into Biscayne Bay by diverting water from the coastal structures into fresh and tidal wetlands. This performance metric is calculated as the average of the nitrate load reduction target achieved and the peak phosphorus load reduction achieved by a given alternative.

C.1.1.7 Nitrate Load Reduction

This metric addresses Performance Measure #5. This performance metric compares the ability of a project to achieve the desired nitrate load target. The Biscayne Bay Coastal Wetlands project will reduce nitrate loading to Biscayne Bay as a result of the diversion of surface water into freshwater and saltwater wetlands. The existing nitrate load is estimated using the most recent average nitrate concentrations measured in the four canals and the total flow that passes through the coastal structures. The target nitrate load for the four coastal structures (S-123, S-21, S-21A, and S-20F) is estimated using a target nitrate concentration and multiplying this by the average annual flow available at the four structures. The estimated amount of nitrate removed by the project alternatives is based upon the amount of water diverted to the wetlands, the effective treatment area of the wetlands, and the concentration of nitrate once the water has passed through the wetland. Present and future nitrate concentrations in the four canals were taken from a paper by Graves and Pitts (2004). The future nitrate concentrations for the canals are estimated by Graves and Pitts using projections of the change in land use over the next 45 years. The target load condition is estimated using the existing flow conditions and the target nitrate concentration of 0.05 milligrams per liter (mg/L) as determined by Graves and Pitts for the Biscayne Bay Coastal Wetland project.

The reduction in nitrate load to Biscayne Bay was estimated using the first-order area-based "K-C*" model developed by Kadlec and Knight (1996). This equation is:

$$C_o = C^* + (C_i - C^*)\exp(-kA/Q),$$

Where:

C_o is the concentration of nitrate in the wetland effluent (mg/L)
C^* is the lowest achievable nitrate concentration in a wetland (mg/L)
C_i is the inflow concentration of nitrate for flow entering the wetland (mg/L)
K is the rate constant (M/yr)
A is the area of the wetland (M^2)
Q is the volume of water applied (M^3/yr)

For this study, C* was assumed to be 0.0075 mg/L and K was assumed to be 50 M/yr (meters per year). This equation was used to estimate the future wetland effluent concentration for each basin based upon the amount of diverted flow and the maximum upper size of the wetland area. The K-C* model provides the long-term average effluent concentration for treatment wetlands. Though the K-C* equation may not be the best design equation for sizing southern Miami-Dade County wetlands where seepage is large relative to inflow, it can be used here since as a comparative tool with limited risk of compromising the alternative selection process.

The amount of water diverted by each alternative was estimated using the total available pump capacity regardless of whether the water was diverted into freshwater or saltwater wetlands. The wetland acreage available in each basin was estimated based upon the design stormwater treatment area (STA) size or the targeted acreage of rehydrated wetlands. Since each alternative diverted a different quantity of water into the wetlands, and the alternatives incorporated different sizes for the target wetlands, the effluent concentrations estimated for each basin are unique to a given alternative. The future land use and nitrate concentrations for each basin are shown in

Table C-8. The treatment acreage estimated for each alternative is shown in ***Table C-9***.

The effectiveness of each alternative in reducing nitrate discharges to Biscayne Bay was calculated as a percent of the target nitrate load reduction achieved. The existing condition nitrate load was used as the baseline. The estimated nitrate loads computed for the D13R and DBHYDRO flow records as well as the percent target achieved for each alternative are shown in ***Table C-10.***

C.1.1.8 Peak Phosphorus Load Reduction

This metric addresses Performance Measure #6. This metric measures the reduction in peak phosphorus loading to Biscayne Bay which results from diverting water from the coastal structures. The average phosphorus concentrations in the four canals within the study are near five parts per billion (ppb). Given such low average concentrations, it is not reasonable to expect that water diverted into and discharged from rehydrated wetlands would be at a lower concentration. However, the discharge of peak phosphorus concentrations would be attenuated by diverting flow into wetlands. This performance metric incorporates flow based concentration estimation equations developed by the U.S. Geological Survey (USGS) (Lietz, 1996) and the pump size to estimate the fraction of peak concentration load that is diverted from the canals. The following equations were taken from Lietz:

S-20F $P = 5.08X10^{-4} + 2.43X10^{-5} X Q$, *R-Squared = 0.99*
S-21 $P = -7.38X10^{-4} + 4.27X10^{-8} X Q^2$, *R-Squared = 0.88*
S-21A $Ln(P) = 4.72 + 1.71X Ln(Q)$, *R-Squared = 0.23*
S-123 $P = 6.7X10^{-4} + 5.34X10^{-5} X Q$, *R-Squared = 0.99*

Using the daily flow record, the daily load and average phosphorus concentration was calculated for each canal. The daily excess phosphorus concentration was estimated by subtracting six ppb from the daily average phosphorus concentration. The excess phosphorus concentration was set to zero for those periods when the average discharge phosphorus concentration was calculated to be less than six ppb. The daily load of the excess phosphorus diverted was estimated using the available pump capacity for each basin. The overall peak phosphorus load reduction was estimated as the percentage of excess phosphorus load diverted relative to the total excess phosphorus load. The results of this calculation are shown in ***Table C-11.***

C.1.1.9 Nearshore Salinity Benefits

This metric addresses Performance Measure #1. This metric is evaluated using measured salinities in the nearshore area to represent existing conditions and future without alternatives and the Scenario 10 of the TABS-MDS preliminary

scenario runs (Brown, 2003) to evaluate the effectiveness of distributing freshwater flows at multiple locations along the shoreline. Since neither the existing condition nor the future without project conditions scenarios include water diversion, the preliminary scenario runs model could not be used to estimate the acreage meeting the nearshore salinity criteria. For the existing condition scenario, observed data were used from several sites to determine the percent of time during a three-year period of record when salinity was 20 parts per thousand or less within the targeted nearshore zone. For this metric, the nearshore zone is defined as the area between the shoreline out to 500 meters.

The delineation of the four geographic zones used in this metric is as follows: (1) Deering Estate to C-100, (2) C-100 to C-1, (3) C-1 to Military Canal, and (4) Military Canal to Florida City Canal. Barnes Sound and Manatee Bay were not included in this analysis because very little of the project water is diverted south of Florida City Canal. Observed data from salinity stations 64, 52, 30, and 16 were used to represent zones 1, 2, 3, and 4, respectively, for 2004 through 2007. For stations 64, 52, 30, and 16, the percent of time salinity was 20 parts per thousand or less, was 9, 27, 38, and 23 percent, respectively. To obtain habitat units, these percentages were applied to the total acres in the respective zones. In the absence of similar information to estimate the future without nearshore acreage, it was assumed that the future without acreage for this metric would be the same as for existing conditions. This is a reasonable assumption since, in total; the anticipated non-project related changes are thought to provide similar but somewhat less nearshore acreage than presently provided by the existing conditions.

The Scenario 10 preliminary scenario runs were set up to determine the optimal spatial and temporal distribution of freshwater inflow necessary to continuously meet the target nearshore zone salinity of less than or equal to 20 parts per thousand. The period of simulation for the TABS preliminary scenario runs was August 1, 1997 to July 31, 1998 which represents fairly average bay salinity conditions. The daily flow required to meet the salinity target in each of four nearshore zones as estimated by the Scenario 10 preliminary scenario run is shown in the ***Table C-12.*** The ability of each alternative to meet the target salinity is evaluated by comparing the volume of diverted water for each alternative to the flow requirements predicted by the Scenario 10 flows.

The volume of daily flows diverted into the saltwater (tidal) wetlands for each of the four zones is calculated based on water available at the coastal water control structures of the major conveyance canals in the project area (S123, S21, S21A, and S20F), and pump sizes and operations defined by each alternative. The results from the saltwater wetland diversion calculations are used here. Water diverted to the saltwater wetlands was used in this metric since the water diverted to the freshwater wetlands is done west of the L-31W Borrow Canal for

the most part. To calculate the percentage of the nearshore acres meeting the salinity target, the percent of the target flow delivered for each sub-basin is calculated on a daily basis. The percent flow target achieved is limited to 100 percent for those days where the diverted flow volume exceeds the daily target volume from the preliminary scenario run. The results of the nearshore salinity performance measure are shown for DBHYDRO flows in ***Table C-13***.

The overall nearshore habitat benefit is estimated by calculating the percent target achieved for each of the four metrics, taking the average of these, and then multiplying this fraction by the total nearshore acreage (8,585 acres) available within the project area.

C.1.2 Criteria Based Ecological Evaluation Matrix Summary Results

Table C-14, Table C-15, Table C-16, and ***Table C-17*** show the CBEEM results for the freshwater wetlands, saltwater wetlands, and the nearshore ecozones.

TABLE C-2: DIVERSION PUMP CAPACITIES FOR FRESHWATER AND SALTWATER WETLAND REHYDRATION

TOTAL PUMP CAPACITY (cfs)					
Alternative	**C-100**	**C-1**	**C-102**	**C-103**	**REUSE**
Alternative O	200	400	550	520	200
Alternative Q	170	400	400	500	200
Alternative M	20	620	0	50	200
Alternative YB	50	200	200	250	200
Alternative O PHASE 1	100	400	150	120	200
Alternative O, NAI	200	400	550	520	0
Alternative M, NAI	20	620	0	50	0
Alternative O P-1, NAI	100	400	150	120	0
FRESHWATER WETLAND DIVERSION PUMP CAPACITY (cfs)					
Alternative O	50	50	250	470	150
Alternative Q	85	50	400	500	150
Alternative M	10	50	0	0	75
Alternative YB	50	50	200	250	150
Alternative O PHASE 1	50	0	0	100	150
Alternative O, NAI	50	50	250	470	0
Alternative M, NAI	10	50	0	0	0
Alternative O P-1, NAI	50	0	0	100	0
SALTWATER WETLAND DIVERSION PUMP CAPACITY (cfs)					
Alternative O	150	350	300	50	50
Alternative Q	85	350	0	0	50
Alternative M	10	570	0	50	125
Alternative YB	0	150	0	0	50
Alternative O PHASE 1	50	400	150	20	50
Alternative O, NAI	150	350	300	50	0
Alternative M, NAI	10	570	0	50	0
Alternative O P-1, NAI	50	400	150	20	0

Key: cfs cubic feet per second
NAI next added increment

TABLE C-3: ESTIMATE OF FRACTION OF FLOW DIVERTED TO FRESHWATER WETLANDS FOR EACH CANAL BASIN AND FOR THE ENTIRE PROJECT AREA USING DBHYDRO FLOWS

FRESHWATER DIVERSION BENEFITS (percent diverted)							
	C-100	**C-1**	**C-102**	**C-103**	**REUSE**	**With Reuse**	**Without Reuse**
Total Available Flow (ac-ft/yr)	**27,380**	**127,367**	**76,227**	**137,960**	**108,595**	**477,529**	**368,934**
Alternative O	13%	10%	42%	77%	100%	55%	42%
Alternative Q	23%	10%	87%	85%	100%	65%	55%
Alternative M	5%	7%	0%	0%	100%	15%	3%
Alternative YB	20%	13%	73%	68%	100%	59%	47%
Alternative O Phase I	17%	0%	0%	36%		34%	15%
Alternative O, NAI	13%	10%	42%	77%		42%	42%
Alternative M, NAI	5%	7%	0%	0%		3%	3%
Alternative O Phase I, NAI	17%	0%	0%	36%		15%	15%
FRESHWATER DIVERSION FLOWS (ac-ft/yr)							
Alternative	**C-100**	**C-1**	**C-102**	**C-103**	**REUSE**	**With Reuse**	**Without Reuse**
Total Available Flow (ac-ft/yr)	**27,380**	**127,367**	**76,227**	**137,960**	**108,595**	**477,529**	**368,934**
Alternative O	3,466	12,342	31,724	106,746	108,595	262,873	154,278
Alternative Q	6,358	12,342	66,443	117,054	108,595	310,793	202,198
Alternative M	1,253	9,239	-	-	108,595	73,102	10,492
Alternative YB	5,401	17,078	55,839	94,005	108,595	280,918	172,323
Alternative O Phase I	4,591	-	16,698	49,107	108,595	91,116	70,396
Alternative O, NAI	3,466	12,342	31,724	106,746	-	199,689	154,278
Alternative M, NAI	1,253	9,239	-	-	-	13,580	10,492
Alternative O Phase I, NAI	4,591	-	-	49,107	-	69,504	53,698

Key: ac/ft acre/feet
NAI next added increment

TABLE C-4: ESTIMATED FRESHWATER WETLAND REHYDRATION LIFT (SUBMETRIC B.1) FOR EACH ALTERNATIVE CALCULATED USING DBHYDRO FLOWS

AVERAGE ANNUAL ACRES OF FRESHWATER REHYDRATION LIFT							
	C-100	C-1	C-102	C-103	Reuse	With Reuse	Without Reuse
Alt O	6	121	416	1553	1076	3172	2096
Alt Q	6	121	568	1,984	1,318	3997	2680
Alt M	6	106	-	-	96	209	112
Alt YB	7	174	805	1,944	1,451	4381	2930
Alt O, Phase I	6	-	-	188	39	233	194
Alt O, NAI	6	121	416	1,553	-		2096
Alt M, NAI	6	106	-	-	-		112
Alt O, Phase I, NAI	6	-	-	188	-		194
DRY SEASON ACRES OF FRESHWATER WETLAND REHYDRATION LIFT							
Alt O	5	92	340	1277	1301	3015	1713
Alt Q	5	92	478	1,598	1,526	3,699	2,173
Alt M	5	79	-	-	119	202	84
Alt YB	5	133	665	1,571	1,622	3,997	2,375
Alt O, Phase I	5	-	-	167	60	232	172
Alt O, NAI	5	92	340	1,277	-		1,713
Alt M, NAI	5	79	-	-	-		84
Alt O, Phase I, NAI	5	-	-	167	-		172
WET SEASON ACRES OF FRESHWATER WETLAND REHYDRATION LIFT							
Alt O	7	151	491	1829	850	3329	2478
Alt Q	8	151	658	2,369	1,110	4,296	3,186
Alt M	8	133	-	-	74	215	141
Alt YB	8	215	945	2,317	1,281	4,766	3,486
Alt O, Phase I	8	-	-	208	18	234	216
Alt O, NAI	7	151	491	1,829	-		2,478
Alt M, NAI	8	133	-	-	-		141
Alt O, Phase I, NAI	8	-	-	208	-		216
REHYDRATION UNDER 10 PERCENT EXCEEDANCE FREQUENCY FLOW CONDITIONS							
DRY SEASON ACRES OF FRESHWATER WETLAND REHYDRATION LIFT							
	C-100	C-1	C-102	C-103	Reuse	With Reuse	Without Reuse
Alt O	2	42	141	608	1802	2595	793
Alt Q	3	42	196	734	1,901	2,875	974
Alt M	3	33	-	-	164	200	36
Alt YB	3	65	277	726	1,937	3,008	1,070
Alt O, Phase I	3	-	-	132	94	230	135
Alt O, NAI	2	42	141	608	-		793
Alt M, NAI	3	33	-	-	-		36
Alt O, Phase I, NAI	3	-	-	132	-		135

Key: NAI next added increment

TABLE C-5: SALTWATER WETLAND BENEFITS RESULTING FROM FLOW DIVERSION AS ESTIMATED USING THE DBHYDRO FLOW RECORDS

DBHYDRO SALTWATER WETLAND BENEFITS (Flow Diversion)							
	C-100	**C-1**	**C-102**	**C-103**	**REUSE**	**With Reuse**	**Without Reuse**
Total Annual Avg Flow	27,380	127,367	76,227	137,960	-	368,934	368,934
ALTERNATIVE O							
Pump Capacity (cfs)	**150**	**350**	**300**	**50**	**50**		
Avg Annual Pumped Flow	10,397	86,397	38,068	11,356	36,198	182,416	146,218
Fraction Diverted	0.38	0.68	0.50	0.08	1.00	0.45	0.40
ALTERNATIVE Q							
Pump Capacity (cfs)	**85**	**350**	**0**	**0**	**50**		
Avg Annual Pumped Flow	6,358	86,397	-	-	36,198	128,953	92,755
Fraction Diverted	0.23	0.68	0.00	0.00	1.00	0.32	0.25
ALTERNATIVE M							
Pump Capacity (cfs)	**10**	**570**	**0**	**50**	**125**		
Avg Annual Pumped Flow	1,253	105,330	-	27,474	90,496	224,553	134,057
Fraction Diverted	0.05	0.83	0.00	0.20	1.00	0.49	0.36
ALTERNATIVE YB							
Pump Capacity (cfs)	**0**	**150**	**0**	**0**	**50**		
Avg Annual Pumped Flow	-	51,234	-	-	36,198	87,432	51,234
Fraction Diverted	0.00	0.40	0.00	0.00	1.00	0.22	0.14
ALTERNATIVE O Phase 1							
Pump Capacity (cfs)	**50**	**400**	**150**	**20**	**50**		
Avg Annual Pumped Flow	4,591	98,739	50,093	9,821	36,198	199,443	163,245
Fraction Diverted	0.17	0.78	0.66	0.07	1.00	0.49	0.44
ALTERNATIVE O, NAI							
Pump Capacity (cfs)	**150**	**350**	**300**	**50**	**0**		

Avg Annual Pumped Flow	10,397	86,397	38,068	11,356	-	146,218	146,218
Fraction Diverted	0.38	0.68	0.50	0.08	N/A	0.40	0.40
ALTERNATIVE M, NAI							
Pump Capacity (cfs)	**10**	**570**	**0**	**50**	**0**		
Avg Annual Pumped Flow	1,253	105,330	-	27,474	-	134,057	134,057
Fraction Diverted	0.05	0.83	0.00	0.20	N/A	0.36	0.36
ALTERNATIVE O Phase 1 NAI							
Pump Capacity (cfs)	**150**	**350**	**300**	**50**	**0**		
Avg Annual Pumped Flow	10,397	86,397	38,068	11,356	-	146,218	146,218
Fraction Diverted	0.38	0.68	0.50	0.08	N/A	0.40	0.40

Key: Avg – average cfs -cubic feet per second NAI - next added increment

TABLE C-6: AVERAGE DAILY ESTIMATED ACRES OF HYDRATED SALTWATER WETLANDS WITH SALINITY LESS THAN 20 PRACTICAL SALINITY UNITS

Alternative	Area of Hydration	Net From FWO	Percent of Target
Wet year Model Results (1995-1996 Simulation Period)			
FWO	6,977	-	33%
Alternative O	9,656	2,679	46%
Alternative M	7,939	962	38%
Alternative Q	7,834	857	37%
Existing Condition	6,778	(199)	32%
Alternative O NAI	9,299	2,321	44%
Alternative O Phase I, NAI	9,299	2,321	44%
Average Year Model Results (1998-1999 Simulation Period)			
FWO	1,869	-	9%
Alternative O	3,916	2,047	19%
Alternative M*	3,219	1,351	15%
Alternative Q*	3,177	1,308	15%
Alternative YB**	3,177	1,308	15%
Existing Condition*	1,815	(54)	9%
Alternative O NAI	3,446	1,577	16%
Alternative O Phase I, NAI***	3,446	1,577	16%

* Average year model versions were not rerun during last modeling iteration. Results here are proportional to wet year results as compared to Alternative O.

** YB alternative not rerun during last modeling iteration. Tidal wetland benefits estimated as similar to Alternative Q since location of water application in Alternative YB is most similar to Alternative Q.

*** Alt O Phase -1, NAI was not run in TABS. Estimated Net benefits set to result from Alt O, NAI. Reasoning is that though total pump capacity is less in Alt O P-1, a higher proportion of total diverted flow is sent to tidal wetlands since very little pump capacity diverts water to freshwater wetlands.

Key: FWO Future Without
NAI next added increment

TABLE C-7: ESTIMATED TOTAL VOLUME OF WATER DIVERTED FROM COASTAL STRUCTURES USING THE DBHYDRO FLOW RECORDS

Total Volume of Diverted Water (ac-ft/yr)					
Alternative	**C-100**	**C-1**	**C-102**	**C-103**	**Totals**
Available Flow	27,380	127,367	76,227	137,960	368,934
Alternative O	13,862	98,739	69,792	118,102	300,496
Alternative Q	12,715	98,739	66,443	117,054	294,952
Alternative M	2,505	114,570	-	27,474	144,549
Alternative YB	5,401	68,312	55,839	94,005	223,557
Alternative O Phase I	9,182	98,739	50,093	58,928	216,943
Alternative O, NAI	13,862	98,739	69,792	118,102	300,496
Alternative M, NAI	2,505	114,570	-	27,474	144,549
Alternative O Phase I, NAI	9,182	98,739	50,093	58,928	216,943
Fraction of Water Diverted					
Alternative O	0.51	0.78	0.92	0.86	
Alternative Q	0.46	0.78	0.87	0.85	
Alternative M	0.09	0.90	0.00	0.20	
Alternative YB	0.20	0.54	0.73	0.68	
Alternative O Phase I	0.34	0.78	0.66	0.43	
Alternative O, NAI	0.51	0.78	0.92	0.86	
Alternative M, NAI	0.09	0.90	0.00	0.20	
Alternative O Phase I, NAI	0.34	0.78	0.66	0.43	

Key: ac-ft/yr acre feet per year
NAI next added increment

TABLE C-8: EXISTING AND FUTURE LAND USE AND RESULTING AVERAGE NITRATE CONCENTRATIONS

	C-100		C-1		c-102		C-103	
	Present	**Future**	**Present**	**Future**	**Present**	**Future**	**Present**	**Future**
Basin Land Use								
Agriculture	2%	2%	36%	7%	62%	25%	51%	20%
Urban	96%	96%	51%	80%	31%	68%	41%	72%
Other	3%	3%	13%	13%	7%	7%	8%	8%
Nitrate Concentration (mg/L)	**0.12**	**0.12**	**1.5**	**0.33**	**2.59**	**1.06**	**2.13**	**0.88**

Key: mg/L milligrams per liter

TABLE C-9: WETLAND REHYDRATION AND TREATMENT ACREAGE

WETLAND TREATMENT AREAS BY ALTERNATIVE					
Alternative	**C-100**	**C-1**	**C-102**	**C-103**	**Totals**
Freshwater Wetland Application Area (acres)					
Alt O	33	207	797	5,174	6,211
Alt Q	33	207	865	7,558	8,663
Alt M	33	207	-	-	240
Alt YB	33	277	1,408	7,739	9,424
Alt O, Phase I	33	-	-	463	496
Alt O, NAI	33	207	797	5,174	6,211
Alt M, NAI	33	207	-	-	240
Alt O, Phase I, NAI	33	-	-	463	496
Saltwater Wetland Application Area (acres)					
Alt O	804	1,823	1,178	1,178	4,982
Alt Q	804	1,823	1,178	1,178	4,982
Alt M	804	1,823	1,178	1,178	4,982
Alt YB	804	1,823	1,178	1,178	4,982
Alt O, Phase I	150	1,823	903	903	3,779
Alt O, NAI	804	1,823	1,178	1,178	4,982
Alt M, NAI	804	1,823	1,178	1,178	4,982
Alt O, Phase I, NAI	150	1,823	903	903	3,779
Total Application Area (acres)					
Alt O	837	2,030	1,975	6,352	11,193
Alt Q	837	2,030	2,043	8,736	13,645
Alt M	837	2,030	1,178	1,178	5,222
Alt YB	837	2,100	2,586	8,917	14,440
Alt O, Phase I	183	1,823	903	1,366	4,275
Alt O, NAI	837	2,030	1,975	6,352	11,193
Alt M, NAI	837	2,030	1,178	1,178	5,222
Alt O, Phase I, NAI	183	1,823	903	1,366	4,275

Key: NAI next added increment

TABLE C-10: NITRATE REMOVAL ESTIMATES FOR DBHYDRO FLOW RECORDS

Existing Conditions Nitrate Load Calculations					
Existing Water Quality Concentration (mg/L)	0.12	1.50	2.59	2.13	
Total Load To Biscayne Bay without Diversion	3.9	236.6	243.6	363.4	847.4
Target Load (assume 0.05 mg/L)	1.7	7.9	4.7	8.5	22.8
Future Conditions Nitrate Load Calculations					
2050 Water Quality Concentration (mg/L)	0.12	0.33	1.06	0.88	
Future Discharge Effluent Concentration Estimates (mg/L)					
Alternative O	0.01	0.02	0.02	0.01	
Alternative Q	0.01	0.02	0.01	0.01	
Alternative M	0.01	1.03	-	0.01	
Alternative YB	0.01	0.01	0.01	0.01	
Alternative O Phase I / NAI	0.01	0.02	0.06	0.03	
Alternative O, NAI	0.01	0.02	0.02	0.01	
Alternative M, NAI	0.01	0.03	-	0.01	
FWO and Target Nitrate Loads (mTons/yr)					
FWO Total Load (mTons/year)	3.9	52.1	99.7	149.4	305.1
2050 With Project Condition Nitrate Load Estimates (mTons/yr)					
Alternative O	2.1	14.0	9.9	22.6	48.6
Alternative Q	2.2	14.0	14.0	23.7	53.9
Alternative M	3.6	8.8	99.6	119.8	231.8
Alternative YB	3.2	24.9	27.2	48.4	103.7
Alternative O Phase I / NAI	2.7	14.5	38.0	87.5	142.8
Alternative O, NAI	2.1	14.0	9.9	22.6	48.6
Alternative M, NAI	3.6	8.8	99.6	119.8	231.8
Percent Nitrate Target Achieved Relative to Existing Condition					
FWO	0%	81%	60%	60%	66%
Alternative O	83%	97%	98%	96%	97%
Alternative Q	77%	97%	96%	96%	96%
Alternative M	15%	100%	60%	69%	75%
Alternative YB	33%	93%	91%	89%	90%
Alternative O Phase I / NAI	53%	97%	86%	78%	85%
Alternative O, NAI	83%	97%	98%	96%	97%
Alternative M, NAI	15%	100%	60%	69%	75%

Key:
- Avg average
- cfs cubic feet per second
- FWO future without
- mg/L milligrams per liter
- NAI next added increment

TABLE C-11: REDUCTION IN PEAK PHOSPHORUS LOADING EVENTS

DBHYDRO REDUCTION IN PEAK PHOSPHORUS DISCHARGE EVENTS					
Alternative	**C-100**	**C-1**	**C-102**	**C-103**	**Totals**
Percent Reduction in High Phosphorus Loading					
Alternative O	0.50	0.38	1.00	0.86	0.62
Alternative Q	0.46	0.38	1.00	0.85	0.61
Alternative M	0.09	0.58	-	0.20	0.27
Alternative YB	0.19	0.19	0.99	0.68	0.44
Alternative O Phase I	0.33	0.38	0.93	0.43	0.47
Alternative O, NAI	0.50	0.38	1.00	0.86	0.62
Alternative M, NAI	0.09	0.58	0.00	0.20	0.27
Alternative O Phase I, NAI	0.33	0.38	0.93	0.43	0.47

TABLE C-12: REQUIRED FLOW TO MEET NEARSHORE SALINITY TARGET (LESS THAN 20 PARTS PER THOUSAND) FROM SCENARIO 10 OF TABS PRELIMINARY SCENARIO RUNS

Nearshore Zone:	**Source of Diverted Water**	**Average Daily Flow to Meet Salinity Target**	**Target Acreage (Shoreline to 500 m)**
		(ac-ft/day)	(acres)
Deering Estates	½ C-100	340	364
North Cutler	½ C-100 + C-1 + Tidal Wetlands Reuse	540	1326
C-1 to Military Canal (includes South Cutler)	C-102	315	827
Military Canal to Florida City Canal	C-103	210	945
TOTAL		**1405**	**3462**

TABLE C-13: NEARSHORE AREA MEETING SALINITY TARGET OF LESS THAN 20 PRACTICAL SALINITY UNITS BASED ON PRELIMINARY SCENARIO RUN TABS SIMULATION AND THE FLOW RECORDS FROM DBHYDRO

DBHYDRO NEARSHORE SALINITY LESS THAN 20 PSU					
	Deering	**Cutler**	**N. Homestead**	**S. Homestead**	**TOTAL**
Target Flow	340	540	315	210	1,405
Dry Season Target Acres	364	1,326	827	945	3,462
Wet Season Target Acres	364	1,326	827	945	3,462
Average Target Acreage	364	1,326	827	945	3,462
ALTERNATIVE O					
Average Annual Nearshore Area with Salinity < 20 psu (acres)	17	736	255	149	1,157
Percent Target Acreage Achieved	5%	63%	31%	16%	33%
ALTERNATIVE Q					
Average Annual Nearshore Area with Salinity < 20 psu (acres)	10	734	-	-	744
Percent Target Acreage Achieved	3%	55%	0%	0%	21%
ALTERNATIVE M					
Average Annual Nearshore Area with Salinity < 20 psu (acres)	2	995	-	350	1,348
Percent Target Acreage Achieved	1%	75%	0%	37%	39%
ALTERNATIVE YB					
Average Annual Nearshore Area with Salinity < 20 psu (acres)	-	605	-	-	605
Percent Target Acreage Achieved	0%	46%	0%	0%	17%
ALTERNATIVE O PHASE I					
Average Annual Nearshore Area with Salinity < 20 psu (acres)	7	760	374	126	1,268
Percent Target Acreage Achieved	2%	57%	45%	13%	37%
ALTERNATIVE O, NEXT ADDED INCREMENT					
Average Annual Nearshore Area with Salinity < 20 psu (acres)	17	552	255	149	973
Percent Target Acreage Achieved	5%	42%	31%	16%	28%

ALTERNATIVE M, NEXT ADDED INCREMENT					
Average Annual Nearshore Area with Salinity < 20 psu (acres)	2	557	-	350	909
Percent Target Acreage Achieved	1%	42%	0%	37%	26%
ALTERNATIVE O PHASE I, NEXT ADDED INCREMENT					
Average Annual Nearshore Area with Salinity < 20 psu (acres)	7	581	374	126	1,089
Percent Target Acreage Achieved	2%	44%	45%	13%	31%

Key: psu practical salinity units

TABLE C-14: FRESHWATER WETLAND HABATAT LIFT SUMMARY

CRITERION BASED ECOLOGICAL EVAULATION MATRIX													
DBHYDRO FLOWS													
FRESHWATER WETLAND ECOLOGICAL ZONE													
Objectives and Criteria	**Units**	**Method**	**Target**	**Existing Condition**	**Future Without Project**	**Alt O**	**Alt M**	**Alt Q**	**Alt YB**	**Alt O, Part I**	**Alt O NAI**	**Alt O, P I, NAI**	**Alt M, NAI**
A. Rehydrated wetland lift													
1. Wetlands with sufficient water (PM 4)	Acre-lift	GIS Mapping /Seepage Analysis	9638	3997	3,997	7,168	4,205	7,994	8,378	4,229	6,092	4,191	4,109
B. Reduced invasive non-native plants *													
1. Acres of Invasive/Exotics Removed (PM 7)	Acre-lift	GIS Mapping Analysis	9763	0	0	3051	160.5	6632	4555	334	3051	334	160.5
Net FW Wetland Habitat Units (Net from Future Without Condition) (acre-lift)				**0**	**0**	**3,111**	**185**	**5,315**	**4,468**	**283**	**2,573**	**264**	**136**

Key:
- Alt — Alternative
- FWO — Future Without
- GIS — Geographical Information System
- PM — Performance Measure

TABLE C-15: SALTWATER WETLAND HABITAT LIFT SUMMARY

CRITERION BASED ECOLOGICAL EVAULATION MATRIX													
DBHYDRO FLOWS													
SALTWATER WETLAND ECOLOGICAL ZONE													
Objectives and Criteria	**Units**	**Method**	**Target**	**Existing Condition**	**Future Without Project**	**Alt O**	**Alt M**	**Alt Q**	**Alt YB**	**Alt O, Part I**	**Alt O NAI**	**Alt O, P I, NAI**	**Alt M, NAI**
A. Reduced canal discharge													
1. Potential percent of surface water diverted to SW Wetlands (PM 4)	ac-ft/yr	Flow diversion using DBHydro Database	368,934	-	-	166,118	180,322	117,431	79,620	181,623	146,218	163,245	134,057
				0%	0%	45%	49%	32%	22%	49%	40%	44%	36%
B. Salinity performance													
1. Acres of tidal wetlands meeting 0-20 psu criterion (PM 2)	Acres	Average Daily SW Wetland Acres Meeting Criteria (TABS-MDS model output)	21,035	1,815	1,869	3,916	3,219	3,177	3,177	3,446	3,446	3,446	3,219
				8.63%	8.88%	18.62%	15.30%	15.10%	15.10%	16.38%	16.38%	16.38%	15.30%
Saltwater Wetlands Mean Criteria Result				0.043	0.044	0.318	0.321	0.235	0.183	0.328	0.280	0.303	0.258
Total SW Wetland Acres Available				22,550	22,550	22,550	22,550	22,550	22,550	22,550	22,550	22,550	22,550
Total SW Wetland Habitat Units				973	1,002	7,176	7,236	5,292	4,136	7,398	6,316	6,836	5,822
Net SW Wetlands Habitat Units (Net from Future Without Condition)				-29	0	6,174	6,234	4,290	3,134	6,396	5,314	5,834	4,820

Key: ac-ft/yr: acre-feet per year, Alt: Alternative, PM: performance measure, ppt: parts per thousand

TABLE C-16: NEARSHORE HABITAT LIFT SUMMARY

CRITERION BASED ECOLOGICAL EVAULATION MATRIX													
DBHYDRO FLOWS													
NEARSHORE ECOLOGICAL ZONE													
Objectives and Criteria	**Units**	**Method**	**Target**	**Existing Condition**	**Future Without Project**	**Alt O**	**Alt M**	**Alt Q**	**Alt YB**	**Alt O, Part I**	**Alt O NAI**	**Alt O, P I, NAI**	**Alt M, NAI**
A. Reduced canal discharge													
1. Potential percent of surface water diverted from canal (PM 3)	ac-ft/yr	Flow quantity diverted from canals (DBHYDRO)	368,934	-	-	300,496	144,549	294,952	223,557	216,943	300,496	216,943	144,549
				0%	0%	81%	39%	80%	61%	59%	81%	59%	39%
B. Reduced contaminant concentrations and loads													
1. Nitrate Load Reduction (PM 5)	Mtons/yr	GIS Land use / TN Removal Eqn.	23	847	305	49	232	54	104	143	49	143	232
				0%	66%	97%	75%	96%	90%	85%	97%	85%	75%
2. Phosphorus Peak Load Reduction (PM 6)	Mtons/yr	USGS Flow / Conc Eqn.	0	33	33	21	9	20	14	15	21	15	9
				0%	0%	62%	27%	61%	44%	47%	62%	47%	27%
Average % Target Achieved				0%	33%	80%	51%	79%	67%	66%	80%	66%	51%
C. Salinity performance													
1. Acres of Bay bottom meeting 20 psu criterion (within 500 M of shore) (PM 1)	Acres	TABS / PSR Run Analysis with Flow Diversion Calcs	3462	886	886	1157	1348	744	605	1268	973	1089	909
				25.6%	25.6%	33%	39%	21%	17%	37%	28%	31%	26%
Nearshore Mean Criteria Result				0.085	0.195	0.648	0.430	0.600	0.483	0.539	0.631	0.521	0.388
Total Available Nearshore Acres				8,585	8,585	8,585	8,585	8,585	8,585	8,585	8,585	8,585	8,585

Total Nearshore Habitat Units	732	1,673	5,565	3,696	5,154	4,147	4,624	5,413	4,475	3,333
Nearshore Habitat Units (Net from Future Without)	-941	0	3,892	2,023	3,481	2,474	2,950	3,740	2,802	1,660

Key: Alt Alternative PM performance measure TN Total nitrogen
GIS Geographical Information System PSR preliminary scenario runs USGS US Geological Survey
M meter

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TABLE C-17: TOTAL HABITAT LIFT SUMMARY

TOTAL HABITAT UNIT SUMMARY (NET FWO CONDITION)										
DBHYDRO FLOWS										
	Existing Condition	Future Without	Alt O	Alt M	Alt Q	Alt YB	Alt O, P1	Alt O, NAI	Alt O-P1, NAI	Alt M, NAI
	Performance Critieria Averaged as Equal (No Weighting)									
Nearshore Indices	0.09	0.19	0.65	0.43	0.60	0.48	0.54	0.63	0.52	0.39
Available Acreage	8,585	8,585	8,585	8,585	8,585	8,585	8,585	8,585	8,585	8,585
Functional Habitat (acres)	**732**	**1,673**	**5,565**	**3,696**	**5,154**	**4,147**	**4,624**	**5,413**	**4,475**	**3,333**
2050 HU Lift		**941**	**3,892**	**2,023**	**3,481**	**2,474**	**2,950**	**3,740**	**2,802**	**1,660**
Saltwater Indices	0.04	0.04	0.32	0.32	0.23	0.18	0.33	0.28	0.30	0.26
Available Acreage	22,550	22,550	22,550	22,550	22,550	22,550	22,550	22,550	22,550	22,550
Functional Habitat (acres)	**973**	**1,002**	**7,176**	**7,236**	**5,292**	**4,136**	**7,398**	**6,316**	**6,836**	**5,822**
2050 HU Lift		**29**	**6,174**	**6,234**	**4,290**	**3,134**	**6,396**	**5,314**	**5,834**	**4,820**
Freshwater Indices	0.41	0.41	0.74	0.43	0.97	0.88	0.44	0.68	0.44	0.43
Available Acreage	9,638	9,638	9,638	9,638	9,638	9,638	9,638	9,638	9,638	9,638
Functional Habitat (acres)	3,997	**3,997**	**7,108**	**4,181**	**9,311**	**8,465**	**4,280**	**6,570**	**4,261**	**4,133**
2050 HU Lift		**-**	**3,111**	**185**	**5,315**	**4,468**	**283**	**2,573**	**264**	**136**
NET 2050 Habitat (acre-lift)		**970**	**13,177**	**8,441**	**13,085**	**10,077**	**9,629**	**11,627**	**8,900**	**6,617**

Key: FWO: future without, HU: habitat unit

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C.2 MODEL DOCUMENTATION

C.2.1 Background

C.2.1.1 Purpose of Model

The CBEEM was developed to assess the ecological benefits and consequences of Biscayne Bay Coastal Wetlands project alternatives in order to select the Selected Plan.

