

INTERLOCAL AGREEMENT
FOR

Port of Ilwaco/Port of Chinook Dredging and Dredge Material Placement Project

This Agreement is made this 10th day of November, 2021, effective November 23, 2021 ("effective date"), pursuant to RCW 39.34.030 et seq., and RCW 53.08.240 between the Port of Ilwaco (Ilwaco), a Port District of the State of Washington, and the Port of Chinook (Chinook), a Port District of the State of Washington. In this Agreement, the two Ports are referred to collectively as "the Ports" or "the Parties".

WHEREAS, by the authority granted in RCW 39.34.030 et seq. units of local government may enter into agreements with other units of local government, and by RCW 53.08.240 Ports may enter into agreements with other Ports, for the performance of any or all functions and activities that a party to the agreement, its officers, or agents have the authority to perform; and

WHEREAS, the Port of Ilwaco and Port of Chinook currently operate under an interlocal agreement for Ilwaco to provide inclusive management services to Chinook; and

WHEREAS, dredge material placement is essential for performing regular marina maintenance dredging activities at both Ilwaco and Chinook; and

WHEREAS, both Ilwaco and Chinook current have upland dredge material placement sites, which are at or nearing capacity, and alternative placement sites are necessary to maintain permitted depths in each respective marina; and

WHEREAS, failure to develop alternative dredge material placement sites will significantly jeopardize operations at the respective marina, which will lead to cessation of the business and commerce generated by activities at the port(s), leading to significant negative economic and social impacts for the local community and Pacific County; and

WHEREAS, the Port of Ilwaco provides dredging related services for the Port of Chinook marina; and

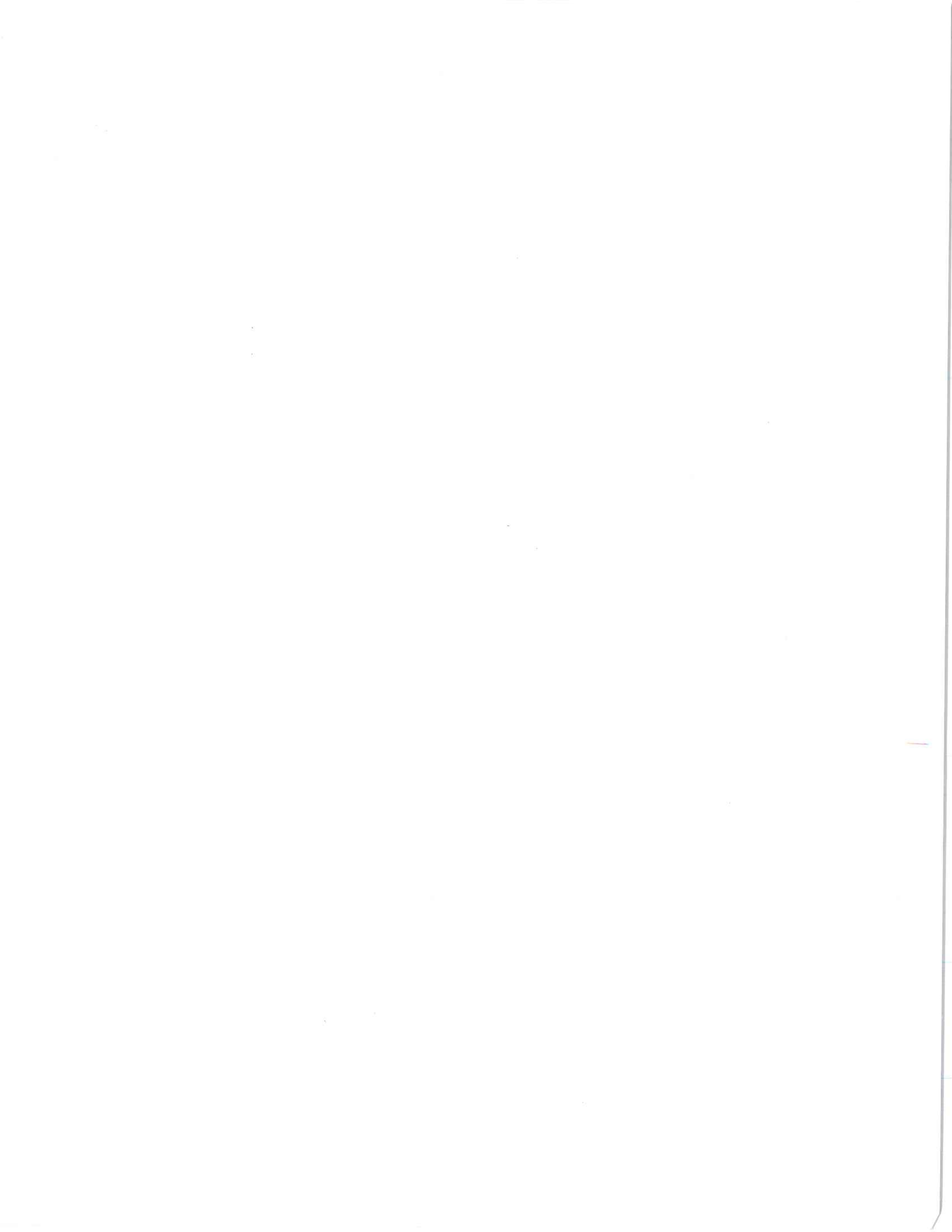
WHEREAS, the Parties anticipate coordination in developing alternative dredge material placement sites promotes a cost-effective and efficient use of public resources; and

WHEREAS, the Commissions of both Ports will remain accountable to the constituents in their respective Districts and believe cooperative efforts between the Ports best serves their common purposes, communities and users; and

WHEREAS, both Ports share the common interest of supporting commercial and recreational fishing given their importance to our local and regional economy and heritage of our coastal community; and

WHEREAS, the Ports secured funding through the State of Washington Capital Budget for Port of Ilwaco/Port of Chinook Dredging and Dredge Material Placement Project; and

WHEREAS, such funding for the Ports will be shared as stipulated in the legislative request and will be administrated and accounted for by and through the Port of Ilwaco, in accordance with the Washington State Department of Commerce contracts as specified:



- a) Contract Number: _____: Ports of Ilwaco and Chinook Marina Dredging and Dredge Material Placement Project (net grant amount \$621,320 – with the intent of funds being split \$375,000 for development of in-water dredge material disposal sites for each port (permitting and preliminary engineering total for both ports) and \$246,320 for Chinook dredging (in addition to additional funds provided by the Port of Chinook to complete the project). (**Section I**)

NOW, THEREFORE, in consideration of the covenants and agreements hereinafter set forth, the Parties desire to enter into an agreement setting forth the conditions of the Port of Ilwaco/Port of Chinook Dredging and Dredge Material Placement Project:

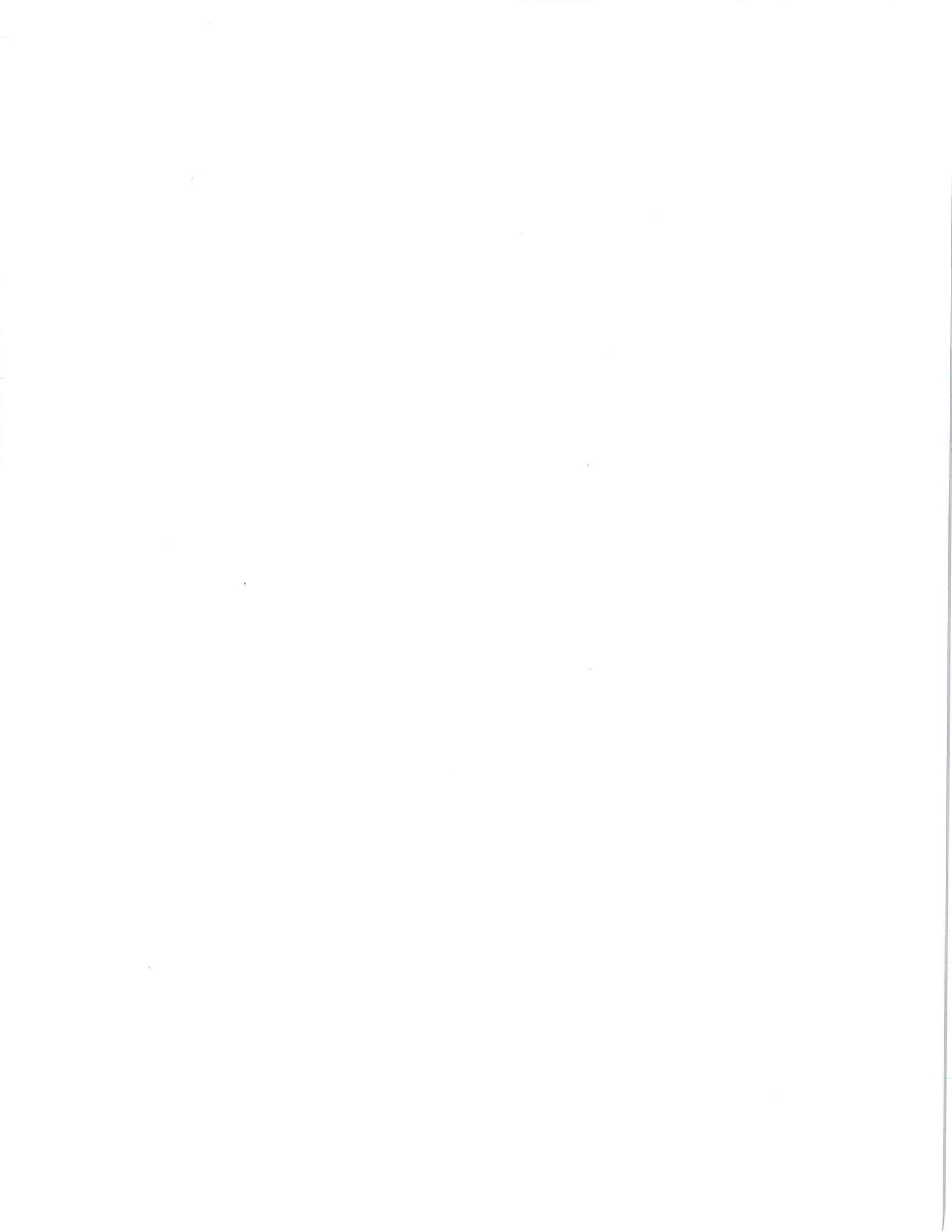
SECTION I. PORTS OF ILWACO AND CHINOOK PORT OF ILWACO/PORT OF CHINOOK DREDGING AND DREDGE MATERIAL PLACEMENT PROJECT

A. ILWACO RESPONSIBILITIES

1. Ilwaco will undertake leading the process of developing alternative dredge material disposal sites for the marinas at the Port of Ilwaco and Port of Chinook.
2. Ilwaco will facilitate and coordinate with the Port of Chinook Commission through this process of developing the sites, including coordination and communication with the project consultants and the ports.
3. Project oversight will be provided by Ilwaco management under the current interlocal agreement for inclusive management services. Ilwaco provide an accounting of expenditures as provided as submitted to the State of Washington Department of Commerce (granting agency).
4. Funding for completion of the dredge material placement in Ilwaco and Chinook shall be via funds received from the State, which shall be administered by Ilwaco. Additional funds will be needed from the Ports to complete the project and shall be shared in Schedule A. Review and reimbursement of such expenses shall be completed by Ilwaco, with oversight of the Chinook Commission when tied to the development of dredge material placement for their marina. Unanticipated costs associated with this project specific to the material placement at each port, in excess of funds made available through State funding for the respective marina, shall be the sole responsibility of the respective port.

B. CHINOOK RESPONSIBILITIES

1. Funding for the Dredging and Dredge Material Placement Project for Chinook will be administered by the Port of Ilwaco through funding received from the State of Washington, the Port of Ilwaco and the Port of Chinook.
2. Unanticipated costs associated with Dredging and Dredge Material Placement Project at each port, in excess of funds made available through State funding for the respective marina, and in excess of the budgeted amount to be contributed by each port, shall be the sole responsibility of the respective port.
3. Chinook has an obligation to engage in this process and be proactive in working with Ilwaco staff and, in coordination with Ilwaco, engage directly with the consulting firm working on the project.



4. Chinook shall continue to have the responsibility for all of its obligations not assumed by Ilwaco under this Agreement.

C. INDEMNITIES

1. At all times during this Agreement, to the fullest extent permitted by law, Chinook shall defend, indemnify, reimburse and hold harmless Ilwaco from and against any and all claims, demands, fines, damages for bodily injury and damage to property, to the extent caused by Chinook or otherwise the responsibility of Chinook but for this Agreement. The duty to defend shall arise immediately and shall include, but not be limited to, all fees and costs of any arbitration, mediation or other settlement efforts, the costs of any experts retained to assist with the defense, the cost of trial preparation.
2. Chinook will also hold Ilwaco harmless for any financial decision made by Chinook and implemented by Ilwaco pursuant to the directive of Chinook's governing Board.
3. At all times during this Agreement, to the fullest extent permitted by law, Ilwaco shall defend, indemnify, reimburse and hold harmless Chinook from and against any and all claims, demands, fines, damages for bodily injury and damage to property, to the extent caused by Ilwaco or otherwise the responsibility of Ilwaco but for this Agreement. The duty to defend shall arise immediately and shall include, but not be limited to, all fees and costs of any arbitration, mediation or other settlement efforts, the costs of any experts retained to assist with the defense, the cost of trial preparation.

D. INSURANCE

1. At all times during the term of this Agreement, Ilwaco shall maintain insurance sufficient to comply with at least minimum limits for federal and state regulations including Workers Compensation, and Property Damage insurance, and general liability coverage including vehicular coverage, with a combined single limit of not less than \$1,000,000, and property insurance with reasonable deductibles and co-insurance provisions, and shall name Chinook as an additional insured in its general liability policy. In addition, Ilwaco will maintain fidelity bonds for all staff handling Chinook funds.
2. At all times during the terms of this Agreement, Chinook shall maintain general liability insurance coverage including vehicular coverage, with a combined single limit of not less than \$1,000,000, as well as all other statutorily required insurance coverage, and property insurance with reasonable deductibles and co-insurance provisions, and shall name Ilwaco as an additional insured in its general liability policy.

E. MISCELLANEOUS PROVISIONS

1. This Agreement shall be effective upon dual execution by both Ports, and remain in effect until June 30, 2023, or upon earlier termination as authorized in this Agreement. If terminated early by either party, reimbursement of costs incurred by either port shall be determined by mutual agreement of the port commissions.
2. Ilwaco will administer the State funding in accordance with the contracts developed by the State of Washington Department of Commerce: _____ no additional fees for administering the contract are contemplated for Chinook beyond the existing interlocal agreement for inclusive management services.

