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**Draft Integrated Feasibility Report  
and Environmental Assessment and Draft Finding of No Significant Impact**

**APPENDIX D: COST ENGINEERING**

**Whittier, Alaska**

**June 2018**



**US Army Corps  
of Engineers**

Alaska District



## **WHITTIER HARBOR IMPROVEMENTS**

### **WHITTIER, ALASKA**

#### **COST ENGINEERING**

##### **Basis OVERVIEW**

This Cost Engineering Basis will be consolidated into the decision document Feasibility Report for Whittier, Alaska. The purpose of the feasibility study is to evaluate alternatives for a potential construction contract. This Appendix discusses the cost assumptions, methodology, materials, labor, and equipment, utilized in the contract construction cost estimates.

##### **SCOPE - PROJECT TYPE, FEATURES & ALTERNATIVES**

Whittier, Alaska, is a second class city in Valdez-Cordova Census Area. The city was incorporated in 1969. Whittier, Latitude 60.7744, Longitude -148.6883, is located on the northeast shore of the Kenai Peninsula, at the head of Passage Canal. It is on the west side of Prince William Sound, 60 miles southeast of Anchorage.

Whittier falls within the gulf coast maritime climate zone, characterized by a rainy atmosphere, long, cold winters, and mild summers. Visitors and residents enjoy sport-fishing, commercial fishing, and subsistence activities. Sales Tax is 5.0%, and is only applied April through September.

Whittier has an ice-free port and two city docks (70' cargo dock and 60' floating passenger dock). A small boat harbor has slips for 360 fishing, recreation, and charter vessels. It is served by road, rail, the state ferry, boat, and aircraft. Since 2000, a tunnel has provided a road connection. The Anton Anderson Memorial Tunnel was reconstructed to accommodate both rail and road vehicles. The railway carries passengers, vehicles, and cargo 12 miles from the Portage Station east of Girdwood. The state-owned gravel airstrip accommodates charter aircraft, and a city-owned seaplane dock is available for passenger transfer.

This project for Whittier Harbor, is intended as protective harbor dredging with additional boat launch and recovery improvement measures. The project area is located at the head of Passage Canal, less than one mile west of the City of Whittier. The proposed USACE Alternative is situated along the waterfront east of the former DOD tank farm, north of the airstrip and south of the unnamed creek flowing from Learnard Glacier.

Currently, Whittier harbor is heavily congested and lacks sufficient moorage. Marine vessels experience delays to all harbor users (vessels, pedestrians, vehicles, and trains) as they converge into the upland area adjacent to the existing harbor; damages beyond normal wear and tear due to excessive rafting, rushed launching and recovery, or not being able to access the harbor during a storm; lost business opportunities for commercial vessels; lost opportunities for recreational boat owners; lost opportunity for individuals to gather subsistence resources; and life and safety risks

with users crossing over rafted vessels, hurrying loading and unloading of trailered craft, and crossing the railroad tracks and between rail cars to access upland parking.

The primary selected project features are excavating/dredging a new harbor turning basin and entrance channel; rock rubble mound breakwater; and multi-lane boat launch ramps. The harbor basin and entrance channel areas will be dredged to a depth of -11.5 MLLW. A 1ft allowance will be calculated into the total dredge quantity. There is about a 10 foot tide level difference between MLW and MHW, with a MLLW of 0.13 ft below datum.

The minor project features are road and uplands parking; utilities; navigation aids; shoreline protection; and contaminated dredge material handling and upland disposal.

Disposal of dredge spoils will be evaluated before or during PED to determine least likely cost in accordance with current guidance. Several alternatives to dredge/dispose a harbor basin to different depths and footprints were reviewed. At this time, the level, extent, and quantity of contamination in the dredged material is not certain. For purposes of this phase of the study, it is assumed that 5% of the dredge quantity is contaminated to the extent that it will be hauled to a treatment facility in Anchorage. The remaining soil that's determined to not require treatment will be stockpiled upland.

### **MAJOR ASSUMPTIONS - COST ESTIMATE BASIS SUMMARY**

Documents Referenced for Cost Scope of Work: Alternatives Sketches, Geotechnical Survey Drawings, Quantities from Designers, and the Feasibility Report. Quantities and dimensions were provided by the project designers (see APPENDIX, HYDRAULIC DESIGN). Project conditions and construction costing were based upon the alternatives presented. Lands and Damages costs were provided by the Real Estate Branch, POA. The PED, SIOH and the Cultural Resources costs were provided by the project PM/PF.

Labor rates are based on Alaska Laborers' & Mechanics' Minimum Rates of Pay, 1 Mar 2017. Equipment rates are based on MII Equipment 2017 Region 09. On-Road Diesel was assumed at \$2.75/Gal. Fuel price is volatile across Alaska, and contractors often purchase bulk quantities and mobilize the majority of the fuel they expect to use to have a reliable supply and known price because third party deliveries to remote sites are uncertain and subject to rapid increases.

Construction Prime Contractor Markups include Alaska payroll tax, and WCI for Excavation; a 15% FOOH, 6% HOOH, 8.67% PWG, and 2% Bond. A Tug & Barge Sub-contractor was used to calculate mob/demob of assumed plant and equipment. A Trucking Sub-contractor was used for long-distance haul of materials, and likely executed concurrently with the dredging. A Survey Sub-contractor was used, as this work can be specialized, and normally requires a third-party registered surveyor to validate locations and quantities.

The dredging work is well understood, and access to the harbor would be with land-based and marine floating equipment. Contaminated dredging/disposal upland has been accomplished a number of times in previous Alaska dredging contracts. Weather is a direct impact on working in the marine coastal environment with both land-based and floating equipment. There may be environmental windows to complete the work, and marine vessel traffic accessing Whittier may

experience delays.

Since the contaminated dredge material quantity is not certain, it may require additional space and preparation to use upland disposal near the site. The current assumption is material will be dredged with a clamshell bucket, from a marine barge deck. The material will be placed in a scow and dewatered. The material will then be loaded and hauled upland to a stockpile location near the project (land will be provided in the contract). Based on sampling, the material will be segregated into above action level and below action level. The above action level material will be loaded into supersacks or lined contained trucks then hauled to the treatment facility. The estimates for this study are all based on an assumption that 5% of the dredged quantity will be above the action level.

Dredging contaminated material costs were developed in CEDEP. There is no operating local contamination processing facility and little demand for local processing of contaminated dredge materials. The known option for POL contaminated soil disposal is to truck it to Anchorage for thermal treatment.

