

**SHORE PROTECTION PROJECT FOR  
FLAGLER COUNTY, FLORIDA**

**DRAFT FEASIBILITY REPORT  
AND ENVIRONMENTAL ASSESSMENT**

**APPENDIX B  
COST ENGINEERING AND RISK ANALYSIS**

**DECEMBER 3, 2013**

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**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 tentatively selected 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 (Tentatively Selected Plan/Locally Preferred Alternative Plan) is prepared in MCACES/MII 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 Tentatively Selected 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 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 Tentatively Selected Plan(s)

The Tentatively Selected Plan (TSP) or NED plan was chosen by the Project Delivery Team (PDT) according to Cost Effectiveness/Incremental Cost Analysis procedures and resulted directly from the plan formulation described above. The Economics Appendix fully describes the plan selection. The scope of work for the TSP is found in Appendix A, Engineering. The MCACES/MII cost estimate for the TSP (Section A3, below) 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

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 Engineering 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 TSP contains contingencies as noted in the estimate (below) and were determined as a result of the 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 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. The overall project schedule is provided below.

#### B.1.6 Total Project Cost Summary

The cost estimate for the TSP 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; Preconstruction 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 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. TENTATIVELY SELECTED PLAN (NED) COST ESTIMATE**

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

Refer to the MII Printout on the next page.

### **B4. SCHEDULE**

Refer to the Schedule on page B-26.

113166 FLAGLER COUNTY SHORE PROTECTION PROJECT  
TENTATIVELY SELECTED PLAN ESTIMATE  
Tentatively Selected Plan estimate for Reach C dune only option (ReachCduneH).

Estimated by CESAJ-EN-TC

Designed by CESAJ-EN-WC

Prepared by Jennifer Tyler

Preparation Date 11/20/2013

Effective Date of Pricing 10/1/2013

Estimated Construction Time Days

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113166 FLAGLER COUNTY SHORE PROTECTION PROJECT TENTATIVELY SELECTED PLAN  
ESTIMATE

Designed by  
CESAJ-EN-WC

Estimated by  
CESAJ-EN-TC

Prepared by  
Jennifer Tyler

Design Document Draft EN Appendix  
Document Date 12/4/2013

District Jacksonville District  
Contact Jennifer Tyler

Budget Year 2014  
UOM System Original

**Direct Costs**

LaborCost  
EQCost  
MatlCost  
SubBidCost  
CEDEP  
OTHER

**Timeline/Currency**

Preparation Date 11/20/2013  
Escalation Date 10/1/2013  
Eff. Pricing Date 10/1/2013  
Estimated Duration 0 Day(s)

Currency US dollars  
Exchange Rate 1.000000

**Costbook CB12EB-b: MII English Cost Book 2012-b**

**Labor LFL2010: Labor\_Florida\_2014**

**Labor Rates**

LaborCost1  
LaborCost2  
LaborCost3  
LaborCost4

**Equipment EP11R03: MII Equipment 2011 Region 03**

**Note: Off-Road diesel based on price 10/7/13-EIA less taxes. On-Road diesel and gas prices obtained from AAA Fuel Gauge Report on 10/23/13.**

**03 SOUTHEAST**

Sales Tax 8.35  
Working Hours per Year 1,530  
Labor Adjustment Factor 0.86  
Cost of Money 1.75  
Cost of Money Discount 25.00  
Tire Recap Cost Factor 1.50  
Tire Recap Wear Factor 1.80  
Tire Repair Factor 0.15  
Equipment Cost Factor 1.00  
Standby Depreciation Factor 0.50

**Fuel**

Electricity 0.087  
Gas 3.337  
Diesel Off-Road 3.294  
Diesel On-Road 3.934

**Shipping Rates**

Over 0 CWT 15.58  
Over 240 CWT 14.19  
Over 300 CWT 12.14  
Over 400 CWT 10.20  
Over 500 CWT 6.13  
Over 700 CWT 6.13  
Over 800 CWT 9.25

113166 FLAGLER COUNTY SHORE PROTECTION PROJECT TENTATIVELY SELECTED PLAN  
ESTIMATE

**Date Author Note**

1/15/2013 J. Tyler **Project Name: Flagler Co. SPP Feasibility Study  
Tentatively Selected Plan**

**Scope of Work:**

Provide a Total Lifecycle Cost estimate for the Selected Plan, Reach C Dune Only Option, which includes construction of a 10' wide dune extension from R-80 to R-95 utilizing material from an offshore borrow source, Borrow Site 2A, located approximately 6.5 miles from the project site. Include 12.9 acres of dune plantings (sea oats) at 24" spacing in the initial construction.

**Reach C Dune Only Option**

Reach Length: 13,881 ft

Quantities as provided by Engineering and Economics as a result of BeachFx output:

Initial Volume-2016: 322,429 CY (Rounded to 330,000 CY)

Renourishment-2027: 311,898 CY (Rounded to 320,000 CY) Renourishment-2038: 313,332 CY (Rounded to 320,000 CY)

Renourishment-2049: 318,924 CY (Rounded to 320,000 CY)

Renourishment-2060: 318,071 CY (Rounded to 320,000 CY)

Average Distance to Borrow Site 2A: 6.5 miles

Dune Plantings: 138,800 Sea Oats (calculated based on dimensions of the dune template)

**Documents Used as the Basis for this Estimate:**

Engineering Appendix; quantities used in the estimate were calculated by BeachFx and are the average volumes for the Base sea level rise scenario as listed in Table A-22: Project Volumes of the EN Appendix.

**Major Project Features:**

The dune is the major feature.

**Federal and non-Federal Cost Sharing Requirements:**

Initial Construction: 65% Federal/ 35% Non-Federal

Renourishments: 50% Federal/ 50% Non-Federal

**Volatile Cost Items:**

Fuel and Plant Pricing

**Risk Analysis:**

113166 FLAGLER COUNTY SHORE PROTECTION PROJECT TENTATIVELY SELECTED PLAN  
ESTIMATE

**Date Author Note**

An abbreviated risk analysis was done for the initial construction and the renourishments.

**Reach C Dune Option:**

**Initial Construction:**

Construction Contingency: 34.15%  
Lands/Damages Contingency: 25.00%  
Planning, Engineering & Design Contingency: 24.3%  
Construction Management Contingency: 14.77%

**Renourishments:**

Construction Contingency: 38.32%  
Lands/Damages Contingency: 25.00%  
Planning, Engineering & Design Contingency: 24.3%  
Construction Management Contingency: 14.77%

**Construction Schedule (including date of mid-point of construction):**

**Reach C:**

**Initial Construction- 2016**

Mob/Demob = 30 Days  
Construction = 39 Days  
Total Duration = 69 Days

**Renourishment 1- 2027**

Mob/Demob = 30 Days  
Construction = 38 Days  
Total Duration = 68 Days

**Renourishment 2- 2038**

Mob/Demob = 30 Days  
Construction = 38 Days  
Total Duration = 68 Days

**Renourishment 3- 2049**

Mob/Demob = 30 Days  
Construction = 38 Days  
Total Duration = 68 Days

**Renourishment 4- 2060**

113166 FLAGLER COUNTY SHORE PROTECTION PROJECT TENTATIVELY SELECTED PLAN  
ESTIMATE

**Date Author Note**

Mob/Demob = 30 Days  
Construction = 38 Days  
Total Duration = 68 Days

**Construction Windows**

Unknown at this time, but it is likely that there will be a beach placement restriction related to a turtle window.

**Escalation**

No escalation was applied to this estimate.

**General Assumptions:**

1. **Taxes:** 7%
2. **JOOH:** 10%
3. **HOOH:** 6.5%
4. **Profit:** 10%
5. **Bond:** Bond Table Used
6. **Price Level:** FY13
7. **Productivity/Overtime Usage:** N/A
8. **Contingency:** Varies (see paragraph above)
9. **PED costs:** Itemized Breakdown provided by PM + 3.5% of construction contract costs for EDC
10. **S&A costs:** 7.5% of construction contract costs

**Site Access:**

There should be sufficient access, but exact locations have yet to be identified. Staging areas is listed as a risk item in the risk register.

**Borrow Areas:**

Borrow Site 2A will be used for the life of the project and is located approximately 6.5 miles from the project.

**Unusual Conditions (Soil, Water, Weather):**

**Weather Days:**

Weather days have been factored in based on the historical production from Duval Co. SPP used in the production model.

113166 FLAGLER COUNTY SHORE PROTECTION PROJECT TENTATIVELY SELECTED PLAN  
ESTIMATE

**Date Author Note**

**Unique Construction Techniques:**

This should be a typical beach/dune construction with periodic renourishment. There is some risk associated with the construction due to the limited work area.

**Equipment and Labor Availability and Distance Traveled:**

Too early to gauge availability, but dredge type is assumed to be a medium hopper dredge. Equipment availability is rated as a risk item on the risk register due to the potential for issues with available hopper dredges during busy environmental windows.

**Environmental Concerns During Construction:**

Turtles and turtle nesting as well as shorebirds. Hardbottoms do not appear to be an issue with beach placement at this time.

**Acquisition Plan:**

Assumed construction contract will be advertised as either an IFB or under the Hopper MATOC.