3. Either Party may terminate its participation by providing thirty (30) days written notice to the other Party. Any amounts due and owing by a terminating Party shall continue as a debt and shall be paid within twenty-one (21) days of termination. If the agreement is terminated any residual State funding allocated between the parties will be subject to a determination by the State, and potentially by mutual agreement of the parties, disbursed or withheld as concluded.
4. Each Party is an independent contractor and there is no employment relationship between the Parties.
5. Each Port shall continue to comply with all applicable local, state and federal regulations and laws.
6. Notwithstanding any provision of this Agreement, neither Ilwaco nor Chinook shall be authorized to perform or receive or pay for any service which is not authorized by the laws of the State of Washington.
7. This Agreement shall be governed by the laws of the State of Washington. Any action commenced in connection with this Agreement shall be in the Superior Court of Pacific County.
8. Any notice under this Agreement shall be in writing and shall be effective when actually delivered in person or when deposited in the U.S. mail, registered or certified, postage prepaid and addressed to the Manager of each respective Port.
9. Time is of the essence in the performance of the terms of this Agreement.
10. This Agreement contains the entire understanding of the Parties and supersedes all prior agreements, oral or written, and all other communications between the Parties relating to the subject matter of this Agreement.
11. This Agreement may be modified or amended by mutual agreement of the Port Commissions at any time. However, the Parties shall not waive, alter, modify, supplement or amend this Agreement without a written instrument signed by both Parties. The Parties contemplate that the Agreement may require modification or amendment as the services necessary to be provided and cost for those services are clarified over the term of the Agreement. The Parties understand that the services provided by this Agreement may evolve as the Agreement matures, and may change in quantity depending on the amount of work required, particularly seasonal and emergency work. These kinds of changes are not the type of changes that require prior Board approval.
12. In the event that a dispute arises under or related to the terms of this Agreement including, but not limited to, its enforcement or interpretation, the Parties agree to meet and confer to attempt to resolve the dispute through the Executive Director of Ilwaco and Chair of each Port Commission prior to the initiation of litigation.
13. The Parties agree to cooperate fully and execute any and all supplementary documents and to take all additional actions which may be necessary or appropriate to give full force and effect to the basic terms and intent of this Agreement.

14. Ilwaco and Chinook are the only Parties to this Agreement and are the only Parties entitled to enforce its terms. Nothing in this Agreement gives, is intended to give, or shall be construed to give or provide any benefit or right, whether directly, indirectly or otherwise, to third persons.
15. Attachments to this agreement include the following (Please note – “Task 2” identified in the attachments relates to the dredging and dredge material placement project. “Task 1” is an unrelated project independent to Ilwaco’s operation and does not pertain to this project or interlocal agreement.)
- a. A cost breakdown of allocated grant funds identifying the contribution of each port towards this combined project.
 - b. Proposal from Moffatt and Nichol – Port of Ilwaco Marina Structure Replacement and Port of Ilwaco/Port of Chinook Dredging and Dredge Material Placement Project.
 - c. Memo from Moffatt and Nichol describing their phased approach.
 - d. Port of Ilwaco and Port of Chinook Engineering Study/Solutions In Support of Maintenance Dredging (completed in 2019)

For the PORT OF ILWACO:



Signature

Commissioner

Title

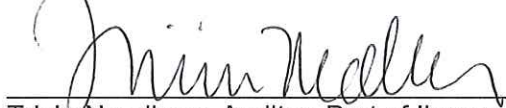
For the PORT OF CHINOOK:



Signature

Title

Attest:



Tricia Needham, Auditor, Port of Ilwaco

Task 2 - Dredge site development

Total Cost Alternative 1 (In Water)	\$564,369
Less State Capital Budget Grant Proceeds*	-\$375,000
Costs in excess of Grant Proceeds	\$189,369
55/45 Ilwaco/Chinook split (per M&N)	
Ilwaco contribution 55%	\$104,152.95
Chinook contribution 45%	\$85,216.05

* Total funds from WA State Capital Budget - \$621,320

\$375,000 allocated to Dredge Material Placement Project

\$246,320 allocated to Chinook Marina Maintenance Dredging – Priority Areas

Note – project is estimated to be \$315,000 and the Port of Chinook will be contributing up to \$68,680 from cash reserves or other funding sources available to the port.

To: Guy Glenn, Port of Ilwaco
From: Victoria England, LG
Project: Port of Ilwaco Marina Structure Replacement and Port of Ilwaco/Port of Chinook Dredging and Dredge Material Placement Project
Date: 12 October 2021
Subject: Proposed Phased Approach – Scope and Estimated Cost

Introduction and Purpose

The following information is provided at the request of the Port of Ilwaco and summarizes the scope and fee associated with a phased approach to the scope of work provided to the Port on 7 October 2021 – Draft Proposal- Port of Ilwaco Marina Structure Replacement and Port of Ilwaco/Port of Chinook Dredging and Dredge Material Placement Project (Moffatt & Nichol, 6 October 2021). The submitted proposal presents our understanding of the project scope of work and the current best estimate based on available information and project variables that may affect the scope and fee for the project. The nature of the project and our approach to the scope of work provides decision points along the way to refine scope/cost/schedule as additional information and data is obtained. We can approach the project in phases, refining the scope at each phase/decision point, as discussed during our 8 October 2021 meeting with the Port.

The phases summarized below were identified based on identified decision points where the project scope will be affected by the nature of the decision. The phased costs shown in Table 1 below are compiled based on the 6 October 2021 scope and fee estimate provided to the Port.

Table 1: Phased Approach to the Marine Structure Replacement and Dredging Project

Phase	Task	Scope Included	Estimated Cost
Phase 1		Data acquisition, preliminary design, early regulatory consultation	
	Task 1	<ul style="list-style-type: none"> ▪ Preliminary design coordination with Port ▪ Site visit ▪ Early agency consultation ▪ Bathymetric/topographic surveys¹ – POI and POC 	\$92,258
	Task 2	<ul style="list-style-type: none"> ▪ LEDPA Pre-submittal Consultation ▪ Infrastructure Risk Inventory² ▪ BOD & 30% Engineering Design 	\$78,900
Phase 1 Key Deliverables: Revised Phase 2 Scope, estimate of construction cost, plan for proposed improvements (Task 1), permitting strategy, other deliverables as noted in proposal.			

¹ Supports Task 1 & 2 work. Topographic survey of upland disposal sites is presented as contingency in the main proposal document.

² Supports dredge design (Subcontracted analysis)

Phase	Task	Scope Included	Estimated Cost	
Phase 2		Detailed permitting/consultation, further design		
	Task 1	<ul style="list-style-type: none"> ▪ To 50% design ▪ Geotechnical engineering ▪ Agency consultation and permits 	\$245,426	
	Task 2	Alternative 1: Permitting <ul style="list-style-type: none"> ▪ Includes potential mitigation consultation Alternative 1 & 2 include: <ul style="list-style-type: none"> ▪ BOD, Engineering Design for LEDPA ▪ Final Alternatives Analysis and consultation ▪ Agency consultation and permits ▪ Studies to support permits³ 	Alternative 1 \$401,301	Alternative 2 \$339,847
Phase 2 Key Deliverables: Revised Phase 3 Scope, estimate of construction cost, other deliverables as noted in proposal.				
Phase 3	Task 1	Final design & Bid Support – there’s the potential to attach stage 3 costs to construction costs if the Port is comfortable with that [90% & Final]	\$207,037	
	Task 2		\$84,168	

Project phasing provides the Port with the opportunity to phase the project contract so that the scope of work for subsequent phases can be refined based on the findings of early phases. The Moffatt & Nichol team looks forward to discussing this project approach. Feel free to contact either Shane Phillips [phone (206) 622-0222, or by email sphillips@moffattnichol.com] or Victoria England [phone (206)501-2332, or by email vengland@moffattnichol.com] with any questions.

³ Assumes use of Port staff/boat for grab sampling to save in subcontracted fees.



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www.moffattnichol.com

13 October 2021

Port of Ilwaco
165 Howerton Avenue
Ilwaco, WA 98624

Attn: Guy Glenn, Port Manager

Subject: Proposal – Port of Ilwaco Marina Structure Replacement and Port of Ilwaco/Port of Chinook Dredging and Dredge Material Placement Project.

Mr. Glenn,

The Moffatt & Nichol (M&N) team appreciates this opportunity provide the Port of Ilwaco (POI) with this proposal for engineering design and permitting services to support replacement of structures (the east bulkhead, west gangway access pier, and shoreline protection) in the northwest portion of the Ilwaco Marina (marina); capital dredging at POI and Port of Chinook (POC) marinas, and alternatives analysis and permitting for dredge disposal sites. This proposal is based on our understanding of conditions in the marinas and at the existing upland dredge disposal sites and potential beneficial use dredge placement sites from previous grant application work and recent discussions with POI.

The goal of our work will be to complete engineering and permitting for the projects to the extent that the project is considered "shovel" ready. Our proposal presents a full scope of services including site inspection, conceptual through final engineering, bid-ready construction documents, final alternatives analysis, environmental documentation preparation and submittal, and permitting coordination. The work is arranged to allow an interim goal of completing the engineering to the extent needed to prepare the permitting applications. This will allow final design to occur concurrently with the agencies' permit review process, or when funding for the project is available.

The following summary tables for Task 1 POI Structure Replacement and Task 2 POI/POC Dredging and Dredge Material Placement provides an overview of project tasks that can be completed concurrently ("Workflow") to streamline the work and maintain progress throughout the project.

Workflow	Task 1 – POI Structure Replacement Engineering and Permitting	
A	Design meeting with the Port to identify design alternatives, Port/tenant needs and preferred alternative	Complete surveys, geotechnical analyses, and begin permit applications
B	Preliminary Design	Finalize and submit permit applications. Applications can be completed at ~30% design stage.
C	Finalize Design and develop bid documents	Regulatory Agency Review and associated consultation
D	Receive permits	
E	Advertise bid package and provide bid support	

Workflow	Task 2 – POI/POC Dredging and Dredge Material Placement	
A	Reviewing and finalizing the dredging and placement site(s) preferred alternatives	Coordinate with Agencies: early consultation will be key to agreeing on the LEDPA
	Decision Point: LEDPA/Port Preferred Alternative	
B	Alternative 1: If chosen a major modification to the existing dredge permit is proposed. This option is more complex due to the use of a nearshore location to place dredged material. It requires more studies and likely will require mitigation.	Environmental Studies, Start Permit Applications
	Alternative 2: If chosen a major modification to the existing dredge permit is proposed. This option is relatively straight forward, may require sediment characterization of the material stored in the upland site and will require a DNR site use authorization.	
C	Preliminary Design	Submit Permit Applications
D	Finalize Design	Receive Permits

The team will integrate engineering, environmental permitting, and stakeholder considerations into a seamless coordination effort that begins with initial planning, early coordination with the Agencies and continues through design. We will work with the Port at each decision point to insure that we are meeting the Port’s needs.

Bidding and construction support services are included for both the structure replacement and dredging/disposal portions of this project. A summary fee estimate is provided at the end of this document and a detailed fee estimate is provided as an attachment. A preliminary schedule is also attached. Our specific scope of services is described below.

Scope of Work

Task 1 Port of Ilwaco Structure Replacement Engineering & Environmental Permitting

Task 1.1 Project Management

M&N will provide scheduling, coordination meetings, invoicing, and administrative support to manage the project through preliminary design and permitting. Project management will also include M&N team coordination, calls and Port of Ilwaco coordination as needed, progress communications at regular intervals, change management, and budget tracking.

We have included an allowance for members of the design team to perform a kick-off site visit. This will ensure the design team is familiar with the project site, current conditions and constraints.

We anticipate a project duration of approximately 6 months to complete conceptual design and permitting submittals. We anticipate regulatory agency review to take 9 to 12 months. Project management fees have been estimated for 18 months based on the approximate duration from notice to proceed through permit approval. The scope of work assumes bi-weekly meetings for the first 6 months of the project followed by as needed monthly progress meetings attended by 2 MN staff for the remaining 12 months.

Task 1.1 Deliverables:

- Project schedule and periodic updates
- Meeting/correspondence summaries
- Project invoicing

Task 1.2 – East Bulkhead Replacement

The scope for this task consists of the replacement of the existing failing timber bulkhead with a sheet pile bulkhead and a grouted tie back anchor system.

- The replacement bulkhead will be located to the waterside of the existing timber bulkhead and will have the same overall length. The new bulkhead will not extend to the east (towards the West Access Pier), or south past the southern terminus of the existing timber bulkhead.
- Early in the design phase we will perform an alternatives analysis to determine whether a steel sheet pile system, or a composite material such as fiber reinforced polymer (FRP) sheet piles will provide the best design solution.
- Ground improvements behind the bulkhead wall will be evaluated as necessary to mitigate the effects of liquefaction.
- The top of the bulkhead wall elevation will be built to accommodate the effects of sea level rise.

Task 1.3 – East Bulkhead Fender and Mooring System

The scope for this task is to design a new fender system that will be installed in front of the new sheet pile wall, to allow temporary berthing and moorage of work boats such as skiffs and fishing vessels.

Contingent Items

- If the Port would like to include a heavy-duty berthing and mooring system we will work with the Port to determine the additional scope and fee for the system selected.

Task 1.4 – Shoreline Protection

The scope for this task is to raise the shoreline area between the east side of the Safe Coast Seafoods wharf and the West Access Pier (approximately 120 linear feet of shoreline).

Task 1.5 – West Access Pier Replacement

The scope for this task is to replace the existing timber West Access Pier and the 40-foot-long aluminum gangway with a steel pile supported timber platform and an 80-foot-long ADA compliant aluminum gangway respectively.

- The top of platform elevation will be raised to accommodate the effects of sea level rise.
- Extra floatation will be added to the existing gangway landing float to accommodate the heavier gangway.
- We will evaluate the existing abutment to determine if it can be reused. We have provided a contingency task and fee if replacement of the abutment is required.

Contingent Items

- If it is determined that the existing abutment cannot be reused, then we have provided an additional scope and fee for the design of a replacement reinforced concrete abutment. This includes the analysis and design of the abutment, along with production of drawings, specifications, and cost estimates.

Task 1.6 – Bid Support

Bid period support tasks will include the following:



- Attending pre-bid conference and contractor site walk through in Port of Ilwaco and Port of Chinook.
- Assistance in answering bidder RFI's and producing addenda.
- Produce Conform Documents, Issued for Construction (IFC), to incorporate all the addenda, after the contract is awarded.

Tasks 1.2 through 1.6 Deliverables

In order to accommodate adequate interaction between the design team and the Port and other stakeholders, the project will include the following submission milestones. The following table summarizes the anticipated construction drawings for the project.

Submittals	Documents Included (PDF only)			
50% Submittal	Design Drawings	Technical Specifications Outline	Estimate of Construction Costs	Draft Geotechnical Report
90% Submittal	Design Drawings	Technical Specifications ¹	Estimate of Construction Costs	Draft Geotechnical Report
Final Submittal	Issued for Bid Design Drawings	Technical Specifications ¹	Estimate of Construction Costs	Final Geotechnical Report
Conformed Documents	Issued for Construction Design Drawings		Issued for Construction Technical Specifications	

¹Front-end Division 00 and 01 specifications are typically client-specific and are not anticipated in this scope, but the M&N can assist in their development at the Port's request.

Task 1.7 –Geotechnical Engineering (GeoEngineers)

The M&N design team will coordinate with our geotechnical engineer, GeoEngineers, for the successful completion of the design tasks included in our scope. The geotechnical site exploration and development of preliminary recommendations will occur before the M&N team commences the design of the marine structures. M&N and GeoEngineers will coordinate informally as the design progresses, this coordination has been included in our fee.

1.7.1 Geotechnical Explorations and Analyses

GeoEngineers will perform a geotechnical exploration program for the Project that will include the following:

- Review information regarding subsurface soil and groundwater conditions at the site, including reports in our files, selected geologic maps, and other geotechnical engineering related information for the project area.
- Coordinate and manage the field investigation, including public utility notification and scheduling of subcontractors and GeoEngineers' field staff. Public utility locates will be called in by our office as required by law.
- Explore subsurface soil and groundwater conditions at the site by drilling a total of two (2) drilled borings using a truck-mounted drill rig. One boring will be located near the north end of the existing East Bulkhead and one boring will be located near the south end of the existing East Bulkhead. We anticipate that both borings will be advanced to depths up to 80 feet below ground surface (bgs). The anticipated depth for the borings is based on the assumed top of siltstone elevation. Borings will be advanced to a minimum depth equal to 10 feet below the top of siltstone.
- Due to the anticipated presence of ground anchors for the existing East Bulkhead, as well as utilities and other buried structural elements, the upper 10 to 15 feet of each boring will be cleared using a vacuum truck.