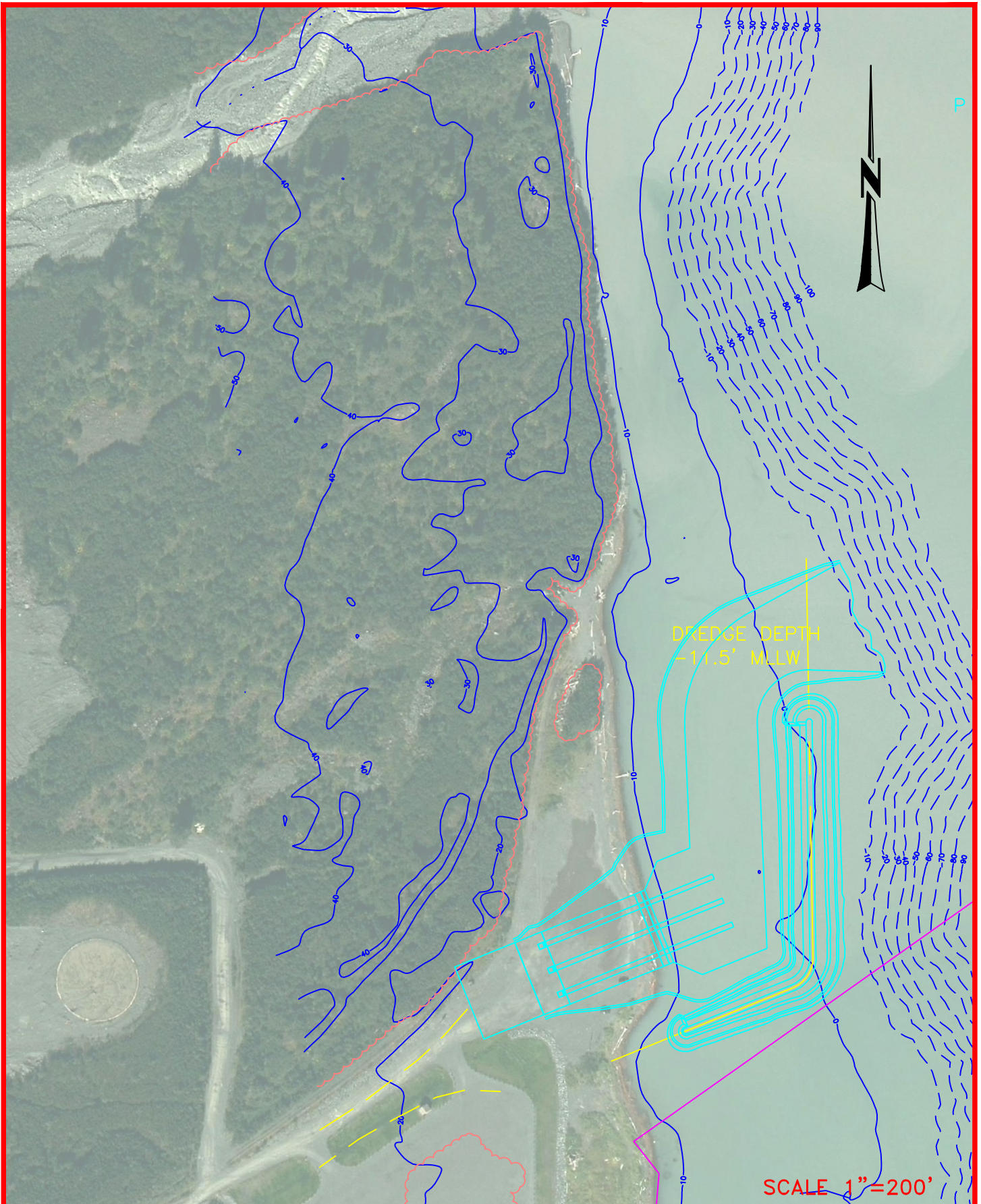
Project cost risks include in-water construction of ramps and rock revetments, variable rock prices with low competition, encountering rock or marine debris in an excavation, mischaracterization of dredge materials, vessel traffic delays, freezing temperatures, storms and increased wind/waves. The project dredge Max Pay depth is about 20 feet below MSL and is not anticipated to contain scarce or unique cultural, historic, or tribal resources. This work has moderate to above average risk.

Contingency for alternative selection was derived from the Cost Abbreviated Risk Analysis (ARA). The ARA defined contingencies for the project budget. Construction Escalation is based on the Civil Works Construction Cost Index System (CWCCIS), EM 1110-2-1304, dated 30 Sep 2017. Please refer to the Total Project Cost Summary (TPCS) for cost breakdown.

The Construction Contractor will furnish all labor, equipment, supplies and materials to accomplish the work. Contract acquisition is assumed to be IFB. Construction can occur throughout the year. Any exceptions when no in-water work will be performed is being coordinated with concerned agencies. Off-season dredge work may be required, but rock revetment construction in freezing weather is not satisfactory.

#### **COST ESTIMATE SUMMARY – ARA - TPCS**

The initial cost range of the Alt#7 project is \$15-\$19 million at the Contract Cost level. Initial Abbreviated Risk Analysis put the project cost Contingency moderate to average because of the lack of field/design data, and the uncertainty of the contaminated disposal quantities. These issues are being reviewed and it is anticipated the data will be refined before and during PED. The current Total Project Cost of the Tentatively Selected Plan is under \$30 million including a contingency of 21% and escalation of 4.84%.

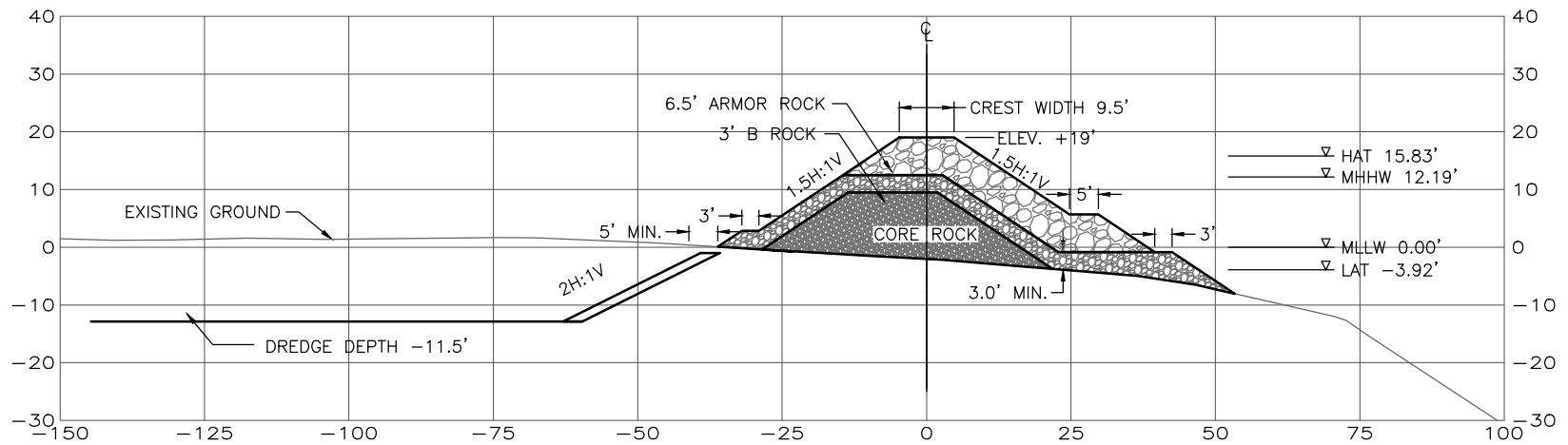


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## ALTERNATIVE 7 – 6 LAUNCH WHITTIER HARBOR

