Feasibility Report
and
Environmental Impact Statement

on

Coastal Storm Damage Reduction

SURF CITY and NORTH TOPSAIL BEACH
NORTH CAROLINA

Appendix N

Project Costs

Appendix N: Cost Engineering

SURF CITY and NORTH TOPSAIL BEACH
NORTH CAROLINA

1. The Cost Engineering Appendix project costs were prepared to identify the Current Working Estimate (CWE) for the National Economic Development (NED) Plan for the Surf City/North Topsail Beach, Feasibility Report – Coastal Storm Damage Reduction.

The NED Plan is the alternative selected plan which has the greatest net benefits. The NED Plan is to construct a sand dune to elevation 15-ft (25-ft top width) and a berm to the ocean at elevation of 7-ft (50-ft wide). The NED plan for SCNT is often referred to as the 15/50 plan. Material for placement on the beach will come from offshore borrow areas. Hopper dredges will excavate material, travel to offshore pump out stations, and pump material on the beach.

2. The TOTAL CURRENT WORKING ESTIMATE (CWE) for Initial Construction of beach nourishment is $101,495,000, October 2010 pricing ($123,135,000 with 21 percent contingencies). Initial Construction will take 4 years during the periods (seasons) December 1 thru March 31 using 2-hopper dredges.

Future or subsequent Periodic Nourishments are estimated to average $28,270,000, OCT 2010 pricing ($34,207,000 with 21% contingencies). The periodic nourishments are anticipated every six (6) years after Initial Construction. The periodic nourishments will take 1 season using 2 or 3-hopper dredges.

The CWE costs, for construction and non-construction items, were established to be the Baseline Cost Estimate at October 2010 price levels.

3. Baseline CWE's are shown in the attached MCACES (Microcomputer Aided Cost Engineering System) summary sheets. The summary sheets are formatted into a Code of Accounts framework for reporting. The costs included under each Code of Accounts are described below.

The Cost Estimates were prepared under guidance given in the Corps of Engineers Regulation ER 1110-2-1302, CIVIL WORKS COST ENGINEERING and Engineering Instructions, EI 01D010, CONSTRUCTION COST ESTIMATES.

4. CODE OF ACCOUNTS

CODE OF ACCOUNT 01 – LANDS AND DAMAGES: The estimated costs were prepared and furnished by the Real Estate Division, Savannah District as discussed in the Real Estate Appendix.

CODE OF ACCOUNT 17 – BEACH REPLENISHMENT: This account includes project costs for mobilization and demobilization, dredging, beach fill shaping, beach tilling, dune vegetation, and dune walkover structures.

Emphasis was placed on accuracy of dredging costs during evaluation of alternative plans to develop the NED Plan. The location and features of borrow areas in relation to the project, as well as historical production of dredges for similar projects, were used in conjunction with the Corps of Engineers Dredge Estimating Program (CEDEP).

CEDEP considers details of borrow area characteristics, depth of borrow, effective production time, distances from borrow sites, costs of dredge plant ownership, operating and repair, fuel consumption, and other economic adjustments for labor and equipment.

a. For Initial Construction it was determined that offshore Borrow Areas H, J, O, L, and P would be most suitable for hopper dredges to use and place sand on the beach. Therefore, mobilization, demobilization of dredge equipment, pipe and beach fill equipment, as well as, dredging and beach fill average unit costs are based on 2-hopper dredges with pump out stations located offshore about 3,000 feet. The unit price of $6.93 per cubic yard ($8.38/cy with contingency) represents the average cost using all borrow areas mentioned above. The average travel distance 1-way to the pump out stations is approximately 3.5 miles for initial construction.

The initial construction time for placement of 11,855,175 cubic yards is estimated to take approximately 16 months based on using 2-hoppers with pump out to the beach. The environmental window for hopper dredges is December 1 through March 31 or about 4 months for this project. Therefore, construction costs include 4 mobs/demobs for 2-hoppers to complete the initial construction which will occur over four years (4-seasons). Additional time for mob/demob and set up pipe on the beach needs to be added for each season. Mobilization is typically estimated at approximately 30 days prior to beginning initial placement and 30 days demobilization of pipe and equipment off the beach, as well as beach tilling.

Two hoppers were considered to be typical of past project equipment availability that would be used for construction. More than 2-hoppers could be used for Initial construction and could reduce construction time. Pipeline suction

cutterhead dredges were considered more expensive for construction, based on multiple borrow areas, shallow borrow depths for pipeline inefficiencies, average pipeline lengths of 4 to 5 miles to reach the beach, and then over 10 miles of beach length to place material. However, the solicitation for construction will not limit the type of equipment to construct the project.

b. For Periodic Nourishments periods 2 thru 6 of 2,642,000 cy, it was determined that hopper dredges with pump out would be the most suitable method to place sand on the beach. This was also based on the borrow area depths and proximity to the beach. A pumpout station located approximately 3,000 feet offshore was assumed. The average travel distance from borrow areas to the pumpout for periodic nourishment is approximately 7 miles. Once the pumpout pipe reaches shore, it was estimated placement would be 3,000 feet in each direction from a tee valve on shore (or 6,000 LF total pump out distance). The unit price of $7.52 per cubic yard ($9.10/cy with contingencies) represents the average pumping costs using all borrow areas throughout the life of the project.

The periodic nourishment construction time for placement of 2,642,000 cubic yards is estimated to take approximately one environmental season from December 1 through March 31 in addition to mobilization and set up of pipe/pumpout locations on the beach. Mobilization would be another 30 days and 30 days for demobilization.

c. It should be noted and has been anticipated that the First Periodic Nourishment (or the 6th season following Initial Construction) will not require the full periodic nourishment volume. The first periodic nourishment is anticipated to be approximately 2,000,000 cubic yards. The average unit price of $7.17/cy ($8.67/cy with contingencies) is expected and will take only 1-season with 2-hopper dredges.

A final periodic nourishment will require 3,523,000 cubic yards at the average unit price of $9.70/cy ($11.75/cy with contingencies).

Beach fill costs are included as part of the hopper dredging unit price. Beach fill consists of shaping the dredged material with dozers to the required cross section while the dredge is pumping material onto the beach.

d. The costs for Beach Tilling were based on historical costs for similar projects. The costs for Dune Vegetation were based on historical pricing and discussions with North Carolina extension services. The price for Dune Walkover Structures was based on detailed cost estimates used for similar structures and historical costs on similar projects.

A contingency was included to represent unanticipated conditions or uncertainties not known at the time the estimate was developed. There is a

better than average level of confidence in the dredge pricing, because of the detailed geotechnical investigations of borrow areas, similarities of other beach nourishment projects, and the historical costs for similar projects. A contingency of 21% was included for ACCOUNT 17 and developed during the Cost/Risk Analysis through the Cost Center of Expertise in Walla Walla, Washington.

CODE OF ACCOUNT 30 – PLANNING, ENGINEERING AND DESIGN: The costs included in this account were furnished by those responsible for performing each activity. This account includes plans and specifications, field investigations and surveys, cost estimates, engineering during construction, environmental monitoring, and project management. A 25% contingency was assigned to ACCOUNT 30.

CODE OF ACCOUNT 31 – CONSTRUCTION MANAGEMENT – This account includes supervision and administration of the contracts by construction management, hydrologic surveys during construction and contracting personnel during construction. A 25% contingency was assigned to ACCOUNT 31.

SAW – SURF CITY BEACH AND NORTH TOPSAIL BEACH FEASABILITY REPORT
PRESENTED BY:
USACE- WILMINGTON DISTRICT

COST ENGINEERING DX TPCS ATR CERTIFICATION

The Walla Walla Cost Dx representatives have provided an adequate Agency Technical Review (ATR) of the 2012 Budget Year and Total Project Cost, studying the project scope, report, cost estimates, schedules, escalation, risk analysis and contingency development in accordance with ER 1110-2-1150 Engineering and Design for Civil Works Projects and ER 1110-2-1302 Civil Works Cost Engineering.

As of 9 November, 2010, the Walla Walla District, Cost Engineering Directory of Expertise (Dx) for Civil Works, certifies the Surf City Beach and North Topsail Feasibility Report presented by USACE Wilmington District. The Cost DX agency technical review (ATR) resulted in the total project cost estimated values of:

First Costs 1 Oct 2012 Price Level:	$124,986,000
First Costs Fully Funded Amount:	$135,339,000
O&M Cost 1 Oct 2012 Price Level:	$208,642,000
O&M Fully Funded Amount:	$372,471,000

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

11/9/2010
Date

John P. Skarbek
Chief, Cost Engineering
Walla Walla District

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

PROJECT: SURF CITY BEACH AND NORTH TOPSAIL BEACH
LOCATION: NORTH CAROLINA

DISTRICT: WILMINGTON DISTRICT PREPARED: 10/5/2010
POC: CHIEF, COST ENGINEERING, Don Carmen

This Estimate reflects the scope and schedule in report; FEASIBILITY REPORT DATED NOVEMBER 2010

Estimate Prepared: 5-Oct-10
Effective Price Level: 1 OCT 10

Program Year (Budget EC): 2012
Effective Price Level Date: 1 OCT 11

TOTAL INITIAL CONSTRUCTION SUMMARY

WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FULLY FUNDED CONSTRUCTION ESTIMATE Spent Thru: 1-Oct-10 ($K)		MidPt AUG 2016 COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
17	BEACH REPLENISHMENT	$93,332	$19,600	21%	$112,932	1.4%	$94,677	$19,882	$114,559			$102,625	$21,551	$124,176
	CONSTRUCTION ESTIMATE TOTALS:	$93,332	19,600		**$112,932**	1.4%	$94,677	$19,882	$114,559			$102,625	$21,551	$124,176
01	LANDS AND DAMAGES	$4,182	1,046	25%	$5,228	1.4%	$4,242	$1,061	$5,303			$4,350	$1,087	$5,437
30	PLANNING, ENGINEERING & DESIGN	$2,454	614	25%	$3,068	3.0%	$2,527	$632	$3,159			$2,695	$674	$3,369
31	CONSTRUCTION MANAGEMENT	$1,527	382	25%	$1,909	3.0%	$1,573	$393	$1,966			$1,885	$471	$2,357
	PROJECT CONSTRUCTION COST TOTALS:	$101,495	21,640	21%	**$123,135**	1.5%	$103,019	$21,968	$124,986			$111,555	$23,784	$135,339

ESTIMATED FEDERAL FIRST COST: **$87,970**
ESTIMATED NON-FEDERAL FIRST COST: **$47,369**
ESTIMATED TOTAL PROJECT COST INITIAL CONSTRUCTION: $135,339

Estimate Prepared: 5-Oct-10
Effective Price Level: 1 OCT 10

Program Year (Budget EC): 2012
Effective Price Level Date: 1 OCT 11

TOTAL OPERATIONS AND MAINTENANCE SUMMARY

WBS NUMBER	Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FULLY FUNDED O&M ESTIMATE Spent Thru: 1-Oct-10 ($K)	MidPt AUG 2039 COST ($K)	CNTG ($K)	FULL ($K)
17	BEACH REPLENSIHMENT 2021-2057	$162,215	$34,065	21%	$196,280	1.4%	$164,552	$34,556	$199,108		$284,085	$59,658	$343,743
	PERIODIC RENOURISHMENT TOTAL:	$162,215	$34,065		**$196,280**		$164,552	$34,556	$199,108		$284,085	$59,658	$343,743
30	PLANNING, ENGINEERING & DESIGN	$4,606	$1,152	25%	$5,758	3.0%	$4,744	$1,186	$5,930		$14,107	$3,527	$17,634
31	CONSTRUCTION MANAGEMENT	$2,800	$700	25%	$3,500	3.0%	$2,884	$721	$3,605		$8,875	$2,219	$11,093
	PROJECT RENOURISHMENT TOTALS:	$169,621	$35,917	21%	**$205,538**	1.5%	$172,180	$36,463	$208,642		$307,067	$65,403	$372,471

ESTIMATED FEDERAL O&M COST: **$242,106**
ESTIMATED NON-FEDERAL O&M COST: **$130,365**
ESTIMATED TOTAL RENOURISHMENT COSTS 2021-2057: $372,471

_____ CHIEF, COST ENGINEERING,

_____ PROJECT MANAGER,

_____ CHIEF, REAL ESTATE,

SURFCITY-NTOPSAIL-INITIAL OCT'10
INITIAL CONSTRUCTION
SUMMARY OF COSTS
CURRENT WORKING ESTIMATE (CWE)
CODE OF ACCOUNTS

Designed By: USACE - WILMINGTON DISTRICT
Estimated By: CESAW-TS-EE

Prepared By: John C. Caldwell
CESAW-TS-EE

Preparation Date: 10/05/10
Effective Date of Pricing: 10/01/10

Sales Tax: 0.00%

** PROJECT OWNER SUMMARY - Feature (Rounded to 1000's) **

	QUANTY	UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
1 Summary of Initial Construction						
1.01 LANDS AND DAMAGES			4,182,000	1,046,000	5,228,000	
1.17 BEACH REPLENISHMENT - INITIAL			93,331,000	19,600,000	112,931,000	
1.30 PLANNING, ENGINEERING & DESIGN			2,454,000	614,000	3,068,000	
1.31 CONSTRUCTION MANAGEMENT			1,527,000	382,000	1,909,000	
TOTAL Summary of Initial Construction			101,494,000	21,640,000	123,135,000	

** PROJECT OWNER SUMMARY - Sub-Feat (Rounded to 1000's) **

	QUANTY	UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
1 Summary of Initial Construction						
1.01 LANDS AND DAMAGES						
1.01. 1 LANDS OWNERSHIP			1,216,000	304,000	1,520,000	
1.01. 2 IMPROVEMENTS			137,000	34,000	171,000	
1.01. 3 PL 91-646 RELOCATION COSTS			4,000	1,000	5,000	
1.01. 4 AQUISITION COST-FEDERAL			332,000	83,000	415,000	
1.01. 5 AQUISITION COST- NON-FEDERAL			2,493,000	623,000	3,116,000	
TOTAL LANDS AND DAMAGES			4,182,000	1,046,000	5,228,000	
1.17 BEACH REPLENISHMENT - INITIAL						
1.17.01 MOB AND DEMOB- 4ea @ $1,900,000			7,600,000	1,596,000	9,196,000	
1.17.02 DREDGING and BEACH PLACEMENT	1,855,175	CY	82,102,000	17,241,000	99,344,000	8.38
1.17.03 TILLING	150.00	ACR	113,000	24,000	137,000	911.53
1.17.04 DUNE VEGETATION	165.00	ACR	1,650,000	347,000	1,997,000	12100
1.17.05 DUNE WALKOVER STRUCTURES	60.00	EA	1,866,000	392,000	2,258,000	37631
TOTAL BEACH REPLENISHMENT - INITIAL			93,331,000	19,600,000	112,931,000	
1.30 PLANNING, ENGINEERING & DESIGN						
1.30. A ENGINEERING			1,164,000	291,000	1,455,000	
1.30. B ENVIRONMENTAL			6,000	2,000	8,000	
1.30. C PROJECT MGT			60,000	15,000	75,000	
1.30. D Geotechnical Investigations			1,176,000	294,000	1,470,000	
1.30. E Procurment-Contracting			40,000	10,000	50,000	
1.30. F Construction Mgt			8,000	2,000	10,000	
TOTAL PLANNING, ENGINEERING & DESIGN			2,454,000	614,000	3,068,000	
1.31 CONSTRUCTION MANAGEMENT						
1.31. A ENGINEERING			245,000	61,000	306,000	
1.31. B ENVIRONMENTAL			100,000	25,000	125,000	
1.31. C PROJECT MGT			80,000	20,000	100,000	
1.31. D Geotechnical Investigations			28,000	7,000	35,000	
1.31. E Procurment-Contracting			40,000	10,000	50,000	
1.31. F Construction Mgt			1,034,000	259,000	1,293,000	
TOTAL CONSTRUCTION MANAGEMENT			1,527,000	382,000	1,909,000	
TOTAL Summary of Initial Construction			101,494,000	21,640,000	123,135,000	

LABOR ID: JC2010 EQUIP ID: JC2010 Currency in DOLLARS CREW ID: JC2010 UPB ID: JC2010

SCN TOPSAIL-First PeriodicJUNE10
1ST PARTIAL PERIODIC NOURISHMENT
CONSTRUCTION- SUMMARY OF COSTS
CURRENT WORKING ESTIMATE (CWE)
CODE OF ACCOUNTS

Designed By: USACE - WILMINGTON DISTRICT
Estimated By: CESAW-TS-EE

Prepared By: John C. Caldwell
CESAW-TS-EE

Preparation Date: 10/05/10
Effective Date of Pricing: 10/01/10

Sales Tax: 0.00%

** PROJECT OWNER SUMMARY - Feature (Rounded to 1000's) **

	QUANTITY UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
2 Sum of 1ST Periodic Construction					
2.17 BEACH REPLENISHMENT -PERIODIC		16,152,000	3,392,000	19,543,000	
2.30 PLANNING, ENGINEERING & DESIGN		658,000	165,000	823,000	
2.31 CONSTRUCTION MANAGEMENT		400,000	100,000	500,000	
TOTAL Sum of 1ST Periodic Construction		17,210,000	3,656,000	20,866,000	

** PROJECT OWNER SUMMARY - Sub-Feat (Rounded to 1000's) **

	QUANTITY	UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
2 Sum of 1ST Periodic Construction						
2.17 BEACH REPLENISHMENT -PERIODIC						
2.17.01 MOB AND DEMOB			1,900,000	399,000	2,299,000	
2.17.02 DREDGING and BEACH PLACEMENT	1981665.00	CY	14,202,000	2,982,000	17,184,000	8.67
2.17.03 TILLING	66.00	ACR	50,000	10,000	60,000	912
TOTAL BEACH REPLENISHMENT -PERIODIC			16,152,000	3,392,000	19,543,000	
2.30 PLANNING, ENGINEERING & DESIGN						
2.30. A ENGINEERING			152,000	38,000	190,000	
2.30. B ENVIRONMENTAL			4,000	1,000	5,000	
2.30. C PROJECT MGT			30,000	8,000	38,000	
2.30. D GEOTECHNICAL INVESTIGATIONS			450,000	113,000	563,000	
2.30. E Procurment-Contracting			20,000	5,000	25,000	
2.30. F Construction Management			2,000	1,000	3,000	
TOTAL PLANNING, ENGINEERING & DESIGN			658,000	165,000	823,000	
2.31 CONSTRUCTION MANAGEMENT						
2.31. A ENGINEERING			28,000	7,000	35,000	
2.31. B ENVIRONMENTAL			40,000	10,000	50,000	
2.31. C PROJECT MGT			40,000	10,000	50,000	
2.31. D GEOTECHNICAL INVESTIGATIONS			13,000	3,000	16,000	
2.31. E Procurment-Contracting			20,000	5,000	25,000	
2.31. F Construction Management			259,000	65,000	324,000	
TOTAL CONSTRUCTION MANAGEMENT			400,000	100,000	500,000	
TOTAL Sum of 1ST Periodic Construction			17,210,000	3,656,000	20,866,000	

SURFCITY & NTOPSAIL,NC PERIOD2-6
PERIODIC NOURISHMENTS 2 thru 6
CONSTRUCTION- SUMMARY OF COSTS
CURRENT WORKING ESTIMATE (CWE)
CODE OF ACCOUNTS

Designed By: USACE - WILMINGTON DISTRICT
Estimated By: CESAW-TS-EE

Prepared By: John C. Caldwell
CESAW-TS-EE

Preparation Date: 10/19/10
Effective Date of Pricing: 10/01/10

Sales Tax: 0.00%

** PROJECT OWNER SUMMARY - Feature (Rounded to 1000's) **

		QUANTITY	UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
2	Summary of Periodic Construction						
2.17	BEACH REPLENISHMENT -PERIODIC			21,819,000	4,582,000	26,401,000	
2.30	PLANNING, ENGINEERING & DESIGN			658,000	165,000	823,000	
2.31	CONSTRUCTION MANAGEMENT			400,000	100,000	500,000	
TOTAL	Summary of Periodic Construction			22,878,000	4,847,000	27,724,000	