- The borings will be backfilled as required by state law and surface disturbance minimized to the extent practical. We will endeavor to clean up exploration areas and minimize surface damage and surface impacts to project areas. We can discuss this with the POI or the Project team if requested.
- Obtain samples at representative intervals from the explorations, observe groundwater conditions and maintain detailed logs in general accordance with ASTM International (ASTM) Standard Practices Test Method D 2488. Qualified staff from our office will observe and document field activities.
- Perform laboratory tests on selected soil samples obtained from the explorations to evaluate pertinent engineering characteristics. Specific laboratory tests will depend on soil conditions encountered, but may include moisture/density tests, Atterberg limit tests, percent fines tests, consolidation tests, and unconfined compressive strength tests for rock.

Based on results of the geotechnical exploration program, GeoEngineers will perform geotechnical analyses for use for final design for the Project. Geotechnical analyses to be performed for the Project are anticipated to consist of the following:

- Evaluation of geologic and seismic hazards present at the Project site, including liquefaction and lateral spread.
- Development of seismic design parameters, including soil site class evaluation in accordance with the current version of the International Building Code (IBC).
- Geotechnical design parameters for the proposed POI Wharf East Bulkhead including lateral earth pressure coefficients and/or diagrams, minimum pile toe elevation for geotechnical stability, and ground anchor capacity. If required, the geotechnical analyses performed for the East Bulkhead will also include an evaluation of ground improvement for mitigation of liquefaction and/or lateral spread.
- Geotechnical design parameters for the proposed West Gangway Access Pier including lateral pile capacity parameters, axial pile capacities, and lateral earth pressures and bearing capacity for the pier abutment.
- Static and seismic slope stability analyses for the proposed slope protection to be located between the POI Wharf East Bulkhead and the West Gangway Access Pier.
- Static and seismic slope stability analyses for slopes to be constructed during dredging for the Project.

A summary of results of geotechnical analyses performed for the Project as well as project-specific design recommendations will be provided in a geotechnical engineering report that will address the following geotechnical components:

- A general description of site topography, geology and subsurface conditions.
- An opinion as to the adequacy of the proposed Project from a geotechnical engineering standpoint.
- Seismic design recommendations including, if necessary, recommendations for ground improvement for construction of the POI Wharf East Bulkhead.
- Recommendations for proposed structures including the POI Wharf East Bulkhead and West Gangway Access Pier.
- Recommendations for proposed slope protection to be located between the POI Wharf East Bulkhead and West Gangway Access Pier as well as recommendations for dredge slopes.

Task 1.7 Deliverable:

- Draft and Final Geotechnical Report

Task 1.8 – Environmental Permitting – Structure Replacement

The goal of this task is to obtain the applicable federal, state and local environmental reviews and permits needed to complete the proposed repair and replacement activities described above. Our scope of services is based on the assumed regulatory requirements listed in the table below and generally includes:

- Working closely with the engineering team to understand the design and construction needs and methods.
- Completing required environmental studies.
- Developing federal, state, and local permit applications for the proposed work.
- Developing JARPA drawings depicting site conditions, the repairs and construction methods
- Presenting the project at a multiagency pre-application meeting on-line.
- Submitting permit documents to the appropriate agencies.
- Coordinating with the USACE and other agencies as needed throughout the application review period.

Structure Replacement - Required Permits, Approvals, Application Needs, and Supporting Studies

Agency	Reviews/Permit	Application Requirements	Supporting Studies
City of Ilwaco	Washington State Environmental Policy Act (SEPA) Exemption	SEPA Exemption Request*	SEPA Checklist
City of Ilwaco	Shorelines/Land Use/ Critical Areas Exemption	Shoreline/Critical Areas Exemption*	None
City of Ilwaco	Building Permit	Drawings/Specifications	None
US Army Corps of Engineers (USACE)	Section 10 Nationwide No. 3 Maintenance	Joint Aquatic Resources Project Application (JARPA)	Conceptual (30%) Design information is required
National Oceanic and Atmospheric Administration (NOAA); National Marine Fisheries Services (NMFS)	Endangered Species Act (ESA) and Magnuson Stevens Act (MSA) Consultation	JARPA	Biological Assessment (BA) and Essential Fish Habitat Assessment (EFHA)
US Department of Fish and Wildlife (USFW)	ESA and MSA Consultation	JARPA	BA and EFHA
WA Department of Ecology (WDOE)	401 Water Quality Certification	JARPA	None
WDOE	Coastal Zone Management (CZM) Consistency Determination	Certification Form	None
WA Department of Fish and Wildlife (WDFW)	Hydraulic Project Approval (HPA)	JARPA	None

*Our cost estimate for this subtask is based on an exemption for SEPA. Additional scope and budget may be needed if the City determines the project is not exempt.

Task 1.8.1 – City of Ilwaco - State Environmental Policy Act (SEPA) Review

This project may be eligible for SEPA exemption in accordance with WAC 187-11-810, depending on the design and construction methods used and the final footprints of the improvements. We recommend the Port schedule a "Pre-Application Meeting" with the City Planner to determine if the project actions are exempt or if SEPA will be required.

Our cost estimate for this subtask is based on an exemption for SEPA. Additional scope and budget may be needed if the City determines the project is not exempt.

Task 1.8.2 – Shorelines and Critical Areas Exemption

M&N will prepare a City of Ilwaco planning department application for exemption for Shoreline Development, and Critical Areas review.

Our cost estimate for this subtask is based on an assumed exemption for SEPA, which also makes the project exempt from Shorelines regulations. Additional scope and budget may be needed if the City determines the project is not exempt.

Task 1.8.3 – JARPA Application

M&N will develop the JARPA drawings (8.5-inch by 11-inch sheets) and application narrative based on the chosen conceptual options for each project component (i.e. slope protection, Safe Coast Seafoods east bulkhead repair and the West Gangway Access Pier repairs).

Task 1.8.4 – Biological Evaluation (BE) and Essential Fish Habitat Assessment (EFHA)

M&N will complete a BE and EFHA for inclusion within the JARPA application submittal. The BE and EFHA are required to support Endangered Species Act and Magnuson-Stevens Act compliance review by the National Marine Fisheries Services (NMFS) and the United States Department of Fish and Wildlife (USFW). The BE and EFHA will be completed using available data, along with field observations and assessment of the potential for adverse environmental impacts from the proposed repairs.

Task 1.8.5 – Application Submittal / Agency Coordination

This task consists of pre-application coordination, leading a pre-application meeting with appropriate regulatory agencies (on-line, one-hour meeting), and post-application coordination as needed.

Task 1.8 Deliverables:

- M&N will participate in the pre-application meeting with the Port and the city planner to discuss SEPA exemption. We will prepare meeting materials and a summary of the results of the meeting.
- M&N will participate in the pre-application meeting with the Port and the city planner to discuss Shorelines exemption. We will prepare meeting materials and a summary of the results of the meeting.
- Draft Application Materials
 - Draft and Final JARPA application and drawings (up to ten 8.5-inch by 11-inch sheets)
 - SEPA Checklist
 - BE and EFHA documents
- Pre-Application conference call presentation and meeting summary
- Final Application Materials
- As-needed agency coordination documentation

Task 1.9 – Environmental Permitting – Geotechnical Investigation-CONTINGENCY

The proposed Task 1 structural replacement work may require geotechnical investigations to evaluate subsurface conditions at the site, including in-water borings. The associated permitting is included as contingency in the event that such in-water investigation is required by the proposed design.

The following are the permits that are likely to be required to complete in-water investigations at the site.

Geotechnical Investigation(s) - Required Permits, Approvals, and Application Needs

Agency	Reviews/Permit	Application Requirements	Supporting Studies
City of Ilwaco	Washington State SEPA Exemption	SEPA Exemption Request*	SEPA Checklist
City of Ilwaco	Shorelines/Land Use/ Critical Areas Exemption	Shoreline/Critical Areas Exemption*	None
USACE	Section 10 Nationwide No. 6 Survey Activities	JARPA	None
WDOE	401 Water Quality Certification	JARPA	None
WDOE	CZM Consistency Determination	Certification Form	None
WDFW	HPA	JARPA	None

Preparation of the sampling permit applications would take approximately 4 to 6 weeks depending upon internal and Port review time. Agency review of investigation permits can take approximately 2 to 4 months depending upon agency staffing and response time. Geotechnical investigations may also be required as part of the beneficial use site evaluation and design. This scope of work and associated fee estimate can be used as a reference to consider the level of effort that would be required to permit those investigations (if any) as well.

Task 1.9 Deliverables

- Draft Application Materials
 - Draft and Final JARPA application and drawings (up to ten 8.5-inch by 11-inch sheets)
 - SEPA Checklist
- Pre-Application conference call presentation and meeting summary
- Final Application Materials
- As-needed agency coordination documentation

**Task 1.10 - Project Topographic and Bathymetric Surveys (Solmar Hydro, Inc.)
(supports Task 1 and 2)**

Topographic and bathymetric surveys will be required to support the engineering design for Tasks 1 and 2. Topographic and bathymetric surveys will be needed to support the Task 1 structure replacement engineering design and the proposed dredging (Task 2) at Port of Ilwaco Marina and either a survey of the proposed beneficial use site or the upland disposal site near the marina will also need to be completed depending upon the preferred dredged material alternative (Task 2).

A bathymetric survey will be required for the proposed dredging at Port of Chinook Marina and either a survey of the proposed beneficial use site or the upland disposal site near the marina will also need to be completed depending upon the preferred dredged material alternative (Task 2).

The survey work for both sites can be completed with a single mobilization. For the purposes of this proposal and fee estimate, the surveys of the upland disposal sites are included as contingency to show the overall cost of the likely preferred alternative, the beneficial use disposal sites as that option would provide the most longterm use and benefit to the Ports if approved for their dredged material disposal sites.

The scope of work for the proposed surveys includes:

- POI Wharf topographic survey will be completed using a drone modified for surveys and ground survey tools to measure horizontal and vertical coordinates of the structures identified for replacement. The survey will include:
 - Measuring locations of existing buildings and utilities along with all of the elevations/grades.

- Collecting as much detail in the Safe Coast wharf as possible to facilitate successful interface with the bulkhead repairs
- Measuring existing piles in the water just off of the east bulkhead and at the SE corner of the Safe Coast wharf (to be completed via sUAV aerial imagery and georeferenced take-off)
- Measuring locations of utilities running under the access pier and onto the floats (to the extent feasible)
- Measuring location and dimensions of the access ramp abutment.
- POI and POC Marinas: high resolution multibeam bathymetric survey of the marina and proposed dredge area.
- POI and POC beneficial use sites: Survey will be completed using a single beam bathymetric data due to the shallow water depths in the area. This portion of the survey will be completed during high tide to maximise coverage of the shoreline. During survey operations, soundings will be collected to as shallow and as near the shoreline as can be safely completed (generally this means to water depths of approximately 1-2 feet below the sonar).
- POI and POC upland disposal site survey will be completed using a drone outfitted for this purpose if the upland disposal sites are identified as the preferred alternative (CONTINGENCY).

Task 1.10 Deliverables:

- Final data products at the Port of Ilwaco:
 - AutoCAD and PDF chart of the MBES marina data, SBES in-water disposal site data, wharf data, and upland disposal site data.
 - Individual datasets that will be provided will include ASCII XYZ text files, DEM of the MBES data, orthorectified imagery (from sUAV data), DEMs of the sUAV data.
 - AutoCAD file will include bathymetric and topographic contours (where applicable) and relevant planimetric features
- Final data products at the Port of Chinook:
 - AutoCAD and PDF chart of the MBES marina data, SBES in-water disposal site data, and upland disposal site data.
 - Individual datasets that will be provided will include ASCII XYZ text files, DEM of the MBES data, orthorectified imagery (from sUAV data), DEM of the sUAV data.
 - AutoCAD file will include bathymetric and topographic contours (where applicable)

Task 1 Assumptions and Limitations

We request that Port of Ilwaco provide available design drawings, bathymetric survey information, geotechnical reports and any legacy repair documentation, which will be needed for efficient execution of the engineering and environmental tasks.

General

- Port of Ilwaco will review all draft and final deliverables and will have one cycle of review to be completed within 10 working days of submittal receipt.
- The scope includes a single kickoff site visit for up to three MN staff, members of the design team and the project manager, This site visit will consist of a single 12 hour day.
- Design coordination meetings will be held via telephone/online.
- The scope assumes biweekly meetings for the first 6 months of Task 1 followed by monthly progress meetings for the remainder of the 12 months schedule. The meetings are assumed to be conference call or virtual in nature and attended by up to 2 MN staff.

East Bulkhead Replacement

- Due to the proximity of the Safe Coast Seafoods facility, coordination efforts with the Port and Safe Coast Seafoods has been included to determine the most desirable solution for all stakeholders. At the project

outset, the design concept for the site will be established at a design charrette meeting with the design team and the appropriate stakeholders. We have included a fee for the assumed level of coordination with the Port and stakeholders including the design charrette and subsequent coordination.

- We have assumed that the truck lane cannot be raised (in part or in entirety) as part of this project due to overall project scope, extents of the bulkhead replacement, and proximity of existing building, therefore we will design the bulkhead for phased improvements to accommodate future projects to address the remainder of the wharf.
- The roadway elevation will be raised to the maximum extent while still providing positive stormwater drainage away from the existing buildings. The reconstruction will not include storm drainage conveyance other than sheet flow.
- The top of the bulkhead wall elevation will be built to the proposed elevation accounting for sea level rise and will stand above the repaved roadway.
- No utility work will be performed at the bulkhead.

East Bulkhead and Fender Mooring System

- We have assumed that the berth would be for fair weather berthing only. The assumed fender system will consist of rubber fender units attached directly to the waterside face of the new bulkhead.
- Light duty mooring hardware will be installed on the new bulkhead wall to accommodate the design vessels.
- M&N will work with the Port to modify the mooring system design if a heavy-duty berthing solution is required for the Port's purposes. Such a system may require a more robust fender, sheet pile and anchor system, and a change in design approach and scope could be required. We have included a fee for the assumed level of coordination with the Port for determining the appropriate berthing and mooring system.

Shoreline Protection

- The shoreline will be protected with rock at a 2H:1V slope and will raise the crest (top) elevation to accommodate the effects of sea level rise.
- The typical section will consist of a rock bedding layer and armor stone.
- The upland site grading at the northeast of the East Bulkhead wall and around the West Access Pier will be seeded fill slope. The slope will drain to existing conveyance in Waterfront Way.
- No stormwater calculations are expected. Existing drainage patterns are being maintained without increased demand on existing systems. Any existing deficiencies in stormwater conveyance will remain post construction.

West Access Pier Replacement

- The paved walkway to the access pier will be reconstructed as an asphalt paved pedestrian walkway
- Existing utilities will be routed from the new access pier, under the gangway, and connect to the utilities on the float system. Utility reconnection at gangway will be replacement in kind. No calculations or capacity analysis will be performed. . One new light pole will be located on the new pier.

Environmental Permitting

- Additional field work (e.g., eelgrass or forage fish surveys, sediment quality assessment) and archaeological surveys and site assessments, which could be required to support permitting, are not anticipated for Task 1 at this time. If requested by the regulatory agencies, additional scope and fee may be required.
- The project will qualify for an exemption to the Shoreline Substantial Development Permit (SSDP) and State Environmental Policy Act review.
- It is assumed that a Section 401 Water Quality Certification and a Coastal Zone Management Consistency Determination (CZM) will not be required under a NWP #3.
- The project is assumed to be self-mitigating. If mitigation is required, additional scope and budget will be required.
- Scope and fee to support acquisition of any local City demolition or construction permits is not included at this time.