7



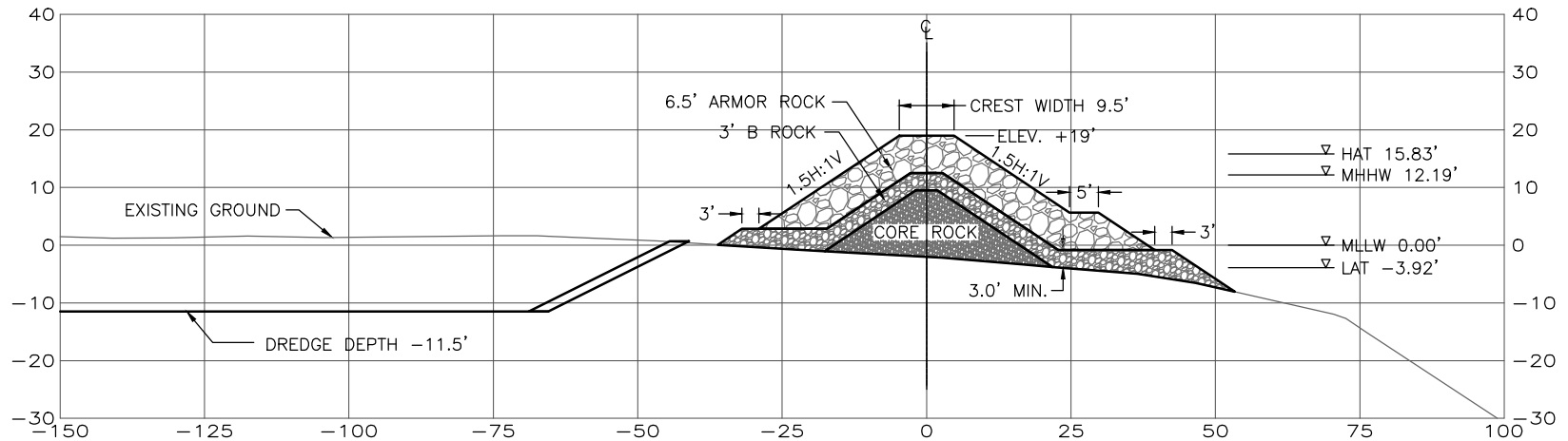


B  
W2W5  
W3

## TYPICAL BREAKWATER SECTION—ALTERNATIVES 6–9

STATION 00+00 TO STATION 00+00

1. SECTION VERTICAL UNITS ARE FEET MEAN LOWER LOW WATER (MLLW).
2. SECTION HORIZONTAL UNITS ARE REFERENCE PERPENDICULAR TO THE NORTH AND SOUTH BREAKWATER ALIGNMENTS.
3. BREAKWATER ARMOR ROCK, B ROCK AND CORE ROCK SLOPES ARE 1.5H:1V UNLESS NOTED OTHERWISE.



A  
W2W5  
W3

## TYPICAL BREAKWATER SECTION—ALTERNATIVES 1–5

STATION 00+00 TO STATION 00+00

1. SECTION VERTICAL UNITS ARE FEET MEAN LOWER LOW WATER (MLLW).
2. SECTION HORIZONTAL UNITS ARE REFERENCE PERPENDICULAR TO THE NORTH AND SOUTH BREAKWATER ALIGNMENTS.
3. BREAKWATER ARMOR ROCK, B ROCK AND CORE ROCK SLOPES ARE 1.5H:1V UNLESS NOTED OTHERWISE.

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Whittier Feasibility Study - Summary of all Alts with ARA Contingency using assumption of 5% Contamination									
Item	Alt 6 4Lane-North	Alt 7 6Lane-North (TSP)	Alt 8 4Lane-South	Alt 9 6Lane-South	Abbreviated Risk Analysis Contingency	Alt 6 4Lane-North	Alt 7 6Lane-North (TSP)	Alt 8 4Lane-South	Alt 9 6Lane-South
	Estimated Construction Cost (ECC) from MII Files				(percentage)	Estimated Construction Cost + ARA Contingency			
Mobilization and Demobilization (GNF)	\$864,175	\$864,175	\$864,175	\$864,175	11.03%	\$959,493	\$959,493	\$959,493	\$959,493
Breakwater, Survey and Nav Aids	\$3,442,509	\$3,493,554	\$2,808,182	\$3,269,428	21.74%	\$4,190,911	\$4,253,053	\$3,418,681	\$3,980,201
Breakwater (GNF)	\$2,601,708	\$2,601,708	\$2,091,165	\$2,473,291		\$3,167,319	\$3,167,319	\$2,545,785	\$3,010,985
Topographic/Hydrographic Surveys (GNF & LSF)	\$372,389	\$372,389	\$372,389	\$372,389		\$453,346	\$453,346	\$453,346	\$453,346
Navigation Aids (Coast Guard Funded)	\$47,291	\$47,291	\$47,291	\$47,291		\$57,572	\$57,572	\$57,572	\$57,572
Slope Protection Rock (GNF & LSF)	\$421,121	\$472,166	\$297,337	\$376,457		\$512,673	\$574,815	\$361,978	\$458,299
Dredge Maneuvering Basin (GNF & LSF)	\$3,690,376	\$3,945,114	\$3,341,878	\$3,691,561	17.66%	\$4,342,096	\$4,641,821	\$3,932,053	\$4,343,490
Disposal of Dredge Spoils (GNF & LSF)	\$879,060	\$941,057	\$793,000	\$879,320	120.00%	\$1,933,932	\$2,070,325	\$1,744,600	\$1,934,504
Boat Ramp (LSF)	\$4,021,068	\$6,031,602	\$4,021,068	\$6,031,602	11.03%	\$4,464,592	\$6,696,888	\$4,464,592	\$6,696,888
Real Estate	\$287,400	\$287,400	\$287,400	\$287,400	20.00%	\$344,880	\$344,880	\$344,880	\$344,880
Construction Management	\$1,196,550	\$1,196,550	\$1,196,550	\$1,196,550	17.03%	\$1,400,323	\$1,400,323	\$1,400,323	\$1,400,323
PED	\$2,243,532	\$2,243,532	\$2,243,532	\$2,243,532	13.61%	\$2,548,877	\$2,548,877	\$2,548,877	\$2,548,877
<b>Project Cost</b>	<b>\$16,624,670</b>	<b>\$19,002,984</b>	<b>\$15,555,785</b>	<b>\$18,463,567</b>		<b>\$20,185,103</b>	<b>\$22,915,659</b>	<b>\$18,813,499</b>	<b>\$22,208,656</b>