**Sub-contracting Plan**

Dune Planting and Environmental Monitoring will be sub-contracted.

**Effective Dates for Labor, Equipment and Material Pricing:**

FY13 Material Pricing, 2011 Equipment and 2013 Labor

**Supporting Databases:**

2012 Mii Cost Book, 2011 Mii Equipment and 2013 Mii Labor

3/26/2013 J. Tyler Estimate revised to include post construction monitoring costs. Also, adjusted quantity in Renourishment 4 to reflect placement of only 6 years of material instead of 11 since federal participation runs out 6 years after Renourishment 4 is estimated to occur. Decreased Renourishment 4 quantity from 320,000 CY to 175,000 CY.

6/19/2013 5:00:37 PM J. Tyler Updated estimate based on AFB ATR comments. Abbreviated Risk Analysis was updated and contingency results are listed below. The schedule was adjusted to allow duration for dune planting during initial construction.

**Reach C Dune Option:**

113166 FLAGLER COUNTY SHORE PROTECTION PROJECT TENTATIVELY SELECTED PLAN  
ESTIMATE

**Date Author Note**

**Initial Construction:**

Construction Contingency: 33.04%  
Lands/Damages Contingency: 25.00%  
Planning, Engineering & Design Contingency: 18.85%  
Construction Management Contingency: 14.77%

**Renourishments:**

Construction Contingency: 33.51%  
Planning, Engineering & Design Contingency: 20.96%  
Construction Management Contingency: 16.59%

**Construction Schedule:**

**Reach C:**

**Initial Construction- 2016 (330,000 CY)**

Mob/Demob = 30 Days  
Construction = 57 Days  
Total Duration = 87 Days

**Renourishment 1- 2027 (320,000 CY)**

Mob/Demob = 30 Days  
Construction = 41 Days  
Total Duration = 71 Days

**Renourishment 2- 2038 (320,000 CY)**

Mob/Demob = 30 Days  
Construction = 41 Days  
Total Duration = 71 Days

**Renourishment 3- 2049 (320,000 CY)**

Mob/Demob = 30 Days  
Construction = 41 Days  
Total Duration = 71 Days

**Renourishment 4- 2060 (175,000 CY)**

Mob/Demob = 30 Days  
Construction = 23 Days  
Total Duration = 53 Days

113166 FLAGLER COUNTY SHORE PROTECTION PROJECT TENTATIVELY SELECTED PLAN  
ESTIMATE

**Date Author Note**

10/23/2013 J. Tyler Updated estimate based on SAD and HQ comments.  
5:20:19 PM

Construction costs for 42 dune walkover structures were added to the initial construction costs. The schedule was adjusted to account for construction of the dune walkover structures.

Also, adjusted quantity in Renourishment 4 to reflect a full renourishment of 320,000 CY.

11/7/2013 J. Tyler Updated estimate based on revised RE Appendix. RE Acquisition and Administrative Costs were revised to address HQ comments.  
3:24:50 PM

Draft formal risk analysis was completed and resultant contingency incorporated into TPCS.

11/20/2013 B. Blake The number of Dune Crossover structures to be replaced during the initial project construction has been revised from 42 to 21. Office of Counsel has determined that  
12:32:05 PM only Public dune crossovers can be replaced and that Privately owned crossovers are the owner's responsibility in accordance with land easement agreements. The determination was reached during the PDT meeting held on 20 November 2013 and later confirmed by the PTL via email directed to Cost Engineering this same date.

The estimated cost and construction duration for the Dune Crossover project feature in the Selected Plan under the Initial Construction, has therefore been revised based on this decision. Changes as follows.

Revised Initial Construction 2016 for Cost:

Mob/Demob - Prep Work - Demolition of Existing Crossovers (21).

Associated General Items - Dune Crossover Construction (21 each).

S&A cost (based on 7.5 percent of total construction cost).

Revised Durations for Initial Construction 2016 Schedule:

Mob/Demob - no change.

Associated Work - Dune Crossover Construction from 132 days to 66 days.

12/9/2013 J. Tyler **Project Name: Flagler Co. SPP Feasibility Study**  
11:05:37 AM **Tentatively Selected Plan**

113166 FLAGLER COUNTY SHORE PROTECTION PROJECT TENTATIVELY SELECTED PLAN  
ESTIMATE

**Date Author Note**

**Scope of Work:**

Provide a Total Lifecycle Cost estimate for the Selected Plan, Reach C Dune Only Option, which includes construction of a 10' wide dune extension from R-80 to R-95 utilizing material from an offshore borrow source, Borrow Site 2A, located approximately 6.5 miles from the project site. Include 12.9 acres of dune plantings (sea oats) at 24" spacing in the initial construction. Also, include demolition and reconstruction of 21 dune walkover structures that will be impacted by the dune construction; these structures provide public access to the beach.

**Reach C Dune Only Option**

Reach Length: 13,881 ft

Quantities as provided by Engineering and Economics as a result of BeachFx output:

Initial Volume-2016: 322,429 CY (Rounded to 330,000 CY)

Renourishment-2027: 311,898 CY (Rounded to 320,000 CY) Renourishment-2038: 313,332 CY (Rounded to 320,000 CY)

Renourishment-2049: 318,924 CY (Rounded to 320,000 CY)

Renourishment-2060: 318,071 CY (Rounded to 320,000 CY)

Average Distance to Borrow Site 2A: 6.5 miles

Dune Plantings: 138,800 Sea Oats (calculated based on dimensions of the dune template)

Dune Walkovers: 21 existing structures

Average Length of Existing = 40'

Average Length of Proposed = 50'

**Documents Used as the Basis for this Estimate:**

1. Engineering Appendix; quantities used in the estimate were calculated by BeachFx and are the average volumes for the Base sea level rise scenario as listed in Table A-22: Project Volumes of the EN Appendix.
2. Dune Walkover Excel file provided by EN-WC with information gathered during a site inspection

**Major Project Features:**

The dune is the major feature.

**Federal and non-Federal Cost Sharing Requirements:**

Initial Construction: 65% Federal/ 35% Non-Federal

Renourishments: 50% Federal/ 50% Non-Federal

113166 FLAGLER COUNTY SHORE PROTECTION PROJECT TENTATIVELY SELECTED PLAN  
ESTIMATE

**Date Author Note**

**Volatile Cost Items:**

Fuel, Plant and Steel (bolts for walkovers) pricing

**Risk Analysis:**

A full blown risk analysis was completed by the Cost MCX, NWW, for the initial construction and the renourishments. Contingency was established as 22.5%.

**Construction Schedule (including date of mid-point of construction):**

Reach C:

Initial Construction- 2016

Mob/Demob = 30 Days

Construction = 123 Days

Total Duration = 153 Days

Renourishment 1- 2027

Mob/Demob = 30 Days

Construction = 41 Days

Total Duration = 71 Days

Renourishment 2- 2038

Mob/Demob = 30 Days

Construction = 41 Days

Total Duration = 71 Days

Renourishment 3- 2049

Mob/Demob = 30 Days

Construction = 41 Days

Total Duration = 71 Days

Renourishment 4- 2060

Mob/Demob = 30 Days

Construction = 41 Days

Total Duration = 71 Days

**Construction Windows**

Unknown at this time, but it is likely that there will be a beach placement restriction related to a turtle window.

113166 FLAGLER COUNTY SHORE PROTECTION PROJECT TENTATIVELY SELECTED PLAN  
ESTIMATE

**Date Author Note**

**Escalation**

No escalation was applied to this estimate.

**General Assumptions:**

1. **Taxes:** 7%
2. **JOOH:** 10%
3. **HOOH:** 6.5%
4. **Profit:** 10%
5. **Bond:** Bond Table Used
6. **Price Level:** FY13
7. **Productivity/Overtime Usage:** N/A
8. **Contingency:** 25% RE/22.5% Project
9. **PED costs:** Itemized Breakdown provided by PM + 3.5% of construction contract costs for EDC
10. **S&A costs:** 7.5% of construction contract costs

**Site Access:**

There should be sufficient access per email dated 6/14/13 from Bruce Campbell, City of Flagler Beach:

"You can enter our Beach at the intersection of SR 100 and A1A. There is a grade that goes directly to our beach which is hard-packed sand and coquina rock. Traveling south you can go under our Pier and continue southward. Depending on the tide, there is a good 10 to 12 feet of overhead clearance. A dozer should not be any problem going under. We have taken cranes with their booms lowered in past years."

Staging areas is listed as a risk item in the risk register.

**Borrow Areas:**

Borrow Site 2A will be used for the life of the project and is located approximately 6.5 miles from the project.

**Unusual Conditions (Soil, Water, Weather):**

**Weather Days:**

Weather days have been factored in based on the historical production from Duval Co. SPP used in the production model.

**Unique Construction Techniques:**

This should be a typical beach/dune construction with periodic renourishment. There is some risk associated with the construction due to the limited work area.

113166 FLAGLER COUNTY SHORE PROTECTION PROJECT TENTATIVELY SELECTED PLAN  
ESTIMATE

**Date Author Note**

**Equipment and Labor Availability and Distance Traveled:**

Too early to gauge availability, but dredge type is assumed to be a medium hopper dredge. Equipment availability is rated as a risk item on the risk register due to the potential for issues with available hopper dredges during busy environmental windows.