** PROJECT OWNER SUMMARY - Sub-Feat (Rounded to 1000's) **

	QUANTITY	UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
2 Summary of Periodic Construction						
2.17 BEACH REPLENISHMENT -PERIODIC						
2.17.01 MOB AND DEMOB			1,900,000	399,000	2,299,000	
2.17.02 DREDGING and BEACH PLACEMENT	2,642,225.00	CY	19,870,000	4,173,000	24,042,000	9.10
2.17.03 TILLING	66.00	ACR	50,000	10,000	60,000	912
TOTAL BEACH REPLENISHMENT -PERIODIC			21,819,000	4,582,000	26,401,000	
2.30 PLANNING, ENGINEERING & DESIGN						
2.30. A ENGINEERING			152,000	38,000	190,000	
2.30. B ENVIRONMENTAL			4,000	1,000	5,000	
2.30. C PROJECT MGT			30,000	8,000	38,000	
2.30. D GEOTECHNICAL INVESTIGATIONS			450,000	113,000	563,000	
2.30. E Procurment-Contracting			20,000	5,000	25,000	
2.30. F Construction Management			2,000	1,000	3,000	
TOTAL PLANNING, ENGINEERING & DESIGN			658,000	165,000	823,000	
2.31 CONSTRUCTION MANAGEMENT						
2.31. A ENGINEERING			28,000	7,000	35,000	
2.31. B ENVIRONMENTAL			40,000	10,000	50,000	
2.31. C PROJECT MGT			40,000	10,000	50,000	
2.31. D GEOTECHNICAL INVESTIGATIONS			13,000	3,000	16,000	
2.31. E Procurment-Contracting			20,000	5,000	25,000	
2.31. F Construction Management			259,000	65,000	324,000	
TOTAL CONSTRUCTION MANAGEMENT			400,000	100,000	500,000	
TOTAL Summary of Periodic Construction			22,878,000	4,847,000	27,724,000	

SURF CITY & NTOPSAIL, NC PERIOD
7th PERIODIC NOURISHMENT
CONSTRUCTION- SUMMARY OF COSTS
CURRENT WORKING ESTIMATE (CWE)
CODE OF ACCOUNTS

Designed By: USACE - WILMINGTON DISTRICT
Estimated By: CESAW-TS-EE

Prepared By: John C. Caldwell
CESAW-TS-EE

Preparation Date: 10/05/10
Effective Date of Pricing: 10/01/10

Sales Tax: 0.00%

** PROJECT OWNER SUMMARY - Feature (Rounded to 1000's) **

	QUANTITY UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
2 Summary of Periodic Construction					
2.17 BEACH REPLENISHMENT -PERIODIC		36,967,000	7,763,000	44,730,000	
2.30 PLANNING, ENGINEERING & DESIGN		658,000	165,000	823,000	
2.31 CONSTRUCTION MANAGEMENT		400,000	100,000	500,000	
TOTAL Summary of Periodic Construction		38,025,000	8,028,000	46,053,000	

** PROJECT OWNER SUMMARY - Sub-Feat (Rounded to 1000's) **

	QUANTITY	UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
2 Summary of Periodic Construction						
2.17 BEACH REPLENISHMENT -PERIODIC						
2.17.01 MOB AND DEMOB			2,728,000	573,000	3,301,000	
2.17.02 DREDGING and BEACH PLACEMENT	3523000.00	CY	34,173,000	7,176,000	41,349,000	11.74
2.17.03 TILLING	87.00	ACR	66,000	14,000	79,000	912
TOTAL BEACH REPLENISHMENT -PERIODIC			36,967,000	7,763,000	44,730,000	
2.30 PLANNING, ENGINEERING & DESIGN						
2.30. A ENGINEERING			152,000	38,000	190,000	
2.30. B ENVIRONMENTAL			4,000	1,000	5,000	
2.30. C PROJECT MGT			30,000	8,000	38,000	
2.30. D GEOTECHNICAL INVESTIGATIONS			450,000	113,000	563,000	
2.30. E Procurment-Contracting			20,000	5,000	25,000	
2.30. F Construction Management			2,000	1,000	3,000	
TOTAL PLANNING, ENGINEERING & DESIGN			658,000	165,000	823,000	
2.31 CONSTRUCTION MANAGEMENT						
2.31. A ENGINEERING			28,000	7,000	35,000	
2.31. B ENVIRONMENTAL			40,000	10,000	50,000	
2.31. C PROJECT MGT			40,000	10,000	50,000	
2.31. D GEOTECHNICAL INVESTIGATIONS			13,000	3,000	16,000	
2.31. E Procurment-Contracting			20,000	5,000	25,000	
2.31. F Construction Management			259,000	65,000	324,000	
TOTAL CONSTRUCTION MANAGEMENT			400,000	100,000	500,000	
TOTAL Summary of Periodic Construction			38,025,000	8,028,000	46,053,000	

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

PROJECT: SURF CITY BEACH AND NORTH TOPSAIL BEACH
LOCATION: NORTH CAROLINA

DISTRICT: WILMINGTON DISTRICT PREPARED: 10/5/2010
POC: CHIEF, COST ENGINEERING, Don Carmen

This Estimate reflects the scope and schedule in report; FEASIBILITY REPORT DATED NOVEMBER 2010

TOTAL INITIAL CONSTRUCTION SUMMARY

Program Year (Budget EC): 2012
Effective Price Level Date: 1 OCT 11

ESTIMATED MIDPOINT AUG 2016
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)	Spent Thru: 1-Oct-09 ($K)		COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
17	BEACH REPLENISHMENT	$93,332	19,600	21%	$112,932	1.4%	$94,677	$19,882	$114,559			$102,625	$21,551	$124,176
				-		-								
				-		-								
				-		-								
						-								
	CONSTRUCTION ESTIMATE TOTALS:	$93,332	19,600		**$112,932**	1.4%	$94,677	$19,882	$114,559			$102,625	$21,551	$124,176
01	LANDS AND DAMAGES	$4,182	1,046	25%	$5,228	1.4%	$4,242	$1,061	$5,303			$4,350	$1,087	$5,437
30	PLANNING, ENGINEERING & DESIGN	$2,454	614	25%	$3,068	1.5%	$2,490	$622	$3,112			$2,574	$644	$3,218
31	CONSTRUCTION MANAGEMENT	$1,527	382	25%	$1,909	1.5%	$1,549	$387	$1,936			$1,672	$418	$2,090
	PROJECT COST TOTALS:	$101,495	21,640	21%	**$123,135**	1.4%	$102,958	$21,952	$124,910			$111,221	$23,700	$134,921

_____ CHIEF, COST ENGINEERING,

_____ PROJECT MANAGER,

_____ CHIEF, REAL ESTATE,

_____ CHIEF, PLANNING,

_____ CHIEF, ENGINEERING,

_____ CHIEF, OPERATIONS,

_____ CHIEF, CONSTRUCTION,

_____ CHIEF, CONTRACTING,

_____ CHIEF, PM-PB,

_____ CHIEF, DPM,

ESTIMATED FEDERAL COST: **$87,699**
ESTIMATED NON-FEDERAL COST: **$47,222**

ESTIMATED TOTAL PROJECT COST: $134,921

ESTIMATED TOTAL PROJECT PERIODIC NOURISHMENT COST FOR 50 YEARS: $359,293
YEARS 2021 THRU 2057 FULLY FUNDED WITH 21% CONTINGENCY

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

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

PROJECT: SURF CITY BEACH AND NORTH TOPSAIL BEACH
LOCATION: NORTH CAROLINA
This Estimate reflects the scope and schedule in report; FEASIBILITY REPORT DATED NOVEMBER 2010

DISTRICT: WILMINGTON DISTRICT PREPARED: 10/5/2010
POC: CHIEF, COST ENGINEERING,

Estimate Prepared: 5-Oct-10
Effective Price Level: 1 OCT 11

Program Year (Budget EC): 2012
Effective Price Level Date: 1 OCT 11

WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FULLY FUNDED PROJECT ESTIMATE: 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*
	INITIAL CONSTRUCTION YEAR 1 - DEC 2014 til MAR 2015													
17	BEACH REPLENISHMENT	$ 23,333	$ 4,900	21%	$ 28,233	1.4%	$23,669	$4,971	$28,640	2015Q2	5.6%	$24,994	$5,249	$30,243
	CONSTRUCTION ESTIMATE TOTALS:	23,333	4,900	21%	**28,233**		$23,669	$4,971	$28,640			$24,994	$5,249	$30,243
01	LANDS AND DAMAGES	$ 4,182	$ 1,046	25%	$ 5,228	1.4%	$4,242	$1,061	$5,303	2013Q3	2.5%	$4,350	$1,087	$5,437
30	PLANNING, ENGINEERING & DESIGN													
	PLANNING, ENGINEERING & DESIGN	1,854	$ 464	25%	2,318	1.5%	$1,881	$470	$2,351	2013Q2	2.1%	$1,920	$480	$2,400
31	CONSTRUCTION MANAGEMENT													
	Construction Management	382	$ 95	25%	477	1.5%	$387	$97	$484	2015Q2	5.4%	$408	$102	$510
	CONTRACT COST TOTALS:	29,751	6,504		**36,255**		$30,180	$6,598	$36,778			$31,671	$6,918	**$38,589**

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

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

PROJECT: SURF CITY BEACH AND NORTH TOPSAIL BEACH
LOCATION: NORTH CAROLINA
This Estimate reflects the scope and schedule in report; FEASIBILITY REPORT DATED NOVEMBER 2010

DISTRICT: WILMINGTON DISTRICT PREPARED: 10/5/2010
POC: CHIEF, COST ENGINEERING,

Estimate Prepared: 5-Oct-10
Effective Price Level: 1 OCT 11

Program Year (Budget EC): 2012
Effective Price Level Date: 1 OCT 11

WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FULLY FUNDED PROJECT ESTIMATE: 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*
	INITIAL CONSTRUCTION YEAR 2 - DEC 2015 til MAR 2016													
17	BEACH REPLENISHMENT	$ 23,333	$ 4,900	21%	$ 28,233	1.4%	$23,669	$4,971	$28,640	2016Q2	7.4%	$25,419	$5,338	$30,757
	CONSTRUCTION ESTIMATE TOTALS:	23,333	4,900	21%	**28,233**		$23,669	$4,971	$28,640			$25,419	$5,338	$30,757
01	LANDS AND DAMAGES	$ -	$ -	25%	$ -									
30	PLANNING, ENGINEERING & DESIGN													
	PLANNING, ENGINEERING & DESIGN	200	$ 50	25%	250	1.5%	$203	$51	$254	2015Q3	5.8%	$215	$54	$268
31	CONSTRUCTION MANAGEMENT													
	Construction Management	382	$ 95	25%	477	1.5%	$387	$97	$484	2016Q2	7.0%	$415	$104	$518
	CONTRACT COST TOTALS:	23,915	5,045		**28,960**		$24,259	$5,118	$29,377			$26,048	$5,495	**$31,543**

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

PROJECT: SURF CITY BEACH AND NORTH TOPSAIL BEACH
LOCATION: NORTH CAROLINA
This Estimate reflects the scope and schedule in report; FEASIBILITY REPORT DATED NOVEMBER 2010

DISTRICT: WILMINGTON DISTRICT PREPARED: 10/5/2010
POC: CHIEF, COST ENGINEERING,

Estimate Prepared: 5-Oct-10
Effective Price Level: 1 OCT 11

Program Year (Budget EC): 2012
Effective Price Level Date: 1 OCT 11

WBS	Civil Works	COST	CNTG	CNTG	TOTAL	ESC	COST	CNTG	TOTAL	FULLY FUNDED PROJECT ESTIMATE: Mid-Point	ESC	COST	CNTG	FULL
NUMBER	Feature & Sub-Feature Description	($K)	($K)	(%)	($K)	(%)	($K)	($K)	($K)	Date	(%)	($K)	($K)	($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	INITIAL CONSTRUCTION YEAR 3 - DEC 2016 til MAR 2017													
17	BEACH REPLENISHMENT	$ 23,333	$ 4,900	21%	$ 28,233	1.4%	$23,669	$4,971	$28,640	2017Q2	9.3%	$25,873	$5,433	$31,307
	CONSTRUCTION ESTIMATE TOTALS:	23,333	4,900	21%	**28,233**		$23,669	$4,971	$28,640			$25,873	$5,433	$31,307
01	LANDS AND DAMAGES	$ -	$ -	25%	$ -									
30	PLANNING, ENGINEERING & DESIGN													
	PLANNING, ENGINEERING & DESIGN	200	$ 50	25%	250	1.5%	$203	$51	$254	2016Q3	7.5%	$218	$55	$273
31	CONSTRUCTION MANAGEMENT													
	Construction Management	382	$ 95	25%	477	1.5%	$387	$97	$484	2017Q2	8.8%	$421	$105	$527
	CONTRACT COST TOTALS:	23,915	5,045		**28,960**		$24,259	$5,118	$29,377			$26,513	$5,593	**$32,106**

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

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

PROJECT: SURF CITY BEACH AND NORTH TOPSAIL BEACH
LOCATION: NORTH CAROLINA
This Estimate reflects the scope and schedule in report; FEASIBILITY REPORT DATED NOVEMBER 2010

DISTRICT: WILMINGTON DISTRICT PREPARED: 10/5/2010
POC: CHIEF, COST ENGINEERING,

Estimate Prepared: 5-Oct-10
Effective Price Level: 1 OCT 11

Program Year (Budget EC): 2012
Effective Price Level Date: 1 OCT 11

WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FULLY FUNDED PROJECT ESTIMATE: 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*
	INITIAL CONSTRUCTION YEAR 4 - DEC 2017 til MAR 2018													
17	BEACH REPLENISHMENT	$ 23,333	$ 4,900	21%	$ 28,233	1.4%	$23,669	$4,971	$28,640	2018Q2	11.3%	$26,339	$5,531	$31,870
	CONSTRUCTION ESTIMATE TOTALS:	23,333	4,900	21%	**28,233**		$23,669	$4,971	$28,640			$26,339	$5,531	$31,870
01	LANDS AND DAMAGES	$ -	$ -	25%	$ -									
30	PLANNING, ENGINEERING & DESIGN													
	PLANNING, ENGINEERING & DESIGN	$200	$ 50	25%	250	1.5%	$203	$51	$254	2017Q3	9.2%	$222	$55	$277
31	CONSTRUCTION MANAGEMENT													
	Construction Management	$382	$ 95	25%	477	1.5%	$387	$97	$484	2018Q2	10.6%	$428	$107	$535
	CONTRACT COST TOTALS:	$23,915	5,045		**28,960**		$24,259	$5,118	$29,377			$26,989	$5,694	**$32,682**

US Army Corps of Engineers®

Hurricane Protection and Beach Erosion Control
Surf City and North Topsail Beach, North Carolina
Feasibility Report and Environmental Impact Statement
Project Cost and Schedule Risk Analysis Report

Prepared for:

U.S. Army Corps of Engineers,
Wilmington District

Prepared by:

U.S. Army Corps of Engineers
Cost Engineering Directory of Expertise, Walla Walla

November 23, 2010

TABLE OF CONTENTS

APPENDIX

APPENDIX A includes

Detailed Risk Analysis

- Risk Register Summary
- Sensitivity Charts
- Total Project Cost Presentation
- Project Confidence Curves

EXECUTIVE SUMMARY

Under the auspices of the US Army Corps of Engineers (USACE), Wilmington District, this report presents a recommendation for the total project cost and schedule contingencies for the Surf City and North Topsail Beach Feasibility Report and Environmental Impact Statement. In compliance with Engineer Regulation (ER) 1110-2-1302 CIVIL WORKS COST ENGINEERING, dated September 15, 2008, a formal risk analysis study was conducted for the development of contingency on the total project cost. The purpose of this risk analysis study was to establish project contingencies by identifying and measuring the cost and schedule impact of project uncertainties with respect to the estimated total project cost.

Specific to the Surf City and North Topsail Beach project, the most likely project cost is estimated at approximately $101 Million. Based on the results of the analysis, the Cost Engineering Directory of Expertise for Civil Works (Walla Walla District) recommends a contingency value of $22 Million, or 21%.

The Project Delivery Team (PDT) conducted a series of brainstorming sessions in February 2009 to identify the risks associated with the project. The expert judgment of estimator and the risk analyst also helped to identify and define the risks. Walla Walla Cost Dx performed risk analysis using the Monte Carol technique, producing the aforementioned contingencies and identifying key risk drivers.

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

Table ES-1. Contingency Development Summary

Most Likely Cost Estimate	**$101,494,800**	
Confidence Level	**Value ($$)**	**Contingency (%)**
5%	$101,911,908	0.41%
50%	$115,734,303	14.03%
80%	**$123,033,021**	**21.22%**
95%	$129,928,279	28.01%

The following table ES-2 portrays the full costs of the recommended alternative based on the anticipated contracts. The costs are intended to address the congressional request of estimates to implement the project. The contingency is based on an 80% confidence level, as per accepted USACE Civil Works guidance.

Table ES-2. Contingency Analysis Table

SURF CITY AND NORTH TOPSAIL BEACH		COST ($1,000)	CNTG ($1,000)	TOTAL ($1,000)
01	LANDS AND DAMAGES	4,182	1,046	5,228
17	BEACH REPLENISHMENT	93,332	19,600	112,932
30	PLANNING, ENGINEERING AND DESIGN	2,454	614	3,068
31	CONSTRUCTION MANAGEMENT	1,527	382	1,909
	TOTAL PROJECT COSTS	**101,495**	**21,640**	**123,135**

Notes:
1) Construction costs include the recommended contingency of 21%. Lands and Damages (01), Planning, Engineering and Design (30), and Construction Management (31) Accounts include contingencies of 25%, as provided by others.
2) Costs exclude O&M and Life Cycle Cost estimates.

KEY FINDINGS/OBSERVATIONS RECOMMENDATIONS

The key cost risk drivers identified through sensitivity analysis are Programmatic Risk EXT-1 (Market Conditions), Contract Risks EST-4 (Two-Dredge Productivity) and EST-3 (Fuel), which together contribute 82 percent of the statistical cost variance. Other notable cost risk drivers are Contract Risks EST-1 (Dredge, Number & Size) and CON-1 (Contract Modifications) which each contribute 5.9 percent to the statistical cost variance.