Costs above do not include escalation

Contingency is based on the Abbreviated Risk Register (ARA) dated Feb 2018

Any costs that are split between GNF and LSF are pending PDT discussion to determine those splits.

prepared by: KJH

Date: Feb 15,2018

Revise Feb 16, 2018 and May 31, 2018

1. First costs estimates as of July 2016.

2. Interest During Construction assumes 2-year construction window.

3. Operations, Maintenance, Repair, Rehabilitation, and Replacement assumes 5% of armor rock every 25 years, dredging every 25 years, and float replacement every 40 years.

Whittier Feasibility Report - Alternate #7 - 6 Launch N. Entrance

Estimated by	CEPOA-EC-D-CE
Designed by	CEPOA-EN-CE-HH
Prepared by	KJH and AA
Preparation Date	5/31/2018
Effective Date of Pricing	5/31/2018
Estimated Construction Time	720 Days

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<u>Description</u>	<u>Quantity</u>	<u>UOM</u>	<u>ContractCost</u>	<u>Escalation</u>	<u>Contingency</u>	<u>SIOH</u>	<u>ProjectCost</u>
<b><u>Real Estate, GNF,LSF, O&amp;M</u></b>			<b><u>16,602,159</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>16,602,159</u></b>
			<i>15,560,811</i>				<i>15,560,811</i>
<b><u>Alternative 7</u></b>	<b><u>1</u></b>	<b><u>EA</u></b>	<b><u>15,560,811</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>15,560,811</u></b>
			<i>20,529</i>				<i>20,529</i>
<b><u>Real Estate</u></b>	<b><u>14</u></b>	<b><u>ACR</u></b>	<b><u>287,400</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>287,400</u></b>
			<i>20,000</i>				<i>20,000</i>
<b><u>Admin Costs</u></b>	<b><u>1</u></b>	<b><u>EA</u></b>	<b><u>20,000</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>20,000</u></b>
			<i>133,700</i>				<i>133,700</i>
<b><u>LERR</u></b>	<b><u>2</u></b>	<b><u>ACR</u></b>	<b><u>267,400</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>267,400</u></b>
<b><u>GNF</u></b>	<b><u>1</u></b>	<b><u>LS</u></b>	<b><u>15,273,411</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>15,273,411</u></b>
			<i>864,175</i>				<i>864,175</i>
<b><u>Mobilize and Demobilize</u></b>	<b><u>1</u></b>	<b><u>EA</u></b>	<b><u>864,175</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>864,175</u></b>
			<i>1,084</i>				<i>1,084</i>
<b><u>Boudary layout</u></b>	<b><u>14</u></b>	<b><u>ACR</u></b>	<b><u>15,178</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>15,178</u></b>
			<i>21,737</i>				<i>21,737</i>
<b><u>Mobilization</u></b>	<b><u>20</u></b>	<b><u>DAY</u></b>	<b><u>434,731</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>434,731</u></b>
			<i>20,713</i>				<i>20,713</i>
<b><u>Demobilization</u></b>	<b><u>20</u></b>	<b><u>DAY</u></b>	<b><u>414,265</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>414,265</u></b>
			<i>3,493,554</i>				<i>3,493,554</i>
<b><u>Breakwater, Survey and Nav Aides</u></b>	<b><u>1</u></b>	<b><u>EA</u></b>	<b><u>3,493,554</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>3,493,554</u></b>
			<i>3,639</i>				<i>3,639</i>
<b><u>Breakwater Construction</u></b>	<b><u>715</u></b>	<b><u>LF</u></b>	<b><u>2,601,708</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>2,601,708</u></b>
			<i>180</i>				<i>180</i>
<b><u>Armor Rock</u></b>	<b><u>6,390</u></b>	<b><u>ECY</u></b>	<b><u>1,151,055</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>1,151,055</u></b>
			<i>141</i>				<i>141</i>
<b><u>B-Rock</u></b>	<b><u>5,760</u></b>	<b><u>ECY</u></b>	<b><u>812,591</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>812,591</u></b>
			<i>128</i>				<i>128</i>
<b><u>Core Rock</u></b>	<b><u>5,000</u></b>	<b><u>ECY</u></b>	<b><u>638,062</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>638,062</u></b>
			<i>355</i>				<i>355</i>
<b><u>Topographic/Hydrographic Surveys</u></b>	<b><u>1,050</u></b>	<b><u>HR</u></b>	<b><u>372,389</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>0</u></b>	<b><u>372,389</u></b>