**Environmental Concerns During Construction:**

Turtles and turtle nesting as well as shorebirds. Hardbottoms do not appear to be an issue with beach placement at this time.

**Acquisition Plan:**

Assumed construction contract will be advertised as either an IFB or under the Hopper MATOC.

**Sub-contracting Plan**

Dune Planting, Dune Walkovers and Environmental Monitoring will be sub-contracted.

**Effective Dates for Labor, Equipment and Material Pricing:**

FY14 Material Pricing, 2011 Equipment and 2014 Labor

**Supporting Databases:**

2012 Mii Cost Book, 2011 Mii Equipment and 2014 Mii Labor

1/15/2014 11:39:38 AM	J. Tyler	Revised estimate based on OC Review and Legal Cert prior to Public Release of Draft Report.  OC requested that the Dune Walkovers be identified as a Relocations cost and identified as such in the RE Appendix. The cost associated with the reconstruction of the Dune Walkovers was then moved from the 17 Beach Replenishment construction account into an 02 Relocations construction account.
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113166 FLAGLER COUNTY SHORE PROTECTION PROJECT TENTATIVELY SELECTED PLAN  
 ESTIMATE

Description	Quantity	UOM	ContractCost	Escalation	Contingency	ProjectCost
<b>Project Cost Summary Report</b>			<b>34,680,112</b>	<b>0</b>	<b>0</b>	<b>34,680,112</b>
<b>Flagler Co SPP-Selected Plan</b>	<b>1.00</b>	<b>LS</b>	<b>34,680,112</b>	<b>0</b>	<b>0</b>	<b>34,680,112</b>
			<i>21.54</i>			<i>21.54</i>
<b>Reach C</b>	<b>1,610,000.00</b>	<b>CY</b>	<b>34,680,112</b>	<b>0</b>	<b>0</b>	<b>34,680,112</b>
			<i>21.54</i>			<i>21.54</i>
<b>Dune Option</b>	<b>1,610,000.00</b>	<b>CY</b>	<b>34,680,112</b>	<b>0</b>	<b>0</b>	<b>34,680,112</b>
			<i>34.04</i>			<i>34.04</i>
<b>Initial Construction- 2016 (153 Days)</b>	<b>330,000.00</b>	<b>CY</b>	<b>11,232,495</b>	<b>0</b>	<b>0</b>	<b>11,232,495</b>
<b>Construction Costs</b>	<b>1.00</b>	<b>LS</b>	<b>6,643,095</b>	<b>0</b>	<b>0</b>	<b>6,643,095</b>
<b>17 Beach Replenishment</b>	<b>1.00</b>	<b>LS</b>	<b>5,704,081</b>	<b>0</b>	<b>0</b>	<b>5,704,081</b>
<b>1700 Beach Replenishment</b>	<b>1.00</b>	<b>LS</b>	<b>5,704,081</b>	<b>0</b>	<b>0</b>	<b>5,704,081</b>
			<i>939,014.19</i>			<i>939,014.19</i>
<b>02 Relocations</b>	<b>1.00</b>	<b>EA</b>	<b>939,014</b>	<b>0</b>	<b>0</b>	<b>939,014</b>
			<i>939,014.19</i>			<i>939,014.19</i>
<b>0203 Cemetery, Utilities, &amp; Structure</b>	<b>1.00</b>	<b>EA</b>	<b>939,014</b>	<b>0</b>	<b>0</b>	<b>939,014</b>
<b>Non-Construction Costs</b>	<b>1.00</b>	<b>LS</b>	<b>4,589,400</b>	<b>0</b>	<b>0</b>	<b>4,589,400</b>
<b>01 Lands and Damages</b>	<b>1.00</b>	<b>LS</b>	<b>2,768,000</b>	<b>0</b>	<b>0</b>	<b>2,768,000</b>
<b>0123 Constructn Contract(s) Documnts</b>	<b>1.00</b>	<b>LS</b>	<b>2,768,000</b>	<b>0</b>	<b>0</b>	<b>2,768,000</b>
<b>30 Planning, Engineering and Design</b>	<b>1.00</b>	<b>LS</b>	<b>1,343,400</b>	<b>0</b>	<b>0</b>	<b>1,343,400</b>
<b>3023 Constructn Contracts(s) Documnts</b>	<b>1.00</b>	<b>LS</b>	<b>1,343,400</b>	<b>0</b>	<b>0</b>	<b>1,343,400</b>
<b>31 Construction Management</b>	<b>1.00</b>	<b>LS</b>	<b>478,000</b>	<b>0</b>	<b>0</b>	<b>478,000</b>
<b>3123 Construction Contracts</b>	<b>1.00</b>	<b>LS</b>	<b>478,000</b>	<b>0</b>	<b>0</b>	<b>478,000</b>
			<i>18.37</i>			<i>18.37</i>
<b>Renourishment 1- 2027 (71 Days)</b>	<b>320,000.00</b>	<b>CY</b>	<b>5,879,404</b>	<b>0</b>	<b>0</b>	<b>5,879,404</b>
<b>Construction Costs</b>	<b>1.00</b>	<b>LS</b>	<b>4,832,404</b>	<b>0</b>	<b>0</b>	<b>4,832,404</b>
<b>17 Beach Replenishment</b>	<b>1.00</b>	<b>LS</b>	<b>4,832,404</b>	<b>0</b>	<b>0</b>	<b>4,832,404</b>
<b>1700 Beach Replenishment</b>	<b>1.00</b>	<b>LS</b>	<b>4,832,404</b>	<b>0</b>	<b>0</b>	<b>4,832,404</b>
<b>Non-Construction Costs</b>	<b>1.00</b>	<b>LS</b>	<b>1,047,000</b>	<b>0</b>	<b>0</b>	<b>1,047,000</b>
<b>30 Planning, Engineering and Design</b>	<b>1.00</b>	<b>LS</b>	<b>685,000</b>	<b>0</b>	<b>0</b>	<b>685,000</b>
<b>3023 Constructn Contracts(s) Documnts</b>	<b>1.00</b>	<b>LS</b>	<b>685,000</b>	<b>0</b>	<b>0</b>	<b>685,000</b>
<b>31 Construction Management</b>	<b>1.00</b>	<b>LS</b>	<b>362,000</b>	<b>0</b>	<b>0</b>	<b>362,000</b>
<b>3123 Construction Contracts</b>	<b>1.00</b>	<b>LS</b>	<b>362,000</b>	<b>0</b>	<b>0</b>	<b>362,000</b>
			<i>18.37</i>			<i>18.37</i>
<b>Renourishment 2- 2038 (71 Days)</b>	<b>320,000.00</b>	<b>CY</b>	<b>5,879,404</b>	<b>0</b>	<b>0</b>	<b>5,879,404</b>
<b>Construction Costs</b>	<b>1.00</b>	<b>LS</b>	<b>4,832,404</b>	<b>0</b>	<b>0</b>	<b>4,832,404</b>
<b>17 Beach Replenishment</b>	<b>1.00</b>	<b>LS</b>	<b>4,832,404</b>	<b>0</b>	<b>0</b>	<b>4,832,404</b>
<b>1700 Beach Replenishment</b>	<b>1.00</b>	<b>LS</b>	<b>4,832,404</b>	<b>0</b>	<b>0</b>	<b>4,832,404</b>
<b>Non-Construction Costs</b>	<b>1.00</b>	<b>LS</b>	<b>1,047,000</b>	<b>0</b>	<b>0</b>	<b>1,047,000</b>
<b>30 Planning, Engineering and Design</b>	<b>1.00</b>	<b>LS</b>	<b>685,000</b>	<b>0</b>	<b>0</b>	<b>685,000</b>
<b>3023 Constructn Contracts(s) Documnts</b>	<b>1.00</b>	<b>LS</b>	<b>685,000</b>	<b>0</b>	<b>0</b>	<b>685,000</b>