C.2.1.2 Model Description and Depiction

The CBEEM is a Microsoft (MS) Excel spreadsheet tool that utilizes hydrologic modeling results, management measure size and operation, and available hydrologic data to calculate a habitat unit score for each alternative. The CBEEM is used to evaluate ecological benefits for each of the three major ecological zones present within the project area separately using nine performance measures. The three ecological zones include the nearshore bay estuarine zone, the saltwater or tidal wetlands zone, and the freshwater wetlands zone. ***Attachment 1*** includes documentation sheets for each performance measure. The evaluation was developed by a multi-agency team of ecologists and scientists familiar with the study area and knowledgeable about the ecological stressors the Biscayne Bay Coastal Wetlands project seeks to influence.

The CBEEM evaluation is accomplished in four steps: (1) calculate performance measure output, (2) normalize performance measure output, (3) compute quality index, and (4) compute habitat units.

C.2.1.3 Contribution to Planning Effort

The CBEEM was used to calculate habitat units for each alternative. Habitat units were input for the cost effectiveness and incremental cost analyses conducted separately with IWR-PLAN. The IWR-PLAN decision support software facilitates plan comparison by conducting cost effectiveness and incremental cost analyses, identifying the plans which are the best financial investments and displaying the effects of each on a range of decision variables.

C.2.1.4 Description of Input Data

Input, which varied for each performance measure, included hydrologic data from the historic measurement record (DBHDRO database) or simulation results from the SFWMM 2x2, salinity results from the Biscayne Bay Coastal Wetlands TABS MDS model, average nitrate concentrations measured in the four canals, phosphorus load equations from the USGS, and projected changes on existing landscape features (land use, length of levees, acres of invasive exotic

vegetation) The input required for each performance measure is described in ***Attachment 1.***

C.2.1.5 Description of Output Data

Habitat units are the output of the CBEEM.

C.2.1.6 Statement on the Capabilities and Limitation of the Model

The CBEEM was created specifically for plan evaluation for the Biscayne Bay Coastal Wetlands project. No other use was considered. The CBEEM is primarily intended to provide relative differences in ecological benefits attributable to project alternatives rather than absolute quantification of benefits.

C.2.1.7 Description of Model Development Process Including Documentation on Testing Conducted (Alpha and Beta Tests)

The CBEEM consists of an MS Excel spreadsheet; no computer software was created. No formalized Alpha/Beta testing was conducted. However, spreadsheet functions and cell relationships were evaluated by team members to ensure performance measure and alternative scores were computed correctly.

C.2.2 Technical Quality

C.2.2.1 Theory

The performance measures that drive the CBEEM are generally based on relationships described in two conceptual ecological models that were developed for the CERP. One of the conceptual ecological models dealt with mangroves and the second with Biscayne Bay. Attachment 2 includes both as they were published in the peer reviewed scientific journal, *Wetlands*, in 2006. The specific rationale behind each performance measure is included in ***Attachment 1.***

C.2.2.2 Description of System Being Represented by the Model

The Biscayne Bay Coastal Wetlands project area is located in southeast Miami-Dade County, south of downtown Miami and east of Florida City and Homestead, within the SFWMD's Lower East Coast water supply planning region. Historically, the project area included freshwater marshes, mangroves, and estuarine habitat. Much of the study area is now either suburban or agricultural, though some lands have been preserved by the local, state and Federal government. The area to be affected by the project is mostly coastal wetlands and nearshore habitat that have been degraded by various degrees due to water management practices, past land uses, and compartmentalization of the landscape.

The study area is bounded by south-central Biscayne Bay and Biscayne National Park (BNP) to the south and east, and the Atlantic Coastal Ridge and agricultural and suburban development to the north and west. Florida Power & Light's (FPL's) Turkey Point nuclear power plant, Homestead Air Reserve Base and the South Dade Landfill are located in the project area. The project area overlaps several drainage basins, six of which are named for the associated major east-west canals: Canal 100 (C-100), C-1, C-102, C-103, North Canal, and Florida City Canal. The canals are generally managed to discharge excess rainfall runoff from basins during the wet season and maintain minimum water levels during the dry season. The north-south trending L-31E Levee and Canal crosses the project area, and water control structures exist at its intersections with the major east-west canals.

C.2.2.3 Analytical Requirements

Microsoft Excel is required to run the CBEEM. There are no additional analytical requirements.

C.2.2.4 Assumptions

Each performance measure involves simplifying assumptions described in *Attachment 1*.

C.2.2.5 Conformance with U.S. Army Corps of Engineers Policies and Procedures

The CBEEM conforms with USACE's policies and procedures.

C.2.2.6 Identification of Formulas Used in the Model and Proof That the Computations Are Appropriate and Done Correctly

The formulas used for each performance measure are described in *Attachment 1*. Standard MS Excel functions were also used to normalize and summarize performance measure output.

C.2.3 System Quality

C.2.3.1 Description and Rationale for Selection of Supporting Software Tool/ Programming Language and Hardware Platform

MS Excel was selected as a platform for the CBEEM because it is ubiquitous, user-friendly, and includes the standard functions needed for this application.

C.2.3.2 Programming Proof

The spreadsheet includes many equations that depend on the relative positions of cells to operate. Testing of the equations used to calculate diversion of water

was done in a separate spreadsheet. Careful review of the spreadsheet calculations were conducted by several team members to ensure that the equations have been properly managed to minimize errors associated with fixed and relative addresses. A copy of the CBEEM spreadsheet has also been provided to the model review team for their assessment.

C.2.3.3 Availability of Software and Hardware Required by Model

MS Excel is common and available software.

C.2.3.4 Description of Process Used to Test and Validate Model

Team members scrutinized the spreadsheet for errors. Multiple flow datasheets were input into the spreadsheet to determine if results were reasonable and comparable. Data inputs such as pump size, available acreage, seepage rates, were varied within reasonable limits to ensure that the model would provide reasonable results given any combination of reasonable inputs. Sensitivity analysis was performed to ensure that the selection of the Selected Plan alternative was not overly biased by input estimates for only one or two of the performance measures.

C.2.3.5 Discussion of the Ability to Import Data into Other Software Analysis Tools (interoperability issue)

Input data was simply imported from hydrologic model output and databases in a tab delimited format. Final CBEEM calculation results are combined with cost data to perform the incremental cost analysis.

C.2.4 Usability

C.2.4.1 Availability of Input Data Necessary to Support the Model

Input data was readily available to CBEEM users, the project team. Hydrologic input data were obtained from the online DBHYDRO database maintained by the project sponsor (the SFWMD) and from hydrodynamic modeling results provided by USACE Research and Development Center. Landscape information, such as spatial extent of various habitat types and feature dimensions, were obtained from various team members and local experts.

C.2.4.2 Formatting of Output in an Understandable Manner

Primary output is limited to habitat units per alternative. Performance measure output is also readily available. Hydrologic summary data is provided in chart format to aid in the assessment of water utilization and restoration benefits.

C.2.4.3 Usefulness of Results to Support Project Analysis

The CBEEM and its inputs were the primary tools used for selecting the Selected Plan for the Biscayne Bay Coastal Wetlands project.

C.2.4.4 Ability to Export Results into Project Reports

The CBEEM results are easily usable in project reports and as input to the cost estimate/incremental cost analysis software.

C.2.4.5 Training Availability

Training availability criteria is not applicable because the CBEEM users are the developers. The spreadsheet has been automated to facilitate use by team members.

C.2.4.6 Usability

The spreadsheet has been setup to allow automated recalculation of benefits by non-expert users who are familiar with spreadsheet navigation. The intent is to provide all project delivery team members the opportunity to use the tool to get a better understanding of the methods that the team is using to estimate project benefits.

C.2.4.7 Technical Support Availability

Technical support is available for team member wishing to enhance their understanding of project benefit calculations. The software/hardware platform is available to most, if not all, users because MS Excel is common and available software.

C.2.4.8 Accessibility of the Model

The CBEEM is available to intended users: the Biscayne Bay Coastal Wetlands PDT.

C.2.4.9 Transparency of Model and How It Allows for Easy Verification of Calculations and Outputs

The rationale behind each performance measure is included in ***Attachment 1.*** All formulas are evident in the spreadsheet. The spreadsheet is available for independent review.

C.2.5 References

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ATTACHMENT 1
Performance Measure Documentation

Evaluation Criterion Number and Name
Performance Measure 1. Restore nearshore salinity regime.
Criterion Target and Description
The nearshore salinity target is equal to or less than 20 parts per thousand (ppt). The nearshore area is defined as the area between the shoreline out to 500 meters. This performance measure evaluates the restoration of nearshore habitat as a function of salinity and the average daily volume of water diverted from canals. It directly addresses Project Object 1 (Restore nearshore and tidal wetland salinity regimes to reestablish productive nursery habitat along the shoreline) by quantifying the spatial extent of nearshore restoration using salinity as a surrogate. The performance measure is also tied closely to the Biscayne Bay conceptual ecological model by addressing a key driver (water management) and primary stressors (operation of structures and altered freshwater flow) that influence salinity patterns in Biscayne Bay, thus impacting various ecological attributes such as estuarine fish and invertebrates, benthic communities, etc. (Browder et al. 2005).
Justification and Current Condition
The salinity regime of the nearshore areas of southwestern Biscayne Bay has been modified significantly due to manmade changes in local hydrology. Today, higher salinities along the shoreline, especially during the dry season, have led to the decline in oyster reefs that once thrived at creek mouths, reduced the suitability of the area for American crocodiles (*Crocodylus acutus*), and have resulted in a shift of fish and macro invertebrate fauna to that more characteristic of marine conditions than estuarine conditions. Restoring the salinity in the nearshore habitat to mesohaline conditions (5 to 20 ppt) throughout the year would provide the optimal salinity regime for the flora and fauna that historically inhabited this area, such as widgeon grass (*Ruppia maritima*), shoal grass (*Halodule wrightii*), eastern oysters (*Crassostrea virginica*), American crocodiles, red drum (*Sciaenops ocellatus*), and other fish and invertabrates. In Florida, for example, oyster spat have an optimal salinity range of 20-23 ppt, whereas juveniles prefer salinities between 10-20 ppt and adults have an optimum range of 10-20 ppt (Woodward-Clyde 1998). Target salinity for estuarine fishes is 5-15 ppt from June through October, with higher salinities during the remainder of the year. Ideal salinity for juvenile crocodiles is 0-20 ppt in the mangrove wetlands and coastal creeks during the wet season and several months into the dry season (approximately June through January; Mazzotti and Cherkiss. 2003). The salinity target for this performance measure is set at 20 ppt, which is at the mid to upper end of the preferred range for most of the above species. Without freshwater discharges the salinity would exceed the 20 ppt target. Alternatives that provide the most uniform freshwater discharge in terms of timing and spatial extent are scored the highest for this

performance measure.

Reestablishing mesohaline salinities (20 ppt) along the shoreline should help restore a broader, more stable zone in shallow waters further offshore (500 to 1000 m) that will provide more suitable nursery habitat for pink shrimp (*Farfantepenaeus duorarum)* (Browder et al. 2002, Diaz 2001). Shrimp densities in the northern part of the restoration area (between Shoal Point and Black Point) appear robust (Diaz, pers. comm. 2001). However, shrimp densities in the southern area (between Black Point and Convoy Point) are very low (Diaz, pers. comm. 2001), possibly because of the widely fluctuating salinities that now prevail in the southern area.

Lowering salinities in the nearshore areas will also serve to reduce or eliminate periods of high salinity (greater than 35 ppt) concentration in parts of Biscayne Bay (the area between the shoreline out to 500 m offshore) within the project area. These hypersaline conditions inhibit estuarine productivity by contributing to salinity variability and slowing the growth rates of target species (Browder et al. 2005). Areas of hypersalinity have occurred nearshore in Biscayne National Park during the dry season, and throughout the year within Manatee Bay and the Florida Keys National Marine Sanctuary (Card Sound and Barnes Sound).

Evaluation Method/Approach

CBEEM Performance Metric(s):

Nearshore, C.1. Acres of Bay Bottom Meeting Salinity Criteria (<=20 ppt)

This metric is evaluated using measured salinity in the nearshore area for existing conditions and Scenario 10 of the TABS-MDS Preliminary Scenario Runs (PSR) to estimate the effect on nearshore salinity of diverting water into the tidal wetlands. The Scenario 10 PSR runs were set up to determine the spatial and temporal distribution of freshwater inflow necessary to continuously meet the target nearshore zone salinity of <= 20 ppt. The period of simulation for the TABS PSR runs was August 1, 1997 to July 31, 1998 which represents fairly average bay salinity conditions. The nearshore zone is defined for the dry season (December through May) as the area between the shoreline out to 500 meters.

The delineation of the four geographic areas used in this metric is as follows: (1) Deering Estate to C-100, (2) C-100 to C-1, (3) C-1 to Military Canal, and (4) Military Canal to Florida City Canal. Barnes Sound and Manatee Bay were not included in this analysis because the PSR run did not include this area and furthermore very little of the project water is diverted south of Florida City Canal. The daily flow required to meet the salinity target in each of four nearshore zones is shown in the ***Table C-18***. Note that the Cutler basin receives diverted water from three sources. The ability of each alternative to

meet the target salinity is evaluated by comparing the volume of diverted water and the Scenario 10 flows required to meet the salinity.

The volume of daily flows diverted into the saltwater (tidal) wetlands for each of the four zones is calculated based on water available at the coastal water control structures of the major conveyance canals in the project area (S123, S21, S21A, and S20F), and pump sizes and operations defined by each alternative. The results from the saltwater wetland diversion calculations are used here. Water diverted to the saltwater wetlands was used in this metric since the water diverted to the freshwater wetlands mostly occurs west of the L-31W borrow canal. To calculate the percentage of nearshore acres meeting the salinity target, the percent of the target flow delivered for each sub-basin is calculated on a daily basis. The percent flow target achieved is limited to 100% for those days where the diverted flow volume exceeds the daily target volume from the PSR run. The average seasonal percent flow target for each basin is then calculated and multiplied by the total acreage available to compute the average acreage meeting the salinity target.

Since neither existing condition (EC) and Future Without Project Conditions (FWO) scenarios include water diversion, the PSR model runs could not be used to estimate the acreage meeting the nearshore salinity criteria. For the existing condition scenario, observed data were used from several sites to determine the percent of time during a 3-year period of record when salinity was 20 ppt or less within the targeted nearshore zone.

TABLE C-18: REQUIRED FLOW TO MEET NEARSHORE SALINITY TARGET (LESS THAN 20 PARTS PER THOUSAND) FROM SCENARIO 10 OF TABS PRELIMINARY SCENARIO RUNS

Nearshore Zone:	Source of Diverted Water	Average Daily Flow to Meet Salinity Target from PSR TABS Runs	Target Acreage (Shoreline to 500 m)
		(ac-ft/day)	(acres)
Deering Estates	½ C-100	340	364
North Cutler	½ C-100 + C-1 + Tidal Wetlands Reuse	540	1326
C-1 to Military Canal (includes South Cutler)	C-102	315	827
Military Canal to Florida City Canal	C-103	210	945
TOTAL		**1405**	**3462**

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Comments/Notes

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Evaluation Criterion Number and Name (PM)
Performance Measure 2. Restore tidal wetland salinity regime.
Criterion Target and Description
This performance measure uses the latest TABS runs to determine the number of acres of tidal wetlands that are maintained at a salinity of 20 ppt or less (the optimal salinity for restoration in this wetland type). The performance measure directly addresses Project Objective 1 (Restore nearshore and tidal wetland salinity regimes to reestablish productive nursery habitat along the shoreline) by quantifying the spatial extent of tidal wetland restoration using salinity as a surrogate. It also addresses Objective 3 (Restore and improve quantity, quality, timing, and distribution of freshwater to Biscayne Bay, including Biscayne National Park) by improving the quantity, quality, timing, distribution of freshwater to Biscayne Bay. It is also directly tied to the Everglades Mangrove Estuaries CEM by addressing one of the two primary drivers (water management) and one of the three primary stressors (freshwater flow volume, duration, and distribution) that determine coastal salinity gradients. These salinity gradients, in turn, affect numerous ecological attributes in the coastal wetlands, including crocodiles, mangrove fish communities, and wading birds (Davis et al., 2005). This performance measure is applied only to the saltwater wetlands zone.
Justification and Current Condition
Key ecological indicators for healthy tidal wetlands include eastern oysters, American crocodiles, and estuarine fish. Optimal salinities for these species are generally 0-20 ppt. Maintaining salinities between 0-20 ppt will also provide optimal conditions for restoring the complex network of creek systems that historically characterized the tidal wetlands in the project area (Meeder et al. 1999, 2000, 2001). These creeks provide unique and important habitat for various flora and fauna, including deep water refugia and low salinities required by the American crocodile. Salinity regimes near the mouths of creeks apparently provided the only suitable living conditions for the eastern oyster (*Crassostrea virginica*) in Biscayne Bay, as evidenced by relic oyster reefs found near the mouths of historic creeks by Meeder *et al.* (1999). These oyster reefs, in turn, provided habitat for a variety of estuarine organisms. Alternatives that score best with this performance measure will theoretically restore the most saltwater wetland habitat in the project area. Alteration of freshwater flow patterns and volumes have reduced the occurrence of mesohaline, oligohaline, freshwater marshes, and sloughs, and allowed the landward expansion of saltwater and mangrove wetlands, including low-productivity, sparsely vegetated dwarf mangroves communities typical of the hypersaline or white zone (Egler, 1952; Tabb et al., 1967; Meeder et al., 1996; Ross et al., 1996, 2000, 2002). Historically, graminoids such as sawgrass (*Cladium jamaicense*) and spike rush (*Eleocharis cellulose*) occurred almost to

the western shore of Biscayne Bay. Re-establishing an oligohaline-to-mesohaline salinity gradient across the tidal wetlands, as evaluated by this performance measure, should serve, over time, to increase the density and spatial coverage of desirable graminoids in this ecological zone.

Also, reestablishing appropriate salinities in the tidal wetlands (i.e., attaining the salinity target for this performance measure) should increase the production of preyfish in this habitat type. There is evidence that decreased freshwater flows to marshes and estuaries have decreased the productivity of these areas for fish populations, probably as a result of increasing the salinity in these wetlands (Pool et al., 1975; Schomer and Drew, 1982; Loftus and Eklund, 1995). These studies also suggest that the process is reversible in that persistent freshwater conditions result in higher prey fish biomass than either brackish or marine conditions. Re-hydration of the coastal wetlands should decrease the salinity in the wetlands and, thus, increase the productivity of prey fish resulting in an increase in the numbers of foraging and nesting wading birds (Browder et al. 2005).

Evaluation Method/Approach

CBEEM Performance Metric(s):

Saltwater Wetlands, B.1. Acres of Tidal Wetlands Meeting 0-20 ppt Criteria

The acres of tidal wetlands with salinity below 20 ppt will be estimated using output from the Biscayne Bay Coastal Wetlands TABS MDS model developed specifically for this project. The available acres of tidal wetlands for five different areas will be estimated using GIS coverage as well as the TABS model mesh. The regions are Shoal Point (Deering), Cutler North, Cutler South, Homestead North, Homestead South, and Card Point. The available tidal acreage for each of these zones is shown below:

TABLE C-19: TIDAL ACREAGE BY ZONE

Available Tidal Wetlands	
Shoal Point	151
Cutler North	842
Cutler South	1,599
Homestead North	1,462
Homestead South	1,000
Card Point	15,981
Total Acres	**21,035**

The estimated tidal wetland salinity benefit will be calculated by determining the average daily area (acres) where salinity was less than 20 ppt during the critical time period of June through January. Keeping salinities below 20 ppt

during this time period is important for hatchling and juvenile crocodiles, but it is also important to keep salinities near 20 ppt during the dry season for oysters, American crocodiles, and other wildlife. The salinity output from the TABS model runs will be post-processed by identifying the model elements where the average daily salinity is less than < = 20 ppt, adding the area of those model elements to compute the daily acreage of tidal wetlands with salinity meeting the criteria. The average daily acreage of tidal wetlands meeting the criteria is calculated based on the daily results. The percent of target achieved is then calculated by dividing the average daily acreage by the total available acreage. The original modeling and evaluation plan was to have TABS results available for three versions of each alternative (average, wet, and dry conditions) and then take an average of these results. However, given time constraints it will not be possible to run several of the alternatives using TABS under average and dry conditions. With this constraint, the "average" tidal wetland benefits for Alternative M, and Alternative Q are estimated based upon the results of the wet conditions model runs, or in the case of the Yellow Book, based upon the most similar alternative (Alternative Q). Though this method of estimation is not as desirable as having modeling results, it presents little risk of skewing the overall evaluation of the alternatives since the metric is less than 15 percent of the overall score and the difference between alternatives is not significant.

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Evaluation Criterion Number and Name (PM)
Performance Measure 3. Reduce direct canal discharge.
Criterion Target and Description
This performance measure evaluates the project's ability to reduce point source discharges from major conveyance canals that dissect the project area. The target is to completely eliminate flow through the coastal structures (S-123, S-21, S-21A, and S-20F) by diverting all available water into the coastal wetlands. It directly addresses Project Objective 2: Redistribute freshwater flow to minimize point source discharges to improve freshwater and estuarine habitat. It also addresses Project Objective 1 (Restore nearshore and tidal wetland salinity regimes to reestablish productive nursery habitat along the shoreline), Project Objective 3 (Restore and improve quantity, quality, timing, and distribution of freshwater to the Biscayne Bay, including Biscayne National Park), and Project Objective 4 (Preserve and restore spatial extent of natural coastal glades habitat) by increasing the quantity, and improving the distribution, of freshwater to restore nearshore, tidal wetland, and coastal glades habitats. The performance measure addresses a key driver (water management) and important stressors (structure operations and freshwater flow volume, duration, and distribution) in both the Biscayne Bay and Everglades Mangrove Estuaries Conceptual Ecological Models (CEMs) (Browder et al., 2005, Davis et al., 2005). These drivers and stressors affect coastal salinity gradients and hydroperiods, as well as, physical impacts (structure operation and depth alteration) that influence the many ecological attributes of these systems (fish, birds, macro invertebrates, benthic communities, etc.). Variations of this performance measure are applied to the spatial extent of all three ecological zones (nearshore, saltwater wetlands, and freshwater wetlands) since the ability to divert water is a key element of the Biscayne Bay Coastal Wetlands project restoration efforts.
Justification and Current Condition
Channelized flow of freshwater across the watershed and point source discharges at canal mouths have been responsible for a variety of negative ecological impacts to the coastal wetlands and nearshore areas of western Biscayne Bay. These impacts are significant in the Biscayne Bay Coastal Wetlands project area as four major conveyance canals (C-100, C-1, C-102, and C-103) discharge runoff to the Biscayne Bay. Point source discharges are especially damaging because they result in large and highly ephemeral fluctuations in salinity. In southern Biscayne Bay, the salinity of marine waters (30-35 ppt) downstream of coastal canal structures frequently drops 20 ppt within 60 minutes and returns almost as rapidly (Wang et al. 1988). As currently operated, these dramatic salinity fluctuations can occur several times per day during the wet season (May – October). These extreme and rapid shifts in salinity create an extremely unstable estuarine environment that greatly

inhibits productivity. The unnatural salinity fluctuation can severely impact or kill attached or rooted plants (such as seagrasses) and animals (such as sponges and corals), as well as more mobile organisms like finfishes (Montague and Ley, 1993; Irlandi et al., 1997; Serafy et al., 1997). Thorhaug et al. (1976) observed that species diversity and numbers of fish, mollusks, crustaceans, and algae decreased in the vicinity of a canal in Biscayne Bay. The problem can be alleviated by shifting canal discharge to a more widespread overland flow which results in more gradual salinity fluctuations that are more conducive to a biologically healthy bay ecosystem (Alleman et al., 1995). This performance measure evaluates the capability of each project alternative to reduce point source canal discharges.

Degradation of estuarine conditions has also resulted from severely reduced overland flow due to channelization. Once healthy oyster bars that existed in and off the mouths of historic creeks (Meeder et al. 2001) and populations of other important estuarine species that were once abundant in the area, such as American crocodiles, red drum, and spotted sea trout have been reduced (Kushlan and Mazzotti, 1989; Serafy et al., 1996). Redirecting water from conveyance canals across broad expanses of tidal wetlands to nearshore areas will help reverse these effects through reestablishment of appropriate salinity regimes.

Redirecting water from conveyance canals into freshwater wetlands should also improve hydropatterns (hydroperiods and water levels) in freshwater wetlands in the project area (Browder et al. 2005). Channelized flow has severely reduced sheet flow, lowered water levels and reduced hydroperiods across these wetlands resulting in displacement of gramninoid marshes by shrubby/forested wetlands. Modified hydropatterns have also allowed infestation by invasive non-native vegetation. Of particular concern is the establishment of Brazilian pepper (*Schinus terebinthifolius*) and Australian pine (*Casuarina* spp.) in the wetlands. Redirecting the canal flows into these marshes should improve hydropatterns and help restore the appropriate marsh vegetation. This performance measure evaluates each project alternative's capability to redirect canal flow into the adjacent wetlands.

Evaluation Method/Approach

CBEEM Performance Metrics:

Nearshore, A.1. Potential Percent of Surface Water Diverted from Canal

Saltwater Wetland, A.1. Potential Percent of Surface Water Diverted to Saltwater Wetlands

The reduced canal discharge metric for the nearshore ecological zone is calculated as a percent of the available water that is diverted by project features into freshwater or saltwater wetland areas. The logic of this performance

measure is that harmful salinity swings at the mouths of the canals will be moderated by the diversion of canal discharge into both freshwater and saltwater wetland areas. It is calculated using the total capacity of pumps in each basin that divert water from the canals and the time series of daily coastal structure discharges provided either by the historic measurement record (DBHDRO database) or by simulation results from the South Florida Water Management Model 2x2. The four coastal structures of interest are: S-123 on the C-100 canal, S-21 on the C-1 canal, S-21A on the C-102 canal, and S-20F on the C-103 canal. The freshwater and saltwater wetland and total diversion pump capacities for each of the alternative are shown in ***Table C-20.*** To calculate the volume of water that could be diverted from the canal on a given day, the following logic statement was used in the calculation spreadsheet:

If the Daily Structure flow (Q) is less than or equal to total pump capacity (P_{TPC}), then the diversion quantity is equal to Q. If Q is greater than P_{TPC}, then a volume equal to P_{TPC} is diverted and the remainder is released to tide. Where P_{TPC} is the total pump capacity for the basin. As an Excel function this equation is written as:

=if(Q<=Tot_Pump_Cap, Q, Tot_Pump_Cap).

The reduced canal discharge metric as applied to the freshwater wetlands is calculated as a percent of the total water available that is diverted by project features into freshwater wetland areas. It is calculated using the capacity of pumps that divert water into freshwater wetland areas and the time series of daily coastal structure discharges either historic flows or simulated flows. The four coastal structures of interest are: S-123 on the C-100 canal, S-21 on the C-1 Canal, S-21A on the C-102 Canal, and S-20F on the C-103 Canal. The pump capacities in this table are assigned to receiving wetlands, either saltwater or freshwater. For these benefit estimates, water is proportionately divided between the freshwater and saltwater wetlands based upon the relative size of the pumps dedicated to each habitat type. To calculate the volume of water that could be diverted from the canal into freshwater wetlands on a given day, the following logic statement is used in the calculation spreadsheet:

*If the Daily Structure flow (Q) is less than or equal to freshwater pump size (P_{FW}), then freshwater diversion quantity is equal to Q * P_{FW} / P_{TPC}; If Q is greater than P_{TPC}, then a volume equal to P_{FW} is diverted and the remainder is released to tide or pumped by the P_{SW}: Where P_{FW} is pump capacity for freshwater wetlands, P_{SW} is the pump capacity for saltwater wetlands and P_{TPC} is the total diversion pump capacity for the basin. As an Excel function this equation is written as:*

*=if(Q<=Tot_Pump_Cap, Q*FW_Pump_Cap/Tot_Pump_Cap, FW_Pump_Cap).*

The percent of canal discharge diverted to saltwater wetlands is also calculated using the capacity of pumps that divert water into saltwater wetland areas and the daily time series of coastal structure discharges. The same calculation logic is used for the saltwater wetland benefits associated with canal diversion.

For all three of the canal flow diversion performance metrics, the reported value is the percent of available flow that is diverted to either the saltwater and freshwater wetland ecozones or in the case of the nearshore ecozone, the total percent of all diverted flow.

TABLE C-20: DIVERSION PUMP CAPACITIES FOR FRESHWATER AND SALTWATER WETLAND REHYDRATION

TOTAL PUMP CAPACITY (cfs)					
Alternative	**C-100**	**C-1**	**C-102**	**C-103**	**REUSE**
Alternative O	200	400	550	520	200
Alternative Q	170	400	400	500	200
Alternative M	20	620	0	50	200
Alternative YB	50	200	200	250	200
Alternative O PHASE 1	100	400	150	120	0
FRESHWATER WETLAND DIVERSION PUMP CAPACITY (cfs)					
Alternative O	**50**	**50**	**250**	**470**	**150**
Alternative Q	85	50	400	500	150
Alternative M	10	50	0	0	150
Alternative YB	50	50	200	250	150
Alternative O PHASE 1	50	0	50	100	0
SALTWATER WETLAND DIVERSION PUMP CAPACITY (cfs)					
Alternative O	150	350	300	50	50
Alternative Q	85	350	0	0	50
Alternative M	10	570	0	50	50
Alternative YB	0	150	0	0	50
Alternative O PHASE 1	50	400	100	20	0

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Evaluation Criterion Number and Name (PM)
Performance Measure 4. Potential freshwater wetland rehydration.
Criterion Target and Description
This performance measure quantifies the spatial extent of freshwater wetlands that can potentially be rehydrated by each alternative. The target is to fully restore the freshwater wetlands within the freshwater wetland ecological zone of the project area that generally includes the area west of L-31E between C-102 and Florida City Canal, and it includes roughly the northern third of the Model Lands east of Card Sound Road. The specific area for which the analysis was performed is defined by the freshwater wetland area anticipated to be affected by Alternative Q, including the Lennar Flow-way (~9600 acres). It is directly tied to Project Objective 4: Preserve and restore spatial extent of natural coastal glades habitat. It also addresses Project Objective 3 by improving timing and distribution of freshwater flow to the Biscayne Bay. The metric is applied only to the freshwater wetland zone.
Justification and Current Condition
This performance measure assumes that the greater the potential to hydrate freshwater wetlands the greater the potential for achieving the following ecological benefits: (1) increased spatial restoration of coastal glades and freshwater marsh habitat, (2) increased spatial restoration of sheetflow from freshwater habitats to Biscayne Bay, (3) improved timing and distribution of freshwater flow to Biscayne Bay. This performance measure is only applied to the spatial area of the freshwater wetlands. Historically, most of the area east of the coastal ridge within the project area was freshwater marl prairie with some deeper hydroperiod habitat downstream of the transverse glades (Davis, 1943). Historic reports for the area (Egler, 1952) indicate that the vegetation was dominated by a broad band of freshwater graminoid marsh that graded landward into pinelands and seaward into brackish graminoid marsh and mangrove swamps. The freshwater marsh was dominated by sawgrass but mixed with a variety of other graminoids at higher elevations (shorter hydroperiods) and with spike rush at lower elevations (longer hydroperiods). Current vegetation patterns include replacement of extensive pinelands and the shortest hydroperiod wetlands with urban and agricultural development, encroachment of woody species into higher elevation (shorter hydroperiod) wetlands, landward encroachment of brackish-tolerant species such as buttonwood (*Conocarpus erectus*) and red mangrove (*Rhizophora mangle*), and landward expansion of the white zone (Ross et al., 1996, Meeder et al., 1996). The importance of freshwater wetlands in the coastal regions of Southern Florida has been documented. Freshwater wetlands are linked to: 1) increased wildlife diversity and abundance; 2) improved water quality; 3) increased storage

capacity; 4) groundwater and aquifer recharge; 5) enhanced downstream functions of the natural environment; and 6) improved human interests. Thus, reversing the historic trend of freshwater wetland losses and achieving additional gains would be a significant achievement. This performance measure evaluates the potential freshwater wetland spatial area that can be restored if sufficient water is available to achieve required hydropatterns.