<u>Description</u>	<u>Quantity</u>	<u>UOM</u>	<u>ContractCost</u>	<u>Escalation</u>	<u>Contingency</u>	<u>SIOH</u>	<u>ProjectCost</u>
<u>Nav Marker &amp; Base</u>	<u>1</u>	<u>EA</u>	<sup>47,291</sup> <u>47,291</u>	<u>0</u>	<u>0</u>	<u>0</u>	<sup>47,291</sup> <u>47,291</u>
<u>Slope Protection Rock</u>	<u>3,700</u>	<u>ECY</u>	<sup>128</sup> <u>472,166</u>	<u>0</u>	<u>0</u>	<u>0</u>	<sup>128</sup> <u>472,166</u>
<u>Rock at Quarry</u>	<u>7,326</u>	<u>TON</u>	<sup>42</sup> <u>306,861</u>	<u>0</u>	<u>0</u>	<u>0</u>	<sup>42</sup> <u>306,861</u>
<u>Transport Aggregates between quarry and Whittier</u>	<u>7,326</u>	<u>TON</u>	<sup>17</sup> <u>121,653</u>	<u>0</u>	<u>0</u>	<u>0</u>	<sup>17</sup> <u>121,653</u>
<u>Place Core Rock</u>	<u>4,070</u>	<u>CY</u>	<sup>11</sup> <u>43,652</u>	<u>0</u>	<u>0</u>	<u>0</u>	<sup>11</sup> <u>43,652</u>
<u>Entrance &amp; Maneuver Channel Dredge and Disposal</u>	<u>72,389</u>	<u>CY</u>	<sup>67</sup> <u>4,884,080</u>	<u>0</u>	<u>0</u>	<u>0</u>	<sup>67</sup> <u>4,884,080</u>
<u>Dredge and Store Upland Spoils</u>	<u>72,389</u>	<u>EA</u>	<sup>54</sup> <u>3,945,114</u>	<u>0</u>	<u>0</u>	<u>0</u>	<sup>54</sup> <u>3,945,114</u>
<u>Construct Disposal/Dewatering Area</u>	<u>205,223</u>	<u>SF</u>	<sup>2</sup> <u>335,451</u>	<u>0</u>	<u>0</u>	<u>0</u>	<sup>2</sup> <u>335,451</u>
<u>Dredging to -11.5 MLLW</u>	<u>72,389</u>	<u>CY</u>	<sup>16</sup> <u>1,143,567</u>	<u>0</u>	<u>0</u>	<u>0</u>	<sup>16</sup> <u>1,143,567</u>
<u>Upland Disposal</u>	<u>72,389</u>	<u>CY</u>	<sup>34</sup> <u>2,466,096</u>	<u>0</u>	<u>0</u>	<u>0</u>	<sup>34</sup> <u>2,466,096</u>
<u>Contaminated Soil Disposal</u>	<u>3,619</u>	<u>CY</u>	<sup>259</sup> <u>938,966</u>	<u>0</u>	<u>0</u>	<u>0</u>	<sup>259</sup> <u>938,966</u>
<u>Load Trucks</u>	<u>3,619</u>	<u>CY</u>	<sup>3</sup> <u>9,601</u>	<u>0</u>	<u>0</u>	<u>0</u>	<sup>3</sup> <u>9,601</u>
<u>Truck Haul Material and Dump at Selected Site</u>	<u>3,619</u>	<u>CY</u>	<sup>38</sup> <u>137,099</u>	<u>0</u>	<u>0</u>	<u>0</u>	<sup>38</sup> <u>137,099</u>
<u>Process Soil</u>	<u>3,619</u>	<u>CY</u>	<sup>219</sup> <u>792,266</u>	<u>0</u>	<u>0</u>	<u>0</u>	<sup>219</sup> <u>792,266</u>
<u>Launch Ramp</u>	<u>6</u>	<u>LAN</u>	<sup>1,005,267</sup> <u>6,031,602</u>	<u>0</u>	<u>0</u>	<u>0</u>	<sup>1,005,267</sup> <u>6,031,602</u>
			<sup>1,005,267</sup>				<sup>1,005,267</sup>

<u>Description</u>	<u>Quantity</u>	<u>UOM</u>	<u>ContractCost</u>	<u>Escalation</u>	<u>Contingency</u>	<u>SIOH</u>	<u>ProjectCost</u>
<u>Parametric Launch Ramp Estimate</u>	<u>6</u>	<u>EA</u>	<u>6,031,602</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>6,031,602</u>
			<i>1,041,349</i>				<i>1,041,349</i>
<u>OMRR&amp;R</u>	<u>1</u>	<u>EA</u>	<u>1,041,349</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>1,041,349</u>
			<i>865,742</i>				<i>865,742</i>
<u>12 Mobilize and Demobilize</u>	<u>1</u>	<u>EA</u>	<u>865,742</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>865,742</u>
			<i>489</i>				<i>489</i>
<u>Boudary layout</u>	<u>14</u>	<u>ACR</u>	<u>6,851</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>6,851</u>
			<i>21,992</i>				<i>21,992</i>
<u>Mobilization</u>	<u>20</u>	<u>DAY</u>	<u>439,836</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>439,836</u>
			<i>20,953</i>				<i>20,953</i>
<u>Demobilization</u>	<u>20</u>	<u>DAY</u>	<u>419,055</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>419,055</u>
			<i>183</i>				<i>183</i>
<u>Armor Rock</u>	<u>959</u>	<u>ECY</u>	<u>175,606</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>175,606</u>
			<i>68</i>				<i>68</i>
<u>Rock at Quarry</u>	<u>1,898</u>	<u>TON</u>	<u>128,216</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>128,216</u>
			<i>14</i>				<i>14</i>
<u>Transport Aggregates between quarry and Whittier</u>	<u>1,898</u>	<u>TON</u>	<u>26,770</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>26,770</u>
			<i>20</i>				<i>20</i>
<u>Place Armor</u>	<u>1,054</u>	<u>LCY</u>	<u>20,621</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>20,621</u>

**Whittier SBH Alt #7 - 6 Lanes North Entrance**  
Feasibility (Recommended Plan)  
Abbreviated Risk Analysis

**Risk Evaluation**

<b><u>WBS</u></b>	<b><u>Potential Risk Areas</u></b>	<b>Project Management &amp; Scope Growth</b>	<b>Acquisition Strategy</b>	<b>Construction Elements</b>	<b>Specialty Construction or Fabrication</b>	<b>Technical Design &amp; Quantities</b>	<b>Cost Estimate Assumptions</b>	<b>External Project Risks</b>	<b>Cost in Thousands</b>
<b>01 LANDS AND DAMAGES</b>	<b>Real Estate</b>								\$287,400
<b>12 02 HARBORS</b>	<b>0</b>	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
12 NAVIGATION, PORTS AND HARBORS	Mob/Demob & Prep Work	0	0	1	0	0	1	1	\$864
10 BREAKWATERS AND SEAWALLS	Breakwater & Slope Protection	1	1	1	0	1	2	2	\$3,446
10 BREAKWATERS AND SEAWALLS	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
12 02 HARBORS	Entrance & Manuever Dredging	1	0	1	0	1	1	2	\$3,945
12 02 HARBORS	Launch Ramp & Parking	0	0	1	0	0	1	1	\$6,032
<b>12 02 HARBORS</b>	<b>0</b>	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
<b>12 02 HARBORS</b>	<b>Contaminated Dredge Spoils Disposal</b>	4	3	4	3	4	4	4	\$939
<b>12 02 HARBORS</b>	<b>0</b>	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
<b>12 02 HARBORS</b>	<b>0</b>	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
<b>0</b>	<b>0</b>	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
All Other	Remaining Construction Items	0	0	0	0	0	2	2	\$47
30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	1	0	0	0	0	2	1	\$2,291
31 CONSTRUCTION MANAGEMENT	Construction Management	2	0	0	0	0	1	2	\$1,222
									<b>\$18,786</b>
<b>Risk</b>		\$ 595	\$ 140	\$ 1,335	\$ 115	\$ 289	\$ 647	\$ 750	<b>\$3,871</b>
<b>Fixed Dollar Risk Allocation</b>		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	<b>\$0</b>
<b>Risk</b>		\$ 595	\$ 140	\$ 1,335	\$ 115	\$ 289	\$ 647	\$ 750	<b>\$3,871</b>
<b>Total</b>									<b>\$22,657</b>

## Whittier SBH Alt #7 - 6 Lanes North Entrance

Feasibility (Recommended Plan)

Abbreviated Risk Analysis

Meeting Date: 1/29/2018 => Updated Feb 12 2018

Risk Level					
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3
	Negligible	Marginal	Moderate	Significant	Critical