113166 FLAGLER COUNTY SHORE PROTECTION PROJECT TENTATIVELY SELECTED PLAN  
 ESTIMATE

Description	Quantity	UOM	ContractCost	Escalation	Contingency	ProjectCost
<b>31 Construction Management</b>	<b>1.00</b>	<b>LS</b>	<b>362,000</b>	<b>0</b>	<b>0</b>	<b>362,000</b>
<b>3123 Construction Contracts</b>	<b>1.00</b>	<b>LS</b>	<b>362,000</b>	<b>0</b>	<b>0</b>	<b>362,000</b>
			<i>18.37</i>			<i>18.37</i>
<b>Renourishment 3- 2049 (71 Days)</b>	<b>320,000.00</b>	<b>CY</b>	<b>5,879,404</b>	<b>0</b>	<b>0</b>	<b>5,879,404</b>
<b>Construction Costs</b>	<b>1.00</b>	<b>LS</b>	<b>4,832,404</b>	<b>0</b>	<b>0</b>	<b>4,832,404</b>
<b>17 Beach Replenishment</b>	<b>1.00</b>	<b>LS</b>	<b>4,832,404</b>	<b>0</b>	<b>0</b>	<b>4,832,404</b>
<b>1700 Beach Replenishment</b>	<b>1.00</b>	<b>LS</b>	<b>4,832,404</b>	<b>0</b>	<b>0</b>	<b>4,832,404</b>
<b>Non-Construction Costs</b>	<b>1.00</b>	<b>LS</b>	<b>1,047,000</b>	<b>0</b>	<b>0</b>	<b>1,047,000</b>
<b>30 Planning, Engineering and Design</b>	<b>1.00</b>	<b>LS</b>	<b>685,000</b>	<b>0</b>	<b>0</b>	<b>685,000</b>
<b>3023 Constructn Contracts(s) Documnts</b>	<b>1.00</b>	<b>LS</b>	<b>685,000</b>	<b>0</b>	<b>0</b>	<b>685,000</b>
<b>31 Construction Management</b>	<b>1.00</b>	<b>LS</b>	<b>362,000</b>	<b>0</b>	<b>0</b>	<b>362,000</b>
<b>3123 Construction Contracts</b>	<b>1.00</b>	<b>LS</b>	<b>362,000</b>	<b>0</b>	<b>0</b>	<b>362,000</b>
			<i>18.15</i>			<i>18.15</i>
<b>Renourishment 4- 2060 (71 Days)</b>	<b>320,000.00</b>	<b>CY</b>	<b>5,809,404</b>	<b>0</b>	<b>0</b>	<b>5,809,404</b>
<b>Construction Costs</b>	<b>1.00</b>	<b>LS</b>	<b>4,832,404</b>	<b>0</b>	<b>0</b>	<b>4,832,404</b>
<b>17 Beach Replenishment</b>	<b>1.00</b>	<b>LS</b>	<b>4,832,404</b>	<b>0</b>	<b>0</b>	<b>4,832,404</b>
<b>1700 Beach Replenishment</b>	<b>1.00</b>	<b>LS</b>	<b>4,832,404</b>	<b>0</b>	<b>0</b>	<b>4,832,404</b>
<b>Non-Construction Costs</b>	<b>1.00</b>	<b>LS</b>	<b>977,000</b>	<b>0</b>	<b>0</b>	<b>977,000</b>
<b>30 Planning, Engineering and Design</b>	<b>1.00</b>	<b>LS</b>	<b>615,000</b>	<b>0</b>	<b>0</b>	<b>615,000</b>
<b>3023 Constructn Contracts(s) Documnts</b>	<b>1.00</b>	<b>LS</b>	<b>615,000</b>	<b>0</b>	<b>0</b>	<b>615,000</b>
<b>31 Construction Management</b>	<b>1.00</b>	<b>LS</b>	<b>362,000</b>	<b>0</b>	<b>0</b>	<b>362,000</b>
<b>3123 Construction Contracts</b>	<b>1.00</b>	<b>LS</b>	<b>362,000</b>	<b>0</b>	<b>0</b>	<b>362,000</b>

113166 FLAGLER COUNTY SHORE PROTECTION PROJECT TENTATIVELY SELECTED PLAN  
 ESTIMATE

Description	Quantity	UOM	Contractor	DirectCost	SubCMU	CostToPrime	PrimeCMU	ContractCost
<b>Contract Cost Summary Report</b>				28,585,127	283,157	28,868,284	5,811,827	34,680,112
<b>Flagler Co SPP-Selected Plan</b>	1.00	LS		28,585,127	283,157	28,868,284	5,811,827	34,680,112
<b>Reach C</b>	1,610,000.00	CY		28,585,127	283,157	28,868,284	5,811,827	34,680,112
<b>Dune Option</b>	1,610,000.00	CY	Prime Contractor-Initial	28,585,127	283,157	28,868,284	5,811,827	34,680,112
<b>Initial Construction- 2016 (153 Days)</b>	330,000.00	CY	Prime Contractor-Initial	9,610,963	265,788	9,876,751	1,355,744	11,232,495
<b>Construction Costs</b>	1.00	LS	Prime Contractor-Initial	5,021,563	265,788	5,287,351	1,355,744	6,643,095
<b>17 Beach Replenishment</b>	1.00	LS	Prime Contractor-Initial	4,347,379	122,149	4,469,528	1,234,553	5,704,081
<b>1700 Beach Replenishment</b>	1.00	LS	Prime Contractor-Initial	4,347,379	122,149	4,469,528	1,234,553	5,704,081
<b>02 Relocations</b>	1.00	EA	Prime Contractor-Initial	674,184	143,639	817,823	121,191	939,014
<b>0203 Cemetery, Utilities, &amp; Structure</b>	1.00	EA	Prime Contractor-Initial	674,184	143,639	817,823	121,191	939,014
<b>Non-Construction Costs</b>	1.00	LS	Government: Non-Construction	4,589,400	0	4,589,400	0	4,589,400
<b>01 Lands and Damages</b>	1.00	LS	Government: Non-Construction	2,768,000	0	2,768,000	0	2,768,000
<b>0123 Constructn Contract(s) Documnts</b>	1.00	LS	Government: Non-Construction	2,768,000	0	2,768,000	0	2,768,000
<b>30 Planning, Engineering and Design</b>	1.00	LS	Government: Non-Construction	1,343,400	0	1,343,400	0	1,343,400
<b>3023 Constructn Contracts(s) Documnts</b>	1.00	LS	Government: Non-Construction	1,343,400	0	1,343,400	0	1,343,400
<b>31 Construction Management</b>	1.00	LS	Government: Non-Construction	478,000	0	478,000	0	478,000
<b>3123 Construction Contracts</b>	1.00	LS	Government: Non-Construction	478,000	0	478,000	0	478,000
<b>Renourishment 1- 2027 (71 Days)</b>	320,000.00	CY	Prime Contractor-Nourish1	4,761,041	4,342	4,765,383	1,114,021	5,879,404
<b>Construction Costs</b>	1.00	LS	Prime Contractor-Nourish1	3,714,041	4,342	3,718,383	1,114,021	4,832,404
<b>17 Beach Replenishment</b>	1.00	LS	Prime Contractor-Nourish1	3,714,041	4,342	3,718,383	1,114,021	4,832,404
<b>1700 Beach Replenishment</b>	1.00	LS	Prime Contractor-Nourish1	3,714,041	4,342	3,718,383	1,114,021	4,832,404
<b>Non-Construction Costs</b>	1.00	LS	Government: Non-Construction	1,047,000	0	1,047,000	0	1,047,000

113166 FLAGLER COUNTY SHORE PROTECTION PROJECT TENTATIVELY SELECTED PLAN  
 ESTIMATE

Description	Quantity	UOM	Contractor	DirectCost	SubCMU	CostToPrime	PrimeCMU	ContractCost
<b>30 Planning, Engineering and Design</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>685,000</b>	<b>0</b>	<b>685,000</b>	<b>0</b>	<b>685,000</b>
<b>3023 Constructn Contracts(s) Documnts</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>685,000</b>	<b>0</b>	<b>685,000</b>	<b>0</b>	<b>685,000</b>
<b>31 Construction Management</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>362,000</b>	<b>0</b>	<b>362,000</b>	<b>0</b>	<b>362,000</b>
<b>3123 Construction Contracts</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>362,000</b>	<b>0</b>	<b>362,000</b>	<b>0</b>	<b>362,000</b>
<b>Renourishment 2- 2038 (71 Days)</b>	<b>320,000.00</b>	<b>CY</b>	<b>Prime Contractor-Nourish2</b>	<b>4,761,041</b>	<b>4,342</b>	<b>4,765,383</b>	<b>1,114,021</b>	<b>5,879,404</b>
<b>Construction Costs</b>	<b>1.00</b>	<b>LS</b>	<b>Prime Contractor-Nourish2</b>	<b>3,714,041</b>	<b>4,342</b>	<b>3,718,383</b>	<b>1,114,021</b>	<b>4,832,404</b>
<b>17 Beach Replenishment</b>	<b>1.00</b>	<b>LS</b>	<b>Prime Contractor-Nourish2</b>	<b>3,714,041</b>	<b>4,342</b>	<b>3,718,383</b>	<b>1,114,021</b>	<b>4,832,404</b>
<b>1700 Beach Replenishment</b>	<b>1.00</b>	<b>LS</b>	<b>Prime Contractor-Nourish2</b>	<b>3,714,041</b>	<b>4,342</b>	<b>3,718,383</b>	<b>1,114,021</b>	<b>4,832,404</b>
<b>Non-Construction Costs</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>1,047,000</b>	<b>0</b>	<b>1,047,000</b>	<b>0</b>	<b>1,047,000</b>
<b>30 Planning, Engineering and Design</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>685,000</b>	<b>0</b>	<b>685,000</b>	<b>0</b>	<b>685,000</b>
<b>3023 Constructn Contracts(s) Documnts</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>685,000</b>	<b>0</b>	<b>685,000</b>	<b>0</b>	<b>685,000</b>
<b>31 Construction Management</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>362,000</b>	<b>0</b>	<b>362,000</b>	<b>0</b>	<b>362,000</b>
<b>3123 Construction Contracts</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>362,000</b>	<b>0</b>	<b>362,000</b>	<b>0</b>	<b>362,000</b>
<b>Renourishment 3- 2049 (71 Days)</b>	<b>320,000.00</b>	<b>CY</b>	<b>Prime Contractor-Nourish3</b>	<b>4,761,041</b>	<b>4,342</b>	<b>4,765,383</b>	<b>1,114,021</b>	<b>5,879,404</b>
<b>Construction Costs</b>	<b>1.00</b>	<b>LS</b>	<b>Prime Contractor-Nourish3</b>	<b>3,714,041</b>	<b>4,342</b>	<b>3,718,383</b>	<b>1,114,021</b>	<b>4,832,404</b>
<b>17 Beach Replenishment</b>	<b>1.00</b>	<b>LS</b>	<b>Prime Contractor-Nourish3</b>	<b>3,714,041</b>	<b>4,342</b>	<b>3,718,383</b>	<b>1,114,021</b>	<b>4,832,404</b>
<b>1700 Beach Replenishment</b>	<b>1.00</b>	<b>LS</b>	<b>Prime Contractor-Nourish3</b>	<b>3,714,041</b>	<b>4,342</b>	<b>3,718,383</b>	<b>1,114,021</b>	<b>4,832,404</b>
<b>Non-Construction Costs</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>1,047,000</b>	<b>0</b>	<b>1,047,000</b>	<b>0</b>	<b>1,047,000</b>
<b>30 Planning, Engineering and Design</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>685,000</b>	<b>0</b>	<b>685,000</b>	<b>0</b>	<b>685,000</b>
<b>3023 Constructn Contracts(s) Documnts</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>685,000</b>	<b>0</b>	<b>685,000</b>	<b>0</b>	<b>685,000</b>
<b>31 Construction Management</b>	<b>1.00</b>	<b>LS</b>	<b>Government:</b>	<b>362,000</b>	<b>0</b>	<b>362,000</b>	<b>0</b>	<b>362,000</b>

