

LOXAHATCHEE RIVER WATERSHED RESTORATION PROJECT
(LRWRP)

APPENDIX B
COST ENGINEERING AND RISK ANALYSIS

JANUARY 2020

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B. COST ESTIMATES

B.1 GENERAL INFORMATION

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

- Engineer Regulation (ER) 1110-1-1300, Cost Engineering Policy and General Requirements, 26 March 1993
- ER 1110-2-1302, Civil Works Cost Engineering, 30 June 2016
- 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 2017), Civil Works Construction Cost Index System, 31 March 2017
- CECW-CP Memorandum for Distribution, Subject: Initiatives to Improve the Accuracy of Total Project Costs in Civil Works Feasibility Studies Requiring Congressional Authorization, 19 September 2007
- CECW-CE Memorandum for Distribution, Subject: Application of Cost Risk Analysis Methods to Develop Contingencies for Civil Works Total Project Costs, 3 July 2007
- Cost and Schedule Risk Analysis Process, March 2008
- DCM

The objective of the cost estimates for the Loxahatchee River Watershed Restoration Project (LRWRP) is to present a Total Project Cost (Construction and non-Construction costs) for the recommended plan at the current price level to be used for project justification/authorization, and to escalate costs 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 defines the Government's and non-Federal sponsor's obligations.

The cost estimates used for plan selection rely on construction feature unit pricing obtained from the 2010 Cost Appendix developed by the Huntington District for the alternatives on the North Palm Beach County project (precursor to LRWRP), ARCADIS/MECCA cost estimate, and the MWH cost estimate for C-51 features; and escalated to FY19 dollars. A fully funded, escalated for inflation through project completion, cost estimate, (i.e. the Baseline Cost Estimate or Total Project Cost Summary), has also been developed.

B.2 PLAN FORMULATION COST ESTIMATES

The plan formulation is described in the Main Report. The final alternatives considered for the project are:

- **Alternative 2**
- **Alternative 5**
- **Alternative 5R**
- **Alternative 10**
- **Alternative 13**

B.2.1 Alternatives Description

- Alternative 2: This alternative includes: C-18W reservoir of 7,200 ac-ft; L-8 shallow storage area including cells 1, 2, 3, and a rehydration area; M-O canal with 100 cfs pump station; 2-well ASR system; structures G-160 and G-161; improvements to the canals at Ranch Colony and Cypress Creek; restoration of all components of the Gulfstream West property; improvements to Moonshine Creek, Gulfstream East and Kitching Creek; improvements to Pepper Farm / Hobe Farms drainage facilities; and restoration of the Nine Gems property; among other improvements.
- Alternative 5: This alternative includes: C-18W reservoir of 9,400 ac-ft; M-1 canal pump station; M-O Canal with 100 CFS pump station; a 4-well ASR system; improvements to the canals at Ranch Colony and Cypress Creek; restoration of all components of the Gulfstream West property; improvements to Moonshine Creek, Gulfstream East and Kitching Creek; improvements to Pepper Farm / Hobe Farms drainage ponds; restoration of Nine Gems property; structures at G-160 and G-161; Grassy Water Preserve; among other improvements.
- Alternative 5R: This alternative includes: Shiloh Farms & Mack Dairy Rd. spreader; C-18W reservoir of 9,400 ac-ft; M-1 canal pump station; M-O Canal with 100 CFS pump station; a 4-well ASR system; improvements to the canals at Ranch Colony and Cypress Creek; restoration of all components of the Gulfstream West property; improvements to Moonshine Creek, Gulfstream East and Kitching Creek; improvements to Pepper Farm / Hobe Farms drainage ponds; restoration of Nine Gems property; structures at G-160 and G-161; Grassy Water Preserve; among other improvements. **(RECOMMENDED PLAN)**
- Alternative 10: This alternative includes: C-18 reservoir of 7,200 ac-ft; C-51 reservoir of 44,000 ac-ft; M-O Canal with 100 CFS pump station; improvements to the canals at Ranch Colony and Cypress Creek; improvements to Moonshine Creek, Gulfstream East and Kitching Creek; Force Main; among other improvements.
- Alternative 13: This alternative includes: L-8 shallow storage area cells 1, 2, 3, and rehydration area; M-O Canal with 100 cfs pump station; a 4-well ASR system ; flowway across Avenir and Mecca; Pine Glades seepage barrier; improvements to the canals at Ranch Colony and Cypress Creek; restoration of all components of the Gulfstream West property; improvements to Moonshine Creek, Gulfstream East and Kitching Creek; improvements to Pepper Farm / Hobe Farms drainage ponds; restoration of Nine Gems property; Shiloh flowway and pump station; among other improvements.

B.2.2 Project Scope for Recommended Plan

The RECOMMENDED PLAN, Alternative 5R, consists of the following components:

- In the south and southeast: conveyance structures in the C-18 Canal, a pump station at the M-1 Canal, and earthwork to improve connectivity in the Grassy Waters Triangle.
- In the southwest and west: a 9,500 acre-foot above ground storage reservoir with pump stations and inflow and discharge canals, 4 co-located aquifer storage and recovery (ASR) wells; new canals, structures, and a pump station to connect the M-O Canal to the reservoir and wetland restoration in Loxahatchee Slough.

- In the north: Wetland restoration sites (Kitching Creek, Gulfstream East, Moonshine Creek, and Pal-Mar East) and a flow attenuation facility including a pump station.

The RECOMMENDED PLAN would deliver 98% of wet season restoration flow target and 91% of the dry season restoration flow target for the Northwest Fork of the Loxahatchee River. Restoration of season flows will reverse the trend of increasing salinity levels and help conserve the remaining riverine cypress habitat designated as the first National Wild and Scenic River in Florida. Restored flows will also promote recovery of important freshwater vegetation and estuarine zones that are important for Federally managed fish species, protected species and oysters.

The RECOMMENDED PLAN improves wetland hydrology in the Pal-Mar natural area complex and restore 17,000 acres of various types of agricultural land that are part of the historical Greater Everglades. An additional 9,500 acres of natural areas are improved in the J.W. Corbett WMA, Loxahatchee Slough, and Kitching Creek. The restoration actions also improve connectivity for over 78,000 acres of natural areas and restored wetlands that benefit many species of flora and fauna both endangered and important recreational species.

While the overall project purpose is ecosystem restoration, the wetland restoration components will provide multiple recreation and economic opportunities for the local areas in the form of hunting, fishing, boating, and other outdoor recreation.

B.2.3 Estimating Methodology

The MCACES/MII cost estimate for the Selected Plan is based on the pre-final Engineering Appendix and Plates provided. The estimate is formatted in the CWWBS.

The estimate include both construction and non-construction costs. The construction costs fall under the following feature codes:

- 02 – Relocations
- 03 – Reservoirs
- 08 – Roads, Railroads, and Bridges
- 09 – Channels & Canals
- 11 – Levees & Floodwalls
- 13 – Pumping Plants
- 14 – Recreation Facilities
- 15 – Floodway Control & Diversion Structures
- 19 – Building, Grounds & Utilities

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

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

The direct cost for project features was developed in the MCACES/MII estimate using labor, equipment, and materials for the majority of the cost items. However, some cost items are priced using parametric tools based on Historical data. The database line item productivities have been used where possible with productivity adjustments made as necessary. Where required, new crews

have been created using the appropriate number of equipment, size of equipment, and labor trades to fit the work activity.

The estimate assumes the prime contractor shall be a heavy civil contractor and will self-perform embankment placement, excavation, foundation drain installation for embankment and canal work. Seeding & Sodding be subcontracted.

The estimates assumes the prime contractor shall be a general contractor and will self-perform structural concrete and site preparation. The mechanical and electrical work will be subcontracted.

Crew productivity were adjusted as necessary for efficiency factor / weather delays. In addition, a 7% material sales tax markup has been included in the estimate.

The following prime contractor's markups were applied to the direct and sub-contractor's costs:

- Job Office Overhead - 20% Prime contractor; 20% Sub-contractor
- Home Office Overhead - 10.0% Prime contractor, 10% Sub-contractor
- Profit - 9.37% Prime contractor & Sub-contractor
- Performance Bond: 1.26% Table B

The risk analysis performed resulted in a 33% contingency. Additional information follows on the risk analysis. Major risk factors are shown in the sensitivity analyses. A Cost and Schedule Risk Analysis was conducted according to the procedures outlined in the following documents and sources:

- Cost and Schedule Risk Analysis Process guidance prepared by the USACE Cost Engineering MCX.
- Engineer Regulation (ER) 1110-2-1302 CIVIL WORKS COST ENGINEERING, dated September 15, 2008.
- Engineer Technical Letter (ETL) CONSTRUCTION COST ESTIMATING GUIDE FOR CIVIL WORKS, dated September 30, 2008.

Operations and Maintenance (O&M) cost for each of the project's features were considered for the Economic Analysis; O&M costs were omitted from the cost estimates but included in the Economic Analysis. Refer to the Main Report for additional details.

Non-construction costs include Real Estate, Planning, Engineering and Design (PED), and Construction Management (Supervision and Administration, S&A). All real estate costs were provided by Real Estate Division.

Planning, Engineering and Design cost were calculated based upon a percentage of 15.95%.