Freshwater rehydration will result in additional benefits associated with the attenuation of high flows that result in negative impacts to the nearshore environment. Also freshwater rehydration will provide the saltwater wetlands a more reliable supply of water through diverting surface water flows into the groundwater system. These benefits are accounted for separately in nearshore and saltwater performance measures.

Evaluation Method/Approach

CBEEM Performance Metric:

Freshwater, A.1. Wetlands With Sufficient Water

There are several methods of estimating the ecological benefits of wetland rehydration. In other South Florida restoration projects, wetland rehydration benefits are typically estimated using hydrologic models that predict the change in the number of days in which a given area has a groundwater stage within a range suitable for wetland species. This method was used in the original Comprehensive Everglades Restoration Plan Restudy modeling done with the South Florida Water Management Model 2x2. However given the extremely high transmissivity of the surficial Biscayne Bay Aquifer in the study area, it is not a trivial undertaking to create a sub-regional groundwater model that is capable of accurately reflecting project related hydroperiod changes. In this part of Florida, groundwater simulation model results show that applied water disappears quickly into the groundwater flow system without changing the groundwater stage histogram significantly. With these modeling obstacles in mind, the team developed the simplified method for estimating wetland benefits.

The simplified method used to account for wetland benefits associated with wet but not saturated soils relies upon the assumption that an acre of land is sufficiently hydrated to support wetland vegetation if the quantity of surface water applied on a given day at least equals the expected seepage losses to the groundwater system. In other words, wetland lift is proportional to the volume of water applied and inversely proportional to the rate of pond stage recession. This method does not consider groundwater stage to determine whether wetland acreage is inundated; however, it is reasonable to apply in this case since excessive groundwater seepage rates in southern Miami-Dade County limit the duration in which water ponds in wetland restoration projects. The equation used here to estimate wetland lift is:

$$L = Q / (S*CF)$$

Where:

L = Wetland lift (acres of lift)
Q = Flow diverted into wetland (cfs)
S = Recession rate (ft/hr)
CF = Conversion factor (86400 sec/day/43560 ft^2/acre)

For example, a volume of water equal to 100 cubic feet per second (cfs) diverted into a wetland where seepage losses are equal to 0.5 ft per hour, will generate net wetland lift of 165 acres ((100 ft^3/sec)/(0.5 ft/hr*24 hours/day*86400 seconds/day/43560 ft^2/acre) = 165 acres).

The most relevant source of data for the recession rate of southern Miami-Dade County constructed wetlands comes from the S-332B, S-332C, and S-332D detention areas constructed along L-31N and L-31W canal/levees in western Dade County and the Military Canal Pilot Wetland site operated by Miami-Dade DERM. The soils and hydrogeologic properties of the soils at these constructed wetlands are very similar to those in the Biscayne Bay Coastal Wetlands project area. ***Figure C-3*** shows seepage as a function of depth of inundation at S-322C pond. Since the Biscayne Bay Coastal Wetlands constructed wetlands will be primarily built to enhance wetland function and not as flood detention areas such as at S-332C, the range of inundation should be approximately 0.5 to 1.5 ft above land surface. At these depths of inundation, the estimated recession rate is between 0.3 to 1.2 feet per day. The pond stage recession rates originally used for the wetland lift calculations for the Biscayne Bay Coastal Wetlands project were 0.6 ft/day for the wet season and 1.2 ft/day for the dry season. Subsequent discussions with IEPR reviewers resulted in a recession rate of 0.14 ft/day as a reasonable estimate for the BBCW freshwater wetlands based upon the Military Canal Pilot Wetland Study performed by Miami-Dade DERM in 2007.

To calculate the daily number of freshwater wetland functional lift acres, the quantity of water diverted within each basin for each alternative is computed using the pump diversion capacity. The daily diverted volume is multiplied by the seasonal seepage constant (acres/cfs) which is calculated based on reasonable pond stage recession rate. The average freshwater wetland functional lift is calculated by taking an average of the daily functional lift over the period of record. The total for each alternative is computed by adding together the lift from each basin. The estimated lift from reuse water for each alternative is calculated by assuming a constant daily volume of water applied to the freshwater wetlands and multiplying it by the recession constant to compute rehydrated acreage.

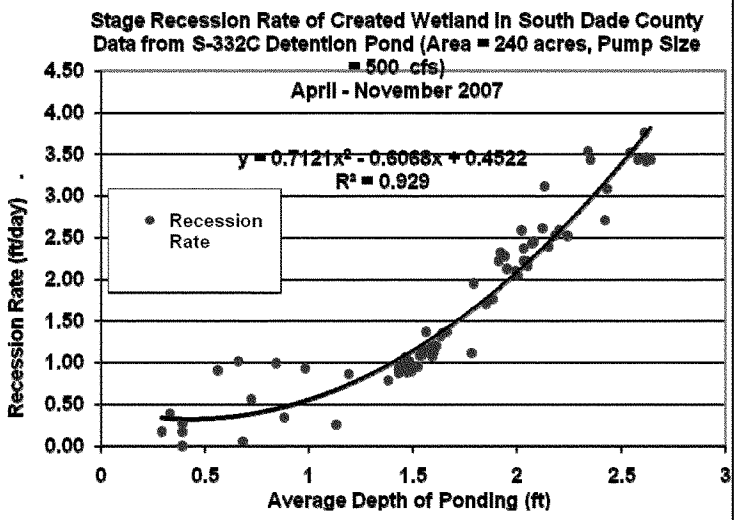

FIGURE C-3: RECESSION RATE OF CREATED WETLAND IN SOUTH DADE COUNTY

In the C-1 and C-100 basins, the freshwater diversion pump capacity for all of the alternatives exceeds the available freshwater wetland acres when the recession rate is estimated to be 0.6 ft/day. For the C-102 and C-103 basins, the available wetland acreage is not all rehydrated even at peak diversion rates for any of the alternatives. To ensure that the acreage estimates for each basin cannot exceed the available acreage regardless of the recession rate assumed, all of the wetland rehydration acreage equations are set up to check to see if the available acreage is exceeded. The available freshwater acreages are specified by alternative and basin on the input page of the spreadsheet.

To compute the percentage of lift achieved, the average freshwater wetland rehydrated acreage for each alternative is divided by the available lift. Available lift is computed as the total number of acres available times one minus the existing wetland function (Available FW Lift = Total FW Acres * (1 – Functional Value).

It is important to note that this simple method of estimating wetland lift

provides a means of discriminating between alternatives using relative comparisons. It is not meant as a method of computing absolute wetland lift as this would require a broader investigation of site conditions as well as final design conditions.

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Comments/Notes

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Evaluation Criterion Number and Name (PM)
Performance Measure 5. Reduce nitrogen concentrations.
Criterion Target and Description
Water quality (in terms of nitrogen reduction) is evaluated based on the spatial extent of stormwater treatment areas (STAs) and wetlands, and on the volume of water diverted into those features by each alternative. This performance measure addresses Project Objective 3 by quantifying the improvement to the quality of water (in terms of nitrogen removal) entering Biscayne Bay and Biscayne National Park. It also addresses a key driver (water management) and important stressors (freshwater flow and altered nutrient inputs) in the Biscayne Bay and Everglades Mangrove Estuaries CEMs (Browder et al. 2005, Davis et al. 2005). These, in turn, influence coastal nutrient dynamics and water quality that affect numerous ecological attributes in these systems, including estuarine fish, wading birds, benthic flora and fauna, etc. It is applied only to the nearshore zone.
Justification and Current Condition
Open waters of south Biscayne Bay are highly oligotrophic (i.e., the water has very low concentrations of dissolved organic and inorganic nutrients, including nitrogen species). Flora and fauna characteristic of the Biscayne Bay rely on the oligotrophic conditions for their health and well-being. Corals, which are found scattered across the hardbottom habitat of central Biscayne Bay, are particularly sensitive to nutrient concentrations, having evolved in nutrient-poor conditions. Seagrasses common in the nearshore zone of the project area also respond to changes in nutrient concentrations. Excess nutrients in this system can stimulate the growth of phytoplankton and epiphyte populations that can prevent sufficient light penetration through the water column to sustain benthic communities, such as seagrass, corals, and sponges. Dissolved nitrogen concentrations (particularly nitrates) are much higher in canal waters than the receiving waters of Biscayne Bay. This performance measure quantifies the reduction in nitrates in water entering the Biscayne Bay as a result of passing across wetlands prior to their entry to the Biscayne Bay. Wetlands are known to reduce nitrogen inflow concentrations. However, the reduction capacity is dependent on several factors, including the ratio of organic to inorganic nitrogen, dissolved oxygen levels, alkalinity, availability of carbon, wetland pH, hydraulic residence times, and total nitrogen load. Kadlec and Knight (1996) list first-order, area-based rate constants for nitrogen removal for several wetlands. The values range from a low of 0.56 meters/year (m/yr) to 66.36 m/yr, with a mean of 15.4 m/yr, and are considered to be temperature dependent. Presently, untreated water enters the Biscayne Bay from conveyance canals. Alleman et al. (1995) noted that increases in nutrient concentrations in Biscayne Bay account for most of the negative water quality trends in the Biscayne Bay.

Management measures that remove nutrients from the water prior to its entry to the Biscayne Bay can reverse these trends. All project alternatives include measures to reroute nutrient laden canal water through STAs and wetlands, which should reduce concentrations or nutrient loads reaching the Biscayne Bay. The primary difference in the alternatives is the volume of water that will be rerouted and the spatial extent of wetlands into which the water will be diverted. This performance measure evaluates the extent to which each alternative can remove nitrogen from water redirected into STAs and coastal wetlands, prior to its entry to the Biscayne Bay.

Evaluation Method/Approach

CBEEM Performance Metric:

Nearshore, B.1. Nitrate Load Reduction

The Biscayne Bay Coastal Wetlands project will reduce nitrate loading to the Biscayne Bay as a result of the diversion of surface water into freshwater and saltwater wetlands. This performance measure compares the ability of a project to achieve the desired nitrate load target. The existing nitrate load is estimated using the most recent average nitrate concentrations measured in the four canals and the total flow that passes through the coastal structures. The target nitrate load for the four coastal structures (S-123, S-21, S-21A, and S-20F) is estimated using a target nitrate concentration and multiplying this by the average annual flow available at the four structures. The estimated amount of nitrate removed by the project alternatives is based upon the amount of water diverted to the wetlands, the effective treatment area of the wetlands, and the concentration of nitrate once the water has passed through the wetland. Present and future nitrate concentrations in the four canals were taken from a paper by Graves and Pitts (2004). The future nitrate concentrations for the canals are estimated by Graves and Pitts using projections of the change in land use over the next 45 years. The target load condition is estimated using the existing flow conditions and the target nitrate concentration of 0.05 mg/L as determined by Graves and Pitts for the Biscayne Bay Coastal Wetland Project.

The reduction in nitrate load to the Biscayne Bay was estimated using the first-order area-based "K-C*" model developed by Kadlec and Knight (1996). This equation is:

$$C_o = C^* + (C_i - C^*)\exp(-kA/Q),$$

Where:

C_o is the concentration of nitrate in the wetland effluent (mg/L)
C^* is the lowest achievable nitrate concentration in a wetland (mg/L)
C_i is the inflow concentration of nitrate for flow entering the wetland (mg/L)
K is the rate constant (M/yr)

A is the area of the wetland (M^2)
Q is the volume of water applied (M^3/yr)

For this study, C* was assumed to be 0.0075 mg/L and K was assumed to be 50 M/yr. This equation was used to estimate the future wetland effluent concentration for each basin based upon the amount of diverted flow and the maximum upper size of the wetland area. The K-C* model provides the long-term average effluent concentration for treatment wetlands. Though the K-C* equation may not be the best design equation for sizing southern Miami-Dade County wetlands where seepage is large relative to inflow, it can be used here as a comparative tool with limited risk of type 1 or type 2 error.
The amount of water diverted by each alternative was estimated using the total available pump capacity regardless of whether the water was diverted into freshwater or saltwater wetlands. The wetland acreage available in each basin was estimated based upon the design STA size. Where no defined STA size is specified, the treatment acreage was estimated based on pump size, feature location, and site conditions. Since each alternative diverted a different quantity of water into the wetlands, and the alternatives incorporated different sizes for the target wetlands, the effluent concentrations estimated for each basin are unique to a given alternative. The future land use and nitrate concentrations for each basin are shown in ***Table C-21***. The treatment acreage estimated for each alternative is shown in

Table C-22. The effectiveness of each alternative in reducing nitrate discharges to the Biscayne Bay is calculated as a percent of the target nitrate load reduction achieved. The existing condition nitrate load is used as the baseline.

TABLE C-21: EXISTING AND FUTURE LAND USE AND RESULTING AVERAGE NITRATE CONCENTRATIONS

	C-100		C-1		c-102		C-103	
	Present	Future	Present	Future	Present	Future	Present	Future
Basin Land Use								
Ag	2%	2%	36%	7%	62%	25%	51%	20%
Urban	96%	96%	51%	80%	31%	68%	41%	72%
Other	3%	3%	13%	13%	7%	7%	8%	8%
Nitrate Concentration (mg/L)	**0.12**	**0.12**	**1.5**	**0.33**	**2.59**	**1.06**	**2.13**	**0.88**

TABLE C-22: WETLAND TREATMENT ACRES AND ESTIMATED EFFLUENT NITRATE CONCENTRATIONS FOR D13R AND DBHYDRO FLOW RECORDS

Wetland Acreage Estimates for Nitrate Reduction					
Freshwater Wetland Application Area (acres)					
ALTERNATIVE	**C-100**	**C-1**	**C-102**	**C-103**	**Total**
Alternative O	142	207	1000	3000	4349
Alternative Q	142	207	1000	3000	4349
Alternative M	142	207	0	0	349
Alternative YB	142	277	2250	2000	4669
Alternative O Phase I	142	207	500	480	1329
Saltwater Wetland Application Area (acres)					
ALTERNATIVE	**C-100**	**C-1**	**C-102**	**C-103**	**Total**
Alternative O	150	500	500	500	1650
Alternative Q	150	500	0	0	650
Alternative M	150	500	0	0	650
Alternative YB	150	500	0	0	650
Alternative O Phase I	150	500	500	500	1650
Total Wetland Application Area (acres)					
ALTERNATIVE	**C-100**	**C-1**	**C-102**	**C-103**	**Total**
Alternative O	292	707	1500	3500	5999
Alternative Q	292	707	1000	3000	4999
Alternative M	292	707	0	0	999
Alternative YB	292	777	2250	2000	5319
Alternative O Phase I	292	707	1000	980	2979

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Comments/Notes

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Evaluation Criterion Number and Name (PM)
Performance Measure 6: Reduce total phosphorous loading to Biscayne Bay.
Criterion Target and Description
Not to exceed a monthly average of 5μg/L in open waters and with an average flow-weighted mean inflow concentration of approximately 6 parts per billion (ppb) for Southern Glades, Model Lands, and Coastal Basins.
Justification and Current Condition
Open waters of south Biscayne Bay are oligotrophic, as are other natural systems of south Florida. Past studies have documented that phosphorus is generally the limiting nutrient in Biscayne Bay. However, some canal water that currently discharges into south Biscayne Bay and groundwater have higher concentrations of nutrients. Alterations in quality and quantity of water released into Biscayne Bay, Florida Bay, Barnes Sound, and Manatee as a result of the modifications contemplated in the C-111 North Spreader and Biscayne Bay Coastal Wetlands projects could affect the concentration of phosphorus reaching Biscayne Bay surface waters in a beneficial or adverse fashion. Re-routing of nutrient laden canal water through wetlands or treatment and detention areas could reduce concentrations or nutrient loads reaching Biscayne Bay. Increased phosphorus, or phosphorus together with nitrogen inputs, may result in undesirable algal blooms in the water column or as epiphytes on submerged vegetation, and consequently affect seagrass distribution or productivity. Long-term phosphorus concentration limits established by the Everglades Forever Act represent the concentration levels delivered during the OFW baseline period of March 1, 1978 too March 1, 1979, adjusted for observed variations. The long-term concentration limit for Taylor Slough (S-332 and S-175) and the Coastal Basin (S-18C) is 11 ppb. Compliance with these concentration limits is expected to provide a long-term average flow- weighted mean inflow concentration of approximately 6 ppb for the Taylor Slough and Coastal Basins. These limits are targets set to prevent an imbalance of Everglades flora and fauna.
Evaluation Method/Approach
CBEEM Performance Metric: B.2. Peak Phosphorus Load Reduction The average phosphorus concentrations in the four canals within the study are near 6 ppb. Given such low average concentrations, it is not reasonable to expect that water diverted into and discharged from rehydrated wetlands would

be at a lower concentration. However, the discharge of peak phosphorus concentrations would be attenuated by diverting flow into wetlands. This performance metric incorporates flow based concentration estimation equations developed by the U.S. Geological Survey (Lietz, 1996) and the pump size to estimate the fraction of peak concentration load that is diverted from the canals. The following equations were taken from Lietz:

S-20F: $P = 5.08X10^{-4} + 2.43X10^{-5} X Q$, *R-Squared = 0.99*
S-21: $P = -7.38X10^{-4} + 4.27X10^{-8} X Q^2$, *R-Squared = 0.88*
S-21A: $Ln(P) = 4.72 + 1.71X Ln(Q)$, *R-Squared = 0.23*
S-123: $P = 6.7X10^{-4} + 5.34X10^{-5} X Q$, *R-Squared = 0.99*

Using the daily flow record, the daily load and average phosphorus concentration will be calculated for each canal. The daily excess phosphorus concentration will be estimated by subtracting 6 ppb from the daily average phosphorus concentration. The excess phosphorus concentration is set to zero for those periods when the average discharge phosphorus concentration is calculated to be less than 6 ppb. The overall peak phosphorus load reduction is then estimated as the percentage of excess phosphorus load diverted relative to the total excess phosphorus load.

Source/Contact Information

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Biscayne Bay Conceptual Model
Chapter 62-602 F.A.C.
Chapter 24 of the Code of Miami-Dade County
1991 Settlement Agreement United States v. SFWMD, *et al.*, Fla. Stat. § 373.4592 (1994) Everglades improvement and management
Lietz, Arthur C., 1996, Methodology for the determination of nutrient loads to East Coast canals: St. Petersburg, FL, U.S. Geological Survey, Factsheet FS-129-96, *Available online at* http://sofia.usgs.gov/publications/fs/129-96/

Comments

Evaluation Criterion Number and Name
Performance measure 7. Reduce non-native vegetation.
Criterion Target and Description
This performance measure evaluates the extent to which each project alternative can eliminate non-native vegetation from the project area. The metric addresses Project Objective 4 (Preserve and restore spatial extent of natural coastal glades habitat) by removing non-native vegetation from the coastal glades. It is applied to the freshwater wetlands zone only. The target is the total number of acres of non-native vegetation within the preliminary Biscayne Bay Coastal Wetlands project boundary, which was determined to be at 9763 acres. None of the alternatives are anticipated to affect lands outside the preliminary project boundary. Acres of non-native vegetation anticipated to be removed by each alternative were normalized against the target. Note that any vegetation class that included non-natives as part of the mix (e.g., white mangrove/Brazilian pepper mix) was included as non-native vegetation coverage.
Justification and Current Condition
The Florida Exotic Pest Plant Council lists 62 species as invading and disturbing the native plant communities in the State, and an additional 57 species as showing a potential to do the same (Florida Exotic Pest Plant Council 1997). Non-indigenous plants can disrupt native biotic communities in several ways, including: 1) changes in community structure and composition, 2) alteration of ecological processes, and 3) hybridization between exotic species and their related native ones, resulting in potentially new pests (Austin 1978, Schmitz et al,. 1997, Simberloff 1997). In addition, exotics can affect the quality of human life in the State by impacting water quality and use, diminishing property values, colonizing agricultural lands, increasing fire risk, and producing less aesthetically-pleasing views (Schmitz et al. 1997). In southern Florida, altered hydrology from drainage and disturbance from development have increased opportunities for non-native plants to become established and thrive (McPherson and Halley 1996). Modification of the State's waterways for flood control, water supplies, irrigation, and recreation has further facilitated the spread of some of these species. Non-native vegetation affects both wetland and upland habitats in South Florida. Schmitz *et al.* 1997 estimate that nearly 2.5 million acres of habitat in southern Florida are covered by the five most widespread non-native species, including in order of significance, Brazilian pepper (*Schinus terebinthifolius*), paperbark tea tree (*Melaleuca quinquenervia*), Australian pine (*Casuarina* spp.), hydrilla (*Hydrilla verticillata*), and water hyacinth (*Eichhornia crassipes*).

Presently, significant portions of the Biscayne Bay Coastal Wetlands project area are covered with pure or mixed stands of invasive, non-native vegetation (EPA 1994, M.Ross personal communication). The two non-native species most problematic in the project area are Brazilian pepper and Australian pine. These species typically colonize areas that have been disturbed, usually through direct removal of native vegetation and soil disturbance, or through some form of hydrologic change that is typically anthropogenic in origin. Brazilian pepper is the most common non-indigenous plant in the project area, with an abundance of mature stands occurring almost exclusively in freshwater habitats. These stands often consist almost entirely of Brazilian pepper, with a scattering of willows and an occasional strangler fig or other hammock tree species (EPA 1994). Many stands have an understory consisting primarily of leather fern (*Acrostichum danaeifolium*). Australian pine is the next most common non-native species. It occurs most commonly along road banks, levees, and berms associated with mosquito ditching, and forms patches or rows that are interspersed with the native dominated community. Australian pine may or may not have an understory consisting of white mangrove (*Laguncularia racemosa*), gulf cordgrass (*Spartina spartinae*), or a mixed mangrove community. Other non-native species of note in the project area include the paperbark tea tree, shoebutton Ardisia (*Ardisia elliptica*), and more recently the Old World climbing fern (*Lygodium microphyllum*).

Initial manual eradication of existing non-native vegetation will likely be required to obtain the desired reduction in non-native coverage. Reduction in areal extent of artificial topographic highs, such as canal levees and drainage ditch berms, should help alleviate recolonization of non-natives. Application of additional land management techniques, such as prescribed burns, will likely be required to prevent re-colonization and spread of non-natives.

Evaluation Method/Approach

CBEEM Performance Metric:

B.1. Reduce Non-native Vegetation

The metric also assumes that all non-native vegetation within the footprint of a given alternative will be controlled or eliminated by changes in hydrology resulting from the project and other means, if necessary (e.g., mechanical and/or chemical removal). Using the vegetation map created by the U.S. Fish and Wildlife Service in 2005 (FWS 2005) and the 1999 Florida Land Use, Cover and Forms Classification System (FDOT 1999) map, the total area of non-native vegetation lying within the projected footprint of each alternative was determined. Both maps were required because the U.S. Fish and Wildlife Service map (the most accurate and current) did not cover all of the project area. The Florida Land Use, Cover and Forms Classification System map was used in

the region that the U.S. Fish and Wildlife Service map did not cover, which was most of the Model Lands area.

For Alternatives M and O, it was assumed that increased hydration would occur in the wetlands to the west of L-31E from operational changes that would raise groundwater in L-31E, so those wetlands were included in the calculations. For Alternatives O and Q, it was assumed that increased hydration would occur in the wetlands to the west of the spreader canal in the Homestead wetlands (between C-1 and Florida City Canal). Operational changes would raise groundwater in the freshwater wetlands west of L-31E, so those wetlands west of the spreaders were included in the calculations. No exotics removal was credited to the Future Without Project Conditions (FWO) project condition because urban development removing exotics would also remove wetlands. It was assumed that all freshwater wetlands west of L-31E were developed in the FWO condition. Exotics removed by the 200-acre Lennar STA/Flowway were credited to Alternatives M, O, and Q.
Wetland vegetation monitoring via aerial photo-interpretation will be able to determine the extent to which non-native vegetation has been eliminated by comparing future aerial photos with existing vegetation maps of the project area.

Source/Contact Information

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Comments/Notes

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U.S. Environmental Protection Agency (EPA). 1994. Technical Summary Document for the Advanced Identification of Possible Future Disposal Sites and Areas Generally Unsuitable for Disposal of Dredged or Fill Material in Wetlands Adjacent to Southwest Biscayne Bay, Dade County, Florida. EPA Report No. EPA 904/R-94/007.

Evaluation Criterion Number and Name (PM)
Performance Measure 8. Restore connections between basins and wetlands.
Criterion Description and Target
This metric evaluates the increase in wetland connectivity by quantifying the length of manmade obstructions that are removed by each alternative. It assumes that removal of physical obstructions to surface flow, like roads and levees, will increase wetland connectivity within and between basins. It directly addresses Project Objective 5 (Reestablish connectivity between Biscayne coastal wetlands, C-111 Basin, Model Lands, and adjacent basins), but it also indirectly addresses Project Objectives 3 and 4 by allowing for a better distribution of water across the wetlands that should help restore coastal wetland habitat. This performance measure is applied to the freshwater and saltwater wetlands zones. The target is based on features envisioned for removal by all project alternatives combined, and include: Military Canal, North Canal, North Canal Drive, Palm Drive, Florida City Canal, Card Sound Road Canal, Tallahassee Road, SW 360th Street, and L-31E (from C-1 to Palm Drive and the Model Lands dogleg). The combined length of the above features is 54.95 miles.
Justification and Current Condition
Increasing wetland connectivity results in the following primary benefits: (1) establishes a more natural gradient in salinity across the wetlands, (2) restores sheet flow across a broad front, and (3) provides broad corridors for wildlife movement between basins and wetlands. Reestablishing wetland and basin connectivity should result in a more natural water flow that will support more productive freshwater and estuarine systems than what is observed today. Water dependent wildlife like fish and wading birds require large, contiguous areas with a diversity of ecotones for feeding, nesting, and reproduction. Historically, these areas existed in the project area. Earliest aerial photographs and descriptions document that freshwater marshes covered a large expanse of the lowlands east of the ridge, continuing unbroken almost to Biscayne Bay's shoreline (Meeder et al. 2001). The historic surface water sheet and creek flow supported more productive freshwater and estuarine systems than what is observed today (Alleman et al. 1995). Over the past century these wetlands have been significantly reduced, destroyed, or fragmented by drainage and compartmentalization through construction of conveyance canals, secondary drainage ditches, mosquito ditches, levees, and roads. Major drainage basins, including C-100, C-1, C-102, C-103, and the Model Lands, have become isolated, as well as smaller basins, such as Military Canal, North Canal, and Florida City Canal. Levee 31-E is particularly effective in disrupting flow to the Biscayne Bay. Roadways also play a major role in fragmenting and isolating the basins

and associated wetlands.

Reconnecting wetlands and basins by removing roads, levees, or canals will increase wildlife corridors in the project area. The establishment of wildlife corridors should reduce the negative effects caused by compartmentalization and fragmentation. The benefits of wildlife corridors for reconnecting fragmented habitat have been well documented for a wide variety of landscape types (Noss 1983, Noss 1993, Rosenburg et al., 1997). Of particular relevance to the project area are studies demonstrating the effectiveness of drainage culverts and similar structures as habitat linkages. Culverts are effective not only in providing passageways for fish and other aquatic or wetland organisms between fragmented habitats, but they serve as effective corridors for upland animals as well (Clavenger et al., 2001). Florida panthers and many other vertebrate species regularly utilize wildlife underpasses beneath Alligator Alley (I-75) that link segments of Big Cypress Swamp (Foster and Humphrey 1991). Even relatively small structures such as "toad tunnels" have been utilized successfully to aid migrating amphibians in avoiding the hazards of road crossings (Langton 1989).

Removal of manmade obstacles to create wildlife corridors in the project area may be of particular benefit to the Federally threatened American crocodile. Mortality data indicate that between 1971 and 2001 as many as 14 crocodiles were killed by motor vehicles along Card Sound Road and 16 individuals were killed on U.S.1 between Florida City and Key Largo (Mazzotti and Cherkiss 2003). Additional crocodiles were killed by motor vehicles on secondary roads in the project area. The incidence of crocodile roadkill may be increasing as recent data indicate that as many as 10 crocodiles were killed by motor vehicles in or near the project area in 2002 (S.Klett, personal communication).

Evaluation Method/Approach

The analysis was limited to major features identified for removal, backfilling, or culverting in descriptions of alternatives, including the Yellow Book alternative. The target is based on features envisioned for removal by all project alternatives combined, and include: Military Canal, North Canal, North Canal Drive, Palm Drive, Florida City Canal, Card Sound Road Canal, Tallahassee Road, SW 360th Street, and L-31E (from C-1 to Palm Drive and the Model Lands dogleg). Feature removal or filling receives the total score of feature length; features supposedly made hydrologically transparent by culverting receive scores of half the feature length.

All alternatives, including the Future Without Condition, are given half credit for the 2.5 miles of the L-31E section in the Model Lands that will be culverted as part of the Florida Power and Light's Everglades Mitigation Bank Phase II project. All alternatives, including Existing Condition, are credited with 0.01 miles of L-31E culverted by the South Florida Water Management District L-31E Pilot Project. Analysis was conducted using GIS and project alternative descriptions.

*****This metric is not currently included in the Criteria Based Ecological Evaluation Matrix (CBEEM) evaluation due to difficulty in converting the measurement of linear features removed into acres of habitat restored.**

Source/Contact Information

Patrick Pitts, USFWS, patrick_pitts@fws.gov

Comments/Notes

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C.3 SUMMARY OF ENVIRONMENTAL CONDITIONS – HTRW INVESTIGATIONS

SUMMARY OF ENVIRONMENTAL CONDITIONS

For the

BISCAYNE BAY
COASTAL WETLANDS PROJECT
ALTERNATIVE "O" PHASE I
MIAMI-DADE COUNTY, FLORIDA

Prepared for

SOUTH FLORIDA
WATER MANAGEMENT DISTRICT
ENVIRONMENTAL ENGINEERING UNIT
LAND MANAGEMENT AND OPERATIONS SUPPORT
3301 GUN CLUB ROAD
WEST PALM BEACH, FLORIDA 33406

Prepared by

Professional Service Industries, Inc.
5801 Benjamin Center Drive
Tampa, FL 33634
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PSI PROJECT NO. 0552386-1

August 18, 2010

Information To Build On
Engineering • Consulting • Testing

SUMMARY OF ENVIRONMENTAL CONDITIONS

For the

BISCAYNE BAY
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August 18, 2010

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Sr. Environmental Engineer

Stephen P. Long, PE, PG
Chief Engineer

psi Information To Build On
Engineering • Consulting • Testing

August 18, 2010

South Florida Water Management District
Environmental Engineering Unit
Land Management and Operations Support
3301 Gun Club Road
West Palm Beach, Florida 33406

Attn: Mr. Robert Taylor

Re: Summary of Environmental Conditions
Biscayne Bay Coastal Wetlands Project - Alternative "O" Phase I
Miami-Dade County, Florida
PSI Project No.: 552-7G139

Dear Mr. Taylor:

In accordance with our agreement, Professional Service Industries, Inc. (PSI) has compiled a summary of environmental assessment activities for the above-referenced project, the results of which are summarized below.

Thank you for choosing PSI as your consultant for this important project. If you have any questions, or if we can be of additional service, please call us at (813) 886-1075.

Respectfully submitted,

PROFESSIONAL SERVICE INDUSTRIES, INC.

Donna Cline, PE
Senior Environmental Engineer

Steve Long, P.E., P.G.
Chief Engineer

Appendices: A – Regulatory Concurrence Letters

Professional Service Industries, Inc. • 5801 Benjamin Center Drive, Suite 112 • Tampa, FL 33634 • Phone 813/886-1075 • Fax 813/249-0301
FL Engineering Business 3684

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A – Regulatory Concurrence Letters

1. Property/Project Description

1.1 Introduction

The Biscayne Bay Coastal Wetlands (BBCW) project is being conducted as a component of the Comprehensive Everglades Restoration Plan (CERP) with the objective to restore more natural flows to Biscayne Bay by restoring coastal wetlands and tributaries through re-hydrating and reconnecting freshwater and marine wetlands along Biscayne Bay.

Surface water from the C-100 A, C-1, C-102, and C-103 canals will be re-distributed to flow across three major flow ways through the project area, which are described as the Cutler Wetlands Flow Way, the Deering Estates Flow Way, and the L-31E Flow Way. Several alternative project boundaries were proposed for the project area. This report specifically addresses the updated Alternative "O" Phase I Configuration

The BBCW Alternative O, Phase I project area encompasses 63 different SFWMD Tracts and 80 different Miami-Dade County (MDC) Parcel Identification Numbers (PIN). It should be noted that some South Florida Water Management District (SFWMD) Tracts encompass more than one MDC parcel, and not all of the MDC parcels have been assigned SFWMD Tract numbers.

The project area is divided into three project areas known as Region 1 (Deering Estates Flow Way), Region 2 (Cutler Bay Wetlands Flow Way) and Region 3 (L-31 East Culverts). The boundaries for the project are shown on a USGS Map as **Figure 1** and on a 2004 aerial photograph as **Figure 2**. The Tract ID numbers for each parcel are shown below by project area:

Region 1 (Deering Estates Flow Way)
TA500-073
TA500-074

Region 2 (Cutler Bay Wetlands Flow Way)

TA500-056	TA500-023
Unnamed Tract – PIN 3660150000030	TA500-024
GZ300-006	TA500-025
GZ300-010	TA500-027
GZ300-011	TA500-028
GZ300-012	TA500-030
GZ300-013	TA500-031
GZ300-014	TA500-032
GZ300-015	TA500-033
TA500-001	TA500-039
TA500-002	TA500-062
TA500-021	

Region 3 (L-31 East Culverts)

45800-013
45800-016
45800-070
45800-161
45800-168
GZ200-001
GZ200-002
GZ200-004
GZ200-008
GZ200-009
GZ200-011
Unknown ID –PIN 3060330000020
Unknown ID –PIN 3060330000040
Unknown ID –PIN 3070040000012
Unknown ID –PIN 3070040000022
Unknown ID –PIN 3070040000032
Unknown ID –PIN 3070090000011
Unknown ID –PIN 3070090000020
Unknown ID –PIN 3070090000021
Unknown ID –PIN 3070090000032
Unknown ID –PIN 3070090000060
Unknown ID –PIN 3070090000080
45800-006
45800-007
45800-008
45800-009
45800-011
45800-014
45800-015
45800-016
45800-018
45800-019
45800-021
45800-171
GZ200-005
GZ200-006
GZ200-007

Tract ID maps for each of these three areas are illustrated on **Figure 3** through **Figure 5**, for regions 1, 2, and 3, respectively. Many of the Tracts were assessed individually or in small groups as the District acquired the rights to the properties. As such, a large number of environmental reports have been prepared by PSI and other consultants. Each of these reports included recommendations for further study or specific remedial actions on individual Tracts. It is important to note that there was no project-wide assessment that addressed the project as a whole. This updated summary report is intended to summarize all of the previous environmental reports and to synthesize all of the data into a single unit for decision-making purposes. In addition, PSI has performed limited historical research on the entire project area, with an emphasis on the areas where no previous assessment was conducted, as part of this project.