113166 FLAGLER COUNTY SHORE PROTECTION PROJECT TENTATIVELY SELECTED PLAN  
 ESTIMATE

Description	Quantity	UOM	Contractor	DirectCost	SubCMU	CostToPrime	PrimeCMU	ContractCost
			<b>Non-Construction</b>					
3123 Construction Contracts	1.00	LS	<b>Government: Non-Construction</b>	362,000	0	362,000	0	362,000
Renourishment 4- 2060 (71 Days)	320,000.00	CY	<b>Prime Contractor-Nourish4</b>	4,691,041	4,342	4,695,383	1,114,021	5,809,404
Construction Costs	1.00	LS	<b>Prime Contractor-Nourish4</b>	3,714,041	4,342	3,718,383	1,114,021	4,832,404
17 Beach Replenishment	1.00	LS	<b>Prime Contractor-Nourish4</b>	3,714,041	4,342	3,718,383	1,114,021	4,832,404
1700 Beach Replenishment	1.00	LS	<b>Prime Contractor-Nourish4</b>	3,714,041	4,342	3,718,383	1,114,021	4,832,404
Non-Construction Costs	1.00	LS	<b>Government: Non-Construction</b>	977,000	0	977,000	0	977,000
30 Planning, Engineering and Design	1.00	LS	<b>Government: Non-Construction</b>	615,000	0	615,000	0	615,000
3023 Constructn Contracts(s) Documnts	1.00	LS	<b>Government: Non-Construction</b>	615,000	0	615,000	0	615,000
31 Construction Management	1.00	LS	<b>Government: Non-Construction</b>	362,000	0	362,000	0	362,000
3123 Construction Contracts	1.00	LS	<b>Government: Non-Construction</b>	362,000	0	362,000	0	362,000

113166 FLAGLER COUNTY SHORE PROTECTION PROJECT TENTATIVELY SELECTED PLAN  
 ESTIMATE

Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost
<b>Project Direct Costs Report</b>				<b>1,073,625</b>	<b>3,465,946</b>	<b>530,039</b>	<b>102,515</b>	<b>23,413,001</b>	<b>28,585,127</b>
<b>Flagler Co SPP-Selected Plan</b>	<b>1.00</b>	<b>LS</b>		<b>1,073,625</b>	<b>3,465,946</b>	<b>530,039</b>	<b>102,515</b>	<b>23,413,001</b>	<b>28,585,127</b>
<b>Reach C</b>	<b>1,610,000.00</b>	<b>CY</b>		<b>1,073,625</b>	<b>3,465,946</b>	<b>530,039</b>	<b>102,515</b>	<b>23,413,001</b>	<b>28,585,127</b>
<b>Dune Option</b>	<b>1,610,000.00</b>	<b>CY</b>	<b>Prime Contractor-Initial</b>	<b>1,073,625</b>	<b>3,465,946</b>	<b>530,039</b>	<b>102,515</b>	<b>23,413,001</b>	<b>28,585,127</b>
<b>Initial Construction- 2016 (153 Days)</b>	<b>330,000.00</b>	<b>CY</b>	<b>Prime Contractor-Initial</b>	<b>472,013</b>	<b>858,248</b>	<b>524,626</b>	<b>20,990</b>	<b>7,735,086</b>	<b>9,610,963</b>
<b>Construction Costs</b>	<b>1.00</b>	<b>LS</b>	<b>Prime Contractor-Initial</b>	<b>472,013</b>	<b>858,248</b>	<b>524,626</b>	<b>20,990</b>	<b>3,145,686</b>	<b>5,021,563</b>
<b>17 Beach Replenishment</b>	<b>1.00</b>	<b>LS</b>	<b>Prime Contractor-Initial</b>	<b>282,790</b>	<b>777,747</b>	<b>120,166</b>	<b>20,990</b>	<b>3,145,686</b>	<b>4,347,379</b>
<b>1700 Beach Replenishment</b>	<b>1.00</b>	<b>LS</b>	<b>Prime Contractor-Initial</b>	<b>282,790</b>	<b>777,747</b>	<b>120,166</b>	<b>20,990</b>	<b>3,145,686</b>	<b>4,347,379</b>
<b>02 Relocations</b>	<b>1.00</b>	<b>EA</b>	<b>Prime Contractor-Initial</b>	<b>189,223</b>	<b>80,501</b>	<b>404,460</b>	<b>0</b>	<b>0</b>	<b>674,184</b>
<b>0203 Cemetery, Utilities, &amp; Structure</b>	<b>1.00</b>	<b>EA</b>	<b>Prime Contractor-Initial</b>	<b>189,223</b>	<b>80,501</b>	<b>404,460</b>	<b>0</b>	<b>0</b>	<b>674,184</b>
<b>Non-Construction Costs</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4,589,400</b>	<b>4,589,400</b>
<b>01 Lands and Damages</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2,768,000</b>	<b>2,768,000</b>
<b>0123 Constructn Contract(s) Documnts</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2,768,000</b>	<b>2,768,000</b>
<b>30 Planning, Engineering and Design</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1,343,400</b>	<b>1,343,400</b>
<b>3023 Constructn Contracts(s) Documnts</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1,343,400</b>	<b>1,343,400</b>
<b>31 Construction Management</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>478,000</b>	<b>478,000</b>
<b>3123 Construction Contracts</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>478,000</b>	<b>478,000</b>
<b>Renourishment 1- 2027 (71 Days)</b>	<b>320,000.00</b>	<b>CY</b>	<b>Prime Contractor-Nouris h1</b>	<b>150,403</b>	<b>651,925</b>	<b>1,353</b>	<b>20,381</b>	<b>3,936,979</b>	<b>4,761,041</b>
<b>Construction Costs</b>	<b>1.00</b>	<b>LS</b>	<b>Prime Contractor-Nouris h1</b>	<b>150,403</b>	<b>651,925</b>	<b>1,353</b>	<b>20,381</b>	<b>2,889,979</b>	<b>3,714,041</b>
<b>17 Beach Replenishment</b>	<b>1.00</b>	<b>LS</b>	<b>Prime Contractor-Nouris h1</b>	<b>150,403</b>	<b>651,925</b>	<b>1,353</b>	<b>20,381</b>	<b>2,889,979</b>	<b>3,714,041</b>
<b>1700 Beach Replenishment</b>	<b>1.00</b>	<b>LS</b>	<b>Prime</b>	<b>150,403</b>	<b>651,925</b>	<b>1,353</b>	<b>20,381</b>	<b>2,889,979</b>	<b>3,714,041</b>