- The M&N Team will be designated as Port of Ilwaco's permitting agent for securing the required environmental permits. Completed permit applications will be signed by Port of Ilwaco.
- The scope assumes one round of Port review for the draft permit application submittal prior to finalization
- The scope assumes that all permit documents will be provided to the Port electronically.
- The scope assumes that all client and agency meetings associated with the permits will be virtual. In-person meetings may require as scope and fee amendment.
- The permitting scope assumes that agency consultation will be relatively straightforward. If agency or stakeholder consultation increases in complexity, the scope of work and fee estimate for the permitting task may need to be amended.

Geotechnical (GeoEngineers)

- Access to the site will be provided for geotechnical exploration personnel and equipment and facilitated through Port of Ilwaco and be arranged prior to our arrival at the site to conduct field explorations.
- Surface damage that will result from exploration activities is acceptable to Port of Ilwaco. We can discuss this item further with the project team if requested.
- A truck-mounted drill rig can adequately access the site without use of additional transporting equipment. Specialized track-mounted or limited access drilling equipment can be mobilized for additional cost if authorized.
- A vacuum truck will be required to clear each boring to a depth of 10 to 15 feet below ground surface. Buried structural elements or obstructions, if encountered, may result in additional time required to complete drilling operations which may result in additional Project costs. If delays during drilling are encountered due to buried elements, we will notify you and discuss how to proceed.
- Spoils from drilled boring explorations can be drummed and removed from the site.
- Contaminated soils will not be encountered during our exploration and sampling. If contaminated or suspected contamination is encountered (based on field screening), we will stop drilling operations, notify you and discuss how to proceed.
- No specialty permits, or archaeological testing provisions are required.

Site Topographic/Bathymetric Surveys

- SHI will have access to use the boat launch ramps at both the Port of Ilwaco and Port of Chinook
- A single mobilization is assumed.
- Data collection cost estimates have been prepared assuming tasks are completed on separate days; however, if weather and tide conditions cooperate, SHI will attempt to complete all tasks in as few days as possible, combining tasks on same days where feasible.
- Costs for weather delay and/or standby days have not been included.
 - Weather/Standby days will be determined by the SHI field lead and the M&N PM based on the observed weather conditions during surveying activities
 - Weather/standby days, if enacted, will be billed at 8 hour days, for 2 people, at \$110/hr each person. Equipment rates for leased equipment will be billed at the actual rental rate. Equipment rates for owned equipment, if equipment could be used on another project, will be billed at half normal rates.
 - Vessel captain will make the final decision regarding weather conditions for safe navigation and on-water survey activities.
- Horizontal data coordinate system will comprise NAD83/11 State Plane Coordinate System Washington South Zone with units in U.S. Survey Feet.
- Vertical datum will comprise the North American Vertical Datum of 1988 (NAVD88), using the Geoid12B model, and with units in feet.
- M&N will provide SHI with georeferenced digital files (e.g., DXF, SHP, KMZ) of all areas requiring survey prior to mobilization.
- Hydrographic data collection will only take place in areas that are accessible and safely navigable.

- Hydrographic surveys will be completed at as high a daytime tide level as possible
- In water disposal site surveys will be completed when wind and wave conditions allow for safe navigation and data collection
- The Port of Ilwaco Wharf sUAV survey will be completed at as low a daytime tide as possible to target overlapping data with the marina MBES survey
- sUAV data collection will be completed only during safe flying conditions (i.e., no active rainfall and relatively low wind conditions).

Task 2 Port of Ilwaco/Port of Chinook Marinas – Dredging and Beneficial Use – Engineering and Environmental Permitting

We understand that the Port's existing upland dredged material disposal areas are nearing capacity and the Port is evaluating various disposal alternatives to accommodate dredged material generated during future dredging activities at the Ilwaco and Chinook Marinas. The Port has an ongoing marina maintenance dredging program that generates approximately 30,000 cubic yards (CY) per year at the Ilwaco Marina and approximately 10,000 CY per year at Chinook Marina. The current upland disposal sites have capacity for two to three more cycles of maintenance dredging at those volumes.

The Port owns and operates a pipeline dredge used for maintenance dredging at both the Port of Ilwaco Marina and the Port of Chinook Marina. The existing sediment accumulation in both marinas is extensive and functional draft has been reduced. The ongoing annual maintenance dredging is therefore critical for the functions of the marinas which serve both recreational boating and commercial fishing operations.

We also understand the Port wishes to conduct a "capital" dredging event that will restore the navigational draft of the marinas to their design depths. This could reduce the frequency of future maintenance dredging. The capital dredging volume is estimated to be a total of approximately 450,000 CY¹ at the Ilwaco Marina and Chinook Marina, to be removed during a single dredging contract. These volumes cannot be accommodated at the existing upland disposal sites in their current condition.

Our scope is based on the conceptual alternatives study completed by Coast & Harbor Engineering [CHE]², and the preferred alternatives identified in the associated CHE Executive Summary³ as described below.

- Preferred Alternative #1 includes placement of the capital dredged material and future maintenance dredging at a nearby proposed beneficial use site that will be located to the northeast of the marinas.
- Preferred Alternative #2 includes removing the existing material stored at the Port's upland disposal site and transporting it by barge to one of the United States Army Corps of Engineers (USACE) disposal sites located near the entrance to Baker Bay; future maintenance dredging material will be placed at the restored upland site.

Our approach is organized to achieve early elimination of one of the alternatives during the initial stages of the work. Our approach scope of work generally consists of:

¹ This volume is based on 2013 bathymetry. Current bathymetry should be determined to verify the capital dredging volume and to serve as a base for the engineering design and permit drawings.

² CHE, 3 June 2019. "Technical Memorandum-Port of Ilwaco and Port of Chinook Engineering Study Solutions in Support of Maintenance Dredging."

³ CHE, 11 June 2019 Technical Memorandum – Executive Summary. "Port of Ilwaco and Port of Chinook Engineering Study/Solutions in Support of Maintenance Dredging."

- Refining the two preferred alternatives including verifying the conditions at the proposed disposal sites, along with confirming the material quantities and costs as assumed in the CHE studies.
- Completing alternative analysis to identify the “least environmentally damaging practicable alternative” (LEDPA) in accordance with USACE guidance (Section 10/ 404 b1). This alternatives analysis is expected to be critical to successful permitting and should include a discussion of past alternatives considered to further support approval of a final placement site.
- Developing the preliminary engineering design for dredging and disposal for the LEDPA.
- Developing federal, state and local permitting applications and additional studies for the capital dredging for the identified LEDPA disposal method.
- Completing a contract package for public bidding of the work including final design, engineering plans, specifications and cost estimate.

Task 2 Scope of Work

The following Tasks 2 through 4 will support the Port with selecting the LEDPA, preliminary and final design engineering, permitting, and associated baseline studies. Quality control for all work will be performed consistent with M&N’s Corporate Quality Manual.

Task 2.1 – Project Management

M&N will provide project oversight, schedule and budget management, and clerical support throughout design and permitting. Project management will include but not be limited to: M&N team coordination, progress communications at regular intervals, scheduling support and subconsultant management.

Task 2.1 Deliverables:

Deliverables will be provided in electronic format via email, including:

- Project schedule – An overall project schedule will be developed in Microsoft Project at the start of the project and will be updated monthly.
- Meeting notes – A summary of all internal project meetings and telephone conferences will be prepared and submitted to the Port.
- Billing – Invoices and associated back up documents- monthly.

Task 2.1 Assumptions:

- We assume most of the work will be completed and permit application materials will be submitted within approximately 12 months. Permit agency review and approvals will likely be completed within 18 to 24 months of submittal. Final engineering will be prepared after permit applications are submitted. We assume a total project duration of 24 to 36 months.
- Bi-weekly progress calls until permits are submitted and monthly thereafter until permits are approved (24 bi-weekly calls and 24 monthly calls).
- Our budget includes up to 1 meeting at the Port of Ilwaco to be attended by the project manager and one specialist. All other meetings are assumed to be virtual
- Meeting summaries will be provided in PDF format.
- Agency project meetings are included in specific tasks below.
- Monthly invoices will be submitted in PDF format.

Task 2.2 – Final Alternatives Analysis and LEDPA Selection

This task consists of reviewing and refining the two preferred alternatives to validate and further advance the concepts to the extent that a single LEDPA can be selected to move forward. The review will include the following:

- Capital dredging volume will be determined based on the new bathymetry (the existing volume information is based on 2013 bathymetric survey) and the desired dredging depths as assumed in the CHE studies, or as otherwise determined by the Port.
- Future maintenance dredging needs will be reviewed and verified using sediment accumulation data developed based on the 2013 survey, recent survey information, and available maintenance dredging records. Data collected during previous phases of work will be used by the coastal engineer (Mott MacDonald) to support the design development, development of the project survey base map, and to form the basis of design.
- The M&N team (including coastal engineer) will develop and compile a project survey base map for the purposes of identifying and documenting key project areas and features, property extents, navigation infrastructure, upland and in-water infrastructure, and existing site conditions.
- Cost estimates presented in the CHE studies will be verified and updated as appropriate based on the verified volume and current estimated dredging costs.
- Completing the USACE Section 404 b1 Alternative Analysis. Both of the “preferred” alternatives will be included. The analysis may also incorporate the conceptual alternatives as described in the CHE Technical Study to meet the 404b1 framework requirements. The approach and level of detail needed for the analysis will be coordinated with the USACE prior to proceeding.
- Coordination with USACE (Portland District), the Washington Department of Ecology (ECY), National Oceanic and Atmospheric Administration (NOAA) and other key regulators/stakeholders to present findings of the analysis, the LEDPA and verify the assumed path forward and permitting requirements.
- As part of the final alternatives analysis development, the two previously developed will be refined to achieve the project goals and criteria outlined in the BOD (Task 2.2.1) , while considering cost, operations, maintenance, and regulatory permit requirements in coordination with the Team’s environmental consultant. Alternatives will be refined to roughly a 10% design level, building upon the preferred alternatives assessment work previously completed. The refinement of the alternatives to be considered will include the following scope of work:
 - Site Assessment: A site visit followed by an initial coastal engineering analysis will be conducted to observe and determine the site-specific metocean criteria and geomorphologic conditions for use in designing the dredging prisms and beneficial use sites. Coastal processes analysis will likely consist of a combination of qualitative and quantitative engineering analyses, including review and analysis of previous modelling data, geomorphology, and coastal processes; limited wave modelling; review and analyse existing hydrodynamic models previously completed at the site and in the vicinity.
 - Development of a conceptual site model to align the project team on processes likely affecting the POI/POC marina areas and associated beneficial use sites.
- Preferred dredging prism layouts and beneficial use/upland placement sites (POI and POC) will be developed and may include combinations of various element alternatives within the assessment. Concept layouts will be developed in AutoCAD (Up to 6 sheets total).
- Class 5 capital construction cost estimates (+100/-30%) developed as part of alternatives refinement. will be tabulated and presented within the preferred alternatives report.
- Alternatives will be presented in schematic format within a PPT for Consultant Team and Port review
- The preferred alternative will be selected in coordination with the Port and justification will be documented as part of the preferred alternatives report.

2.2.1 Alternatives Analysis - Basis of Design

The M&N team's coastal engineer, Mott MacDonald, will develop the Basis of Design (BOD) technical memorandum to document project requirements and agreed design criteria for both the POI and POC dredging and beneficial use sites. The BOD is a living document and will be maintained by Mott MacDonald throughout the duration of the design phases described herein in coordination with the M&N Team and the POI/POC. Selection of design parameters such as environmental conditions, design vessel(s), horizontal and vertical dredging limits, geotechnical site characteristics, offsets, slopes, constructability factors, anticipated construction equipment mix, and other parameters will be documented within the BOD.

Task 2.2 Deliverables:

- Project Survey Base Map in .pdf format, incorporating new elevation and eelgrass survey (if applicable) data.
- Basis of Design Memorandum in .pdf format
- Technical memorandum summarizing the results of the refined capital volume and accumulation rate verification analysis
- 10% Concept CAD Drawings
 - Conceptual-level plans and sections indicating anticipated dredging prisms and beneficial use and/or upland placement site design at the POI and POC for the selected, preferred alternative(s).
- AutoCAD 11" x 17" format plans and sections (up to 3 sheets per site).
 - Class 5 (+100/-30%) level cost estimate and construction schedules for the preferred alternative(s).
- Meeting minutes summarizing input from USACE and other key agencies regarding the Section 404b1 alternatives analysis requirements.
- 404b1 Alternatives Analysis Summary Report identifying the LEDPA.
- Meeting minutes from agency coordination after reviewing the completed alternatives analysis and LEDPA selection.

Task 2.2 Assumptions:

- The Port will provide available information regarding maintenance dredging volumes and costs, including previously prepared cost estimates.
- Coordination of the alternatives analysis and presentation of the results with USACE will consist of two 1-hour conference calls to be attended by the M&N project manager and up to two specialists.
- M&N will coordinate the call and prepare appropriate materials (agenda, presentations and/or other pre-call submittals).

Task 2.3 – Coastal and Dredging Engineering (Mott Macdonald)

The following tasks summarizes the coastal and engineering services that will be provided to support the project. These tasks include :

- Data collection and compilation
- Conceptual-level (10%) engineering analysis and design updates
- Preliminary-level (30%) engineering analysis and design
- Permitting support, AND
- Final engineering analysis and design (Task 3).

Conceptual level engineering analysis is included to align the Port and M&N consultant team on concept alternatives which are needed for developing the sediment sampling to support dredging permits. The scope of work for Task 2.3 is summarized below.

Subtask 2.3.1. Basis of Design Update

The BOD is a living document and will be updated through completion of the final design phase. The BOD memo will be updated to document project requirements and agreed upon preferred alternatives.

Subtask 2.3.2. Preliminary Engineering Analysis and Design

Upon refinement and selection of the preferred alternatives, the coastal engineering team, Mott MacDonald, will complete the preliminary engineering design (30% design level) of each project element. This work will consist of evaluating anticipated construction methods and configurations of the project elements to provide baseline information for developing permit application documents and for estimating construction costs. Engineering analysis and computations will be conducted to develop and refine cross-sectional and plan view geometric requirements for each location, including preliminary-level details for dredging prisms and beneficial use/upland placement sites. The results of previous work tasks will be used as the basis for performing the preliminary engineering design.

Preliminary engineering (30%) analysis and design work includes the following:

- Engineering Analysis
 - Additional engineering analysis that is required to revise dredge prisms and beneficial use site/upland placement site design at the POI and the POC
 - Update numerical models to incorporate revisions to the preferred alternatives.
 - Update sedimentation estimates based upon preferred alternative layouts associated with the dredging prisms and/or beneficial use sites at the POI and/or POC.
- Preliminary Design
 - Develop dredging plans, sections, and associated details.
 - Develop beneficial use site/upland placement site plans, sections and associated details.
 - Develop a quantity and construction cost estimate for each site at the Class 3 (+50%/0%) level of project definition.
- Permitting Review and Technical Narrative
 - Review construction requirements for all proposed in-water work for development of permit application project description.
 - Coordinate with permitting lead and develop a technical project description for use in the permit application documents summarizing design details including construction methods, materials, time requirements and temporary use of the site for locations located below Ordinary High Water for the purposes of documenting potential impacts during construction.

Task 2.3.2 Deliverables:

- Basis of Design Update
- PowerPoint presentation summarizing preliminary engineering design.

