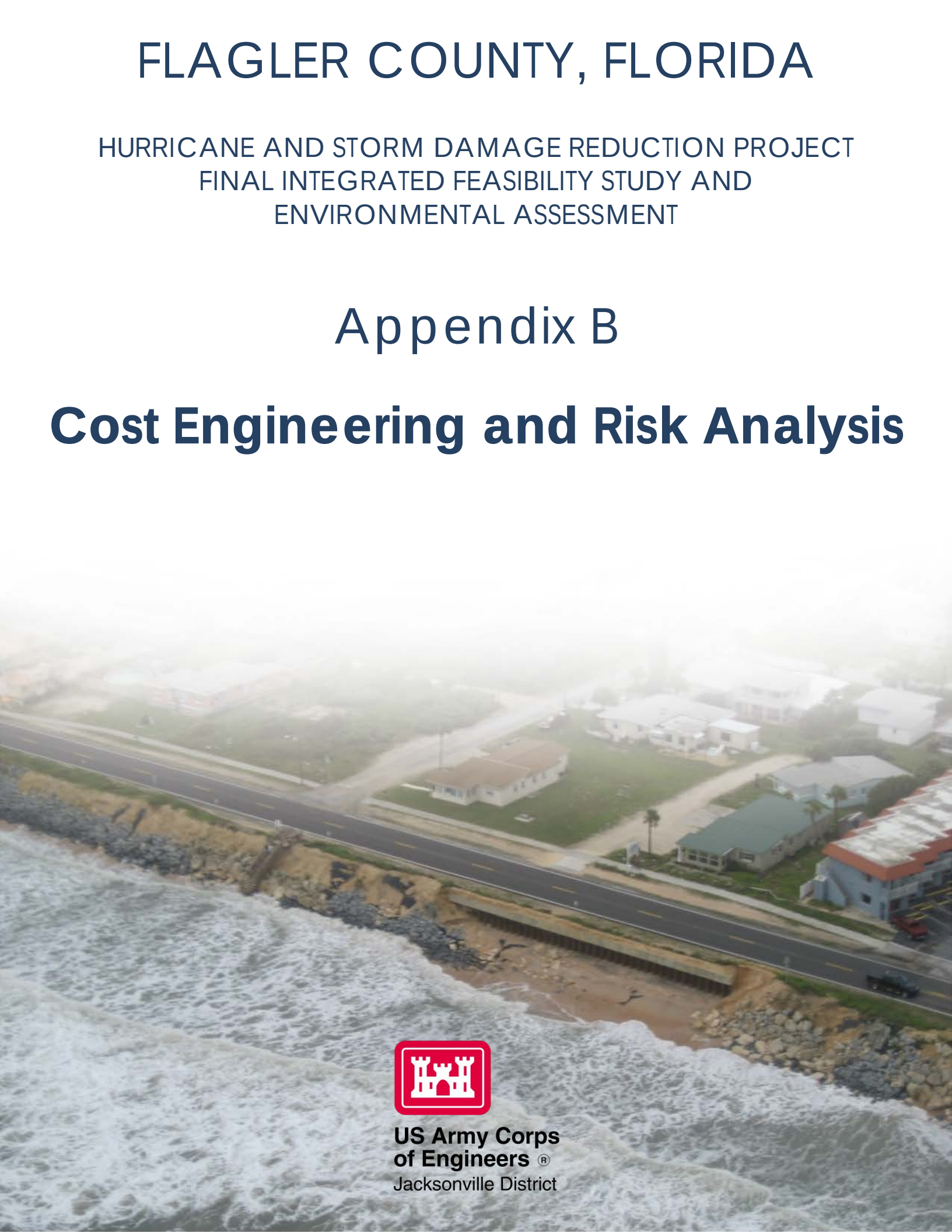
FLAGLER COUNTY, FLORIDA

HURRICANE AND STORM DAMAGE REDUCTION PROJECT
FINAL INTEGRATED FEASIBILITY STUDY AND
ENVIRONMENTAL ASSESSMENT

Appendix B

Cost Engineering and Risk Analysis



US Army Corps
of Engineers ®
Jacksonville District

HURRICANE AND STORM DAMAGE REDUCTION PROJECT FOR FLAGLER COUNTY, FLORIDA

INTEGRATED FEASIBILITY STUDY AND ENVIRONMENTAL ASSESSMENT

APPENDIX B
COST ENGINEERING AND RISK ANALYSIS

AUGUST 2014

TABLE OF CONTENTS

B. COST ESTIMATES 1

B1. GENERAL INFORMATION 1

B.1.1 Plan Formulation Cost Estimates 2

B.1.2 Recommended Plan(s) 2

B.1.3 Construction Cost 2

B.1.4 Non-construction Cost 2

B.1.5 Construction Schedule 3

B.1.6 Total Project Cost Summary 3

B2. PLAN FORMULATION COST ESTIMATES 3

B3. RECOMMENDED PLAN (NED) COST ESTIMATE 5

B4. SCHEDULE 5

B5. RISK AND UNCERTAINTY ANALYSIS 7

B.5.1 Risk Analysis Methods 7

B.5.2 Risk Analysis Results 7

B6. TOTAL PROJECT COST SUMMARY 8

B.6.1 Total Project Cost Summary Spreadsheet 8

B7. COST DX TPCS CERTIFICATION 15

ATTACHMENT TO APPENDIX B

ATTACHMENT A: COST AND SCHEDULE RISK ANALYSIS

B. COST ESTIMATES

B1. 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 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

The goal of the cost estimates for the Flagler County Shore Protection Project Feasibility Study are to present a Total Project Cost (construction and non-construction costs) for the Recommended Plan(s) 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 the definition of the Government's and the non-Federal sponsor's obligations.

The cost estimating effort for the 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 Work Breakdown Structure (CWWBS) format to the sub-feature level. The cost estimate supporting the National Economic Development (NED) plan (Recommended Plan/Locally Preferred Plan) is prepared in MCACES/MII (Microcomputer Aided Cost Estimating System) format to the CWWBS 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.

An abbreviated risk analysis was prepared that addresses project uncertainties and sets contingencies for the plan formulation cost estimates. A full cost and schedule risk analysis was performed to establish the project contingency for the Recommended Plan's cost items.

B.1.1 Plan Formulation Cost Estimates

For the plan formulation cost estimates, unit prices for dredging related work were developed in CEDEP and then entered into MCACES/MII. Unit prices for the remaining major or variable construction elements were developed in MCACES/MII based on input from the PDT. Design details, information and assumptions were provided in the Engineering Appendix. Plan formulation alternatives were run through Beach-Fx for calculation of the Benefit-to-Cost Ratio (BCR). Cost Engineering provided estimates for the initial construction on all alternatives that were input into Beach-Fx. An abbreviated risk analysis was completed in order to establish the contingency for each of the alternatives. Non-construction costs were included as percentages of the total construction contract cost for this level of comparison and screening.

Refer to Economics Section in the main report for final plan formulation cost tables.

B.1.2 Recommended Plan(s)

The Recommended Plan or NED plan was chosen by the Project Delivery Team (PDT) according to the plan formulation described above. The Economics Appendix fully describes the plan selection. The scope of work for the Recommended Plan is found in Appendix A, Engineering. The MCACES/MII cost estimate for the Recommended Plan is based on that scope and is formatted in the CWWBS. The notes provided in the body of the estimate detail the estimate parameters and assumptions. These include pricing at the Fiscal Year 2014 price level (1 October 2013-30 September 2014). For project justification purposes, the estimate costs are categorized under the appropriate CWWBS code and include both construction and non-construction costs.

The construction costs fall under the following feature codes:

- 17 Beach Replenishment
- 02 Relocations

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

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

B.1.3 Construction Cost

For the construction costs, unit prices for dredging related work were developed in the Cost Engineeing Dredge Estimating Program (CEDEP) and then entered into MCACES/MII. These costs include all major project components categorized under the appropriate CWWBS to the sub-feature level. The Total Project Cost Summary (TPCS) on the Recommended Plan contains contingencies that were determined as a result of the cost and schedule risk analysis, which is covered under another paragraph.

B.1.4 Non-construction Cost

Non-construction costs typically include Lands and Damages (Real Estate), Planning Engineering & Design (PED) and Construction Management Costs (Supervision & Administration, S&A). These costs were provided by the PDT either as a lump sum cost or as

a percentage of the total Construction Contract Cost. Lands and Damages are provided by Real Estate and are best described in the Real Estate Appendix, Appendix D. PED costs are for the preparation of contract plans and specifications (P&S) and include itemized costs that were provided by the PDT, as well as costs for Post-Construction Monitoring costs and percentages for Engineering During Construction (EDC) that were provided by the project manager. Construction Management costs are for the supervision and administration of a contract and include Project Management and Contract Admin costs. These costs were provided by the project manager and are included as a percentage of the total construction contract cost.

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.1.5 Construction Schedule

A construction schedule was prepared utilizing input from the PDT and reflects all project construction components. The schedule considers not only durations of individual components of construction, but also the timing of construction contracts based on funding and construction windows. The construction schedule was combined with the project schedule to create an overall schedule that was used for the generation of the TPCS. The construction schedule will change as the project moves through the various project lifecycle phases.

B.1.6 Total Project Cost Summary

The cost estimate for the Recommended Plan is prepared with an identified price level date and inflation factors are used to adjust the pricing to the project schedule. 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; Planning Engineering and Design; Construction Management; Contingency; and Inflation.

B2. PLAN FORMULATION COST ESTIMATES

There were several alternatives the PDT evaluated during plan formulation in order to identify the Tentatively Selected Plan (TSP). All alternatives that were evaluated at various stages in the study can be found in the Economics Appendix and are also outlined in the Main Report.

The Final Array of Alternatives looked at the initial construction costs for three identified reaches, three separate conditions (varying beach widths) for each reach and several combinations of reaches and conditions; altogether there were fifteen beach replenishment alternatives estimated, evaluated and compared in the final array to determine the TSP.

All alternatives in the final array considered varying dune or beach widths constructed via dredging and hydraulic pumpout; costs for dune plantings were also included. All reach lengths, volumes and distances to borrow areas were provided in spreadsheet format by Engineering. The volumes were calculated by BeachFx. Average distances to borrow sites were estimated

using GoogleEarth. Quantities for dune plantings were calculated based on acreages and FDEP planting requirement information provided by Planning.

The various alternatives were as follows:

Reach A:

ReachAduneH

This alternative is a 10-foot extension of the existing ReachA dune and beach profile.