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

Risk is comprised of cost and schedule risk elements. This analysis considers schedule elements within the cost analysis, as this project is not susceptible to uncaptured escalation nor significant recurring monthly costs. The following tables tabulate the results of the risk analysis currently identified as a 20.75%

Figure ES-1. Cumulative Frequency Chart

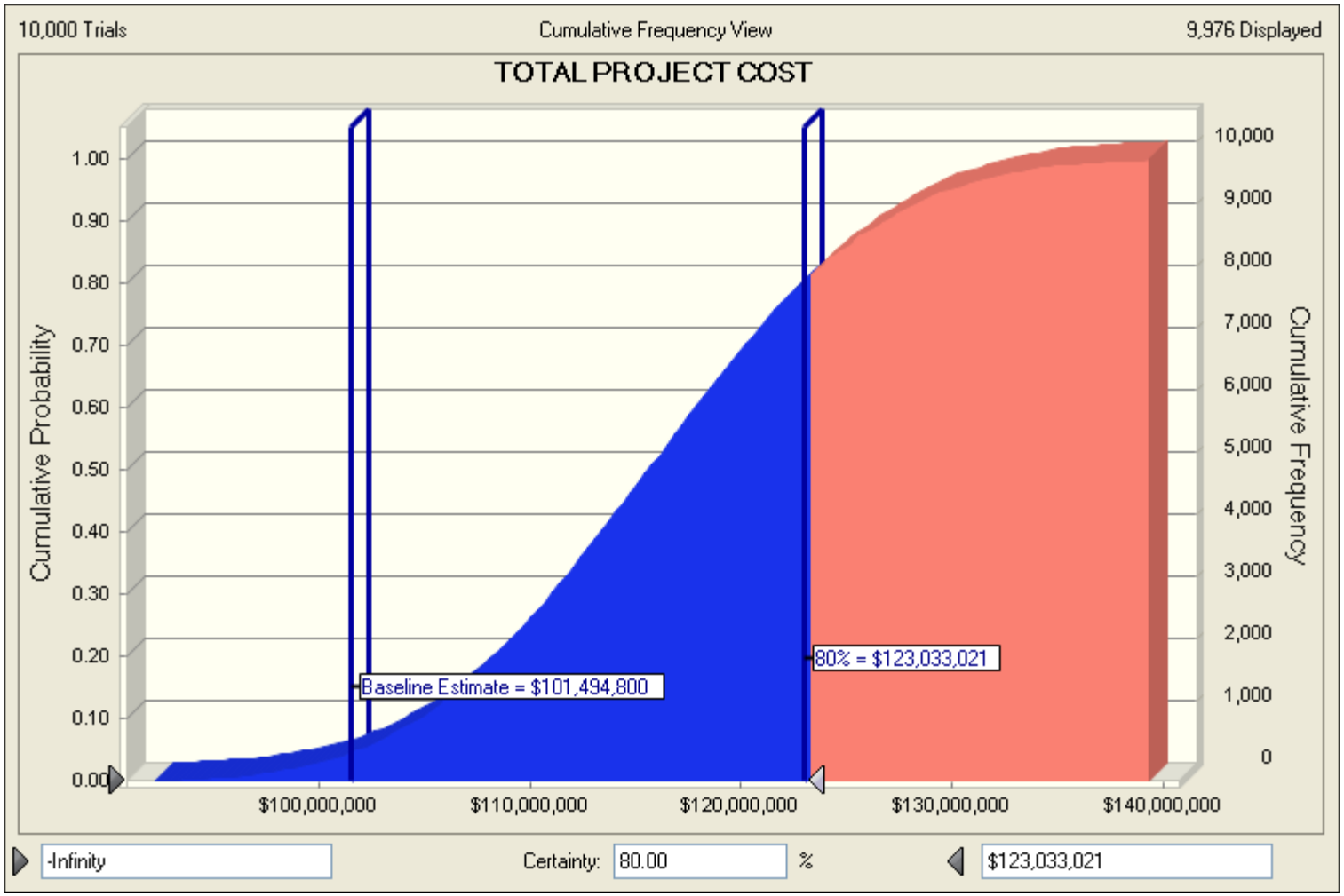
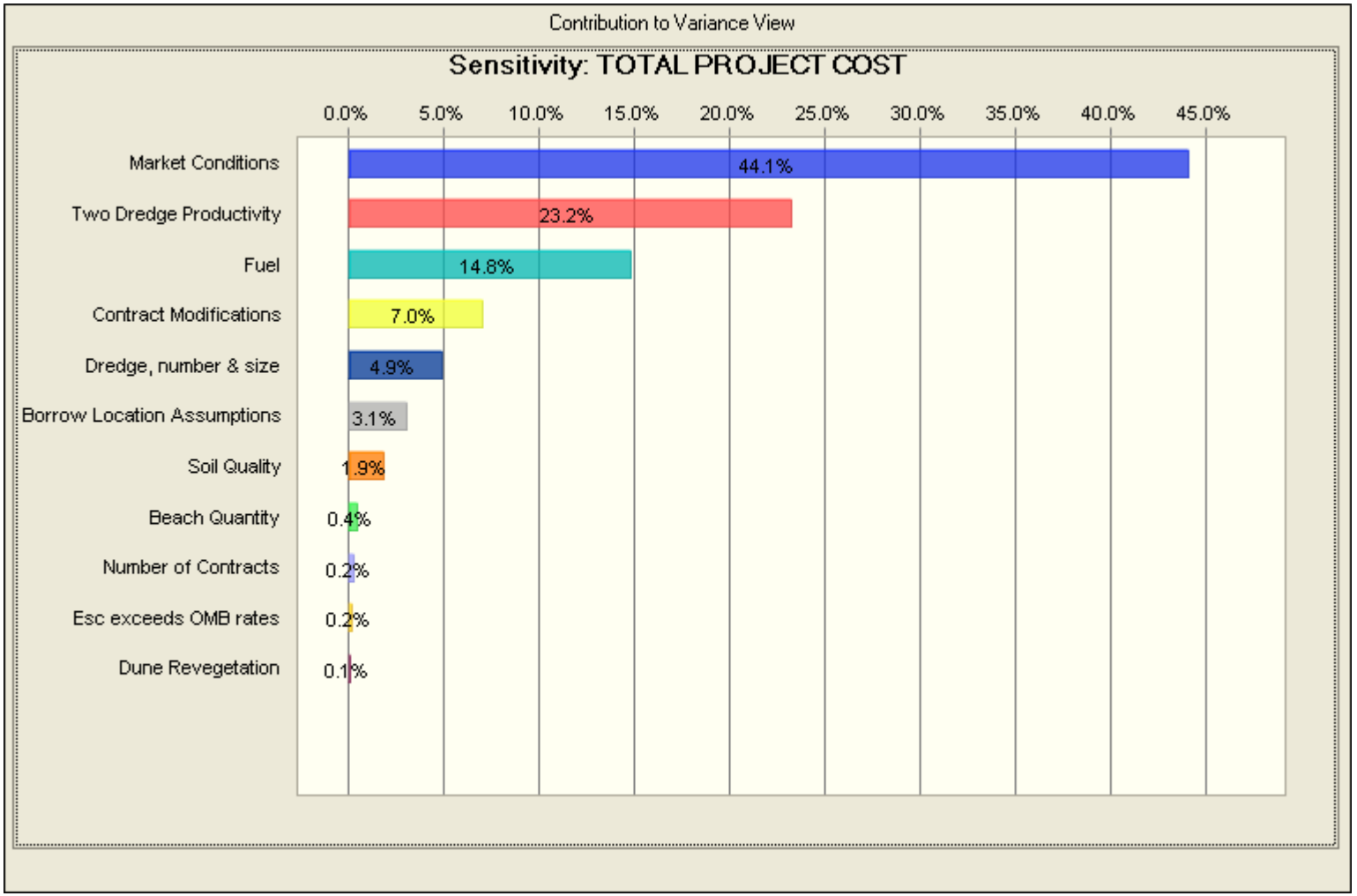


Figure ES-2. Sensitivity Chart



1. PURPOSE

Risk Analysis is based on SURF CITY AND NORTH TOPSAIL BEACH FEASIBILITY REPORT AND ENVIRONMENTAL IMPACT STATEMENT. The purpose for a cost and schedule risk analysis (CSRA) is to briefly present discussion of the studied elements related to cost and schedule with an outcome contingency calculation at the recommended confidence level for both cost and schedule that are measured in terms of dollars. The most common and recommended contingency has been established at 80% confidence.

2. BACKGROUND

The NED Plan is the alternative selected plan which has the greatest net benefits. The NED Plan is to construct a sand dune to elevation 15-ft (25-ft top width) and a berm to the ocean at elevation of 7-ft (50-ft wide). The NED plan for Surf City and North Topsail Beach (SCNT) is often referred to as the 15/50 plan. Material for placement on the beach will come from offshore borrow areas. Hopper dredges will excavate material, travel to offshore pumpout stations, and pump material onto the beach.

3. REPORT SCOPE

The scope of the risk analysis report is to calculate and present the cost and schedule contingencies at the 80 percent confidence level using the risk analysis processes, as mandated by U.S. Army Corps of Engineers (USACE) Engineer Regulation (ER) 1110-2-1150, Engineering and Design for Civil Works, ER 1110-2-1302, Civil Works Cost Engineering, and Engineer Technical Letter 1110-2-573, Construction Cost Estimating Guide for Civil Works. The report presents the contingency results for cost risks for all project features. The study and presentation can include or exclude consideration for operation and maintenance or life cycle costs, depending upon the program or decision document intended for funding.

3.1 Project Scope

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

3.2 USACE Risk Analysis Process

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

communication of important steps, logic, key assumptions, limitations, and decisions to help ensure that risk analysis results can be appropriately interpreted.

Risk analysis results are also intended to provide project leadership with contingency information for scheduling, budgeting, and project control purposes, as well as provide tools to support decision making and risk management as the project progresses through planning and implementation. To fully recognize its benefits, cost and schedule risk analyses should be considered as an ongoing process conducted concurrent to, and iteratively with, other important project processes such as scope and execution plan development, resource planning, procurement planning, cost estimating, budgeting, and scheduling.

In addition to broadly defined risk analysis standards and recommended practices, the risk analysis is performed to meet the requirements and recommendations of the following documents and sources:

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

4. METHODOLOGY/PROCESS

The Cost Dx assembled a team, also relying on local Wilmington District staff to further augment labor, expertise and information gathering. The Cost Dx team consisted of two senior civil cost engineers. The Wilmington staff included cost support from the cost engineer as well as coordination support from project management and the assigned project delivery team (PDT).

The Cost Dx Team facilitated a risk identification and qualitative analysis meeting with the Wilmington PDT via teleconference on February 24, 2009. Several meetings via teleconference were conducted during that time frame to further develop the risk register. The risk identification and qualitative analysis process resulted in recommendations for revisions to the estimate, both for the ATR cost review process and for the inputs to the cost and schedule risk analysis.

The cost risk model was completed and results reported on April 15, 2009.

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

In simple terms, contingency is an amount added to an estimate to allow for items, conditions or events for which the occurrence or impact is uncertain and that experience suggests will likely result in additional costs being incurred or additional time being required. The amount of contingency included in project control plans depends, at least in part, on the project leadership's willingness to accept risk of project overruns. The less risk that project leadership is willing to accept the more contingency should be applied in the project control plans. The risk of overrun is expressed, in a probabilistic context, using confidence levels.

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

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

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

4.1 Identify and Assess Risk Factors

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

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

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

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

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

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

4.2 Quantify Risk Factor Impacts

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

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

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

- Maximum possible value for the risk factor.
- Minimum possible value for the risk factor.
- Most likely value (the statistical mode), if applicable.
- Nature of the probability density function used to approximate risk factor uncertainty.
- Mathematical correlations between risk factors.
- Affected cost estimate and schedule elements.

The resulting product from the PDT discussions is captured within a risk register as presented in section 6 for both cost and schedule risk concerns. Note that the risk register records the PDT's risk concerns, discussions related to those concerns, and potential impacts to the current cost and schedule estimates. The concerns and

discussions are meant to support the team's decisions related to event likelihood, impact, and the resulting risk levels for each risk event.

4.3 Analyze Cost Estimate and Schedule Contingency

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

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

5. PROJECT ASSUMPTIONS

The following data sources and assumptions were used in quantifying the costs associated with the with- and without-project conditions at Surf City and North Topsail Beach.

a. Two medium size Hopper dredges were used to developed cost estimates using CEDEP. The hopper dredges would dredge material from the borrow areas and haul material to pump out locations approximately 3,000 LF offshore. On the beach, the material would be placed from a wye/tee for 3,000 LF in each direction or a total of 6,000 lf on the beach.

b. Hopper dredges were assumed because the distance from the borrow areas to the beach averages approximately 3 to 5 miles, and the borrow area contours show relatively shallow depths of sand (bank height is generally less than 5 feet in most cases). It was determined that the conditions above would not be efficient for pipeline cutter head suction dredges. However, pipeline cutter head suction dredges will not be restricted from the competitive bids.

c. The entire length of the beach to be renourished is approximately 10 miles. Initial nourishment will require 11,500,000 CY and subsequent periodic nourishments will require 1,639,000 CY.

d. Hopper dredge operations are limited to environmental windows and are only allowed to dredge during the period from December 1 through March 31.

e. The unit prices are based on historical effective work times for offshore borrow areas with pumping to the beach.

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

g. The schedule was not analyzed for impact to the total project cost, as this project is not susceptible to uncaptured escalation (local market inflation notably higher than national average) or recurring monthly costs (unavoidable fixed contract costs and/or languishing federal administration costs incurred continuously throughout delay).

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

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

6. RISK ANALYSIS RESULTS

The following table tabulates the results of the risk analysis currently identified as a 21.22% contingency amount based on 80% confidence level. The complete list of tables and figures are included within Appendix A.

Table 1. Cost Contingency Summary

Contingency on Base Estimate	80% Confidence Project Cost
Total Construction Cost (Most Likely) ->	**$101,494,800**
Construction Cost Contingency Amount ->	$21,538,221
Total Construction Cost (80% Confidence) ->	**$123,033,021**

6.1 Risk Register

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

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

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

6.2 Cost Risk Analysis - Cost Contingency Results

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

Contingency was quantified as approximately $22 Million at the P80 confidence level (about 21% of the base cost estimate). For comparison, the cost contingency at the P50 and P100 confidence levels was quantified as 14% and 42% of the baseline cost estimate, respectively.

Table 2. Base Estimate Cost Contingency Summary

Risk Analysis Forecast	Base Estimate	Total Contingency[1] ($)	Total Contingency (%)
50% Confidence Level			
Total Project Cost	$101,495	$14,240	14.03%
80% Confidence Level			
Total Project Cost	$101,495	$21,538	21.22%
100% Confidence Level			
Total Project Cost	$101,495	$42,090	41.47%

Notes:
1) Includes cost contingency, but not schedule contingency impacts.

7. MITIGATION RECOMMENDATIONS

Risk Management is an all-encompassing, iterative, and life-cycle process of project management. The Project Management Institute's (PMI) *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, *4th edition*, states that "project risk management includes the processes concerned with conducting risk management

planning, identification, analysis, responses, and monitoring and control on a project." Risk identification and analysis are processes within the knowledge area of risk management. Its outputs pertinent to this effort include the risk register, risk quantification (risk analysis model), contingency report, and the sensitivity analysis.

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

The Cost and Schedule Risk Analysis (CSRA) produced by the PDT identifies issues that require the development of subsequent risk response and mitigation plans. This section provides a list of recommendations for continued management of the risks identified and analyzed in this study. Note that this list is not all inclusive and should not substitute a formal risk management and response plan.

1. Key Risk Drivers: The key cost risk drivers identified through sensitivity analysis are Programmatic Risk EXT-1 (Market Conditions), Contract Risks EST-4 (Two-Dredge Productivity) and EST-3 (Fuel), which together contribute 82 percent of the statistical cost variance. Other notable cost risk drivers are Contract Risks EST-1 (Dredge, Number & Size) and CON-1 (Contract Modifications) which each contribute 5.9 percent to the statistical cost variance.

Whereas the developed contingency, itself, is a response to the potential for these risks, these risks warrant consideration of other potential responses and proactive monitoring and control.

a) Market Conditions: With respect to Market Conditions (Risk EXT-1), Cost Dx recommends continuous monitoring of the price fluctuations and behaviors in the regional dredging industry in the PDT's ongoing market research. Project leadership should craft the acquisition strategy with relation to the market trends to minimize the impact of the industry contraction and maximize competition on the project.

b) Two-Dredge Productivity: With respect to two-dredge productivity (Risk EST-4), Cost Dx recommends further research into the likelihood of the use of this model scenario. This research should parallel ongoing market research.

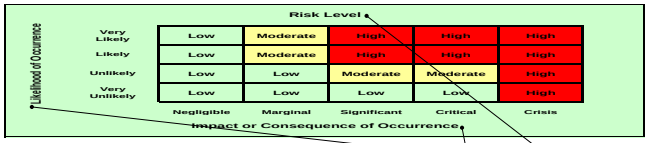
c) Fuel: With respect to fuel prices (Risk EST-3), Cost Dx recommends proactive market research to identify trends and their effect on the project cost.

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

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

APPENDIX A

SURF CITY AND NORTH TOPSAIL BEACH, NC - RISK REGISTER



Risk No.	Risk/Opportunity Event (logic by feature, contract, responsibility)	PDT Event Concerns (include all to archive)	PDT Discussions (support the likelihood and impact)	Responsibility/POC	Project Cost			Project Schedule			COMPLETED BY RISK ANALYST AFTER PDT DISCUSSIONS						Cost Comments	Schedule Comments
					Likelihood*	Impact*	Risk Level*	Likelihood*	Impact*	Risk Level*	Cost Impact ($)	Variance Distribution (Cost)	Schedule Impact (mo)	Variance Distribution (Schedule)	Correlation to Others (minimize)	Affected Project Component		
	Contract Risks (Internal Risk Items are those that are generated, caused, or controlled within the PDT's sphere of influence.)																	
	PROJECT & PROGRAM MGMT																	
PPM-1	Congressional Funding - Feasibility	Adequate Congressional funding to complete the feasibility study	PM feels that adequate PED funding has been made available to support Feasibility study and report as well as initiate PED phase.	PM	Very Unlikely	Marginal	Low	Very Unlikely	Marginal	Low	Less Than 1%	Low Risk - Not Studied	Less Than 1%	*Schedule Risks Not Formerly Studied		Project Cost & Schedule		
PPM-2	Congressional Funding - PED	Concern is that the PED Congressional funding is uncertain, post feasibility.	Anticipated need of $1.5-2M to complete PED, but not certain all needed Congressional funding will be made available in a timely manner for FY 2010.	PM	Likely	Negligible	Low	Likely	Marginal	Moderate	Less Than 1%	Low Risk - Not Studied	+12 mo	*Schedule Risks Not Formerly Studied	PPM-3, PPM-8	Project Schedule		Up front authorization and funding delays could impact PED start and consequently the construction start. There is a potential that funding is delayed a year, causing a year lost. Will study PPM-3 separately in time.
PPM-3	Congressional Funding Construction	Concern is that construction funding is incremental per FY and can be impacted by budget delays such as continuing resolutions. We can no longer award a continuing contract.	Based on estimated construction value, the PDT feels it unlikely that total construction will be funded all at once. This could result in additional PED expenses as well as escalation in schedule growth. Some risk mitigation could occur by breaking the project into seasonal contracts, but the Dec-Mar seasonal construction is dependent upon the FY budget appropriation each FY. Delays in budget approval can impact the Dec start. The converse argument is that IF authorization has already been received, even if the construction funding is delayed, that funding will add the OMB escalation onto the funding request.	PM and Contracting	Very Likely	Negligible	Low	Very Likely	Marginal	Moderate	Less Than 1%	Low Risk - Not Studied	+24 mo	*Schedule Risks Not Formerly Studied	PPM-2, PPM-8, CA-2	Project Schedule		Construction activities dependent upon receiving the PED funds AND the PED activities prior to construction. The construction could then be delayed more months if construction funding is not all received at the construction start. Since there may be as many as four contracts, we assumed incremental funding that has a potential of one or more years.
PPM-4	Stakeholder funding capability	2 sponsors: Surf City and North Topsail Beach having adequate funding support for their shares.	Sponsors must fund portion of 50% feasibility, 25% PED and 35% initial construction plus 100% real estate acquisition. Breaking construction into 3-4 separate contracts lessens funding risks. Sponsors feel confident that their budget shares are not a critical constraint and that the Federal shares and funding are a greater concern.	Sponsor	Very Unlikely	Negligible	Low	Very Unlikely	Marginal	Low	Less Than 1%	Low Risk - Not Studied	Less Than 1%	*Schedule Risks Not Formerly Studied		Project Cost		
PPM-5	Adequate PDT Resources	Several PDT members scheduled for near term retirement.	The District feels that there is adequate District support and team development for future efforts.	PM	Unlikely	Negligible	Low	Unlikely	Negligible	Low	Less Than 1%	Low Risk - Not Studied	Less Than 1%	*Schedule Risks Not Formerly Studied		Project Schedule		
PPM-6	Sponsor Support	Sponsor support and agreement with the project plan.	Sponsor coordination and support is healthy, alleviated with monthly meetings that include PDT and sponsors.	PM	Unlikely	Negligible	Low	Unlikely	Negligible	Low	Less Than 1%	Low Risk - Not Studied	Less Than 1%	*Schedule Risks Not Formerly Studied		Project Cost & Schedule		
PPM-7	Schedule quality	Concern whether current schedule is realistic, optimistic.	PDT feels the schedule is not overly optimistic and there is adequate time available. The PED is confident of the schedule for PED and construction durations. The construction durations reflect a conservative estimate approach and establish the construction schedule.	PM	Unlikely	Negligible	Low	Unlikely	Negligible	Low	Less Than 1%	Low Risk - Not Studied	Less Than 1%	*Schedule Risks Not Formerly Studied		Project Schedule		
	Opportunity													*Schedule Risks Not Formerly Studied				
PPM-8	Construction Schedule - 4 years	Construction duration expectation is 4 seasons (1 Dec - 31 Mar) due to Environmental Window for hopper dredge. The estimate choice for assumed equipment establishes the duration. Opportunities may exist within the contract solicitation package or further estimate study to decrease the schedule and resulting costs.	Historically, 2 dredges have occurred based on market availability as well quantities. The construction estimate assumes 2 medium-sized dredges. Hopper dredge size and number of dredges is commonly established by quantity within the contract. Market study and contract development could result in opportunity.	Estimator	Likely	Marginal	Moderate	Very Likely	Significant	High	SEE EST-1	Uniform		*Schedule Risks Not Formerly Studied	EST-1	Contract Cost & Schedule	Direct relationship to EST-1. Model under EST-1.	Direct relationship to EST-1. Model under EST-1.
	Contract Acquisition																	
CA-1	Contract Acquisition Strategy	The acquisition strategy could impact the construction cost and schedule.	Work type is not complicated. It is likely that it will be a FFP large business, based on historical and small business does not have capability. The contract packages will consider the estimate schedule projections related to productivity.	PM/KO	Unlikely	Negligible	Low	Unlikely	Negligible	Low	Less Than 1%	Low Risk - Not Studied	Less Than 1%	*Schedule Risks Not Formerly Studied		Contract Cost & Schedule		
CA-2	Number of Contracts	Possibility of single or multiple contracts.	Multiple contracts are likely, which would reduce risks related to bid competition and funding availability. However, multiple contracts will result in more PED and Contracting efforts.	PM/KO	Likely	Marginal	Moderate	Likely	Negligible	Low	WC = $300K/contract for 3 contracts	Uniform	Less Than 1%	*Schedule Risks Not Formerly Studied	PPM-3, PPM-8	Contract Cost	PED costs are ~ $1.5M. Approx $800K of the $1.5M is for subsurface investigations. There is an additional $200K for final plans and specs prep. Assuming $150K for P&S and $150K for subsurface investigations per contract.	Schedule risk is low because PED work can be performed concurrently with construction contracts.
	Technical																	
T-1	Soil Quality	Concern that the quality soil may be insufficient in quantity to construct project because soil characterization is not complete. State has new, more stringent, criteria related to material quality.	This potential problem is more likely to occur in the long term, unlikely in the short term but dependent upon further study. 20% soil characterization is complete. Further study is significant, but scheduled for PED phase and the initial contracts have adequate borrow sources available. Greater risk is in the out years because the current activities would simply result in a local remobe to another borrow source.	PM/Geotech	Unlikely	Marginal	High	Likely	Significant	High	$5,474,000 MORE	Triangular	NOT SIGNIFICANT	*Schedule Risks Not Formerly Studied	T-2	Contract Cost & Schedule	MOST LIKELY: Estimate assumes 18% losses from borrow area to the beach fill based on geotech studies. BEST CASE: Assume Most Likely. WORSE CASE: 25% losses total OR 7% INCREASE IN QUANTITY	Schedule risk is low because EACH additional season would be approx 8 days outside window which is very little risk.
T-2	Beach Quantity	Scope definition is excellent, but quantities can change over time due to beach erosion during the PED phase and geotechnical overfill ratios- additionally funding delays may increase quantities.	Contract quantities are currently established by dredged borrow assumptions related to quantity and overfill ratios for payment, based on borrow surveys underwater. Storms can change profile bottom, but PDT feels the borrow sources are outside the storm impact zone. Borrow surveys must occur asap to establish the qty's. Surveys can result in claims and mods, but further beach erosion could also increase the borrow needs. Also could be more quantity due to funding delays.	Coastal/Geotech	Likely	Significant	High	Likely	Significant	High	$2,704,000 MORE	Triangular	NOT SIGNIFICANT	*Schedule Risks Not Formerly Studied	T-1	Contract Cost & Schedule	MOST LIKELY: Estimate assumes funding for FY 13 and subsequent erosion until that FY 13. BEST CASE: Assume same as Most Likely. WORSE CASE: 91,500 cy erosion each year beyond scheduled year FY 13. Assume 4 years delay or about 400,000 cy.	Schedule risk is low because EACH additional season would be approx 4 days outside window which is very little risk.
T-3	Non-Compatible Soil	Concern that non-satisfactory soil is brought upon beach.	Plan is to monitor during dredging process. Mitigation would require contractor removal. Hopper dredge and screening possible before beach placement. PED stage with added borings would better clarify. Must determine if the estimates include any monitoring costs and potential disposat.	Geotech	Unlikely	Marginal	Low	Unlikely	Marginal	Low	Less Than 1%	Low Risk - Not Studied	Less Than 1%	*Schedule Risks Not Formerly Studied		Contract Cost & Schedule		
T-4	Hard Bottom Encounter	Hard bottoms may be uncovered later in out years.	Sand bottom may be covering hard bottoms, leaving a risk in the borrow quantity available at each site. It could damage the hopper dredge. Risk is increased in the out years, because in the near term the dredge can simply relocate. Better clarification should occur during PED phase with better surveys.	Geotech	Unlikely	Marginal	Low	Unlikely	Marginal	Low	Less Than 1%	Low Risk - Not Studied	Less Than 1%	*Schedule Risks Not Formerly Studied		Contract Cost & Schedule		
	Real Estate																	
RE-1	Acquire real estate	Concern that RE cannot acquire real estate timely to support the construction contracts.	Historically, a good track record and relocations are minor.	RE	Unlikely	Negligible	Low	Unlikely	Negligible	Low	Less Than 1%	Low Risk - Not Studied	Less Than 1%	*Schedule Risks Not Formerly Studied		Project Schedule		
RE-2	Real Estate Estimate	Real Estate estimate may cause cost impact.	Historical information is good. The estimate currently includes a 25% contingency. This should be re-evaluated within the risk analysis outcome.	RE	Unlikely	Negligible	Low	Unlikely	Negligible	Low	Less Than 1%	Low Risk - Not Studied	Less Than 1%	*Schedule Risks Not Formerly Studied		Project Cost		