Construction Management cost were calculated based upon a percentage of 10.0%

B.2.4 Project Schedule

The project schedule was prepared by the cost engineer in collaboration with Project Management. The construction duration and sequence were established based on Historical Data. The construction schedule will be changed as the design of the project proceeds into plans and specifications phase. Once the contract is awarded, the contractor will provide a construction schedule which may differ from this draft schedule based on Historical data.

B.2.5 Total Project Cost Summary

The Total Project Cost Summary (TPCS) includes escalation through project completion. The MCACES/MII estimate is priced in today's dollars and does not contain escalation to midpoint of construction since this is incorporated in the TPCS.

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

B.3 SCHEDULE DEVELOPMENT

The project schedule include the construction and non-construction activities. The construction duration for the different features was developed using historical data. The sequencing was developed by analyzing the project features, benefits, and possible funding stream. See Attachment A for schedule.

B.4 RISK AND UNCERTAINTY ANALYSIS

B.4.1 Risk Analysis Methods

The risk analysis process for this study followed the USACE Headquarters requirements as well as the guidance provided by the Cost Engineering Directory of Expertise for Civil Works (Cost Engineering DX). The risk analysis process reflected within this report uses probabilistic cost and schedule risk analysis methods within the framework of the Oracle Crystal Ball software application. 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. The most likely 'high,' and 'low' values were assigned to estimate items using the software's 'Assumption' function and the triangular distribution. 'Forecasts' were then defined and the model was run.

After the model was run the results were extracted from the sensitivity chart, the forecast chart and the percentiles table for major items. The percentiles were then used to determine the contingency at the 80% confidence level. The appropriate contingency was then applied to the MCACES/MII estimate for the Selected Plan, producing the 'After Risk Analysis' cost estimate contained herein. Upon completion of this estimate the Total Project Cost Summary was prepared.

B.4.2 Risk Analysis Results

Results of the risk analysis are shown in Attachment B. First, the risk register is presented, then results are given for the construction costs and the schedule. For each major item studied, the results include a sensitivity chart, a percentile table including the most likely cost and contingencies. Finally, a table is shown providing contingencies.

B.5 TOTAL PROJECT COST SUMMARY

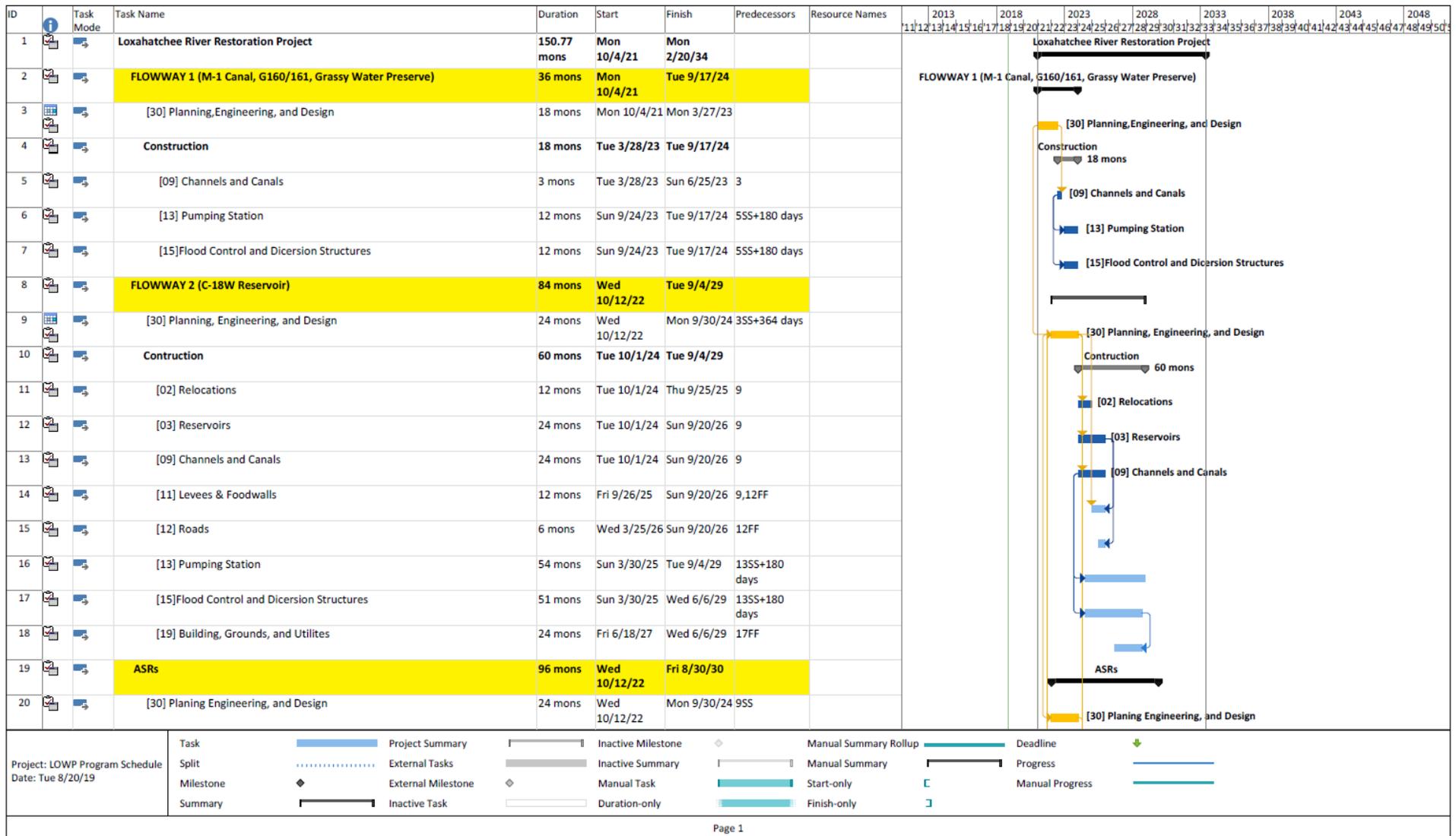
The Total Project Cost Summary (TPCS) addresses inflation through project completion (accomplished by escalation to mid-point of construction per ER 1110-2-1302, Attachment C, Page C-2). It is based on the scope of the RECOMMENDED PLAN and the project schedule. The TPCS includes Federal and non-Federal 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, 30 September 2010) factors for escalation of PED and S&A costs.

Attachment C shows the Cost Agency Technical Review certification including the Total Project Cost Summary prepared using the MCACES/MII cost estimate on the RECOMMENDED PLAN with contingencies set by the risk analysis (and the exceptions as described above) and the official project schedule.

ATTACHMENTS

ATTACHMENT A – Project Schedule



ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names	Timeline											
								2013	2018	2023	2028	2033	2038	2043	2048				
21	ASR Construction	72 mons	Tue 10/1/24	Fri 8/30/30				ASR Construction 72 mons											
22	[13] Pumping Plant, Aquifer Storage and Recovery (ASR)	72 mons	Tue 10/1/24	Fri 8/30/30	20			[13] Pumping Plant, Aquifer Storage and Recovery (ASR)											
23	FLOWWAY 3 (Gulf Stream West, Nine Gems, Mack Dairy, Culpepper)	102 mons	Fri 10/11/24	Fri 2/25/33				FLOWWAY 3 (Gulf Stream West, Nine Gems, Mack Dairy, Culpepper)											
24	[30] Planning, Engineering, and Design	24 mons	Fri 10/11/24	Wed 9/30/26	9			[30] Planning, Engineering, and Design											
25	Construction	78 mons	Thu 10/1/26	Fri 2/25/33				Construction 78 mons											
26	[09] Channels and Canals	18 mons	Thu 10/1/26	Thu 3/23/28	24			[09] Channels and Canals											
27	[11] Levees & Foodwalls	60 mons	Thu 10/1/26	Thu 9/4/31	24			[11] Levees & Foodwalls											
28	[12] Roads	6 mons	Sun 3/9/31	Thu 9/4/31	27FF			[12] Roads											
29	[13] Pumping Station	30 mons	Tue 3/30/27	Fri 9/14/29	26SS+180 days			[13] Pumping Station											
30	[15] Flood Control and Dicsersion Structures	72 mons	Tue 3/30/27	Fri 2/25/33	26SS+180 days			[15] Flood Control and Dicsersion Structures											
31	[19] Building, Grounds, and Utilites	3 mons	Sun 11/28/32	Fri 2/25/33	30FF			[19] Building, Grounds, and Utilites											
32	FLOWWAY 4 (Hobe Grove, Kitching Creek)	42 mons	Thu 10/12/23	Wed 3/24/27				FLOWWAY 4 (Hobe Grove, Kitching Creek)											
33	[30] Planning, Engineering, and Design	18 mons	Thu 10/12/23	Thu 4/3/25	9SS+365 days			[30] Planning, Engineering, and Design											
34	Construction	24 mons	Fri 4/4/25	Wed 3/24/27				Construction											
35	[09] Channels and Canals	6 mons	Fri 4/4/25	Tue 9/30/25	33			[09] Channels and Canals											
36	[15] Flood Control and Dicsersion Structures	18 mons	Wed 10/1/25	Wed 3/24/27	35SS+180 days			[15] Flood Control and Dicsersion Structures											
37	RECREATION	12 mons	Sat 2/26/33	Mon 2/20/34				RECREATION											
38	Construction	12 mons	Sat 2/26/33	Mon 2/20/34				Construction											
39	[14] Recreation	12 mons	Sat 2/26/33	Mon 2/20/34	30			[14] Recreation											