ReachA30

This alternative is a 10-foot extension of ReachA dune and a 20-foot berm extension.

ReachA50

This alternative is a 10-foot extension of ReachA dune and a 40-foot berm extension.

Reach B:

ReachBduneH

This alternative is a 10-foot extension of the existing ReachB dune and beach profile.

ReachB30

This alternative is a 10-foot extension of ReachB dune and a 20-foot berm extension.

ReachB50

This alternative is a 10-foot extension of ReachB dune and a 40-foot berm extension.

Reach C:

ReachCduneH

This alternative is a 10-foot extension of the existing ReachC dune and beach profile.

ReachC30

This alternative is a 10-foot extension of ReachC dune and a 20-foot berm extension.

ReachC50

This alternative is a 10-foot extension of ReachC dune and a 40-foot berm extension.

Reach A/C

ReachACduneH

This alternative is a 10-foot extension of the existing ReachA and ReachC dunes and beach profiles.

ReachAC30

This alternative is a 10-foot extension of ReachA and ReachC dunes and a 20-foot berm extension.

ReachAC50

This alternative is a 10-foot extension of ReachA and ReachC dunes and a 40-foot berm extension.

Reach A/B:

ReachABduneH

This alternative is a 10-foot extension of the existing ReachA and ReachB dunes and beach profiles.

Reach B/C:

ReachBCduneH

This alternative is a 10-foot extension of the existing ReachB and ReachC dunes and beach profiles.

Reach A/B/C:

ReachABCduneH

This alternative is a 10-foot extension of the existing ReachA, ReachB and ReachC dunes and beach profiles.

All dredging unit costs were calculated in CEDEP and transferred to MII to determine the total initial construction costs for each alternative. Real estate provided costs for the Lands and Damages by reach. The Planning, Engineering and Design (PED) costs, Engineering During Construction (EDC) costs and Supervision & Administration (S&A) costs were provided as a percentage of the total construction contract cost per the Project Manager.

A contingency was applied to each alternative. The contingency for the Real Estate costs was provided by RE Division. The contingencies for the construction and remaining non-construction costs were developed using an Abbreviated Risk Analysis. All major risk components were the same for each reach and alternative. Fluctuations in contingencies were mostly as a result of varying total initial construction costs. Site access, staging areas and dune crossovers were all identified as risk items that would require further consideration and refinement in the cost estimate.

Once the total initial construction costs for each alternative were developed in MII, the costs were broken down into a spreadsheet so that the PDT could input the cost information into BeachFx. The table listed the Mobilization & Demobilization costs separately and a Total Cost/Cubic Yard that consisted of the Dredging Cost, plus the non-Construction Costs (minus the Real Estate) since these were the two main cost inputs for BeachFx. The cost of the dune plantings and the Real Estate costs were listed separately and were added to the total project cost outside of BeachFx.

B3. RECOMMENDED PLAN (NED) COST ESTIMATE

The recommended design, ReachCduneH covers approximately 2.6 miles of the study area extending from R-80 to R-94 with tapers extending approximately 100 ft north of R-80 and approximately 100ft south of R-94. The construction template consists of a 10 foot wide dune extension with a 1 on 3 slope, a 35.0 foot berm with a 1 on 100 slope, and foreshore fill extending to approximately -2 ft-NAVD88 with a slope of 1 on 5.

The Reach C project length (R-80 to R-94) contains twenty-one public dune walkovers. Each crosses the dune within the project area and will require replacement due to placement of the initial project fill. Although the existing structures range from basic to relatively elaborate, for feasibility level design and cost estimating purposes, a single dune walkover design is applied to all replacements. It should be noted that modification of this design may occur during the detailed design phase of the study.

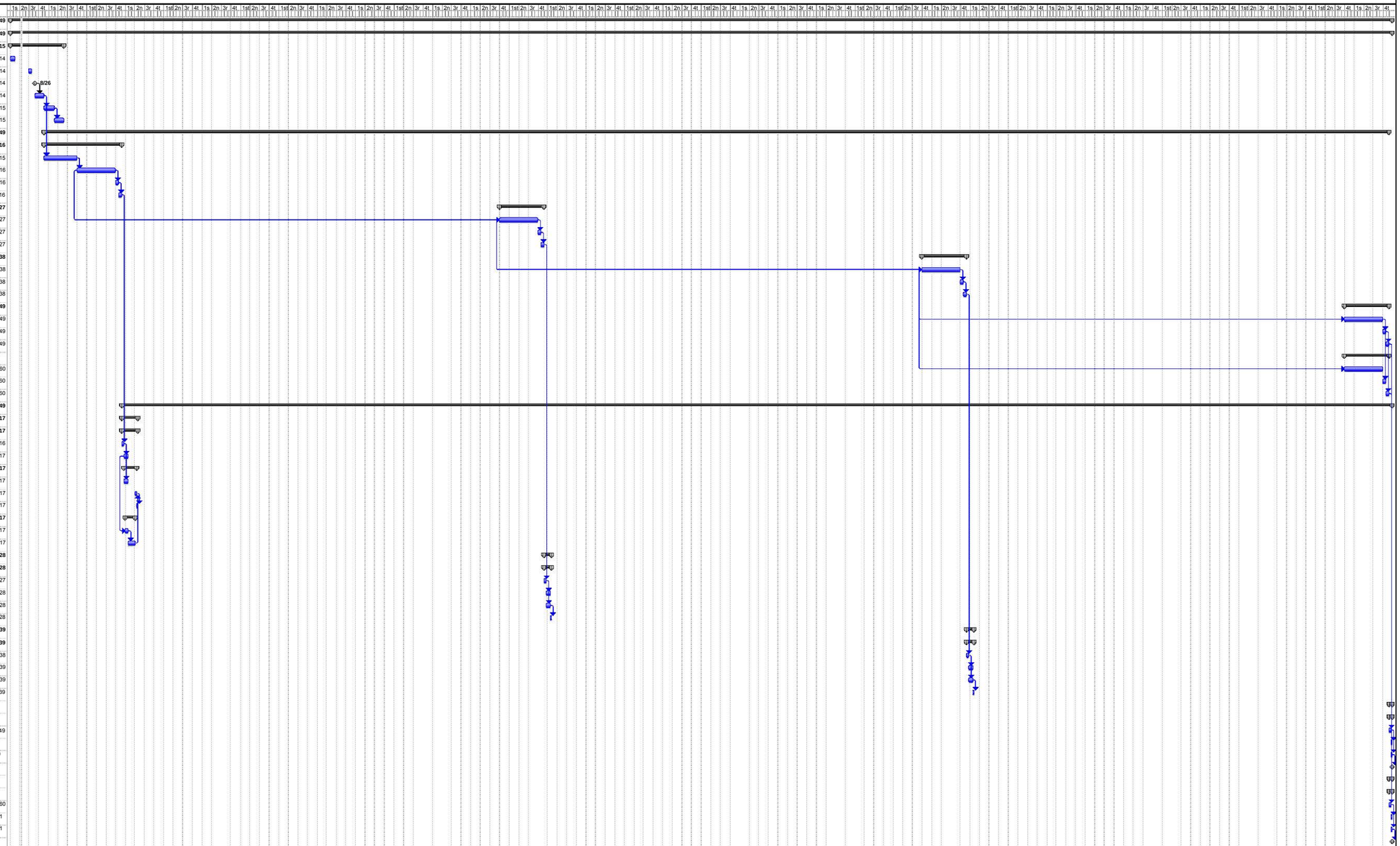
The Recommended Plan estimate was prepared for the Total Project Cost, not just the initial construction costs.

B4. SCHEDULE

The project schedule covers the lifecycle phases of the recommended plan (Planning Phase, Preconstruction, Engineering and Design (PED) Phase and the Construction Phase). Refer to the Schedule on page B-6.