	Environmental																			
ENV-1	Encountering small arms	HTRW - Historically, the borrow area was part of a local WWII Anti-aircraft training center. Small arms firing off shore may result in encountering some small arms material.	In 1994 USACE surveyed beach only. Off shore not surveyed. There is potential of encountering from dredging and placement onto beach. Beach monitoring will be required. Mitigation will be required if encountered.	Environmental	Unlikely	Negligible	Low	Unlikely	Negligible	Low		Less Than 1%	Low Risk - Not Studied	Less Than 1%	*Schedule Risks Not Formerly Studied		Contract Cost		
ENV-2	Sea Turtle Site Take	Hopper dredge may impact sea turtle population.	Winter work window is based on sea turtle concern. Risk is minimized, but such an encounter may shut down work activity for a period, resulting in standby and lost time costs.	Environmental	Unlikely	Marginal	Low	Unlikely	Marginal	Low		Less Than 1%	Low Risk - Not Studied	Less Than 1%	*Schedule Risks Not Formerly Studied		Contract Cost & Schedule		
ENV-3	SAD Turtle Incidental Take	Other projects encountering sea turtles	Other SAD impacts or "takes" can impact this project. Time frame shut down could occur (standby time based in days).	Environmental	Unlikely	Marginal	Low	Unlikely	Marginal	Low		Less Than 1%	Low Risk - Not Studied	Less Than 1%	*Schedule Risks Not Formerly Studied		Contract Cost & Schedule		
ENV-4	Bird Nesting	Bird nesting impacts construction.	Winter work window is also based on bird nesting concerns. Risk is minimized, but such an encounter may shut down work activity for a period of time.	Environmental	Unlikely	Marginal	Low	Unlikely	Marginal	Low		Less Than 1%	Low Risk - Not Studied	Less Than 1%	*Schedule Risks Not Formerly Studied		Contract Cost & Schedule		
ENV-5	Wright Whale Restrictions	Encounter potential impacts dredge fleet speed	Probably of the 10 knot speed restriction is low. Larger hopper dredges have a higher speed that could be impacted. Feds may not require this restriction on a federal project and the current estimate assumes smaller dredges with slower speed capability. Feds also monitor whale movement. Estimate must accommodate speed restrictions, affecting the productivity. The estimate will be redeveloped to accommodate the speed restrictions.	Environmental	Unlikely	Marginal	Low	Unlikely	Marginal	Low		Less Than 1%	Low Risk - Not Studied	Less Than 1%	*Schedule Risks Not Formerly Studied		Contract Cost & Schedule		
ENV-6	Environmental Monitoring	Environmental monitoring required during dredging.	Dredge relocation to another borrow source would be required if impacts are found. Environmental group will have a separate monitoring contract. The monitoring costs have been considered within PED.	Environmental	Unlikely	Marginal	Low	Unlikely	Marginal	Low		Less Than 1%	Low Risk - Not Studied	Less Than 1%	*Schedule Risks Not Formerly Studied		Contract Cost & Schedule		
ENV-7	Dune Revegetation	Dune revegetation may be required.	Estimate includes first vegetation. Dune revegetation requirement is likely and may not be adequately covered within the estimate.	Environmental	Likely	Marginal	Moderate	Likely	Negligible	Low		$830,000 MORE	Uniform	Less Than 1%	*Schedule Risks Not Formerly Studied		Contract Cost	MOST LIKELY: The estimate currently includes initial planting, no revegatation if first planting fails. BEST CASE: No replanting. WORST CASE: Replant 60% of initial.	
ENV-8	Archeological	Concern that there may be uncovered archeological finds during the underwater excavations.	Borrow areas have been well established with adequate investigation to determine this is not a concern. If anything was discovered, another available nearby borrow source, already identified and studied, would be the next source.	Coastal/Geotech	Very Unlikely	Marginal	Low	Very Unlikely	Marginal	Low		Less Than 1%	Low Risk - Not Studied	Less Than 1%	*Schedule Risks Not Formerly Studied		Contract Cost & Schedule		

	Estimate																		
EST-1	Dredge, number & size	Estimate choice can effect efficiency and productivity, causing a change to the estimate.	Estimate assumed two medium-sized hopper dredges but equipment is not restrictive w/in contract. The chosen estimate hopper size and number can affect the cost and productivity. Hopper dredges accommodate poor weather better than pipeline dredges. A large hopper results in greater efficiency as compared to two smaller hoppers, but less available and may be impacted by speed restrictions. Estimate hopper dredge choice is more common at 77% efficiency and based on historical occurrence. Further study is still necessary.	Estimator	Likely	Marginal	Moderate	Likely	Marginal	Moderate	$7,178,000 LESS	Uniform	ALL WORK IN 2 SEASONS INSTEAD OF 4 SEASONS and reflected in new cost $7.128mil	*Schedule Risks Not Formerly Studied	EST-4, PPM-8	Contract Cost & Schedule	MOST LIKELY: Base estimate assumes 2 medium sized hopper dredges at a productivity rate of 77% = 2.9 Million CY/season (4 mo) based on average historical data. BEST CASE: 4.3 million CY/season assuming 3 various-sized hopper dredges . WORST CASE: Same as most likely.	MOST LIKELY: Base estimate assumes 2 medium sized hopper dredges at a productivity rate of 77% = 2.9 Million CY/season (4 mo) based on average historical data. BEST CASE: 4.3 million CY/season assuming 3 various-sized hopper dredges . WORST CASE: Same as most likely.
EST-2	Pipeline dredge	The potential that a pipeline dredge is used in lieu of the estimated hopper dredge could impact the bid cost.	The estimate assumes hopper dredge as more cost efficient for this project based on distance between borrow source, beach location and historical experience. Assuming bidding interest, the pipeline dredge is no real cost benefit.	Estimator	Unlikely	Marginal	Low	Unlikely	Marginal	Low	Less Than 1%	Low Risk - Not Studied	Less Than 1%	*Schedule Risks Not Formerly Studied		Contract Cost & Schedule		
EST-3	Fuel	Fuel fluctuations can impact dredging costs.	On dredging projects, fuel is a major cost driver for equipment. Fuel has fluctuated drastically in the past 18 months. It is now back on the upswing. Study should be for time of funding date estimate.	Estimator	Likely	Significant	High	Unlikely	Marginal	Low	$11,798,000 MORE	Triangular	Less Than 1%	*Schedule Risks Not Formerly Studied	EXT-5	Contract Cost	MOST LIKELY: Base estimate assumes $2.80/gal based on historical data and projection studies that eliminate anomalies. BEST CASE: $1.50/gal at Feb 23 2009. WORST CASE: $6.00/gal based on studied projection to 2010 feasibility authorization. $4.50/gal experienced in 2008.	
EST-4	Two Dredge Productivity	The estimate assumes a certain productivity based on two medium sized dredge. Productivity may vary.	The current estimate makes assumptions in the size and productivity for two medium sized hopper dredges with a 3.2 mile haul. Those estimate assumptions establish the schedule. Productivity of two hopper dredges can vary due to various possibilities.	Estimator	Likely	Significant	High	Likely	Negligible	Low	$15,965,000 MORE AT 60% EWT AND $10,290,000 LESS AT 88% EWT	Triangular	All work for 60% will require 5 mob/demob seasons AND for 88% will require 3 mob/demob seasons.	*Schedule Risks Not Formerly Studied	EST-1, PPM-8	Contract Cost	MOST LIKELY: Base estimate assumes 2 medium sized hopper dredges at a productivity rate of 77% EWT = 2.9 Million CY/season (4 mo) based on average historical data. BEST CASE: Assuming 2 medium hopper dredges at a productivity rate 88% EWT. WORST CASE: 2 medium sized hopper dredges at a 60% EWT.	MOST LIKELY: Base estimate assumes 2 medium sized hopper dredges at a productivity rate of 77% EWT = 2.9 Million CY/season (4 mo) based on average historical data. BEST CASE: Assuming 2 medium hopper dredges at a productivity rate 88% EWT. WORST CASE: 2 medium sized hopper dredges at a 60% EWT = 1-extra hopper season at $900,000.
EST-5	Borrow Location Assumptions	The estimate makes assumptions as to which borrow areas will be used to support the beach locations.	There may be a potential that the assumed locations are not the ones approved for each contract. The estimate assumed the best case of closer locations, but there is a possibility that borrow sources farther from the beach will be used. This could impact productivity and remobilization costs.	Coastal/Geotech	Likely	Marginal	Moderate	Likely	Negligible	Low	$6,325,000 MORE	Triangular	Less Than 1%	*Schedule Risks Not Formerly Studied	CON-1	Contract Cost	MOST LIKELY: Assumes the closest borrows to the closest pumpout stations averaging a 3.2-mile haul distance. BEST CASE: Same as most likely case. WORSE CASE: Average haul distance of 5 miles based on using Borrow Areas "L" and "J" as initial construction.	
	Construction																		
CON-1	Contract Modifications	There may be modification issues that have not been captured in current risks.	The normal modifications for dredging is quantities. This is considered elsewhere. Each contract will likely carry the intended quantities per contract, but is restricted by the work window. Competing work, loss of dredger, quantity assumption can cause modifications such as remobilizations and delays. Other modification potentials could include borrow source remobilization resulting from environmental impacts.	Estimator	Likely	Marginal	Moderate	Unlikely	Significant	Moderate	$1,780,000 MORE	Uniform	+12 mo	*Schedule Risks Not Formerly Studied	T-2, EST-5	Contract Cost & Schedule	MOST LIKELY: Base estimate. BEST CASE: Same as most likely. WORSE CASE: Remobilization into next season.	Modification may go beyond work window, causing work into the next season.
CON-2	Pipeline Dredge	The estimate assumes a hopper dredge because of longer pipeline distances and depth to borrow.	Reviewing the project, the hopper dredge seems the most likely choice. Dredge shortages may result in pipeline dredges bidding. This could increase the cost. Schedule would be affected by mobilization distances, but better productivity.	Estimator	Unlikely	Marginal	Low	Unlikely	Marginal	Low	Less Than 1%	Low Risk - Not Studied	Less Than 1%	*Schedule Risks Not Formerly Studied		Contract Cost & Schedule		

External Risk Items are those that are generated, caused, or controlled exclusively outside the PDT's sphere of influence.)

					Project Cost			Project Schedule			COMPLETED BY RISK ANALYST							
Risk No.	**Risk/Opportunity Event**	**Concerns**	**PDT Discussions**	**Responsibility/POC**	**Likelihood***	**Impact***	**Risk Level***	**Likelihood***	**Impact***	**Risk Level***	**Cost Impact ($)**	**Variance Distribution (Cost)**	**Schedule Impact (mo)**	**Variance Distribution (Schedule)**	**Correlation to Others)**	**Affected Project Component**		
EXT-1	Market Conditions	Market conditions and competing projects may impact bid competition.	Currently, there are a lot of projects planned when considering the number of dredges available. There are more hopper dredges than pipeline dredges. It is a tough bidding climate based on environmental time-line restrictions. Construction start is scheduled for 2014.	Estimator	Likely	Significant	High	Likely	Negligible	Low	$20,736,000 MORE	Triangular	Less Than 1%	*Schedule Risks Not Formerly Studied		Contract Cost	MOST LIKELY: Base estimate. BEST CASE: 5% below the most likely based on GAO audit. WORSE CASE: 25% above most likely estimate (35% w/o profit) due to lack of dredging companies and dredges for competing projects because of the work window restrictions.	
EXT-2	External Opposition	External opposition may cause scope or schedule change.	Feds adhering to the environmental requirements. Sponsors in favor of project. No onus on historical intervention because it is a beach renourishment project.	PM	Unlikely	Marginal	Low	Unlikely	Marginal	Low	Less Than 1%	Low Risk - Not Studied	Less Than 1%	*Schedule Risks Not Formerly Studied		Project Cost & Schedule		
EXT-3	Acts of God	Severe weather may impact cost or schedule.	Nor'easter storms or hurricanes could impact construction as well as beach profile. Construction occurs in low period of weather risks; however, storms are still a potential. As long as the estimate and schedules assume some inefficiency, it should not be a serious issue.	God	Likely	Negligible	Low	Likely	Negligible	Low	Less Than 1%	Low Risk - Not Studied	Less Than 1%	*Schedule Risks Not Formerly Studied		Project Cost & Schedule		
EXT-4	Borrow Competition	External entities may compete for the borrow sources.	For initial construction this is unlikely. Long term competition is likely. The long term competition does not impact initial appropriation needs and feasibility funding request. Future projects must consider this potential as it occurs in future contracts.	PM	Unlikely	Marginal	Low	Unlikely	Marginal	Low	Less Than 1%	Low Risk - Not Studied	Less Than 1%	*Schedule Risks Not Formerly Studied		Contract Cost		
EXT-5	Esc exceeds OMB rates	Over longer periods of time, the actual market may be greater than the OMB rates, impacting contract costs.	Volatile fuel, being a larger risk on dredging projects, may not correlate with the OMB rates and may be higher as time goes into the 4th contract year.	Estimator	Likely	Marginal	Moderate	Unlikely	Negligible	Low	$1,051,725 MORE	Uniform	Less Than 1%	*Schedule Risks Not Formerly Studied	EST-3	Project Cost	Assume fuel is the greatest cost driver that may cause annual costs to go beyond the OMB rates. The study will focus on fuel projections converted to excavation unit prices as the measurement made against the OMB rates.	

*Likelihood, Impact, and Risk Level to be verified through market research and analysis (conducted by cost engineer).