Project: LOWP Program Schedule Date: Tue 8/20/19	Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
	Split		External Tasks		Inactive Summary		Manual Summary		Progress	
	Milestone		External Milestone		Manual Task		Start-only		Manual Progress	
	Summary		Inactive Task		Duration-only		Finish-only			

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ATTACHMENT B.1 – Cost & Schedule Risk Assessment

CREF	Risk/Opportunity Event	Risk Event Description	PDT Discussions on Impact and Likelihood	Project Cost			Project Schedule		
				Likelihood ©	Impact ©	Risk Level ©	Likelihood (S)	Impact (S)	Risk Level (S)
Organizational and Project Management Risks (PM)									
PM1	Yearly Appropriations - Fed	What is likelihood of Federal fundings issues?	<p>Getting a \$40M appropriation yearly can be a challenge, for acquisition. Congressional budget uncertainty and lateness could result in several 6 month funding delays over the length of this project.</p> <p>Constant changing of priorities. Funding could be taken from other projects to cover this risk, but the risk is that another project could take this funding.</p> <p>If there is a situation where either the Sponsor or USACE doesn't receive funding but the other does, the project can continue to operate with these reduced funds.</p> <p>Impact would be for repackaging the currently scheduled contracts to these reduced funding levels.</p>	Likely	Marginal	Medium	Likely	Critical	High
PM2	PED Labor Availability	Impact from a lack of PED labor available locally.	<p>This risk is for the impact of no available labor. If this labor is not done by the district but by an AE, this is modeled under Risk PM 4 Project Execution.</p> <p>Unplanned work could pull PED labor away. Solutions include sharing work with other districts and A/Es.</p>	Unlikely	Negligible	Low	Unlikely	Negligible	Low
PM3	Vertical Chain Approval and Review	Authorization of this project by Division and HQ as appropriate.	<p>Don't foresee any problems with approval. Based on the long term schedule these shorter delays will not have an impact on the project schedule.</p> <p>After authorization this isn't an issue.</p>	Unlikely	Negligible	Low	Unlikely	Negligible	Low
PM4	Project Execution	There is the potential SAJ could have multiple large projects concurrently in construction, resulting in potential schedule delays due to the districts inability to execute several hundred million in work yearly.	<p>Project execution due to workload districtwide could be an impact. Priority is for the large projects, this one would be a medium to small sized project.</p> <p>Stakeholders can have an impact on raising the visibility on this project.</p> <p>Schedule is a 2 year potential delay due to design reviews.</p> <p>This should not be doubled up as a Sponsor risk.</p>	Likely	Marginal	Medium	Very Likely	Critical	High
Contract Acquisition Risks (CA)									
CA1	100% USACE Acquisition	All contract acquisition performed by USACE, none by the Sponsor	<p>Current estimate assuming 100% contracting by USACE with 50/50 funding from the Sponsor.</p> <p>Potential credit if sponsor does some of the acquisition, which is possible, because Sponsor acquisition is typically less expensive. May revisit this risk later or in later years.</p>	Unlikely	Negligible	Low	Unlikely	Negligible	Low
CA2	Contract Acquisition Strategy	Design bid build, assume several contracts	<p>The current strategy is design, bid, build and is represented in the baseline cost estimate. Small Business Administration for 20% of the project is likely.</p> <p>Possible some of the remote sites could be design-build.</p>	Very Likely	Moderate	High	Unlikely	Negligible	Low

CREF	Risk/Opportunity Event	Risk Event Description	PDT Discussions on Impact and Likelihood	Project Cost			Project Schedule		
				Likelihood @	Impact @	Risk Level @	Likelihood (S)	Impact (S)	Risk Level (S)
CA3	Multiple Contracts	Additional contract(s) could lead to additional procurement cost and schedule.	<p>Would necessitate multiple contracting actions. Would require action from the whole PED team.</p> <p>Chances are the C18W reservoir and associated structures would be awarded as one large contract and this is 129M total (about 50% of the total).</p> <p>ASRs would be a separate contract.</p> <p>Remaining would be in 5 or 6 contracts.</p> <p>If this needs to be split further it could impact the schedule.</p>	Very Likely	Marginal	Medium	Very Likely	Negligible	Low
CA4	Bid Protest	Protests on contracts of this magnitude are always a possibility.	<p>Typical protest here in SAJ could result in a 6 month delay. Typical to get a protest or two every year, with ~100 actions this is <2% probability.</p> <p>The one large contract from CA3 would be the biggest impact, 128M procurement.</p>	Unlikely	Moderate	Low	Unlikely	Critical	Medium
CA5	Market Conditions and Bidding Climate	Good pool of construction contractors	No impact expected. Large enough project that will attract many qualified contractors.	Unlikely	Negligible	Low	Unlikely	Negligible	Low
General Technical Risks (TR)									
TR1	Limited Geotechnical Data for Levees	Side slopes, levee configuration design considerations can differ depending on the local geotechnical data	<p>We currently have a fair amount of data for the C18W reservoir, enough for the PIR phase. Using geotech data from other projects/agencies that are local to this project.</p> <p>Not enough data for Flowway 1 and 3. Estimate quantity of additional excavation and import fill based on feature foot prints.</p> <p>Flowway 2; On levee L111 we don't know if the current spoil base is adequate to build upon or will it need to be removed. Currently it is 45% keep the spoil base. ** Will update the estimate to capture this cost. Will also look at spoils.**</p> <p>No geotech data for other structures.</p>	Likely	Moderate	Medium	Likely	Negligible	Low
TR2	Soil HTRW	Contaminated soil	Did a phase 1 HTRW, nothing found. Some small cleanup items that are the Sponsor responsibility and not cost creditable.	Unlikely	Negligible	Low	Unlikely	Negligible	Low
TR3	Water Diversion	Diversion of water during construction	<p>Water diversion hasn't been incorporated into the project schedule. Impacts not likely, perhaps in Cypress Creek Canal, which is a large structure in an existing canal. There is plenty of land to construct a bypass. Cost is under \$1M.</p> <p>Construction seasons for earthwork have not been incorporated into the schedule. The bigger portions of the project are on higher land and won't be impacted, but there are many features that are in canals and would be impacted. Overall delay on a 2 year contract would be less than 3 months.</p>	Possible	Negligible	Low	Likely	Negligible	Low

CREF	Risk/Opportunity Event	Risk Event Description	PDT Discussions on Impact and Likelihood	Project Cost			Project Schedule		
				Likelihood ©	Impact ©	Risk Level ©	Likelihood (\$)	Impact (\$)	Risk Level (\$)
TR4	Slope Protection & Water Seepage During Construction	Slope protection and water seepage under the newly constructed levees before the soil cement has been installed	Most applicable to the C18W reservoir. Sequencing of the work would prevent this from impacting the cost, could be included in the specs. This could be modeled under the Construction Risks but was chosen for Technical Risk so that the PED team could include this in their designs. Could be an impact to productivity.	Possible	Negligible	Low	Possible	Negligible	Low
TR5	ASRs	Aquifer Storage Recharge well design changes	Only 4 wells, any impact would be negligible. Jacksonville has designed and awarded many ASRs and is confident in the construction costs. The risk for discharge water filters is in Risk RG5 and is not covered here.	Possible	Negligible	Low	Possible	Negligible	Low
TR6	Restoration Plantings	Additional plantings included for restoration	Area of Gulf Stream East and West will need vegetation restoration. No amount or plant species have been identified yet, cost impact assumed to be marginal.	Likely	Marginal	Medium	Unlikely	Negligible	Low
TR7	Control Structures and Pump Stations	Structure sizes may change based on further design refinements (eg. Climate Change considerations) or additional features may be required.	Estimate based on HHD and other projects, then scaled down to this size, meaning most/all features should be accounted for. Include sheet pile structures here also.	Possible	Marginal	Low	Unlikely	Negligible	Low
TR8	Utilities	Possible impact from existing utilities	This was a concern, although the majority of the project is free from existing utilities. Potential areas of concern are: Existing gas line under C18 canal; Possible gas line, cable, water line and rail road at the intersection of State Road 710. Current plan is to avoid these.	Possible	Moderate	Medium	Unlikely	Negligible	Low
TR9	Electrical Power	High voltage electrical lines and transformers needed to supply power	This project is located in a rural area with close electrical supply. Anticipate needing 10 miles of electrical line hung on power poles to supply all the pump stations, ASRs and control structures. This feature is not in the cost estimate.	Very Likely	Significant	High	Unlikely	Negligible	Low