A4. SCHEDULE

ID	Task Name	Duration	Start	Finish
1	**Flagler Co. SPP**	**13143 days**	**Mon 1/6/14**	**Fri 12/31/49**
2	**Recommended Plan: Reach C- Dune Only Option**	**13143 days**	**Mon 1/6/14**	**Fri 12/31/49**
3	**Planning Phase**	**509 days**	**Mon 1/6/14**	**Sat 5/30/15**
4	Submit Final Report to DE Commander	45 days	Mon 1/6/14	Thu 2/20/14
5	Division Engineer Transmittal Letter	32 days	Thu 6/26/14	Mon 7/28/14
6	CWRB	0 days	Tue 8/26/14	Tue 8/26/14
7	Chief of Engineers Report	86 days	Wed 8/27/14	Fri 11/21/14
8	ASA(CW) Transmittal to Congress	100 days	Fri 11/21/14	Sun 3/1/15
9	WRDA Authorization	90 days	Sun 3/1/15	Sat 5/30/15
10	**PED Phase**	**12793 days**	**Fri 11/21/14**	**Tue 11/30/49**
11	**Initial Construction- 2017**	**740 days**	**Fri 11/21/14**	**Wed 11/30/16**
12	PPA	314 days	Fri 11/21/14	Thu 10/1/15
13	Prepare P&S/Permit/MMS Agreemen	366 days	Thu 10/1/15	Sat 10/1/16
14	Advertise	30 days	Sat 10/1/16	Mon 10/31/16
15	Award	30 days	Mon 10/31/16	Wed 11/30/16
16	**Renourishment 1- 2028**	**425 days**	**Thu 10/1/26**	**Tue 11/30/27**
17	Prepare P&S/Permit	365 days	Thu 10/1/26	Fri 10/1/27
18	Advertise	30 days	Fri 10/1/27	Sun 10/31/27
19	Award	30 days	Sun 10/31/27	Tue 11/30/27
20	**Renourishment 2- 2039**	**425 days**	**Thu 10/1/37**	**Tue 11/30/38**
21	Prepare P&S/Permit	365 days	Thu 10/1/37	Fri 10/1/38
22	Advertise	30 days	Fri 10/1/38	Sun 10/31/38
23	Award	30 days	Sun 10/31/38	Tue 11/30/38
24	**Renourishment 3- 2050**	**425 days**	**Thu 10/1/48**	**Tue 11/30/49**
25	Prepare P&S/Permit	365 days	Thu 10/1/48	Fri 10/1/49
26	Advertise	30 days	Fri 10/1/49	Sun 10/31/49
27	Award	30 days	Sun 10/31/49	Tue 11/30/49
28	**Renourishment 4- 2061**	**425 days**	**Thu 10/1/**	**Tue 11/30/**
29	Prepare P&S/Permit	365 days	Thu 10/1/59	Fri 10/1/60
30	Advertise	30 days	Fri 10/1/60	Sun 10/31/60
31	Award	30 days	Sun 10/31/60	Tue 11/30/60
32	**Construction Phase**	**12084 days**	**Wed 11/30/16**	**Fri 12/31/49**
33	**Initial Construction- 2017**	**153 days**	**Wed 11/30/16**	**Tue 5/2/17**
34	**17 Beach Renourishment**	**153 days**	**Wed 11/30/16**	**Tue 5/2/17**
35	Mob & Preparatory Work	20 days	Wed 11/30/16	Tue 12/20/16
36	Hopper Dredging	42 days	Tue 12/20/16	Tue 1/31/17
37	**Associated General Items**	**123 days**	**Tue 12/20/16**	**Sat 4/22/17**
38	Environmental Monitoring	42 days	Tue 12/20/16	Tue 1/31/17
39	Dune Planting	15 days	Fri 4/7/17	Sat 4/22/17
40	Demob	10 days	Sat 4/22/17	Tue 5/2/17
41	**02 Relocations**	**96 days**	**Sun 1/1/17**	**Fri 4/7/17**
42	Mob & Preparatory Work	30 days	Sun 1/1/17	Tue 1/31/17
43	Construct Dune Walkovers	66 days	Tue 1/31/17	Fri 4/7/17
44	**Renourishment 1- 2028**	**71 days**	**Tue 11/30/27**	**Wed 2/9/28**
45	**17 Beach Renourishment**	**71 days**	**Tue 11/30/27**	**Wed 2/9/28**
46	Mob & Preparatory Work	20 days	Tue 11/30/27	Mon 12/20/27
47	Hopper Dredging	41 days	Mon 12/20/27	Sun 1/30/28
48	Associated General Items	41 days	Mon 12/20/27	Sun 1/30/28
49	Demob	10 days	Sun 1/30/28	Wed 2/9/28
50	**Renourishment 2- 2039**	**71 days**	**Tue 11/30/38**	**Wed 2/9/39**
51	**17 Beach Renourishment**	**71 days**	**Tue 11/30/38**	**Wed 2/9/39**
52	Mob & Preparatory Work	20 days	Tue 11/30/38	Mon 12/20/38
53	Hopper Dredging	41 days	Mon 12/20/38	Sun 1/30/39
54	Associated General Items	41 days	Mon 12/20/38	Sun 1/30/39
55	Demob	10 days	Sun 1/30/39	Wed 2/9/39
56	**Renourishment 3- 2050**	**days**	**Tue 11/30/49**	**Fri / /**
57	**17 Beach Renourishment**	**days**	**Tue 11/30/49**	**Fri / /**
58	Mob & Preparatory Work	20 days	Tue 11/30/49	Mon 12/20/49
59	Hopper Dredging	41 days	Mon 12/20/49	Fri 1/30/50
60	Associated General Items	41 days	Mon 12/20/49	Fri 1/30/50
61	Demob	10 days	Fri 1/30/50	Fri 2/9/50
62	**Renourishment 4- 2061**	**days**	**Tue 11/30/**	**Fri 2/ /**
63	**17 Beach Renourishment**	**days**	**Tue 11/30/**	**Fri 2/ /**
64	Mob & Preparatory Work	20 days	Tue 11/30/60	Mon 12/20/60
65	Hopper Dredging	41 days	Mon 12/20/60	Fri 1/31/61
66	Associated General Items	41 days	Mon 12/20/60	Fri 1/31/61
67	Demob	10 days	Fri 1/31/61	Fri 2/10/61



Project: FlaglerCoSPP-SelectedPlan
Date: Wed 4/16/14

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

B5. RISK AND UNCERTAINTY ANALYSIS

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.

B.5.1 Risk Analysis Methods

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 the desired level of cost confidence.

The entire PDT participated in a risk analysis brainstorming session to identify risks associated with the Recommended Plan. The risks were listed in the risk register, which is a tool commonly used in project planning and risk analysis, and evaluated by the PDT. The actual Risk Register is provided in Attachment A. Assumptions were made as to the likelihood and impact of each risk item, as well as the probability of occurrence and magnitude of the impact if it were to occur. A risk model was then developed by Walla Walla in order to establish contingencies to apply to the project cost. Risks were evaluated for the following features of work:

- 01 Lands and Damages
- 02 Relocations
    - Dune Walkover Construction (Initial Construction Only)
- 17 Beach Replenishment
    - Mob, Demob & Preparatory Work
    - Hopper Dredging
    - Dune Planting (Initial Construction Only)
- 30 Planning, Engineering and Design
- 31 Construction Management

After the model was run, the results were reviewed and all parameters were re-evaluated by the PDT as a sanity check of assumptions and inputs. Adjustments were made to the analysis accordingly and the final contingency was established. The contingency was applied to the Recommended Plan estimate in the Total Project Cost Summary in order to obtain the Fully Funded Cost.

B.5.2 Risk Analysis Results

Risk analysis results are intended to provide project leadership with contingency information for scheduling, budgeting, and project control purposes, as well as to provide tools to support decision making and risk management as projects progress through planning and implementation.

Based on the risks that were assessed for the project, the resultant contingency was 23%. The complete breakdown of results can be viewed in the Cost and Schedule Risk Analysis

report prepared by Walla Walla Mandatory Cost Center of Expertise and provided in Attachment A.

B6. 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 Recommended Plan and the official project schedule. The TPCS includes Federal and non-Federal costs for Lands and Damages, all construction features, PED, S&A, along with the appropriate contingencies and escalation associated with each of these activities. The TPCS is formatted according to the CWWBS and uses Civil Works Construction Cost Indexing System (CWCCIS) 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 was prepared using the MCACES/MII cost estimate on the Recommended Plan, as well as the contingencies set by the risk analysis and the official project schedule.

B.6.1 Total Project Cost Summary Spreadsheet

Refer to the Total Project Cost Summary Spreadsheet on the next page.

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

Printed:8/21/2014

PROJECT: **Flagler Co. Shore Protection Project**
PROJECT NO: **113166**
LOCATION: Flagler County, Florida

DISTRICT: SAJ- Jacksonville PREPARED: 6/4/2014
POC: ACTING CHIEF, COST ENGINEERING, Theresa Gneiting-James

This Estimate reflects the scope and schedule in report; Flagler Co. Shore Protection Project Integrated Feasibility Report

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2015 Effective Price Level Date: 1 OCT 14									
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	Spent Thru: **10/1/2013** ($K)	**TOTAL FIRST COST** ($K)	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*				*M*	*N*	*O*
17	BEACH REPLENISHMENT	$25,527	$5,871	23%	$31,398	1.6%	$25,924	$5,962	$31,886	$0	$31,886	66.9%	$43,270	$9,952	$53,223
02	RELOCATIONS	$941	$216	23%	$1,157	1.6%	$955	$220	$1,175	$0	$1,175	4.4%	$997	$229	$1,227
	CONSTRUCTION ESTIMATE TOTALS:	$26,468	$6,088		$32,555	1.6%	$26,879	$6,182	$33,061	$0	$33,061	64.7%	$44,268	$10,182	$54,449
01	LANDS AND DAMAGES	$2,768	$637	23%	$3,405	1.6%	$2,811	$647	$3,458	$0	$3,458	2.8%	$2,891	$665	$3,556
30	PLANNING, ENGINEERING & DESIGN	$4,732	$1,088	23%	$5,820	2.2%	$4,834	$1,112	$5,946	$0	$5,946	252.9%	$17,059	$3,924	$20,983
31	CONSTRUCTION MANAGEMENT	$1,987	$457	23%	$2,444	2.2%	$2,030	$467	$2,497	$0	$2,497	262.1%	$7,351	$1,691	$9,042
	PROJECT COST TOTALS:	$35,955	$8,270	23%	$44,224		$36,554	$8,407	**$44,962**	$0	**$44,962**	95.8%	$71,569	$16,461	$88,030

GNEITING-JAMES.THERESA.ANNE.1395797847 — ACTING CHIEF, COST ENGINEERING, Theresa Gneiting-James

HARRAH.JASON.S.1265654769 — PROJECT MANAGER, Jason Harrah

ORMEROD.AUDREY.C.1230602634 — CHIEF, REAL ESTATE, Audrey Ormerod

CHIEF, PLANNING, Eric Bush

BOROCHANER.LAUREEN.A.1229042080 — CHIEF, ENGINEERING, Laureen Borochaner

CHIEF, OPERATIONS, Jim Jeffords

CHIEF, CONSTRUCTION, Stephen Duba

CHIEF, CONTRACTING, Carlos Clark

CHIEF, PM-PB, Daniel Haubner

CHIEF, DPM, David Hobbie

ESTIMATED INITIAL CONSTRUCTION FEDERAL COST:	**65.0%**	**$9,666**
ESTIMATED INITIAL CONSTRUCTION NON-FEDERAL COST:	**35.0%**	**$5,205**
ESTIMATED PERIODIC RENOURISHMENT FEDERAL COST:	**50.0%**	**$36,580**
ESTIMATED PERIODIC RENOURISHMENT NON-FEDERAL COST:	**50.0%**	**$36,580**
ESTIMATED TOTAL PROJECT COST:		**$88,030**

Filename: FlaglerCoSPP_RecommendedPlan_TPCS Mar 2014_Rev_01.xlsx
TPCS

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

Printed:8/21/2014

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

PROJECT: Flagler Co. Shore Protection Project
LOCATION: Flagler County, Florida
This Estimate reflects the scope and schedule in report; Flagler Co. Shore Protection Project Integrated Feasibility Report

DISTRICT: SAJ- Jacksonville
POC: ACTING CHIEF, COST ENGINEERING, Theresa Gneiting-James
PREPARED: 6/4/2014