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

*** Can not assess these items**

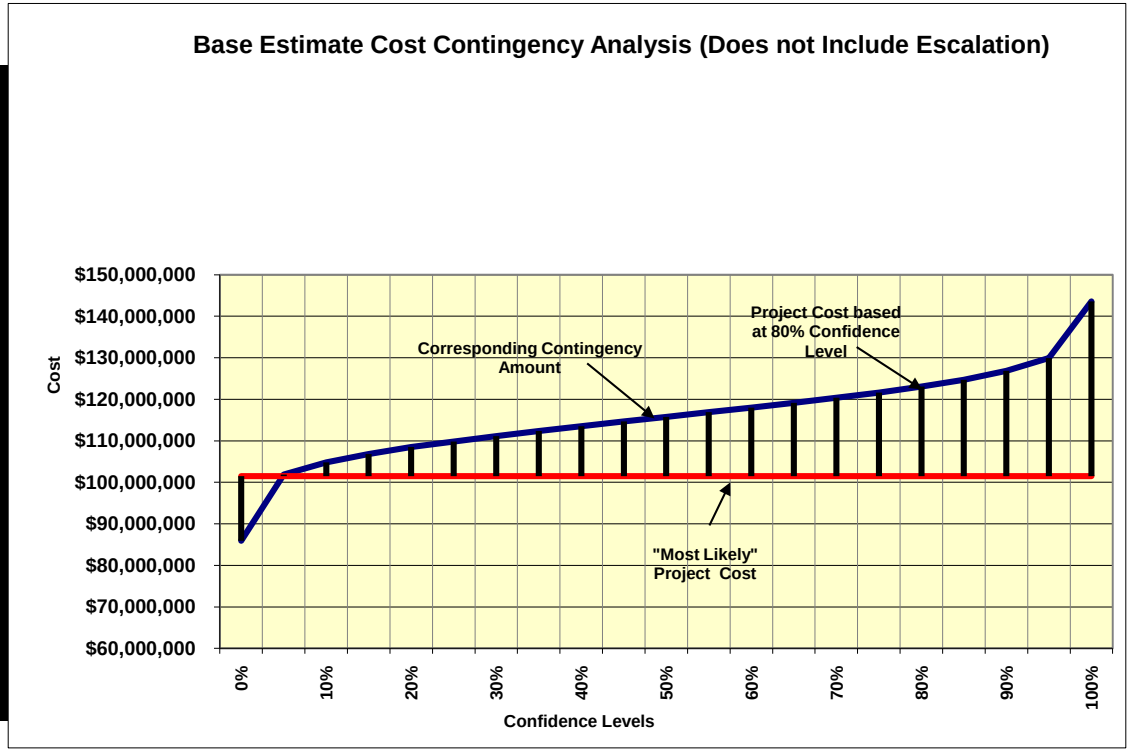
*** Schedule impacts are captured within the Cost Risk Analysis (Risk EXT-5), as this project is not otherwise susceptible to uncaptured escalation or notable "Hotel" costs.**

Contingency on Base Estimate	80% Confidence Project Cost
Total Construction Cost (Most Likely) ->	**$101,494,800**
Construction Cost Contingency Amount ->	$21,538,221
Total Construction Cost (80% Confidence) ->	**$123,033,021**

- CONSTRUCTION COST CONTINGENCY DEVELOPMENT -

Contingency Analysis

Most Likely Cost Estimate	$101,494,800	
Confidence Level	**Value**	**Contingency**
0%	**$85,925,481**	**-15.34%**
5%	**$101,911,908**	**0.41%**
10%	**$104,795,243**	**3.25%**
15%	**$106,814,070**	**5.24%**
20%	**$108,499,275**	**6.90%**
25%	**$109,841,194**	**8.22%**
30%	**$111,138,419**	**9.50%**
35%	**$112,343,382**	**10.69%**
40%	**$113,477,724**	**11.81%**
45%	**$114,679,638**	**12.99%**
50%	**$115,734,303**	**14.03%**
55%	**$116,877,628**	**15.16%**
60%	**$117,966,618**	**16.23%**
65%	**$119,114,634**	**17.36%**
70%	**$120,364,594**	**18.59%**
75%	**$121,596,135**	**19.81%**
80%	**$123,033,021**	**21.22%**
85%	**$124,677,058**	**22.84%**
90%	**$126,882,131**	**25.01%**
95%	**$129,928,279**	**28.01%**
100%	**$143,584,335**	**41.47%**



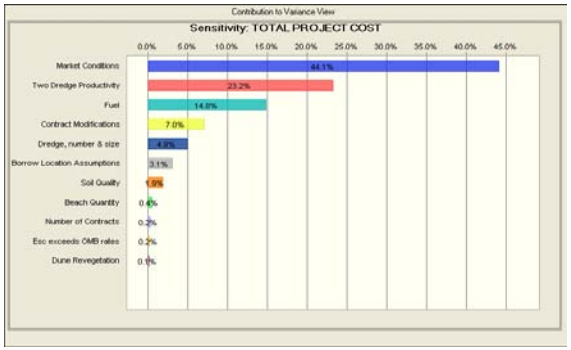
SURF CITY AND NORTH TOPSAIL BEACH, NC - Cost Risk Analysis Model

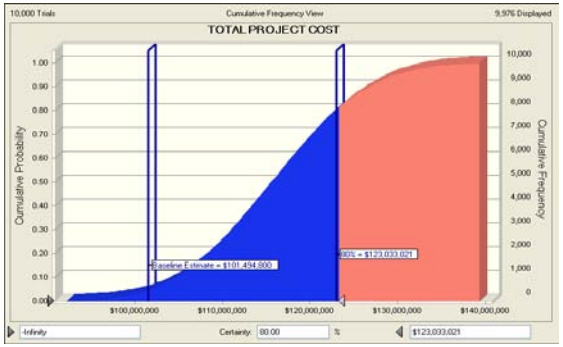
Risk No.	Risk/Opportunity Event	Concerns	Discussion	Project Cost: Likelihood*	Project Cost: Impact*	Project Cost: Risk Level*	Variance Distribution	Correlation to Other(s)	Crystal Ball Simulation: Expected Values ($$$): Low	Most Likely	High		Crystal Ball Simulation: Expected Values (%s): Low	Most Likely	High
Contract Risks (Internal Risk Items are those that are generated, caused, or controlled within the PDT's sphere of influence.)															
PROJECT & PROGRAM MGMT															
OPPORTUNITIES															
PPM-8	Construction Schedule - 4 years	Construction duration expectation is 4 seasons (1 Dec - 31 Mar) due to Environmental Window for hopper dredge. The estimate choice for assumed equipment establishes the duration. Opportunities may exist within the contract solicitation package or further estimate study to decrease the schedule and resulting costs.	Historically, 2 dredges have occurred based on market availability as well quantities. The construction estimate assumes 2 medium-sized dredges. Hopper dredge size and number of dredges is commonly established by quantity within the contract. Market study and contract development could result in opportunity.	Likely	Marginal	Moderate	Uniform	EST-1	($7,178,000)	$0	$0	*Removed from risk model - captured by Risk EST-1*	7.3%	0.0%	0.0%
CONTRACT ACQUISITION RISKS															
CA-2	Number of Contracts	Possibility of single or multiple contracts.	Multiple contracts are likely, which would reduce risks related to bid competition and funding availability. However, multiple contracts will result in more PED and Contracting efforts.	Likely	Marginal	Moderate	Uniform	PPM-8	$0	$0	$1,200,000		0.0%	0.0%	1.2%
TECHNICAL RISKS															
T-1	Soil Quality	Concern that the quality soil may be insufficient in quantity to construct project because soil characterization is not complete. State has new, more stringent, criteria related to material quality.	This potential problem is more likely to occur in the long term, unlikely in the short term but dependent upon further study. 20% soil characterization is complete. Further study is significant, but scheduled for PED phase and the initial contracts have adequate borrow sources available. Greater risk is in the out years because the current activities would simply result in a local remobe to another borrow source.	Unlikely	Marginal	High	Triangular	T-2	$93,332,000	$93,332,000	$98,465,260		0.0%	0.0%	5.5%
T-2	Beach Quantity	Scope definition is excellent, but quantities can change over time due to beach erosion during the PED phase and geotechnical overfill ratios--additionally funding delays may increase quantities.	Contract quantities are currently established by dredged borrow assumptions related to quantity and overfill ratios for payment, based on borrow surveys underwater. Storms can change profile bottom, but PDT feels the borrow sources are outside the storm	Likely	Significant	High	Triangular	T-1	$93,332,000	$93,332,000	$95,665,300		0.0%	0.0%	2.5%
ENVIRONMENTAL RISKS															
ENV-7	Dune Revegetation	Dune revegetation may be required.	Estimate includes first vegetation. Dune revegetation requirement is likely and may not be adequately covered within the estimate.	Likely	Marginal	Moderate	Uniform		$0	$0	$830,000		0.0%	0.0%	0.8%
ESTIMATE RISKS															
EST-1	Dredge, number & size	Estimate choice can effect efficiency and productivity, causing a change to the estimate.	Estimate assumed two medium-sized hopper dredges but equipment is not restrictive w/in contract. The chosen estimate hopper size and number can affect the cost and productivity. Hopper dredges accommodate poor weather better than pipeline dredges. A large hopper results in greater efficiency as compared to two smaller hoppers, but less available and may be impacted by speed restrictions. Estimate hopper dredge choice is more common at 77% efficiency and based on historical occurrence. Further study is still necessary.	Likely	Marginal	Moderate	Uniform	EST-4, PPM-8	($6,533,240)	$0	$0		6.7%	0.0%	0.0%
EST-3	Fuel	Fuel fluctuations can impact dredging costs.	equipment. Fuel has fluctuated drastically in the past 18 months. It is now back on the upswing. Study should be for time of funding date estimate.	Likely	Significant	High	Triangular	EXT-5	$90,056,047	$93,332,000	$104,998,500		-3.5%	0.0%	12.5%
EST-4	Two Dredge Productivity	The estimate assumes a certain productivity based on two medium sized dredge. Productivity may vary.	The current estimate makes assumptions in the size and productivity for two medium sized hopper dredges with a 3.2 mile haul. Those estimate assumptions establish the schedule. Productivity of two hopper dredges can vary due to various possibilities.	Likely	Significant	High	Triangular	EST-1, PPM-8	$83,532,140	$93,332,000	$104,531,840		-10.5%	0.0%	12.0%
EST-5	Borrow Location Assumptions	as to which borrow areas will be used to support the beach locations.	the ones approved for each contract. The estimate assumed the best case of closer locations, but there is a possibility that borrow sources farther from the beach will be	Likely	Marginal	Moderate	Triangular	CON-1	$93,332,000	$93,332,000	$99,398,580		0.0%	0.0%	6.5%
CONSTRUCTION RISKS															
CON-1	Contract Modifications	There may be modification issues that have not been captured in current risks.	The normal modifications for dredging is quantities. This is considered elsewhere. Each contract will likely carry the intended quantities per contract, but is restricted by the work window. Competing work, loss of dredger, quantity assumption can cause modifications such as remobilizations and delays. Other modification potentials could include borrow source remobilization resulting from environmental impacts.	Likely	Marginal	Moderate	Uniform	T-2, EST-5	$0	$0	$7,612,110		0.0%	0.0%	7.8%

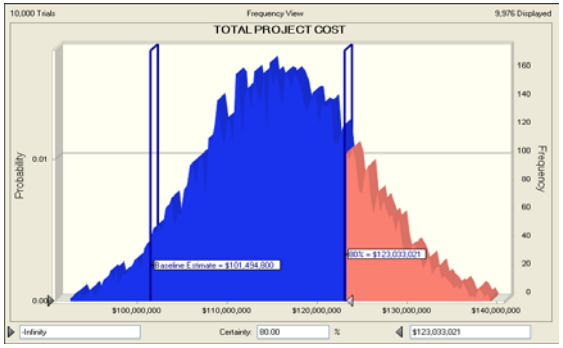
Percentages are calculated as the variance from the assumption value to facilitate iteration of the model should the cost values change throughout the project phases. Uniform distribution percentages reflect variation from the total project cost.

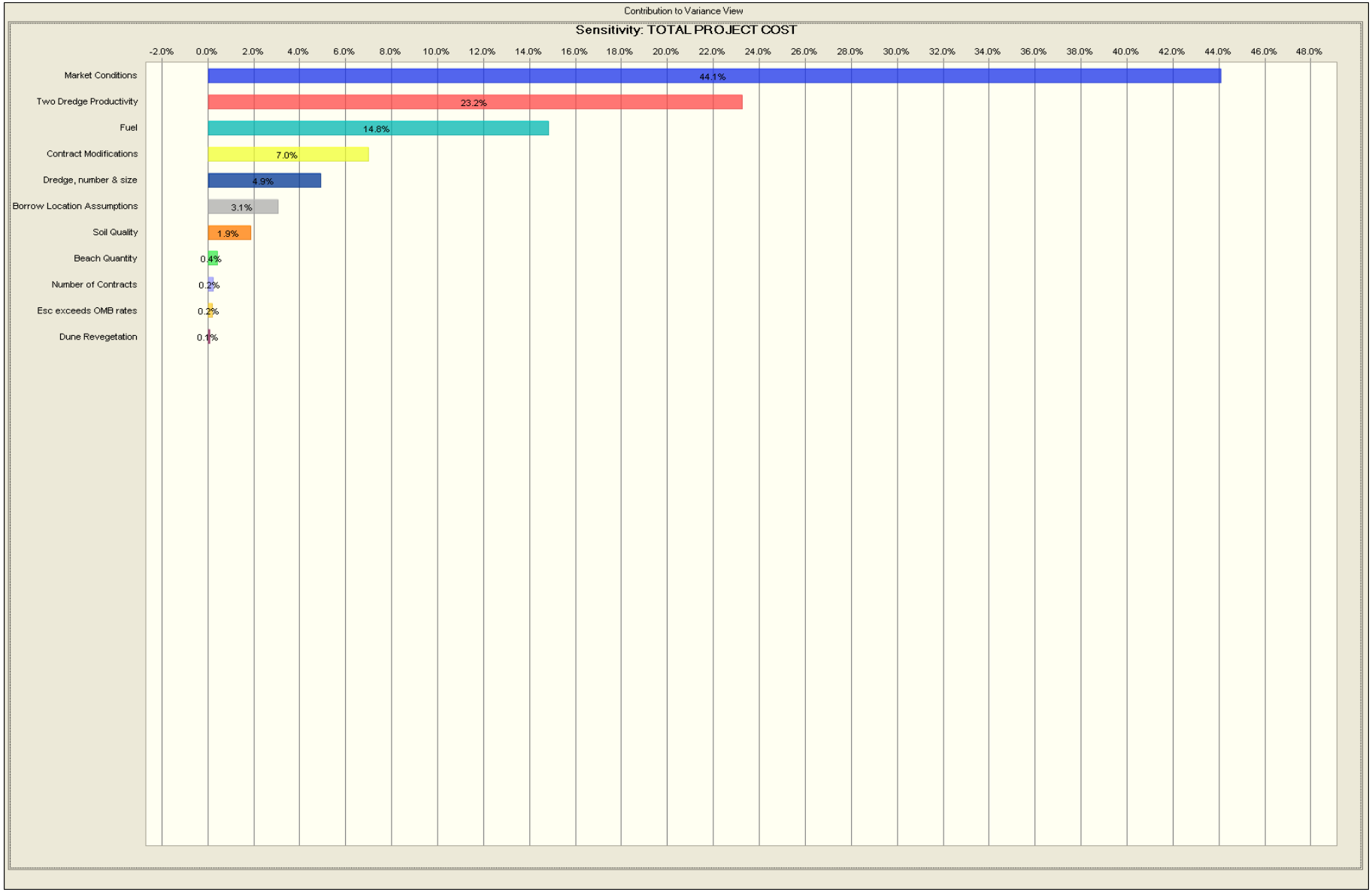
Programmatic Risks (External Risk Items are those that are generated, caused, or controlled exclusively outside the PDT's sphere of influence.)															
EXT-1	Market Conditions	Market conditions and competing projects may impact bid competition.	Currently, there are a lot of projects planned when considering the number of dredges available. There are more hopper dredges than pipeline dredges. It is a tough bidding climate based on environmental time-line restrictions. Construction start is scheduled for 2014.	Likely	Significant	High	Triangular		($5,379,224)	$0	$13,701,798		5.5%	0.0%	14.0%
EXT-5	Esc exceeds OMB rates	Over longer periods of time, the actual market may be greater than the OMB rates, impacting contract costs.	Volatile fuel, being a larger risk on dredging projects, may not correlate with the OMB rates and may be higher as time goes into the 4th contract year.	Likely	Marginal	Moderate	Uniform	EST-3	$0	$0	$1,420,927		0.0%	0.0%	1.4%
	All Other Project Costs		Placeholder for costs not captured in summation of risks being studied.									*Not Part of Study - Placeholder for Project Summation Purposes Only*			
										$101,494,800					

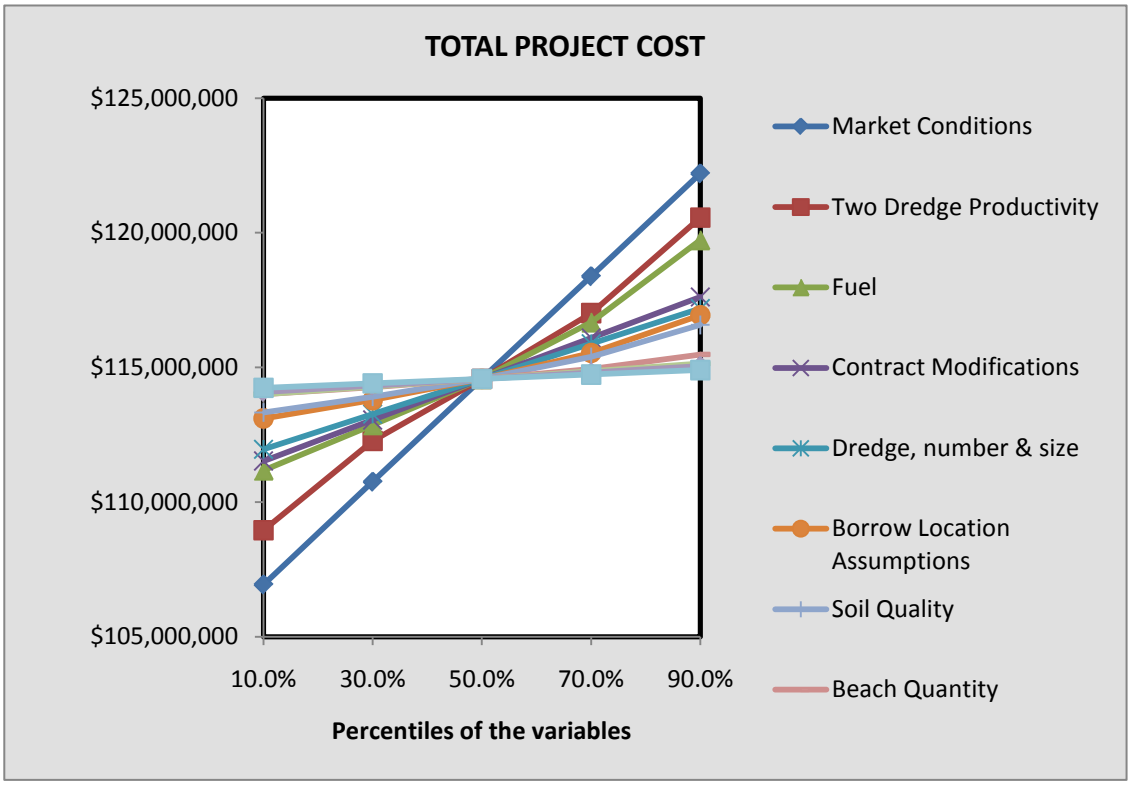
TOTAL PROJECT COST	Percentile	Forecast values	Contingency Amount	Contingency %
	0%	$85,925,481	($15,569,319)	-15.34%
	5%	$101,911,908	$417,108	0.41%
	10%	$104,795,243	$3,300,443	3.25%
	15%	$106,814,070	$5,319,270	5.24%
	20%	$108,499,275	$7,004,475	6.90%
	25%	$109,841,194	$8,346,394	8.22%
	30%	$111,138,419	$9,643,619	9.50%
	35%	$112,343,382	$10,848,582	10.69%
	40%	$113,477,724	$11,982,924	11.81%
	45%	$114,679,638	$13,184,838	12.99%
	50%	$115,734,303	$14,239,503	14.03%
	55%	$116,877,628	$15,382,828	15.16%
	60%	$117,966,618	$16,471,818	16.23%
	65%	$119,114,634	$17,619,834	17.36%
	70%	$120,364,594	$18,869,794	18.59%
	75%	$121,596,135	$20,101,335	19.81%
	80%	$123,033,021	$21,538,221	21.22%
	85%	$124,677,058	$23,182,258	22.84%
	90%	$126,882,131	$25,387,331	25.01%
	95%	$129,928,279	$28,433,479	28.01%
	100%	$143,584,335	$42,089,535	41.47%