CREF	Risk/Opportunity Event	Risk Event Description	PDT Discussions on Impact and Likelihood	Project Cost			Project Schedule		
				Likelihood ©	Impact ©	Risk Level ©	Likelihood (\$)	Impact (\$)	Risk Level (\$)
TR10	Availability of Local Embankment Fill	Concern for the availability of local embankment fill for the levee work	<p>Plenty of good fill located in the area, confident in the location. Borrow is from the C18W reservoir.</p> <p>Fill is assumed to originate from the excavated material from the seepage canal (for C-18W) and if any additional fill is required it will be obtained from within the limits of the embankment footprint. For other levees/berms material will be obtained from Gulf Stream West excavation. No cost to purchase fill.</p> <p>If assuming \$4/cy hauling cost for 10% of total, you get 200,000 CY x \$4/cy = \$800K, negligible</p>	Unlikely	Negligible	Low	Unlikely	Negligible	Low
Lands and Damages (LD)									
LD1	Additional Land Acquisitions	Will there be a need to acquire more land?	<p>Possibility to acquire the Pepper farm instead of routing the drainage around it. For 320 acres at \$75k/acre, this would be \$24M. The cost of routing drainage is much less than this.</p> <p>Unlikely this would be a viable option.</p>	Unlikely	Negligible	Low	Unlikely	Negligible	Low
LD2	Land Acquisitions	Status of land acquisitions	<p>Approximately 85% of the land has already been acquired.</p> <p>Canal easements and canals need to be acquired.</p> <p>Need agreements with multiple agencies regarding moving water within the project.</p> <p>Risk is to the schedule, being able to negotiate these agreements.</p>	Unlikely	Negligible	Low	Possible	Moderate	Medium
Regulatory Environmental Risks (RG)									
RG1	Environmental Impact of Construction Access	Will there be an impact from additional construction access that wasn't considered in the EIS?	<p>Temp roads for levee and canal construction have already been considered in the report.</p> <p>Possible areas for lay down areas are already impacted areas, that require clearing and grubbing to be a part of the levee project.</p> <p>These areas have been included in the proposed project area.</p>	Unlikely	Negligible	Low	Unlikely	Negligible	Low

ATTACHMENT B.2 – Project and Schedule Contingency Development

SAJ FY19 LRWRP CSRA 08.12.19.xlsmSAJ FY19 LRWRP CSRA 08.12.19.xlsmProject Contingency

Contingency on Base Estimate		80% Confidence Project Cost
Base Construction Estimate	\$254,169,585	33%
Baseline Estimate Cost Contingency Amount ->	\$83,875,963	
Baseline Estimate Construction Cost (80% Confidence) ->	\$338,045,548	

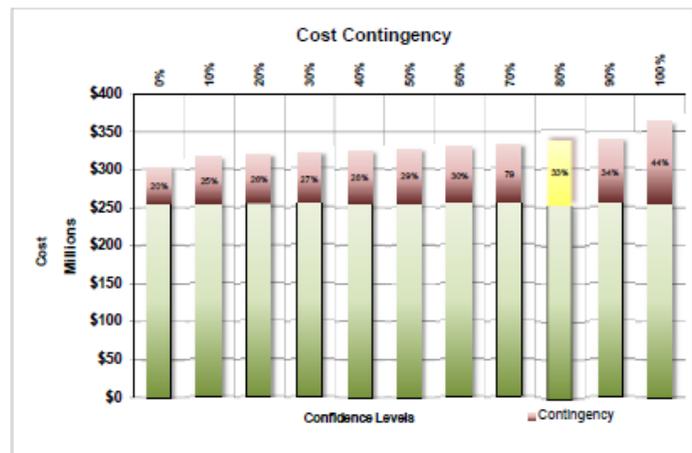
Contingency on Schedule		80% Confidence Project Schedule
Project Base Schedule Duration ->	148.8 Months	27%
Schedule Contingency Duration ->	40.2 Months	
Project Schedule Duration (80% Confidence) ->	188.9 Months	

Loxahatchee River Watershed Restoration Project

- PROJECT CONTINGENCY DEVELOPMENT -

INITIAL CONSTRUCTION Contingency Analysis

Base Case Estimate (Excluding 01)		\$254,169,585
Confidence Level	Contingency Value	Contingency
0%	50,833,917	20%
10%	63,542,396	25%
20%	66,084,092	26%
30%	68,625,788	27%
40%	71,167,484	28%
50%	73,709,180	29%
60%	76,250,875	30%
70%	78,792,571	31%
80%	83,875,963	33%
90%	86,417,659	34%
100%	111,834,617	44%

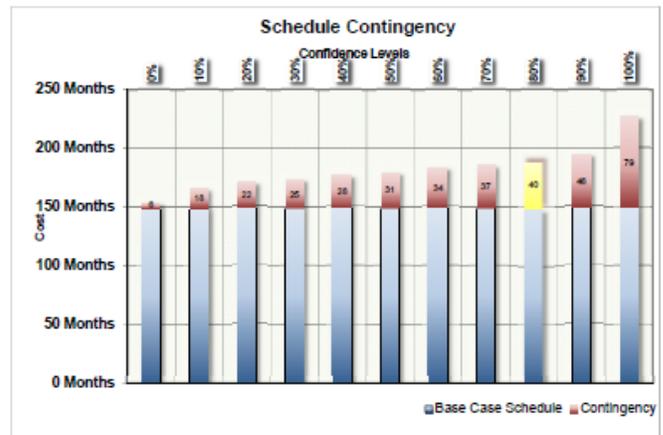


Loxahatchee River Watershed Restoration Project

- SCHEDULE CONTINGENCY (DURATION) DEVELOPMENT -

Contingency Analysis

Base Case Schedule		148.8 Months
Confidence Level	Contingency Value	Contingency
0%	6 Months	4%
10%	18 Months	12%
20%	22 Months	15%
30%	25 Months	17%
40%	28 Months	19%
50%	31 Months	21%
60%	34 Months	23%
70%	37 Months	25%
80%	40 Months	27%
90%	46 Months	31%
100%	79 Months	53%



ATTACHMENT B.3 – Cost and Schedule Outputs Distribution and Sensitivity

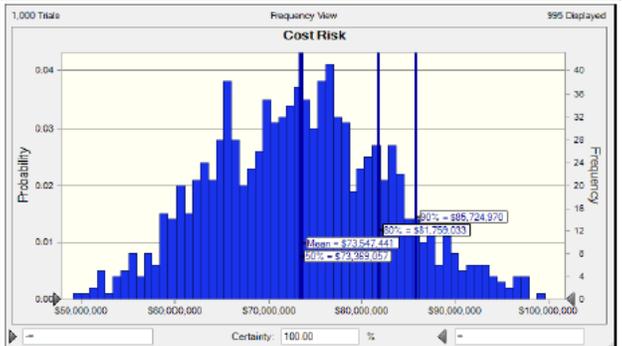
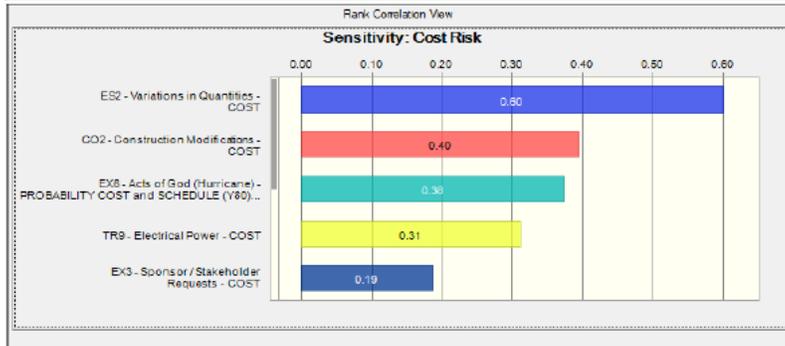
SAJ FY19 LRWRP CSRA 08.12.19.xlsxSAJ FY19 LRWRP CSRA 08.12.19.xlsxSensitivity Charts

Contingency on Base Estimate		
Base Construction Estimate	\$254,169,585	33%
Baseline Estimate Cost Contingency Amount ->	\$83,875,963	
Baseline Estimate Construction Cost (80% Confidence) ->	\$338,045,548	

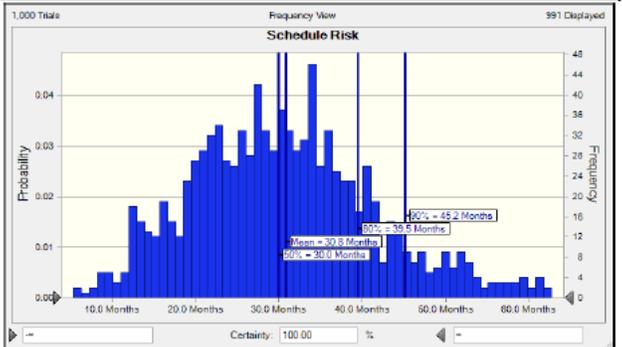
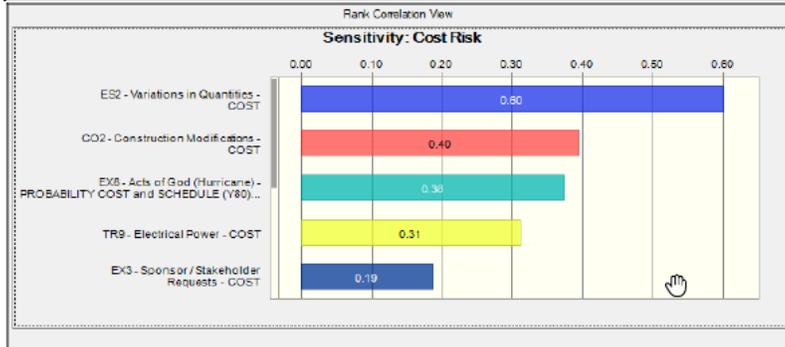
Loxahatchee River Watershed Restoration Project

Contingency on Schedule		
Project Base Schedule Duration ->	148.8 Months	27%
Schedule Contingency Duration ->	40.2 Months	
Project Schedule Duration (80% Confidence) ->	188.9 Months	

- Cost Outputs Distribution and Sensitivity -



- Schedule Outputs Distribution and Sensitivity -



ATTACHMENT C – Cost Agency Technical Review Certification

**WALLA WALLA COST ENGINEERING
MANDATORY CENTER OF EXPERTISE**

COST AGENCY TECHNICAL REVIEW

CERTIFICATION STATEMENT

For Project No. 114479

SAJ – Loxahatchee River Watershed Restoration Project

The Loxahatchee River Watershed Restoration Project, as presented by Jacksonville District, has undergone a successful Cost Agency Technical Review (Cost ATR), performed by the Walla Walla District Cost Engineering Mandatory Center of Expertise (Cost MCX) team. The Cost ATR included study of the project scope, report, cost estimates, schedules, escalation, and risk-based contingencies. This certification signifies the products meet the quality standards as prescribed in ER 1110-2-1150 Engineering and Design for Civil Works Projects and ER 1110-2-1302 Civil Works Cost Engineering.