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 3/15/2014 Effective Price Level: 10/1/2013				Program Year (Budget EC): 2015 Effective Price Level Date: 1 OCT 14								
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	RISK BASED 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*
	CONTRACT 1- INITIAL CONSTRUCTION													
17	BEACH REPLENISHMENT	$5,811	$1,336	23%	$7,147	1.6%	$5,901	$1,357	$7,258	2017Q2	4.4%	$6,160	$1,417	$7,577
02	RELOCATIONS	$941	$216	23%	$1,157	1.6%	$955	$220	$1,175	2017Q2	4.4%	$997	$229	$1,227
		$0	$0	0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
		$0	$0	0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
		$0	$0	0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
							$0							
	CONSTRUCTION ESTIMATE TOTALS:	$6,751	$1,553	23%	**$8,304**		$6,856	$1,577	$8,433			$7,158	$1,646	$8,804
01	LANDS AND DAMAGES	$2,768	$637	23%	$3,405	1.6%	$2,811	$647	$3,458	2016Q3	2.8%	$2,891	$665	$3,556
30	PLANNING, ENGINEERING & DESIGN													
	Project Management	$80	$18	23%	$98	2.2%	$82	$19	$101	2016Q3	5.4%	$86	$20	$106
	Planning & Environmental Compliance	$249	$57	23%	$306	2.2%	$254	$59	$313	2016Q3	5.4%	$268	$62	$330
	Engineering & Design	$524	$121	23%	$645	2.2%	$535	$123	$658	2016Q3	5.4%	$564	$130	$694
	Reviews, ATRs, IEPRs, VE	$22	$5	23%	$27	2.2%	$22	$5	$28	2016Q3	5.4%	$24	$5	$29
	Life Cycle Updates (cost, schedule, risks)	$0	$0	23%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	Contracting & Reprographics	$62	$14	23%	$76	2.2%	$63	$15	$78	2016Q3	5.4%	$67	$15	$82
	Engineering During Construction	$169	$39	23%	$208	2.2%	$173	$40	$212	2017Q2	8.5%	$187	$43	$230
	Planning During Construction	$0	$0	23%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	Post Construction Monitoring	$210	$48	23%	$258	2.2%	$215	$49	$264	2022Q2	31.7%	$283	$65	$348
31	CONSTRUCTION MANAGEMENT													
	Construction Management	$507	$117	23%	$624	2.2%	$518	$119	$637	2017Q2	8.5%	$562	$129	$691
	Project Operation:	$0	$0	23%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	Project Management	$0	$0	23%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONTRACT COST TOTALS:	$11,342	$2,609		**$13,951**		$11,530	$2,652	$14,182			$12,090	$2,781	**$14,870**

Filename: FlaglerCoSPP_RecommendedPlan_TPCS Mar 2014_Rev_01.xlsx
TPCS

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

Printed:8/21/2014

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

PROJECT: Flagler Co. Shore Protection Project
LOCATION: Flagler County, Florida
This Estimate reflects the scope and schedule in report; Flagler Co. Shore Protection Project Integrated Feasibility Report

DISTRICT: SAJ- Jacksonville
POC: ACTING CHIEF, COST ENGINEERING, Theresa Gneiting-James
PREPARED: 6/4/2014

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 3/15/2014 Effective Price Level: 10/1/2013				Program Year (Budget EC): 2015 Effective Price Level Date: 1 OCT 14								
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*
	CONTRACT 2- RENOURISHMENT 1													
17	BEACH REPLENISHMENT	$4,929	$1,134	23%	$6,063	1.6%	$5,006	$1,151	$6,157	2028Q2	29.8%	$6,497	$1,494	$7,992
		$0	$0	0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
		$0	$0	0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
		$0	$0	0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
		$0	$0	0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
							$0							
	CONSTRUCTION ESTIMATE TOTALS:	$4,929	$1,134	23%	**$6,063**		$5,006	$1,151	$6,157			$6,497	$1,494	$7,992
01	LANDS AND DAMAGES	$0	$0	23%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
	Project Management	$80	$18	23%	$98	2.2%	$82	$19	$101	2027Q3	63.6%	$134	$31	$164
	Planning & Environmental Compliance	$74	$17	23%	$91	2.2%	$76	$17	$93	2027Q3	63.6%	$124	$28	$152
	Engineering & Design	$262	$60	23%	$322	2.2%	$267	$61	$329	2027Q3	63.6%	$437	$101	$538
	Reviews, ATRs, IEPRs, VE	$10	$2	23%	$12	2.2%	$10	$2	$13	2027Q3	63.6%	$17	$4	$21
	Life Cycle Updates (cost, schedule, risks)	$50	$12	23%	$62	2.2%	$51	$12	$63	2027Q3	63.6%	$84	$19	$103
	Contracting & Reprographics	$62	$14	23%	$76	2.2%	$63	$15	$78	2027Q3	63.6%	$104	$24	$127
	Engineering During Construction	$124	$29	23%	$153	2.2%	$127	$29	$156	2028Q2	68.9%	$214	$49	$263
	Planning During Construction	$0	$0	23%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	Post Construction Monitoring	$210	$48	23%	$258	2.2%	$215	$49	$264	2033Q2	112.5%	$456	$105	$561
31	CONSTRUCTION MANAGEMENT													
	Construction Management	$370	$85	23%	$455	2.2%	$378	$87	$465	2028Q2	68.9%	$639	$147	$785
	Project Operation:	$0	$0	23%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	Project Management	$0	$0	23%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONTRACT COST TOTALS:	$6,171	$1,419		**$7,590**		$6,274	$1,443	$7,717			$8,704	$2,002	**$10,706**

Filename: FlaglerCoSPP_RecommendedPlan_TPCS Mar 2014_Rev_01.xlsx
TPCS

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

Printed:8/21/2014

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

PROJECT: Flagler Co. Shore Protection Project
LOCATION: Flagler County, Florida
This Estimate reflects the scope and schedule in report; Flagler Co. Shore Protection Project Integrated Feasibility Report

DISTRICT: SAJ- Jacksonville
POC: ACTING CHIEF, COST ENGINEERING, Theresa Gneiting-James
PREPARED: 6/4/2014

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			3/15/2014	Program Year (Budget EC):			2015					
		Effective Price Level:			10/1/2013	Effective Price Level Date:			1 OCT 14					
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*
	CONTRACT 3- RENOURISHMENT 2													
17	BEACH REPLENISHMENT	$4,929	$1,134	23%	$6,063	1.6%	$5,006	$1,151	$6,157	2039Q2	61.4%	$8,079	$1,858	$9,937
		$0	$0	0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
		$0	$0	0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
		$0	$0	0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
		$0	$0	0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
							$0							
	CONSTRUCTION ESTIMATE TOTALS:	$4,929	$1,134	23%	**$6,063**		$5,006	$1,151	$6,157			$8,079	$1,858	$9,937
01	LANDS AND DAMAGES	$0	$0	23%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
	Project Management	$80	$18	23%	$98	2.2%	$82	$19	$101	2038Q3	175.4%	$225	$52	$277
	Planning & Environmental Compliance	$74	$17	23%	$91	2.2%	$76	$17	$93	2038Q3	175.4%	$208	$48	$256
	Engineering & Design	$262	$60	23%	$322	2.2%	$267	$61	$329	2038Q3	175.4%	$736	$169	$905
	Reviews, ATRs, IEPRs, VE	$10	$2	23%	$12	2.2%	$10	$2	$13	2038Q3	175.4%	$28	$6	$35
	Life Cycle Updates (cost, schedule, risks)	$50	$12	23%	$62	2.2%	$51	$12	$63	2038Q3	175.4%	$141	$32	$173
	Contracting & Reprographics	$62	$14	23%	$76	2.2%	$63	$15	$78	2038Q3	175.4%	$174	$40	$215
	Engineering During Construction	$124	$29	23%	$153	2.2%	$127	$29	$156	2039Q2	175.4%	$349	$80	$429
	Planning During Construction	$0	$0	23%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	Project Operations	$210	$48	23%	$258	2.2%	$215	$49	$264	2044Q2	175.4%	$591	$136	$727
31	CONSTRUCTION MANAGEMENT													
	Construction Management	$370	$85	23%	$455	2.2%	$378	$87	$465	2039Q2	185.7%	$1,080	$248	$1,328
	Project Operation:	$0	$0	23%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	Project Management	$0	$0	23%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONTRACT COST TOTALS:	$6,171	$1,419		**$7,590**		$6,274	$1,443	$7,717			$11,610	$2,670	**$14,280**

Filename: FlaglerCoSPP_RecommendedPlan_TPCS Mar 2014_Rev_01.xlsx
TPCS

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

Printed:8/21/2014

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

PROJECT: Flagler Co. Shore Protection Project
LOCATION: Flagler County, Florida
This Estimate reflects the scope and schedule in report; Flagler Co. Shore Protection Project Integrated Feasibility Report

DISTRICT: SAJ- Jacksonville
POC: ACTING CHIEF, COST ENGINEERING, Theresa Gneiting-James
PREPARED: 6/4/2014

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			3/15/2014	Program Year (Budget EC):			2015					
		Effective Price Level:			10/1/2013	Effective Price Level Date:			1 OCT 14	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*
	CONTRACT 4- RENOURISHMENT 3													
17	BEACH REPLENISHMENT	$4,929	$1,134	23%	$6,063	1.6%	$5,006	$1,151	$6,157	2050Q2	100.7%	$10,045	$2,310	$12,355
		$0	$0	0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
		$0	$0	0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
		$0	$0	0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
		$0	$0	0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
							$0							
	CONSTRUCTION ESTIMATE TOTALS:	$4,929	$1,134	23%	**$6,063**		$5,006	$1,151	$6,157			$10,045	$2,310	$12,355
01	LANDS AND DAMAGES	$0	$0	23%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
	Project Management	$80	$18	23%	$98	2.2%	$82	$19	$101	2049Q3	374.7%	$388	$89	$477
	Planning & Environmental Compliance	$74	$17	23%	$91	2.2%	$76	$17	$93	2049Q3	374.7%	$359	$83	$441
	Engineering & Design	$262	$60	23%	$322	2.2%	$267	$61	$329	2049Q3	374.7%	$1,268	$292	$1,560
	Reviews, ATRs, IEPRs, VE	$10	$2	23%	$12	2.2%	$10	$2	$13	2049Q3	374.7%	$48	$11	$60
	Life Cycle Updates (cost, schedule, risks)	$50	$12	23%	$62	2.2%	$51	$12	$63	2049Q3	374.7%	$242	$56	$298
	Contracting & Reprographics	$62	$14	23%	$76	2.2%	$63	$15	$78	2049Q3	374.7%	$301	$69	$370
	Engineering During Construction	$124	$29	23%	$153	2.2%	$127	$29	$156	2050Q2	392.5%	$624	$143	$767
	Planning During Construction	$0	$0	23%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	Post Construction Monitoring	$210	$48	23%	$258	2.2%	$215	$49	$264	2055Q2	530.8%	$1,353	$311	$1,665
31	CONSTRUCTION MANAGEMENT													
	Construction Management	$370	$85	23%	$455	2.2%	$378	$87	$465	2050Q2	392.5%	$1,862	$428	$2,290
	Project Operation:	$0	$0	23%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	Project Management	$0	$0	23%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONTRACT COST TOTALS:	$6,171	$1,419		**$7,590**		$6,274	$1,443	$7,717			$16,490	$3,793	**$20,283**