1.2 Purpose

The purpose of this updated report is to summarize the environmental conditions on the parcels within the Alternative O, Phase I configuration of the BBCW project. The summary is based on all available environmental reports for the area. It should be noted that a majority of these reports have been previously submitted to the United States Fish and Wildlife Service (USFWS) and the Florida Department of Environmental Protection (FDEP). PSI has received concurrence on a number of the reports by both USFWS and FDEP. Copies of the concurrence letters are provided in **Appendix A**.

2. Historical Use

Portions of the project area have historically been utilized for the cultivation of various row crops and portions have been undeveloped. Mosquito drainage canals were cut across much of the area in the 1930s to drain the area. Generally speaking, agricultural use occurred in the western portion of the project area, with mosquito drainage canals in the central portion, which subsequently discharged into the salt marshes located along the eastern portion of the project area. The United States Department of Agriculture Farm Service Agency (USDAFSA) has previously indicated that properties within the project area may have been used for the production of malanga, yucca and potatoes. However, the USDAFSA was not able to identify activities that were conducted on specific Tracts. Based on the suspect crop types cultivated within the project area, copper, chlorinated pesticides (e.g., DDT/ Toxaphane), as well as arsenic may have been applied as part of the cultivation process. A hurricane hit near the east coast of Florida in the 1960's and the coastal agricultural land was inundated with salt water and exotic invasive species (i.e. Brazilian Pepper) flourished and much of the land was subsequently abandoned.

2.1 Historical Aerial Review

Region 1 (Deering Estates Flow Way)

Summary	
Year(s)	**Interpreted Property Use**
1938	Areas of development were apparent in the south section; however, buildings were not identified. The remainder of the subject property appeared as undeveloped, wooded land. Please note that the north section of the property was not depicted on the aerial photographs reviewed.
1953	Paths were apparent in the north section; however, no structures were depicted. Potential evidence of structures was apparent in the southwest corner on the subject property on Tract TA500-073; however, the presence of structures could not be verified due to the poor quality of the aerial photograph. The remainder of the subject property appeared relatively unchanged.
1963, 1968	Vegetation was cleared from the northeast corner. Canals were apparent in this location. No structures were apparent. The remainder of the subject property appeared relatively unchanged.
1970, 1973, 1985	Additional paths were apparent in the east section. The remainder of the subject property appeared relatively unchanged.
1998, 2006	Commercial buildings were apparent in the south. The remainder of the subject property appeared relatively unchanged.

Adjoining North	
Year(s)	**Interpreted Property Use**
1938	The property was not depicted on the aerial photographs reviewed.
1953	Two commercial developments were apparent. The remainder of the property appeared as undeveloped, wooded land.
1963, 1968, 1970	Scattered residential dwellings were apparent. The remainder of the property appeared relatively unchanged.
1973	A residential development was apparent. The remainder of the property appeared relatively unchanged.
1985, 1998, 2006	A section of agricultural development was apparent. One structure was depicted approximately 250 feet to the north of the subject property.

Adjoining East	
Year(s)	**Interpreted Property Use**
1938, 1953, 1963, 1968, 1970, 1973, 1985, 1998, 2006	The property appeared as Biscayne Bay.

Adjoining South	
Year(s)	**Interpreted Property Use**
1938, 1953, 1963, 1968, 1970, 1973, 1985,	The property appeared as undeveloped, wooded land and Biscayne Bay.
1998, 2006	A commercial structure was apparent on the property. The remainder of the property appeared relatively unchanged.

Adjoining West	
Year(s)	**Interpreted Property Use**
1938	Potential evidence of structures was apparent on the property adjacent to Tract TA500-073; however, the presence of structures could not be verified due to the poor quality of the aerial photograph. The remainder of the property appeared as undeveloped, wooded land.
1953	Evidence of scattered agricultural development was apparent. No structures were depicted. The remainder of the property appeared relatively unchanged.
1963, 1968	Scattered residential dwellings were apparent. The remainder of the property appeared relatively unchanged.
1970	Additional scattered residential dwellings were apparent. The remainder of the property appeared relatively unchanged.
1973	A residential subdivision was apparent. The remainder of the property appeared relatively unchanged.
1985	Agricultural development was no longer apparent. Area is now residential. Additional residential apparent throughout. Only one section adjacent to the subject property remained undeveloped, wooded land.

Adjoining West	
Year(s)	**Interpreted Property Use**
1998, 2006	One commercial structure was apparent in the location previously noted as undeveloped land. The area remained undeveloped, with the exception of this structure. The remainder of the property appeared relatively unchanged.

Region 2 (Cutler Bay Wetlands Flow Way)

Summary	
Year(s)	**Interpreted Property Use**
1938, 1953, 1963, 1968, 1970, 1973, 1985. 1998, 2007	The subject property appeared as undeveloped, wooded land in the east section and agriculturally developed in the west section. A large number of mosquito control canals criss-cross the property. Paths were apparent in the southern section.

Adjoining North	
Year(s)	**Interpreted Property Use**
1938, 1953, 1963, 1968, 1970, 1973, 1985, 1998, 2007	The property appeared as undeveloped, wooded land and agriculturally developed land.

Adjoining East	
Year(s)	**Interpreted Property Use**
1938, 1953, 1963, 1968, 1970, 1973, 1985, 1998, 2007	The property appeared as Biscayne Bay.

Adjoining South	
Year(s)	**Interpreted Property Use**
1938, 1953, 1963, 1968, 1970, 1973, 1985, 1998, 2007	The property appeared as undeveloped, wooded land in the east section and agriculturally developed land.
2007	Vegetation had been cleared from the property. The remainder of the property appeared relatively unchanged.

Adjoining West	
Year(s)	**Interpreted Property Use**
1938, 1953, 1963, 1968	The property appeared as agriculturally developed.
1970	One commercial structure was apparent adjacent to Tract No. TA500-073. The remainder of the property appeared relatively unchanged.
1973	Residential developments were under construction adjacent to the north section of Cutler South. The remainder of the property appeared relatively unchanged.

Adjoining West	
Year(s)	**Interpreted Property Use**
1985, 1998	Development of residential communities appeared to be ongoing. Retention ponds were now apparent. The remainder of the property appeared relatively unchanged.
1998, 2006	A commercial structure was apparent to the west of the southern section of Cutler South. An additional residential subdivision was apparent central west of Cutler South. The remainder of the property appeared relatively unchanged.

Region 3 (L-31 East Culverts)

Summary	
Year(s)	**Interpreted Property Use**
1938	The east section of the subject property appeared as undeveloped, wooded land in the east section and agriculturally developed land in the west section.
1952, 1963	A marina was apparent in the southeast corner of the Homestead South area. The remainder of the subject property appeared relatively unchanged.
1970, 1973	A wider canal was apparent in the approximate center running north-south. The remainder of the subject property appeared relatively unchanged.
1985	A pond was apparent in the northwest corner. The remainder of the subject property appeared relatively unchanged.
1998, 2007	An additional pond was apparent in the northwest corner of Homestead North. The remainder of the subject property appeared relatively unchanged. Please note that a 1998 aerial depicting the southern section of the subject property was not available to PSI.

Adjoining North	
Year(s)	**Interpreted Property Use**
1938, 1952, 1963, 1968	The property appeared as undeveloped, wooded land and agriculturally developed land. An east-west running canal connected to Biscayne Bay and a marina area were apparent in this location
1970, 1973, 1985, 1998, 2007	A pond was apparent adjacent to the northwest corner of the property. The remainder of the property appeared relatively unchanged.

Adjoining East	
Year(s)	**Interpreted Property Use**
1938, 1952, 1963, 1968, 1970, 1973, 1985, 1998, 2007	The property appeared as Biscayne Bay.

Adjoining South	
Year(s)	**Interpreted Property Use**
1938, 1952, 1963, 1968, 1970, 1973, 1985, 2007	The property appeared as undeveloped, wooded land in the east section and agriculturally developed land in the west section.
2007	Vegetation had been cleared from the northeast tip of Homestead North. The remainder of the property appeared relatively unchanged.

Adjoining West	
Year(s)	**Interpreted Property Use**
1938, 1952	The property appeared as agriculturally developed land.
1963, 1968, 1970, 1973, 1985, 1998, 2007	Homestead Air Force Base was apparent. Land was cleared of vegetation adjacent to the northern tip of Homestead North. The remainder of the property appeared relatively unchanged.

2.2 Regulatory Database Review

Records of previous assessment could not be located for a few Tracts within the Subject Property. PSI attempted to cover the gap for these areas by conducting additional historical and regulatory database review as part of this summary report. The historical uses have been summarized above. In addition, PSI reviewed an environmental database report, provided by Environmental Data Resources, Inc. (EDR) the results of which are summarized below. Copies of the EDR report can be found in the Phase I ESAs prepared by PSI for Region 1, 2 and 3, under separate cover.

Region 1 (Deering Estates Flow Way)

Facility Name Address	Florida John Deering Estate 16701 SW 7th Ave Miami, FL 33157	Map ID No. Distance (mile) Direction	6 <1/4 Mile West, Southwest
This facility is located immediately south of the Subject Property at 16701 SW 72nd Avenue. It is listed in the EDR report as a FINDS, Miami-Dade Co. Industrial Waste, and RCRA-NonGen facility. Review of available information indicated that this facility was formerly classified as a RCRA large quantity generator (LQG) of hazardous waste. PSI conducted a Phase I/II ESA on the property in November of 2006. The Phase I ESA found 55-gallon drums with soil staining and identified the past use as agricultural. PSI recommended the evaluation of potential soil impacts around the 55-gallon drums and soil sampling for agrochemicals in accordance with the US Fish and Wildlife Service protocol. The Phase II ESA included soil borings screened by OVA along with a soil sample around the identified drums and soil samples of the agricultural property in a grid pattern. The sampling around the drum did			

Facility Name Address	Florida John Deering Estate 16701 SW 7th Ave Miami, FL 33157	Map ID No. Distance (mile) Direction	6 <1/4 Mile West, Southwest
not identify analytes above applicable or relevant and appropriate requirements. Contaminants were discovered in soil in the agricultural area at concentrations exceeding the regulatory cleanup criteria. Arsenic was identified above the Soil Cleanup Target Level for direct exposure in a residential setting (SCTL-R) criterion, but below the soil cleanup target level for commercial direct exposure. Soil characteristics indicated that leaching of impacted material would not be likely. Given proposed end land use and site layout, no significant concerns requiring remediation were identified. PSI updated the recommendations in January 2007 recommending the placement of an institutional control on the property to negotiate a "no further action" letter and the development of a Soil Management Plan for safe handling of excavated soils from the proposed wetland area, canal extension area and stormwater ponds.			

Facility Name Address	RK Oil Inc. / Cutler Marathon 16780 Old Cutler Road Perrine, FL 33157	Map ID No. Distance (mile) Direction	7 <1/2 Mile West
This facility is located approximately 1600 feet west of the Subject Property. A discharge was reported on October 10, 1984. Subsequently, the facility was found to be eligible for the state funded Early Detection Incentive (EDI) cleanup program with an initial scoring of 30. A groundwater treatment pump and treat system was subsequently operated from 1986 through 1996 when remedial activities halted indefinitely. There were four additional instances of discharges at the facility from 1987 to 1991. Monitoring and sampling activities at the site indicate the groundwater flow direction to be to the south/southeast. In July 2008 three USTs were removed from the facilty and three new 12,000-gallon USTs were installed. The facility is currently scored 32 in the EDI program. On February 25, 2003, the Miami-Dade County DERM approved the Site Assessment Report Addendum prepared by BBLES on January 21, 2003 which recommended that additional site work be postponed indefinitely given the current site score combined with the FDEP's current operating procedures governing the preapproval program. Additional groundwater sampling upon reactivitation was recommended. Given the current scoring, distance from the Subject Property, direction of groundwater flow, and fact that a responsible party has been named, this listing is not considered to be a recognized environmental condition in connection with the subject property at this time			

Facility Name Address	16425 Old Cutter Road Miami, FL	Map ID No. Distance (mile) Direction	3 <1/8 Mile West
This listing is located approximately 900 feet west of the Subject Property. It is listed in the EDR report as a DEDB facility. Facilities in this database have concentrations of ethylene dibromide (EDB), a soil fumigant, in amounts exceeding the maximum contaminant level as stated in Chapter 62-550 or 520 Florida Administrative Code (FAC), which is considered a potential threat to public human health when present in drinking water. Previously, a water sample was collected from an on-site well and submitted for laboratory analyses for EDB. EDB was not detected in the sample collected. As such, this listing is not considered to be evidence of a recognized environmental condition in connection with the subject property at this time.			

Several facilities were found to be mis-mapped according to their address. These facilities include Mobil Oil Corp SS #A15, WW Oil Industries Inc. and 7200 SW 165th Street. These facilities are not in the vicinity of the Subject Property

No other regulated facilities or spill sites were identified within one mile of the subject property Tracts.

Region 2 (Cutler Bay Wetlands Flow Way)

Facility Name Address	South Dade Area Brownfields Area BF139912000 Miami-Dade (County), FL	Map ID No. Distance (mile) Direction	NA Target Property NA
The South Dade Brownfields area is a contiguous area of one or more brownfield sites, some of which may not be contaminated, and which has been designated by a local government by resolution. Facilities located within the South Dade Brownfields area do not necessarily have negative soil or groundwater impact. They are areas which have been designated as community redevelopment areas and where one or more Brownfield sites are located. Based on the nature of Brownfields areas, there exists the possibility of soil and/or groundwater impact on the subject property. The subject property, however, is not listed as a known site of soil or groundwater impact. Additionally, there is no evidence to suggest that the subject property has been impacted by discharges from any parcels within the Brownfields Area boundary.			

Facility Name Address	MDW&S South District 8950 SW 232 Street Miami, FL 33190	Map ID No. Distance (mile) Direction	1 <1/8 Mile Southwest
This facility was verified to be adjacent to the south of Tract TA500-039 TA500-062, and TA500-001. It is listed in the EDR report as a UST, LUST, IW-2-4, ENF, AP, and NPDES facility and is a Miami-Dade Water and Sewer wastewater treatment plant (WWTP). This facility currently utilizes one 1,000-gallon AST for the storage of an unknown substance, one 12,000-gallon AST for the storage of unleaded gasoline, and two 12,000-gallon and five 25,000-gallon ASTs for the storage of diesel fuel, located approximately 650 feet to the south of the subject property. The area formerly utilized one 6,000-gallon UST for the storage of unleaded gasoline, one 6,000-gallon UST for the storage of diesel fuel, one 8,000-gallon UST for the storage of fuel oil, and one 2,000-gallon AST for the storage of diesel fuel. These tanks have since been removed. A discharge from an AST was reported in 1993 and assessment activities were conducted. Impacts to the soil and groundwater of naphthalene, 1-methylnapthalene, 2-methylnapthalene and total recoverable petroleum hydrocarbons (TRPH) were reported. Approximately 20.74 tons of impacted soils were previously removed off-site to a thermal treatment facility. Subsequently, the site was placed into a monitoring only plan (MOP). Impacts to the soil have reportedly been removed. As of December 2007, the site was placed into Natural Attenuation Monitoring (NAM) for the previously reported impacts. The area of concern is isolated within the facility boundaries, approximately 650 feet from the subject property. Based on continuing remedial activities and the separation distance of the area of impact, as well as assessment activities that have been conducted on the above-referenced Tracts, this listing is not considered to be a recognized environmental condition in connection with the subject property at this time. This facility is an existing domestic wastewater treatment plant. Injection wells are located throughout the site. Water is filtered through the system and effluent samples are collected. Water is drained into on-site percolation ponds. No exceedances were reported through review of available information.			

Facility Name Address	Loggerhead at Black Point Marina 24777 SW 87th Avenue Miami, FL 33032	Map ID No. Distance (mile) Direction	2 <1/8 Mile Southwest
This facility is located west of Tract TA500-033 and TA500-028 and is an existing marina. It is listed in the EDR report as a UST, ENF, GTO and MOP facility. This facility utilizes two 12,000-gallon and one 20,000-gallon USTs for the storage of unleaded gasoline. The most recent compliance inspection was conducted on April 8, 2008 and the site was out of compliance for out of date financial responsibility, lack of proper record keeping, and release detection not conducted monthly or yearly. No records that the site is currently in compliance were identified. The industrial portion of the facility is located in the approximate center of the site, approximately 200 feet from the subject property, and is surrounded by water on the north, east and west sides. No discharges have been reported. Based on the location of the USTs, and lack of reported discharges, this facility is not considered to be evidence of a recognized environmental condition in connection with the subject property at this time.			

Facility Name Address	Pirate's Spa Marina 870124777 SW 87th Avenue Miami, FL 33032	Map ID No. Distance (mile) Direction	3 <1/8 Mile Southwest
This facility is located west of Tract TA500-033 between the Blackpoint Marina and the South Dade landfill. It is listed in the EDR report as a LUST and UST facility. This former facility utilized two USTs of an unknown size that were removed from this site in 1994. A release was discovered during tank removal and, subsequently, approximately 285 tons of petroleum-impacted soil were excavated and removed to an off-site facility. Impacts of methyl-tert butyl ether (MTBE) were reported in the groundwater in excess of groundwater cleanup target levels (GCTLs) at that time. NAM was conducted until June 1995, when MTBE was reported below its GCTL. A Site Rehabilitation Completion Order (SRCO) was issued on July 10, 1995. Based on regulatory closure, this former facility is not considered to be evidence of a recognized environmental condition in connection with the subject property at this time.			

No other regulated facilities or spill sites were identified within one mile of the subject property Tracts.

Region 3 (L-31 East Culverts)

Facility Name Address	SFWMD S-21A SW 26th Street and SW 97th Avenue Homestead, FL	Map ID No. Distance (mile) Direction	2 Target Property (PIN 3060330000020)
This facility is listed in the EDR report as an UST facility. The former SFWMD maintenance structures associated with the water control (locks) were located on this parcel. The EDR report indicates that a 280-gallon fuel oil, underground storage tanks (USTs) was historically located on this parcel. The UST is reported as having been removed in 1985. Based on the lack of evidence of a release, the historical presence of the UST this parcel does not represent evidence of a recognized environmental condition in connection with the subject property.			

Facility Name Address	SFWMD S-21A SW 26th Street and SW 97th Avenue Homestead, FL	Map ID No. Distance (mile) Direction	3 Target Property (PIN 3070090000021)
This facility is listed in the EDR report as an UST facility. The former SFWMD maintenance structures associated with the water control (locks) were located on this parcel. The EDR report indicates that a 280-gallon fuel oil, underground storage tanks (USTs) was historically located on this parcel. The UST is reported as having been removed in 1985. Based on the lack of evidence of a release, the historical presence of the UST this parcel does not represent evidence of a recognized environmental condition in connection with the subject property.			

Facility Name Address	SFWMD S-21A SW 26th Street and SW 97th Avenue Homestead, FL	Map ID No. Distance (mile) Direction	4 Target Property (PIN 3070160000060)
This facility is listed in the EDR report as an UST facility. The former SFWMD maintenance structures associated with the water control (locks) were located on this parcel. The EDR report indicates that a 280-gallon fuel oil, underground storage tanks (USTs) was historically located on this parcel. The UST is reported as having been removed in 1985. Based on the lack of evidence of a release, the historical presence of the UST this parcel does not represent evidence of a recognized environmental condition in connection with the subject property.			

Facility Name Address	Homestead Air Force Base (HAFB) Miami, FL 33032	Map ID No. Distance (mile) Direction	1 1 Mile West

The HAFB is on the National Priority List (NPL) database, which is a subset of the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS), and identifies sites for priority cleanup under the Superfund program. The United States Environmental Protection Agency (U.S. EPA) is the source of the database. When the Base was in operation it covered approximately 2,916 acres. According to information obtained on the U.S. EPA website, the HAFB was proposed for listing on the NPL in July 1989. Hurricane Andrew virtually destroyed the Base in August 1992. In September 1993, the Base was designated for closure with a subsequent decision for realignment in April 1994. After realignment the Base officially became Homestead Air Reserve Base and covered approximately 1,943 acres. The remainder of the Base has been transferred to Miami-Dade County for redevelopment. The impacts to the Base were primarily caused by heavy metals and jet fuel, which are typical concerns with the operation of an airport. The impacts were discovered in many small areas around the Base. There are several canals located around the Base, and these were of particular concern because they discharge directly into Biscayne National Park. According to the U.S. EPA website, Construction Completion was accomplished at the HAFB in September 2006. All remedial action has been completed and all Records of Decision have been signed. The U.S. EPA is still conducting quarterly groundwater monitoring until Federal and State groundwater standards have been met. The U.S. EPA is also currently managing the Land Use Controls (LUCs) on areas that were remediated for industrial but not residential reuse. According to Brittain Doyle, Senior Remedial Project Manager, U.S. EPA Region IV, no properties outside the boundaries of HAFB were affected by activities that occurred on the Base. Based on the information from Mr. Doyle, all remedial action, with the exception of groundwater monitoring and management of LUCs, has been satisfactorily completed. The HAFB does not represent evidence of a recognized environmental condition in connection with the Subject Property.
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Facility Name Address	Biscayne Bay National Park Convoy 328th Street Homestead, FL 33033	Map ID No. Distance (mile) Direction	6 Adjacent S

This facility is listed as having five aboveground storage tanks (ASTs) removed from the site. The sizes of the tanks 3,000-gallons (2), 1,000-gallons (2), and 500-gallons. The facility is also listed as having one 6,000-gallon AST and one 4,000-gallon AST currently in service. Based on the lack of evidence of a release of hazardous substances from the property, the historical and current presence of the tanks does not represent evidence of a recognized environmental condition in connection with the subject property.

Facility Name Address	Homestead Bay Front Park 9698 SW 328th Street Homestead, FL 33033	Map ID No. Distance (mile) Direction	5 1/8 S

The marina is separated by a canal from the subject property. The facility is listed as a leaking underground storage tank (LUST) site and an underground storage tank (UST) site. The facility is listed as having two 2,500-gallon USTs containing leaded gas, removed in 1988. The facility currently maintains one 10,000-gallon UST containing vehicular diesel, which was installed in 1984. The facility reported a release in October 1988. The discharge cleanup status is listed as No Cleanup Required and the cleanup work status is listed as Completed as of May 2001. Based on the location across a canal from the Study Area, this facility does not represent evidence of a recognized environmental condition in connection with the subject property.
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No other regulated facilities or spill sites were identified within one mile of the subject property Tracts.

2.3 Tract Summary

A general summary of available environmental information on each Tract, including recommendations as necessary, are included as **Table 1**. The data summarized in the table has all been previously been presented in the various environmental reports; this report does not contain any new data. Similarly, the historical aerial photographic review and governmental database review has been previously discussed in previous reports. In most cases, the general summary and recommendations presented herein are consistent with those presented in the previous reports. However, in a few cases, conclusions and recommendations have been updated due to changes in the cleanup target levels since the time the original report was prepared. For example, the arsenic SCTL-RDE criterion has increased from 0.8 mg/kg to 2.1 mg/kg since some of the earlier reports have been completed, so recommendations for cleanup may be revised.

3. Conclusions

3.1 Project-Wide Conclusions

One of the objectives of this updated summary report was to compile and summarize all previous environmental information, which is contained in a number of environmental reports into a single document. Another objective was to synthesize all data that was collected on individual Tracts into a single unit that would allow evaluation of the project as a whole, rather than piecemeal decision-making on a Tract by Tract basis.

In evaluating the project as a whole, it is apparent that two historical land use types are present within the project area, as described below:

1. **Former Agricultural Use Areas**: These areas were primarily historically used for agricultural purposes, but have since recently have remained fallow and have become overgrown with exotic vegetation. Some of these Tracts are partially inundated at times due to tidal fluctuations and may be utilized as filter marsh once the project is implemented; therefore, potential ecological risks are considered critical for these areas. The typical contaminants of concern appear to be OCPs (DDT, DDD, and DDE), arsenic, and copper. While the metals may appear to be widespread, the OCPs typically are only found in isolated locations where concentrations are of concern.
2. **Coastal Wetlands**: The Tracts on the eastern-most portion of the project area front Biscayne Bay and serve as tidal coastal wetlands and are currently inundated at most times. These areas do not appear to have been farmed and have not seen any development. Native vegetation dominates in this area and much of the area is inundated for all or part of each day, depending upon the tidal cycle. No sampling was performed on these Tracts, as the chance for impacts was considered very low. These Tracts will not be significantly disturbed during the construction and hydrologic conditions will remain relatively similar after construction, with the exception that more fresh water will be flushed through the area subsequent to the completion of the Cutler project. As such, the only realistic potential for impacts from agro-chemicals and/or metals may be from run-off via the mosquito drainage canals, or other surface water systems.

3.2 Parcel Specific Conclusions and Recommendations

A general summary of recommendation(s) for each Tract are included as **Table 2**.

- Phase I Environmental Assessment or Phase I ESA updates are recommended on the following properties :
    - TA500-021
    - 45800-006

- 45800-007
- 45800-008
- 45800-009
- 45800-011
- 45800-014
- 45800-015
- 45800-016
- 45800-018
- 45800-019
- 45000-021

- Based on PSI's limited historical research described herein, it appears that the Tracts listed above that need Phase I ESAs have been historically utilized for agricultural purposes. Phase II ESAs should be performed on these parcels to determine whether residual agrochemicals are present associated with previous agricultural usage. This sampling should be conducted in accordance with the USFWS-SFWMD Ecological Risk Assessment Protocol. It should be noted that additional point sources may be discovered on any of the Tracts listed above during Phase I activities which may also require Phase II investigation:

  - 45800-006
  - 45800-007
  - 45800-008
  - 45800-009
  - 45800-011
  - 45800-014
  - 45800-015
  - 45800-016
  - 45000-018
  - 45800-019
  - 45000-021

- Phase I ESAs were either recently performed in May 2010 on the following Tracts, or access issues prevented the Phase II ESA from occurring, which resulted in recommendations for Phase II activities that have not been completed. Phase II ESAs should be performed on these Tracts and the Phase II scope of work for each Tract should reflect the concerns that were identified in the previous Phase I ESA:

  - TA500-001
  - TA500-073
  - 45800-013
  - 45800-016
  - 45800-070
  - 45800-161
  - 45800-168

- PSI has previously completed Phase I/II ESAs on all Tracts within the Cutler Bay Wetlands Flow Way portion of the project, with the exception of two right of way parcels along 87th Avenue. PSI conducted Phase I ESAs on these two parcels in May 2010 and did not find any evidence of recognized environmental conditions. These previous reports were previously summarized in PSI's Cutler Flow Way Summary Report. All of the Phase I/II ESAs and the Summary report were submitted to FDEP and USFWS for concurrence on a project-wide basis. Concurrence letters are provided in the report appendix.

- TA500-062 (former Lennar Landfill) – Lennar Homes has completed the removal of the landfill, and has satisfied the closure permit requirements, with the exception of completing the required quarterly monitoring. Lennar is currently conducting groundwater monitoring on a quarterly basis. The quarterly monitoring indicates the presence of ammonia in the groundwater beneath the landfill, but the ammonia plume has not migrated beyond the property boundary. The parcel is also being operated as a wetlands mitigation area for the adjacent Lennar Homes development to the north. The wetland mitigation permit requires Lennar to maintain the property as a wetland and requires Lennar to meet certain success criteria for the wetland, routine reporting of maintenance efforts, and a 5-year compliance review before the permit is closed. PSI recommends that the District continue to monitor the progress of Lennar in completing these activities.

- TA500-001 – Previous Phase II testing by MACTEC and PSI did not confirm the presence of any contaminants at concentrations of concern, given that the property will not be inundated. However, the northeastern portion of the property is so densely wooded that sampling crews could not sample within this area. Additional sampling of this area is recommended when this Tract is cleared and grubbed for construction. This area is important because the proposed concrete channel for the Lennar Flow Way will run through this area.

- Phase I/II ESAs have been completed on the following Tracts and Screening Level Ecological Risk Assessments have been performed as needed. The conclusions in these reports indicate that No Further Action or Investigation is warranted on these parcels. It should be noted that the conclusions in these reports were primarily based on screening for potential ecological risk, assuming the use of these Tracts for ecosystem restoration purposes. However, it should be noted that contaminants are present in the soil on a number of these sites at concentrations that exceed human health criteria for residential exposure. If any of these Tracts are to be sold off or used for purposes other than for ecosystem restoration, these conclusions should be reviewed for appropriateness. No further action or investigation was recommended on the following Tracts:

  Region 2 (Cutler)
  Unnamed Tract – PIN 3660150000030
  GZ300-006

GZ300-010
GZ300-011
GZ300-012
GZ300-013
GZ300-014
GZ300-015
TA500-001
TA500-023
TA500-024
TA500-025
TA500-027
TA500-028
TA500-031

Region 3 (L-31 Culverts)
GZ200-001
GZ200-008
GZ300-009
Unknown ID –PIN 3060330000020
Unknown ID –PIN 3060330000040
Unknown ID –PIN 3070040000012
Unknown ID –PIN 3070040000022
Unknown ID –PIN 3070040000032
Unknown ID –PIN 3070090000011
Unknown ID –PIN 3070090000020
Unknown ID –PIN 3070090000021
Unknown ID –PIN 3070090000032
Unknown ID –PIN 3070090000060
Unknown ID –PIN 3070090000080
45800-171
GZ200-005
GZ200-006
GZ200-007

- Tract TA500-039 – Arsenic was detected in the soil across this site at concentrations exceeding the human health standards (i.e., SCTL-residential direct exposure criterion of 2.1 mg/kg). In most cases, PSI recommended no further action when only the human health standards were exceeded and ecological results were not significant, given the current wooded condition and proposed future land use of these parcels. However, this parcel is immediately adjacent to a l4arge residential development. Therefore, PSI recommends that the parcel be fenced to keep out trespassers.

- Tract TA500-074 – Arsenic was detected in the shallow soils at this site. PSI understands that a portion of this Tract is to be excavated for use as a man-made wetland education area and a pump station. A Soil Management Plan was

previously developed for these soils by PSI to ensure proper off-site relocation of the impacted soils.

- Soil Management Plans were recommended for a number of the assessed parcels due to the presence of low level metals and OCP impacts in soil, which were not considered a risk given current land use, but could pose a risk if relocated to a site with a different usage. The intent of this recommendation was to ensure that soils with contaminant concentrations exceeding SCTL-residential criteria are not transported off-site and re-used in a residential area, or that soils on upland parcels with contaminant concentrations exceeding ecological screening criteria are not relocated to parcels that will be inundated in the future. To date, Soil Management Plans have been developed only for Tracts TA500-001, and Tract TA500-074. However, PSI recommends development of a single project-wide Soil Management Plan in lieu of the individual plans that were recommended in each report. A project-wide Health and Safety Plan should also be developed to address worker safety when handling these impacted soils. The project-wide Soil Management Plan and Health and Safety Plan should include the following sites:

    - TA500-074
    - TA500-056
    - TA500-002
    - TA500-030
    - TA500-032
    - TA500-033
    - TA500-039
    - TA500-062

  Several Tracts within the Alternative O boundary are currently not owned by the District or under contract; therefore, PSI was not able to enter these properties. However, PSI did observe these properties from the perimeter from surrounding roadways, public access points, or other SFWMD-owned Tracts. Further ground reconnaissance should be performed on the following parcels when access is negotiated:

    - 45800-13
    - 45800-70
    - GZ200-002
    - GZ200-004
    - GZ200-011

4. Warranty

PSI warrants that the findings and conclusions reported herein were conducted in general accordance with good commercial and customary practice for conducting a project summary and limited historical review. However, these findings and conclusions contain all of the limitations inherent in these methodologies.

This summary report has been developed to provide the client with information regarding apparent indications of chemical impacts to the subject property. It is necessarily limited to the conditions observed and to the information available at the time of the work. The assessment and conclusions presented herein were based upon the subjective evaluation of limited data. They may not represent all conditions at the subject site as they reflect the information gathered from specific locations. PSI warrants that the findings and conclusions contained herein have been promulgated in accordance with generally accepted environmental investigation methodology and only for the site described in this report.

Due to the limited nature of the work, there is a possibility that there may exist conditions which could not be identified within the scope of the assessment or which were not apparent at the time of report preparation. It is also possible that the testing methods employed at the time of the report may later be superseded by other methods. The description, type, and composition of what are commonly referred to as "hazardous materials or conditions" can also change over time. PSI does not accept responsibility for changes in the state of the art, nor for changes in the scope of various lists of hazardous materials or conditions. PSI believes that the findings and conclusions provided in this report are reasonable. However, no other warranties are implied or expressed.