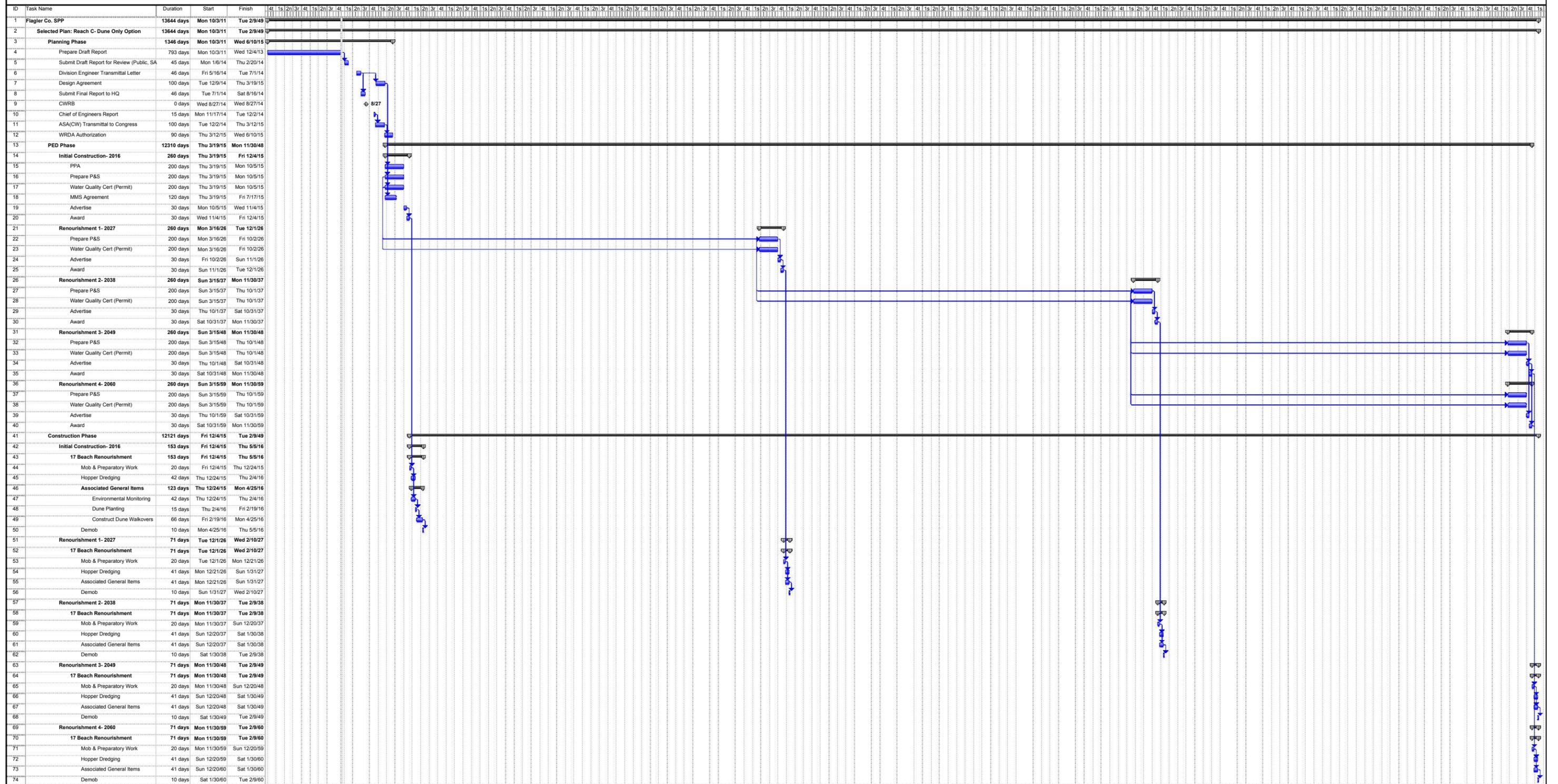
113166 FLAGLER COUNTY SHORE PROTECTION PROJECT TENTATIVELY SELECTED PLAN  
 ESTIMATE

Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost
			<b>Contractor-Nouris h1</b>						
<b>Non-Construction Costs</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1,047,000</b>	<b>1,047,000</b>
<b>30 Planning, Engineering and Design</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>685,000</b>	<b>685,000</b>
<b>3023 Constructn Contracts(s) Documnts</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>685,000</b>	<b>685,000</b>
<b>31 Construction Management</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>362,000</b>	<b>362,000</b>
<b>3123 Construction Contracts</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>362,000</b>	<b>362,000</b>
<b>Renourishment 2- 2038 (71 Days)</b>	<b>320,000.00</b>	<b>CY</b>	<b>Prime Contractor-Nouris h2</b>	<b>150,403</b>	<b>651,925</b>	<b>1,353</b>	<b>20,381</b>	<b>3,936,979</b>	<b>4,761,041</b>
<b>Construction Costs</b>	<b>1.00</b>	<b>LS</b>	<b>Prime Contractor-Nouris h2</b>	<b>150,403</b>	<b>651,925</b>	<b>1,353</b>	<b>20,381</b>	<b>2,889,979</b>	<b>3,714,041</b>
<b>17 Beach Replenishment</b>	<b>1.00</b>	<b>LS</b>	<b>Prime Contractor-Nouris h2</b>	<b>150,403</b>	<b>651,925</b>	<b>1,353</b>	<b>20,381</b>	<b>2,889,979</b>	<b>3,714,041</b>
<b>1700 Beach Replenishment</b>	<b>1.00</b>	<b>LS</b>	<b>Prime Contractor-Nouris h2</b>	<b>150,403</b>	<b>651,925</b>	<b>1,353</b>	<b>20,381</b>	<b>2,889,979</b>	<b>3,714,041</b>
<b>Non-Construction Costs</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1,047,000</b>	<b>1,047,000</b>
<b>30 Planning, Engineering and Design</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>685,000</b>	<b>685,000</b>
<b>3023 Constructn Contracts(s) Documnts</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>685,000</b>	<b>685,000</b>
<b>31 Construction Management</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>362,000</b>	<b>362,000</b>
<b>3123 Construction Contracts</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>362,000</b>	<b>362,000</b>
<b>Renourishment 3- 2049 (71 Days)</b>	<b>320,000.00</b>	<b>CY</b>	<b>Prime Contractor-Nouris h3</b>	<b>150,403</b>	<b>651,925</b>	<b>1,353</b>	<b>20,381</b>	<b>3,936,979</b>	<b>4,761,041</b>
<b>Construction Costs</b>	<b>1.00</b>	<b>LS</b>	<b>Prime Contractor-Nouris h3</b>	<b>150,403</b>	<b>651,925</b>	<b>1,353</b>	<b>20,381</b>	<b>2,889,979</b>	<b>3,714,041</b>
<b>17 Beach Replenishment</b>	<b>1.00</b>	<b>LS</b>	<b>Prime</b>	<b>150,403</b>	<b>651,925</b>	<b>1,353</b>	<b>20,381</b>	<b>2,889,979</b>	<b>3,714,041</b>

113166 FLAGLER COUNTY SHORE PROTECTION PROJECT TENTATIVELY SELECTED PLAN  
 ESTIMATE

Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost
			<b>Contractor-Nourish3</b>						
<b>1700 Beach Replenishment</b>	<b>1.00</b>	<b>LS</b>	<b>Prime Contractor-Nourish3</b>	<b>150,403</b>	<b>651,925</b>	<b>1,353</b>	<b>20,381</b>	<b>2,889,979</b>	<b>3,714,041</b>
<b>Non-Construction Costs</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1,047,000</b>	<b>1,047,000</b>
<b>30 Planning, Engineering and Design</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>685,000</b>	<b>685,000</b>
<b>3023 Constructn Contracts(s) Documnts</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>685,000</b>	<b>685,000</b>
<b>31 Construction Management</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>362,000</b>	<b>362,000</b>
<b>3123 Construction Contracts</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>362,000</b>	<b>362,000</b>
<b>Renourishment 4- 2060 (71 Days)</b>	<b>320,000.00</b>	<b>CY</b>	<b>Prime Contractor-Nourish4</b>	<b>150,403</b>	<b>651,925</b>	<b>1,353</b>	<b>20,381</b>	<b>3,866,979</b>	<b>4,691,041</b>
<b>Construction Costs</b>	<b>1.00</b>	<b>LS</b>	<b>Prime Contractor-Nourish4</b>	<b>150,403</b>	<b>651,925</b>	<b>1,353</b>	<b>20,381</b>	<b>2,889,979</b>	<b>3,714,041</b>
<b>17 Beach Replenishment</b>	<b>1.00</b>	<b>LS</b>	<b>Prime Contractor-Nourish4</b>	<b>150,403</b>	<b>651,925</b>	<b>1,353</b>	<b>20,381</b>	<b>2,889,979</b>	<b>3,714,041</b>
<b>1700 Beach Replenishment</b>	<b>1.00</b>	<b>LS</b>	<b>Prime Contractor-Nourish4</b>	<b>150,403</b>	<b>651,925</b>	<b>1,353</b>	<b>20,381</b>	<b>2,889,979</b>	<b>3,714,041</b>
<b>Non-Construction Costs</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>977,000</b>	<b>977,000</b>
<b>30 Planning, Engineering and Design</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>615,000</b>	<b>615,000</b>
<b>3023 Constructn Contracts(s) Documnts</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>615,000</b>	<b>615,000</b>
<b>31 Construction Management</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>362,000</b>	<b>362,000</b>
<b>3123 Construction Contracts</b>	<b>1.00</b>	<b>LS</b>	<b>Government: Non-Construction</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>362,000</b>	<b>362,000</b>

A4. SCHEDULE



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 tentatively selected 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:

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

The 01 Lands and Damages contingency was provided by Real Estate and was not determined based on the risk analysis.