Filename: FlaglerCoSPP_RecommendedPlan_TPCS Mar 2014_Rev_01.xlsx
TPCS

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

Printed:8/21/2014

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

PROJECT: Flagler Co. Shore Protection Project
LOCATION: Flagler County, Florida
This Estimate reflects the scope and schedule in report; Flagler Co. Shore Protection Project Integrated Feasibility Report

DISTRICT: SAJ- Jacksonville
POC: ACTING CHIEF, COST ENGINEERING, Theresa Gneiting-James
PREPARED: 6/4/2014

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			3/15/2014	Program Year (Budget EC):			2015					
		Effective Price Level:			10/1/2013	Effective Price Level Date:			1 OCT 14	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*
	CONTRACT 5- RENOURISHMENT 4													
17	BEACH REPLENISHMENT	$4,929	$1,134	23%	$6,063	1.6%	$5,006	$1,151	$6,157	2061Q2	149.5%	$12,489	$2,873	$15,362
		$0	$0	0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
		$0	$0	0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
		$0	$0	0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
		$0	$0	0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
							$0							
	CONSTRUCTION ESTIMATE TOTALS:	$4,929	$1,134	23%	**$6,063**		$5,006	$1,151	$6,157			$12,489	$2,873	$15,362
01	LANDS AND DAMAGES	$0	$0	23%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
	Project Management	$80	$18	23%	$98	2.2%	$82	$19	$101	2060Q3	718.2%	$669	$154	$822
	Planning & Environmental Compliance	$74	$17	23%	$91	2.2%	$76	$17	$93	2060Q3	718.2%	$619	$142	$761
	Engineering & Design	$262	$60	23%	$322	2.2%	$267	$61	$329	2060Q3	718.2%	$2,186	$503	$2,689
	Reviews, ATRs, IEPRs, VE	$10	$2	23%	$12	2.2%	$10	$2	$13	2060Q3	718.2%	$84	$19	$103
	Life Cycle Updates (cost, schedule, risks)	$50	$12	23%	$62	2.2%	$51	$12	$63	2060Q3	718.2%	$418	$96	$514
	Contracting & Reprographics	$62	$14	23%	$76	2.2%	$63	$15	$78	2060Q3	718.2%	$518	$119	$637
	Engineering During Construction	$124	$29	23%	$153	2.2%	$127	$29	$156	2061Q2	748.9%	$1,075	$247	$1,323
	Planning During Construction	$0	$0	23%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	Post Construction Monitoring	$140	$32	23%	$172	2.2%	$143	$33	$176	2064Q2	884.9%	$1,409	$324	$1,733
31	CONSTRUCTION MANAGEMENT													
	Construction Management	$370	$85	23%	$455	2.2%	$378	$87	$465	2061Q2	748.9%	$3,209	$738	$3,947
	Project Operation:	$0	$0	23%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	Project Management	$0	$0	23%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONTRACT COST TOTALS:	$6,101	$1,403		**$7,504**		$6,202	$1,427	$7,629			$22,675	$5,215	**$27,890**

Filename: FlaglerCoSPP_RecommendedPlan_TPCS Mar 2014_Rev_01.xlsx
TPCS

B7. COST MCX TPCS CERTIFICATION

The recommended plan estimate, formal cost and schedule risk analysis and total project cost summary spreadsheet underwent cost review and certification by the Walla Walla Mandatory Center of Expertise in June 2014. The resulting cost certification that was issued for the Flagler County Hurricane and Storm Damage Reduction Project can be found on the next page.

WALLA WALLA COST ENGINEERING MANDATORY CENTER OF EXPERTISE

COST AGENCY TECHNICAL REVIEW

CERTIFICATION STATEMENT

For Project No. 113166

SAJ – Flagler County
Hurricane and Storm Damage Reduction

The Flagler County Hurricane and Storm Damage Reduction Study, 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 June 6, 2014, the Cost MCX certifies the estimated total project cost, including initial and 4 renourishments:

FY 2015 Price Level: $44,962,000
Fully Funded Amount: $88,030,000

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 throughout the life of the project.

NEUBAUER.JAMES.GERARD.1153289898

Digitally signed by NEUBAUER.JAMES.GERARD.1153289898
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=NEUBAUER.JAMES.GERARD.1153289898
Date: 2014.06.06 09:38:50 -07'00'

For Kim C. Callan, PE, CCE, PM
Chief, Cost Engineering MCX
Walla Walla District

ATTACHMENT A
COST AND SCHEDULE RISK ANALYSIS

US Army Corps
of Engineers®

Flagler County Shore Protection Project

Flagler County, Florida

Cost and Schedule Risk Analysis Report

for the

Feasibility Report

Prepared for:
U.S. Army Corps of Engineers,
Jacksonville District

Prepared by:
U.S. Army Corps of Engineers
Walla Walla Cost MCX

Date: June 2014

TABLE OF CONTENTS

EXECUTIVE SUMMARY 1

Report Purpose 1

Project Scope 1

Risk Analysis Results 2

High Risk Items, Cost 2

High Risk Items, Schedule 2

Mitigation Recommendations 2

Total Project Cost Summary 3

PURPOSE/BACKGROUND 1

REPORT SCOPE 1

Project Scope 1

USACE Risk Analysis Process 2

METHODOLOGY/PROCESS 2

Identify and Assess Risk Factors 4

Quantify Risk Factor Impacts 4

Analyze Cost Estimate and Schedule Contingency 5

KEY CONSIDERATIONS AND ASSUMPTIONS 6

RISK ANALYSIS RESULTS 6

Risk Register 6

Cost Risk Analysis - Cost Contingency Results 9

Schedule Risk Analysis - Schedule Contingency Results 11

LIST OF TABLES

Table 1 - Risk Analysis Results 2

Table 2 - Cost Summary 3

Table 3 - PDT Risk Identification Team 2

Table 4 - Work Breakdown Structure by Feature 5

Table 5 - Risk Register (High and Moderate) 8

Table 6 - Contingency Analysis at Various Confidence Levels 11

LIST OF FIGURES

Figure 1 - Project Reach 1

Figure 2 - Sensitivity Analysis 10

APPENDIX

APPENDIX A Detailed Risk Register

EXECUTIVE SUMMARY

Report Purpose

The Recommended Plan for Flagler County will:

a) Inform Congress' decision to authorize and fund. If authorized and funded, will consist of approximately 2.6 miles of construction from south 7th (R-80) Street to south 28th Street (R-94) (vicinity of Flagler Beach).

b) Provide a 10' dune extension seaward matching the existing dune elevation (15-20' NAVD 88).

c) Construct a berm that will allow equilibrium for the 10' shift seaward (elevation to match berm existing (11' NAVD 88).

d) Planting of vegetation to stabilize the new dune during initial construction.

e) Utilize an offshore borrow source in Federal waters (approximately 7 miles) placing approximately 320,000 CY each construction sequence.

f) Period of Federal Participation would be 50 years from initial construction. "Project Life" extends until de-authorized by Congress

Project Scope

The study area is the entire coast of Flagler County (Figure 1), which is subject to storm damage and shoreline erosion. The study area includes about 2.6 miles of critically eroding shoreline in Flagler Beach.

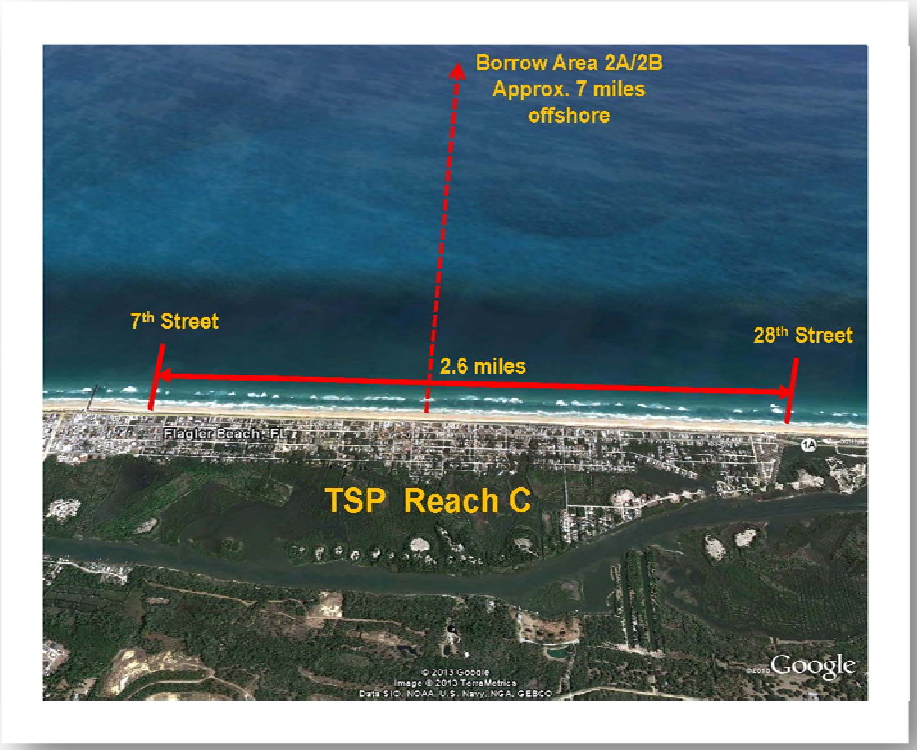


Figure 1 - Project Reach

Risk Analysis Results

A Cost and Schedule Risk Analysis (CSRA) was performed on 3/13/13 - 4/12/13 on this project to identify the 80% confidence level contingencies for the remaining construction activities. The contingencies considered both cost and schedule; the schedule risks then being converted to an additional cost risk. The resulting 23% was then applied to the remaining project activities such as Lands and Damages, Planning, Engineering & Design and Construction Management. The following results were observed:

Table 1 - Risk Analysis Results

Construction Results	Contingency Amount	Contingency %
Remaining Construction	$8,270,000	23%
Project Schedule	50 years (5 dredge seasons)	0%

High Risk Items, Cost

The following were high risk items affecting cost. The complete risk register can be viewed in Appendix A.