TABLES

Table 1 - BBCW Alternative "O" Phase I - Summary of Environmental Site Assessments

Region	Consultant	SFWMD Tract ID	PIN	Parcel Size (Acres)	General Results	Recommendations
Deering Estates Flow Way	PSI	TA500-073	3350250040010	341.780	A Phase I ESA was conducted on this property in May 2010. A relatively small portion of the Subject Property was used as a grove until circa 1998. The area is located on the southern tip of the parcel and did not appear to currently be maintained as an agricultural area. While no evidence of structures or point source releases were identified on this parcels, previous investigations within the BBCW project area have identified the presence of contaminants such as heavy metals and OCPs in the shallow soil associated with historic farming practices. Conclusions: Potential historical use of the property for agricultural purposes is considered evidence of a recognized environmental condition (REC) and the property should be investigated further.	PSI recommends a Phase II ESA to evaluate former citrus cultivation area.
	PSI	TA500-074	3350260000040	9.630	PSI conducted a Phase I/II ESA on the property in Novernber of 2006. The Phase I ESA found 55-gallon drums with soil staining and identified the past use as agricultural. PSI recommended the evaluation of potential soil impacts around the 55-gallon drums and soil sampling for agrochemicals in accordance with the US Fish and Wildlife Service protocol. Soil borings were performed and screened by OVA; a soil sample for analytical analysis was collected proximate to the south Dade Landfill. Soil samples were also collected in the agricultural property in a grid pattern. The sampling around the drum did not identify analytes above applicable or relevant and appropriate requirements. Contaminants were discovered in soil in the agricultural area at concentrations exceeding the regulatory cleanup criteria. Arsenic was identified above the SCTL-RDE criterion, but below the soil cleanup target level for commercial direct exposure. Conclusions: No significant risk to USFWS trust species is predicted. However, a soil management plan should be developed to address soil handling practices during project construction.	PSI recommended placing an institutional control on the property to negotiate a no further action letter and the development of a Soil Management Plan for safe handling of excavated soils from the proposed wetland area, canal extension area and stormwater ponds.
Cutler Bay Wetlands Flow Way	N/A	GZ300-009	3660100000041	19.080	Does not fall within Alt O boundary according to Property Appraiser website.	Recommend evaluation of parcel to determine whether inside project boundary.
	PSI	TA500-056	3060220000060 (or 3060170000011 per 2008 report)	16.710	PSI conducted regional groundwater sampling on this parcel in 2006 and conducted a Phase I ESA for the property in 2010. This property is a ROW along 87th Avenue. Arsenic was detected in soil at concentrations exceeding SCTLs and SQAGs. Conclusions: While As concentrations in soil do exceed SCTL-RDE and SQAG criteria, the property use is to remain as a roadway; therefore no corrective action appears necessary.	No further investigation is recommended. However, PSI recommends development of a soil management plan to handle arsenic impacted soils during construction.
	PSI	NA	3660150000030	16.840	PSI conducted a Phase I ESA for the property in 2010. The property consists of a canal and adjacent levee road and associated right of way. Conclusions: No recognized environmental conditions were identified. The majority of the property is to continue in its current use as a roadway/canal. A Phase II ESA was not recommended.	No further investigation or remediation is warranted.
	PSI	GZ300-006	3660110000010	397.110	PSI conducted a Phase I/II Environmental Site Assessment on the property in 2006. The report indicated that the property was utilized for agricultural use in the past. The property was divided into a grid pattern and assessed for organochlorine and organophosphate pesticides, RCRA metals, selenium, and copper. Cadmium, arsenic, barium, copper, chromium, silver, mercury, lead, DDE, and DDT were detected in soil at concentrations above SQAG-TEC, but SLERA indicates no concern for USFWS Trust Species. Soil: Cd>SQAG-TEC; Cr>SQAG-TEC; Ag,Hg>SCTL-LSW; DDT>SQAG-TEC. Groundwater: No testing performed. Conclusions: Cadmium, chromium, silver, mercury, lead, and DDT were detected in soil, but SLERA indicates no concern for USFWS Trust Species.	No further assessment or remediation is warranted.

Table 1 - BBCW Alternative "O" Phase I - Summary of Environmental Site Assessments

Region	Consultant	SFWMD Tract ID	PIN	Parcel Size (Acres)	General Results	Recommendations
Cutler Bay Wetlands Flow Way	PSI	GZ300-010	3660090220050	50.800	URS conducted a Summary of Environmental Assessments in September of 2005. The historical use of the property was identified to be agricultural. PSI conducted a Phase II ESA in January 2006. Conclusions: Cadmium (Cd>SQAG-PEC), chromium (Cr>SCTL-LSW), and mercury (Hg>SCTL-LSW) were detected in soil, but SLERA indicates no concern for USFWS Trust Species.	No further investigation or remediation is warranted.
	PSI	GZ300-011	3660100000050	32.260	PSI conducted a Phase I/II Environmental Site Assessment on the property in 2006. The report indicated that the property was utilized for agricultural use in the past. The property was divided into a grid pattern and assessed for organochlorine and organophosphate pesticides, RCRA metals, selenium, and copper. Cadmium, arsenic, barium, copper, chromium, silver, mercury, lead, DDE, and DDT were detected in soil at concentrations above SQAG-TEC, but SLERA indicates no concern for USFWS Trust Species. Soil: Cd>SQAG-TEC; Cr>SQAG-TEC; Ag,Hg>SCTL-LSW; DDT>SQAG-TEC. Groundwater: No testing performed. Conclusions: Cadmium, chromium, silver, mercury, lead, and DDT were detected in soil, but SLERA indicates no concern for USFWS Trust Species.	No further investigation or remediation is warranted.
	PSI	GZ300-012	3660100000081	3.670	PSI conducted a Phase II ESA on the property in January 2006. A single ten point composite soil sample was collected from Parcel GZ300-012 and adjacent parcel GZ300-010. The sample results indicated the presence of arsenic, and lead at concentrations exceeding the SQAG-TEC criteria and cadmium at a concentration exceeding the SQAG-PEC. The measured arsenic concentration of 16.7 mg/kg also exceeded the SCTL-RDE criterion. Chromium and mercury were also detected at concentrations exceeding the SCTL-LSW criteria, but further SPLP testing indicates no risk of leaching to surface water. As part of this Phase II ESA, PSI performed an ecological risk assessment. Arsenic, cadmium, chromium, or mercury concentrations were evaluated for unacceptable risk to USFWS trustee species. The hazard quotients for all COPECs were well below one. Conclusions: No unacceptable risk to USFWS Trust species.	No further investigation or remediation is warranted.
			3660150000070	31.630		
	PSI	GZ300-013	3660150000050	113.460	PSI conducted a Phase I/II Environmental Site Assessment on the property in April 2006. The report indicated that the property was historically utilized for agricultural purposes. For the Phase II ESA sampling, the tract was divided into five equally sized grids, each representing about 55 acres. Each 55-acre section was then subdivided into ten, 5.5-acre sub-plots. Within each 55-acre grid, PSI collected ten 5.5-acre sub-grid samples and composited the sub-samples for laboratory analysis. Each composite sample represented approximately 55 acres. The composite samples were analyzed for OCPs, chlorinated herbicides, organophosphorus pesticides, and RCRA metals plus copper. All of the individual sub-samples were also analyzed for copper. Arsenic was detected in all samples at concentrations exceeding the SCTL-RDE and in one sample at a concentration exceeding the SQAG-TEC, but below the SQAG-PEC. Cadmium was detected in all of the samples at concentrations exceeding the SQAG-TEC, but below the SQAG-PEC. Chromium, silver, and mercury were detected in all of the samples at concentrations exceeding the SCTL-LSW criteria. Mercury and silver concentrations also exceeded the SQAG-TEC in one sample. Lead concentrations exceeded the SQAG-TEC in one sample. DDT concentrations in one sample exceeded the SQAG-TEC, but were below the SQAG-PEC. Consistent with the methodology established by FWS, a screening level ecological risk assessment was subsequently performed for all contaminants exceeding the ecological standards. The results of that assessment suggest that unacceptable ecological risk is not associated with soils on this parcel. Hazard quotients for all COPECs were well below one for all USFWS trust species. Conclusions: No unacceptable risk to USFWS trust species.	No further assessment or remediation is warranted.
			3660140000030	162.030		

Table 1 - BBCW Alternative "O" Phase I - Summary of Environmental Site Assessments

Region	Consultant	SFWMD Tract ID	PIN	Parcel Size (Acres)	General Results	Recommendations
Cutler Bay Wetlands Flow Way	PSI	GZ300-014	3660090220060	3.560	PSI conducted a Phase I/II Environmental Site Assessment on the property in 2006. The report indicated that the property was utilized for agricultural use in the past. The property was divided into a grid pattern and assessed for organochlorine and organophosphate pesticides, RCRA metals, selenium, and copper. Cadmium, arsenic, barium, copper, chromium, silver, mercury, lead, DDE, and DDT were detected in soil at concentrations above SQAG-TEC, but SLERA indicates no concern for USFWS Trust Species. Soil: Cd>SQAG-TEC; Cr>SQAG-TEC; Ag,Hg>SCTL-LSW; DDT>SQAG-TEC. Groundwater: No testing performed. Conclusions: Cadmium, chromium, silver, mercury, lead, and DDT were detected in soil, but SLERA indicates no concern for USFWS Trust Species.	No further investigation or remediation is warranted.
	PSI	GZ300-015	3660150000020	322.830	PSI conducted a Phase I/II Environmental Site Assessment on the property in 2006. The report indicated that the property was historically utilized for agricultural purpose: The Phase II ESA sampling on this property included the collection of 8 composite soil samples. Arsenic was detected in all of the samples at concentrations exceeding the SCTL-RDE and in two samples at concentrations exceeding the SQAG-TEC, but below the SQAG-PEC. Barium was detected in one sample at a concentration exceeding the SQAG-TEC, but below the SQAG-PEC. Cadmium was detected in all but one of the samples at concentrations exceeding the SQAG-TEC, but below the SQAG-PEC. Chromium, silver, and mercury were detected in all of the samples at concentrations exceeding the SCTL-LSW criteria. Mercury and silver concentrations also exceeded the SQAG-TEC in one sample. Lead concentrations exceeded the SQAG-TEC, but below the SQAG-PEC in seven samples. DDT concentrations in two samples and DDE concentrations in one sample exceeded the SQAG-TEC, but were below the SQAG-PEC. Copper was detected in one of the discrete soil samples (P-133) at a concentration of 594 mg/kg, which significantly exceeds the USFWS Interim Screening Standard of 85 mg/kg. Copper was not detected above the screening standard in any of the remaining standards. Consistent with the methodology established by FWS, a screening level ecological risk assessment was subsequently performed for all contaminants exceeding the ecological standards. The results of that assessment suggest that unacceptable ecological risk is not associated with soils on this parcel, with the exception of copper at the location of P-133. Hazard quotients for all other COPECs were well below one for all USFWS trust species. In response to the copper detection, PSI collected additional discrete soil samples immediately surrounding P-133, in order to define the extent of the copper impacts. These results were reported in the Additional Assessment Report – Corrective Action Plan, dated January 10, 2007, prepared by PSI. PSI collected 5 additional discrete soil samples within the immediate proximity (i.e., within 20 feet) of P-133. Copper was not detected in any of these samples at concentrations exceeding the USFWS Interim Standard. Soil: As, Ba, Cu, DDE>SQAG-TEC, Cu in one sample>SQAG-PEC. Groundwater: No testing performed. Conclusions: No unacceptable risk to USFWS trust species; copper result appeared to be an anomaly and further testing indicated that hot spot was not large enough to warrant remediation.	No further investigation or remediation is warranted.
			3660140000020	53.370		

Table 1 - BBCW Alternative "O" Phase I - Summary of Environmental Site Assessments

Region	Consultant	SFWMD Tract ID	PIN	Parcel Size (Acres)	General Results	Recommendations
Cutler Bay Wetlands Flow Way	MACTEC, PSI	TA500-001	3660160000030	61.670	The Phase I ESA conducted by MACTEC in January of 2003 identified the historical use as agricultural. As part of a Phase II ESA, MACTEC collected nine discrete soil samples (SB-1 through SB-9) from locations scattered across the site for analysis of RCRA metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver), copper and OCPs. The results indicated that concentrations of OCPs (DDT, DDE, DDD, and Chlordane) were detected in three of the samples at concentrations exceeding the SQAG-TEC criteria. MACTEC then collected eight additional composite samples (SB-C12 through SB-C19) from across the property. The results indicated the presence of DDT, DDE, DDD and total chlordane at 5 locations including very high concentrations at SB-6. MACTEC returned to the site in April 2004 in order to collect 12 additional discrete samples surrounding the "hot spot" around previous boring SB-6. The additional samples did not confirm the high concentrations measured in SB-6. Based on these results, MACTEC developed an ecological risk assessment in March 2005 to determine whether the OCP concentrations detected on-site represented an unacceptable risk to USFWS trustee species, based on the proposed end use of the property at the time. MACTEC developed risk based cleanup target levels based on a food web model. However, USFWS noted fundamental problems with the modeling approach, so the results of the risk assessment were not accepted by the Service. PSI was then contracted to address the USFWS concerns with the model. PSI developed RBCs for the OCPs of concern. USFWS provided comments on the RBC's via e-mail. In response to the USFWS, PSI submitted revised ecological risk assessment calculations in the January 2007 Additional Assessment Report and Corrective Action Plan. It should be noted that the previous ecological risk assessments prepared by both MACTEC and PSI were intended to evaluate risks to USFWS trust species, assuming that the parcel was going to be inundated as part of the Cutler project implementation, creating an attractive habitat for wading birds that are sensitive receptors for the OCPs of concern. PSI collected 5 soil samples from to delineate the horizontal and vertical extent of pesticides in surficial soils in the area of interest (SB-6). No analytes were detected in any of the soil samples collected from this area. The results of SB-6-1 did not confirm the earlier MACTEC results. It should be noted that subsequent to their initial sampling, MACTEC collected numerous additional soil samples in the vicinity of SB-6 which did not detect any OCPs at concentrations approaching the cleanup target levels. Conclusions: Measured OCP concentrations are below the human health criteria in Chapter 62-777, FAC, so no further action was proposed, as long as the design is not altered to include flooding of this parcel. However, further sampling is needed on the northeast corner of the parcel.	It appears that the initial OCP concentrations reported by MACTEC at SB-6 were either in error, or the area of impact is so small that it is not likely to present a significant ecological or human health risk. Therefore, no remedial action is planned on Tract TA500-001. However, there is no data from the northeast corner of TA500-001 due to the presence of dense vegetation. Thus, additional sampling in this area may be warranted once the area is cleared for construction.
	MACTEC	TA500-002	3060170000050	32.610	MACTEC performed a Phase I/II ESA on the property in 2003. The historical use of the property was reported to be agricultural. Soil samples were analyzed for RCRA metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver), copper, OCPs and TOC. OCPs were detected on the eastern portion of the tract at concentrations exceeding the SQAG-TEC, but below the USFWS ESV and FDEP-CDE criteria. MACTEC developed an ecological risk assessment in order to determine whether the OCP concentrations detected on-site represented an unacceptable risk to USFWS trustee species, based on the proposed end use of the property. However, USFWS noted fundamental problems with the modeling approach, so the results of the risk assessment were not accepted by the Service. PSI was then contracted to address the USFWS concerns with the model. PSI developed RBCs for the OCPs of concern, and USFWS provided comments on the RBCs via e-mail. The ecological risk assessment calculations were revised to reflect changes requested by USFWS and included in the Additional Assessment Report and Corrective Action Plan. The calculations included derivation of alternate soil/sediment cleanup target levels based on ecological risk. Based on the RBCs generated by PSI, OCP concentrations exceed the RBCs at sample locations SS-1, SS-2, SS-3, SS-4, B-8, B-10, B-11, B-12 and B-19. PSI conducted additional sampling around each of these sample points in order to delineate the extent of OCP-impacted soils exceeding the RBCs. Initial composite samples collected by MACTEC from Areas 2 and 3 indicated the presence of OCPs at concentrations exceeding the proposed RBCs, but re-sampling did not confirm these results. Subsequent to the development of the risk assessment, the design for the Cutler Flow Way was changed to include an above-grade, concrete-lined channel instead of a canal, with no proposed flooding of this parcel. As such, the ecological RBC's were no longer considered. Conclusions: Measured OCP concentrations are below the human health criteria in Chapter 62-777, FAC, so no further action was proposed, as long as the design is not altered to include flooding of this parcel.	Since concentrations of OCPs and other constituents present in the soils on Tract TA500-002 are below the Chapter 62-777, FAC SCTL-CDE and SCTL-LGW criteria, no corrective action is planned on this parcel. However, a soil management plan should be developed for the site for use during construction to ensure that soils with OCP concentrations exceeding the SLERA RBCs are not relocated to other areas that will become inundated and that soils with arsenic concentrations above the SCTL-RDE criteria are not relocated to potential residential areas. Also, a site specific safety and health plan should be developed for workers involved in project construction to minimize exposure to low-level OCPs and arsenic in the site soils and to inform workers of potential risks.

Table 1 - BBCW Alternative "O" Phase I - Summary of Environmental Site Assessments

Region	Consultant	SFWMD Tract ID	PIN	Parcel Size (Acres)	General Results	Recommendations
Cutler Bay Wetlands Flow Way		TA500-021	3060090020560	105.620	No assessment has been performed on this parcel, however the parcel is owned by the National Park Service, and is located on the far eastern portion of Region 2. This parcel is similar to other coastal wetland areas where sampling was not deemed necessary due to the nature of the property.	A Phase I ESA is recommended at the time this property is acquired.
	PSI	TA500-023	3060140000050	112.320	PSI conducted a Phase I ESA for the property in 2007. The property consists of dense mangrove wetlands and no current or past use of the property for commercial or agricultural properties was noted. Conclusions: No Recognized Environmental Conditions were identified in the Phase I ESA. Therefore, a Phase II ESA was not recommended.	No further investigation or remediation is warranted.
	PSI	TA500-024	3060140000040	79.160	PSI conducted a Phase I ESA for the property in 2007. The property consists of dense mangrove wetlands and no current or past use of the property for commercial or agricultural properties was noted. Conclusions: No Recognized Environmental Conditions were identified in the Phase I ESA. Therefore, a Phase II ESA was not recommended.	No further investigation or remediation is warranted.
	PSI	TA500-025	3060230000010	82.680	PSI conducted a Phase I ESA for the property in 2007. The property consists of dense mangrove wetlands and no current or past use of the property for commercial or agricultural properties was noted. Conclusions: No Recognized Environmental Conditions were identified in the Phase I ESA. Therefore, a Phase II ESA was not recommended.	No further investigation or remediation is warranted.
	PSI	TA500-027	3060220000021	22.350	PSI conducted a Phase I ESA for the property in 2007. The property consists of dense mangrove wetlands and no current or past use of the property for commercial or agricultural properties was noted. Conclusions: No Recognized Environmental Conditions were identified in the Phase I ESA. Therefore, a Phase II ESA was not recommended.	No further investigation or remediation is warranted.
			3060270000010	32.040		
	PSI	TA500-028			PSI conducted a Phase I/II Environmental Site Assessment on the property in 2006. The report indicated that the property was utilized for agricultural use in the past. The property was divided into a grid pattern and assessed for organochlorine and organophosphate pesticides, RCRA metals, selenium, and copper. Cadmium, arsenic, barium, copper, chromium, silver, mercury, lead, DDE, and DDT were detected in soil at concentrations above SQAG-TEC, but SLERA indicates no concern for USFWS Trust Species. Recommendations: No further assessment or remediation is warranted. Soil: Cd>SQAG-TEC; Cr>SQAG-TEC; Ag,Hg>SCTL-LSW; DDT>SQAG-TEC. Groundwater: No testing performed. Conclusions: Cadmium, chromium, silver, mercury, lead, and DDT were detected in soil, but SLERA indicates no concern for USFWS Trust Species.	No further investigation or remediation is warranted.

Table 1 - BBCW Alternative "O" Phase I - Summary of Environmental Site Assessments

Region	Consultant	SFWMD Tract ID	PIN	Parcel Size (Acres)	General Results	Recommendations
Cutler Bay Wetlands Flow Way	PSI	TA500-030	3060220000010	403.370	Information contained in the 2005 URS BBCW Summary Report indicated that the western portion of the property may have been historically utilized for agricultural purposes. A network of mosquito control ditches is present on the northwestern portion of the property, which were also visible in historical aerial photographs. PSI conducted a Phase II ESA on the property in January 2006. Arsenic was detected in the site soils at concentrations exceeding the SQAG-TEC and SCTL-RDE criteria. Cadmium was also detected at concentrations exceeding the Sediment Quality Assessment Guideline Threshold Effect Concentration (SQAG-TEC) and SCTL-LGW criteria in the site soils. Chromium and mercury were also detected at concentrations exceeding the SCTL-LGW criteria. However, PSI conducted a screening level ecological risk assessment as part of the Phase II ESA for this parcel to evaluate potential risks to United States Fish and Wildlife Service (USFWS) trust species. The hazard quotients for all of the Constituents of Potential Ecological Concern (COPEC) were well below one for all species of concern. Proposed construction on this parcel includes filling of some existing drainage canals and excavation of a spreader canal. Conclusions: No significant risk to USFWS trust species is predicted. However, arsenic concentrations exceed the SCTL-RDE so a soil managment plan is required to address the handling of As impacted soils during construction of the spreader canal.	Based on the results of the ecological risk assessment, no additional assessment or corrective action is recommended for Parcel TA500-030, as no significant concerns were identified. A soil management plan is recommended for project construction. to manage metal-impacted soils.
	PSI	TA500-031	3060220000070	28.390	The 2005 URS Environmental Assessment Summary Report indicated that this parcel was previously utilized for agricultural purposes. PSI conducted a Phase II ESA on the property in January 2006. Chromium and mercury were detected in the site soils at concentrations exceeding the SCTL-LGW criteria. However, PSI conducted a screening level ecological risk assessment as part of the Phase II ESA for this parcel to evaluate potential risks to USFWS trust species. The hazard quotients for all of the COPECs were well below one for all species of concern. Conclusions: No significant risk to USFWS trust species is predicted.	No further investigation or remediation is warranted.
	PSI	TA500-032	3060220000025	145.720	The 2005 URS Environmental Assessment Summary Report indicated that the western portion of this parcel was previously agriculturally developed. PSI conducted a Phase II ESA on the property in January 2006. Arsenic, cadmium, and lead were detected in the soils on this parcel at concentrations exceeding the SQAG-TEC criteria. Chromium and mercury were also detected at concentrations exceeding the SCTL-LGW criteria. However, PSI conducted a screening level ecological risk assessment as part of the Phase II ESA for this parcel to evaluate potential risks to USFWS trust species. The hazard quotients for all of the COPECs were well below one for all species of concern. Conclusions: No significant risk to USFWS trust species is predicted. However, if construction is to be performed, a soil management plan and HASP should be developed to address metals concentrations in soils exceeding SCTL-RDE criteria. Soils from this parcel should not be relocated in areas where residential development might occur or where residents would be in close proximity to the soils.	No additional investigation or remediation is warranted. However, a soil management plan and HASP should be developed if construction occurs on this parcel.
	PSI	TA500-033	3060220000020	10.890	The 2005 URS Environmental Assessment Summary Report indicated that the western portion of this parcel was previously agriculturally developed. PSI conducted a Phase II ESA on the property in January 2006. Arsenic, cadmium, and lead were detected in the soils on this parcel at concentrations exceeding the SQAG-TEC criteria. Chromium and mercury were also detected at concentrations exceeding the SCTL-LGW criteria. However, PSI conducted a screening level ecological risk assessment as part of the Phase II ESA for this parcel to evaluate potential risks to USFWS trust species. The hazard quotients for all of the COPECs were well below one for all species of concern. Conclusions: No significant risk to USFWS trust species is predicted. However, if construction is to be performed, a soil management plan and HASP should be developed to address metals concentrations in soils exceeding SCTL-RDE criteria. Soils from this parcel should not be relocated in areas where residential development might occur or where residents would be in close proximity to the soils.	No additional investigation or remediation is warranted. However, a soil management plan HASP should be developed if construction occurs on this parcel.

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Region	Consultant	SFWMD Tract ID	PIN	Parcel Size (Acres)	General Results	Recommendations
Cutler Wetlands Flow Way	PSI	TA500-039	3660160000026	6.760	PSI conducted a Phase II ESA on the property. Arsenic was detected in the soils at concentrations exceeding the SCTL-RDE criteria, but below the SQAG-TEC criteria. Since this parcel will not be used for residential purposes, no further assessment or remediation appears warranted for this parcel. However, it should be noted that construction on this parcel will include installation of an above-grade, concrete lined, and channel across the central portion of the site. At least some site grading and excavation of soils is likely to be required to construct this channel. Conclusions: No potential risk to USFWS trust species is predicted, as this area will not be inundated as part of the project. However, As concentrations on the site do exceed the SCTL-RDE criteria, and the parcel is in close proximity to a residential development, so fencing of the parcel may be warranted. A soil management plan and HASP should be developed to address the handling of soils from this site. Soils from this site should not be relocated to areas where residential development might occur, or to areas immediately adjacent to residential areas where regular human contact is likely.	No significant concerns identified; however, arsenic exceeds the SCTL-RDE across site. PSI recommended fencing around site to limit use by neighboring development and development of a soil management plan to address soil handling during project construction.
	PSI	TA500-062	3660160152070	26.780	An approximate 20-acre C&D debris landfill (Lennar Landfill) was previously operated on this tract from 1975 to 1993. It was reopened in 1993 by the USACE for debris of Hurricane Andrew. Hydrologic Associates, Inc. (HLA) performed a Phase I/Phase II ESA on this property on behalf of Lennar. The Phase II ESA included a limited number of sampling points and a limited laboratory analytical protocol. However, ammonia and arsenic were detected in the groundwater within the landfill area and up gradient of the landfill at concentrations exceeding the state regulatory standards. Arsenic was also detected in the site soils at concentrations exceeding the soil cleanup target level for residential direct exposure. It should be noted that the soils sampled by HLA were subsequently removed as part of the landfill closure.	No further corrective action on this parcel appears warranted.
			3660160200020	81.350	PSI conducted investigation activities within the landfill area as part of the January 23, 2006 Phase II ESA. At the time of PSI's activities, the landfill removal was approximately 95% complete. Much of the area that had been excavated was inundated and was not accessible for sampling. PSI installed ten shallow soil borings in order to collect soil samples. In areas where waste was still present, PSI did not sample the waste materials, but attempted to sample native soils beneath the debris zone that would remain in place after closure. Five soil samples were submitted for laboratory analysis of VOCs, SVOCs, PCBs, TPH, phenols, RCRA metals, copper, OCPs, chlorinated herbicides, and organophosphorus pesticides. Five of the borings were also converted to groundwater monitoring wells to facilitate groundwater sample collection. The groundwater samples were analyzed for TDS, chloride, sulfate, nitrate/nitrite/TKN, ammonia, iron, aluminum, RCRA metals, PCBs, VOCs, SVOCs, and phenols. Soil sample results indicated the presence of arsenic, barium, cadmium, chromium, lead, selenium, DDE, dieldrin, PCBs, and numerous PAH compounds in one or more samples at concentrations exceeding the SQAG-TEC criteria. TPH was also detected in the soil at concentrations above the SCTL-RDE, but no SQAG-TEC for TPH exists. Ammonia, TDS, sulfate, and chloromethane were detected in the groundwater in one or more wells at concentrations above the GCTLs.	However, a soil management plan and HASP is recommended to address soil handling during project construction.
			3660170000080	55.560	Subsequent to the completion of the debris removal, PSI conducted additional investigation activities within the former landfill. This investigation is detailed in the Supplemental Phase II ESA, dated May 4, 2006. PSI collected twenty additional surface soil samples (SB-10-SB-29) on a grid basis throughout areas of the landfill that had not been previously assessed. The samples were analyzed for OCPs, PAHs, PCBs, and RCRA metals. Monitoring wells MW-1 through MW-3 were also re-sampled during the investigation. All remaining wells within the landfill had been destroyed by debris removal activities. Arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, alpha-chlordane, gamma chlordane, DDE, Arochlor-1260 (PCB), and numerous PAH compounds were all detected at concentrations exceeding the SQAG-TEC criteria in one or more soil samples. Arsenic was detected in groundwater in the background well (MW-1; 0.029 mg/L) at a concentration slightly exceeding the GCTL of 0.01 mg/L, but was not detected in groundwater within the landfill. Aluminum was also detected in one well and iron was detected in all three wells at concentrations exceeding the secondary drinking water standards. Based on these results, PSI conducted a screening level ecological risk assessment (SLERA) to evaluate risks to USFWS trustee species associated with exposure to the soils after the project is completed. The SLERA was presented in the Supplemental Phase II ESA. PSI determined that there was no significant ecological risk associated with the presence of arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, chlordane, or DDE. The current risk model is not capable of addressing PAHs, but it is PSI's opinion that the concentrations present in the site soils are not likely to be a significant ecological concern. PSI calculated 95% upper confidence limit (UCL) estimates of the mean concentrations of each PAH compound. 95% UCL values for a few of the PAHs exceeded the SQAG-TEC criteria, but all concentrations were significantly below the SQAG-PEC criteria.	

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Region	Consultant	SFWMD Tract ID	PIN	Parcel Size (Acres)	General Results	Recommendations
Cutler Bay Wetlands Flow Way	PSI	TA-500-062 cont...	3660170000080 cont...	55.60 cont...	PAH and OCP concentrations in SB-10 appeared to be significantly higher than the remaining soil samples. Therefore, PSI conducted additional sampling surrounding this area to determine the extent of the hot spot, and to ensure that higher concentrations would not be measured in this area. PSI collected grab samples from the interval 0-6 and 6-12 inches bls at 13 locations to delineate the horizontal and vertical extent of PAHs and OCPs in surficial soils around the SB-10 sample location. The sampling was performed on centers of 25 ft. Soil samples were analyzed for PAHs by EPA Method 8270 and OCPs by EPA Method 8081. DDE was detected in four of the soil samples at concentrations exceeding the SQAG-TEC criterion, but below the SQAG-PEC and RBC established in the ecological risk assessment in every case. Total chlordane (alpha plus gamma) was detected at concentrations exceeding the SQAG-TEC in ten of thirteen samples and exceeded the SQAG-PEC in two samples. The highest detected chlordane concentration (40 µg/kg) exceeds the SQAG-PEC of 18 µg/kg, but is well below the RBC of 72 µg/kg that was established through the risk assessment. Numerous PAH compounds were detected in soil samples SB-10-3 (0-0.5ft), SB-10-3(0.5-1 ft) and SB-10-10 (0-0.5 ft) at concentrations exceeding the SQAG-TEC, but none of the measured concentrations exceeded the SQAG-PEC criteria. PSI previously calculated tract-wide 95% UCL concentrations for all constituents that exceeded the SQAG-TEC criteria in one or more samples on this parcel. The 95% UCL concentrations were then utilized in the SLERA to evaluate ecological risk. The SLERA did not indicate that any of the constituents present on the site were likely to present a significant ecological concern. However, the DDE, chlordane, and pyrene concentrations measured in a single sample, SB-10, exceeded the SQAG-PEC. Based on this exceedance, PSI conducted a hot spot removal action to remove these soils for off-site disposal. Confirmation sampling after excavation indicates that all impacted soils were removed. Conclusions: No significant risk to USFWS trust species is predicted, given that the property will be used for construction of a lined, above-grade concrete flume and will not be inundated as part of the project. However, a soil management plan should be developed for the site for use during construction to ensure that soils with OCP concentrations exceeding the SLERA RBCs are not relocated to other areas that will become inundated and that soils with contaminant concentrations above the SCTL-RDE criteria are not relocated to potential residential areas. Also, a site specific safety and health plan should be developed for workers involved in project construction to minimize exposure to low-level OCPs and arsenic in the site soils and to inform workers of potential risks.	
L-31E Culverts	PSI	45800-013	3070170010010	319.280	A Phase I ESA was conducted on this property in May 2010. Portions of this parcel may have been historically utilized as agricultural land. While no evidence of structures or point source releases were identified on these parcels, previous investigations within the BBCW project area have identified the presence of contaminants such as heavy metals and OCPs in the shallow soil associated with historic farming practices. Conclusions: Potential historical use of the property for agricultural purposes is considered evidence of a recognized environmental condition (REC) and the property should be investigated further.	This parcel is not currently owned by the District or under contract, therefore PSI was not able to enter this property. However, PSI did observe this property from the perimeter from surrounding roadways, public access points, or other SFWMD-owned tracts. Further ground reconnaissance should be performed on this parcel when access can be negotiated. PSI recommends a Phase II ESA due to potential historic farming activities.
	PSI	45800-016	3070170010041	8.370	A Phase I ESA was conducted on this property in May 2010. Portions of this parcel may have been historically utilized as agricultural land. While no evidence of structures or point source releases were identified on these parcels, previous investigations within the BBCW project area have identified the presence of contaminants such as heavy metals and OCPs in the shallow soil associated with historic farming practices. Conclusions: Potential historical use of the property for agricultural purposes is considered evidence of a recognized environmental condition (REC) and the property should be investigated further.	PSI recommends a Phase II ESA.

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Region	Consultant	SFWMD Tract ID	PIN	Parcel Size (Acres)	General Results	Recommendations
L-31 Culverts	PSI	45800-070	3070180010010	8.600 35.630 48.210	A Phase I ESA was conducted on this property in May 2010. Portions of this parcel may have been historically utilized as agricultural land. While no evidence of structures or point source releases were identified on these parcels, previous investigations within the BBCW project area have identified the presence of contaminants such as heavy metals and OCPs in the shallow soil associated with historic farming practices. Conclusions: Potential historical use of the property for agricultural purposes is considered evidence of a recognized environmental condition (REC) and the property should be investigated further.	This parcel is not currently owned by the District or under contract, therefore PSI was not able to enter this property. However, PSI did observe this property from the perimeter from surrounding roadways, public access points, or other SFWMD-owned tracts. Further ground reconnaissance should be performed on this parcel when access can be negotiated. PSI recommends a Phase II ESA.
	PSI	45800-161	3070170010240	0.580	A Phase I ESA was conducted on this property in May 2010. Portions of this parcel may have been historically utilized as agricultural land. While no evidence of structures or point source releases were identified on these parcels, previous investigations within the BBCW project area have identified the presence of contaminants such as heavy metals and OCPs in the shallow soil associated with historic farming practices. Conclusions: Potential historical use of the property for agricultural purposes is considered evidence of a recognized environmental condition (REC) and the property should be investigated further.	PSI recommends a Phase II ESA.
	PSI	45800-168	3070170010045	4.530	A Phase I ESA was conducted on this property in May 2010. Portions of this parcel may have been historically utilized as agricultural land. While no evidence of structures or point source releases were identified on these parcels, previous investigations within the BBCW project area have identified the presence of contaminants such as heavy metals and OCPs in the shallow soil associated with historic farming practices. Conclusions: Potential historical use of the property for agricultural purposes is considered evidence of a recognized environmental condition (REC) and the property should be investigated further.	PSI recommends a Phase II ESA.
	PSI	GZ200-001	3070040000015	124.220	PSI conducted a Phase I ESA on this parcel in May 2010. The property consists of dense mangroves and no current or historical commercial agricultural use of the property was identified.	PSI recommends no further assessment at this time.
	PSI	GZ200-002	3070040000016	91.220	A Phase I ESA was conducted on this property in May of 2010. The property consists of dense mangroves and no current or historical commercial or agricultural use of the property was identified. Conclusions: No RECs were identified based on the Phase I ESA. A Phase II ESA is not recommended; however the property is not currently owned by SFWMD and PSI did not enter the property. A thorough Phase I ground reconnaissance should be conducted when the property access can be arranged.	This parcel is not currently owned by the District or under contract, therefore PSI was not able to enter this property. However, PSI did observe this property from the perimeter from surrounding roadways, public access points, or other SFWMD-owned tracts. Further ground reconnaissance should be performed on this parcel when access can be negotiated.
	PSI	GZ200-004	3070090000030	37.380 94.800	A Phase I ESA was conducted on this property in May 2010. The property consists of dense mangroves and no current or historical commercial or agricultural use of the property was identified. Conclusions: No RECs were identified based on the Phase I ESA. A Phase II ESA is not recommended; however the property is not currently owned by SFWMD and PSI did not enter the property. A thorough Phase I ground reconnaissance should be conducted when the property access can be arranged.	This parcel is not currently owned by the District or under contract, therefore PSI was not able to enter this property. However, PSI did observe this property from the perimeter from surrounding roadways, public access points, or other SFWMD-owned tracts. Further ground reconnaissance should be performed on this parcel when access can be negotiated.