TASK 2.3.3 INFRASTRUCTURE INVENTORY AND RISK MATRIX (GeoEngineers and M&N)

GeoEngineers will support Moffatt & Nichol in developing an infrastructure inventory and risk matrix at both the POI marina and the Port of Chinook (POC) marina. This will include coordination with POI and POC to obtain as-builts, historical information, and other project area information to develop minimum offset from existing structures for the dredge prism as well as providing other specific geotechnical recommendations for construction.

Task 2.3.3 Deliverable:

- Infrastructure Inventory and Risk Matrix

Task 2.4 – Additional Required Studies

Various additional studies will be required depending on which alternative for the dredged material disposal is selected. The assumed studies needed for each preferred alternative are shown in the table below. It is possible that the additional study requirements could change after the LEDPA is determined and more details about the project are known.

Assumed Potential Additional Studies for the LEDPA

Potential Site-Specific Additional Studies	Selected LEDPA	
	Alternative #1 (Beneficial Use at New Shoreline Nourishment Site)	Alternative #2 (Restore existing disposal site capacity w/ disposal of existing stored material at an established USACE open water disposal site)
Hydraulic Analysis	Sediment fate and transport analysis.	Not applicable
Baseline Habitat Studies	Ordinary High-Water Mark (OHWM) determination, aquatic vegetation survey (eelgrass/macroalgae).	Not applicable
Beneficial Use or Disposal Site Survey	Survey the proposed beneficial use site and the existing marina conditions.	Survey existing upland disposal site and the existing marina conditions.
Section 408 Analysis	Analysis of potential impact of dredged material disposal at the beneficial use site on the federal navigation channel.	Not applicable
Dredged Material Characterization (Task 2.4.1)	Characterize material to be dredged during "capital" dredging. The work includes developing a Sampling and Analysis Plan (SAP), sampling, chemical analysis, sediment characterization report (SCR).	Characterize material to be dredged during "capital" dredging. The work includes developing a SAP, sampling, chemical analysis, SCR. May also need to characterize existing material at the upland disposal sites to be removed/transported to existing open-water disposal site. A contingency of \$30,000 is included for characterization at each upland disposal site. The scope of such characterization will need to be refined after the LEDPA is identified and consultation with the agencies has commenced.
Beneficial Use or Disposal Site Use Authorizations	Land leases and use authorizations will be required for use of State, City and Port-managed lands and placement of dredged material at the proposed beneficial use sites.	Disposal authorization by the USACE is required for using an established open-water disposal site.

Hydraulic analysis, if required, will be completed by the M&N team's coastal engineer, Mott Macdonald. Cost estimates to complete eelgrass and critical areas/wetland surveys, if required, are included in our cost estimate as subcontracted surveys to be completed by GeoEngineers. The survey cost estimates are provided by site but the provided fee estimates assume that surveys of the Ilwaco and Chinook dredge and placement sites would be completed with one mobilization.



Similarly, cultural resources surveys may be required by the permits for the proposed work at each of the sites. The cost estimates for the subcontracted (Willamette Cultural Resources) survey(s) are provided by site but the fee estimates were provided with the assumption that the surveys will be completed with one mobilization.

Task 2.4 Deliverables:

The deliverables will depend on which preferred alternative is identified as the LEDPA.

Preferred Alternative #1

- Bathymetric survey of beneficial use site
- OHWM Map
- Hydraulic Analysis Summary Report
- Baseline habitat survey
- Section 408 Checklist
- Section 404b1 Alternatives Analysis
- Dredged material characterization of marina sediment- SAP and Report
- Land lease/site use authorization documents coordination

Preferred Alternative #2

- Upland Disposal Site Survey
- OHWM Map
- Dredged Material Characterization- SAP and Report (if required)
- 404b1 Alternatives Analysis (if needed)
- Disposal Site Use Authorization documents coordination

Task 2.4 Assumptions:

General

- Baseline/additional analysis needs for the identified LEDPA will be confirmed with the USACE and other agencies before the studies begin.
- The topographic and bathymetric survey results from Task 1.10 will be used to support the environmental permit applications for the preferred alternative.
- All studies assume a single mobilization to complete studies at the Port of Ilwaco and Port of Chinook sites.

Wetland/Critical Areas/Macrovegetation Survey Assumptions

- We assume that the scope outlined above will take place over the course of 14 months.
- We assume that Task 2 outlined above will be limited to the capital dredge portion of overall project.
- We assume that the Critical Areas Survey and Macrovegetation Survey will occur at the same time to minimize mobilization and field personnel needed to accomplish each survey. Mobilization and Demobilization costs are factored into the Macrovegetation Survey cost estimate. Should the surveys be separated in time, additional Mobilization and Demobilization cost will need to be scoped in order to accommodate the separation.
- We assume 2 days of survey time for various personnel for both the Critical Areas Survey and Macrovegetation Survey.
- We assume we will encounter one large emergent marsh wetland within the proposed beneficial reuse area adjacent to the Ilwaco marina and potentially one small wetland within the proposed beneficial reuse area adjacent to the Chinook marina.
- We assume that one volunteer wetland scientist from Moffatt & Nichol will be available to assist with Critical Area Survey/Wetland delineation activities.
- We assume that each survey report will require one draft and one final submission version to accommodate review comments from Moffatt & Nichol.

- We assume that no eelgrass or other SAV will be present in the marina footprint and that a majority of the macrovegetation survey effort will be directed at the potential beneficial reuse site(s).
- No advanced macrovegetation survey activities have been scoped as a part of this proposal. Should eelgrass or other SAV be encountered, it may be necessary to scope additional diver-based surveys to quantify potential project impacts. This should be scoped at a later date if eelgrass or other SAV is encountered and once a conceptual design is in place. This will help target our survey efforts and minimize scope.
- No mitigation planning has been included with the above scope and can be added at a later date once project specific impacts have been identified. Once the baseline habitat surveys, project designs are advanced, we can provide an addendum to this scope of work to assist in mitigation planning for the project.

TASK 2.4.1 Port of Ilwaco and Port of Chinook Marina Sediment Characterization

M&N understands that the Port of Ilwaco and Port of Chinook needs to conduct a one-time capital maintenance dredging event to remove accumulated sediments to restore appropriate drafts for vessels that use the facility.

The Port of Ilwaco marina is located within Baker Bay on the northern shore of the Columbia River in Ilwaco, Washington. The Port of Chinook marina is located on the southeast side of Baker Bay on the northern shore of the Columbia River in Chinook. The USACE maintains the Chinook channel from the Columbia River as well as the entrance channel to the Chinook marina. Sediment characterization and project permitting will be required.

We understand the project consists of dredging the existing marinas to the design dredge depths (Port of Ilwaco: -10 feet Mean Lower Low Water [MLLW] in the moorage areas and -16 feet MLLW in the entrance channels; Port of Chinook: -10 ft MLLW and -8 feet MLLW plus 1 foot of allowable overdredge in all locations).

M&N staff will collect surface grab samples while using the Port's support staff and vessel for sample collection. Preliminary discussions with the PSET Sediment Lead have supported our approach of surface grab samples. However, areas in the Port of Ilwaco marina that have not been dredged in the last 10 years will require vibracore sampling.

The Port has historically used upland placement for dredged material disposal. We understand the Port is evaluating permitting a new in-water/nearshore beneficial re-use site for the placement of dredged materials.

Sediment quality will be characterized within the marina at both Port of Ilwaco and Port of Chinook with respect to suitability for in- water placement/nearshore beneficial use and in accordance with SEF protocols and guidance.

This scope and fee is based on a Port dredging need total volume of 450,000 cubic yards at the Ilwaco marina and 70,000 cubic yards at the Chinook marina. The navigation and entrance channel within Baker Bay have been characterized by the USACE. The task includes the following:

- Conducting a 1-hour kickoff meeting with the Port to verify its dredging needs, timelines, and availability. We assume this meeting will occur via teleconference.
- Preparing a Joint Aquatic Resource Permit Application (JARPA) for submittal to WDFW to complete sediment sampling.
- The 30% engineering design and associated analysis of the dredge areas at the Ilwaco and Chinook Marinas will be used to develop the sediment Sampling and Analysis Plan (SAP) documentation and subsequent sediment sample collections and chemical analysis. Pertinent dredging engineering analysis and conceptual-level design sub-tasks include, but are not limited to, the following:
 - Review and incorporate results of sedimentation analysis.
 - Develop horizontal and vertical dredge prism limits and slope stability analysis.

- Conduct volumetric analysis and evaluate potential over-dredge limits.
 - Assess potential dredged material placement options in accordance with the preferred alternatives.
 - Analyze sediment mobility of alternatives using the site wave model and empirical sediment incipient motion and transport formulations
 - Review constructability, dredge production estimates, and develop a cost assessment for incorporation into a Conceptual-level cost estimate at a Class 5 level (+100%/-30%). Cost assessments will incorporate a review of the Port owned dredger and ancillary equipment.
- Completing a SAP for review and approval by the Port and by the PSET prior to sampling activities. Collecting nineteen grab samples (15 sample stations at Port of Ilwaco marina and 4 sample stations at Port of Chinook marina) using a Van Veen sampler. The sampling methodology and number of samples is based on our understanding of the site conditions and SEF requirements. The number of samples and/or the sampling methodology are subject to change during the SEF review process. We will work with the Port to arrange the use of a vessel for sampling and to schedule staff to assist sampling efforts.
 - Collecting and archiving sample material for bioassays, if needed, based on the results of the chemical analysis of the samples. Costs for bioassays are not included in our estimate at this time.
 - Submitting six composite sediment samples for chemical analysis of SEF criteria.
 - Completing a sediment characterization report summarizing the sampling activities and results with respect to SEF criteria.
 - Submitting the sediment characterization report for review and development of a dredged material disposal suitability determination.
 - Providing additional technical support during the PSET's suitability determination review, as needed.

Task 2.4.1 Assumptions/Exclusions

- Both marinas are ranked "low," per SEF rankings and will be considered six dredged material management units (DMMUs) and six chemical analyses will be needed. We assume the total amount of sediment to be dredged is 450,000 cubic yards or less.
- Up to two (2) dredge prism alternative concepts per marina location (POI and POC) will be developed.
- Up to two (2) beneficial use site alternative concepts per marina location (POI and POC) will be developed.
- Up to two (2) upland disposal site alternative concepts per marina location (POI and POC) will be developed.
- The PSET will require vibracore samples at the Port of Ilwaco marina in areas that have not been dredged in the last ten years. Vibracores are not included in this scope of work, however a contingency budget has been provided to complete the vibracore sampling if it is required.
- We anticipate the sediment sampling can be completed in one work week barring extreme weather conditions and other unforeseeable circumstances that may extend the sampling effort. Delays or extensions caused by inclement weather, etc., will be discussed with the Port and additional budget may be required to complete the sample collection.
- Sediment characterization will include all chemicals of concern regulated by the SEF. Chemical analyses will be conducted by Apex Laboratory in Tigard, Oregon. We will archive samples for bioassay testing. Bioassay testing is not included in this scope of work. We assume that dioxin testing will not be required because of the lack of sources in the project area. This assumption is subject to approval by PSET.
- M&N will coordinate with the Port and consult directly with PSET agencies during SAP development.
- The Port will require one round of review for the draft SAP and draft characterization report prior to finalizing and submitting the documents to the PSET.
- The agencies will require one round of review and comments prior to approving the SAP and the final sediment characterization report.
- A current bathymetric survey will be completed for each site.

Task 2.4.1 Deliverables

- Draft SAP (PDF document by e-mail to the Port) and final SAP (PDF to the Port and the PSET)
- Draft and final sediment characterization report (PDF to the Port and the PSET).
- Draft and final sediment sampling JARPA (PDF to the Port and WDFW).

Task 2.5 – Preferred Alternative -Environmental Review and Permits

We assume new federal, state and local environmental reviews and permitting will be required to complete capital dredging to the design dredge depths (-10 feet Mean Lower Low Water [MLLW]) in the moorage areas and -16 feet MLLW in the entrance channels) and the identified LEDPA for dredged material placement or disposal. The permits required for both alternatives are essentially the same and the capital dredging can be completed with permit modifications as described below. We discuss the permit path for Alternative # 1 (beneficial use sites) in more detail in Task 2.5.1 and summarize the permitting for Alternative #2 in Task 2.5.2. Our scope of services assumes the reviews, permits, approvals and supporting studies listed in following table will be required. M&N will coordinate with the USACE and other involved agencies in a pre-application meeting to be held at the USACE Portland District headquarters prior to permit submittal.

Required Permits, Approvals, Application Needs and Supporting Studies

Agency	Reviews/Permit	Application Requirements	Supporting Studies
Federal			
USACE	Rivers and Harbors Act/Section 404 Clean Water Act	JARPA	Preliminary engineering; permit drawings; dredged material characterization
USACE	Section 404 (b) (1) Clean Water Act	Alternatives Analysis	Alternative descriptions, figures showing concept of each alternative.
USACE	Section 408	408 Checklist	Hydraulic analysis
NOAA; NMFS	Section 7 ESA and Magnuson Stevens Act (MSA) Consultation	JARPA	BE and EFHA
USFW	ESA and MSA Consultation	JARPA	BE and EFHA
Washington State Historic Preservation Office (SHPO)/Tribal Historic Preservation Office (THPO)	Section 106 National Preservation Act	Cultural Resources Review	Cultural Resources Study
PSET	SD	Sediment Sampling	Current POI SD expires November 2022; POC SD expires June 2023
State			
WDFW	HPA)	JARPA	Site surveys; OHWM
Washington DNR	Project Authorization and Right of Entry (ROE)	JARPA	Plans and Specifications for Dredging and Placement, survey, dredged material characterization
	Lease Agreement	Survey for Lease	Survey for Lease (Alternative 1)
WDOE	Clean Water Act Section 401 Water Quality Certification	Water Quality Monitoring Plan	Dredged material characterization
WDOE	CZM Consistency Determination	CZM Consistency Form	None

Agency	Reviews/Permit	Application Requirements	Supporting Studies
Local			
City of Ilwaco	Washington SEPA Review	SEPA Checklist	As noted in other permit descriptions.
City of Ilwaco	Shorelines/Land Use Substantial Development /Critical Areas permits (Type III review)	Shoreline/Land use/Critical Areas Applications	Biological Evaluation, eelgrass survey (Alternative 1); critical areas report
City of Ilwaco	Lease/Agreement for use of beneficial use site	To be determined (TBD)	Survey for Lease (Not applicable to Alternative 2)
Port of Ilwaco	Lease/Agreement for use of beneficial use site	TBD	Survey for Lease (Not applicable to Alternative 2)
Tribal Consultation Interested Tribes may include: Quinault Indian Nation, Yakama Nation, Confederated Tribes of the Umatilla Indian Reservation, and Nez Pierce Tribe.	Native American Tribal Consultation	The Tribes will have commenting authority on State and Federal permit application materials.	Additional studies may be requested by the Tribes.

Task 2.5.1 Alternative #1 Capital Maintenance Dredging and Beneficial Use Placement Site Permitting

The Port of Ilwaco and the Port of Chinook are both already permitted for maintenance dredging and for upland placement of the dredged material. Both Ports propose to complete a one time capital dredge event and to add a nearshore beneficial use placement site to their dredging program. The purpose of the beneficial use site is to provide a location for placement of both the capital dredging material and future maintenance dredging material found to be suitable for beneficial reuse.

The project will require a modification to each of the Port’s current Corps Permits⁴, Hydraulic Project Approval (HPA), 401 water quality certificate, a SEPA addendum and shoreline permits to allow for the capital dredge event and the nearshore beneficial reuse of the dredged material. Each of the Port’s current dredge permits will be modified concurrently.

Our scope of services will include the following.