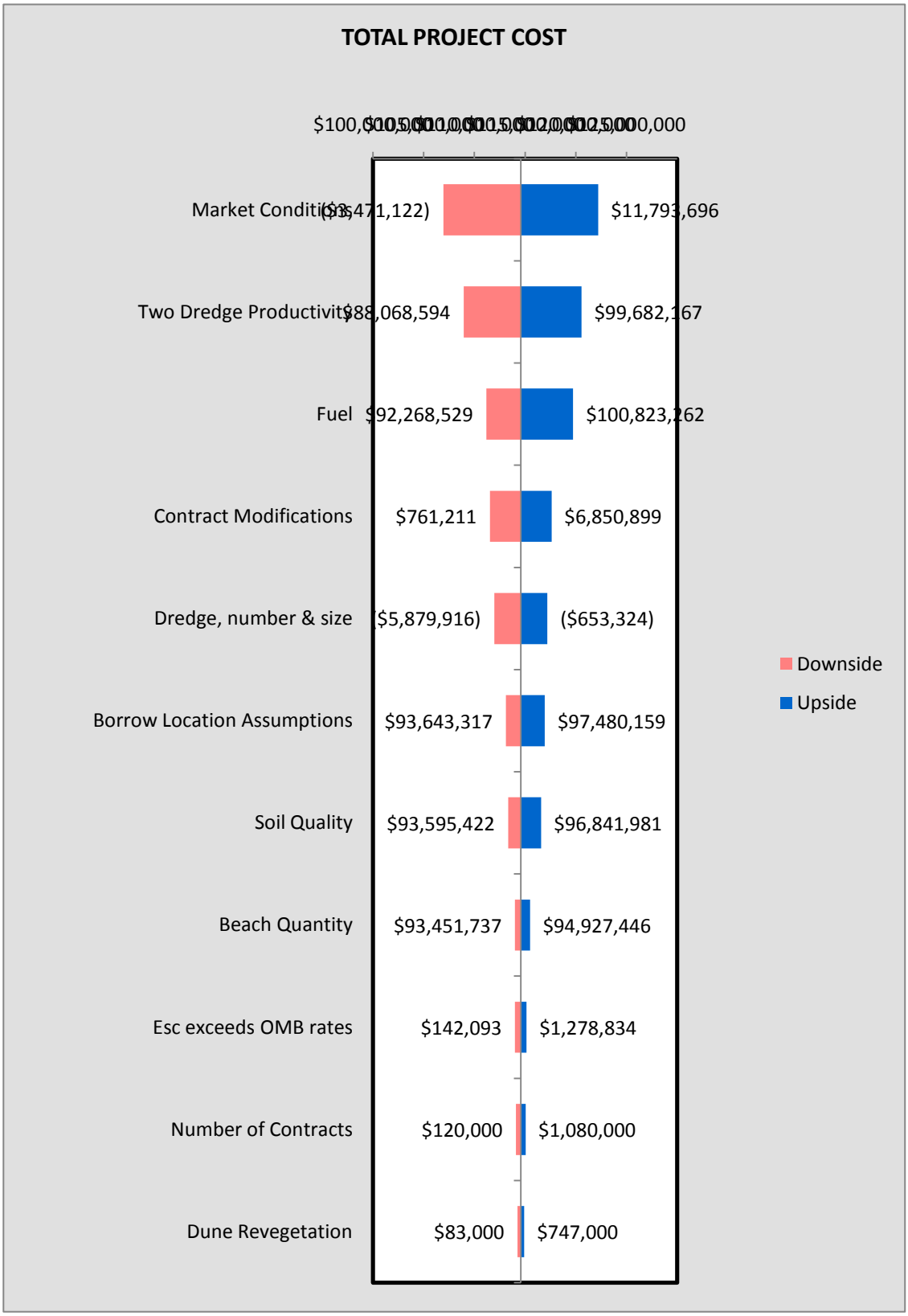





Contribution to Variance View
Sensitivity: TOTAL PROJECT COST
-2.0% 0.0% 2.0% 4.0% 6.0% 8.0% 10.0% 12.0% 14.0% 16.0% 18.0% 20.0% 22.0% 24.0% 26.0% 28.0% 30.0% 32.0% 34.0% 36.0% 38.0% 40.0% 42.0% 44.0% 46.0% 48.0%
Market Conditions
44.1%
Two Dredge Productivity
23.2%
Fuel
14.8%
Contract Modifications
7.0%
Dredge, number & size
4.9%
Borrow Location Assumptions
3.1%
Soil Quality
1.9%
Beach Quantity
0.4%
Number of Contracts
0.2%
Esc exceeds OMB rates
0.2%
Dune Revegetation
0.1%


TOTAL PROJECT COST
$125,000,000
$120,000,000
$115,000,000
$110,000,000
$105,000,000
10.0%
30.0%
50.0%
70.0%
90.0%
Percentiles of the variables
Market Conditions
Two Dredge Productivity
Fuel
Contract Modifications
Dredge, number & size
Borrow Location Assumptions
Soil Quality
Beach Quantity

	TOTAL PROJECT COST				
Variable	*10.0%*	*30.0%*	*50.0%*	*70.0%*	*90.0%*
Market Conditions	$106,938,367	$110,754,571	$114,570,776	$118,386,980	$122,203,185
Two Dredge Productivity	$108,951,728	$112,272,642	$114,570,776	$117,015,094	$120,565,301
Fuel	$111,176,921	$112,860,250	$114,570,776	$116,675,167	$119,731,654
Contract Modifications	$111,525,932	$113,048,354	$114,570,776	$116,093,198	$117,615,620
Dredge, number & size	$111,957,480	$113,264,128	$114,570,776	$115,877,424	$117,184,072
Borrow Location Assumptions	$113,105,232	$113,784,831	$114,570,776	$115,537,693	$116,942,075
Soil Quality	$113,330,701	$113,905,745	$114,570,776	$115,388,936	$116,577,259
Beach Quantity	$114,007,105	$114,268,489	$114,570,776	$114,942,667	$115,482,814
Esc exceeds OMB rates	$114,002,405	$114,286,590	$114,570,776	$114,854,961	$115,139,147
Number of Contracts	$114,090,776	$114,330,776	$114,570,776	$114,810,776	$115,050,776
Dune Revegetation	$114,238,776	$114,404,776	$114,570,776	$114,736,776	$114,902,776


TOTAL PROJECT COST
$100,000,000
Market Conditions
($3,471,122)
$11,793,696
Two Dredge Productivity
$88,068,594
$99,682,167
Fuel
$92,268,529
$100,823,262
Contract Modifications
$761,211
$6,850,899
Dredge, number & size
($5,879,916)
($653,324)
Borrow Location Assumptions
$93,643,317
$97,480,159
Soil Quality
$93,595,422
$96,841,981
Beach Quantity
$93,451,737
$94,927,446
Esc exceeds OMB rates
$142,093
$1,278,834
Number of Contracts
$120,000
$1,080,000
Dune Revegetation
$83,000
$747,000
Downside
Upside

	TOTAL PROJECT COST			Input	
Variable	*Downside*	*Upside*	*Range*	*Downside*	*Upside*
Market Conditions	$106,938,367	$122,203,185	$15,264,818	($3,471,122)	$11,793,696
Two Dredge Productivity	$108,951,728	$120,565,301	$11,613,573	$88,068,594	$99,682,167
Fuel	$111,176,921	$119,731,654	$8,554,733	$92,268,529	$100,823,262
Contract Modifications	$111,525,932	$117,615,620	$6,089,688	$761,211	$6,850,899
Dredge, number & size	$111,957,480	$117,184,072	$5,226,592	($5,879,916)	($653,324)
Borrow Location Assumptions	$113,105,232	$116,942,075	$3,836,842	$93,643,317	$97,480,159
Soil Quality	$113,330,701	$116,577,259	$3,246,559	$93,595,422	$96,841,981
Beach Quantity	$114,007,105	$115,482,814	$1,475,708	$93,451,737	$94,927,446
Esc exceeds OMB rates	$114,002,405	$115,139,147	$1,136,742	$142,093	$1,278,834
Number of Contracts	$114,090,776	$115,050,776	$960,000	$120,000	$1,080,000
Dune Revegetation	$114,238,776	$114,902,776	$664,000	$83,000	$747,000

Base Case
$4,161,287
$93,687,642
$95,662,384
$3,806,055
($3,266,620)
$95,108,860
$94,835,497
$94,015,408
$710,464
$600,000
$415,000

Risk Refer No.	Risk Event	Low	Most Likely	High	
PPM-8	Construction Schedule - 4 years	($7,178,000)	$0	$0	***Removed from risk model - captured by Risk EST-1***

Notes: This item captures the opportunity that using larger dredges may result in substantial savings due to dredging over fewer seasons (2 instead of 4).

Likely This risk item follows a uniform distribution behavior -- no change to most likely cost. Base estimate assumes 2 medium sized hopper dredges at a productivity rate of 77% = 2.9 Million CY/season (4 mo) based on average historical data.

Low Low assumes 4.3 million CY/season assuming 3 various-sized hopper dredges, creating efficiencies and requiring fewer seasonal mobilizations.

High High assumes that no opportunity is realized, yielding no savings.

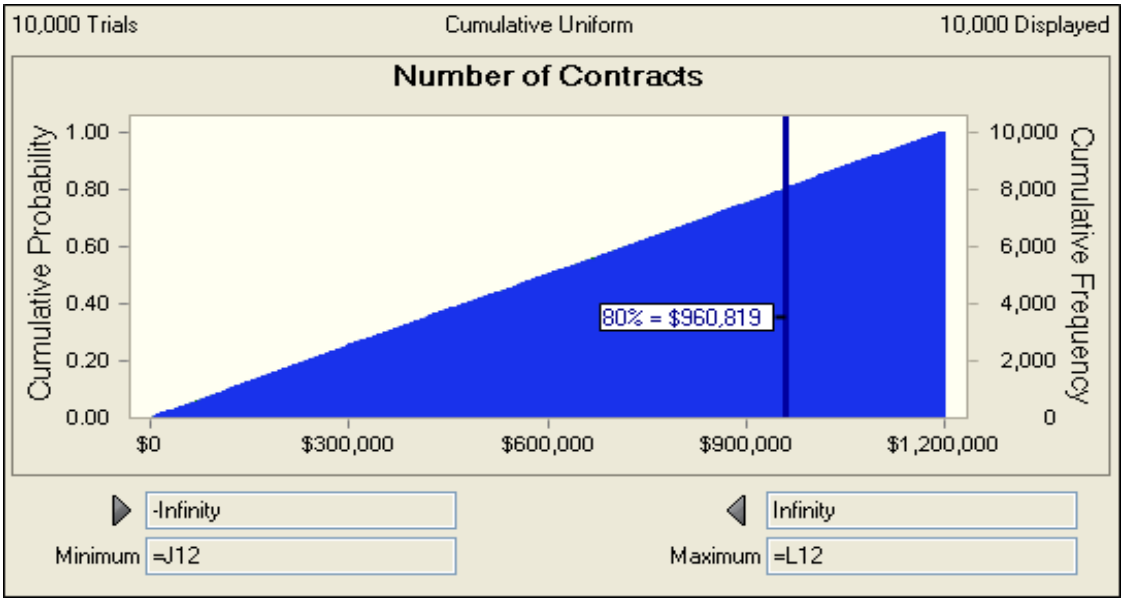
Risk Refer No.	Risk Event	Low	Most Likely	High
CA-2	Number of Contracts	$0	$0	$1,200,000

Notes: Multiple contracts are likely, which would reduce risks related to bid competition and funding availability. However, multiple contracts will result in more PED and Contracting efforts. This item captures the risk that multiple contracts increases total project cost.

Likely This risk item follows a uniform distribution behavior -- no change to most likely cost.

Low Low assumes no adverse effects from utilizing multiple contracts.

High High assumes up to an additional $1.2 M due to utilizing multiple contracts. PED costs are ~ $2.4M. Approx $800K of the $2.4M is for subsurface investigations. There is an additional $200K for final plans and specs prep. Assuming $150K for P&S and $150K for subsurface investigations per contract.



Assumption: Number of Contracts		Resulting Item Contingency
Percentile	**Assumption values**	
0%	$85	$85
10%	$119,567	$119,567
20%	$236,080	$236,080
30%	$355,774	$355,774
40%	$476,420	$476,420
50%	$598,628	$598,628
60%	$723,087	$723,087
70%	$839,531	$839,531
80%	$960,819	$960,819
90%	$1,073,717	$1,073,717
100%	$1,199,752	$1,199,752

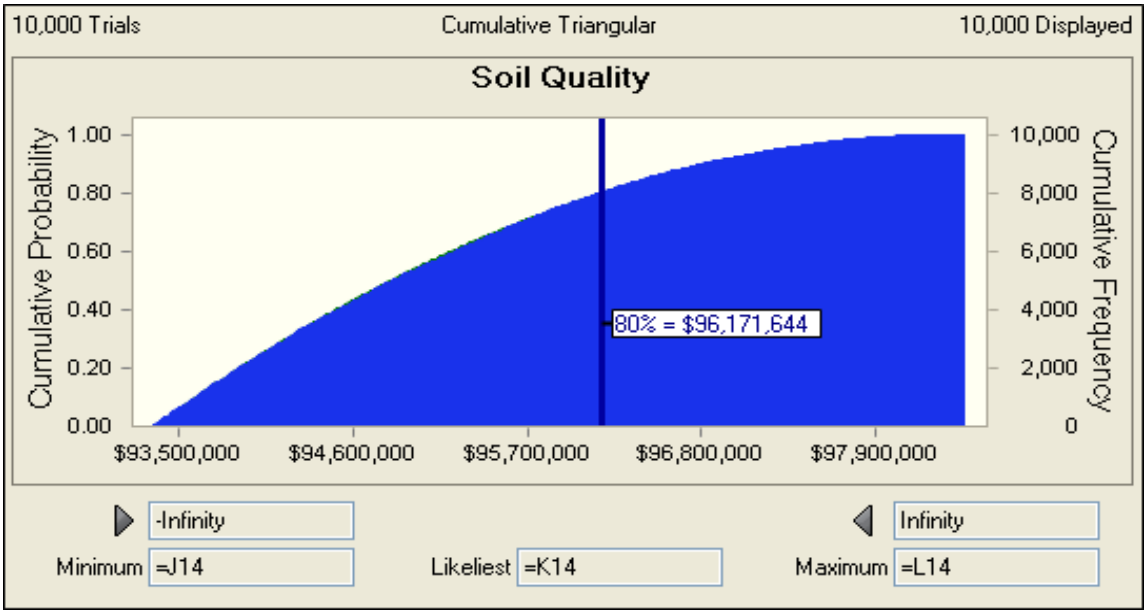
Risk Refer No.	Risk Event	Low	Most Likely	High
T-1	Soil Quality	$93,332,000	$93,332,000	$98,465,260

Notes: This item captures the risk of cost growth due to soil characterization contributing to greater losses than anticipated in the base estimate.

Likely Most likely estimate assumes 18% losses from borrow area to the beach fill based on geotech studies.

Low Low assumes no change from Most Likely.

High High assumes that there are up to 25% losses total OR 7% INCREASE IN QUANTITY.



Assumption: Soil Quality

Percentile	Assumption values	Resulting Item Contingency
0%	$93,332,354	$354
10%	$93,610,179	$278,179
20%	$93,883,300	$551,300
30%	$94,181,871	$849,871
40%	$94,509,621	$1,177,621
50%	$94,855,579	$1,523,579
60%	$95,250,174	$1,918,174
70%	$95,664,835	$2,332,835
80%	$96,171,644	$2,839,644
90%	$96,821,387	$3,489,387
100%	$98,446,161	$5,114,161

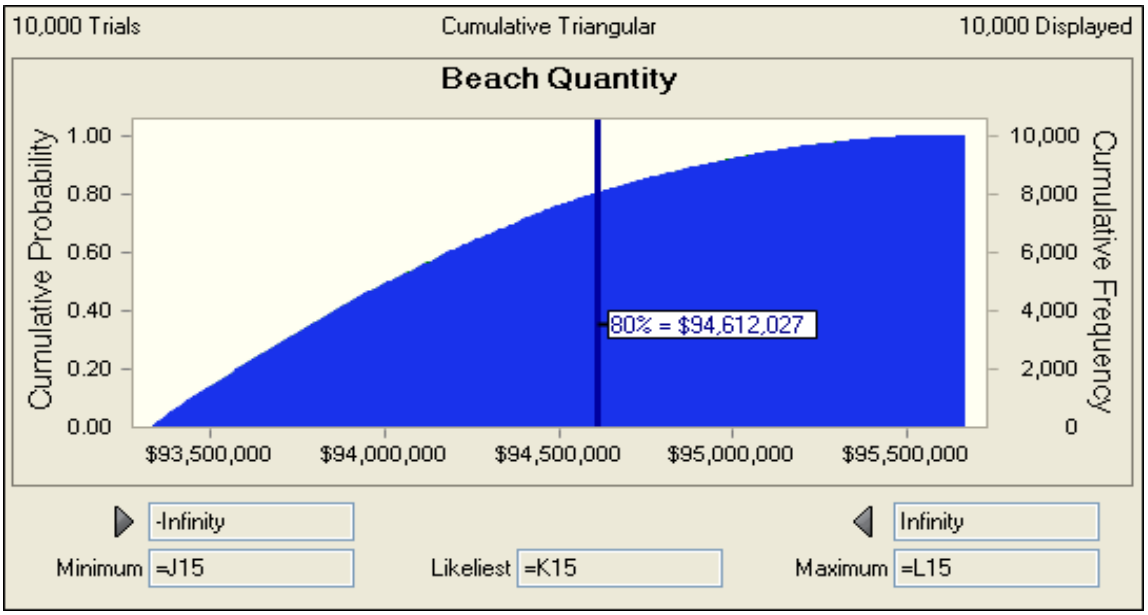
Risk Refer No.	Risk Event	Low	Most Likely	High
T-2	Beach Quantity	$93,332,000	$93,332,000	$95,665,300

Notes: This item captures the risk that quantities will significantly differ from those in the current baseline estimate.

Likely The most likely estimate assumes funding for FY 13 and subsequent erosion until that FY 13.

Low Low assumes no change from Most Likely.

High High assumes that there is 91,500 cy erosion each year beyond scheduled year FY 13. Assume 4 years delay or about 400,000 cy.

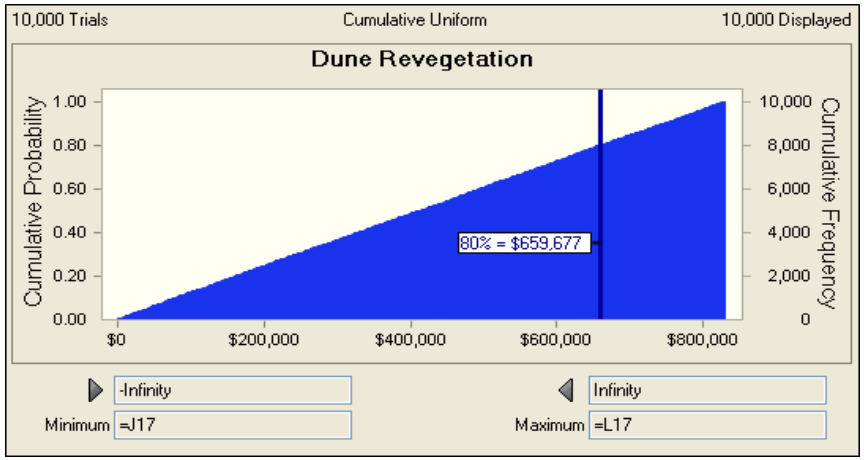


Assumption: Beach Quantity

Percentile	Assumption values	Resulting Item Contingency
0%	$93,332,149	$149
10%	$93,448,663	$116,663
20%	$93,581,072	$249,072
30%	$93,717,369	$385,369
40%	$93,860,127	$528,127
50%	$94,019,015	$687,015
60%	$94,188,354	$856,354
70%	$94,382,589	$1,050,589
80%	$94,612,027	$1,280,027
90%	$94,927,387	$1,595,387
100%	$95,638,677	$2,306,677

Risk Refer No.	Risk Event	Low	Most Likely	High
ENV-7	Dune Revegetation	$0	$0	$830,000

Notes: Estimate includes first vegetation. This item captures the risk that dune revegitation requirement is likely and may not be adequately covered within the estimate.
Likely The estimate currently includes initial planting, no revegetation if first planting fails.
Low Low assumes no replanting.
High High assumes replanting 60% of initial.