As of November 7, 2019, the Cost MCX certifies the estimated total project cost:

FY20 Project First Cost: \$740,760,000
Fully Funded Amount: \$854,275,000

It remains the responsibility of the District to correctly reflect these cost values within the Final Report and to implement effective project management controls and implementation procedures including risk management through the period of Federal Participation.



JACOBS.MICHAEL.PIE Digitally signed by
RRE.1160569537 JACOBS.MICHAEL.PIERRE.1160569537
Date: 2019.11.07 12:18:32 -08'00'

Michael P. Jacobs, PE, CCE
Chief, Cost Engineering MCX
Walla Walla District

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

Printed:11/7/2019
Page 1 of 8

PROJECT: Loxahatchee River Watershed Restoration Project
PROJECT NO: P2 114479
LOCATION: Palm Beach County, FL

DISTRICT: USACE Jacksonville District
POC: CHIEF, COST ENGINEERING, Matthew Cunningham
PREPARED: 11/7/2019

This Estimate reflects the scope and schedule in report; LRWRP PIR

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)					TOTAL PROJECT COST (FULLY FUNDED)				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST (\$K)	CNTG (\$K)	CNTG (%)	TOTAL (\$K)	Program Year (Budget EC): 2020 Effective Price Level Date: 1 OCT 19				Spent Thru: 1-Oct-18 (\$K)	TOTAL FIRST COST (\$K)	INFLATED (%)	COST (\$K)	CNTG (\$K)	FULL (\$K)
						ESC (%)	COST (\$K)	CNTG (\$K)	TOTAL (\$K)						
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
02	RELOCATIONS	\$1,483	\$490	33.0%	\$1,973	2.4%	\$1,519	\$501	\$2,021	\$0	\$2,021	17.0%	\$1,778	\$587	\$2,365
03	RESERVOIRS	\$51,529	\$17,005	33.0%	\$68,534	2.4%	\$52,772	\$17,415	\$70,187	\$0	\$70,187	18.8%	\$62,693	\$20,689	\$83,382
08	ROADS, RAILROADS & BRIDGES	\$6,199	\$2,046	33.0%	\$8,245	2.4%	\$6,349	\$2,095	\$8,444	\$0	\$8,444	25.7%	\$7,981	\$2,634	\$10,614
09	CHANNELS & CANALS	\$41,964	\$13,848	33.0%	\$55,812	2.4%	\$42,977	\$14,182	\$57,159	\$0	\$57,159	19.1%	\$51,170	\$16,886	\$68,057
11	LEVEES & FLOODWALLS	\$21,494	\$7,093	33.0%	\$28,587	2.4%	\$22,013	\$7,264	\$29,277	\$0	\$29,277	31.0%	\$28,841	\$9,518	\$38,359
13	PUMPING PLANT	\$59,055	\$19,488	33.0%	\$78,543	2.4%	\$60,480	\$19,958	\$80,438	\$0	\$80,438	25.4%	\$75,860	\$25,034	\$100,894
14	RECREATION FACILITIES	\$2,861	\$944	33.0%	\$3,806	2.4%	\$2,930	\$967	\$3,898	\$0	\$3,898	48.3%	\$4,345	\$1,434	\$5,778
15	FLOODWAY CONTROL & DIVERSION STRU	\$60,854	\$20,082	33.0%	\$80,935	2.4%	\$62,322	\$20,566	\$82,888	\$0	\$82,888	28.5%	\$80,067	\$26,422	\$106,489
19	BUILDINGS, GROUNDS & UTILITIES	\$8,729	\$2,881	33.0%	\$11,610	2.4%	\$8,940	\$2,950	\$11,890	\$0	\$11,890	30.5%	\$11,669	\$3,851	\$15,520
CONSTRUCTION ESTIMATE TOTALS:		\$254,170	\$83,876		\$338,046	2.4%	\$260,301	\$85,899	\$346,200	\$0	\$346,200	24.6%	\$324,405	\$107,054	\$431,458
01	LANDS AND DAMAGES	\$243,078	\$60,770	25.0%	\$303,848	0.0%	\$243,078	\$60,770	\$303,848	\$0	\$303,848	0.0%	\$243,078	\$60,770	\$303,848
30	PLANNING, ENGINEERING & DESIGN	\$40,540	\$13,378	33.0%	\$53,918	3.4%	\$41,921	\$13,834	\$55,755	\$0	\$55,755	28.4%	\$53,827	\$17,763	\$71,590
31	CONSTRUCTION MANAGEMENT	\$25,417	\$8,388	33.0%	\$33,805	3.4%	\$26,283	\$8,673	\$34,956	\$0	\$34,956	35.5%	\$35,623	\$11,756	\$47,379
PROJECT COST TOTALS:		\$663,205	\$168,411	29.5%	\$729,616		\$571,583	\$169,176	\$740,760	\$0	\$740,760	15.3%	\$656,933	\$197,342	\$854,275

CHIEF, COST ENGINEERING, Matthew Cunningham

ESTIMATED TOTAL PROJECT COST: **\$854,275**

PROJECT MANAGER, Orlando Ramos-Gines

CHIEF, REAL ESTATE, Tim McQuille

CHIEF, PLANNING, Eric Summa

CHIEF, ENGINEERING, Lauren Borocharer

CHIEF, OPERATIONS, Carol Bernstein

CHIEF, CONSTRUCTION, Eric Arndt

CHIEF, CONTRACTING, Ronnell Booker

CHIEF, PM-PB, Karen Smith

CHIEF, DPM, Tim Murphy

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TPCS

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

Printed:11/7/2019
Page 2 of 8

**** CONTRACT COST SUMMARY ****

PROJECT: Loxahatchee River Watershed Restoration Project
LOCATION: Palm Beach County, FL
This Estimate reflects the scope and schedule in report; LRWRP PIR

DISTRICT: USACE Jacksonville District
POC: CHIEF, COST ENGINEERING, Matthew Cunningham
PREPARED: 11/7/2019

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 18-Jul-19		Effective Price Level: 1-Oct-18		Program Year (Budget EC): 2020		Effective Price Level Date: 1 OCT 19						
		RISK BASED												
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST (\$K)	CNTG (%)	CNTG (%)	TOTAL (\$K)	ESC (%)	COST (\$K)	CNTG (%)	TOTAL (\$K)	Mid-Point Date	INFLATED (%)	COST (\$K)	CNTG (%)	FULL (\$K)
A	B	C	D	E	F	G	H	I	J	P	L	M	N	O
FLOWWAY 1 - M-1 Canal, G160/161 and Grassy Water Preserve														
09	CHANNELS & CANALS	\$237	\$78	33.0%	\$315	2.4%	\$243	\$80	\$323	2023Q3	11.1%	\$270	\$89	\$359
13	PUMPING PLANT	\$2,967	\$979	33.0%	\$3,946	2.4%	\$3,039	\$1,003	\$4,041	2024Q2	13.6%	\$3,453	\$1,139	\$4,592
15	FLOODWAY CONTROL & DIVERSION STRU	\$7,211	\$2,380	33.0%	\$9,591	2.4%	\$7,385	\$2,437	\$9,823	2024Q2	13.6%	\$8,392	\$2,769	\$11,161
CONSTRUCTION ESTIMATE TOTALS:		\$10,415	\$3,437	33.0%	\$13,852		\$10,667	\$3,520	\$14,187			\$12,114	\$3,998	\$16,112
01	LANDS AND DAMAGES	\$0	\$0	0.0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0
30	PLANNING, ENGINEERING & DESIGN													
0.50%	Project Management	\$52	\$17	33.0%	\$69	3.4%	\$54	\$18	\$72	2022Q3	9.9%	\$59	\$20	\$79
0.50%	Planning & Environmental Compliance	\$52	\$17	33.0%	\$69	3.4%	\$54	\$18	\$72	2022Q3	9.9%	\$59	\$20	\$79
4.00%	Engineering & Design	\$417	\$137	33.0%	\$554	3.4%	\$431	\$142	\$573	2022Q3	9.9%	\$473	\$156	\$630
1.00%	Reviews, ATRs, IEPRs, VE	\$104	\$34	33.0%	\$139	3.4%	\$108	\$36	\$143	2022Q3	9.9%	\$118	\$39	\$157
0.30%	Life Cycle Updates (cost, schedule, risks)	\$31	\$10	33.0%	\$42	3.4%	\$32	\$11	\$43	2022Q3	9.9%	\$36	\$12	\$47
0.15%	Contracting & Reprographics	\$16	\$5	33.0%	\$21	3.4%	\$16	\$5	\$21	2022Q3	9.9%	\$18	\$6	\$24
4.00%	Engineering During Construction	\$417	\$137	33.0%	\$554	3.4%	\$431	\$142	\$573	2024Q1	16.2%	\$501	\$165	\$666
1.00%	Planning During Construction	\$104	\$34	33.0%	\$139	3.4%	\$108	\$36	\$143	2024Q1	16.2%	\$125	\$41	\$166
4.20%	Adaptive Management & Monitoring	\$437	\$144	33.0%	\$582	3.4%	\$452	\$149	\$602	2024Q1	16.2%	\$526	\$173	\$699
0.30%	Project Operations	\$31	\$10	33.0%	\$42	3.4%	\$32	\$11	\$43	2022Q3	9.9%	\$36	\$12	\$47
31	CONSTRUCTION MANAGEMENT													
8.0%	Construction Management	\$833	\$275	33.0%	\$1,108	3.4%	\$862	\$284	\$1,146	2024Q1	16.2%	\$1,001	\$330	\$1,332
1.0%	Project Operation:	\$104	\$34	33.0%	\$139	3.4%	\$108	\$36	\$143	2024Q1	16.2%	\$125	\$41	\$166
1.0%	Project Management	\$104	\$34	33.0%	\$139	3.4%	\$108	\$36	\$143	2024Q1	16.2%	\$125	\$41	\$166
CONTRACT COST TOTALS:		\$13,118	\$4,329		\$17,447		\$13,461	\$4,442	\$17,904			\$15,317	\$5,055	\$20,371