## Risk Register

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level
PS-2	Mob/Demob & Prep Work	None	Mobilization of plant, labor and equipment are fairly standard. Land-based and floating plant will both be used to build basin, ramp and breakwater. Additional tasks for startup and closeout work are not well defined.	Marginal	Unlikely	0
PS-3	Breakwater & Slope Protection	Intent of project is to provide protected boat launch opportunities. As project progresses, possible that a mooring basin, or added upland features may be desired and scope will grow. Added rock needed to provide protection at PED	Increased BW and upland features would likely be local plan. BW design revisions are PED unlikely, but if it happens it would be a moderate impact as rock is a sensitive cost driver.	Moderate	Unlikely	1
PS-5	Entrance & Manuever Dredging	- Mooring basin size and depth scope increase during PED because right now it is big enough only for the boat launch function.	- Basin size and scope allowed will be limited by benefits and overall cost sharing available from sponsor. The chances of the scope increasing or growing at PED and construction are unlikely. It could however be a moderate impact.	Moderate	Unlikely	1
PS-6	Launch Ramp & Parking	Unresolved real estate use. Need details of construction to refine costs. Minor excavation/dredge for ramp.	Potential for real estate issues to be resolved are very good. The boat ramp concept is pretty straight forward, and there are good go-bys to use for estimating cost and scope before PED.	Negligible	Unlikely	0
PS-8	Contaminated Dredge Spoils Disposal	- Scope of disposal for dredge spoils depends on contamination extent, so the potential for scope growth is likely because level of contamination is unknown. - Funding for spoil disposal is shared by fed and local, so potential for increase in local shared cost is possible.	- At this point, contamination extent is unknown. Scope for disposing contaminated spoils would required trucking through tunnel to treatment facility in Anchorage. Current assumption is 5% of the spoils will be contaminated. The impact to cost would be significant if this increased at all and based on history, it's likely.	Significant	Likely	4
PS-12	Remaining Construction Items	None	Most project features covered in above items. There may be improvements made by the sponsor after the project is completed, such as new pavements, markings, signage, lighting, monitoring and restroom facilities, etc. These items are not required for a complete and useable facility, so they were not included in the Total Project Cost.	Negligible	Unlikely	0
PS-13	Planning, Engineering, & Design	PED assumed at 15% of Contract Cost. Need to develop PED budget.		Marginal	Possible	1



PS-14	Construction Management	SIOH assumed at 8% of Contract Cost. Need to develop S&A budget.		Marginal	Likely	2
AS-2	Mob/Demob & Prep Work	None	Contracting plan not well defined. Possible small business. Multiple subcontractors unlikely. Competition mildly restricted, but reasonable availability of contractors. Assume IFB at this stage.	Marginal	Unlikely	0
AS-3	Breakwater & Slope Protection	Quantity of rock estimated will increase due to changes in bathymetry. Concern that the acquisition plan not established. If this work is subcontracted it could increase estimated costs.	Bathymetry used for initial qty estimation is not current however the project location is not subject to shoaling or scouring and risk of changes by PED is very low. Bid schedule will use estimated qty's with variation clause to decrease risk to bidders. Contracting plan not well defined. Possible small business could increase overall cost for BW. Multiple subcontractors unlikely. Competition mildly restricted, but reasonable availability of contractors. Assume IFB at this stage.	Moderate	Unlikely	1
AS-5	Entrance & Manuever Dredging	- Quantity estimated at bid time could change and increase chance of contract changes	- Qty of dredge spoils is based on bathymetry and is in location that doesn't shoal or scour. Bid schedule will use estimated quantity with variations allowed per FAR Clause	Marginal	Unlikely	0
AS-6	Launch Ramp & Parking	For complete and usable facility, this feature is required along with construction of BW and dredging, so soliciting this feature with the others has to happen. If cost share is not obtained from local sponsor, and it can't be solicited, it may impact the entire project's viability.		Marginal	Unlikely	0
AS-8	Contaminated Dredge Spoils Disposal	- Qty of contaminated spoils could vary widely. Including the cost for disposal of POL contaminated soil with the unit cost of dredging and disposal would put undue risk on the contractor to forward price during solicitation.	- Specifications and bid schedule need to break out a separate cost for disposal of contaminated dredge spoils to reduce risk for estimating overall cost at PED and for contractors during bid. Variations in estimated quantities (VEQ) clauses should be added to contract.	Significant	Possible	3
AS-12	Remaining Construction Items	None	Project features covered in above items.	Negligible	Unlikely	0
AS-13	Planning, Engineering, & Design	PED assumed at 15% of Contract Cost. Need to develop PED budget.	Contracting plan not well defined. Possible small business. Multiple subcontractors likely. Competition mildly restricted, but limited availability of contractors.	Negligible	Unlikely	0

AS-14	Construction Management	SIOH assumed at 8% of Contract Cost. Need to develop S&A budget.	Contracting plan not well defined. Possible small business. Multiple subcontractors likely. Competition mildly restricted, but limited availability of contractors.	Negligible	Unlikely	0
CE-2	Mob/Demob & Prep Work	Tunnel access by land. Staging areas available. Access via road system is through tunnel. Somewhat restrictive due to time schedules that allow vehicles. Contractors may include added costs in bid for mobilizing through tunnel	Work is in proximity to Anchorage. Site access is slightly restricted by road, but rail and marine access is good. Construction methodology and equipment are not unusual. Possible presence of soil contamination, and uncertain disposal are for excavated soils are potential claim areas.	Marginal	Possible	1
CE-3	Breakwater & Slope Protection	Breakwater design may require both land and marine based construction elements. May require added steps for contractors to implement.	While construction methodology and equipment are not unusual, there is a chance some of the BW will need both marine land based equip and thus added challenge for methodology and constructability. Possible presence of soil contamination, and uncertain disposal are for excavated soils are potential claim areas.	Marginal	Possible	1
CE-5	Entrance & Manuever Dredging	<ul style="list-style-type: none"> <li>- Dredging contaminated materials that require upland disposal requires additional steps and handling to properly avoid spreading contamination.</li> <li>- Requires HTRW trained labor, and added oversight and planning</li> <li>- Geotech studies indicate fairly easy to dredge material, but, unforeseen hard difficult materials could cause change conditions.</li> <li>- Dewatering spoils may require treating the water before discharging</li> </ul>	<ul style="list-style-type: none"> <li>- Estimate based on dewatering spoils on barge, moving material for unloading and hauling to upland staging area. Fairly conservative basis that has been used in similar projects recently executed (Petersburg) where contaminated spoils were encountered.</li> <li>- Most skilled labor is properly trained for this type of contaminate (POL) so not likely to impact overall cost estimate.</li> <li>- Dredge production and equipment used in CEDEP can handle everything but solid rock and this is unlikely to encounter.</li> <li>- Treating water could be a moderate impact to cost. Likelihood is possible because the method that will be acceptable to regulators is very hard to predict by the time PED and construction occurs.</li> </ul>	Moderate	Unlikely	1
CE-6	Launch Ramp & Parking	Potential for contaminated soil from excavation for ramp construction	Some allowance for contaminated soil but most of the impacts (cost and schedule) are captured in the dredging cost item. Impact would be marginal for this work item, but is definitely possible.	Marginal	Possible	1
CE-8	Contaminated Dredge Spoils Disposal	<ul style="list-style-type: none"> <li>- Requires HTRW trained labor, and added oversight and planning</li> <li>- Handling contaminated spoils will require additional equipment, personnel and time.</li> <li>- Hard to predict exact contamination action levels, adequate treatment methods and timing for determination on these features.</li> <li>- Hard to predict where allowable location of soil treatment will be at this stage and potential for changes at PED are high.</li> <li>- Dewatering and handling twice can cause risk and added cost if its not clear what the method is.</li> </ul>	<ul style="list-style-type: none"> <li>- This feature of work is likely to become clearer in terms of scope, requirements and special unique construction elements after PED. Because it must be coordinated with environmental regulators, the direction could change drastically between now and then. This risk presents a potential for significant impact on cost and schedule of the overall project.</li> <li>- Assigned all contaminated soil trucking and disposal to subcontractor.</li> </ul>	Significant	Likely	4
CE-12	Remaining Construction Items	None	Project features covered in above items.	Negligible	Unlikely	0