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Region	Consultant	SFWMD Tract ID	PIN	Parcel Size (Acres)	General Results	Recommendations
L-31 Culverts	PSI	GZ200-008	3060330000030	309.210	PSI conducted a Phase I/II ESA for the property in 2007. The property was suspected to have been historically utilized as agricultural land. Adjoining nurseries were also suspected to have impacted the property with pesticides. Past off-site sampling indicated that contamination from the former Miami-Dade County landfill located south of GZ100-002 has not impacted the property. PSI found that past agricultural use and nursery impacts warranted further investigation. The property was divided into grids and analyzed for organochlorine pesticide, chlorinated herbicide, organophosphate pesticide, RCRA eight metals and copper. Groundwater: No testing performed. Soil: As>SCTL-RDE; Hg, Cr>SCTL-LSW, however SPLP results are BDL. Copper exceeded its threshold effects concentration in two of the 60 samples. Conclusions: No significant concerns requiring remediation identified.	PSI recommends no further assessment at this time.
	PSI	GZ200-009	3060330000050	18.400	PSI conducted a Phase I ESA for the property in 2007. The property consists of dense mangrove wetlands and no current or past use of the property for commercial or agricultural properties was noted. Conclusions: No Recognized Environmental Conditions were identified in the Phase I ESA. Therefore, a Phase II ESA was not recommended.	PSI recommends no further assessment at this time.
			3060330000060	108.780		
			3070090000015	20.440		
			3070090000050	132.716		
				47.596		
				18.938		
	PSI	GZ200-011	3070210010010	259.520	A Phase I ESA was conducted on this property in May of 2010. The property consists of dense mangroves and no current or historical commercial or agricultural use of the property was identified. Conclusions: No RECs were identified based on the Phase I ESA. A Phase II ESA is not recommended; however the property is not currently owned by SFWMD and PSI did not enter the property. A thorough Phase I ground reconnaissance should be conducted when the property access can be arranged.	This parcel is not currently owned by the District or under contract, therefore PSI was not able to enter this property. However, PSI did observe this property from the perimeter from surrounding roadways, public access points, or other SFWMD-owned tracts. Further ground reconnaissance should be performed on this parcel when access can be negotiated.
	PSI	N/A	3060330000020	24.900	PSI conducted a Phase I ESA for the property in 2007. The property consists of dense mangrove wetlands and no current or past use of the property for commercial or agricultural properties was noted. Conclusions: No Recognized Environmental Conditions were identified in the Phase I ESA. Therefore, a Phase II ESA was not recommended.	PSI recommends no further assessment at this time.
	PSI	N/A	3060330000040	3.660	PSI conducted a Phase I ESA for the property in 2007. The property consists of dense mangrove wetlands and no current or past use of the property for commercial or agricultural properties was noted. Conclusions: No Recognized Environmental Conditions were identified in the Phase I ESA. Therefore, a Phase II ESA was not recommended.	PSI recommends no further assessment at this time.
	PSI	N/A	3070040000012	2.490	PSI conducted a Phase I ESA for the property in 2007. The property consists of dense mangrove wetlands and no current or past use of the property for commercial or agricultural properties was noted. Conclusions: No Recognized Environmental Conditions were identified in the Phase I ESA. Therefore, a Phase II ESA was not recommended.	PSI recommends no further assessment at this time.
	PSI	N/A	3070040000022	14.050	A Phase I ESA was conducted on this property in May of 2010. The property consists of dense mangroves and no current or historical commercial or agricultural use of the property was identified. Conclusions: No RECs were identified based on the Phase I ESA. Therefore, a Phase II ESA was not recommended.	PSI recommends no further assessment at this time.

Table 1 - BBCW Alternative "O" Phase I - Summary of Environmental Site Assessments

Region	Consultant	SFWMD Tract ID	PIN	Parcel Size (Acres)	General Results	Recommendations
L-31 Culverts	PSI	N/A	3070040000032	7.760	A Phase I ESA was conducted on this property in May of 2010. The property consists of dense mangroves and no current or historical commercial or agricultural use of the property was identified. Conclusions: No RECs were identified based on the Phase I ESA. Therefore, a Phase II ESA was not recommended.	PSI recommends no further assessment at this time.
	PSI	N/A	3070090000011	5.710	A Phase I ESA was conducted on this property in May of 2010. The property consists of dense mangroves and no current or historical commercial or agricultural use of the property was identified. Conclusions: No RECs were identified based on the Phase I ESA. Therefore, a Phase II ESA was not recommended.	PSI recommends no further assessment at this time.
	PSI	N/A	3070090000020	7.240	A Phase I ESA was conducted on this property in May of 2010. The property consists of dense mangroves and no current or historical commercial or agricultural use of the property was identified. Conclusions: No RECs were identified based on the Phase I ESA. Therefore, a Phase II ESA was not recommended.	PSI recommends no further assessment at this time.
	PSI	N/A	3070090000021	0.830	A Phase I ESA was conducted on this property in May of 2010. The property consists of dense mangroves and no current or historical commercial or agricultural use of the property was identified. Conclusions: No RECs were identified based on the Phase I ESA. Therefore, a Phase II ESA was not recommended.	PSI recommends no further assessment at this time.
	PSI	N/A	3070090000032	15.340	A Phase I ESA was conducted on this property in May of 2010. The property consists of dense mangroves and no current or historical commercial or agricultural use of the property was identified. Conclusions: No RECs were identified based on the Phase I ESA. Therefore, a Phase II ESA was not recommended.	PSI recommends no further assessment at this time.
	PSI	N/A	3070160000060	30.720	A Phase I ESA was conducted on this property in May of 2010. The property consists of dense mangroves and no current or historical commercial or agricultural use of the property was identified. Conclusions: No RECs were identified based on the Phase I ESA. Therefore, a Phase II ESA was not recommended.	PSI recommends no further assessment at this time.
	PSI	N/A	3070160000080	21.420	A Phase I ESA was conducted on this property in May of 2010. The property consists of dense mangroves and no current or historical commercial or agricultural use of the property was identified. Conclusions: No RECs were identified based on the Phase I ESA. Therefore, a Phase II ESA was not recommended.	PSI recommends no further assessment at this time.
	MACTEC	45800-006	3070180010380	9.670	MACTEC conducted a Phase I Environmental Assessments (EA) in 2003. The EA found dumping of debris and suspected former agricultural use on the property based on lack of information; additional assessment appears to be required. MACTEC recommended that a debris volume estimation and soil sampling per USF&WS protocol for agricultural sites should be conducted.	PSI recommends an Phase I/II ESA on this tract.
	MACTEC	45800-007	3070180010520	9.690	MACTEC conducted a Phase I Environmental Assessment (EA) in 2003. The EA found suspected former agricultural use.	PSI recommends a Phase II ESA to address agricultural use. Soil sampling per USF&WS protocol for agricultural sites should be conducted.

Table 1 - BBCW Alternative "O" Phase I - Summary of Environmental Site Assessments

Region	Consultant	SFWMD Tract ID	PIN	Parcel Size (Acres)	General Results	Recommendations
L-31 Culverts	MACTEC	45800-008	3070180010390	10.180	MACTEC conducted a Phase I Environmental Assessments (EA) in 2003. The EA found dumping of debris (automobiles) and suspected former agricultural use on the property based on lack of information, additional assessment appears to be required. MACTEC recommended that a debris volume estimation and soil sampling per USF&WS protocol for agricultural sites should be conducted.	PSI recommends a Phase I/II ESA on this tract.
	MACTEC	45800-009	3070180010530	10.170	MACTEC conducted a Phase I Environmental Assessment (EA) in 2003. The EA found suspected former agricultural use.	PSI recommends a Phase II ESA to address agricultural use. Soil sampling per USF&WS protocol for agricultural sites should be conducted.
	MACTEC	45800-011	3070180010600	9.090	MACTEC conducted a Phase I Environmental Assessment (EA) in 2003. The EA found suspected former agricultural use.	PSI recommends a Phase I/II ESA on this tract. Soil sampling per USF&WS protocol for agricultural sites should be conducted.
	MACTEC	45800-014	3070170010042	9.850	MACTEC conducted a Phase I Environmental Assessment (EA) in 2003. The EA found suspected former agricultural use. MACTEC recommended that soil sampling per USF&WS protocol for agricultural sites should be conducted.	PSI recommends a Phase I/II ESA on this tract. Soil sampling per USF&WS protocol for agricultural sites should be conducted.
	MACTEC	45800-015	3070170011600	9.990	MACTEC conducted a Phase I Environmental Assessments (EA) in 2003. The EA indicated historical agricultural use on the property based on lack of information; additional assessment appears to be required. MACTEC recommended that soil sampling per USF&WS protocol for agricultural sites should be conducted.	PSI recommends a Phase I/II ESA on this tract. Soil sampling per USF&WS protocol for agricultural sites should be conducted.
	MACTEC	45800-016	3070170010043 What about 3070170010041? Listed in 2008	4.510	MACTEC conducted a Phase I Environmental Assessment (EA) in 2003. The EA found suspected former agricultural use. MACTEC recommended that soil sampling per USF&WS protocol for agricultural sites should be conducted.	PSI recommends a Phase I/II ESA on this tract. Soil sampling per USFWS protocol for agricultural sites should be conducted.
	MACTEC	45800-018	3070170011610	9.010	MACTEC conducted a Phase I Environmental Assessment (EA) in 2003. The EA found suspected former agricultural use. MACTEC recommended that soil sampling per USF&WS protocol for agricultural sites should be conducted.	PSI recommends a Phase I/II ESA on this tract. Soil sampling per USF&WS protocol for agricultural sites should be conducted.
	MACTEC	45800-019	3070170010050	4.630	MACTEC conducted a Phase I Environmental Assessment (EA) in 2003. The EA found suspected former agricultural use. MACTEC recommended that soil sampling per USF&WS protocol for agricultural sites should be conducted.	PSI recommends a Phase I/II ESA on this tract. Soil sampling per USF&WS protocol for agricultural sites should be conducted.
			3070170010060	4.540		
			3070170010070	4.450		
			3070170010080	4.670		
			3070170010090	4.420		
			3070170010100	3.870		
			3070170010110	9.990		

Table 1 - BBCW Alternative "O" Phase I - Summary of Environmental Site Assessments

Region	Consultant	SFWMD Tract ID	PIN	Parcel Size (Acres)	General Results	Recommendations
L-31 E Culverts	MACTEC	45800-021	3070170010230	5.930	MACTEC conducted a Phase I Environmental Assessment (EA) in 2003. The EA found suspected former agricultural use. MACTEC recommended that soil sampling per USF&WS protocol for agricultural sites should be conducted.	PSI recommends a Phase I/II ESA on this tract. Soil sampling per USF&WS protocol for agricultural sites should be conducted.
	URS	45800-171	3070170010020	91.850	URS conducted a Phase I/II Environmental Site Assessment on the property in May of 2005. The Phase I ESA found no evidence of historical agricultural use; however, mosquito canals were observed on the property during the site assessment. The Phase II ESA investigations included the installation of soil borings and a monitoring well, and the collection and laboratory analysis of discrete soil samples and a groundwater sample. The property was divided into 20, approximately 12-acre grids to represent an equal-area sampling interval per the USFWS and District sampling protocol for analysis by EPA Method 8081 (Organochlorine Pesticides), 8151B (Herbicides), and by EPA Method 6010B (arsenic, lead, and copper). The results found that soil sample SB-12,exhibited elevated concentrations of arsenic, lead, and copper at 35 mg/kg, 140 mg/kg, and 170 mg/kg respectively. SB-12 is located within the southwest portion of Tract 45-800-171, which is located outside of the configuration boundary. These concentrations were above the SQAG PEC of 33 mg/kg for arsenic, 130 mg/kg for lead, and above the Service's Interim Screening Value of 85 mg/kg for copper. The other samples exhibited concentrations of the three metals below their respective PECs. The 95% UCL for the three metals were above the SQAG TECs but below their PEC. Based on the groundwater analytical results, groundwater in the vicinity of the subject property has not been significantly impacted by either current or past land uses. Conclusions: Excluding SB-12, no elevated concentrations of pesticides or metals were detected across the property which would pose an unacceptable risk to the U.S. Fish & Wildlife Service trustee species. Since SB-12 is located outside the configuration boundary, no further investigation is warranted.	URS recommended that further assessment be conducted on the 12-acre grid where SB-12 was collected to confirm the presence and distribution of arsenic, lead and copper. However, since soil sample SB-12 is located outside the configuration boundary, no further assessment is warranted.
	PSI	GZ200-005	3070090000010	46.770	PSI conducted a Phase I/II ESA for the property in 2007. The property was suspected to have been historically utilized as agricultural land. Adjoining nurseries were also suspected to have impacted the property with pesticides. Past off-site sampling indicated that contamination from the former Miami-Dade County landfill located south of GZ100-002 has not impacted the property. The Phase I ESA identified past agricultural use and nursery impacts which warranted a Phase II ESA investigation. The property was divided into grids and analyzed for organochlorine pesticide, chlorinated herbicide, organophosphate pesticide, RCRA eight metals and copper. Groundwater: No testing performed. Soil: Cr>SCTL-LSW, however SPLP results are BDL. Copper was below its threshold effects concentration in all nine of the samples. Conclusions: No significant concerns requiring remediation identified.	No further action or investigation is warranted.
	PSI	GZ200-006	3070160000010	168.770	PSI conducted a Phase I/II ESA for the property in 2007. The property was suspected to have been historically utilized as agricultural land. Adjoining nurseries were also suspected to have impacted the property with pesticides. Past off-site sampling indicated that contamination from the former Miami-Dade County landfill located south of GZ100-002 has not impacted the property. The Phase I ESA identified past agricultural use and nursery impacts which warranted a Phase II ESA investigation. The property was divided into grids and analyzed for organochlorine pesticide, chlorinated herbicide, organophosphate pesticide, RCRA eight metals and copper. Groundwater: No testing performed. Soil: As>SCTL-RDE, SQAG-TEC; Hg, Cr>SCTL-LSW, however SPLP results are BDL. Copper exceeded its threshold effects concentration in four of the 48 samples. PSI recommended performing a screening level ecological risk assessment: however the USFWS did not recommend further assessment or remediation because the contamination was limited to a very small percentage of the property. Conclusions: No significant concerns requiring remediation identified.	No further action or investigation is warranted.
			3070160000020	122.730		
			3070160000030	29.190		
			3070160010010	126.270		

Table 1 - BBCW Alternative "O" Phase I - Summary of Environmental Site Assessments

Region	Consultant	SFWMD Tract ID	PIN	Parcel Size (Acres)	General Results	Recommendations
L-31 E Culverts	PSI	GZ200-007	3060330000010	92.590	PSI conducted a Phase I/II ESA for the property in 2007. The property was suspected to have been historically utilized as agricultural land. Adjoining nurseries were also suspected to have impacted the property with pesticides. Past off-site sampling indicated that contamination from the former Miami-Dade County landfill located south of GZ100-002 has not impacted the property. PSI found that past agricultural use and nursery impacts warranted further investigation. The property was divided into grids and analyzed for organochlorine pesticide, chlorinated herbicide, organophosphate pesticide, RCRA eight metals and copper. Groundwater: No testing performed. Soil: As>SCTL-RDE; Hg, Cr>SCTL-LSW, however SPLP results are BDL. Copper was below its threshold effects concentration in all eighteen of the samples. Conclusions: No significant concerns requiring remediation identified.	No further action or investigation is warranted.

Table 2
BBCW Alternative "O" Phase I - Summary of Recommendations

Region	SFWMD Tract ID	PIN	Recommendations
Deering Estates Flow Way	TA500-073	3350250040010	PSI recommended a Phase II to evaluate former use of part of the site as a citrus grove.
	TA500-074	3350260000040	PSI recommended placing an institutional control on the property to negotiate a no further action letter. Although PSI devloped a site-specific Soil Management Plan for safe handling of excavated soils from the proposed wetland area, canal extension area and stormwater ponds, PSI recommends a site-wide SMP.
Cutler Bay Wetlands Flow Way	GZ300-009	3660100000041	Recommend evaluation of parcel to determine whether inside project boundary.
	TA500-056	3060220000060 (or 3060170000011 per 2008 report)	No further investigation is recommended. However, PSI recommends development of a soil management plan to handle arsenic impacted soils during construction.
	TA500-001	3660160000030	It appears that the initial OCP concentrations reported by MACTEC at SB-6 were either in error, or the area of impact is so small that it is not likely to present a significant ecological or human health risk. Therefore, no remedial action is planned on Tract TA500-001. However, there is no data from the northeast corner of TA500-001 due to the presence of dense vegetation. Thus, additional sampling in this area may be warranted once the area is cleared for construction.
	TA500-002	3060170000050	Since concentrations of OCPs and other constituents present in the soils on Tract TA500-002 are below the Chapter 62-777, FAC SCTL-CDE and SCTL-LGW criteria, no corrective action is planned on this parcel. However, a soil management plan should be developed for the site for use during construction to ensure that soils with OCP concentrations exceeding the SLERA RBCs are not relocated to other areas that will become inundated and that soils with arsenic concentrations above the SCTL-RDE criteria are not relocated to potential residential areas. Also, a site specific safety and health plan should be developed for workers involved in project construction to minimize exposure to low-level OCPs and arsenic in the site soils and to inform workers of potential risks.
	TA500-021	3060090020560	A Phase I ESA is recommended at the time this property is acquired.
	TA500-030	3060220000010	Based on the results of the ecological risk assessment, no additional assessment or corrective action is recommended for Parcel TA500-030, as no significant concerns were identified. A soil management plan is recommended for project construction. to manage metal-impacted soils.

Table 2
BBCW Alternative "O" Phase I - Summary of Recommendations

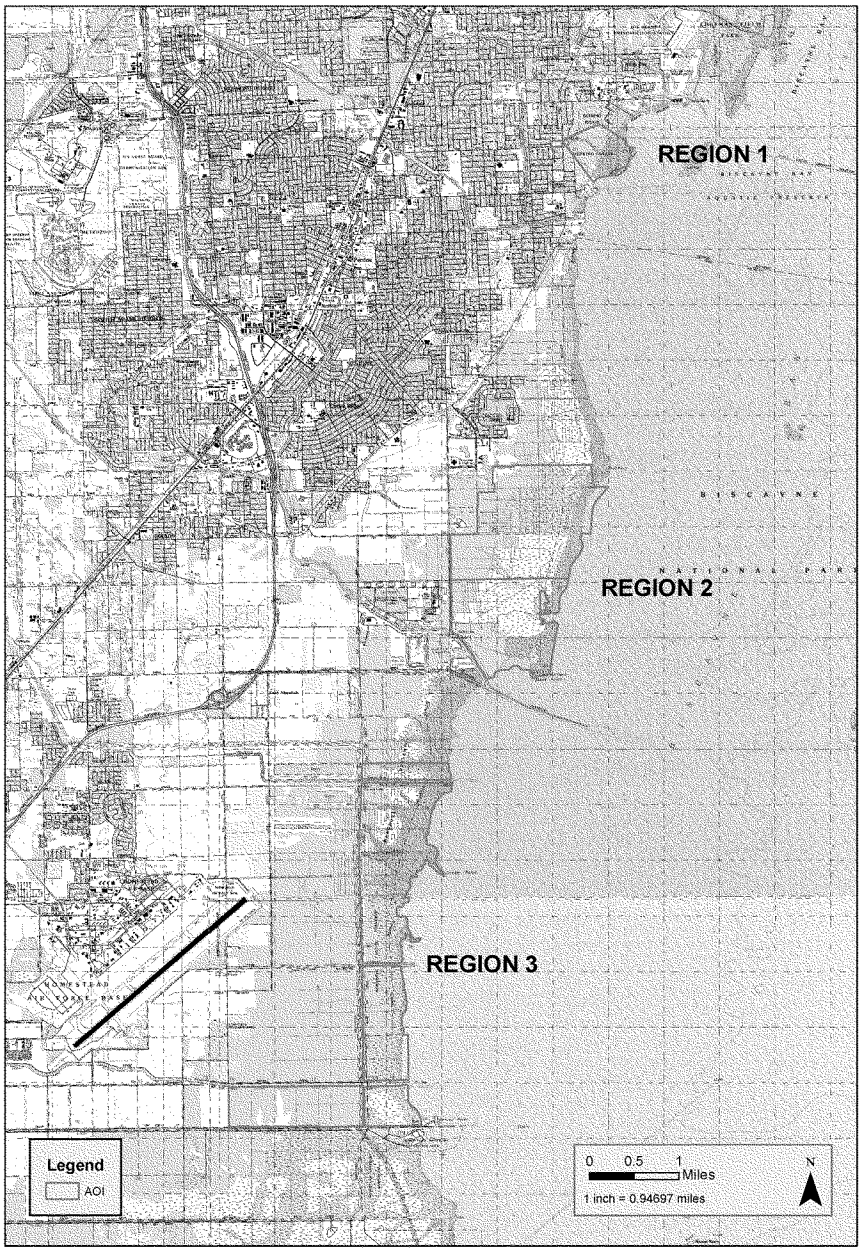
Region	SFWMD Tract ID	PIN	Recommendations
Cutler Bay Wetlands Flow Way	TA500-032	3060220000025	No additional investigation or remediation is warranted. However, a soil management plan and HASP should be developed if construction occurs on this parcel.
	TA500-033	3060220000020	No additional investigation or remediation is warranted. However, a soil management plan HASP should be developed if construction occurs on this parcel.
	TA500-039	3660160000026	No significant concerns identified; however, arsenic exceeds the SCTL-RDE across site. PSI recommended fencing around site to limit use by neighboring development and development of a soil management plan to address soil handling during project construction.
	TA500-062	3660160152070	No further corrective action on this parcel appears warranted. However, continue to monitor the progress of Lennar in completing the landfill Closure Permit Requirements. A soil management plan and HASP is also recommended to address soil handling during project construction.
		3660160200020	
		366170000080	
L-31E Culverts	45800-013	3070170010010	This parcel is not currently owned by the District or under contract, therefore PSI was not able to enter this property. However, PSI did observe this property from the perimeter from surrounding roadways, public access points, or other SFWMD-owned tracts. Further ground reconnaissance should be performed on this parcel when access can be negotiated. PSI recommends a Phase II ESA due to potential historic farming activities.
	45800-016	3070170010041	PSI recommends a Phase II ESA.
	45800-070	3070180010010	This parcel is not currently owned by the District or under contract, therefore PSI was not able to enter this property. However, PSI did observe this property from the perimeter from surrounding roadways, public access points, or other SFWMD-owned tracts. Further ground reconnaissance should be performed on this parcel when access can be negotiated. PSI recommends a Phase II ESA.
	45800-161	3070170010240	PSI recommends a Phase II ESA.
	45800-168	3070170010045	PSI recommends a Phase II ESA.
	GZ200-002	3070040000016	This parcel is not currently owned by the District or under contract, therefore PSI was not able to enter this property. However, PSI did observe this property from the perimeter from surrounding roadways, public access points, or other SFWMD-owned tracts. Further ground reconnaissance should be performed on this parcel when access can be negotiated.

Table 2
BBCW Alternative "O" Phase I - Summary of Recommendations

Region	SFWMD Tract ID	PIN	Recommendations
L-31 E Culverts	GZ200-004	3070090000030	This parcel is not currently owned by the District or under contract, therefore PSI was not able to enter this property. However, PSI did observe this property from the perimeter from surrounding roadways, public access points, or other SFWMD-owned tracts. Further ground reconnaissance should be performed on this parcel when access can be negotiated.
	GZ200-011	3070210010010	This parcel is not currently owned by the District or under contract, therefore PSI was not able to enter this property. However, PSI did observe this property from the perimeter from surrounding roadways, public access points, or other SFWMD-owned tracts. Further ground reconnaissance should be performed on this parcel when access can be negotiated.
	45800-006	3070180010380	PSI recommends an Phase I/II ESA on this tract.
	45800-007	3070180010520	PSI recommends a Phase II ESA to address agricultural use. Soil sampling per USF&WS protocol for agricultural sites should be conducted.
	45800-008	3070180010390	PSI recommends an Phase I/II ESA on this tract.
	45800-009	3070180010530	PSI recommends a Phase II ESA to address agricultural use. Soil sampling per USF&WS protocol for agricultural sites should be conducted.
	45800-011	3070180010600	PSI recommends an Phase I/II ESA on this tract. Soil sampling per USF&WS protocol for agricultural sites should be conducted.
	45800-014	3070170010042	PSI recommends an Phase I/II ESA on this tract. Soil sampling per USF&WS protocol for agricultural sites should be conducted.
	45800-015	3070170011600	PSI recommends an Phase I/II ESA on this tract. Soil sampling per USF&WS protocol for agricultural sites should be conducted.
	45800-016	3070170010043 What about 3070170010041? Listed in 2008	PSI recommends an Phase I/II ESA on this tract. Soil sampling per USFWS protocol for agricultural sites should be conducted.
	45800-018	3070170011610	PSI recommends an Phase I/II ESA on this tract. Soil sampling per USF&WS protocol for agricultural sites should be conducted.
	45800-019	3070170010050	PSI recommends an Phase I/II ESA on this tract. Soil sampling per USF&WS protocol for agricultural sites should be conducted.
		3070170010060	
		3070170010070	
		3070170010080	
		3070170010090	
		3070170010100	
		3070170010110	
	45800-021	3070170010230	PSI recommends an Phase I/II ESA on this tract. Soil sampling per USF&WS protocol for agricultural sites should be conducted.
L-31 E Culverts	45800-171	3070170010020	URS recommended that further assessment be conducted on the 12-acre grid where SB-12 was collected to confirm the presence and distribution of arsenic, lead and copper. Howver, since soil sample SB-12 is located outside the configuration boundary, no further assessment is warranted.

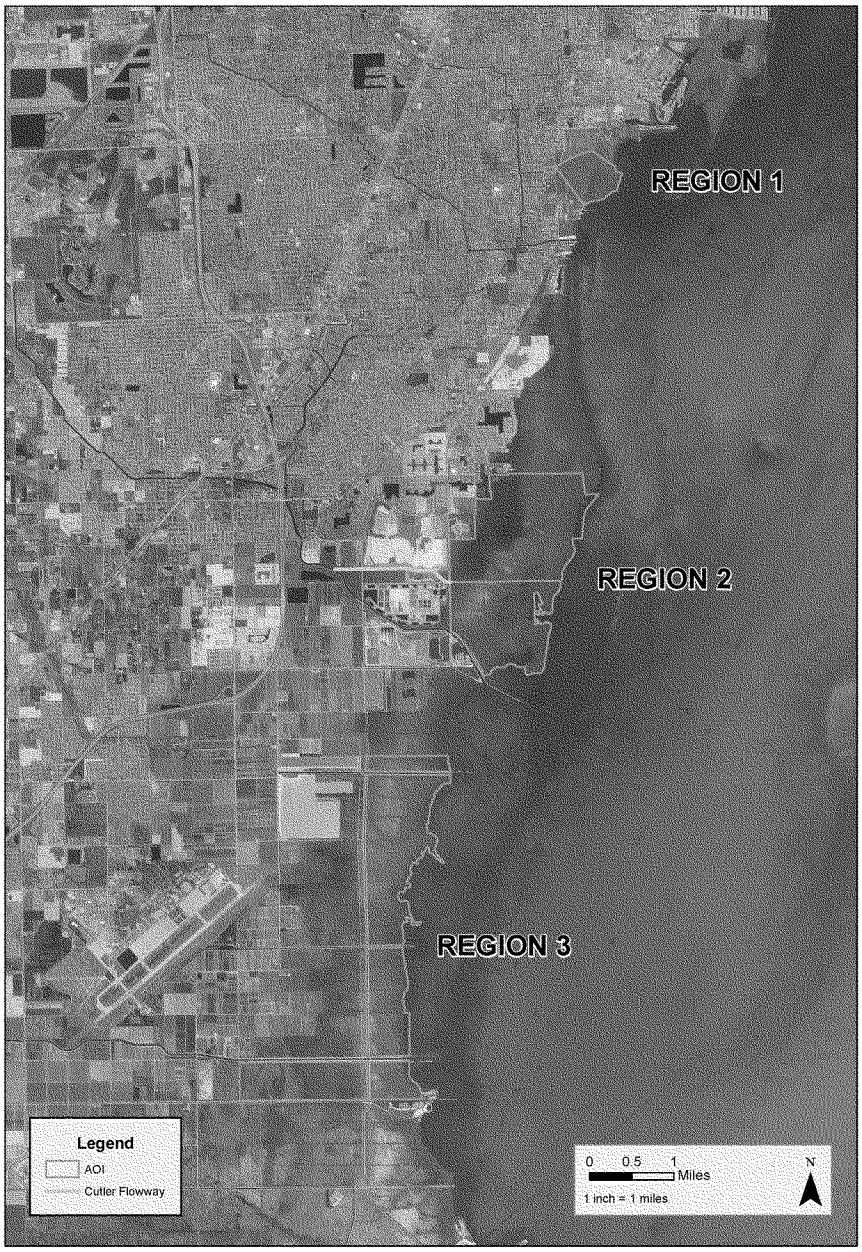
Page 3 of 3

FIGURES



REFERENCE: THE 2004 AERIAL PHOTOGRAPH AND DATA WERE OBTAINED FROM LABINS. THE PRESENTED DATA IS FOR INFORMATIONAL PURPOSES ONLY. IT IS NOT MEANT FOR DESIGN, LEGAL, OR ANY OTHER USES. PSI, INC. ASSUMES NO RESPONSIBILITY FOR ANY DECISIONS MADE OR ANY ACTIONS TAKEN BY THE USER BASED UPON INFORMATION OBTAINED FROM THE ABOVE DATA.

PROJECT NO 0552386 TWN/RNG/SEC VARIOUS DATE CREATED 04/15/10	PSI Information To Build On Engineering • Consulting • Testing	With 125 offices across North America. One Company. One Call. 5801 Benjamin Center Drive Tampa, Florida 33634 (813)885-1075 (813)249-0301 fax	***FIGURE 1 - USGS MAP*** BISCAYNE BAY COASTAL WETLANDS PROJECT ALTERNATIVE "O" FOOTPRINT - SUMMARY REPORT MIAMI, MIAMI-DADE COUNTY, FLORIDA



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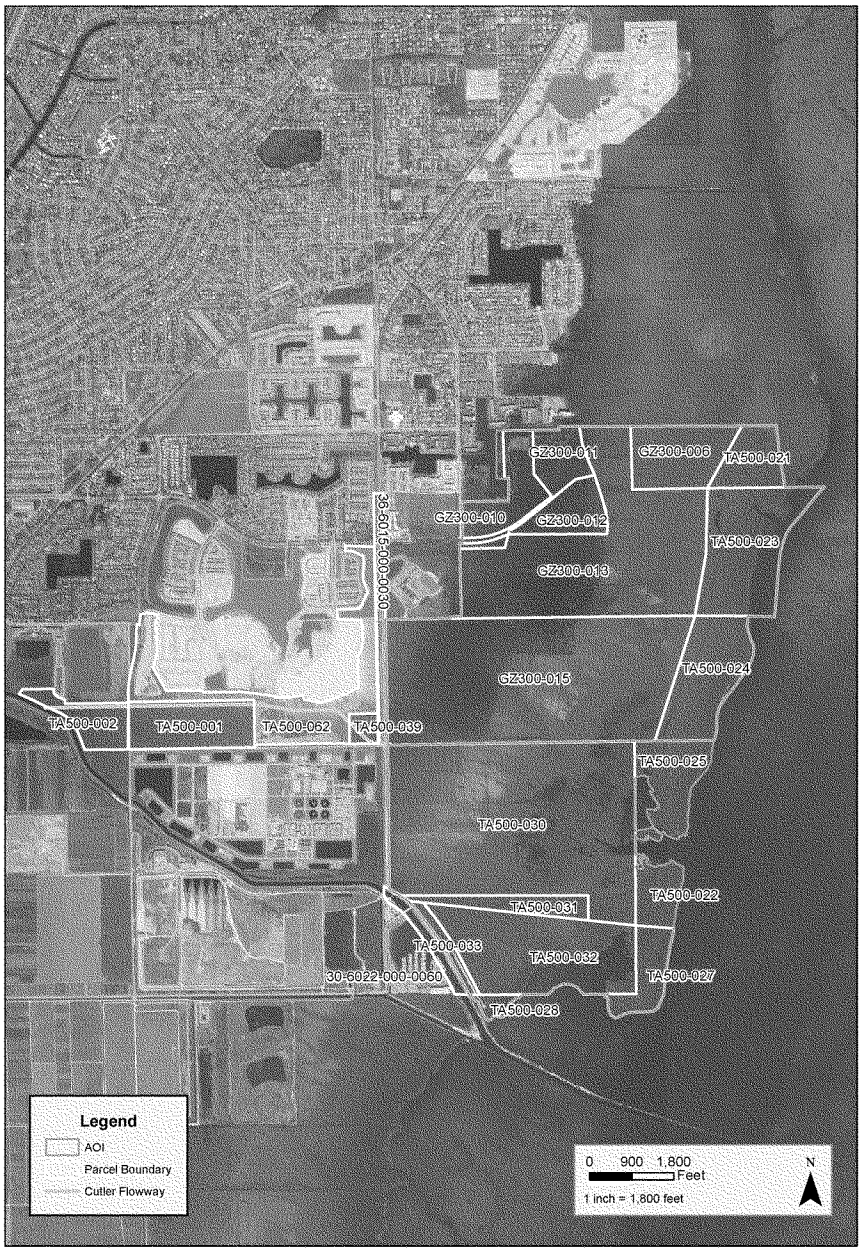
REFERENCE: THE 2004 AERIAL PHOTOGRAPH AND DATA WERE OBTAINED FROM LABINS. THE PRESENTED DATA IS FOR INFORMATIONAL PURPOSES ONLY. IT IS NOT MEANT FOR DESIGN, LEGAL, OR ANY OTHER USES. PSI, INC. ASSUMES NO RESPONSIBILITY FOR ANY DECISIONS MADE OR ANY ACTIONS TAKEN BY THE USER BASED UPON INFORMATION OBTAINED FROM THE ABOVE DATA.