- ES121 - Competition/Market Conditions:

Discussion: Current market conditions seem to indicate a high degree of interest in this type of project. Multiple competitive bids are anticipated, which should keep costs low. However, future market conditions are unknown and competition could affect the cost in a negative manner.

- TD17 & ES134 - Quantities/Finalize Designs:

Discussion: Quantities are estimated based on the best available information; storms and fluctuations in erosion rates could have an effect on actual quantities for construction. Some of the project scope has not been finalized for the project (staging and access areas, etc.), which could add to the project cost.

- ES151 - Current Fuel Price:

Discussion: Fuel cost continues to fluctuate. Dredging cost is highly dependent on fuel cost.

High Risk Items, Schedule

The following items were high risk items affecting the project schedule. The complete risk register can be viewed in Appendix A.

- None

Discussion – The PDT discussed scoping risk items. It was the consensus of the group, the project was flexible enough to complete within the current schedule. Three moderate risk items were identified which could impact windows on yearly seasons, but overall project schedule should show no impact.

Mitigation Recommendations

A positive outcome of the CSRA was a thorough discussion of the risks and their mitigation measures. PDT members worked through each risk item and how the risks would affect the overall project. Most

could not be mitigated such as fuel cost, adverse weather and availability of dredge fleet. However, risk for competition can be mitigated with open competition to the maximum dredge fleet and early solicitation methods.

Major recommendations are as follows for high risk items:

- ES-121 - Competition/Market Conditions – Acquisition planning and early solicitation can help maximize competition. Also, an industry day can give a good indication of interest and feedback on the project.

- TD17 & ES134 - Quantities/Finalize Designs – Obtain up to date surveys prior to construction to reassess project needs. Monitoring reports should be evaluated to verify the assumed erosion rates following initial construction. Complete PED phase which should identify any design issues and conflicts with assumptions made during the feasibility study. Once the design is complete the risk register can be updated to reflect risks that were mitigated.

Total Project Cost Summary

The following table portrays the full costs of the remaining project features based on the anticipated contracts. The costs are intended to address the congressional requests of estimates to complete the project. Costs are in thousands of dollars. The 23% contingency is based on an 80% confidence level, as per USACE Civil Works guidance.

Table 2 - Cost Summary

ACCT	DESCRIPTION		COST ($K)	CONTG ($K)	TOTALS ($k)
01	Lands & Damages		2,768	637	3,405
02	Relocations		941	216	1,157
17	Beach Replenishment		25,527	5,871	31,398
Non-construction Costs					
30	Planning, Engineering & Design**	16.2%	4,732	1,088	5,820
31	Supervision & Administration**	6.8%	1,987	457	2,444
	Summary 30 & 31 Account		**6,719**	**1,545**	**8,264**
Estimated Project Cost			**35,955**	**8,270**	**44,224**

PURPOSE/BACKGROUND

The Recommended Plan for Flagler County will:

a) Inform Congress' decision to authorize and fund. If authorized and funded, will consist of approximately 2.6 miles of construction from south 7th (R-80) Street to south 28th Street (R-94) (vicinity of Flagler Beach).

b) Provide a 10' dune extension seaward matching the existing dune elevation (15-20' NAVD 88).

c) Construct a berm that will allow equilibrium for the 10' shift seaward (elevation to match berm existing (11' NAVD 88).

d) Planting of vegetation to stabilize the new dune during initial construction.

e) Utilize an offshore borrow source in Federal waters (approximately 7 miles) placing approximately 320,000 CY each construction sequence.

f) Period of Federal Participation would be 50 years from initial construction. "Project Life" extends until de-authorized by Congress

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 both cost and schedule risks for all project features. The study and presentation can include or exclude consideration for operation and maintenance or life cycle costs, depending upon the program or decision document intended for funding.

Project Scope

Major Project Features studied from the civil works work breakdown structure (CWWBS) for this project includes:

01 – Lands & Damages

02 – Relocations

17 – Beach Replenishment

30 – Planning, Engineering & Design

31 – Construction Management

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 Engineering MCX). 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:

- ER 1110-2-1150, Engineering and Design for Civil Works Projects.
- ER 1110-2-1302, Civil Works Cost Engineering.
- ETL 1110-2-573, Construction Cost Estimating Guide for Civil Works.
- Cost and Schedule Risk Analysis Process guidance prepared by the USACE Cost Engineering MCX.
- Memorandum from Major General Don T. Riley (U.S. 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.

METHODOLOGY/PROCESS

A CSRA meeting was held in the CESAJ office on 9/4/12 – 9/7/12 with follow-up discussion help in April 2014. Participants include the following members. Note that the meetings included key sponsor participants:

Table 3 - PDT Risk Identification Team

Name	Office	Representing
Harrah, Jason S SAJ	CESAJ-PM-WN	Project Manager
Dobbs, Idris L SAJ;	CESAJ-PD-D	Economics

Name	Office	Representing
Durkin, Martin T SAJ	CESAJ-PD-PN	Planning Lead
Hughes, Daniel B SAJ	CESAJ-PD-EP	Archaeologist
Jones, Russell G SAJ	CESAJ-PD-EQ	Water Quality Permit
McConnell, Kathleen K. SAJ;	CESAJ-PD-EC	NEPA
Nist, Barbara U SAJ	CESAJ-EN-GG	Geologist
Rivers, Katherine C SAJ	CESAJ-RE-A	Real Estate
Shuff, Sheldon G SAJ	CESAJ-OC	Office of Counsel
Tyler, Jennifer L SAJ	CESAJ-EN-TC	Cost Engineering
Jason Engle	CESAJ-EN-WC	Engineering Coastal
Rawls, Colin SAJ	CESAJ-PD-D	Planning Economics
Schrader, Matthew H SAJ	CESAJ-PD-PN	Planning Lead
Bilbao, Jose D SAJ	CESAJ-PM-WN	Project Management
Torres, Glisel SAJ	CESAJ-CD-M	Construction
Long, Wayne T SAJ	CESAJ-CD-NJ	Construction
Corbett, Beau J SAJ	CESAJ-CT-C	Contracting
Denson, Katrina L SAJ	CESAJ-CT-C	Contracting
Callan, Kim C NWW	CENWW-EC-X	Cost Engineering - Risk Analysis
Hughes, Daniel B SAJ	CESAJ-PD-EP	Archaeologist
Mayhew, Troy	CESAJ-EN-GG	Geologist
George, Gregory A SAJ	CESAJ-CD-M	

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. A parallel process is also used to determine the probability of various project schedule duration outcomes and quantify the required schedule contingency (float) needed in the schedule to achieve any desired level of schedule confidence.

In simple terms, contingency is an amount added to an estimate (cost or schedule) 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 Engineering MCX 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 adverse 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 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. Because Crystal Ball is an Excel add-in, the schedules for each option are recreated in an Excel format from their native format. 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 would be provided in section 6.

Identify and Assess Risk Factors

Identifying the risk factors via the PDT are considered a qualitative process that results in establishing a risk register that serves as the document for the further 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.

A Formal PDT meeting was held in CESAJ on 3/14/2013 for the purposes of identifying and assessing risk factors. The initial formal meeting focused primarily on risk factor identification using brainstorming techniques, but also included some facilitated discussions based on risk factors common to projects of similar scope and geographic location. Discussions focused primarily on risk factor assessment and quantification.

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.

Risk discussions focused on the various project features as presented within the USACE Civil Works Work Breakdown Structure for cost accounting purposes. It was recognized that the various features carry differing degrees of risk as related to cost, schedule, design complexity, and design progress. It was also understood that features were in various phases of design and construction, varying risks further. The example features under study are presented in table 1:

Table 4 - Work Breakdown Structure by Feature

01	LANDS AND DAMAGES
02	RELOCATIONS
17	BEACH REPLENISHMENTS
30	PLANNING, ENGINEERING & DESIGN
31	CONSTRUCTION MANAGEMENT

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.

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 base 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.

For schedule contingency analysis, the option schedule contingency is calculated as the difference between the P80 option duration forecast and the base schedule duration. These contingencies are then used to calculate the time value of money impact of project delays that are included in the presentation of total cost contingency in section 6. The resulting time value of money, or added risk escalation, is then added into the contingency amount to reflect the USACE standard for presenting the "total project cost" for the fully funded project amount.

Schedule contingency is analyzed only on the basis of each option and not allocated to specific tasks. Based on Cost Engineering MCX guidance, only critical path and near critical path tasks are considered to be uncertain for the purposes of contingency analysis.

KEY CONSIDERATIONS AND ASSUMPTIONS

Key assumptions include the following:

- Remaining project features will be awarded as multiple projects.
- The project schedule is presented in the main report.
- Various project features are at different stages of design and construction. See 3.1 for details.
- The remaining components are at the feasibility level of design. The design PDT believes that they are conservative and will be reduced as H&H modeling is completed.
- Observed construction practices from work in progress have been included for future features. That is, estimates were based on current observed crews and productivity rates.
- Life Cycle costs have not been included in this cost estimate.
- Contract acquisition strategy will be full and open.

RISK ANALYSIS RESULTS

Risk Register

Risk is unforeseen or unknown factors that can affect a project's cost or schedule. Time and money have a direct relationship due to the time value of money. A risk register is a tool commonly used in project planning and risk analysis and serves as the basis for the risk studies and Crystal Ball risk models. The risk register describes risks in terms of cost and schedule. A summary risk register that includes typical risk events studied (high and moderate levels) is presented in this section. The risk register reflects the results of risk factor identification and assessment, risk factor quantification, and contingency analysis. A more detailed risk register is provided in Appendix A. The detailed risk registers of Appendix A include low level and unrated risks, as well as additional information regarding the specific nature and impacts of each risk.

It is important to note that a risk register can be an effective tool for managing and communicating 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.

A correlation is a dependency that exists between two risks and may be direct or indirect. An indirect correlation is one in which large values of one risk are associated with small values of the other. Indirect correlations have correlation coefficients between 0 and -1. A direct correlation is one in which large values of one risk are associated with large values of the other. Direct correlations have correlation coefficients between 0 and 1. Correlations were not identified in this analysis.

The risk register identifies thirty one different risks that are either moderate or high risks. An abridged version of the risk register is presented below.