CE-13	Planning, Engineering, & Design	PED assumed at 15% of Contract Cost. Need to develop PED budget.	Work is in proximity to Anchorage. Site access is slightly restricted by road, but rail and marine access is good. Construction methodology and equipment are not unusual. Possible presence of soil contamination, and uncertain disposal are for excavated soils are potential claim areas.	Negligible	Unlikely	0
CE-14	Construction Management	SIOH assumed at 8% of Contract Cost. Need to develop S&A budget.	Work is in proximity to Anchorage. Site access is slightly restricted by road, but rail and marine access is good. Construction methodology and equipment are not unusual. Possible presence of soil contamination, and uncertain disposal are for excavated soils are potential claim areas.	Negligible	Unlikely	0
SC-2	Mob/Demob & Prep Work	none	Construction of SBH is fairly well understood. Excavation, backfill, compaction, dredging, and rubble mound construction are common to marine contractors. Ramp construction is not new, but some contractors may be less familiar with installation below water level. Possible contamination will require field screening. Disposal areas for excavated soils not certain.	Negligible	Unlikely	0
SC-3	Breakwater & Slope Protection	none		Negligible	Unlikely	0
SC-5	Entrance & Manuever Dredging	none		Negligible	Unlikely	0
SC-6	Launch Ramp & Parking	none		Negligible	Possible	0
SC-8	Contaminated Dredge Spoils Disposal	<ul style="list-style-type: none"> <li>- Specialty items that could potentially impact cost and time are long term storage requirements of POL contaminated soil while testing is occurring.</li> <li>- Hauling contaminated soil over long distance (Whittier to Anchorage) may require special fitted trucks that are not common in the local trucking industry.</li> </ul>	<ul style="list-style-type: none"> <li>- Soil will need to be staged in long term storage cells in accordance with ADEC regulations. Potential for these regulations to change are possible and could present a marginal impact.</li> <li>- POL contaminated soil hauling is fairly common however, the distance is fairly long and could present challenges that cause regulators to implement uncommon requirements.</li> </ul>	Significant	Possible	3

SC-12	Remaining Construction Items	None	Project features covered in above items.	Negligible	Unlikely	0
SC-13	Planning, Engineering, & Design	PED assumed at 15% of Contract Cost. Need to develop PED budget.		Negligible	Unlikely	0
SC-14	Construction Management	SIOH assumed at 8% of Contract Cost. Need to develop S&A budget.		Negligible	Unlikely	0
T-2	Mob/Demob & Prep Work	none		Negligible	Unlikely	0
T-3	Breakwater & Slope Protection	- Tolerance qty variation. Qty based on 2008 survey data.	Possible scope changes as design is refined. QTO is ROM and qlys could change. Geotechnical and Environmental investigations may be needed.	Marginal	Possible	1
T-5	Entrance & Manuever Dredging	- Dredging method specified in technical specs could change due to geotech data that comes out in PED. - Quantities estimated at FS inaccurate	- Based on previous geotech data and design depth (relatively shallow basin) the method specified for dredging should be adequate and is used as the basis of cost estimate and schedule. - Qty's calc'ed based on high level of confidence bathymetry survey.	Moderate	Unlikely	1
T-6	Launch Ramp & Parking	Boat ramp not technically difficult for dredging and breakwater construction contractor, so no known concern		Negligible	Possible	0
T-8	Contaminated Dredge Spoils Disposal	- Level of confidence that the final disposal method/location for spoils is a concern because of the lack of chemical data within the footprint of the project. - Quantity of POL contaminated soil is a guess at this point	- Need to obtain more information to zero in on quantities and method of POL soil disposal. Without that data, the likelihood that quantity is off is likely with a moderate impact resulting.	Significant	Likely	4