PROJECT NO 0552386 TWN/RNG/SEC VARIOUS DATE CREATED 04/15/10	PSI Information To Build On Engineering • Consulting • Testing	With 125 offices across North America. One Company, One Call 5801 Benjamin Center Drive Tampa, Florida 33634 (813)886-1075 (813)249-0301 fax

FIGURE 3 - REGION 1 PARCEL MAP

BISCAYNE BAY COASTAL WETLANDS PROJECT
ALTERNATIVE "O" FOOTPRINT - SUMMARY REPORT
MIAMI, MIAMI-DADE COUNTY, FLORIDA



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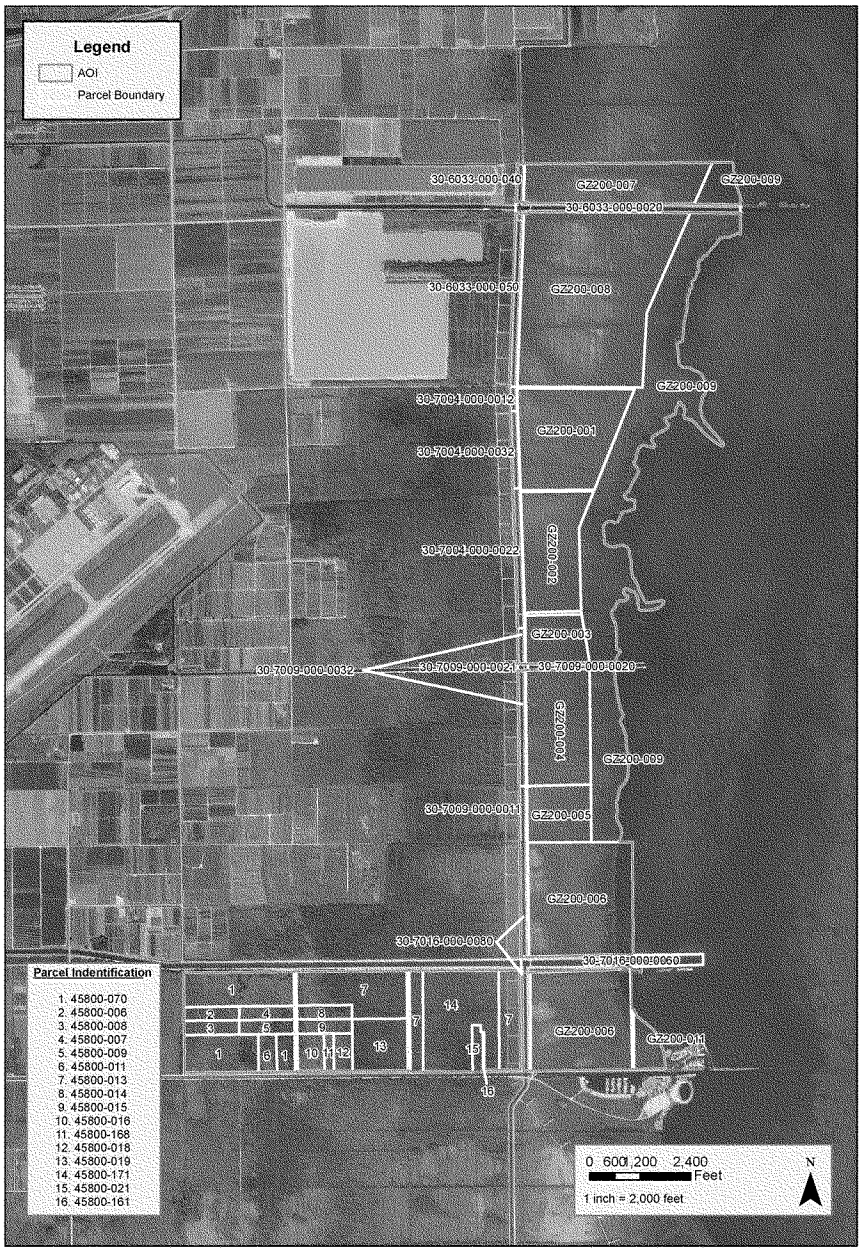
PROJECT NO 0552386 TWN/RNG/SEC VARIOUS DATE CREATED 04/15/10	psi Information To Build On Engineering • Consulting • Testing With 125 offices across North America. One Company. One Call 5801 Benjamin Center Drive Tampa, Florida 33634 (813)885-1075 (813)249-0301 fax	***FIGURE 4 - REGION 2 PARCEL MAP*** BISCAYNE BAY COASTAL WETLANDS PROJECT ALTERNATIVE "O" FOOTPRINT - SUMMARY REPORT MIAMI, MIAMI-DADE COUNTY, FLORIDA



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PROJECT NO. 0552386 TWNRNGSEC VARIOUS DATE CREATED 04/15/10	PSI Information To Build On Engineering • Consulting • Testing With 125 offices across North America. One Company. One Call 5801 Benjamin Center Drive Tampa, Florida 33634 (813)886-1075 (813)249-0301 fax	***FIGURE 5 - REGION 3 PARCEL MAP*** BISCAYNE BAY COASTAL WETLANDS PROJECT ALTERNATIVE "O" FOOTPRINT - SUMMARY REPORT MIAMI, MIAMI-DADE COUNTY, FLORIDA

APPENDIX A

REGULATORY CONCURRENCE LETTERS

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
9900 SW 107TH AVENUE, #203
MIAMI, FLORIDA 33176

REPLY TO
ATTENTION OF

December 7, 2007

Regulatory Division
Enforcement Section
Miami Regulatory Office
SAJ-2001-3245 (MOD #1 & NPR-SC)

Mr. Matt Nelson
Portfolio Manager
Palm Beach Indian River Land Division
8136 Okeechobee Boulevard
West Palm Beach, FL 33411

Mr. Robert Taylor
Land Acquisition Support Division
3301 Gun Club Road
West Palm Beach, FL 33406

Mr. Steve Long, P.E., P.G.
Chief Engineer
Professional Service Industries, Inc.
451 East 124th Avenue
Thornton, CO 80241

Gentlemen:

Reference is made to the request regarding soil remediation activities in association with Department of the Army permit SAJ-2001-3245. The proposed project is located at the Lakes by the Bay Mitigation Area/Lennar Property, south of SW 216th Street, east of Old Cutler Road, north of SW. 232nd Street and west of SW. 87th Avenue, within a portion of Section 16, Township 56 South, Range 40 East, Miami-Dade County, Florida.

Soil samples where taken of the entire mitigation area and it was noted that a 200-foot x 200-foot area indicated the presence of arsenic, barium, cadmium, chromium, lead and numerous polynuclear aromatic haydrocarbon compounds at concentrations exceeding the ecological screening standards. The SFWMD/CERP has requested to excavate the soils within this grid to a depth of one foot below existing land surface. The soils would be transported off-site for disposal at a Subtitle D landfill. The estimated removal is approximately 1,200 tons of contaminated soils.

The area to be excavated is within the area that will be disturbed by future CERP project activities when an above grade, concrete-lined channel will be installed.

The project as proposed will not require a Department of the Army permit in accordance with Section 10 of the Rivers and Harbors Act of 1899 as it is not located within the navigable waters of the United States. Furthermore, a permit will not be required in accordance with Section 404 of the Clean Water Act as it will not involve the discharge of dredged or fill material into waters of the United States. Provided the work is done in accordance with the enclosed drawings, Department of the Army authorization will not be required.

This letter does not obviate the requirement to obtain any other Federal, State, or local permits that may be necessary for your project. Should you have any questions, please contact Shelly Carter at the letterhead address or by telephone at 305-526-7183.

Thank you for your cooperation with our permit program. The Corps Jacksonville District Regulatory Division is committed to improving service to our customers. We strive to perform our duty in a friendly and timely manner while working to preserve our environment. We invite you to take a few minutes to visit the following link and complete our automated Customer Service Survey: http://regulatory.usacesurvey.com/. Your input is appreciated - favorable or otherwise.

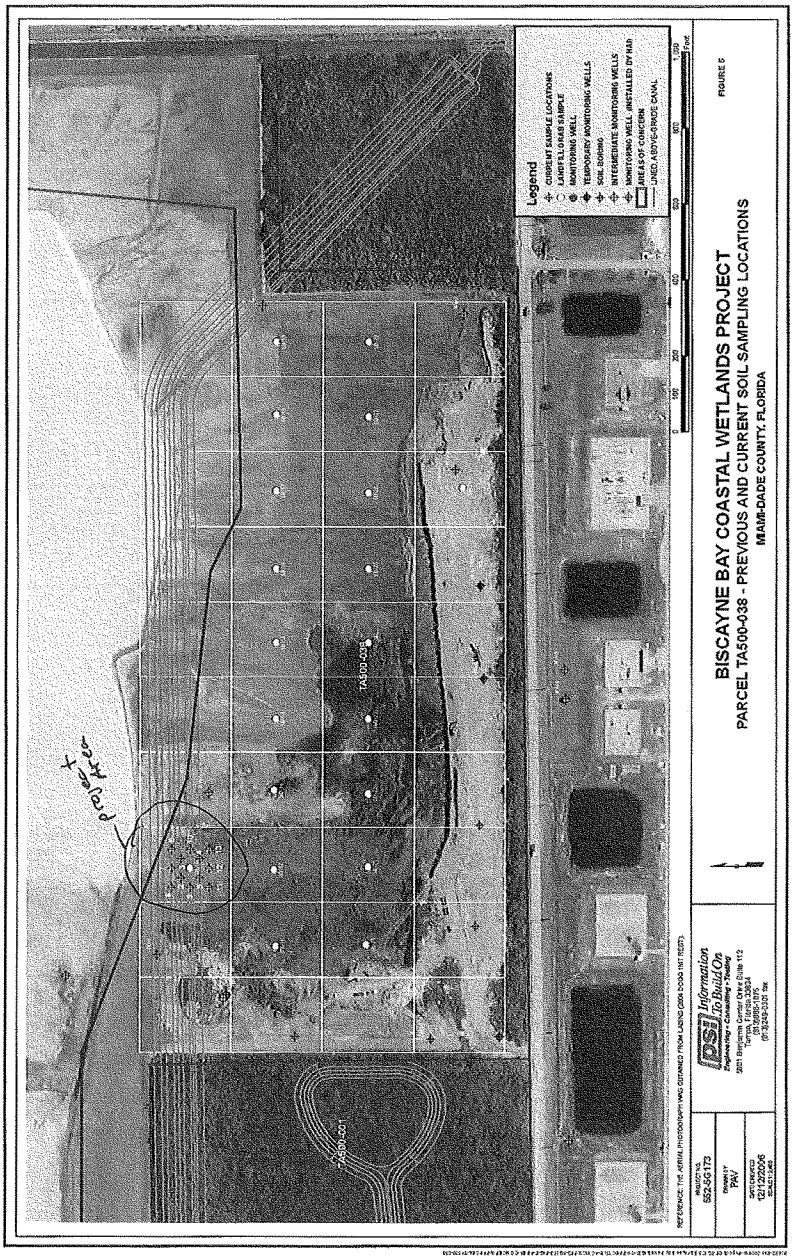
Sincerely,

Dianne S. Griggs

for

Eric P. Summa
Chief, Enforcement Section

Enclosures


BISCAYNE BAY COASTAL WETLANDS PROJECT
PARCEL TA500-038 - PREVIOUS AND CURRENT SOIL SAMPLING LOCATIONS
MIAMI-DADE COUNTY, FLORIDA
FIGURE 5
Legend
CURRENT SAMPLE LOCATIONS
LANDFILL GRAB SAMPLE
MONITORING WELL
TEMPORARY MONITORING WELLS
SOIL BORING
INTERMEDIATE MONITORING WELLS
MONITORING WELL (INSTALLED BY HAB
AREAS OF CONCERN
LINED, ABOVE-GRADE CANAL
TA500-038
TA500-001
Project Area
Information To Build On
PAV
12/12/2006

Description of Proposed Soil Excavation on Lennar Property

Background

A portion of Parcel TA500-062 (aka/TA500-038) was formerly utilized as a construction and demolition debris landfill. However, all of the waste has been removed under permit from Dade County. The current grade is approximately 3 feet below the surrounding land surface, so this area currently holds water for most of the year. The District does not intend to restore the grade in this area, so the area will likely develop into a natural wetland area in the future. Therefore, PSI conducted an environmental investigation of soil and groundwater conditions on the property and evaluated potential ecological risks associated with exposure of ecological receptors (e.g., wading birds) to the remaining soils.

In order to evaluate the post-debris removal soil conditions, PSI divided the site into equally sized grids, and collected a surface soil sample from each grid for chemical analysis. The soil sampling locations are shown on the attached map. The laboratory results indicated the presence of arsenic, barium, cadmium, chromium, lead, selenium, DDE, dieldrin, polychlorinated biphenyls (PCBs), and numerous polynuclear aromatic hydrocarbon (PAH) compounds in one or more soil samples at concentrations exceeding the ecological screening standards. PSI then calculated average concentrations of each constituent of concern across the site and utilized these average concentrations to evaluate ecological risk. The screening level ecological risk assessment indicated that site-wide concentrations of these contaminants are not likely to pose a significant risk to potential wildlife receptors. However, chemical concentrations in one grid (SB-10) were significantly higher than the remaining grids and this area appears to represent a hot spot. PSI collected a number of additional soil samples within this grid to define the extent of the hot spot. Based on the fact that chemical concentrations within this grid are significantly higher than the remainder of the site, and the fact that chemical concentrations in the soil within this grid exceed ecological screening level probable effects concentrations, PSI is proposing to remove the soils within this grid.

Proposed Scope of Work

PSI is proposing to excavate the soils within grid SB-10 to a depth of one foot below existing land surface. These soils will be transported off-site for disposal at a Subtitle D landfill. The District will sign the waste manifests as generator for this soil. Based on the proposed area and depth of excavation, we anticipate the removal of up to 1,200 tons of impacted soils. Once the excavation is complete, the grade within the area will be restored to approximately existing grade. The area to be excavated is within the area that will be disturbed by future project activities when an above-grade, concrete-lined channel will be installed across the northern portion of this tract.

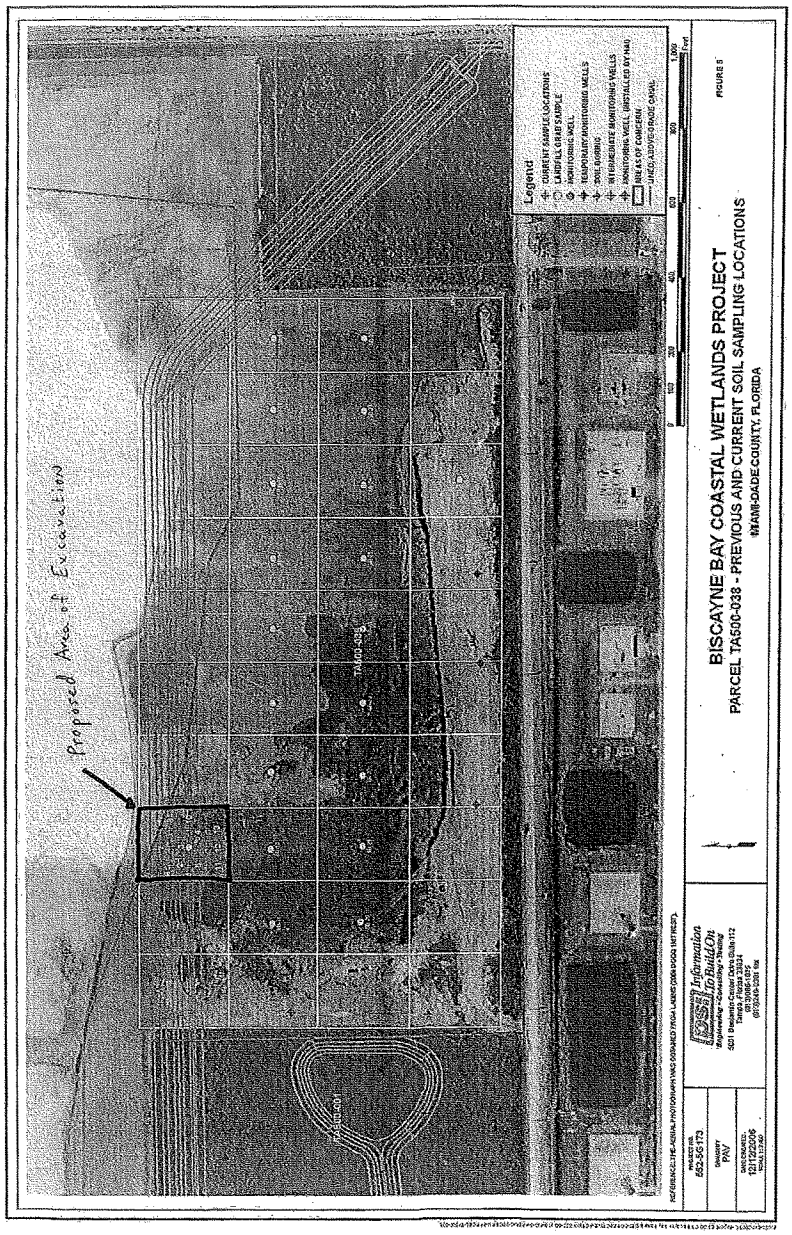

Proposed Area of Excavation
Legend
BISCAYNE BAY COASTAL WETLANDS PROJECT
PARCEL TA500-038 - PREVIOUS AND CURRENT SOIL SAMPLING LOCATIONS
MIAMI-DADE COUNTY, FLORIDA
FIGURE 5

TABLE 4
BISCAYNE BAY COASTAL WETLANDS PROJECT
Lake Ft Abbeyton Area - Soil Results (Subsurface Analyses Only)
PB-Project No. 93-0073

Sample I.D.	Date	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Selenium	Silver	Aluminum	Antimony	Beryllium	Cobalt	Molybdenum	Nickel	Potassium	Sodium	Thallium	Vanadium	Zinc	Cyanide	Phosphorus	Sulfide	Sulfur	Total Organic Carbon	Total Organic Nitrogen	Total Organic Phosphorus	Total Phosphorus	Total Solids	Total Volatile Solids	Total Volatile Solids	Total Volatile Solids
SS-12-01	10/20/00	12.6 U	8.13	13.4	4.3	13.5	13	*	0.07 U	0.041	U 0.041	U 0.041	U 0.041	U 0.13	U 0.03	U 0.07	U 0.07	U 0.07	U 0.07	U 0.07	U 0.07	U 0.07	U 0.07	U 0.07	U 0.07	U 0.07	U 0.07	U 0.07	U 111	U 18.3	U		
SS-12-02		17.4 U	18.2	14.9	13.1	15.2	20.7	*	18.6	0.048	U 0.048	U 0.048	U 0.048	U 0.16	U 0.37	U 34.3	U 34.3	U 34.3	U 34.3	U 34.3	U 34.3	U 34.3	U 34.3	U 34.3	U 34.3	U 34.3	U 34.3	U 34.3	U 115	U 369			
SS-1	10/20/00	17.6 U	15.2	15.4	14.4	14.4	12.3	22.3	*	18.5	0.045	U 0.045	U 0.045	U 0.15	U 0.035	U 0.045	U 0.045	U 0.045	U 0.045	U 0.045	U 0.045	U 0.045	U 0.045	U 0.045	U 0.045	U 0.045	U 0.045	U 0.045	U 109.9	U 43.1	U		
SS-2-01	10/20/00	13.9 U	8.13	13.4	3.9	10.4	7.9	19	*	0.061	U 0.0608	U 0.0608	U 0.0608	U 0.0608	U 0.0608	U 0.0608	U 0.0608	U 0.0608	U 0.0608	U 0.0608	U 0.0608	U 0.0608	U 0.0608	U 0.0608	U 0.0608	U 0.0608	U 0.0608	U 0.0608	U 0.0608	U 26.6	U		
SS-2-02	10/20/00	14.6 U	10.9	14.6	3.7	12.7	7.7	17.6	*	0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 21.2	U		
SS-2-03	10/20/00	13.6 U	10.3	13.6	3.7	12.3	7.7	21.7	*	0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 0.059	U 25.8	U		
Mean		15.2	13.3	14.2	5.4	13.1	9.9	20.4	NA	0.14	0.047	0.047	0.047	0.14	0.037	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047
SCS-1-SW		20.2	11.0	7.3	3.1	10.3	5.5	1.3	3.1	1.1	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
SCS-2-SW		20.2	21.1	8.4	7.1	9.4	5.5	1.3	3.1	1.1	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
SCS-3-SW		17.1	10.1	12.1	3.1	11.3	5.5	1.3	3.1	1.1	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
SCS-4-SW		5.8 U	10.1	3.1	3.1	11.6	5.5	1.3	3.1	1.1	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Mean		15.3	13.3	8.2	4.1	10.7	5.5	1.3	3.1	1.1	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1

Units = MG/KG
U = Results under the laboratory detection limits
(*) Refer to lab bench sheets for laboratory detection method limit and analytical quantitation method limits
* = NA; result pending (subsurf. in only)

TABLE 1 - BISCAYNE BAY COASTAL WETLANDS PROJECT
Leonar Landfill Assessment - Historic Landfill Area Soil Results
PSI Project No. 552-5G173

SAMPLE ID	DATE	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver	Aroclor-1260	DDE	alpha-Chlordane	gamma-Chlordane
SB-10	03/30/06	5.6	0.54	0.74	33	29	0.036	<0.53	<0.25	<0.0045	0.035	0.025	0.0016
SB-11	03/30/06	9.6	19	0.75	18	22	0.013	<0.51	<0.21	<0.0042	0.0125	0.0056	0.0056
SB-12	03/30/06	12	18	0.87	39	13	0.04	<0.61	<0.27	<0.0053	0.021	0.0177	0.012
SB-13	03/30/06	9.1	15	0.74	36	59	0.136	<0.58	<0.23	<0.0045	0.0028 I	0.0014 I	0.0014 I
SB-14	03/30/06	8.2	14	0.58	25	13	0.055	<0.56	<0.22	<0.0044	0.00197	<0.0002	<0.00039
SB-15	03/30/06	20	16	0.97	39	11	0.076	<0.61	<0.25	<0.0048	0.00241	<0.00021	<0.00043
SB-16	03/30/06	15	18	1.2	31	19	0.102	<0.69	<0.27	<0.0059	0.00318	<0.00028	<0.00051
SB-17	03/30/06	2.7	17	1	23	28	<0.014	0.815	<0.27	<0.0057	0.0165	<0.00026	<0.00051
SB-18	03/30/06	12	16	2.1	29	31	0.14	<0.78	<0.31	<0.0063	0.0241	0.00758	0.0072
SB-19		5.4	13	0.44	22	8.5	0.05	<0.69	<0.28	<0.0056	<0.00034	<0.00025	<0.0005
duplicate D-1	03/30/06	4.7	12	0.37	3.4	1.8	0.039	<0.66	<0.27	<0.0055	<0.00034	<0.00025	<0.00049
split SP-1		4.1	14	<0.27	16	5.3	0.0181	<1.1	<0.50	<0.0044	0.000391	<0.0038	
SB-20	03/30/06	9.8	16	0.68	16	16	0.054	<0.61	<0.24	<0.0048	0.00221	0.0027 I	0.00221
SB-21	03/30/06	14	15	0.83	17	13	0.018	<0.6	<0.24	<0.0049	<0.0003	<0.00022	<0.00044
SB-22	03/30/06	8.2	15	0.7	17	16	0.009	<0.61	<0.24	<0.0047	0.00463	<0.00021	<0.00042
SB-23	03/30/06	8.3	14	0.69	15	14	0.043	0.541	<0.20	<0.0042	0.00635	<0.00019	<0.00038
SB-24	03/30/06	13	17	0.77	19	16	0.084	<0.61	<0.24	<0.0048	<0.00029	<0.00021	<0.00043
SB-25	03/30/06	24	17	0.82	24	20	0.055	<0.7	<0.28	<0.0055	<0.00033	<0.00024	<0.00049
SB-26	03/30/06	9.9	14	0.32	9.9	5.5	0.049	<0.7	<0.28	<0.0057	0.00132	<0.00025	<0.00051
SB-27	03/30/06	9.3	22	0.8	27	28	0.065	0.815	<0.31	<0.0061	0.0025 I	<0.00027	<0.00054
SB-28		17	18	0.81	22	22	0.032	<0.79	<0.32	<0.0064	<0.00039	<0.00028	<0.00057
duplicate D-2	03/30/06	9.3	21	0.71	25	28	0.015	<0.67	<0.35	<0.0071	<0.00043	<0.00031	<0.00063
split SP-2		8.7	20	<0.35	20	23	0.011	<0.92	<0.47	0.0231	0.0024	0.0124	0.0
SB-29	03/30/06	16	15	0.73	18	34	0.05	<0.65	<0.26	<0.0053	<0.00032	<0.00024	<0.00047
SCTL-1-GW		SPLP	1600	7.5	35	NA	2.1	5.2	17	17	18	0.6	0.6
SCTLBSW		SPLP	NA	NA	NA	SPLP	0.013	0.5	0.016	0.000	0.004	0.003	0.002
SCTLR		210	1800	1.92	1210	1400	3.2	340	410	0.5	2.9	3.2	2.6
SQAG-TCP		3.3	1000	1.2	43	125	0.11	0.5	0.14	0.06	0.0023	0.0022	0.0034
SQAG-PCC		2.3	1000	5	110	110	1	NS	2.2	0.68	0.041	0.018	0.018

NOTES:
Units = mg/kg
I = value between the laboratory method detection limit and the laboratory practical quantitation limit.

TABLE 2 - BISCAYNE BAY COASTAL WETLANDS PROJECT
Lennar Landfill Assessment - Historic Landfill Area Soil Results
PSI Project No. 552-50173

SAMPLE ID	DATE	Aluminum	Antimony (mg/kg)	Arsenic	Barium (µg/kg)	Beryllium (mg/kg)	Boron (mg/kg) TCLP	Cadmium (µg/kg)	Calcium (mg/kg)	Chloride (mg/kg)	Chromium	Cobalt	Copper	Iron	Lead (mg/kg) TCLP	Lead	Magnesium	Manganese	Mercury (mg/kg)
SB-10	03/30/06	<0.017	<0.007	0.0[illegible]	0.44	0.0[illegible]	0.0[illegible]	1.1	<0.059	0.14	0.0[illegible]	<0.012	0.0[illegible]	<0.001	<0.060	0.0[illegible]	2	0.[illegible]	0.[illegible]
SB-11	03/30/06	0.00481	0.00391	0.0[illegible]	0.[illegible]	0.12	0.0[illegible]	0.18	0.096	0.072	0.15	<0.0043	0.2	0.011	0.063	0.085	0.0[illegible]	0.0
SB-12	03/30/06	<0.031	<0.0019	0.00771	0.037	0.492	0.84	0.83	<0.00053	0.053	0.015	<0.0056	0.038	<0.0012	<0.0036	0.036	0.0231	0.1
SB-13	03/30/06	<0.00363	<0.0018	0.0[illegible]	0.033	0.012	0.03	0.031	<0.0045	0.098	0.023	<0.0046	0.04	<0.001	<0.003	0.014	0.036	0.1
SB-14	03/30/06	<0.00353	<0.0016	<0.00061	0.013	0.012	0.02	0.021	<0.00414	0.017	0.0017	<0.0045	0.0111	<0.001	<0.0099	0.00391	0.00977	0.03
SB-15	03/30/06	<0.00291	<0.0017	<0.00057	<0.0015	<0.0016	0.004	<0.0037	<0.0046	<0.0025	<0.0013	<0.005	0.00411	<0.0011	<0.0032	<0.001	0.0039	0.01
SB-16	03/30/06	<0.00111	<0.0021	<0.0008	<0.0018	<0.0019	0.01	<0.0032	<0.0046	<0.003	<0.0018	<0.0039	<0.0037	<0.0013	<0.0038	<0.0012	0.00097	0.02
SB-17	03/30/06	<0.0011	<0.0021	<0.0008	<0.0017	<0.0019	0.004	<0.0032	<0.0057	<0.003	<0.0016	<0.0038	<0.0032	<0.0013	<0.0033	<0.0012	<0.0057	0.03
SB-18	03/30/06	<0.0012	<0.0023	<0.0008	<0.0018	<0.0021	0.005	<0.0036	<0.0063	<0.0033	<0.0015	<0.0042	0.00381	<0.0015	<0.0037	<0.0013	<0.00410	0.03
SB-19	03/30/06	<0.0011	<0.0020	<0.0008	<0.0017	<0.0019	0.004	<0.0031	<0.0056	<0.0032	<0.0013	<0.0039	<0.0037	<0.0013	<0.0037	<0.0012	<0.0064	0.01
Duplicate D-1		<0.001	<0.0020	<0.00077	<0.0017	<0.0018	0.004	<0.0031	<0.0055	<0.0029	<0.0015	<0.0037	<0.0036	<0.0013	<0.0037	<0.0012	<0.0065	0.01
SB-20	03/30/06	0.0011	<0.0017	0.0[illegible]	0.049	0.658	0.1	0.076	<0.0046	0.041	0.045	<0.0051	0.046	<0.0011	<0.0033	0.019	0.042	0.2
SB-21	03/30/06	0.00393	<0.016	0.00161	0.028	0.018	0.04	0.048	<0.0049	0.029	0.025	<0.0051	0.046	<0.0011	<0.0033	0.019	0.042	0.2
SB-22	03/30/06	<0.00359	0.00491	0.0[illegible]	0.031	0.019	0.1	0.18	0.032	0.016	0.032	<0.0043	0.035	<0.0011	0.006	0.033	0.11	0.4
SB-23	03/30/06	<0.0038	<0.0015	<0.00069	0.019	0.017	0.02	0.025	<0.0042	0.016	0.0087	<0.0049	0.0181	<0.00089	<0.0035	0.00681	0.0141	0.03
SB-24	03/30/06	<0.00381	<0.0017	<0.00077	0.02	0.02	0.03	0.031	<0.0048	0.033	0.0095	<0.005	0.027	<0.0011	<0.0033	0.00971	0.0201	0.1
SB-25	03/30/06	<0.001	<0.002	<0.00076	0.02	0.021	0.03	0.036	<0.00358	0.025	0.00471	<0.0059	0.0191	<0.0013	<0.0038	0.00561	0.0221	0.03
SB-26	03/30/06	<0.0011	<0.0021	<0.00079	<0.0017	<0.0019	0.004	<0.0032	<0.0037	<0.003	<0.0076	<0.0039	<0.0032	<0.0013	<0.0038	<0.0012	<0.0059	0.02
SB-27	03/30/06	<0.0011	<0.0020	<0.00081	<0.0016	<0.0021	0.003	<0.0031	<0.0041	<0.003	<0.0017	<0.0039	<0.0025	<0.0014	<0.0041	<0.0013	<0.0071	0.02
SB-28	03/30/06	0.01171	<0.0023	0.0[illegible]	0.0[illegible]	0.014	0.0[illegible]	0.26	0.076	0.13	0.0[illegible]	<0.0063	0.27	0.00551	0.055	0.094	0.[illegible]	0.9
Duplicate SB-2	03/30/06	<0.0015	<0.0023	0.0[illegible]	0.0[illegible]	0.0[illegible]	0.1	0.13	<0.0071	0.065	0.024	<0.0073	0.12	<0.0015	<0.0047	0.038	0.13	0.4
SB-29	03/30/06	0.0[illegible]	<0.0019	0.0[illegible]	0.10	0.0[illegible]	0.0[illegible]	1.1	0.39	0.43	0.0[illegible]	<0.0064	0.14	0.0[illegible]	0.42	0.[illegible]	0.[illegible]	0.9
SOILLOW		1.1	27	2500	0.4	4	4.8	2.4	39,000	24	77	8.7	1900	762	5.6	250	550	NA
SB-30 LOW		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SB-30 HIGH		2400	110	31000	18	0.[illegible]	18.1	1.[illegible]	4990	[illegible]	[illegible]	2	200	2000	3	200	2490	NA
SB-30 MEDIAN		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	NA	[illegible]	[illegible]	[illegible]	[illegible]	NA	[illegible]	[illegible]	[illegible]
SB-30 AVG		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	NA	NA	[illegible]	[illegible]	[illegible]	NA	[illegible]	[illegible]	[illegible]

TABLE 2-a: TRACT TA090-03F - SOIL ANALYTICAL DATA SUMMARY, PESTICIDES ONLY (detected constituents only)
PROJECT NAME: Biscayne Bay Coastal Wetlands
PSI PROJECT NO.: 1692-SCCT7

Sample Info			OCP					
Sample ID	Sample Interval (ft bls)	Sample date	4,4-DDD (ug/Kg)	4,4-DDE (ug/Kg)	4,4-DDT (ug/Kg)	alpha-Chlordane (ug/Kg)	gamma-Chlordane (ug/Kg)	Total Chlordane (ug/Kg)
SB-1b-1	0-0.5	7/16/04	<0.07	<0.09	<0.07		0.7	
SB-1b DUP		7/16/04	<0.04	<0.04	<0.07	0.8	7.4	
SB-1b-1		STL	<0.17	7.3	<0.17	6.4	16	
SB-4b-1	0.5-1	7/16/04	<0.04	<0.03	<0.06	0.8	4.4	
SB-9b-2	0-0.5	7/16/04	<0.01	<0.01	0.7	4.6	8.5	
SB-10-2	0-0.5	7/16/04	<0.06	[illegible]	41.1	16	39	
SB-10-3	0.5-1	7/16/04	<0.04	[illegible]	<0.06	15	15	
SB-10-4	0-0.5	7/16/04	<0.03	<0.02	<0.02	<0.03	40.6	40.6
SB-10-5	0-0.5	7/16/04	<0.05	[illegible]	47	5.4	10	[illegible]
SB-10-6	0-0.5	7/16/04	<0.09	1.41	<0.06	1.11	1.01	2.2
SB-10-7	0-0.5	7/16/05	<0.04	<0.04	<0.06	3.7	7.3	[illegible]
SB-10-8	0-0.5	7/16/05	<0.03	3.61	<1.0	4.1	4.0	[illegible]
SB-10-9		STL	<0.69	1.97	<0.83	NA	NA	[illegible]
SB-15-9	0-0.5	7/16/05	<0.13	3.61	<0.07	3.6	4.21	[illegible]
SB-15-10	0-0.5	7/16/05	<0.09	[illegible]	<1.0	6.9	4.2	[illegible]
SB-15-12	0-0.5	7/16/05	<0.10	<0.03	<0.07	4.4	7.4	[illegible]
SB-15-15	0-0.5	7/16/05	<0.04	<0.03	<0.06	10.21	10.48	10.6
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 2-b: TRACT TA500-038 - SOIL ANALYTICAL DATA SUMMARY, SB-10 PAHs ONLY (detected constituents only)
PROJECT NAME: Biscayne Bay Coastal Wetlands
PSI PROJECT NO.: 552-SG173

Sample Info.			PAH																
Sample ID	Sample Interval (ft bls)	Sample date	2-Methylnaphthalene (ug/Kg)	Acenaphthene (ug/Kg)	Acenaphthylene (ug/Kg)	Anthracene (ug/Kg)	Benzo(a)anthracene (ug/Kg)	Benzo(a)pyrene (ug/Kg)	Benzo(b)fluoranthene (ug/Kg)	Benzo(g,h,i)perylene (ug/Kg)	Benzo(k)fluoranthene (ug/Kg)	Chrysene (ug/Kg)	Fluoranthene (ug/Kg)	Fluorene (ug/Kg)	Indeno(1,2,3-cd)pyrene	Naphthalene (ug/Kg)	Phenanthrene (ug/Kg)	Pyrene (ug/Kg)
SB-10-1		7/18/96	<5.4	<1.0	<2.0	<0.70	33	33	44	<5.4	30	13	28	<1.3	<3.6	<0.57	14	39
SB10 DUP	0-0.5	7/18/96	<5.6	<1.0	<2.0	<0.77	29	27	39	<5.6	26	16	32	<1.3	<3.7	<0.59	11	33
SB-10-1		STL	<22	<33	<16	<7.8	32	45	31	231	33	27	233	<7.8	<32	<0.6	24	32
SB-10-2	0-0.5	7/18/96	<6.7	<1.3	<2.4	<0.64	11	<0.2	<3.7	<3.7	<3.8	<1.8	141	<1.6	<1.5	<0.71	4.61	121
SB-10-3	0-0.5	7/18/96	221	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	310	242	416	[illegible]	[illegible]	32	202	30	[illegible]	[illegible]
SB-10-3	0.5-1	7/18/96	<4.8	[illegible]	[illegible]	36	[illegible]	[illegible]	212	133	193	[illegible]	310	121	108	<0.51	102	[illegible]
SB-10-4	0-0.5	7/18/96	<5.2	<0.99	<1.9	<0.72	18	13	21	<0.2	18	2.41	191	<1.2	<3.5	<0.55	3.51	141
SB-10-5	0-0.5	7/18/96	<5.7	<1.1	<2.0	15	56	63	83	33	34	46	86	7.83	33	<0.53	67	130
SB-10-7	0-0.5	7/18/96	<5.5	<1.0	<2.0	6.61	43	<1.8	<3.1	<3.0	<2.9	22	61	<1.3	<3.7	<0.59	21	123
SB-10-8	0-0.5	7/18/96	<5.8	<1.1	<2.1	<0.80	32	<1.8	<3.2	<3.8	<3.1	56	251	<1.3	<3.9	<0.57	11	43
SB-10-9		STL	<24	<69	<17	6.81	<7.4	38	81	141	34	38	70	<3.4	<24	<7.4	42	66
SB-10-10	0-0.5	7/18/96	<5.8	[illegible]	6.31	44	[illegible]	[illegible]	210	133	193	[illegible]	290	181	149	<0.62	102	[illegible]
SCTL-SPC			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
SCTL-LOW			6000	2100	27000	2300000	800	8000	24000	3200000	24000	17000	1200000	150000	6000	1200	250000	830000
SCTL-LOW			8100	1800	NA	400	NA	NA	NA	NA	NA	NA	1300	17000	NA	2200	NA	1300
SQAS-PEC			NA	59	130	850	1100	1500	NA	NA	NA	1300	2200	NA	NA	500	1200	1500
SQAS-TEC			NA	5.7	5.9	33	113	1150	NA	NA	NA	170	2.0	NA	NA	100	200	200

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

October 11, 2007

Robert Taylor
South Florida Water Management District
3301 Gun Club Road
West Palm Beach, Florida 33406

Dear Mr. Taylor:

The Fish and Wildlife Service (Service) has reviewed the document entitled, "Cutler Flow Way Summary Report," submitted by Professional Service Industries, Incorporated (PSI). This report combines into one document summaries of site assessments conducted for all properties within the Cutler Flow Way (CFW) project (Table 1).