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

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**** CONTRACT COST SUMMARY ****

PROJECT: Loxahatchee River Watershed Restoration Project
LOCATION: Palm Beach County, FL
This Estimate reflects the scope and schedule in report, LRWRP PIR

DISTRICT: USACE Jacksonville District
POC: CHIEF, COST ENGINEERING, Matthew Cunningham
PREPARED: 11/7/2019

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 18-Jul-19		Effective Price Level: 1-Oct-18		Program Year (Budget EC): 2020		Effective Price Level Date: 1 OCT 19						
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	INFLATED (%)	COST (\$K)	CNTG (\$K)	FULL (\$K)
A	B	C	D	E	F	G	H	I	J	P	L	M	N	O
FLOWWAY 2 - C-18W Reservoir														
02	RELOCATIONS	\$1,483	\$490	33.0%	\$1,973	2.4%	\$1,519	\$501	\$2,021	2025Q2	17.0%	\$1,778	\$587	\$2,365
03	RESERVOIRS	\$51,529	\$17,005	33.0%	\$68,534	2.4%	\$52,772	\$17,415	\$70,187	2025Q4	18.8%	\$62,693	\$20,689	\$83,382
08	ROADS, RAILROADS & BRIDGES	\$4,204	\$1,387	33.0%	\$5,591	2.4%	\$4,305	\$1,421	\$5,726	2026Q3	21.5%	\$5,229	\$1,726	\$6,955
09	CHANNELS & CANALS	\$38,747	\$12,787	33.0%	\$51,534	2.4%	\$39,682	\$13,095	\$52,777	2025Q4	18.8%	\$47,142	\$15,557	\$62,699
11	LEVEES & FLOODWALLS	\$1,357	\$448	33.0%	\$1,805	2.4%	\$1,390	\$459	\$1,849	2026Q2	20.5%	\$1,676	\$553	\$2,229
13	PUMPING PLANT	\$20,027	\$6,609	33.0%	\$26,636	2.4%	\$20,510	\$6,768	\$27,279	2027Q3	25.1%	\$25,658	\$8,467	\$34,126
15	FLOODWAY CONTROL & DIVERSION STRU	\$23,987	\$7,916	33.0%	\$31,902	2.4%	\$24,565	\$8,107	\$32,672	2027Q3	25.1%	\$30,731	\$10,141	\$40,872
19	BUILDINGS, GROUNDS & UTILITIES	\$7,976	\$2,632	33.0%	\$10,608	2.4%	\$8,169	\$2,696	\$10,864	2028Q3	28.9%	\$10,526	\$3,473	\$13,999
CONSTRUCTION ESTIMATE TOTALS:		\$149,311	\$49,273	33.0%	\$198,584		\$152,913	\$50,461	\$203,375			\$185,434	\$61,193	\$246,627
01	LANDS AND DAMAGES	\$0	\$0	0.0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0
30	PLANNING, ENGINEERING & DESIGN													
0.50%	Project Management	\$747	\$246	33.0%	\$993	3.4%	\$772	\$255	\$1,027	2024Q1	16.2%	\$897	\$296	\$1,193
0.50%	Planning & Environmental Compliance	\$747	\$246	33.0%	\$993	3.4%	\$772	\$255	\$1,027	2024Q1	16.2%	\$897	\$296	\$1,193
4.00%	Engineering & Design	\$5,972	\$1,971	33.0%	\$7,943	3.4%	\$6,176	\$2,038	\$8,214	2024Q1	16.2%	\$7,178	\$2,369	\$9,547
7.00%	Reviews, ATRs, IEPRs, VE	\$1,493	\$493	33.0%	\$1,986	3.4%	\$1,544	\$510	\$2,053	2024Q1	16.2%	\$1,795	\$592	\$2,387
0.30%	Life Cycle Updates (cost, schedule, risks)	\$448	\$148	33.0%	\$596	3.4%	\$463	\$153	\$616	2024Q1	16.2%	\$538	\$178	\$716
0.15%	Contracting & Reprographics	\$224	\$74	33.0%	\$298	3.4%	\$232	\$76	\$308	2024Q1	16.2%	\$269	\$89	\$358
4.00%	Engineering During Construction	\$5,972	\$1,971	33.0%	\$7,943	3.4%	\$6,176	\$2,038	\$8,214	2027Q3	32.6%	\$8,189	\$2,702	\$10,891
7.00%	Planning During Construction	\$1,493	\$493	33.0%	\$1,986	3.4%	\$1,544	\$510	\$2,053	2027Q3	32.6%	\$2,047	\$676	\$2,723
4.20%	Adaptive Management & Monitoring	\$6,271	\$2,069	33.0%	\$8,341	3.4%	\$6,465	\$2,140	\$8,625	2027Q3	32.6%	\$8,598	\$2,837	\$11,436
0.30%	Project Operations	\$448	\$148	33.0%	\$596	3.4%	\$463	\$153	\$616	2024Q1	16.2%	\$538	\$178	\$716
31	CONSTRUCTION MANAGEMENT													
8.0%	Construction Management	\$11,945	\$3,942	33.0%	\$15,887	3.4%	\$12,352	\$4,076	\$16,428	2027Q3	32.6%	\$16,378	\$5,405	\$21,783
1.0%	Project Operation:	\$1,493	\$493	33.0%	\$1,986	3.4%	\$1,544	\$510	\$2,053	2027Q3	32.6%	\$2,047	\$676	\$2,723
1.0%	Project Management	\$1,493	\$493	33.0%	\$1,986	3.4%	\$1,544	\$510	\$2,053	2027Q3	32.6%	\$2,047	\$676	\$2,723
CONTRACT COST TOTALS:		\$188,058	\$62,059		\$250,117		\$192,980	\$63,683	\$256,663			\$236,854	\$78,162	\$315,016

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TPCS

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

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**** CONTRACT COST SUMMARY ****

PROJECT: Loxahatchee River Watershed Restoration Project
LOCATION: Palm Beach County, FL
This Estimate reflects the scope and schedule in report; LRWRP PIR

DISTRICT: USACE Jacksonville District
POC: CHIEF, COST ENGINEERING, Matthew Cunningham
PREPARED: 11/7/2019