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 tentatively selected 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 22.5%. 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:1/15/2014

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

DISTRICT: SAJ- Jacksonville  
 POC: CHIEF, COST ENGINEERING, Tracy Leeser  
 PREPARED: 1/15/2013

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

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	COST (\$K) C	CNTG (\$K) D	CNTG (%) E	TOTAL (\$K) F	Program Year (Budget EC): 2015 Effective Price Level Date: 1 OCT 14				Spent Thru: 1-Oct-13 (\$K) K	L	COST (\$K) M	CNTG (\$K) N	FULL (\$K) O
						ESC (%) G	COST (\$K) H	CNTG (\$K) I	TOTAL (\$K) J					
17	BEACH REPLENISHMENT	\$25,034	\$5,633	23%	\$30,666	1.9%	\$25,522	\$5,742	\$31,264	\$0		\$40,725	\$9,163	\$49,888
02	RELOCATIONS	\$939	\$211	23%	\$1,150	2.0%	\$957	\$215	\$1,173	\$0		\$980	\$221	\$1,201
		\$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
	<b>CONSTRUCTION ESTIMATE TOTALS:</b>	\$25,973	\$5,844		\$31,817	1.9%	\$26,479	\$5,958	\$32,437	\$0		\$41,705	\$9,384	\$51,089
01	LANDS AND DAMAGES	\$2,768	\$692	25%	\$3,460	2.0%	\$2,822	\$705	\$3,527	\$0		\$2,849	\$712	\$3,561
30	PLANNING, ENGINEERING & DESIGN	\$4,014	\$903	23%	\$4,917	3.7%	\$4,160	\$936	\$5,097	\$0		\$15,546	\$3,498	\$19,044
31	CONSTRUCTION MANAGEMENT	\$1,926	\$433	23%	\$2,359	1.9%	\$1,963	\$442	\$2,404	\$0		\$3,102	\$698	\$3,800
	<b>PROJECT COST TOTALS:</b>	\$34,680	\$7,872	23%	\$42,553		\$35,424	\$8,041	\$43,465	\$0		\$63,202	\$14,292	\$77,494

- Mandatory by Regulation CHIEF, COST ENGINEERING, Tracy Leeser
- Mandatory by Regulation PROJECT MANAGER, Jason Harrah
- Mandatory by Regulation CHIEF, REAL ESTATE, Audrey Ormerod
- CHIEF, PLANNING, Eric Bush
- CHIEF, ENGINEERING, Loreen Borocharner
- CHIEF, OPERATIONS, Jim Jeffords
- CHIEF, CONSTRUCTION, Steven Duba
- CHIEF, CONTRACTING, Carlos Clark
- CHIEF, PM-PB, Daniel Haubner
- CHIEF, DPM, David Hobbie







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

Printed:1/15/2014

\*\*\*\* 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 Feasibility Report

DISTRICT: SAJ- Jacksonville  
 POC: CHIEF, COST ENGINEERING, Tracy Leeser  
 PREPARED: 1/15/2013

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 1/15/2013		Effective Price Level: 41548		Program Year (Budget EC): 2015		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
<b>CONTRACT 4- RENOURISHMENT 3</b>														
17	BEACH REPLENISHMENT	\$4,832	\$1,087	23%	\$5,920	1.9%	\$4,927	\$1,108	\$6,035	2049Q2	90.5%	\$9,387	\$2,112	\$11,500
		\$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							
	<b>CONSTRUCTION ESTIMATE TOTALS:</b>	\$4,832	\$1,087	23%	\$5,920		\$4,927	\$1,108	\$6,035			\$9,387	\$2,112	\$11,500
01	LANDS AND DAMAGES	\$0	\$0	25%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0
30	PLANNING, ENGINEERING & DESIGN													
	Project Management	\$28	\$6	23%	\$34	3.7%	\$29	\$7	\$36	2048Q3	419.5%	\$151	\$34	\$185
	Planning & Environmental Compliance	\$54	\$12	23%	\$66	3.7%	\$56	\$13	\$69	2048Q3	419.5%	\$292	\$66	\$358
	Engineering & Design	\$221	\$50	23%	\$270	3.7%	\$229	\$51	\$280	2048Q3	419.5%	\$1,187	\$267	\$1,455
	Reviews, ATRs, IEPs, VE	\$0	\$0	23%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0
	Life Cycle Updates (cost, schedule, risks)	\$0	\$0	23%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0
	Contracting & Reprographics	\$3	\$1	23%	\$4	3.7%	\$3	\$1	\$4	2048Q3	419.5%	\$17	\$4	\$21
	Engineering During Construction	\$169	\$38	23%	\$207	3.7%	\$175	\$39	\$215	2049Q2	440.7%	\$947	\$213	\$1,160
	Planning During Construction	\$0	\$0	23%	\$0	0.0%	\$0	\$0	\$0	0	0.0%	\$0	\$0	\$0
	Post Construction Monitoring	\$210	\$47	23%	\$257	3.7%	\$218	\$49	\$267	2054Q2	606.6%	\$1,538	\$346	\$1,884
31	CONSTRUCTION MANAGEMENT													
	Construction Management	\$362	\$81	23%	\$443	1.9%	\$369	\$83	\$452	2049Q2	90.5%	\$703	\$158	\$861
	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
	<b>CONTRACT COST TOTALS:</b>	\$5,879	\$1,323		\$7,202		\$6,005	\$1,351	\$7,357			\$14,223	\$3,200	\$17,423



**B7. COST DX TPCS CERTIFICATION**

The Recommended Plan estimate, as well as a full Cost and Schedule Risk Analysis and Total Project Cost Summary will undergo Cost Review and Certification by the Walla Walla Mandatory Center of Expertise following the final ATR, prior to submittal of the Final Report.

**ATTACHMENT A**  
**COST AND SCHEDULE RISK ANALYSIS**



**US Army Corps  
of Engineers®**

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**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: December 1, 2013

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**APPENDIX**

APPENDIX A	Detailed Risk Register
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## EXECUTIVE SUMMARY

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### Report Purpose

The Selected 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 erosion 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 22.5% was then applied to the remaining project activities such as Lands and Damages, Design and Construction Management. The following results were observed:

**Table 1 - Risk Analysis Results**

Construction Results	Contingency Amount	Contingency %
Remaining Construction	\$7,977,000	22.5%
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&CA41 - Competition/Market Conditions:

Discussion: The number of bidders interested in bidding on the remaining project feature bid packages is dependent on supply and demand. Current market conditions seem to indicate a high degree of interest in the projects. Multiple competitive bids are anticipated, lowering the costs of the projects.

- TD17 & ES134 - Dredge Quantity, finalize designs:

Discussion: Staging Scope has not been finalized for the project. The project site is located on the coast of Florida is prone to storm events. This could have an effect on site qty's.

- ES151 - Current Fuel Price..... (Per Gallon):

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 maximum dredge fleet and early solicitation methods

Major recommendations are as follows for high risk items:

- ES-121 - Market conditions and bidding competition; maximize competition of bidders thru acquisition planning and early solicitation.
- TD17 & ES134 - Dredge Quantity, finalize designs.

### 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 22.5% contingency is based on an 80% confidence level, as per USACE Civil Works guidance.

**Table 2 - Cost Summary**

ACCT	DESCRIPTION		COST (\$)	CONTG (\$)	TOTALS
01	Lands & Damages		2,768,000	637,000	3,405,000
17	Beach Replenishment		25,972,713	5,974,000	31,946,713

Non-construction Costs					
30	Planning, Engineering & Design**	14.0%	4,013,400	923,000	4,936,400
31	Supervision & Administration**	6.7%	1,926,000	443,000	2,369,000

<b>Summary 30 &amp; 31 Account</b>			<b>5,939,400</b>	<b>1,366,000</b>	<b>7,305,400</b>
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<b>Estimated Project Cost</b>			<b>34,680,000</b>	<b>7,977,000</b>	<b>42,657,000</b>
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## PURPOSE/BACKGROUND

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The Selected 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

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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
- 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

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A CSRA meeting was held in the CESAJ office on 9/4/12 – 9/7/12. 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
Durkin, Martin T SAJ	CESAJ-PD-PN	Planning Lead

## Flagler County Shore Protection Project Risk Analysis

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.

## Flagler County Shore Protection Project Risk Analysis

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.

## Flagler County Shore Protection Project Risk Analysis

- 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**

<b>01</b>	LANDS AND DAMAGES
<b>17</b>	BEACH REPLENISHMENTS
<b>30</b>	PLANNING, ENGINEERING & DESIGN
<b>31</b>	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

## Flagler County Shore Protection Project Risk Analysis

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**

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### **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:

## Flagler County Shore Protection Project Risk Analysis

- 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.