Assumption: Dune Revegitation		Resulting Item Contingency
Percentile	**Assumption values**	
0%	$47	$47
10%	$79,934	$79,934
20%	$161,964	$161,964
30%	$246,165	$246,165
40%	$329,147	$329,147
50%	$413,633	$413,633
60%	$494,615	$494,615
70%	$578,574	$578,574
80%	$659,677	$659,677
90%	$746,922	$746,922
100%	$829,970	$829,970

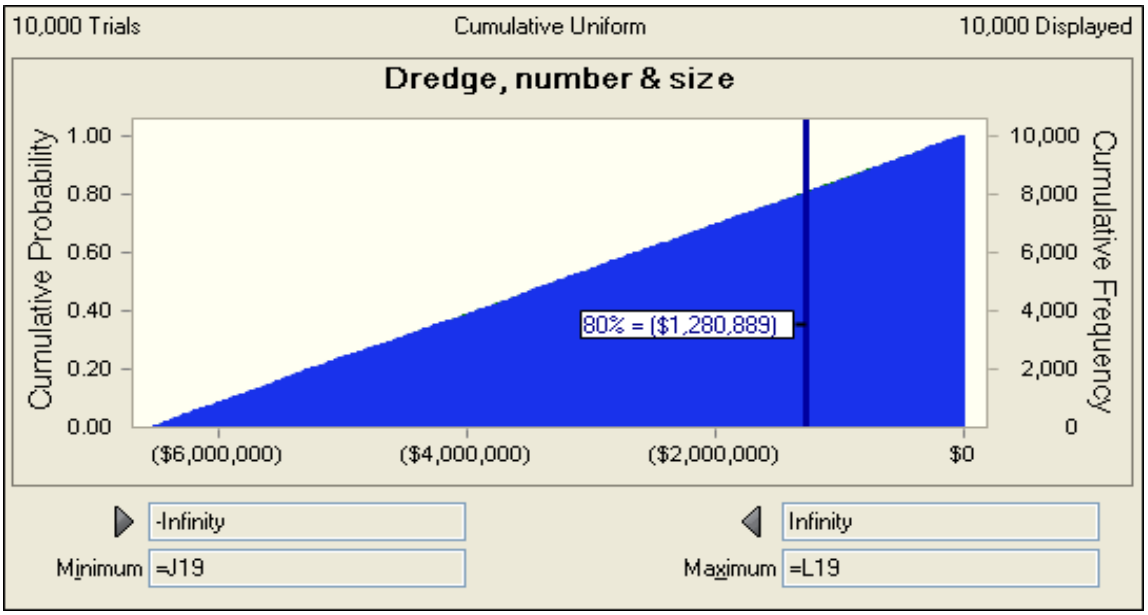
Risk Refer No.	Risk Event	Low	Most Likely	High
EST-1	Dredge, number & size	($6,533,240)	$0	$0

Notes: This item captures the opportunity that using larger dredges may result in substantial savings due to dredging over fewer seasons (2 instead of 4).

Likely This risk item follows a uniform distribution behavior -- no change to most likely cost. Base estimate assumes 2 medium sized hopper dredges at a productivity rate of 77% = 2.9 Million CY/season (4 mo) based on average historical data.

Low Low assumes 4.3 million CY/season assuming 3 various-sized hopper dredges, creating efficiencies and requiring fewer seasonal mobilizations.

High High assumes that no opportunity is realized, yielding no savings.



Assumption: Dredge, number & size		Resulting Item Contingency
Percentile	**Assumption values**	
0%	($6,533,066)	($6,533,066)
10%	($5,896,579)	($5,896,579)
20%	($5,263,201)	($5,263,201)
30%	($4,567,773)	($4,567,773)
40%	($3,903,151)	($3,903,151)
50%	($3,275,336)	($3,275,336)
60%	($2,626,523)	($2,626,523)
70%	($1,967,556)	($1,967,556)
80%	($1,280,889)	($1,280,889)
90%	($641,121)	($641,121)
100%	($1,953)	($1,953)

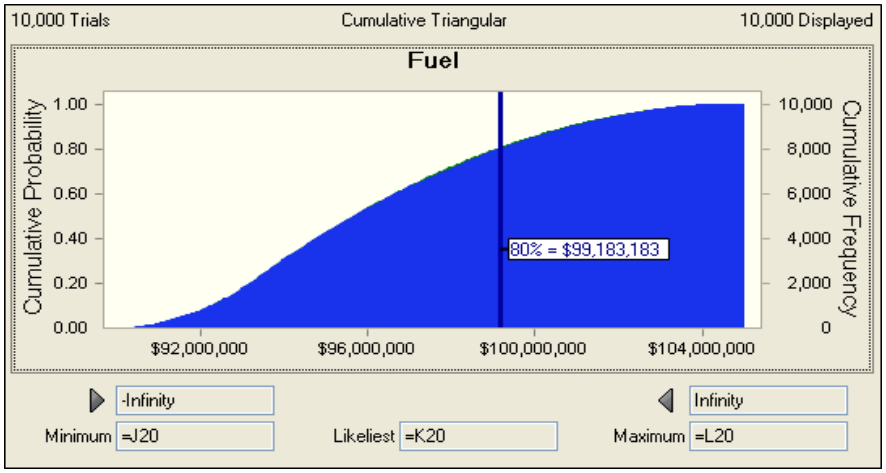
Risk Refer No.	Risk Event	Low	Most Likely	High
EST-3	Fuel	$90,056,047	$93,332,000	$104,998,500

Notes: This item captures the risk that fuel prices will significantly fluctuate either higher or lower, contributing to increased or decreased dredging cost.

Likely The most likely baseline estimate assumes $2.80/gal based on historical data and projection studies that eliminate anomallies.

Low Low assumes that fuel prices could be as low as $1.50/gal (Feb 23 2009).

High High assumes that fuel prices could be as high as $6.00/gal based on studied projection to 2010 feasibility authorization. $4.50/gal experienced in 2008.



Assumption: Fuel

Percentile	Assumption values	Resulting Item Contingency
0%	$90,114,194	($3,217,806)
10%	$92,293,751	($1,038,249)
20%	$93,213,973	($118,027)
30%	$93,968,640	$636,640
40%	$94,800,497	$1,468,497
50%	$95,698,478	$2,366,478
60%	$96,692,820	$3,360,820
70%	$97,882,182	$4,550,182
80%	$99,183,183	$5,851,183
90%	$100,933,557	$7,601,557
100%	$104,890,295	$11,558,295

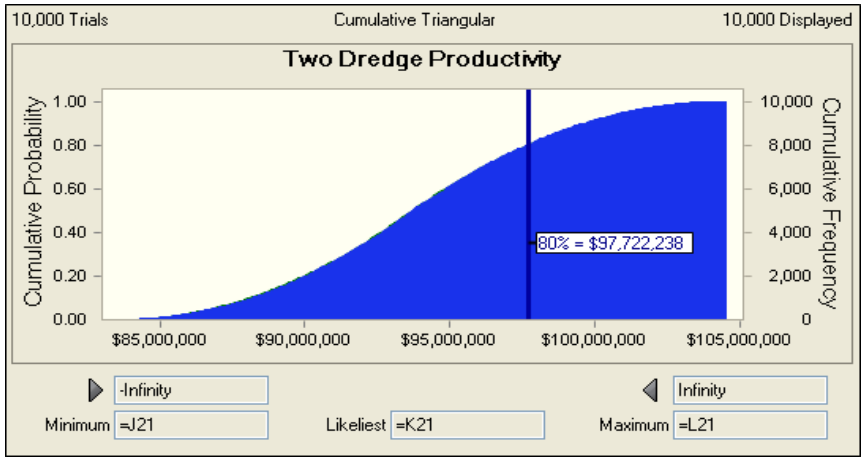
Risk Refer No.	Risk Event	Low	Most Likely	High
EST-4	Two Dredge Productivity	$83,532,140	$93,332,000	$104,531,840

Notes: This item captures the risk that the cost may significantly increase or decrease based on the effective work time of the assumed dredging system.

Likely The most likely baseline estimate assumes 2 medium sized hopper dredges at a

Low Low assumed 2 medium hopper dredges at a productivity rate 88% EWT.

High High assumed 2 medium sized hopper dredges at a 60% EWT.



Assumption: Two Dredge Productivity		
Percentile	**Assumption values**	**Resulting Item Contingency**
0%	$83,683,870	($9,648,130)
10%	$88,220,185	($5,111,815)
20%	$90,025,502	($3,306,498)
30%	$91,466,759	($1,865,241)
40%	$92,693,409	($638,591)
50%	$93,717,470	$385,470
60%	$94,910,261	$1,578,261
70%	$96,138,059	$2,806,059
80%	$97,722,238	$4,390,238
90%	$99,689,817	$6,357,817
100%	$104,413,830	$11,081,830

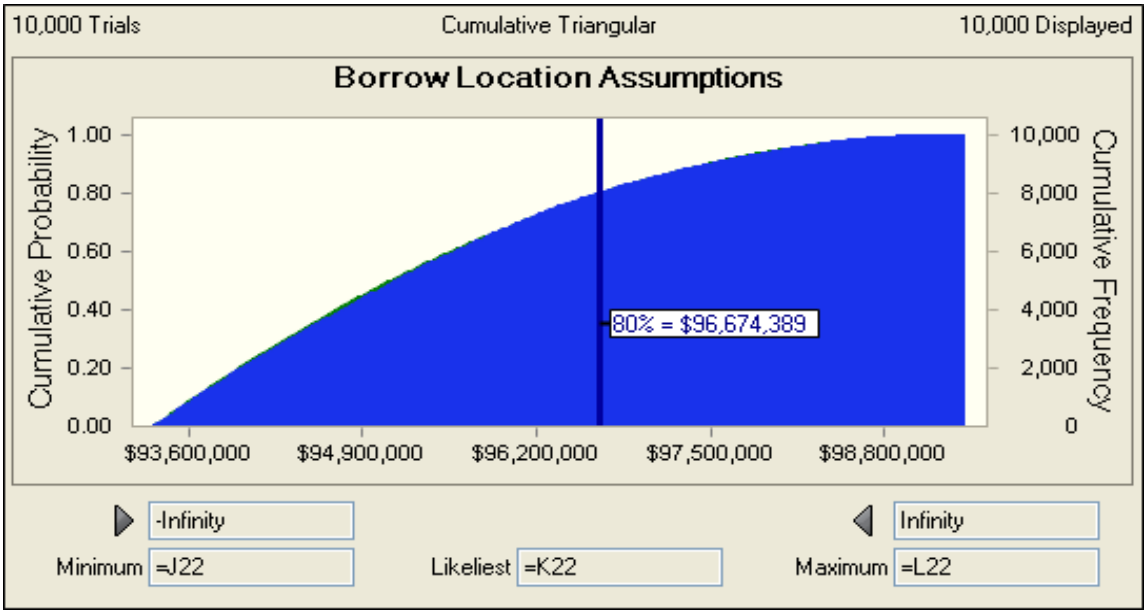
Risk Refer No.	Risk Event	Low	Most Likely	High
EST-5	Borrow Location Assumptions	$93,332,000	$93,332,000	$99,398,580

Notes: This item captures the risk that the dredging and haul costs could increase if the borrow locations are further away than assumed in the current baseline estimate.

Likely The most likely baseline estimate assumes the closest borrows to the closest pumpout

Low Low assumes that closer borrow locations are not available, and hence no savings based on favorable conditions.

High High assumed that the average haul distance of 5 miles based on using Borrow Areas "L" and "J" as initial construction.



Assumption: Borrow Location Assumptions

Percentile	Assumption values	Resulting Item Contingency
0%	$93,332,170	$170
10%	$93,663,035	$331,035
20%	$94,007,639	$675,639
30%	$94,365,139	$1,033,139
40%	$94,757,349	$1,425,349
50%	$95,162,030	$1,830,030
60%	$95,595,223	$2,263,223
70%	$96,081,964	$2,749,964
80%	$96,674,389	$3,342,389
90%	$97,503,736	$4,171,736
100%	$99,337,115	$6,005,115

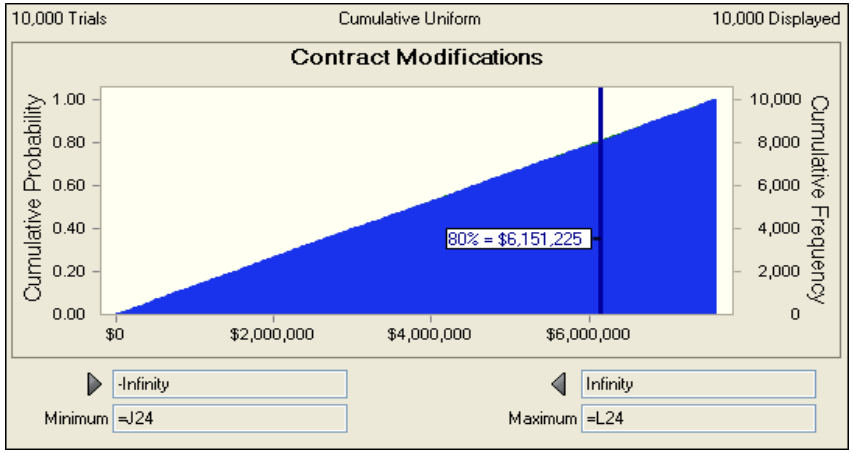
Risk Refer No.	Risk Event	Low	Most Likely	High
CON-1	Contract Modifications	$0	$0	$7,612,110

Notes: This item captures the risk that contract modifications will require additional mobilizations and a 7% increase in quantity.

Likely This risk item follows a uniform distribution behavior -- no change to most likely cost.

Low Low assumes that there are no modifications, and hence, no impact to cost.

High High assumes that an additional mobilization is required, plus a 7% increase in the quantity to be dredged.



Assumption: Two Dredge Productivity		Resulting Item Contingency
Percentile	**Assumption values**	
0%	$833	$833
10%	$735,228	$735,228
20%	$1,519,396	$1,519,396
30%	$2,255,865	$2,255,865
40%	$3,012,223	$3,012,223
50%	$3,799,454	$3,799,454
60%	$4,556,553	$4,556,553
70%	$5,330,454	$5,330,454
80%	$6,151,225	$6,151,225
90%	$6,863,962	$6,863,962
100%	$7,611,320	$7,611,320

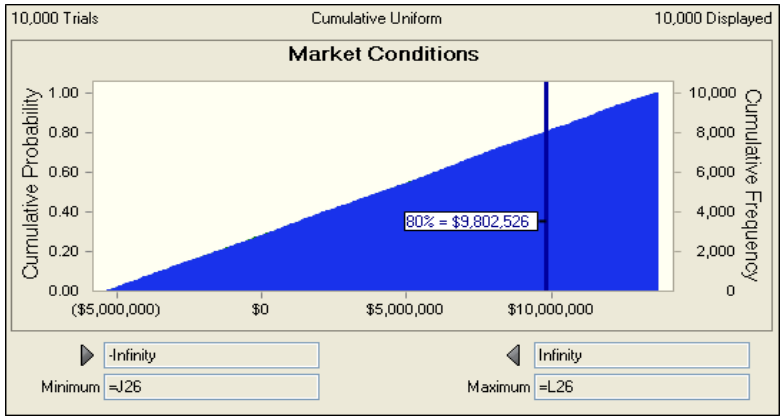
Risk Refer No.	Risk Event	Low	Most Likely	High
EXT-1	Market Conditions	($5,379,224)	$0	$13,701,798

Notes: Currently, there are a lot of projects planned when considering the number of dredges available. There are more hopper dredges than pipeline dredges. It is a tough bidding climate based on environmental time-line restrictions. Construction start is scheduled for 2014. This item captures the risk that there will be significant fluctuations in prices due to market conditions.

Likely Most likely is the total project cost in the baseline estimate.

Low Low assumes that the project could be up to 5% below the most likely based on GAO audit.

High High assumes that the project could be up to 15% above most likely estimate (25% w/o profit) due to lack of dredging companies and dredges for competing projects because of the work window restrictions.



Assumption: Market Conditions		Resulting Item Contingency
Percentile	**Assumption values**	
0%	($5,378,966)	($5,378,966)
10%	($3,488,380)	($3,488,380)
20%	($1,528,574)	($1,528,574)
30%	$381,014	$381,014
40%	$2,178,275	$2,178,275
50%	$4,145,267	$4,145,267
60%	$6,029,642	$6,029,642
70%	$7,825,916	$7,825,916
80%	$9,802,526	$9,802,526
90%	$11,670,214	$11,670,214
100%	$13,696,819	$13,696,819

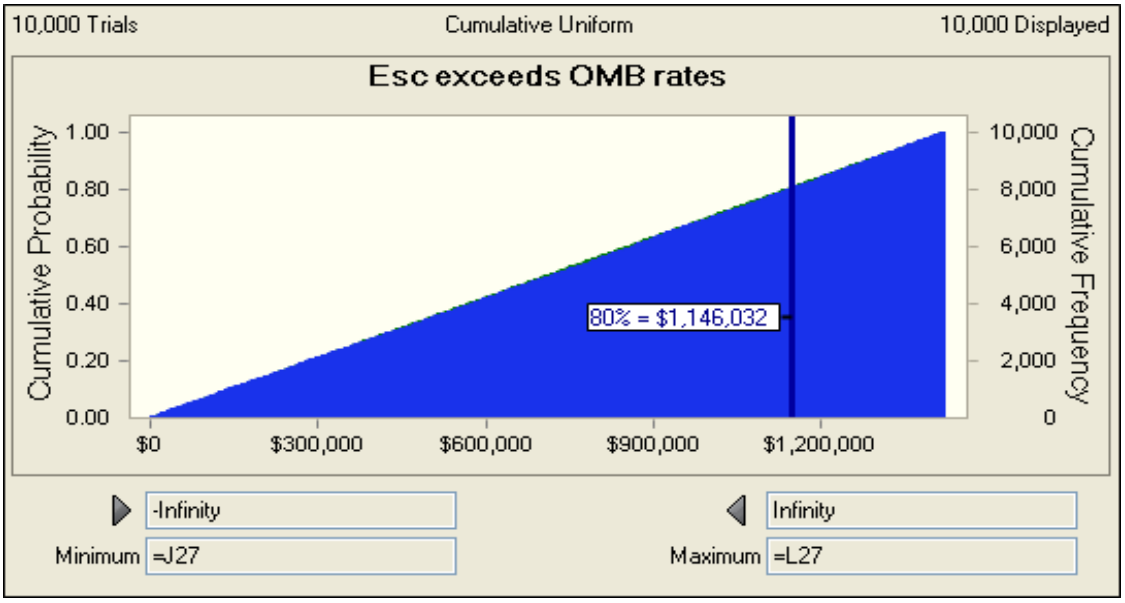
Risk Refer No.	Risk Event	Low	Most Likely	High
EXT-5	Esc exceeds OMB rates	$0	$0	$1,420,927

Notes: Fuel is the greatest cost driver that may cause annual costs to go beyond the OMB rates. The study will focus on fuel projections converted to excavation unit prices as the measurement made against the OMB rates. This item captures the risk that there will be significant cost increase due to inflation above OMB rates.

Likely This risk item follows a uniform distribution behavior -- no change to most likely cost.

Low Low assume no increase or decrease from the base estimate based on inflation.

High High assumes up to an overall $1,051,725 increase based on a fuel rate of $6.00/gallon for marine diesel. This was calculated as the difference betweent he baseline estimate using 2.1% OMB escalation rates vs. the estimate using $6.00/gallon.