- Meet with U.S. Army Corps of Engineers (Corps) Dept. of Civil Works by video conference to discuss the proposed beneficial use sites at each Port.
- Develop rationale and memorandum supporting a request for modification of the Corps permit⁵, HPA, Section 401 water quality certification, SEPA addendum and shoreline approvals. The memo will provide justification to complete the one-time capital dredge event and rationale to support beneficial use of the dredged material for authorizations under sections 404 and 401.

⁴ Per a telephone conversation with the Corps Project Manager (Brad Johnson) on 30 September 2021, the existing Individual Permit for each Port would need a “major modification” to add a one-time capital dredge event and a new nearshore beneficial use placement site. Mr. Johnson indicated that the Ports should consult with the Corps’ Department of Civil Works very early regarding the two proposed nearshore beneficial use sites. He also indicated that mitigation will most likely be required for the two nearshore beneficial use sites.

⁵ One modification request for each dredge permit (Ilwaco marina and Chinook marina).



- All agency meeting - conduct an all-agency meeting (by video conference) to discuss the project with agency representatives prior to application submittal to convey the project description and schedule and hear agency concerns/questions.
- A Biological Evaluation Addendum to address potential effects to species and critical habitat listed under the Endangered Species Act (ESA), priority species of interest to WDFW, and potential effects to water quality.
- Prepare the necessary materials and supporting documentation for the application for amendments or additional permits to conduct the capital dredging/nearshore beneficial use placement [e.g. shorelines materials/applications/narrative/public hearing, Section 408 Checklist for submittal to Corps Navigation group and coordination with Washington Department of Natural Resources (DNR)].
- Coordinate with the Port to obtain DNR, City, and Port land lease and use authorizations for use of the beneficial use sites.
- Coordinate a subcontracted eelgrass survey, critical areas study and cultural resources study at the proposed beneficial use sites.

2.5.1 Deliverables

- Pre/Post Agency Coordination
- Draft permit modification request letter (electronic) for review by the Port
- Final permit modification request letter (electronic) for submittal to the USACE, Ecology and WDFW
- Draft BE addendum (electronic) for review by the Port
- Final BE addendum for submittal to the USACE and WDFW
- DNR right of entry application
- Draft SEPA Checklist Addendum (electronic) for review by Port
- Final SEPA Checklist Addendum (electronic) for submittal to the Port responsible official (Port of Ilwaco) and to Pacific County (Port of Chinook)
- Section 408 Checklist
- Draft and Final City and County shoreline narratives and application to be submitted electronically.
- Coordination with the Port and beneficial use site parcel owners to obtain site lease/use authorizations.
- Attending/presenting at a shoreline hearing.
- Water Quality Monitoring Plan
- CZM Consistency Form
- Eelgrass Survey Report (GeoEngineers)
- Critical Areas Report (GeoEngineers)
- Cultural Resources Report (Willamette)

Task 2.5.2 Alternative #2 Capital Maintenance Dredging and Upland Disposal Site Rehabilitation/Use Permitting

The Port's upland disposal site is nearing capacity and will soon not be able to accommodate additional maintenance dredging episodes. Rehabilitating the upland disposal site for future use by transporting the sediment stored there to one of the open water disposal sites located near the mouth of Baker Bay will be evaluated as one of the preferred alternatives during the alternatives analysis to be completed as required for Section 404(b) consultation. If the upland disposal site (Alternative #2) is the preferred alternative, consultation with PSET will be required and additional characterization of the stockpiled material could be required due to the amount of time that has passed since it was originally characterized. The USACE, WDFW and Washington State Department of Ecology will also be consulted to evaluate requirements by those agencies if, any. Given that the existing disposal sites are permitted and managed by WA DNR and the material to be moved to the sites is previously dredged material, the consultation with agencies outside of PSET is likely to be limited as the action

will be primarily within their and DNR's jurisdiction. The regulatory agencies will likely require approximately 12 to 18 months to review the permit application submittal, including additional required studies, and approve the permits for Alternative #2. M&N will work with the Port to engage the agencies in early consultation during completion of the Alternatives Analysis and prior to identifying and finalizing a preferred alternative to evaluate the regulatory requirements of this alternative.

The permitting for Alternative #2 may be managed with permit modifications as noted under Task 2.5.1. The required permits and deliverables are essentially the same though aquatic lands lease will not be required under this option. DNR Site Use Authorization will be required for any material currently stored at the upland disposal sites that will be placed at previously authorized open water disposal site to rehabilitate the capacity of the upland disposal sites. Coordination with the agencies will also be much as described for Alternative #1 under Task 2.5.1.

Task 2.5.2 Deliverables:

Deliverables will include draft and final versions of each of the documents listed below, provided in electronic Microsoft Word and PDF format for one cycle of review (at each stage) by the Port. One electronic copy and one hard copy of the final documents will be provided to the Port and to the appropriate regulatory agencies.

- Presentation and materials for the agency pre-application meeting and a summary
- JARPA and drawings (up to ten 8.5-inch by 11-inch sheets)
- BE and EFHA
- SEPA Checklist
- Shoreline/Land Use Substantial Development Application
- Critical Areas application
- Dredged material characterization SAP and results report
- 404 b 1 Alternatives Analysis - Task 2.2
- CZM Consistency Application
- Critical Areas Report
- Cultural Resources Study (if required)
- Surveys will include bathymetric survey of the marina and topographic survey of the upland disposal site.
- Eelgrass/aquatic vegetation survey report (if required)

Task 2.5 Assumptions:

- A modified Corps permit, HPA, Water Quality Certification, a SEPA addendum and shoreline permit(s) are required because the proposed dredge volume and method of dredged material placement was not identified in the existing maintenance dredging permits.
- The BE Addendum will be limited to assessing the effects of nearshore beneficial use placement on ESA listed species and habitat.
- The Port's SEPA determination is assumed to be a Mitigated Determination of Non-Significance.
- The project deliverables for each Port will undergo one review and revision cycle.
- The scope includes eight half-hour agency phone calls with the Washington Department of Ecology (Ecology), National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), DNR and the Corps, and four half-hour phone calls with Port of Ilwaco/Port of Chinook.
- The Section 408 checklist will be submitted electronically to the Corps. Note: If the 408 checklist triggers a 408 analysis additional budget will be required.
- The fee for this scope assumes that the two dredge permits (Port of Ilwaco and Port of Chinook) will be modified concurrently therefore the hours allotted to certain tasks/deliverables (e.g. coordination meetings,

BE addendum, SEPA addendum, 408 checklist, water quality monitoring plan) are reflective of time saved by completing them at the same time.

- M&N will monitor the review process and coordinate with the Agencies.
- This scope and cost do not include permit application fees.
- Compensatory mitigation will likely be required by the Agencies for the effects to the nearshore beneficial use sites. A preliminary budget has been provided for mitigation; Additional budget may be required depending on how much mitigation is required by the Agencies.
- The project will require dredged material characterization for the capital dredging and may require characterization of the material currently stored at the upland disposal site.
- Renewing maintenance dredging permits is not included in our scope at this time.
- The Port will lead coordination with the city for shorelines permitting. Our shorelines permitting support will consist of completing application materials, providing technical support to City comments/questions.
- This scope assumes that a public hearing will not be required for the Shoreline permit modification. If additional consultation and/or hearings are required, the scope and fee for this task may need to be amended.
- The City of Ilwaco will issue a Critical Areas Exemption for the project.
- Background information and study reports, if available, will be provided by the Port of Ilwaco/Port of Chinook. This may include existing geotechnical, environmental, hydraulic/hydrodynamic and/or permit documents that may provide pertinent site condition or background information.
- This scope assumes an 18 to 24-month agency review period after the permit applications are submitted to the agencies.

Task 3 – Final Engineering Analysis and Design – Preferred Alternative

Final engineering analysis and design documents will be prepared for bidding once the permitting process has proceeded far enough to ensure the project permits will be issued without major changes in scope or requirements for construction. This is typically conducted upon completion of the federal Section 7 ESA consultation. Deliverables would be provided at 50%, 90% and 100% milestones for Port review and comment. Specifications will be provided in standard CSI format. Cost estimates will also be provided at the aforementioned final design milestones.

- Final Engineering Analysis
 - Perform refinements and additional engineering analysis that may be required to revise dredge prisms and beneficial use site/upland placement site design at the POI and the POC.
- Final Design
 - Develop the technical specifications in CSI format at the 50%, 90%, and 100% (For Bid) milestones. Division 00 and Division 01 specifications and all boiler plate documents will be provided by the Port for review by Mott MacDonald.
 - Develop dredging plans, sections, and associated details at the 50%, 90%, and 100% (For Bid) milestones.
 - Develop beneficial use site/upland placement site plans, sections, and associated details at the 50%, 90%, and 100% (For Bid) milestones.
 - Develop construction cost estimates for each site at the 50%, 90%, and 100% (For Bid) milestones.
- Coordination

- Coordinate with other disciplines (structural, geotechnical, and environmental) throughout the final design phase.
- Bidding Support
 - Up to 30 hours of bidding support is included. Bidding support includes the following:
 - Attendance (virtual) at a pre-bid meeting.
 - Response to RFI's.
 - Development of up to one (1) Addendum to the Contract Documents.

Task 3 Deliverables:

- Dredging Plans, Specifications and Cost Estimates (50%, 90%, and 100% (For Bid)).
- Final Basis of Design

Task 3 Assumptions

- Existing Data. Mott MacDonald will compile all existing, readily available data available for use in conducting the work described herein, inclusive of existing elevation survey data collected during previous phases of work.
- New Data. Geotechnical, eelgrass (if required), and elevation survey work will be performed by others. Mott MacDonald will assist M&N in developing the elevation survey area extents for both the POI and POC dredging, upland disposal, and beneficial use sites.
- Design Deliverables.
 - Preliminary design deliverables of 8.5x11 JARPA format drawings and sections of technical narratives are assumed to be sufficient for the POI/POC to submit permit applications to the applicable regulatory agencies.
 - It is assumed that two (2) JARPA application packages will be developed for this project.
 - One application package will be developed for in-water sediment sampling and chemical analysis and one for the project, inclusive of the Task 2 (Mott MacDonald) works at both the POI and POC.
 - Full size detailed drawings for grading and/or building permit approval will be developed during the final design phase.
- Alternative Assessment. Exclusions.
 - Engineering design for mitigation projects is not included in this scope of work, as none is yet identified.
 - Dredged material disposal: Sediment fate modeling assumed to not be required.

Task 4 – Base Map and Preliminary Landscape Design Services, Contingency. (J.A. Brennan Associates) – Contingency

This task provides preliminary support for the Port a base map that can be presented to the Port commission or other stakeholders as well as preliminary design services for landscape elements (up to two schematic landscape design plans) in the project site area between Port of Ilwaco Marina's Safe Coast Seafood and the West Gangway access pier. This scope is provided as a contingency item, as needed. The contingency for this item is \$8,250.00.

Potential Other Future Task(s)

Sediment Fate Modelling at Beneficial Disposal Site (not included in fee estimate)

Our team has the expertise to provide the additional following tasks, as needed, if the Port should require them. These items are not included in our existing scope and fee but can be added to our scope under an amendment if they are requested by the Port.

- Leverage existing Columbia River circulation models and develop model grid
- Perform cursory validation of the hydrodynamic model
- Perform hydrodynamic modelling during typical conditions and storm conditions
- Analyze mobility of sediment using empirical formulations.
- Develop refined 2D/3D sediment transport model with high resolution at the site
- Perform sediment transport modelling for typical and extreme conditions (2-year, 50-year events)
- Evaluate pathways and magnitude of sediment transport and perform qualitative validation relative to observed sediment transport patterns. Confirm suitability for evaluating dredge prism alternatives, and other alternatives, to minimize the need for maintenance dredging

Anticipated Schedule

Task 1 anticipated duration is approximately 12 months. Task 2 anticipated duration is approximately 24 to 35 months. Both of the task durations include estimated regulatory agency consultation and permit application review time. A preliminary schedule is provided in Attachment 2. The project schedule will be updated during the project kickoff meeting and updated monthly or as needed as the project progresses and the preferred alternative is identified.

Fee Estimate

We propose to complete the scope of work on a time-and-materials basis. This scope will need to be confirmed at project startup and as agency guidance regarding the alternatives analysis and additional study needs are verified. The estimated labor costs for each task are shown in the tables below along with direct (reimbursable) costs and estimated subcontractor services. A detailed fee estimate is included as an attachment. The overall total for project Tasks 1 and 2, assuming Task 2 Alternative 1 and excluding contingencies, is estimated to be \$1,109,090.

The total fee for Task 1 is estimated to be \$544,721, excluding contingencies listed below.

Task 1 - POI Structure Replacement Estimated Project Fees

Task Description	Fee Estimate
Estimated Labor Costs	
TASK 1.1 – Project Management & Meetings	\$40,090
TASK 1.2 – East Bulkhead Replacement	\$161,890
TASK 1.3 - East Bulkhead Fender Mooring System	\$57,250
TASK 1.4 – Shoreline Protection	\$28,230
TASK 1.5 – West Access Pier Replacement	\$84,395
TASK 1.6 – Bid Support	\$29,050
TASK 1.8 – Environmental Permitting – Structure Replacement	\$20,616
Estimated Subcontracted Services Costs	
Task 1.7 Geotechnical Engineering (GeoEngineers)	\$80,294
Task 1.10 Project Topographic and Bathymetric Surveys (Solmar Hydro, Inc.) ¹	\$41,956
Estimated Other Direct Costs	
Mileage (engineer and PM site visit)	\$200
Meals	\$150
Lodging	\$600
Total Fees	<u>\$544,721</u>
Contingency	<u>\$20,348</u>
<i>Task 1.9 Environmental Permitting – Geotechnical Investigation</i>	<i>\$4,848</i>
<i>Task 1.10 POI/POC Upland Disposal Site Survey (Solmar)</i>	<i>\$8,000²</i>
<i>Task 4 Base Map and Preliminary Landscape Design Services (JA Brennan)</i>	<i>\$7,500</i>

¹ Surveys task supports both Tasks 1 and 2.

²Assumes both upland disposal sites can be surveyed in a single day and all survey work will be completed with a single mobilization and demobilization (including bathymetric surveys).



The total fee for Task 2 is estimated to be \$564,369, excluding contingencies listed below.

Task 2 Estimated Project Fees

Task Description ¹	Preferred Alternative	
	1	2
Estimated Labor Costs		
TASK 2.1 – Project Management		\$37,240
TASK 2.2 – Final Alternatives Analysis and LEDPA Identification		\$13,888
Task 2.3.3 - Infrastructure Inventory and Risk Matrix		\$4,384
TASK 2.4 – Additional Required Studies ²		\$43,022
TASK 2.5.1, 2.5.2 – Environmental Review and Permitting – Preferred Alternative	\$119,340	\$57,886**
Task 3 Final Engineering Analysis and Design – Preferred Alternative		\$2,650
Estimated Subcontracted Services Costs		
Task 2.2.1 Alternatives Analysis BOD (Mott MacDonald)		\$85,820
Task 2.3 Coastal Engineering (Mott MacDonald) -30% design		\$55,958
Task 2.3.3 Infrastructure Inventory and Risk Matrix (GeoEngineers)		\$5,723
Task 2.4 Critical Areas/Wetland Surveys (GeoEngineers)		\$25,165
Task 2.4 Macrovegetation Survey (GeoEngineers)		\$44,274
Task 2.4.1 Subcontracted Chemical Analysis (Apex)		\$15,750
Task 2.4 Subcontracted Cultural Resources Survey (Willamette)		\$12,810
Task 2.5 QA of Sampling Permit Submittal (GeoEngineers)		\$22,925
Task 3 – Final Engineering Design Plans, Specifications and Cost Estimate		\$74,070
Estimated Other Direct Costs		
Mileage		\$250
Meals		\$200
Lodging		\$400
Field Supplies		\$500
Total Fees	\$564,369	\$502,915
Contingency	\$10,000	\$87,866
2.4.1 Vibracorer - Ilwaco	\$10,000	--
** 2.5.2 Alternative 2 Permitting (also shown above for comparison purposes)	--	\$57,866
2.5.2 Upland Dredge Material Characterization- if required by agencies	--	\$30,000

¹ All Task 2.0 tasks apply to both sites, Port of Ilwaco and Port of Chinook, unless noted otherwise. The attached cost detail breaks down some tasks by site for reference.