Table 1. Properties comprising the Cutler Flow Way Project. Properties with an asterisk (*) have been reviewed separately by the Service.

Property	Acreage	Service concurrence	Historical Use	Current Condition
TA500-001 *	60		Agriculture	Vacant/overgrown
TA500-002 *	30		Agriculture	Vacant/overgrown
TA500-003 *	14.76	Yes	Agriculture	Vacant/overgrown
TA500-022 *	77	Yes	None	Coastal wetland
TA500-023 *	112.76	Yes	None	Coastal wetland
TA500-024 *	79.18	Yes	None	Coastal wetland
TA500-025 *	77	Yes	None	Coastal wetland
TA500-027 *	53	Yes	None	Coastal wetland
TA500-028	12.2		Agriculture	Coastal wetland
TA500-030	393.4		Agriculture	Coastal wetland
TA500-031	28.4		Agriculture	Coastal wetland
TA500-032	107.5		Agriculture	Coastal wetland
TA500-033	10.9		Agriculture	Road right-of-way
TA500-039	9.8		Agriculture	Vacant/overgrown
TA500-053	12.7		Agriculture	Vacant/overgrown
TA500-062 *	35.95		Agriculture	Closed landfill
GZ300-012	32		Agriculture	Coastal wetland
GZ300-013 *	275	Yes	Agriculture	Coastal wetland
GZ300-015 *	376	Conditional	Agriculture	Coastal wetland

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blue heron (*Egretta caerulea*). However, the latest design includes construction of a pump station, access road, and above grade channel on the property instead of wetlands. Therefore, PSI compared the DDX concentrations to the State of Florida's Soil Cleanup Target Levels and determined remediation on Tract TA500-002 was unnecessary. PSI recommended (1) a soil management plan be developed to ensure that DDX impacted soils are not moved to locations where wetlands will be intentionally created, and (2) removal of DDX contaminated soils if plans for Tracts TA500-001 and -002 are changed to include intentional wetland creation.

This summary document reported data from a site assessment conducted on properties not previously reviewed by the Service (TA500-028, -030 through -033, -039, -053, and GZ300-012). The Service requested and received the site assessment (dated January 23, 2006) for those properties so that it could evaluate together all properties in the CFW project that will be rehydrated (Tracts TA500-022 through -028, TA500-030 through -033, and GZ300-012, -013, and -015). A total of 22 composite samples were collected from these properties. No samples were collected from tracts TA500-022 through -025, and -027 because there was no evidence of current or historical activities on them. Contaminants with detections exceeding sediment quality assessment guideline values are reported in Table 2.

Table 2. Detection frequency and contaminant concentrations (mg/kg dry weight) in samples collected from properties that will be rehydrated (Tracts TA500-022 through -028, TA500-030 through -033, and GZ300-012, -013, and -015).

Contaminant	Detection Frequency	Concentration Range	Number of TEC exceedences (TEC)
DDE	4/22	0.00075 – 0.006	1 (0.0032)
Arsenic	19/22	1.75 – 10.8	6 (9.8)
Barium	22/22	6.44 – 30	1 (20)
Cadmium	21/22	0.818 – 8.48	20 (1)
Chromium	22/22	3.38 – 54.2	1 (43)
Lead	22/22	1.36 – 59.9	10 (36)
Silver	14/22	0.448 – 1.43	2 (1)
Mercury	22/22	0.0227 – 0.342	2 (0.18)
Copper[1]	8/8	4.1 – 28.3	0 (32)
Copper[2]	125/137	2.87 – 594	31 (32)

[1] Composite sample data for tracts TA500-028, -030 through -033, and GZ300-012.
[2] Discrete sample data for tracts GZ300-013 and -015.

Thank you for the opportunity to review this report for the Cutler Flow Way project. Please contact Dr. Tim Bargar at 772-562-3909, extension 315, if you have any questions regarding this review.

Sincerely yours,

Robert Frakes

for Paul Souza
Field Supervisor
South Florida Ecological Services Office

Enclosures

cc:
PSI, Tampa, Florida (Stephen Long) w/o enclosures
Corps, West Palm Beach, Florida (Tori White) w/ enclosures

010922

Florida Department of

Memorandum **Environmental Protection**

TO: Paul Wierzbicki, P.G.
Southeast District Office

THROUGH: Brian Dougherty, Administrator
Program & Technical Support Section, BWC

FROM: Mark Stuckey, P.G.
Program & Technical Support Section, BWC

DATE: September 10, 2007

SUBJECT: Biscayne Bay Coastal Wetlands Parcel GZ300-039; Miami-Dade County; Phase I/II Environmental Site Assessment, dated August 2007

The following comments are based on my review of the subject document, and are provided for use by District personnel in the evaluation of this submittal.

Non-point Source Sampling Results

- The subject parcel of about 8 acres in size was divided into two subareas for soil sampling. One composite sample was taken at the northwest corner of the site which has received fill material. Another composite sample was taken in the heavily vegetated portion of the site east of the filled area, and is representative of the majority of the parcel. There were no point source areas for contamination identified during the assessment.

- Arsenic was detected in the fill area sample above the residential soil cleanup target level, and the report recommendation is to perform additional testing for arsenic in the fill soils to better define the extent. DDE was also detected above the ecological threshold effects concentration, but this is not considered a significant risk since the fill area is not likely to be inundated for any prolonged period of time.

- Mercury, chromium and selenium were detected in one or both composite samples above the leachability to surface water criteria. The report recommends resampling with analysis by SPLP to ensure that these metals will not be leachable from site soil to surface water at concentrations likely to cause ecological impacts. I would recommend that both total metals and SPLP analysis be performed on the proposed additional samples to provide a comparison.

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Memorandum

Florida Department of
Environmental Protection

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TO: Paul Wierzbicki, P.G.
Southeast District Office

THROUGH: Brian Dougherty, Administrator
Program & Technical Support Section, BWC

FROM: Mark Stuckey, P.G.
Program & Technical Support Section, BWC

DATE: May 8, 2007

SUBJECT: Biscayne Bay Coastal Wetlands Parcel TA500-018; Miami-Dade County; Phase I/II Environmental Site Assessment, dated April 2007.

The following comments are based on my review of the subject document, and are provided for use by District personnel in the evaluation of this submittal.

Non-point Source Sampling Results

- The subject parcel of about 68 acres in size was divided into 6 subareas for soil sampling. This resulted in one sample per 11.4 acres for the investigation, and that is a very low sampling density if future land use requires that direct human exposure be considered.

- The only site wide contaminant of concern is mercury in soil. It was consistently detected at concentrations above the leachability to surface water criteria. In many other CERP related document I have reviewed, mercury detected above surface water screening criteria is attributed to regional impacts, and was dropped from further consideration with the recommendation that data from the assessment be made available to "the South Florida Mercury Science Program" for further study. Such recommendation was not included in this report. SPLP analysis was performed on sample "Split-1 (SS-3)", and the result was below the surface water criteria.

- Arsenic was detected slightly above the residential direct exposure risk level at one soil sampling location. Further evaluation for arsenic is recommended if a residential land use is a future consideration.

Point Source Area(s)

- One fugitive dump area was identified that contained mostly discarded household trash, and it was determined to not represent a significant point source for contamination.

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FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

May 1, 2007

Robert Taylor
South Florida Water Management District
3301 Gun Club Road
West Palm Beach, Florida 33406

Dear Mr. Taylor:

The Fish and Wildlife Service (Service) has reviewed the document entitled, "Phase I and Phase II Environmental Site Assessment Biscayne Bay Coastal Wetlands Parcel: TA500-018," submitted by Professional Service Industries, Incorporated (PSI).

Parcel TA500-018, a 68.5 acre property located in southeast Miami-Dade County, will be reverted to historical wetlands as part of the Biscayne Coastal Wetlands Project. The property is heavily overgrown with no evidence of current activities. Agricultural activity is documented to have occurred on the property beginning in the early 1950s, but that ceased in the late 1960s. No structures indicative of past activities, other than drainage ditches for mosquito control, were found on the property. A small amount of solid waste, largely residential, was found in the southwest corner of the property. The only identified potential concern for the property was residual agricultural chemicals from past farming activities.

PSI stated that soil sampling procedures followed the site assessment protocol for properties less than 500 acres (one discrete soil sample per 10 to 20 acres). Six discrete soil samples, one per 11.4 acres, were collected and submitted for analyses. Each sample was a close proximity composite sample; "Within each cell, PSI collected 1 sub-sample from the center of the grid and 4 additional sub-samples from approximately 5 feet away in each of the cardinal directions." The sample submitted for analysis was taken from the composited sub-samples. Each sample was analyzed for organochlorine pesticides, chlorinated herbicides, organophosphate pesticides, the eight RCRA (Resource Conservation and Recovery Act) metals, and copper. No contaminants were detected in any soil sample at concentrations that exceeded sediment quality assessment guidelines for impacts to benthic invertebrates. Based on these results, PSI recommended no further assessment for the property. Provided that the solid waste is removed from the property, the Service concurs that this property is suitable for its intended purpose of wetland restoration.

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Center for Environment & Human Toxicology

PO Box 110885
Gainesville, FL 32611-0885
352-392-4700, ext. 5500
352-392-4707 Fax

June 13, 2007

Ligia Mora-Applegate
Bureau of Waste Cleanup
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Re: Cutler Flow Way Summary Report

Dear Ms. Mora-Applegate:

At your request, we have reviewed *Cutler Flow Way Summary Report for Biscayne Bay Coastal Wetlands Project, Miami-Dade County, Florida*. Professional Service Industries, Inc prepared this report on April 20, 2007. The current assessment serves to summarize all activities within the Cutler Wetlands Flow Way portion of the Biscayne Bay Coastal Wetlands (BBCW) project based on all environmental reports for the area. Based on our review, we have the following comments:

1. Section 3.1 suggests the use of commercial/industrial SCTLs as screening levels for recreational use of the property. Calculation of park specific SCTLs usually results in a lower concentration than the commercial SCTLs due to the exposure of children, a more sensitive receptor. In the absence of site-specific SCTLs we recommend direct contact residential SCTLs for screening.

2. On page 11, the criteria listed for PAHs are SQAG-PEC criteria that represent concentrations above which adverse effects are probable. If these values are used as RBCs, they should be used as a not-to-exceed value. We cannot comment on the risk based concentrations (RBCs) listed for OCPs because we have not seen the methodology used to create these values. However, they are up to 20 times greater than the PEC, suggesting widespread effects to the benthos.

3. On page 11, 85 mg/kg was used as the screening value for copper. The snail kite is a species of concern, but not the only species of concern. The copper TEC of 32 mg/kg for the protection of benthic organisms should have been used as the screening value if the goal is to be broadly protective of environmental receptors.

4. All samples that are provided in Appendix C (Parcels TA500-003, TA500-028, TA500-030, TA500-031, TA500-032, TA500-033, TA500-053, GZ300-012) under the Phase II ESA dated January 23, 2006, appear to be composite samples of the parcels and, in some cases, the composite samples are mixed with other non-adjacent parcels. It is unclear how results can be tied to a specific parcel if the samples are combined with other parcels. The corrective actions proposed for each of the above parcels may need to be investigated further if based on results from Appendix C. Using composite samples is not recommended. A composite of ten subsamples can include areas with concentrations up to ten times the screening value and not lead to designation of the chemical as a COC.

5. In Parcels TA500-003, -028, -030, -031, -032, -033, and GZ300-012, chromium and mercury concentrations exceed the leachability to surface water, not groundwater.

6. In Parcel TA500-001, arsenic was also detected at levels above the SQAG-TEC. While the OCPs may not present a significant ecological or human health risk, the arsenic does. It is above both residential (2.1 mg/kg) and park (5.5 mg/kg) criteria.

7. For parcel TA500-062, which contained a construction and demolition debris landfill, soil from SB-10 exceeds the residential SCTL for arsenic. The proposal to stockpile the soil for further use in upland construction may be inappropriate. Additionally, no SPLP data were presented so it is unclear if the concentrations are below criteria for leachability to groundwater. Sample SB-9 (4-6 ft) appears to have benzo(a)anthracene and pyrene SQAG-PEC exceedances. It is not clear if these exceedances were addressed.

8. For parcel GZ300-012, a single ten point composite was used for a 32 acre plot. For parcel GZ300-013 and GZ300-015 samples were composited to represent 55-acre grids. There is concern that this sampling technique may not be representative of the actual contamination.

9. We agree with the statement (pg 40): "it is likely that some impairment in the benthic community exists currently and will continue to exist after project completion". In Parcels GZ300-012 and -013, cadmium concentrations are above the SQAG-PEC. In Parcel GZ300-015, the average cadmium concentration is above the SQAG-TEC.

10. In Section 4.20 (pg.30) shallow soil samples were collected from around wells that had initially exceeded arsenic GCTLs. The purpose was to determine if the arsenic in the soil was leaching into groundwater. The arsenic concentrations in the soil were compared to the SQAG-TEC and the SQAG-PEC. It is unclear how these criteria relate to leachability. No SPLP data were reported.

Please let us know if you have any questions regarding this review.

Sincerely,

Stephen M. Roberts, Ph.D.

Kendra F. Goff, Ph.D.

Leah Stuchal, Ph.D.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

June 5, 2007

Robert Taylor
South Florida Water Management District
3301 Gun Club Road
West Palm Beach, Florida 33406

Dear Mr. Taylor:

The Fish and Wildlife Service (Service) has reviewed the document entitled, "Phase I and Phase II Environmental Site Assessment Biscayne Bay Coastal Wetlands Tracts GZ200-005 through 009, TA500-022 through -025, TA500-027 and TA500-054," submitted by Professional Service Industries, Incorporated (PSI).

The assessed tracts (GZ200-005, -006, -007, -008, -009, TA500-022, -023, -024, -025, -027, and -054) comprise 1,613.92 acres along Biscayne Bay, just north of Biscayne National Park in southeast Miami-Dade County. The tracts are divided by South Florida Water Management District canals, and contain no evidence of current activities.

PSI identified several potential environmental concerns for these tracts. It was believed, despite the lack of photographic evidence, that four of the tracts (GZ200-005 through -008) may have been farmed since they are dry and other areas in the Biscayne Bay Coastal Wetlands project area were farmed historically. The remaining tracts are along the coast and are primarily mangrove wetlands, limiting the type of activities that may occur on them. Several nurseries on adjacent properties may have introduced pesticides onto the subject tracts. Illicit dump sites of discarded furniture and construction debris were observed on adjacent properties. The former Miami-Dade County landfill is located 1.5 miles to the west of the subject properties. Groundwater sampling wells off-site indicated that groundwater contamination (ammonia) from the now closed landfill has not reached the subject tracts. Evidence of point sources typical of agricultural operations (above ground storage tanks, storage sheds, chemical mix-load locations) was not found on any of the properties. Therefore, only the potential farming activities and the adjacent nurseries were believed to be environmental concerns warranting further investigation.

All soil sampling was limited to the four tracts (comprising 565 acres) thought to have been previously farmed. These tracts were divided into 14 approximately 50-acre grids. Seven to 12 discrete soil samples (one per 5 acres) were collected and composited for each grid, yielding 14 composite samples total for the tracts. The composite samples were submitted for determination of organochlorine pesticide, chlorinated herbicide, organophosphate pesticide, and eight RCRA (Resource Conservation and Recovery Act) metals. In addition, a second set of discrete samples was collected from the same locations as the composited discrete samples. Each discrete sample from the second set was submitted for copper analysis.

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

May 4, 2007

Robert Taylor
South Florida Water Management District
3301 Gun Club Road
West Palm Beach, Florida 33406

Dear Mr. Taylor:

The Fish and Wildlife Service (Service) has reviewed the document entitled, "Phase I and Phase II Environmental Site Assessment for the Biscayne Bay Coastal Wetlands Deering Estate Powers Parcel," submitted to the South Florida Water Management District (District) by Professional Services Industries, Inc. (PSI).

Located in southern Miami-Dade County, the subject property will be converted to an educational wetland. A feeder canal will bring water to the property from the C-100 canal to the west. The educational wetland will be constructed on the southern half of the property while the northern half of the property will remain as upland hardwood hammock. A gravel parking lot will be constructed along the east-central edge of the property.

The property is bordered on the north, west, and south by residential properties. It is bordered on the east by Old Cutler Road and Deering Estate County Park. A house is located in the northwest portion of the property while a tree nursery is located on the southern half. Potential ecological concerns noted upon reconnaissance of the property were several 55 gallon drums with surrounding stained soils, an above ground storage tank (AST), and the nursery where agrichemicals may have been used.

PSI divided the property into four, approximately 2.5 acre quadrants for assessment purposes. A single discrete soil sample was taken from each quadrant for chemical analysis. Discrete samples SB-1 and SB-2 were collected from the northern half of the property while samples SB-3 and SB-4 were collected from the southern half. No chemicals detected in samples SB-3 or SB-4 exceeded sediment quality assessment guideline (SQAG) values. DDE concentrations in SB-1 (9.4 ug/kg) and SB-2 (4.6 ug/kg), and copper in SB-2 (130 mg/kg) exceeded threshold effects SQAG values. Sampling at the AST location found no chemicals of ecological concern.

The Service does not believe contamination detected to date on the property presents a significant risk to its trust resources. No contamination in soils from the two samples in the area of the future wetland exceeds concentrations that would impact benthic organisms, and while DDE and copper exceed SQAG values in the two samples from the northern half of the property, that portion of the property will not be converted to wetland. Therefore, the Service concurs that the property is suitable for its intended purpose.

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070170

Florida Department of

Memorandum **Environmental Protection**

TO: Paul Wierzbicki, P.G.
Southeast District Office

THROUGH: Brian Dougherty, Administrator
Program & Technical Support Section, BWC

FROM: Mark Stuckey, P.G.
Program & Technical Support Section, BWC

RECEIVED
FEB 12 2007
Dept of Env Protection
West Palm Beach

DATE: February 2, 2007

SUBJECT: Biscayne Bay Coastal Wetlands Project, Phase I Cutler Flow Way; Additional Assessment Report and Corrective Action Plan

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The following comments are based on my review of the subject document, and are provided for use by District personnel in the evaluation of this submittal.

- Previous sampling at location P-133 within parcel GZ300-015 indicated elevated copper in soil above all applicable screening criteria. Recent sampling did not confirm the previous result, and so further assessment or remedial action for copper in soil does not appear warranted based on the interim risk based concentration of 85 mg/kg acceptable to the USFWS. This screening level concentration is below the probable effects concentration (PEC) of 150 mg/kg acceptable to FDEP for screening of sediments, but is above the threshold concentration (TEC) of 32 mg/kg for no adverse ecological effects. Previous sampling results did indicate that much of the near surface soil on this parcel is enriched with copper above the TEC, and no further assessment or remedial action is planned. This risk management decision was based on use of site specific ecological risk assessment derived screening criteria (SLERA RBCs), and the fact that the parcel is covered by mature coastal mangrove trees.

- Removal of landfill debris located on Tract TA500-038 was reportedly conducted under a Solid Waste Removal Plan approved by Dade County Environmental Resource Management (DERM). What remains is a large pit approximately 3 feet below grade, and it contains standing water. Subsequent soil sampling across the former landfill area was reportedly conducted within 29 grids. The sampling results from one location, SB-10, were anomalously high. Planned removal of contaminated soil within grid SB-10, an approximate 200' x 200' area, should reduce the risk of adverse ecological effects at that location, but still leaves soil/sediment in place across the rest of the site with contaminant concentrations that are above TECs. The report does not state whether or not any contaminants in the other 28 grid samples exceeded a PEC value, but rather states that a screening level ecological risk assessment was presented in a Supplemental Phase II ESA that concluded "there was no significant ecological risk associated with the presence of arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, chlordane, or DDE." Also, DERM is reportedly addressing contaminants in groundwater as part of the landfill closure.

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MEMORANDUM
Paul Wierzbicki
Page Two

- Regarding Tract TA500-001, it is stated in Section 2.3 that "The results indicated the presence of DDT, DDE, DDD and total chlordane at 5 locations including very high concentrations at SB-6." I could not find the very high concentrations listed for location SB-6 on the report figures or tables in Appendix A. However, the follow-up sampling results reportedly do not exceed any of the risk based contaminant concentrations used for the study. No further assessment or remedial action is recommended for this parcel.

- Contaminant concentrations in soil detected on Tract TA500-002 were above sediment quality screening criteria, but are below the industrial direct exposure and leachability to groundwater cleanup target levels. Therefore, a soil management plan is proposed for Tract TA500-002 to ensure that site soil is not relocated offsite to any area that has the potential to become inundated, or is otherwise not suitable.

Summary Discussion
The soil cleanup criteria selected for individual parcels was based on the anticipated future land use for each. It is now planned that two parcels, Tracts TA500-001 and TA500-002, will not be inundated as originally thought. Therefore, the selected screening criteria consisted of leachability to groundwater, industrial/commercial direct exposure, and USFWS ESVs. The Tracts GZ300-15 and TA500-038 already are inundated, and the selected screening criteria for risk evaluation consisted of site specific SLERA RBCs, industrial/commercial direct exposure, and leachability to groundwater. I believe the leachability to surface water criteria would have been more appropriate to include for the two inundated parcels, and this may or may not have altered the corrective action decisions made for one or both parcels.

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070150

Florida Department of
Environmental Protection

Memorandum

TO: Paul Wierzbicki, P.G. Waste Supervisor
Southeast District, Division of Waste Cleanup

THROUGH: Brian Dougherty, Ph.D., Environmental Administrator,
Program & Technical Support Section, BWC

FROM: Esen Momol, Ph.D., Environmental Scientist, em
Program & Technical Support Section, BWC

DATE: January 30, 2007

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FEB 06 2007
Dept of Env Protection
West Palm Beach

SUBJECT: Biscayne Bay Coastal Wetlands
Deering Estate Powers Parcel
15850 Old Cutler Road, Miami-Dade County
Phase I and Phase II Environmental Site Assessment and Phase II Environmental Assessment Report Addendum dated November 15, 2006

I reviewed the subject Phase I and Phase II Environmental Site Assessment dated November 15, 2006 (received January 18, 2007) prepared by Professional Service Industries, Inc.

I have the following comments for your considerations for your consideration:

1. The samples collected for laboratory analysis were held beyond the accepted time and the reported values failed to meet the established quality control criteria for precision and accuracy. The reporting limits for the leachates by SPLP analysis for aldrin, dieldrin, gamma chlordane, and endrin were higher than the respective GCTL. It is recommended that samples be collected from the same locations and laboratory analysis be repeated with appropriate reporting limits for pesticides.

2. A Physical Setting Source Map exhibited 5 wells within ¼-½ mile radius of the site but Geocheck cited 14 wells within ¼-½ mile radius of the site. Were those wells sampled?

3. The protocol developed by South Florida Water Management District and US Fish and Wildlife Service was followed but this protocol is under review. The property was divided into 2.5 acre quarters and one discrete soil sample from a depth of 0-6 inches from each quarter was collected for laboratory analysis. The results indicated that beta-BHC concentrations were above the SCTL for leachability at SB-1, SB-2, and SB-3 sampling locations, dieldrin and delta-BHC were above the SCTL for leachability at SB-2 sampling location, arsenic was above the SCTL for residential direct exposure at SB-1, SB-2 and SB-4 sampling locations, 4,4-DDT concentrations were above the SQAG-TEC at SB-2 sampling location, 4,4-DDE concentrations were above the SQAG-TEC at SB-1 and SB-2 sampling locations. It is recommended that COCs be delineated both vertically and horizontally.

4. Since pesticides are known to be bioccumulative, human and ecological risk assessment should be conducted to investigate the potential risk. I agree with their recommendation that potential remediation and further investigation can not be determined until development plans are reasonably complete.

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Phase II Environmental Assessment Report Addendum

▶ The soil sample collected from soil boring SB-2 from the northeast portion of the site that will be covered partially with gravel parking and drive way revealed arsenic above the SCTL for direct exposure, beta-BHC, delta-BHC, and dieldrin above the SCTL for leachability. The soil sample collected from SB-1 from the northwest portion that will be developed as wooded upland revealed arsenic concentrations above the SCTL for residential direct exposure, beta-BHC and delta-BHC above the SCTL for leachability. Since the both portions will be utilized by public, it is not appropriate to use Commercial/Industrial criteria. The Department has previously developed an arsenic level of 5.5 mg/kg for the recreational use scenario. It will be appropriate to consider the SCTL for recreational use and placing an institutional control on the property.

▶Arsenic concentrations exceeded the SCTL for residential direct exposure at SB-1 and SB-2 sampling locations. It is recommended that SPLP be conducted in samples collected from SB-1 and SB-2 to determine the potential leachability of arsenic into groundwater.

▶I agree with the consultants's recommendation that it does not appear that any remediation would be required for the intended use of this site. Some excavation of soils will be required to construct wetlands, canal extension and stormwater ponds at the southeast and southwest portions of the site. As PSI indicated, it is required to comply with health and Safety Plan and handle the arsenic impacted soils at the southeast and southwest portion of the site properly during excavation.

Please call me at (850) 245-7501 if you have questions.

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

June 8, 2006

Robert Taylor
South Florida Water Management District
3301 Gun Club Road
West Palm Beach, Florida 33406

Dear Mr. Taylor:

The Fish and Wildlife Service (Service) has reviewed the document entitled "Supplemental Phase II Environmental Site Assessment for the Biscayne Bay Coastal Wetlands Project, Miami-Dade County, Florida," prepared by Professional Service Industries, Incorporated. This document reports the findings from the sampling investigation conducted on the approximately 20-acre Lennar construction and demolition (C&D) landfill, which is proposed for use as part of the Biscayne Bay Coastal Wetlands Project. The Lennar C&D landfill was in operation from 1975 until 1993, and was reopened later the same year as a storage repository for Hurricane Andrew debris. All debris has been removed from the landfill and closure of the site is pending.

To evaluate possible soil contamination, a total of 20 discrete, surficial (0 to 6 inches below land surface) soil samples were collected throughout the landfill area. Analytical results were compared to Florida Department of Environmental Protection Sediment Quality Assessment Guidelines (SQAG) and the Florida Administrative Code Soil Cleanup Target Levels.

Low levels of metal contamination were detected at the landfill. Arsenic concentrations exceeded the SQAG threshold effects concentration (TEC) in 9 of 20 samples. In addition, barium, cadmium, and lead slightly exceeded their respective TEC. A screening level ecological risk assessment (SLERA) predicted no risk (hazard quotients (HQ) < 1) from metal contamination to any federal trust resource.

Organochlorine pesticide contamination was detected from the landfill area. Both alpha- and gamma-chlordane were detected at concentrations exceeding their respective TEC in 4 of 20 samples, one of which also exceeded the probable effects concentration (PEC). Concentrations of 4,4'-DDE were above the PEC in 1 sample and an additional 10 samples also exceeded the TEC (3.2 µg/kg). A SLERA predicted no risk (HQ < 1) to any aquatic avian fauna from exposure to the 95 percent upper confidence limit (UCL) concentration of organochlorine pesticides. Further delineation was recommended for sampling location SB-10, where alpha- and gamma-chlordane and 4,4'-DDE were above their respective PEC.

Several polycyclic aromatic hydrocarbons had calculated 95 percent UCLs above their respective TEC; however, all concentrations were well below the PEC. Since the concentration of pyrene

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(2 mg/kg) exceeded its PEC (1.5 mg/kg), PSI recommended further delineation for pyrene at the SB-10 sampling location.

After reviewing the analytical data, the Service concurs with the recommendation for further delineation at sampling location SB-10, where concentrations of alpha- and gamma-chlordane, 4,4'-DDE, and pyrene exceeded their PEC.

Thank you for the opportunity to provide comments regarding the Lennar C&D Landfill Property. If you have any questions, please contact Emily Boughner at 772-562-3909, extension 335.

Sincerely yours,

for Paul Souza
Acting Field Supervisor
South Florida Ecological Services Office

cc:
PSI, Tampa, Florida (Owen Thornberry)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

June 8, 2006

Robert Taylor
South Florida Water Management District
3301 Gun Club Road
West Palm Beach, Florida 33406

Dear Mr. Taylor:

The Fish and Wildlife Service (Service) has reviewed the document entitled "Phase I and Phase II Environmental Site Assessment for the Biscayne Bay Coastal Wetlands Project Tracts GZ300-011, -013, and -015" submitted by the South Florida Water Management District's (District) contractor Professional Service Industries, Incorporated (PSI).

These three tracts comprise 683 acres of heavily overgrown property in southeast Dade County. The property is intended to be incorporated within the Biscayne Bay Coastal Wetlands as part of the Cutler and Deering Estates Flow Ways (Flow Way). Surface water from the C-1 and C-100 canals will be redirected through the Flow Way towards Biscayne Bay in an effort to re-establish natural surface-water flow patterns. The eastern portion of the property is bordered by Biscayne Bay. The western portion of the property adjoins a former landfill, which will be included within the Flow Way, and an active water treatment facility.

Agriculture was the primary activity that occurred on the property from at least the mid-1950s until 1985. The land is currently fallow and is heavily overgrown in Brazilian pepper and mangrove.

Since no evidence of point source contamination exists on the property, only background contamination was assessed. Grab samples (137 total) were collected at a rate of one per five acres. The property was divided into 14 grids, with most being approximately 50-acres in size. The grab samples collected within each grid were composited for analysis of organochlorine and organophosphate pesticides, the eight Resource Conservation and Recovery Act metals, and selenium. Each grab sample was analyzed individually for copper.

The following table lists the contaminants detected in the collected samples. Metals were the most frequently detected contaminants. Threshold effects concentrations (TECs) for effects to benthic organisms were most frequently exceeded for copper, lead, and cadmium.

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Detection frequency and contaminant concentrations (mg/kg dry weight) in collected samples.

Contaminant	Detection Frequency	Concentration Range	Number of TEC Exceedences (TEC)
DDD	2/14	0.0015 – 0.0043	0 (0.0049)
DDE	4/14	0.00075 – 0.006	1 (0.0032)
DDT	6/14	0.0009 – 0.026	0 (0.0042)
Endrin	1/14	0.00047	0 (0.0022)
β-endosulfan	1/14	0.00052	N/A
Arsenic	14/14	1.75 – 20.5	3 (9.8)
Barium	14/14	7.06 – 30	1 (20)
Cadmium	14/14	0.818 – 2.68	12 (1)
Chromium	14/14	3.38 – 54.2	1 (43)
Lead	13/14	1.36 – 53.4	8 (36)
Silver	14/14	0.448 – 1.43	2 (1)
Mercury	14/14	0.0415 – 0.342	2 (0.18)
Copper	125/137	2.87 – 594	31 (32)

PSI performed food chain modeling for the maximum detected concentration for each contaminant. Only copper (594 mg/kg at P-133) resulted in a risk quotient (2.56) that indicated risk for birds. PSI recommended delineation of copper contamination at the location represented by grab sample P-133, followed by excavation and reuse of the soils elsewhere in the project area where it would not be inundated. PSI recommended the property for its intended purpose following remediation.

PSI also recommended further research into the brownfield area that encompasses Tract GZ300-015. A database search found no information indicating that the area was environmentally impacted. However, a recommendation was made that the District should further research the issue.

Service Comments and Recommendations

- The property-wide geometric mean cadmium concentration (2.06 mg/kg) exceeded its TEC (1 mg/kg). Therefore, cadmium contamination in the soils may impact benthic community development in the future wetland.
- Due to the overall low contamination level on the property, adverse impacts to aquatic dependent birds that may utilize the future wetland are unlikely.

US Army Corps
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FOR CONTINUATION OF HOUSE DOCUMENT 112-145

BISCAYNE BAY COASTAL WETLANDS FINAL INTEGRATED PROJECT IMPLEMENTATION REPORT AND ENVIRONMENTAL IMPACT STATEMENT

SEE VOLUME 6