Assumption: Esc exceeds OMB rates		Resulting Item Contingency
Percentile	**Assumption values**	
0%	$219	$219
10%	$139,869	$139,869
20%	$282,891	$282,891
30%	$430,263	$430,263
40%	$576,785	$576,785
50%	$721,585	$721,585
60%	$864,503	$864,503
70%	$1,004,855	$1,004,855
80%	$1,146,032	$1,146,032
90%	$1,282,695	$1,282,695
100%	$1,420,847	$1,420,847

Crystal Ball Report - Full

Simulation started on 11/23/2010 at 3:11 PM
Simulation stopped on 11/23/2010 at 3:12 PM

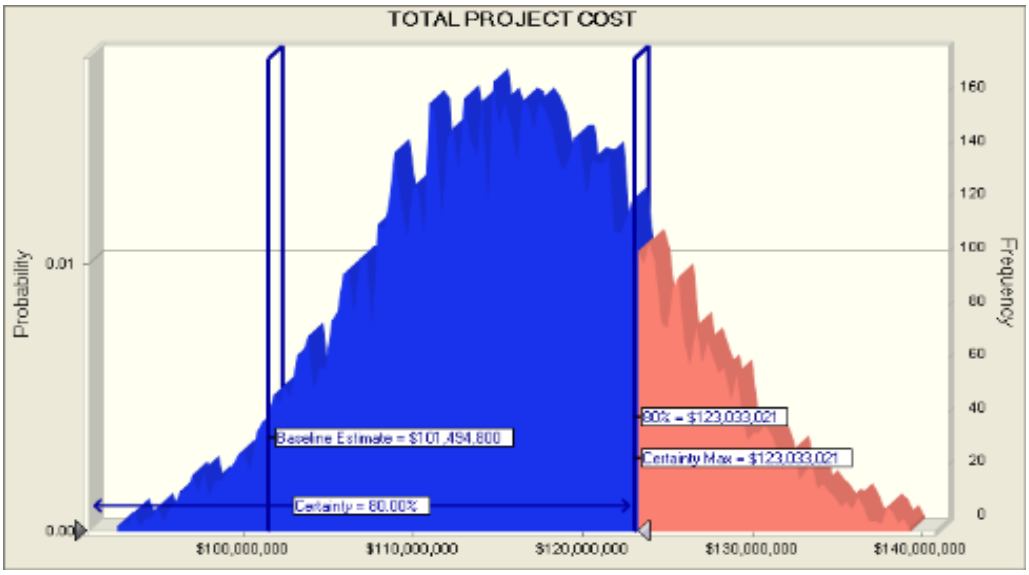
Run preferences:	
Number of trials run	10,000
Monte Carlo	
Seed	999
Precision control on	
Confidence level	95.00%
Run statistics:	
Total running time (sec)	12.54
Trials/second (average)	797
Random numbers per sec	8,772
Crystal Ball data:	
Assumptions	11
Correlations	0
Correlated groups	0
Decision variables	0
Forecasts	1

Forecasts

Worksheet: [Final Report Cost-Risk Analysis - Surf City.xlsx]Cost Risk Model

Forecast: TOTAL PROJECT COST **Cell: K29**

Summary:
Certainty level is 80.00%
Certainty range is from -Infinity to $123,033,021
Entire range is from $85,925,481 to $143,584,335
Base case is $101,494,800
After 10,000 trials, the std. error of the mean is $84,715



Forecast: TOTAL PROJECT COST (cont'd) **Cell: K29**

Statistics:	Forecast values
Trials	10,000
Base Case	$101,494,800
Mean	$115,794,232
Median	$115,734,772
Mode	---
Standard Deviation	$8,471,509
Variance	$71,766,457,130,160
Skewness	0.0466
Kurtosis	2.74
Coeff. of Variability	0.0732
Minimum	$85,925,481
Maximum	$143,584,335
Range Width	$57,658,854
Mean Std. Error	$84,715

Percentiles:	Forecast values
0%	$85,925,481
10%	$104,795,243
20%	$108,499,275
30%	$111,138,419
40%	$113,477,724
50%	$115,734,303
60%	$117,966,618
70%	$120,364,594
80%	$123,033,021
90%	$126,882,131
100%	$143,584,335

End of Forecasts

Assumptions

Worksheet: [Final Report Cost-Risk Analysis - Surf City.xlsx]Cost Risk Model

Assumption: Beach Quantity — **Cell: K15**

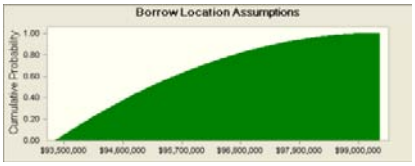
Triangular distribution with parameters:

Minimum	$93,332,000	(=J15)
Likeliest	$93,332,000	(=K15)
Maximum	$95,665,300	(=L15)

Assumption: Borrow Location Assumptions — **Cell: K22**

Triangular distribution with parameters:

Minimum	$93,332,000	(=J22)
Likeliest	$93,332,000	(=K22)
Maximum	$99,398,580	(=L22)



Assumption: Contract Modifications — **Cell: K24**

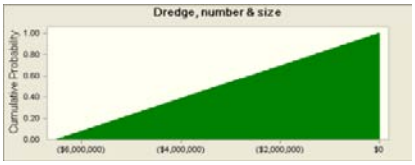
Uniform distribution with parameters:

Minimum	$0	(=J24)
Maximum	$7,612,110	(=L24)

Assumption: Dredge, number & size **Cell: K19**

Uniform distribution with parameters:

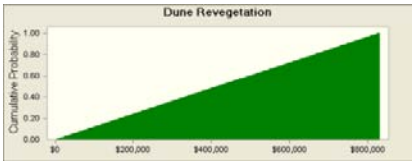
Minimum	($6,533,240)	(=J19)
Maximum	$0	(=L19)



Assumption: Dune Revegetation **Cell: K17**

Uniform distribution with parameters:

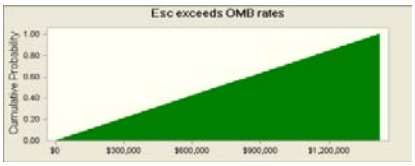
Minimum	$0	(=J17)
Maximum	$830,000	(=L17)



Assumption: Esc exceeds OMB rates **Cell: K27**

Uniform distribution with parameters:

Minimum	$0	(=J27)
Maximum	$1,420,927	(=L27)

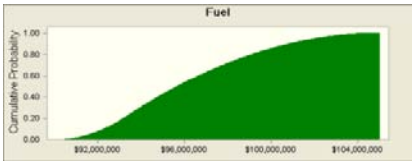


Assumption: Fuel **Cell: K20**

Triangular distribution with parameters:

Minimum	$90,056,047	(=J20)
Likeliest	$93,332,000	(=K20)
Maximum	$104,998,500	(=L20)

Assumption: Fuel (cont'd) **Cell: K20**



Assumption: Market Conditions **Cell: K26**

Uniform distribution with parameters:

Minimum	($5,379,224)	(=J26)
Maximum	$13,701,798	(=L26)

Assumption: Number of Contracts **Cell: K12**

Uniform distribution with parameters:

Minimum	$0	(=J12)
Maximum	$1,200,000	(=L12)

Assumption: Soil Quality **Cell: K14**

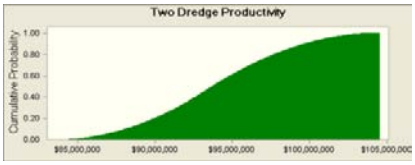
Triangular distribution with parameters:

Minimum	$93,332,000	(=J14)
Likeliest	$93,332,000	(=K14)
Maximum	$98,465,260	(=L14)

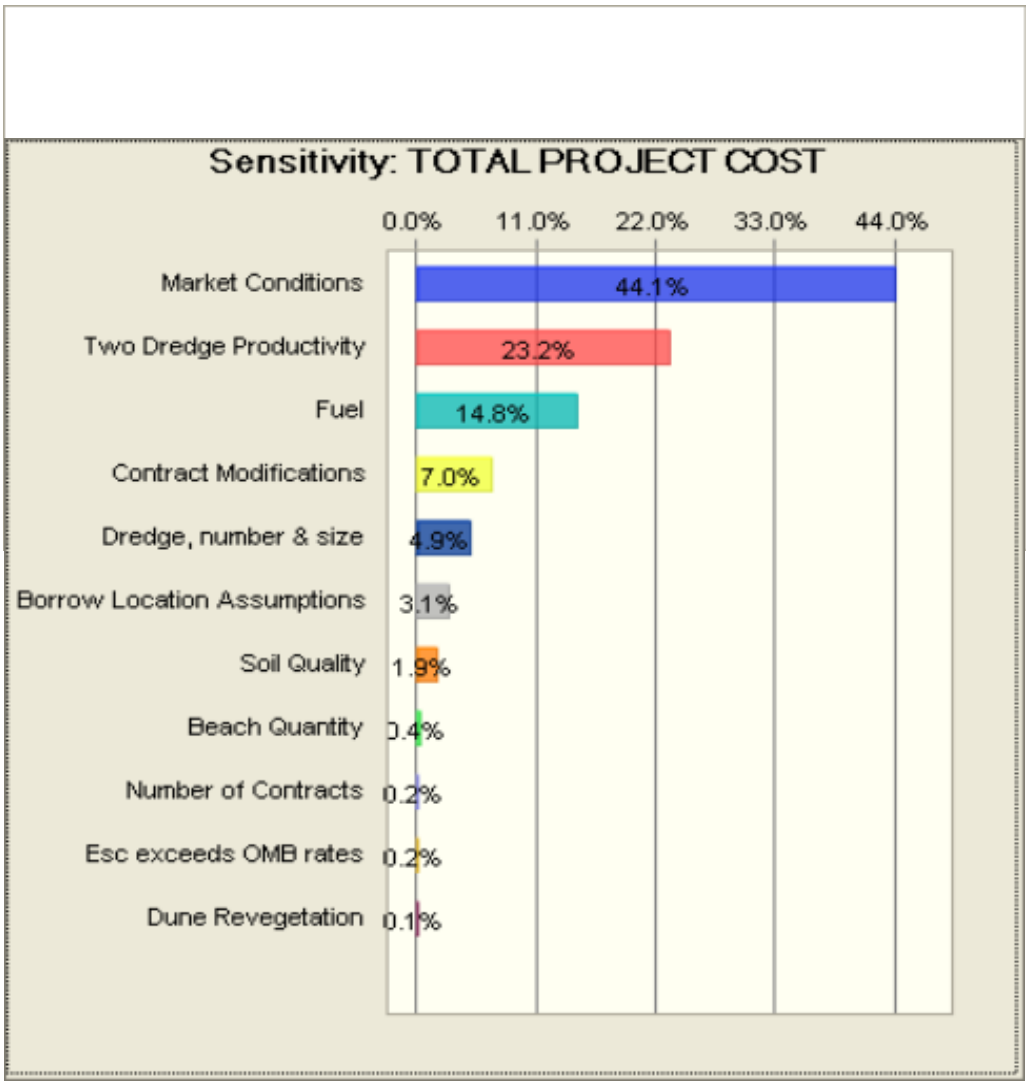
Assumption: Two Dredge Productivity **Cell: K21**

Triangular distribution with parameters:

Minimum	$83,532,140	(=J21)
Likeliest	$93,332,000	(=K21)
Maximum	$104,531,840	(=L21)



End of Assumptions



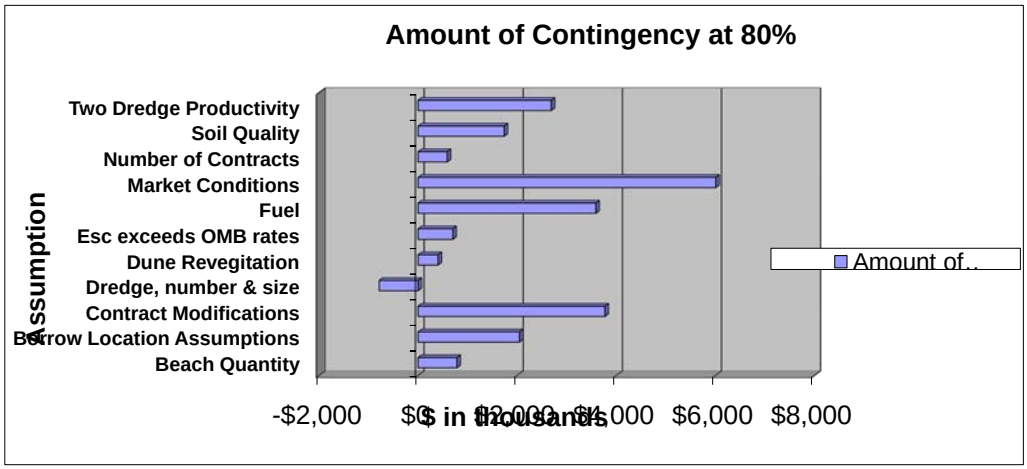
End of Sensitivity Charts

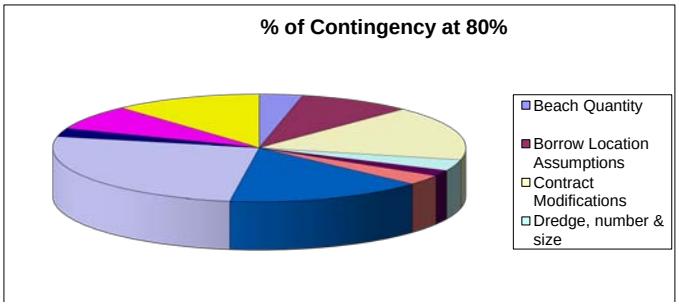
Statistics	TOTAL PROJECT COST	Beach Quantity	Borrow Location Assumptions	Contract Modifications	Dredge, number & size	Dune Revegetation	Esc exceeds OMB rates
Trials	10000	10000	10000	10000	10000	10000	10000
Base Case	$101,494,800	$93,332,000	$93,332,000	$0	$0	$0	$0
Mean	$115,794,232	$94,109,564	$95,379,434	$3,807,960	($3,268,939)	$412,324	$715,928
Median	$115,734,772	$94,019,062	$95,162,337	$3,799,856	($3,273,791)	$413,653	$721,607
Mode	---	---	---	---	---	---	---
Standard Deviation	$8,471,509	$548,512	$1,418,863	$2,209,804	$1,896,686	$240,285	$412,623
Variance	$71,766,457,130,160	$300,865,468,059	$2,013,171,590,523	$4,883,235,699,451	$3,597,419,377,029	$57,736,975,623	$170,257,493,460
Skewness	0.0466	0.5683	0.5541	0.0061	-0.0025	0.0082	-0.0231
Kurtosis	2.74	2.43	2.42	1.79	1.80	1.80	1.79
Coeff. of Variability	0.0732	0.0058	0.0149	0.5803	-0.5802	0.5828	0.5763
Minimum	$85,925,481	$93,332,149	$93,332,170	$833	($6,533,066)	$47	$219
Maximum	$143,584,335	$95,638,677	$99,337,115	$7,611,320	($1,953)	$829,970	$1,420,847
Range Width	$57,658,854	$2,306,528	$6,004,944	$7,610,487	$6,531,114	$829,922	$1,420,628
Mean Std. Error	$84,715	$5,485	$14,189	$22,098	$18,967	$2,403	$4,126

Percentiles	TOTAL PROJECT COST	Beach Quantity	Borrow Location Assumptions	Contract Modifications	Dredge, number & size	Dune Revegetation	Esc exceeds OMB rates
0%	$85,925,481	$93,332,149	$93,332,170	$833	($6,533,066)	$47	$219
5%	$101,911,908	$93,387,362	$93,509,265	$395,437	($6,234,857)	$40,704	$67,478
10%	$104,795,243	$93,448,663	$93,663,035	$735,228	($5,896,579)	$79,934	$139,869
15%	$106,814,070	$93,516,227	$93,830,783	$1,123,442	($5,573,568)	$121,857	$214,127
20%	$108,499,275	$93,581,072	$94,007,639	$1,519,396	($5,263,201)	$161,964	$282,891
25%	$109,841,194	$93,647,935	$94,185,167	$1,884,323	($4,933,211)	$203,660	$358,519
30%	$111,138,419	$93,717,369	$94,365,139	$2,255,865	($4,567,773)	$246,165	$430,263
35%	$112,343,382	$93,789,689	$94,554,352	$2,638,788	($4,253,655)	$287,208	$502,751
40%	$113,477,724	$93,860,127	$94,757,349	$3,012,223	($3,903,151)	$329,147	$576,785
45%	$114,679,638	$93,937,546	$94,955,009	$3,420,388	($3,589,584)	$370,997	$645,003
50%	$115,734,303	$94,019,015	$95,162,030	$3,799,454	($3,275,336)	$413,633	$721,585
55%	$116,877,628	$94,106,939	$95,371,355	$4,206,517	($2,945,558)	$455,367	$793,676
60%	$117,966,618	$94,188,354	$95,595,223	$4,556,553	($2,626,523)	$494,615	$864,503
65%	$119,114,634	$94,281,646	$95,837,116	$4,947,315	($2,276,489)	$536,630	$928,149
70%	$120,364,594	$94,382,589	$96,081,964	$5,330,454	($1,967,556)	$578,574	$1,004,855
75%	$121,596,135	$94,483,899	$96,341,286	$5,731,179	($1,638,311)	$618,479	$1,077,997
80%	$123,033,021	$94,612,027	$96,674,389	$6,151,225	($1,280,889)	$659,677	$1,146,032
85%	$124,677,058	$94,754,476	$97,050,782	$6,500,223	($950,131)	$703,114	$1,215,138
90%	$126,882,131	$94,927,387	$97,503,736	$6,863,962	($641,121)	$746,922	$1,282,695
95%	$129,928,279	$95,147,995	$98,065,046	$7,258,299	($321,527)	$789,372	$1,351,933
100%	$143,584,335	$95,638,677	$99,337,115	$7,611,320	($1,953)	$829,970	$1,420,847

Sensitivity Data Assumptions	TOTAL PROJECT COST
Beach Quantity	0.06
Borrow Location Assumptions	0.17
Contract Modifications	0.26
Dredge, number & size	0.22
Dune Revegetation	0.03
Esc exceeds OMB rates	0.04
Fuel	0.38
Market Conditions	0.65
Number of Contracts	0.05
Soil Quality	0.14
Two Dredge Productivity	0.47

	Raw		Normalized		
	Amount of Contingency at 8	% of Contingency at	Amount of Contingency at 80%	% of Contingency at 80%	
Beach Quantity	$1,280,027	5.94%	$784,498	3.64%	$784
Borrow Location Assumptions	$3,342,389	15.52%	$2,048,470	9.51%	$2,048
Contract Modifications	$6,151,225	28.56%	$3,769,938	17.50%	$3,770
Dredge, number & size	($1,280,889)	-5.95%	-$785,026	-3.64%	-$785
Dune Revegitation	$659,677	3.06%	$404,300	1.88%	$404
Esc exceeds OMB rates	$1,146,032	5.32%	$702,375	3.26%	$702
Fuel	$5,851,183	27.17%	$3,586,049	16.65%	$3,586
Market Conditions	$9,802,526	45.51%	$6,007,733	27.89%	$6,008
Number of Contracts	$960,819	4.46%	$588,863	2.73%	$589
Soil Quality	$2,839,644	13.18%	$1,740,350	8.08%	$1,740
Two Dredge Productivity	$4,390,238	20.38%	$2,690,671	12.49%	$2,691





Fuel	Market Conditions	Number of Contracts	Soil Quality	Two Dredge Productivity
10000	10000	10000	10000	10000
$93,332,000	$0	$0	$93,332,000	$93,332,000
$96,176,219	$4,123,882	$598,864	$95,051,747	$93,852,451
$95,698,712	$4,145,384	$598,726	$94,855,791	$93,717,909
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$3,237,913	$5,466,780	$346,169	$1,201,484	$4,246,218
$10,484,080,826,956	$29,885,686,105,848	$119,832,825,985	$1,443,563,169,538	$18,030,370,597,064
0.4332	-0.0052	-0.0044	0.5422	0.0581
2.35	1.81	1.79	2.38	2.42
0.0337	1.33	0.5780	0.0126	0.0452
$90,114,194	($5,378,966)	$85	$93,332,354	$83,683,870
$104,890,295	$13,696,819	$1,199,752	$98,446,161	$104,413,830
$14,776,102	$19,075,785	$1,199,668	$5,113,807	$20,729,960
$32,379	$54,668	$3,462	$12,015	$42,462

Fuel	Market Conditions	Number of Contracts	Soil Quality	Two Dredge Productivity
$90,114,194	($5,378,966)	$85	$93,332,354	$83,683,870
$91,555,112	($4,417,817)	$62,853	$93,467,452	$86,849,274
$92,293,751	($3,488,380)	$119,567	$93,610,179	$88,220,185
$92,811,861	($2,545,180)	$178,057	$93,744,054	$89,218,372
$93,213,973	($1,528,574)	$236,080	$93,883,300	$90,025,502
$93,582,272	($544,021)	$296,103	$94,031,622	$90,780,278
$93,968,640	$381,014	$355,774	$94,181,871	$91,466,759
$94,380,732	$1,291,811	$415,879	$94,336,242	$92,107,277
$94,800,497	$2,178,275	$476,420	$94,509,621	$92,693,409
$95,233,768	$3,188,540	$541,123	$94,679,784	$93,243,982
$95,698,478	$4,145,267	$598,628	$94,855,579	$93,717,470
$96,182,005	$5,178,260	$663,952	$95,044,738	$94,306,252
$96,692,820	$6,029,642	$723,087	$95,250,174	$94,910,261
$97,261,065	$6,928,205	$782,225	$95,454,115	$95,468,831
$97,882,182	$7,825,916	$839,531	$95,664,835	$96,138,059
$98,512,717	$8,794,387	$899,853	$95,897,701	$96,882,058
$99,183,183	$9,802,526	$960,819	$96,171,644	$97,722,238
$99,975,214	$10,779,036	$1,015,492	$96,457,919	$98,562,979
$100,933,557	$11,670,214	$1,073,717	$96,821,387	$99,689,817
$102,138,957	$12,624,277	$1,138,108	$97,302,146	$101,018,210
$104,890,295	$13,696,819	$1,199,752	$98,446,161	$104,413,830