²Task 2.4 includes sediment characterization and sampling permits

The October 12, 2021 Proposed Phased Approach – Scope and Estimated Cost memorandum is included with this proposal as an attachment for your reference.

October 13, 2021

Closing

We thank you for asking us to provide a proposal for the engineering and environmental services, and we look forward to working with you on this important project. If you have any questions regarding this proposal, feel free to contact Shane Phillips [phone (206) 622-0222, or by email sphillips@moffattnichol.com] or Victoria England [phone (206)501-2332, or by email vengland@moffattnichol.com].

Sincerely,

MOFFATT & NICHOL



R. Shane Phillips, P.E., D.PE, D.CE
Senior Civil/Coastal Engineer



Victoria R. England, LG, ENV SP
Senior Environmental Scientist/Project Manager

Attachments:

Anticipated Construction Drawings
Phased Approach Memorandum
Preliminary Schedule
Fee Estimate

ATTACHMENT 1.

**TASK 1 – POI MARINA STRUCTURES REPLACEMENT:
ANTICIPATED CONSTRUCTION DRAWINGS**

Description	Sheet	Sheet Title
General	G-001	Title Sheet, Vicinity Map
	G-002	General Notes
	G-003	Existing Site Plan
	G-004	Proposed Site Plan
Civil	C-101	Demolition Plan
	C-102	Demolition - Photographs
	C-103	Demolition Details - 1
	C-200	Site Grading - Plan
	C-201	Grading - Sections
	C-202	Grading - Misc Details
	Civil Utilities	C-301
	C-302	Misc. Details
	C-303	Misc. Details
Structural	S-001	Structural Notes
	S-002	Structural Typical Details and Special Inspections
	S-003	Bulkhead Loading Diagrams
	S-101	Bulkhead Layout
	S-102	Bulkhead Construction Sequence
	S-103	Bulkhead Plan and Elevation, 1 of 2
	S-104	Bulkhead Plan and Elevation, 2 of 2
	S-105	Bulkhead Typical Sections
	S-106	Bulkhead Details, 1 of 3
	S-107	Bulkhead Details, 2 of 3
	S-108	Bulkhead Details, 3 of 3
	S-201	Fender Details, 1 of 2
	S-202	Fender Details, 2 of 2
	S-203	Mooring Hardware Details
	S-204	Misc. Details
	S-301	Access Pier Plan
	S-302	Access Pier Typical Section
	S-303	Access Pier Details
	S-304	Access Pier Abutment Details
		S-401
	S-402	Misc. Details
Electrical	E-101	Details



ATTACHMENT 2. PHASED APPROACH MEMORANDUM



To: Guy Glenn, Port of Ilwaco

From: Victoria England, LG

Project: Port of Ilwaco Marina Structure Replacement and Port of Ilwaco/Port of Chinook Dredging and Dredge Material Placement Project

Date: 12 October 2021

Subject: Proposed Phased Approach – Scope and Estimated Cost

Introduction and Purpose

The following information is provided at the request of the Port of Ilwaco and summarizes the scope and fee associated with a phased approach to the scope of work provided to the Port on 7 October 2021 – Draft Proposal- Port of Ilwaco Marina Structure Replacement and Port of Ilwaco/Port of Chinook Dredging and Dredge Material Placement Project (Moffatt & Nichol, 6 October 2021). The submitted proposal presents our understanding of the project scope of work and the current best estimate based on available information and project variables that may affect the scope and fee for the project. The nature of the project and our approach to the scope of work provides decision points along the way to refine scope/cost/schedule as additional information and data is obtained. We can approach the project in phases, refining the scope at each phase/decision point, as discussed during our 8 October 2021 meeting with the Port.

The phases summarized below were identified based on identified decision points where the project scope will be affected by the nature of the decision. The phased costs shown in Table 1 below are compiled based on the 6 October 2021 scope and fee estimate provided to the Port.

Table 1: Phased Approach to the Marine Structure Replacement and Dredging Project

Phase	Task	Scope Included	Estimated Cost
Phase 1		Data acquisition, preliminary design, early regulatory consultation	
	Task 1	<ul style="list-style-type: none"> ▪ Preliminary design coordination with Port ▪ Site visit ▪ Early agency consultation ▪ Bathymetric/topographic surveys¹ – POI and POC 	\$92,258
	Task 2	<ul style="list-style-type: none"> ▪ LEDPA Pre-submittal Consultation ▪ Infrastructure Risk Inventory² ▪ BOD & 30% Engineering Design 	\$78,900
Phase 1 Key Deliverables: Revised Phase 2 Scope, estimate of construction cost, plan for proposed improvements (Task 1), permitting strategy, other deliverables as noted in proposal.			

¹ Supports Task 1 & 2 work . Topographic survey of upland disposal sites is presented as contingency in the main proposal document.
² Supports dredge design (Subcontracted analysis)

Phase	Task	Scope Included	Estimated Cost	
Phase 2		Detailed permitting/consultation, further design		
	Task 1	<ul style="list-style-type: none"> ▪ To 50% design ▪ Geotechnical engineering ▪ Agency consultation and permits 	\$245,426	
	Task 2	Alternative 1: Permitting <ul style="list-style-type: none"> ▪ Includes potential mitigation consultation Alternative 1 & 2 include: <ul style="list-style-type: none"> ▪ BOD, Engineering Design for LEDPA ▪ Final Alternatives Analysis and consultation ▪ Agency consultation and permits ▪ Studies to support permits³ 	Alternative 1	Alternative 2
			\$401,301	\$339,847
Phase 2 Key Deliverables: Revised Phase 3 Scope, estimate of construction cost, other deliverables as noted in proposal.				
Phase 3	Task 1	Final design & Bid Support – there’s the potential to attach stage 3 costs to construction costs if the Port is comfortable with that [90% & Final]	\$207,037	
	Task 2		\$84,168	

Project phasing provides the Port with the opportunity to phase the project contract so that the scope of work for subsequent phases can be refined based on the findings of early phases. The Moffatt & Nichol team looks forward to discussing this project approach. Feel free to contact either Shane Phillips [phone (206) 622-0222, or by email sphillips@moffattnichol.com] or Victoria England [phone (206)501-2332, or by email vengland@moffattnichol.com] with any questions.

³ Assumes use of Port staff/boat for grab sampling to save in subcontracted fees.

ATTACHMENT 3. PRELIMINARY PROJECT SCHEDULE







Meiffitt & Nichol Fee Proposal Detail
PO/POC Marina Structures Replacement, Dredging and Beneficial Use
 12/Oct/2021

Subcontract Markup: 0%
 Other Direct Costs Markup:

TED
 Victoria England
 Project Manager:
 Project Director:
 Share Phillips

I. STAFF/HOUR BUDGET		LABOR CLASSIFICATIONS & CONTRACT RATES													LABOR COST				
Phase	Task	Title	Principal Eng/Sci P-1, P-2, P-3	Supervisory Eng/Sci S-1, S-2, S-3	Senior Eng/Sci SE-1, SE-2, SE-3	Eng/Sci III P-4, P-5, P-6	Eng/Sci II P-7, P-8, P-9	Eng/Sci I P-10, P-11, P-12	Engr E-1, E-2, E-3	Estim/Eng P-13, P-14, P-15	Comm Specialist/ Comm C-1, C-2, C-3	Designer D-1, D-2, D-3	CAO/II C-4, C-5, C-6	CAO/I C-7, C-8, C-9	Project Comm. P-16, P-17, P-18	Non-Personal N-1, N-2, N-3	Comm/Offical C-10, C-11, C-12	STAFF/HOUR SUBTOTALS	LABOR COST SUBTOTALS
1.0	PO Structure Replacement Engineering and Permitting																		
1.1	Project Management and Meeting																	100.0	\$17,180.00
		Project Management																20.0	\$6,480.00
		Kick-off Meeting (2 hr. formal meeting, 2 hour with client + prep.)																30.0	\$5,480.00
		Progress Meetings (1 hr. biweekly for 6 months, monthly for 12 months)																60.0	\$12,200.00
		Document Review																15.0	\$4,710.00
1.2	East Bulkhead Replacement																	88.0	\$19,600.00
		Coordination with Port and Stakeholders																20.0	\$4,200.00
		Concept Feasibility Study																20.0	\$4,200.00
		50% Design Drawings, Specs, Cost Est																20.0	\$4,200.00
		90% Design Drawings, Specs, Cost Est																20.0	\$4,200.00
		Final Design Drawings, Specs, Cost Est																28.0	\$6,160.00
		CAO/II																35.0	\$7,700.00
1.3	East Bulkhead Fender and Mooring Station																	16.0	\$3,540.00
		Coordination with Port																16.0	\$3,540.00
		50% Design Drawings, Specs, Cost Est																12.0	\$2,640.00
		90% Design Drawings, Specs, Cost Est																12.0	\$2,640.00
		Final Design Drawings, Specs, Cost Est																12.0	\$2,640.00
		CAO/II																8.0	\$1,760.00
1.4	West Access Pier																	20.0	\$9,560.00
		Concept Feasibility Study																20.0	\$9,560.00
		50% Design Drawings, Specs, Cost Est																20.0	\$9,560.00
		90% Design Drawings, Specs, Cost Est																20.0	\$9,560.00
		Final Design Drawings, Specs, Cost Est																20.0	\$9,560.00
		CAO/II																12.0	\$2,640.00
1.5	West Access Pier Rehabilitation																	28.0	\$6,160.00
		50% Design Drawings, Specs, Cost Est																28.0	\$6,160.00
		90% Design Drawings, Specs, Cost Est																28.0	\$6,160.00
		Final Design Drawings, Specs, Cost Est																28.0	\$6,160.00
		CAO/II																12.0	\$2,640.00
1.6	Port Support																	20.0	\$4,200.00
		Port Support																20.0	\$4,200.00
		Address																20.0	\$4,200.00
		IPC Documents (Drawings and Specs)																20.0	\$4,200.00
1.7	Technical Expertise (See below)																	8.0	\$1,760.00
1.8	Environmental Permitting/Structure Replacement																	20.0	\$4,200.00
		Pre-submission Agency/Stakeholder Consultation																20.0	\$4,200.00
		JARPA																20.0	\$4,200.00
		City Permits - Sanitary/Chemical Area Extension																20.0	\$4,200.00
		BA/EPIA																20.0	\$4,200.00
		CAO/II																20.0	\$4,200.00
		Pre-submission Agency consultation																20.0	\$4,200.00
		CAO/II																20.0	\$4,200.00
1.9	See contingency																	8.0	\$1,760.00
1.10	Topographical Surveys (See Below)																	20.0	\$4,200.00

ATTACHMENT 4. FEE ESTIMATE



Port of Ilwaco and Port of Chinook Engineering Study/Solutions In Support of Maintenance Dredging

Prepared for:

Port of Ilwaco and Port of Chinook

This document was prepared by a Professional Engineer who conducted an engineering study in order to assist the Port of Ilwaco and Port of Chinook with engineering solutions and cost estimates for feasible and cost-effective measures to support maintenance dredging at the Port of Ilwaco and Port of Chinook Marinas. This document is not to be used for construction purposes.

Prepared by:

Vladimir Shepsis, PhD, PE



**COAST & HARBOR
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Technical Memorandum – Executive Summary

Port of Ilwaco and Port of Chinook Engineering Study/Solutions In Support of Maintenance Dredging

1. Introduction

The Port of Ilwaco and Port of Chinook have regularly conducted dredging in the marinas to maintain minimal required navigation depths to provide safe berthing and maneuvering operations for pleasure and commercial fishing vessels. For the last several decades, dredging at the marinas was conducted by hydraulic pipeline with placement of dredged material at the upland disposal sites. Currently, the upland disposal sites at the Port of Ilwaco and at Port of Chinook are at the limit of their capacity and likely may be available for only 2-3 more dredging cycles.

This study was conducted by Coast & Harbor Engineering, A Division of Mott MacDonald, to develop engineering solutions and cost estimates for feasible and cost-effective measures to provide long-term sustainable and navigable depths in the Port of Ilwaco and Port of Chinook marinas. The study determined the required dredging depths at both the Port of Ilwaco and Port of Chinook marinas, estimated maintenance dredging requirements, identified and evaluated dredged material disposal alternatives, selected the preferred alternative, and developed engineering cost estimates.

The current document presents a summary of the study. For more details of the study, the reader is referred to the study report: Port of Ilwaco and Port of Chinook Engineering Study/Solutions In Support of Maintenance Dredging, June 2019.

2. Dredging Depths and Dredging Requirements

For the purposes of dredging, the Port of Ilwaco Marina area is defined by two areas with navigable depths¹ at 10 ft. MLLW and 16 ft. MLLW. Figure 1a shows these areas overlaid on a 2013 bathymetric survey. Similarly, for dredging purposes, the Port of Chinook Marina is defined by three distinct areas with navigable depths at 10 ft. and 8 ft. MLLW. Figure 1b shows these areas overlaid on the 2016 depth measurements data.

The volumes of dredging for the Port of Ilwaco and Port of Chinook marinas were computed using the alignment and design depths of the areas delineated in Figure 1, and are shown in Table 1.

¹ Please note that the navigation depth does not include 1 ft. of allowable over-dredge and/or advanced maintenance dredging clearance.

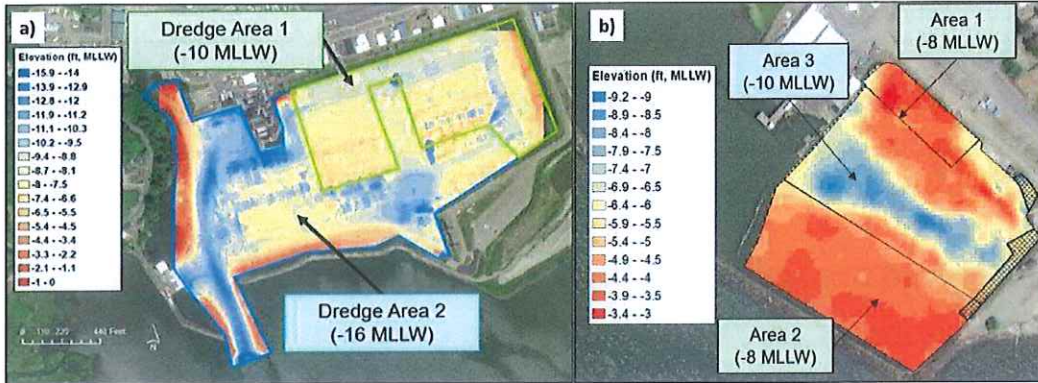


Figure 1. Dredging depths for a) Port of Ilwaco and b) Port of Chinook

Table 1. Dredging Volumes Estimates, Port of Ilwaco and Port of Chinook Marinas

	Dredging to Navigable Depths (CY)	Dredging to Navigable Depths + 1 ft OD (CY)
Port of Ilwaco Marina	400,000	450,000
Port of Chinook Marina	56,000	67,000

Analysis of sedimentation was conducted, and the average yearly rates of sediment deposition² for both the Port of Ilwaco and Port of Chinook Marinas were estimated. Using these rates, the volumes of yearly sediment deposition in the marinas were computed and are depicted in Table 2.