Table 5 - Risk Register

RT	Ref #	Risk/Opportunity Event	Description	PDT Discussions	Likelihood ©	Impact ©	Risk Level ©	Likelihood (S)	Impact (S)	Risk Level (S)
CA	41	Possibility of Multiple Contracts	Added the removal and construction of the dune walkovers the PDT thinks that there will be a separate contract to handle the walkovers, possibly multiple contracts	The estimate currently assumes that the dredging contractor would sub-contract the work, but the PDT foresees the possibility of the dune walkovers being under a separate contract altogether	Likely	Significant	High	Likely	Marginal	Moderate
TD	73	Dredge Estimate scope, quantities, equipment	Varying qty	Significant design, recent surveys, however dredge cost is highly dependant on qty's.	Likely	Significant	High	Likely	Marginal	Moderate
CO	82	Access and Staging Area	Staging area has not been identified to date.	Staging and Access Areas: Due to the existence of a State Highway right along the beach area and the lack of space on the beach, access and room for staging areas may present a problem; Consultation with the County (email) revealed that there are accessible areas close to construction site (may need to get equipment under the pier) and there is room for staging.	Likely	Marginal	Moderate	Unlikely	Negligible	Low
CO	85	Weather Impacts	Storm Impacts	Coast of Florida is prone to storm events. Adverse weather could reduce dredging effective time for dredging	Likely	Marginal	Moderate	Likely	Significant	High
CO	87	Unknown Cultural Historic Preservation	Surveys have not been completed	Borrow areas has significant areas and qtys. Does have allowance for areas to be restrictive	Unlikely	Negligible	Low	Unlikely	Negligible	Low
ES	121	Competition	Matoc, and other acquisition strategy	Schedule is outside of busy window, therefore better competition, however, due to smaller qtys' potential risk for interested Hopper Dredge contractors.	Likely	Significant	High	Unlikely	Negligible	Low
ES	126	Mob, Demob & Prepwork	Higher mob costs due to construction timeframe	Currently project does not have an environmental window and should have a flexible construction schedule that would help to keep mob costs down; if project is completed during hopper season (environmental window from Nov to May), could see higher mob costs	Likely	Marginal	Moderate	Unlikely	Negligible	Low
ES	134	Estimate include waste / drop off quantities	Storm Impacts	Water surge may erode existing qtys	Unlikely	Significant	Moderate	Unlikely	Negligible	Low
ES	136	Estimate reasonableness of crews and productivities	Weather	Productivity changes due to weather; new area of dredging with no historical information, so production assumptions could vary; Environmental Restriction: NMFS may impose speed limit restriction due to whale habitat	Likely	Marginal	Moderate	Unlikely	Negligible	Low
ES	151	Fuel Prices Fluctuate Significantly	Fluctuation of Fuel pricing	Risk will be based on historical fluctuation of Marine fuel rates.	Likely	Significant	High	Unlikely	Negligible	Low
ES	154	Dredging (Plant Value)	Dredge Plant/Labor Cost	Due to Variance in dredge plant/labor cost for limited numbers of contractors and for lack of actual pricing data.	Very Likely	Significant	High	Unlikely	Negligible	Low
ES	159	Turbidly Requirements	Decant of disposal water	Basis of estimate currently allows for turbidity monitoring effects.	Unlikely	Marginal	Low	Unlikely	Negligible	Low
ES	160	Unsuitable Material	• Potential for construction modification and claims? • High risk or complex construction elements, site access, in-water?	Borrow Area: First time use of a borrow area- could encounter unsuitable material; Encountering rock or other unsuitable material in a "new and not established" borrow area happens quite frequently, but should be able to find enough suitable material within borrow area; if screening is required, could see cost increase	Unlikely	Significant	Moderate	Unlikely	Negligible	Low
ES	161	Dune Planting	• High risk or complex construction elements, site access, in-water?	Plant Survival: If plantings do not take root and thrive, may have to do additional plantings	Unlikely	Negligible	Low	Unlikely	Negligible	Low

RT	Ref #	Risk/Opportunity Event	Description	PDT Discussions	Likelihood ©	Impact ©	Risk Level ©	Likelihood (S)	Impact (S)	Risk Level (S)
ES	162	Dune Walkovers	demolition of existing dune walkovers and the construction of new ones	Low risk since we have now accounted for the construction cost in the initial construction of the dune. Estimate considers removal of all 42 existing public and private walkovers and reconstruction of 21 new public walkovers (based on decision by O.C. that the Federal government is only responsible for the public walkovers) with the same basic design considerations. The potential risks are 1) not all 42 walkovers are impacted 2) not all impacts result in complete removal and reconstruction 3) some of the walkovers have a more extravagant design and need to be rebuilt the same way thus being more expensive. This risk item can show a cost savings and a potential cost impact to the project.	Unlikely	Negligible	Low	Unlikely	Negligible	Low
RE	189	Turtle Monitoring	May be environmental requirements within permit that are not covered within estimate	Yearly turtle monitoring will likely be required (typically annually for 3 years after initial construction);	Certain	Negligible	Low	Unlikely	Negligible	Low
RE	190	Physical Monitoring/ Beach Surveys	May be permit requirements that differ from estimate assumptions	Physical monitoring will be a permit requirement; assumptions were made in the estimate as to the frequency	Certain	Negligible	Low	Unlikely	Negligible	Low
RE	191	Turtle Nesting Impacts	Environmental Windows imposed	Environmental windows are not expected to be imposed on this project that would restrict beach placement outside of the turtle nesting season	Unlikely	Marginal	Low	Unlikely	Negligible	Low
RE	192	Hardbottoms	Hardbottom impacts that require mitigation	A hardbottom survey has been completed and nothing was found within the potential footprint of the project.	Unlikely	Marginal	Low	Unlikely	Negligible	Low
EX	213	Acts of God (seismic events: volcanic activity, earthquakes, tsunamis; or severe weather: freezing, flooding or hurricane)	Potential for Storm, may change qty or disrupt contractor	Accounted for on CO 81	Unlikely	Marginal	Low	Unlikely	Marginal	Low
EX	224	Local communities pose objections	Community is divided, could raise issues	Small risk to project, due to project is common on coast.	Unlikely	Negligible	Low	Unlikely	Negligible	Low
EX	226	Adequacy of project funding (incremental or full funding)	Annual incremental funding expected	Project is small in scale and their are risk mitigation measures such as additional sponsor funding	Likely	Negligible	Low	Likely	Negligible	Low

Cost Risk Analysis - Cost Contingency Results

The project Cost Contingency at the 80% confidence level is 23%. This level was established by analyzing the different cost risk factors that affect the project. Cost risks that were specific to individual project features were discussed in detail. The cost sensitivity chart communicates the high variance risk events.

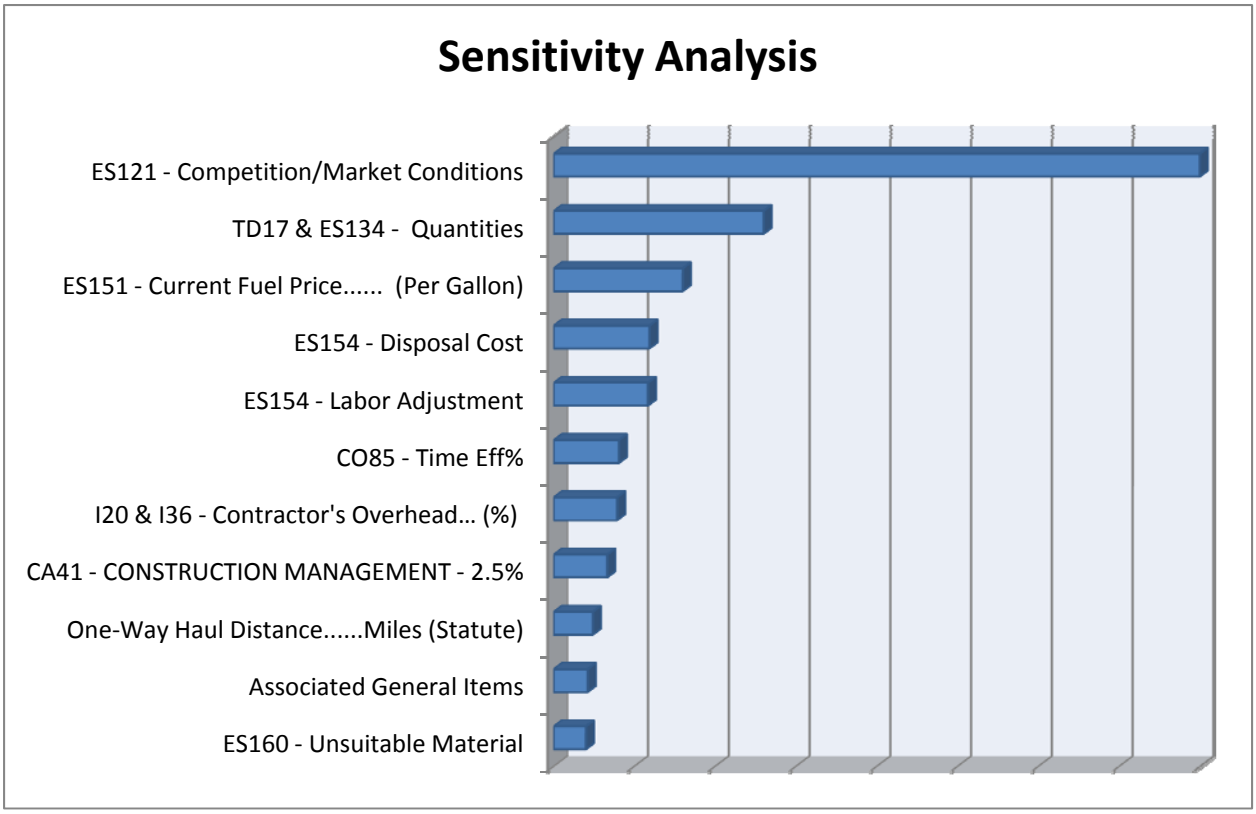


Figure 2 - Sensitivity Analysis

From this chart, we can see that the top three risks that affect cost are;

- ES121 - Competition/Market Conditions
- TD17 & ES134 - Quantities
- ES151 - Current Fuel Price

The confidence table and curve showing the 80% confidence level is below.

Note that these results reflect only those contingencies established from the cost risk analysis.

Schedule Risk Analysis - Schedule Contingency Results

No Schedule risk was derived from team. Project is estimated at 5 seasons ranging over the next 50 years.