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
WBS NUMBER A	Civil Works Feature & Sub-Feature Description B	Estimate Prepared: Effective Price Level:		18-Jul-19 1-Oct-18	Program Year (Budget EC): Effective Price Level Date:				Mid-Point Date P	INFLATED (%) L	COST (\$K) M	CNTG (\$K) N	FULL (\$K) O	
		COST (\$K) C	CNTG (\$K) D	CNTG (%) E	TOTAL (\$K) F	ESC (%) G	COST (\$K) H	CNTG (\$K) I						TOTAL (\$K) J
13	ASR's @ C-18W PUMPING PLANT	\$29,015	\$9,575	33.0%	\$38,589	2.4%	\$29,714	\$9,806	\$39,520	2027Q4	26.0%	\$37,451	\$12,359	\$49,809
CONSTRUCTION ESTIMATE TOTALS:		\$29,015	\$9,575	33.0%	\$38,589		\$29,714	\$9,806	\$39,520			\$37,451	\$12,359	\$49,809
01	LANDS AND DAMAGES	\$0	\$0	0.0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0
30	PLANNING, ENGINEERING & DESIGN													
0.50%	Project Management	\$145	\$48	33.0%	\$193	3.4%	\$150	\$50	\$200	2024Q1	16.2%	\$174	\$58	\$232
0.50%	Planning & Environmental Compliance	\$145	\$48	33.0%	\$193	3.4%	\$150	\$50	\$200	2024Q1	16.2%	\$174	\$58	\$232
4.00%	Engineering & Design	\$1,161	\$383	33.0%	\$1,544	3.4%	\$1,200	\$396	\$1,596	2024Q1	16.2%	\$1,395	\$460	\$1,855
1.00%	Reviews, ATRs, IEPRs, VE	\$290	\$96	33.0%	\$386	3.4%	\$300	\$99	\$399	2024Q1	16.2%	\$349	\$115	\$464
0.30%	Life Cycle Updates (cost, schedule, risks)	\$87	\$29	33.0%	\$116	3.4%	\$90	\$30	\$120	2024Q1	16.2%	\$105	\$35	\$139
0.15%	Contracting & Reprographics	\$44	\$14	33.0%	\$58	3.4%	\$45	\$15	\$60	2024Q1	16.2%	\$52	\$17	\$70
4.00%	Engineering During Construction	\$1,161	\$383	33.0%	\$1,544	3.4%	\$1,200	\$396	\$1,596	2027Q4	33.9%	\$1,607	\$530	\$2,137
1.00%	Planning During Construction	\$290	\$96	33.0%	\$386	3.4%	\$300	\$99	\$399	2027Q4	33.9%	\$402	\$133	\$534
4.20%	Adaptive Management & Monitoring	\$1,219	\$402	33.0%	\$1,621	3.4%	\$1,260	\$416	\$1,676	2027Q4	33.9%	\$1,687	\$557	\$2,244
0.30%	Project Operations	\$87	\$29	33.0%	\$116	3.4%	\$90	\$30	\$120	2024Q1	16.2%	\$105	\$35	\$139
31	CONSTRUCTION MANAGEMENT													
8.0%	Construction Management	\$2,321	\$766	33.0%	\$3,087	3.4%	\$2,400	\$792	\$3,192	2027Q4	33.9%	\$3,213	\$1,060	\$4,274
1.0%	Project Operation:	\$290	\$96	33.0%	\$386	3.4%	\$300	\$99	\$399	2027Q4	33.9%	\$402	\$133	\$534
1.0%	Project Management	\$290	\$96	33.0%	\$386	3.4%	\$300	\$99	\$399	2027Q4	33.9%	\$402	\$133	\$534
CONTRACT COST TOTALS:		\$36,544	\$12,059		\$48,603		\$37,500	\$12,375	\$49,875			\$47,516	\$15,680	\$63,197

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TPCS

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

Printed: 11/7/2019
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**** CONTRACT COST SUMMARY ****

PROJECT: Loxahatchee River Watershed Restoration Project
LOCATION: Palm Beach County, FL
This Estimate reflects the scope and schedule in report; LRWRP PIR

DISTRICT: USACE Jacksonville District
POC: CHIEF, COST ENGINEERING, Matthew Cunningham
PREPARED: 11/7/2019

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
WBS NUMBER A	Civil Works Feature & Sub-Feature Description B	Estimate Prepared: 18-Jul-19 Effective Price Level: 1-Oct-18				Program Year (Budget EC): 2020 Effective Price Level Date: 1 OCT 19				FULLY FUNDED PROJECT ESTIMATE				
		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	INFLATED (%) L	COST (\$K) M	CNTG (\$K) N	FULL (\$K) O
FLOWWAY 3 - Gulf Stream West, Nine Gems, Mack Dairy and Culpepper														
08	ROADS, RAILROADS & BRIDGES	\$1,995	\$658	33.0%	\$2,653	2.4%	\$2,043	\$674	\$2,717	2030Q1	34.7%	\$2,751	\$908	\$3,659
09	CHANNELS & CANALS	\$2,059	\$680	33.0%	\$2,739	2.4%	\$2,109	\$696	\$2,805	2027Q3	25.1%	\$2,638	\$871	\$3,509
11	LEVEES & FLOODWALLS	\$20,137	\$6,645	33.0%	\$26,782	2.4%	\$20,623	\$6,805	\$27,428	2029Q2	31.7%	\$27,166	\$8,965	\$36,130
13	PUMPING PLANT	\$7,047	\$2,325	33.0%	\$9,372	2.4%	\$7,217	\$2,381	\$9,598	2028Q3	28.9%	\$9,299	\$3,069	\$12,367
15	FLOODWAY CONTROL & DIVERSION STRU	\$27,848	\$9,190	33.0%	\$37,038	2.4%	\$28,520	\$9,412	\$37,932	2030Q2	35.7%	\$38,696	\$12,770	\$51,465
19	BUILDINGS, GROUNDS & UTILITIES	\$753	\$248	33.0%	\$1,002	2.4%	\$771	\$254	\$1,026	2033Q2	48.3%	\$1,143	\$377	\$1,521
CONSTRUCTION ESTIMATE TOTALS:		\$59,839	\$19,747	33.0%	\$79,586		\$61,283	\$20,223	\$81,506			\$81,693	\$26,999	\$108,652
01	LANDS AND DAMAGES	\$0	\$0	0.0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0
30	PLANNING, ENGINEERING & DESIGN													
0.50%	Project Management	\$299	\$99	33.0%	\$398	3.4%	\$309	\$102	\$411	2026Q1	25.3%	\$388	\$128	\$516
0.50%	Planning & Environmental Compliance	\$299	\$99	33.0%	\$398	3.4%	\$309	\$102	\$411	2026Q1	25.3%	\$388	\$128	\$516
4.00%	Engineering & Design	\$2,394	\$790	33.0%	\$3,183	3.4%	\$2,475	\$817	\$3,292	2026Q1	25.3%	\$3,103	\$1,024	\$4,126
1.00%	Reviews, ATRs, IEPRs, VE	\$598	\$197	33.0%	\$796	3.4%	\$619	\$204	\$823	2026Q1	25.3%	\$776	\$256	\$1,032
0.30%	Life Cycle Updates (cost, schedule, risks)	\$180	\$59	33.0%	\$239	3.4%	\$186	\$61	\$247	2026Q1	25.3%	\$233	\$77	\$309
0.15%	Contracting & Reprographics	\$90	\$30	33.0%	\$119	3.4%	\$93	\$31	\$123	2026Q1	25.3%	\$116	\$38	\$155
4.00%	Engineering During Construction	\$2,394	\$790	33.0%	\$3,183	3.4%	\$2,475	\$817	\$3,292	2030Q1	46.0%	\$3,614	\$1,193	\$4,806
1.00%	Planning During Construction	\$598	\$197	33.0%	\$796	3.4%	\$619	\$204	\$823	2030Q1	46.0%	\$903	\$298	\$1,202
4.20%	Adaptive Management & Monitoring	\$2,513	\$829	33.0%	\$3,343	3.4%	\$2,599	\$858	\$3,456	2030Q1	46.0%	\$3,795	\$1,252	\$5,047
0.30%	Project Operations	\$180	\$59	33.0%	\$239	3.4%	\$186	\$61	\$247	2026Q1	25.3%	\$233	\$77	\$309
31	CONSTRUCTION MANAGEMENT													
8.0%	Construction Management	\$4,787	\$1,580	33.0%	\$6,367	3.4%	\$4,950	\$1,634	\$6,584	2030Q1	46.0%	\$7,228	\$2,385	\$9,613
1.0%	Project Operation:	\$598	\$197	33.0%	\$796	3.4%	\$619	\$204	\$823	2030Q1	46.0%	\$903	\$298	\$1,202
1.0%	Project Management	\$598	\$197	33.0%	\$796	3.4%	\$619	\$204	\$823	2030Q1	46.0%	\$903	\$298	\$1,202
CONTRACT COST TOTALS:		\$75,367	\$24,871		\$100,239		\$77,340	\$25,522	\$102,862			\$104,275	\$34,411	\$138,686

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

Printed: 11/7/2019
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**** CONTRACT COST SUMMARY ****

PROJECT: Loxahatchee River Watershed Restoration Project
LOCATION: Palm Beach County, FL
This Estimate reflects the scope and schedule in report, LRWRP PIR

DISTRICT: USACE Jacksonville District
POC: CHIEF, COST ENGINEERING, Matthew Cunningham
PREPARED: 11/7/2019