T-12	Remaining Construction Items	None	Project features covered in above items.	Negligible	Unlikely	0
T-13	Planning, Engineering, & Design	PED assumed at 15% of Contract Cost. Need to develop PED budget.	Possible scope changes as design is refined. QTO is ROM and qtys could change. Geotechnical and Environmental investigations may be needed.	Negligible	Unlikely	0
T-14	Construction Management	SIOH assumed at 8% of Contract Cost. Need to develop S&A budget.	Possible scope changes as design is refined. QTO is ROM and qtys could change. Geotechnical and Environmental investigations may be needed.	Negligible	Unlikely	0
EST-2	Mob/Demob & Prep Work	<ul style="list-style-type: none"> <li>- Estimate assumes 2 seasons for construction.</li> <li>- Assumes contractor will move from Pacific Northwest region. Possible no contractors in that area would compete and move costs estimated would increase.</li> <li>- Does estimate include costs for both land and marine based equipment spreads?</li> </ul>	<p>Estimate assumes common marine based equipment spread for dredging and land based for breakwater.</p> <p>Move from Seattle area is good assumption but possible that a farther location is where the competition will bid project and cost could increase.</p>	Marginal	Possible	1
EST-3	Breakwater & Slope Protection	<ul style="list-style-type: none"> <li>- Rock source and price has a very big impact on overall estimated cost and is hard to predict for early cost estimates.</li> <li>- No current direct quotes on materials especially for rock.</li> <li>- Assumed barge haul to site; loaded by crane; placed by excavator. If no quarries are available nor are competitive using marine based method, cost for delivery by rail would be higher than marine based.</li> </ul>	<ul style="list-style-type: none"> <li>- Rock price was based on an average of the bids received for a similar project solicited and awarded in 2014, Valdez Small Boat Harbor.</li> <li>- Cost Estimate Class 4 based on 4-year old bid proposals. There are multiple existing quarries within 350 miles by barge, and possibly other sources available by rail &amp; truck haul.</li> <li>- Contractor' crews assumed typical breakdown of tasks. Production is ROM.</li> <li>- Competition may keep prices down, but Valdez and Kodiak are the only recent rock price quotations.</li> </ul>	Marginal	Likely	2
EST-5	Entrance & Manuever Dredging	<ul style="list-style-type: none"> <li>- Estimate assumes clamshell dredge plant with dewatering scow; spoils in scow are unloaded for haul to upland staging in lined cell for POL contamination testing and analysis.</li> </ul>	<ul style="list-style-type: none"> <li>- Estimate assumes worse case scenario for handling of dredge spoils, so the likelihood of additional handling steps or costs is unlikely. If added steps are required, the impact would be moderate in cost and schedule. At this time, the allowable method is unknown because the extent of contamination is unknown.</li> </ul>	Moderate	Unlikely	1
EST-6	Launch Ramp & Parking	<p>Boat ramp cost estimate is parametric.</p> <p>No detailed design at this point to base detailed estimate on</p> <p>Parking area not defined (size wise)</p>	<p>Use current ramp bids that were obtained from City of Whittier.</p> <p>No current direct quotes on materials. Material sources uncertain. Contractors assumed as typical breakdown of tasks.</p> <p>Production and crews are ROM. Site is accessible by road, rail and marine. Disposal sites not certain. Cost Estimate Class 4 with little refinement.</p>	Marginal	Possible	1

EST-8	Contaminated Dredge Spoils Disposal	- Estimate assumes 5% of the dredge volume will be POL contaminated. This is based on discussions with the PDT. This will require loading from upland stockpile in Whittier, hauling via truck to Anchorage treatment facility. Concern is if the actual quantity is exceeds 5%.	- Treatment for POL soil at Anchorage facility based on quote. The concern of quantity however could impact cost significantly. At this point it's possible without any analytical data.	Significant	Likely	4
EST-12	Remaining Construction Items	None	Project features covered in above items.	Marginal	Likely	2
EST-13	Planning, Engineering, & Design	PED assumed at 15% of Contract Cost. Need to develop PED budget.	No current direct quotes on materials. Material sources uncertain. Contractors assumed as typical breakdown of tasks. Production and crews are ROM. Site is accessible by road, rail and marine. Disposal sites not certain. Cost Estimate Class 4 with little refinement.	Marginal	Likely	2
EST-14	Construction Management	SIOH assumed at 8% of Contract Cost. Need to develop S&A budget.	No current direct quotes on materials. Material sources uncertain. Contractors assumed as typical breakdown of tasks. Production and crews are ROM. Site is accessible by road, rail and marine. Disposal sites not certain. Cost Estimate Class 4 with little refinement.	Marginal	Possible	1
EX-2	Mob/Demob & Prep Work	Weather could cause delays in mob and demobe timelines. Preparatory work and laydown areas may be impacted due to work during busy harbor times causing increase in mob timeline in estimate. Fuel price increase from today to when project is awarded.	Project site is limited on area and possibility of contamination exists. Fuel costs are at historic lows and are beginning to rise. Funding delay will be result in revised CWE and possible revised submittal for appropriation.	Marginal	Possible	1
EX-3	Breakwater & Slope Protection	- Marine mammal observer, fish windows and other environmental constraints could cause delays during BW construction. - Whittier is subject to adverse weather throughout the calendar year, making it possible a typical 2 season construction project to extend to 2.5 or even 3. -Fuel costs are at historic lows and are beginning to rise.	- Project timeline of 2 years is achievable based on scope, however its possible for the concerns to cause overall extension to project timeline and if so it would be an overall moderate impact to the schedule and cost estimate. - Estimate uses fuel cost that is slightly higher than current rate, but still possible to increase more than escalation rates and overall could result in impact.	Moderate	Possible	2
EX-5	Entrance & Manuever Dredging	- Marine mammal observer, fish windows and other environmental constraints could cause delays during dredging operations. - Whittier is subject to adverse weather throughout the calendar year, making it possible a typical 2 season construction project to extend to 2.5 or even 3. -Fuel costs are at historic lows and are beginning to rise.	- Project timeline of 2 years is achievable based on scope, however its possible for the concerns to cause overall extension to project timeline and if so it would be an overall moderate impact to the schedule and cost estimate. - Licensed Contaminated Disposal Facility may not have capacity or ability to accept material. - Estimate uses fuel cost that is slightly higher than current rate, but still possible to increase more than escalation rates and overall could result in impact.	Marginal	Likely	2

EX-6	Launch Ramp & Parking	delay in federal funding. Marine mammal observer. Possible 2 seasons construction including quarrying.	Local Sponsor is tight on funding. Project site is limited on area and possibility of contamination exists. Fuel costs are at historic lows and are beginning to rise. Licensed Contaminated Disposal Facility may not have capacity or ability to accept material. Funding delay will be result in revised CWE and possible revised submittal for appropriation.	Marginal	Possible	1
EX-8	Contaminated Dredge Spoils Disposal	- Cost for disposal depends on regulations, current policy, trucking so fuel impacts.	- Estimate uses fuel cost that is slightly higher than current rate, but still possible to increase more than escalation rates and overall could result in impact. - Regulations vary but overall seem to be pretty consistent for POL contaminated soil its unlikely to change by PED, however without analytical data, impact could be significant.	Significant	Likely	4
EX-12	Remaining Construction Items	delay in federal funding. Marine mammal observer. Possible 2 seasons construction including quarrying.		Marginal	Likely	2
EX-13	Planning, Engineering, & Design	PED assumed at 15% of Contract Cost. Need to develop PED budget. Possible delay in federal funding. Marine mammal observer. Assume 2 seasons construction including quarrying.	Local Sponsor is tight on funding. Project site is limited on area and possibility of contamination exists. Fuel costs are at historic lows and are beginning to rise. Licensed Contaminated Disposal Facility may not have capacity or ability to accept material.	Marginal	Possible	1
EX-14	Construction Management	SIOH assumed at 8% of Contract Cost. Need to develop S&A budget. Possible delay in federal funding. Assume 2 seasons construction including quarrying.	Local Sponsor is tight on funding. Project site is limited on area and possibility of contamination exists. Fuel costs are at historic lows and are beginning to rise. Licensed Contaminated Disposal Facility may not have capacity or ability to accept material.	Marginal	Likely	2