Table 6 - Contingency Analysis at Various Confidence Levels

Most Likely Cost Estimate			$35,955,000
Confidence Level	**Value**	**Contingency**	**Contingency**
0%	**$37,586,000**	**$1,631,000**	**5%**
5%	**$39,956,000**	**$4,001,000**	**11%**
10%	**$40,473,000**	**$4,518,000**	**13%**
15%	**$40,868,000**	**$4,913,000**	**14%**
20%	**$41,225,000**	**$5,270,000**	**15%**
25%	**$41,512,000**	**$5,557,000**	**15%**
30%	**$41,778,000**	**$5,823,000**	**16%**
35%	**$42,036,000**	**$6,081,000**	**17%**
40%	**$42,260,000**	**$6,305,000**	**18%**
45%	**$42,531,000**	**$6,576,000**	**18%**
50%	**$42,766,000**	**$6,811,000**	**19%**
55%	**$42,993,000**	**$7,038,000**	**20%**
60%	**$43,200,000**	**$7,245,000**	**20%**
65%	**$43,462,000**	**$7,507,000**	**21%**
70%	**$43,732,000**	**$7,777,000**	**22%**
75%	**$44,041,000**	**$8,086,000**	**22%**
80%	**$44,302,000**	**$8,347,000**	**23.2%**
85%	**$44,814,000**	**$8,859,000**	**25%**
90%	**$45,339,000**	**$9,384,000**	**26%**
95%	**$46,047,000**	**$10,092,000**	**28%**
100%	**$50,200,000**	**$14,245,000**	**40%**

Use 80% Confidence	**$44,224,650**	**$8,269,650**	**23%**

APPENDIX A

DETAILED RISK REGISTERS

Detailed Risk Register

RT	Ref #	Risk/Opportunity Event	Description	PDT Discussions	Likelihood ©	Impact ©	Risk Level ©	Likelihood (S)	Impact (S)	Risk Level (S)	Cost Variance Distribution	Schedule Variance Distribution	Correlation to Other(s)	Responsibility/ POC	Method for Risk Determination	Affected Project Component
CA	41	Possibility of Multiple Contracts	Added the removal and construction of the dune walkovers the PDT thinks that there will be a separate contract to handle the walkovers, possibly multiple contracts	The estimate currently assumes that the dredging contractor would sub-contract the work, but the PDT foresees the possibility of the dune walkovers being under a separate contract altogether	Likely	Significant	High	Likely	Marginal	Moderate	Triangular	N/A -Not Modeled	N/A	Cost Engineering	Modeled within CEDEP	Contract Cost
TD	73	Dredge Estimate scope, quantities, equipment	Varying qty	Significant design, recent surveys, however dredge cost is highly dependant on qty's.	Likely	Significant	High	Likely	Marginal	Moderate	Triangular	N/A -Not Modeled	N/A	Cost Engineering	Modeled within CEDEP	Contract Cost
CO	82	Access and Staging Area	Staging area has not been identified to date.	Staging and Access Areas: Due to the existence of a State Highway right along the beach area and the lack of space on the beach, access and room for staging areas may present a problem; Consultation with the County (email) revealed that there are accessible areas close to construction site (may need to get equipment under the pier) and there is room for staging.	Likely	Marginal	Moderate	Unlikely	Negligible	Low	Triangular	N/A -Not Modeled	N/A	Construction	Modeled as a separate cost item	Contract Cost
CO	85	Weather Impacts	Storm Impacts	Coast of Florida is prone to storm events. Adverse weather could reduce dredging effective time for dredging	Likely	Marginal	Moderate	Likely	Significant	High	Triangular	N/A -Not Modeled	N/A	Cost Engineering	Included within risk element ES136	Project Cost
CO	87	Unknown Cultural Historic Preservation	Surveys have not been completed	Borrow areas has significant areas and qtys. Does have allowance for areas to be restrictive	Unlikely	Negligible	Low	Unlikely	Negligible	Low	N/A -Not Modeled	N/A -Not Modeled	N/A	Environmental Compliance	Not Modeled	N/A -Not Modeled
ES	121	Competition	Matoc, and other acquisition strategy	Schedule is outside of busy window, therefore better competition, however, due to smaller qtys' potential risk for interested Hopper Dredge contractors.	Likely	Significant	High	Unlikely	Negligible	Low	Triangular	N/A -Not Modeled	N/A	Contracting	Modeled as Market Condition Factor	Contract Cost
ES	126	Mob, Demob & Prepwork	Higher mob costs due to construction timeframe	Currently project does not have an environmental window and should have a flexible construction schedule that would help to keep mob costs down; if project is completed during hopper season (environmental window from Nov to May), could see higher mob costs	Likely	Marginal	Moderate	Unlikely	Negligible	Low	N/A -Not Modeled	N/A -Not Modeled	N/A	Cost Engineering	Modeled as seperate Cost Factor	Contract Cost
ES	134	Estimate include waste / drop off quantities	Storm Impacts	Water surge may erode existing qtys	Unlikely	Significant	Moderate	Unlikely	Negligible	Low	Triangular	N/A -Not Modeled	N/A	Cost Engineering	Modeled as seperate Cost Factor, and within CEDEP	Contract Cost
ES	136	Estimate reasonableness of crews and productivities	Weather	Productivity changes due to weather; new area of dredging with no historical information, so production assumptions could vary; Environmental Restriction: NMFS may impose speed limit restriction due to whale habitat	Likely	Marginal	Moderate	Unlikely	Negligible	Low	Triangular	N/A -Not Modeled	N/A	Cost Engineering	Modeled within CEDEP	Contract Cost
ES	151	Fuel Prices Fluctuate Significantly	Fluctuation of Fuel pricing	Risk will be based on historical fluctuation of Marine fuel rates.	Likely	Significant	High	Unlikely	Negligible	Low	Triangular	N/A -Not Modeled	N/A	Cost Engineering	Modeled within CEDEP	Contract Cost
ES	154	Dredging (Plant Value)	Dredge Plant/Labor Cost	Due to Variance in dredge plant/labor cost for limited numbers of contractors and for lack of actual pricing data.	Very Likely	Significant	High	Unlikely	Negligible	Low	Triangular	N/A -Not Modeled	N/A	Cost Engineering	Modeled within CEDEP	Contract Cost
ES	159	Turbidly Requirements	Decant of disposal water	Basis of estimate currently allows for turbidity monitoring effects.	Unlikely	Marginal	Low	Unlikely	Negligible	Low	N/A -Not Modeled	N/A -Not Modeled	N/A	Cost Engineering	Not Modeled	Contract Cost

Detailed Risk Register

ES	160	Unsuitable Material	• Potential for construction modification and claims? • High risk or complex construction elements, site access, in-water?	Borrow Area: First time use of a borrow area- could encounter unsuitable material; Encountering rock or other unsuitable material in a "new and not established" borrow area happens quite frequently, but should be able to find enough suitable material within borrow area; if screening is required, could see cost increase	Unlikely	Significant	Moderate	Unlikely	Negligible	Low	Yes-No	Yes-No	N/A	Cost Engineering	Not Modeled	N/A -Not Modeled
ES	161	Dune Planting	• High risk or complex construction elements, site access, in-water?	Plant Survival: If plantings do not take root and thrive, may have to do additional plantings	Unlikely	Negligible	Low	Unlikely	Negligible	Low	Yes-No	Yes-No	N/A	Cost Engineering	Not Modeled	N/A -Not Modeled
ES	162	Dune Walkovers	demolition of existing dune walkovers and the construction of new ones	Low risk since we have now accounted for the construction cost in the initial construction of the dune. Estimate considers removal of all 42 existing public and private walkovers and reconstruction of 21 new public walkovers (based on decision by O.C. that the Federal government is only responsible for the public walkovers) with the same basic design considerations. The potential risks are 1) not all 42 walkovers are impacted 2) not all impacts result in complete removal and reconstruction 3) some of the walkovers have a more extravagant design and need to be rebuilt the same way thus being more expensive. This risk item can show a cost savings and a potential cost impact to the project.	Unlikely	Negligible	Low	Unlikely	Negligible	Low	Yes-No	Yes-No	N/A	Cost Engineering	Not Modeled	N/A -Not Modeled
RE	189	Turtle Monitoring	May be environmental requirements within permit that are not covered within estimate	Yearly turtle monitoring will likely be required (typically annually for 3 years after initial construction);	Certain	Negligible	Low	Unlikely	Negligible	Low	Yes-No	Yes-No	N/A	N/A	Not Modeled	N/A -Not Modeled
RE	190	Physical Monitoring/ Beach Surveys	May be permit requirements that differ from estimate assumptions	Physical monitoring will be a permit requirement; assumptions were made in the estimate as to the frequency	Certain	Negligible	Low	Unlikely	Negligible	Low	Yes-No	Yes-No	N/A	N/A	Not Modeled	N/A -Not Modeled
RE	191	Turtle Nesting Impacts	Environmental Windows imposed	Environmental windows are not expected to be imposed on this project that would restrict beach placement outside of the turtle nesting season	Unlikely	Marginal	Low	Unlikely	Negligible	Low	Yes-No	Yes-No	N/A	N/A	Not Modeled	N/A -Not Modeled
RE	192	Hardbottoms	Hardbottom impacts that require mitigation	A hardbottom survey has been completed and nothing was found within the potential footprint of the project.	Unlikely	Marginal	Low	Unlikely	Negligible	Low	Yes-No	Yes-No	N/A	N/A	Not Modeled	N/A -Not Modeled
EX	213	Acts of God (seismic events: volcanic activity, earthquakes, tsunamis; or severe weather: freezing, flooding or hurricane)	Potential for Storm, may change qty or disrupt contractor	Accounted for on CO 81	Unlikely	Marginal	Low	Unlikely	Marginal	Low	N/A -Not Modeled	N/A -Not Modeled	N/A	Cost Engineering	Not Modeled	N/A -Not Modeled
EX	224	Local communities pose objections	Community is divided, could raise issues	Small risk to project, due to project is common on coast.	Unlikely	Negligible	Low	Unlikely	Negligible	Low	N/A -Not Modeled	N/A -Not Modeled	N/A	Project Manager	Not Modeled	N/A -Not Modeled
EX	226	Adequacy of project funding (incremental or full funding)	Annual incremental funding expected	Project is small in scale and their are risk mitigation measures such as additional sponsor funding	Likely	Negligible	Low	Likely	Negligible	Low	N/A -Not Modeled	N/A -Not Modeled	N/A	District Management	Not Modeled	N/A -Not Modeled