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
WBS NUMBER A	Civil Works Feature & Sub-Feature Description B	Estimate Prepared: 18-Jul-19 Effective Price Level: 1-Oct-18				Program Year (Budget EC): 2020 Effective Price Level Date: 1 OCT 19				FULLY FUNDED PROJECT ESTIMATE				
		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	INFLATED (%) L	COST (\$K) M	CNTG (\$K) N	FULL (\$K) O
09	FLOWWAY 4 - Hobe Grove & Kitching Creek													
	CHANNELS & CANALS	\$921	\$304	33.0%	\$1,224	2.4%	\$943	\$311	\$1,254	2025Q4	18.8%	\$1,120	\$370	\$1,490
15	FLOODWAY CONTROL & DIVERSION STRU	\$1,807	\$596	33.0%	\$2,404	2.4%	\$1,851	\$611	\$2,462	2026Q3	21.5%	\$2,248	\$742	\$2,990
CONSTRUCTION ESTIMATE TOTALS:		\$2,728	\$900	33.0%	\$3,628		\$2,794	\$922	\$3,716			\$3,368	\$1,111	\$4,479
01	LANDS AND DAMAGES	\$0	\$0	0.0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0
30	PLANNING, ENGINEERING & DESIGN													
0.50%	Project Management	\$14	\$5	33.0%	\$18	3.4%	\$14	\$5	\$19	2024Q4	19.6%	\$17	\$6	\$22
0.50%	Planning & Environmental Compliance	\$14	\$5	33.0%	\$18	3.4%	\$14	\$5	\$19	2024Q4	19.6%	\$17	\$6	\$22
4.00%	Engineering & Design	\$109	\$36	33.0%	\$145	3.4%	\$113	\$37	\$150	2024Q4	19.6%	\$135	\$45	\$179
1.00%	Reviews, ATRs, IEPRs, VE	\$27	\$9	33.0%	\$36	3.4%	\$28	\$9	\$38	2024Q4	19.6%	\$34	\$11	\$45
0.30%	Life Cycle Updates (cost, schedule, risks)	\$8	\$3	33.0%	\$11	3.4%	\$8	\$3	\$11	2024Q4	19.6%	\$10	\$3	\$13
0.15%	Contracting & Reprographics	\$4	\$1	33.0%	\$5	3.4%	\$4	\$1	\$6	2024Q4	19.6%	\$5	\$2	\$7
4.00%	Engineering During Construction	\$109	\$36	33.0%	\$145	3.4%	\$113	\$37	\$150	2026Q2	26.5%	\$143	\$47	\$190
1.00%	Planning During Construction	\$27	\$9	33.0%	\$36	3.4%	\$28	\$9	\$38	2026Q2	26.5%	\$36	\$12	\$47
4.20%	Adaptive Management & Monitoring	\$115	\$38	33.0%	\$152	3.4%	\$118	\$39	\$158	2026Q2	26.5%	\$150	\$49	\$199
0.30%	Project Operations	\$8	\$3	33.0%	\$11	3.4%	\$8	\$3	\$11	2024Q4	19.6%	\$10	\$3	\$13
31	CONSTRUCTION MANAGEMENT													
8.0%	Construction Management	\$218	\$72	33.0%	\$290	3.4%	\$226	\$74	\$300	2026Q2	26.5%	\$285	\$94	\$380
1.0%	Project Operation:	\$27	\$9	33.0%	\$36	3.4%	\$28	\$9	\$38	2026Q2	26.5%	\$36	\$12	\$47
1.0%	Project Management	\$27	\$9	33.0%	\$36	3.4%	\$28	\$9	\$38	2026Q2	26.5%	\$36	\$12	\$47
CONTRACT COST TOTALS:		\$3,436	\$1,134		\$4,569		\$3,526	\$1,163	\$4,689			\$4,281	\$1,413	\$5,693

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

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**** CONTRACT COST SUMMARY ****

PROJECT: Loxahatchee River Watershed Restoration Project
LOCATION: Palm Beach County, FL
This Estimate reflects the scope and schedule in report; LRWRP PIR

DISTRICT: USACE Jacksonville District
POC: CHIEF, COST ENGINEERING, Matthew Cunningham
PREPARED: 11/7/2019

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
WBS NUMBER A	Civil Works Feature & Sub-Feature Description B	Estimate Prepared: Effective Price Level:		18-Jul-19 1-Oct-18	Program Year (Budget EC): 2020 Effective Price Level Date: 1 OCT 19				FULLY FUNDED PROJECT ESTIMATE					
		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	INFLATED (%) L	COST (\$K) M	CNTG (\$K) N	FULL (\$K) O
14	RECREATION RECREATION FACILITIES	\$2,861	\$944	33.0%	\$3,806	2.4%	\$2,930	\$967	\$3,898	2033Q2	48.3%	\$4,345	\$1,434	\$5,778
CONSTRUCTION ESTIMATE TOTALS:		\$2,861	\$944	33.0%	\$3,806		\$2,930	\$967	\$3,898			\$4,345	\$1,434	\$5,778
01	LANDS AND DAMAGES	\$0	\$0	0.0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0
30	PLANNING, ENGINEERING & DESIGN													
0.50%	Project Management	\$14	\$5	33.0%	\$19	3.4%	\$15	\$5	\$20	2032Q4	62.6%	\$24	\$8	\$32
0.50%	Planning & Environmental Compliance	\$14	\$5	33.0%	\$19	3.4%	\$15	\$5	\$20	2032Q4	62.6%	\$24	\$8	\$32
4.00%	Engineering & Design	\$114	\$38	33.0%	\$152	3.4%	\$118	\$39	\$157	2032Q4	62.6%	\$193	\$64	\$256
1.00%	Reviews, ATRs, IEPs, VE	\$29	\$9	33.0%	\$38	3.4%	\$30	\$10	\$39	2032Q4	62.6%	\$48	\$16	\$64
0.30%	Life Cycle Updates (cost, schedule, risks)	\$9	\$3	33.0%	\$11	3.4%	\$9	\$3	\$12	2032Q4	62.6%	\$14	\$5	\$19
0.15%	Contracting & Reprographics	\$4	\$1	33.0%	\$6	3.4%	\$4	\$1	\$6	2032Q4	62.6%	\$7	\$2	\$10
4.00%	Engineering During Construction	\$114	\$38	33.0%	\$152	3.4%	\$118	\$39	\$157	2033Q2	65.8%	\$196	\$65	\$261
1.00%	Planning During Construction	\$29	\$9	33.0%	\$38	3.4%	\$30	\$10	\$39	2033Q2	65.8%	\$49	\$16	\$65
4.20%	Adaptive Management & Monitoring	\$120	\$40	33.0%	\$160	3.4%	\$124	\$41	\$165	2033Q2	65.8%	\$206	\$68	\$274
0.30%	Project Operations	\$9	\$3	33.0%	\$11	3.4%	\$9	\$3	\$12	2032Q4	62.6%	\$14	\$5	\$19
31	CONSTRUCTION MANAGEMENT													
8.0%	Construction Management	\$229	\$76	33.0%	\$304	3.4%	\$237	\$78	\$315	2033Q2	65.8%	\$393	\$130	\$522
1.0%	Project Operation:	\$29	\$9	33.0%	\$38	3.4%	\$30	\$10	\$39	2033Q2	65.8%	\$49	\$16	\$65
1.0%	Project Management	\$29	\$9	33.0%	\$38	3.4%	\$30	\$10	\$39	2033Q2	65.8%	\$49	\$16	\$65
CONTRACT COST TOTALS:		\$3,604	\$1,189		\$4,793		\$3,698	\$1,220	\$4,919			\$5,612	\$1,852	\$7,464

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

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**** CONTRACT COST SUMMARY ****

PROJECT: Loxahatchee River Watershed Restoration Project
LOCATION: Palm Beach County, FL
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DISTRICT: USACE Jacksonville District
POC: CHIEF, COST ENGINEERING, Matthew Cunningham
PREPARED: 11/7/2019

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)								
WBS NUMBER A	Civil Works Feature & Sub-Feature Description B	Estimate Prepared: 18-Jul-19		TOTAL (\$K) F	Program Year (Budget EC): 2020		TOTAL (\$K) J	FULLY FUNDED PROJECT ESTIMATE										
		COST (\$K) C	CNTG (\$K) D		CNTG (%) E	Effective Price Level: 1-Oct-18		Effective Price Level Date: 1 OCT 19	ESC (%) G	COST (\$K) H	CNTG (\$K) I	Mid-Point Date P	INFLATED (%) L	COST (\$K) M	CNTG (\$K) N	FULL (\$K) O		
LANDS AND DAMAGES																		
CONSTRUCTION ESTIMATE TOTALS:		\$0	\$0	0.0%	\$0		\$0	\$0	\$0				\$0	\$0	\$0			
01	LANDS AND DAMAGES	\$241,053	\$60,263	25.0%	\$301,316	0.0%	\$241,053	\$60,263	\$301,316	2019Q1	0.0%	\$241,053	\$60,263	\$301,316				
01	Federal Administrative Costs	\$810	\$203	25.0%	\$1,013	0.0%	\$810	\$203	\$1,013	2019Q1	0.0%	\$810	\$203	\$1,013				
01	Non-Federal Administrative Costs	\$1,215	\$304	25.0%	\$1,519	0.0%	\$1,215	\$304	\$1,519	2019Q1	0.0%	\$1,215	\$304	\$1,519				
30	PLANNING, ENGINEERING & DESIGN																	
0.50%	Project Management	\$0	\$0	0.0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0				
0.50%	Planning & Environmental Compliance	\$0	\$0	0.0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0				
4.00%	Engineering & Design	\$0	\$0	0.0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0				
1.00%	Reviews, ATRs, IEPRs, VE	\$0	\$0	0.0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0				
0.30%	Life Cycle Updates (cost, schedule, risks)	\$0	\$0	0.0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0				
0.15%	Contracting & Reprographics	\$0	\$0	0.0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0				
4.00%	Engineering During Construction	\$0	\$0	0.0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0				
1.00%	Planning During Construction	\$0	\$0	0.0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0				
4.20%	Adaptive Management & Monitoring	\$0	\$0	0.0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0				
0.30%	Project Operations	\$0	\$0	0.0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0				
31	CONSTRUCTION MANAGEMENT																	
8.0%	Construction Management	\$0	\$0	0.0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0				
1.0%	Project Operation:	\$0	\$0	0.0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0				
1.0%	Project Management	\$0	\$0	0.0%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0				
CONTRACT COST TOTALS:		\$243,078	\$60,770		\$303,848		\$243,078	\$60,770	\$303,848			\$243,078	\$60,770	\$303,848				

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