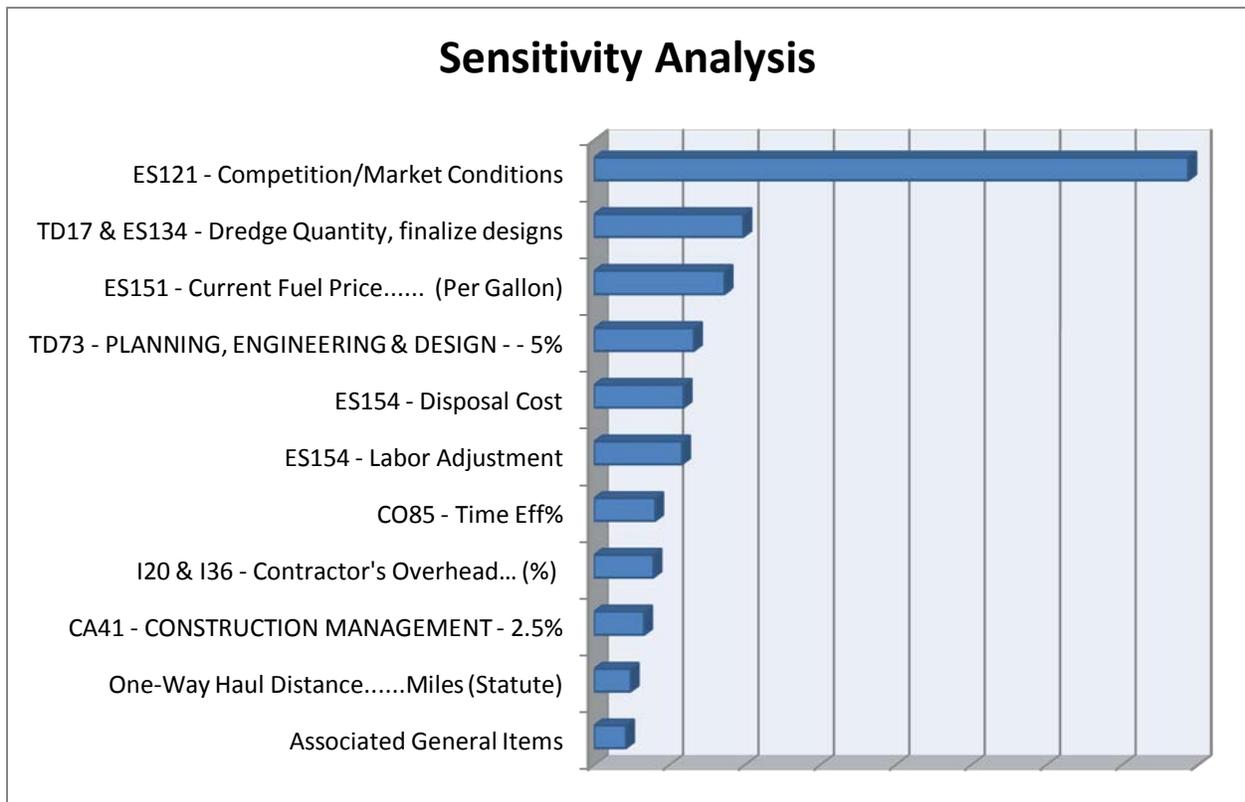
Flagler County Shore Protection Project Risk Analysis

Table 5 - Risk Register (High and Moderate)

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 due to the duration for construction if all 42 are removed and reconstructed, and also due to the mix of public and private structures and varying designs.	Very Likely	Significant	High	Very Likely	Marginal	Moderate
TD	73	Dredge Estimate scope, quantities, equipment	Varying quantity and Project Details	Significant design, recent surveys, however dredge cost is highly dependant on quantity/s. Potential for area storms. Current estimates are based on production estimates and schedules.	Likely	Significant	High	Likely	Marginal	Moderate
CO	82	Staging Area of construction	Staging area has not been identified to date.	There are large assessable areas close to construction site to have staging area, There is potential for building of additional ramps.	Likely	Significant	High	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	Significant	High	Likely	Marginal	Moderate
ES	121	Competition	Matoc, and other acquisition strategy	Schedule is outside of busy window, therefore better competition, however, due to smaller quantities' potential risk for interested Hopper Dredge contractors.	Likely	Significant	High	Unlikely	Negligible	Low
ES	134	Estimate include waste / drop off quantities	Storm Impacts	Water surge may erode existing quantities	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	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

### Cost Risk Analysis - Cost Contingency Results

The project Cost Contingency at the 80% confidence level is 22.5%. 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. For example, risk EST-7, “MEP Design Build” references risks associated with the two remaining pump stations which are specific features. Other risks apply to the entire project such as EXT-3, “Severe Adverse Weather” which would affect all remaining features. Cost contingencies can be either positive or negative. The cost sensitivity chart shows relative cost contingency of individual risks. The sum of all the risks would be 100% of the cost contingency. See the cost sensitivity chart below.



**Figure 2 - Sensitivity Analysis**

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

- ES121&CA41 - Competition/Market Conditions:
- TD17 & ES134 - Dredge Quantity, finalize designs:
- ES151 - Current Fuel Price..... (Per Gallon):

## Flagler County Shore Protection Project Risk Analysis

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			<b>\$34,680,000</b>
Confidence Level	Value	Contingency	Contingency
0%	\$36,224,000	\$1,544,000	4%
5%	\$38,120,000	\$3,440,000	10%
10%	\$38,676,000	\$3,996,000	12%
15%	\$39,001,000	\$4,321,000	12%
20%	\$39,321,000	\$4,641,000	13%
25%	\$39,656,000	\$4,976,000	14%
30%	\$39,942,000	\$5,262,000	15%
35%	\$40,230,000	\$5,550,000	16%
40%	\$40,467,000	\$5,787,000	17%
45%	\$40,750,000	\$6,070,000	18%
50%	\$40,996,000	\$6,316,000	18%
55%	\$41,165,000	\$6,485,000	19%
60%	\$41,388,000	\$6,708,000	19%
65%	\$41,654,000	\$6,974,000	20%
70%	\$41,973,000	\$7,293,000	21%
75%	\$42,246,000	\$7,566,000	22%
<b>80%</b>	<b>\$42,485,000</b>	<b>\$7,805,000</b>	<b>22.5%</b>
85%	\$42,829,000	\$8,149,000	23%
90%	\$43,150,000	\$8,470,000	24%
95%	\$43,842,000	\$9,162,000	26%
100%	\$47,570,000	\$12,890,000	37%

**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 due to the duration for construction if all 42 are removed and reconstructed, and also due to the mix of public and private structures and varying designs.	Very Likely	Significant	High	Very 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. Potential for area storms.	Likely	Significant	High	Likely	Marginal	Moderate	Triangular	N/A -Not Modeled	N/A	Cost Engineering	Modeled within CEDEP	Contract Cost
CO	82	Staging Area of construction	Staging area has not been identified to date.	There are large assessable areas close to construction site to have staging area, There is potential for building of additional ramps.	Likely	Significant	High	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	Significant	High	Likely	Marginal	Moderate	Triangular	N/A -Not Modeled	N/A	Cost Engineering	Modeled within CEDEP	Project Cost
CO	87	Unknown Cultural Historic Preservation	Surveys have not been completed	Borrow areas has significant areas and qty's. 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 acq strategy	Schedule is outside of busy window, therefore better competition, however, due to smaller qty's' 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 & Prework	High risk or complex construction elements, site access, in-water?	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, room for staging areas may present a problem	Unlikely	Negligible	Low	Unlikely	Negligible	Low	N/A -Not Modeled	N/A -Not Modeled	N/A	Cost Engineering	Modeled as separate Cost Factor	Contract Cost
ES	134	Estimate include waste / drop off quantities	Storm Impacts	Water surge may erode existing qty's	Unlikely	Significant	Moderate	Unlikely	Negligible	Low	Triangular	N/A -Not Modeled	N/A	Cost Engineering	Modeled as separate 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	Likely	Marginal	Moderate	Unlikely	Negligible	Low	Triangular	N/A -Not Modeled	N/A	Cost Engineering	Modeled within CEDEP	Contract Cost

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
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
ES	160	Hopper Dredging	<ul style="list-style-type: none"> <li>Potential for construction modification and claims?</li> <li>High risk or complex construction elements, site access, in-water?</li> </ul>	<p>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 and when it happens its usually a big deal; Environmental Restriction: NMFS may impose speed limit restriction due to whale habitat</p>	Unlikely	Negligible	Low	Unlikely	Negligible	Low	Yes-No	Yes-No	N/A	Cost Engineering	Not Modeled	N/A -Not Modeled
ES	161	Dune Planting	<ul style="list-style-type: none"> <li>High risk or complex construction elements, site access, in-water?</li> </ul>	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 considered removal of all 42 existing walkovers and reconstruction of 42 new 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 Mon	Jen to complete	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	Phys Mon Beach Monitoring	Jen to complete	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	Jen to complete	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

Detailed Risk Register

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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	Turbidity 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
ES	160	Hopper Dredging	<ul style="list-style-type: none"> <li>Potential for construction modification and claims?</li> <li>High risk or complex construction elements, site access, in-water?</li> </ul>	<p>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 and when it happens its usually a big deal; Environmental Restriction: NMFS may impose speed limit restriction due to whale habitat</p>	Unlikely	Negligible	Low	Unlikely	Negligible	Low	Yes-No	Yes-No	N/A	Cost Engineering	Not Modeled	N/A -Not Modeled
RE	192	Hardbottoms	Jen to complete	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