Table 2. Averaged per Year Rates of Sedimentation and Volumes of Sediment Deposition Estimates at Port of Ilwaco and Port of Chinook Marinas

	Rate of sedimentation (ft/year)	Volume of Deposition (CY/year)
Port of Ilwaco Marina	0.4	29,000
Port of Chinook Marina	0.6	9,000

Table 3 summarizes the volumes of dredging for the Port of Ilwaco and Port of Chinook Marinas to achieve the designed depths (also referenced as Capital Dredging) and maintenance dredging requirements for a 10-year period³.

² Rate of sediment deposition is the thickness of accumulated sediment layer, averaged over the entire area of the marina.

³ The table considers that the Port of Ilwaco Marina maintenance dredging will remove 58,000 cy of sediment once every two years, and the Port of Chinook Marina maintenance dredging will remove 27,000 cy of sediment once every three years.

Table 3. Summary of Dredging Volumes

Port	Capital Dredging (CY)	Yearly Maintenance (CY/yr)	Total Volume for 10 Years (CY)
Ilwaco	450,000	29,000	740,000
Chinook	67,000	9,000	157,000

3. Dredging and Dredge Material Disposal Alternatives

Analysis and development of the dredging and dredged material disposal alternatives was conducted to identify feasible and cost-effective measures that will provide long-term sustainable and navigable depths in the Port of Ilwaco and Port of Chinook Marinas. As a result, a total of five dredging and dredged material disposal alternatives for the Port of Ilwaco and three dredging and dredged material disposal alternatives for the Port of Chinook were developed and conceptually evaluated to select the preferred option(s). The evaluation was based on the following 7 (seven) criteria: performance, constructability (dredgeability), capital cost, maintenance cost, risks and uncertainties associated with environmental permitting process, use of dredged sediment for shoreline protection, and use of dredged sediment to maintain sediment budget in LCR Estuary. Initial feedback from Portland District USACE dredging experts was also considered in the evaluation of alternatives.

Based on evaluation of the analysis results and coordination with the Port of Ilwaco and Port of Chinook, two preferred alternatives⁴ were selected for the Port of Ilwaco and one preferred alternative was selected for the Port of Chinook.

The preferred alternatives for the Port of Ilwaco are: Preferred Alternative 1– Dredging with a small hydraulic dredge and placement of sediment into nearshore beneficial use disposal sites; and Preferred Alternative 2– Clamshell and bottom dump barges with open water disposal and restoration of existing upland disposal site capacity.

Port of Ilwaco Preferred Alternative 1: Dredging with a small hydraulic dredge and placement of sediment into nearshore beneficial use disposal sites. The objective of this alternative is to develop an unlimited capacity nearshore disposal site with several beneficial uses including: a) minimizing shoreline erosion; and b) restoring historical levels of suspended sediment concentration in the Lower Columbia River Estuary that has apparently been depleted during the last century. Upon implementation of this alternative, no need for an upland disposal site would exist in the future. The concept of the Preferred Alternative 1 is described in Figure 2 (a and b).

⁴ Two alternatives (instead of one) was selected due to the risks associated with obtaining environmental permits for the most preferred, cost-effective alternative. However, during the next phase of the project it may occur that this alternative will require a complex and lengthy process of permitting that may eventually transform this alternative into a more expensive and less preferred alternative. Thus, the funds are secured for a second preferred alternative that should be used to implement it.

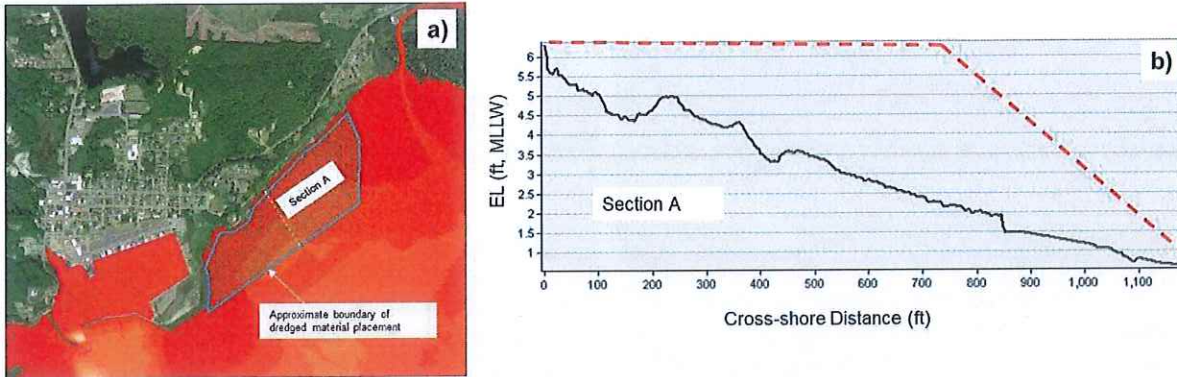


Figure 2. Port of Ilwaco Dredge Material Disposal - Preferred Alternative 1 Concept

Plate “a” of Figure 2 shows the boundary of the proposed nearshore and beneficial use dredged material placement area overlaid on the bathymetric survey data. The boundary of the landward part of the proposed placement site is aligned along the eroding shoreline and armor rock revetment that was placed at some locations to stop the shoreline erosion. Plate “b” of Figure 2 shows, in black, the existing depths (elevations) along Section A and proposed vertical limits (red-dashed line) of the dredged material placement. The geometric volume confined by the boundaries of the proposed site and existing configuration of the bed is estimated to be in excess of 600,000 cy, which would be sufficient for first-time placement and long-term maintenance dredging requirements. Please note that a steep drop of existing elevations at the landward part of the section indicates the presence of armor rock and concrete slabs that were built and maintained historically to stop shoreline erosion.

With this Preferred Alternative 1, the marina would be dredged by a small hydraulic dredge with placement of sediment through a hydraulic pipeline directly at the nearshore disposal area. No confinement for placement of dredged sediment is assumed at this time⁵. Once placed, the dredged material will be subject to erosion from energy produced by waves and tidal currents. However, by eroding and absorbing wave and tidal current energy, the dredged sediment provides protection from shoreline erosion.

Port of Ilwaco Preferred Alternative 2: Clamshell and bottom dump barges with open water disposal and restoration of existing upland disposal site capacity. This alternative includes maintenance of the existing upland disposal site, but periodically (once every 10-15 years) emptying the site using the operations discussed below. The frequency of emptying the upland disposal site would be reduced (more time between re-empty events) if there are opportunities for beneficial use of dredged material⁶. The concept of this alternative is illustrated in Figure 3 (plates “a” and “b”).

⁵ A final decision on the need for a confinement berm would be made during the permitting process and through consultation with the agencies and USACE.

⁶ Based on information from the Port of Ilwaco, there was one example of using a limited amount dredged material (approximately 12,000 cy) from the upland disposal site of the Port for a habitat restoration project. However, long-term and regular users of the dredged material have not yet been identified.

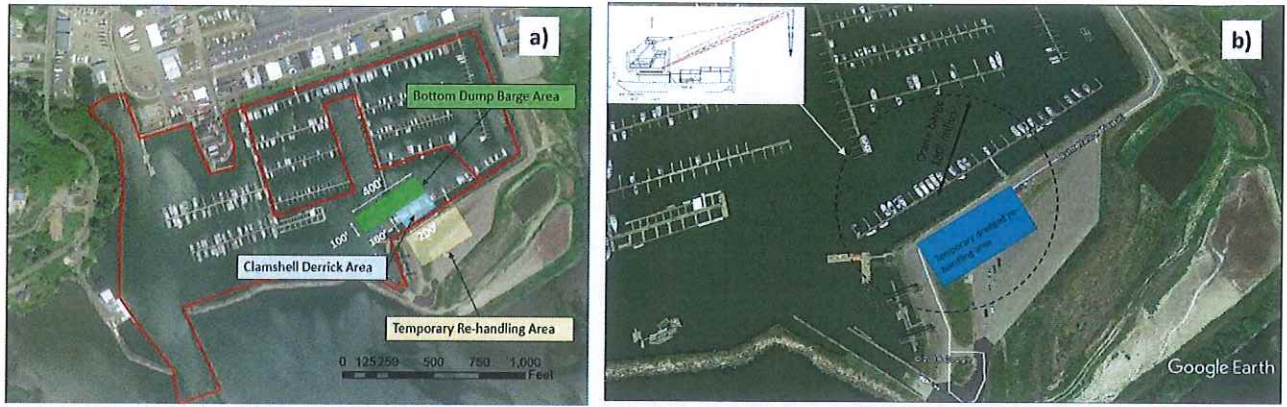


Figure 3. Port of Ilwaco Preferred Alternative 2 concept

Plate A shows the overall view of the Port of Ilwaco Marina with the existing upland site. With Alternative 1, dredged material from this upland disposal site will be periodically mechanically excavated and placed at the temporary re-handling area, also shown in the figure. It should be noted that the specific location of the re-handling facility may change due to possible remodeling of the adjacent upland area⁷, but still will be within reach of the clamshell, shown schematically in Plate B. The clamshell will be able to reach the temporary re-handling facility and load the excavated sediment to the bottom dump barge, stationed at the temporary offloading facilities (Bottom Dump Barge Area), as shown in Plate A.

This alternative assumes using a clamshell and bottom dump barge with a capacity of 4,000 – 6,000 cy, with a loaded draft of 12-17 ft. that will be moored at the temporary loading facility. Additional dredging may be required at this loading facility to accommodate barge loading operations without grounding. The volume of this dredging as well as specific locations of temporary loading and re-handling facilities shall be determined upon preliminary and final design of the dredging operations, if this alternative is implemented.

Once loaded with excavated sediment, the bottom dump barge will be towed to the designated open water disposal site where sediment will be disposed. The specific open water disposal site for placement of excavated sediment shall be determined upon preliminary and final design, but likely would be one of the USACE’s Columbia River Mouth sites.

Port of Chinook Preferred Alternative: Dredging with a hydraulic dredge and placement of sediment at the nearshore beneficial use disposal sites. The objective of this alternative is to develop an unlimited capacity nearshore open water disposal site, restore the eroded bottom slope, and abandon the existing upland disposal site. Also, it is believed that this alternative would beneficially contribute to restoration of historical levels of suspended sediment concentration in the Lower Columbia River Estuary that, apparently, have been depleted during the last century. The concept of the alternative is described in Figure 4.

⁷ For example, as informed by the Port, the marina restroom facilities may be relocated in the vicinity of the proposed project area. Thus, if this occurs, the location of the re-handling area shown in the figure would shift appropriately.



Figure 4. Port of Chinook Preferred Dredging and Dredged Disposal Alternative

The proposed nearshore disposal area is preliminarily identified with dimensions at approximately 3,000 ft. long (along the shore) and 500 ft. wide (perpendicular to the shore), as shown in Figure 4. The location of the disposal area was selected along the nearshore bottom slope that recently has been subjected to scour and deepening (trenching), apparently from landward migration of the tidal channel. Formation of the trench at the nearshore area has contributed to acceleration of shoreline erosion; thus, several shoreline erosion measures have been undertaken at this area recently.

Under this alternative, dredging in the marina would be conducted by a hydraulic dredge. The dredged sediment would be pumped through a short length of pipeline and discharged directly at the proposed nearshore placement area, shown in the figure. The type and dimensions of the hydraulic dredge as well as detailed alignment of the pipeline should be determined during preliminary and final design. Preliminarily, it is expected that a portable hydraulic dredge of a minimum 10" and maximum 16" discharge pipe diameter would be used for the project. The length of pipeline would not exceed 4,000 ft.; thus, no need for a booster pump is assumed.

Placement of dredged material at the proposed placement site would minimize scour effects and preclude further formation of a trench. The placement area would be sufficient for placement of sediment from capital and the following maintenance dredging events.

4. Dredging and Dredged Material Disposal Alternatives Preliminary Cost Estimates

Cost estimates for implementation of each of the preferred dredging and dredged material placement alternatives were developed at the preliminary level⁸ based on the general assumptions as follows:

- All dredged and excavated sediment are suitable for open water disposal.
- Open water disposal sites at the Mouth of Columbia River will be available for placement of sediment from the Port of Chinook and the Port of Ilwaco.
- Costs for permitting and related mitigation measures (if required) are not included.
- Costs for acquiring land or leases of nearshore areas (if required) are not included.
- All dredging work will be performed by the Contractor.
- All costs are in 2018 money values.
- Dredging cost estimates for hydraulic dredging work were computed using the Corps of Engineering Dredging Software (Dredging Cost Spreadsheet).

In addition to the general, the explicit assumptions are described in more detail in the study report. The results of the cost estimates are presented below in Table 4.

Table 4. Port of Ilwaco and Port of Chinook Recommended Dredging and Disposal Alternative Preliminary Cost Estimates

Port	Alternative	First-Time Dredging Costs	Design Maintenance Dredging Event Costs ⁹
Ilwaco	Preferred Alternative 1	\$2,800,000	\$420,000
	Preferred Alternative 2	\$11,000,000	\$460,000
Chinook	Preferred Alternative	\$3,000,000	\$270,000

5. Recommendations

1. Port Ilwaco

- a. Proceed with design, permitting, and implementation for the Preferred Alternative 1 of dredging and dredged material disposal.
- b. Secure the funds for Preferred Alternative 2 (\$11,000,000) in case the permitting process for Preferred Alternative 2 requires unreasonable amounts of time and resources.
- c. Bathymetric and topographic surveys of the bottom slope of Preferred Alternative 1 has been completed under this study effort and the results, xyz format survey data are

⁸ The level of accuracy of the preliminary cost estimates corresponds to the opinion on the order of magnitude and is used herein for comparison analysis and selection of the preferred alternative. More accurate cost estimates would be developed during the next phases of the project; preliminary and final design.

⁹ Maintenance dredging event for the Port of Ilwaco Marina is assumed once every 2 years with a volume of 58,000 cy.

stored in a separate digital file. The survey data of the disposal site are prepared to support future permitting process.

2. Port of Chinook

- a. Proceed with obtaining funds for design, permitting, and implementation of the recommended Preferred Alternative of dredging and dredged material disposal.
- b. Bathymetric and topographic surveys of the bottom slope of Preferred Alternative has been completed under this study effort and the results, xyz format survey data are stored in a separate digital file. The survey data of the disposal site and are prepared to support future permitting process.



Technical Memorandum

Port of Ilwaco and Port of Chinook Engineering Study/Solutions In Support of Maintenance Dredging

6. Introduction

The Port of Ilwaco and Port of Chinook have regularly conducted dredging in the marinas to maintain minimal required navigation depths to provide safe berthing and maneuvering operations for pleasure and commercial fishing vessels. For the last several decades, dredging at the marinas was conducted by hydraulic pipeline with placement of dredged material at the upland disposal sites. Currently, the upland disposal sites at the Port of Ilwaco as well as at the Port of Chinook are at the limit of their capacity and likely may be available for only 2-3 dredging cycles.

This study was conducted by Coast & Harbor Engineering, A Division of Mott MacDonald, to develop the engineering solution and cost estimates for feasible and cost-effective measures to provide long-term sustainable and navigable depths in the Port of Ilwaco and Port of Chinook Marinas. The study determined the required dredging depths in both Port of Ilwaco and Port of Chinook marinas, estimated the maintenance dredging requirements, identified and evaluated the dredged material disposal alternatives, selected the preferred alternative and developed the engineering cost estimates.

7. Design Dredging Depths and Volumes of Dredged Material

7.1. Design Dredging Depths

7.1.1. Port of Ilwaco

As mentioned above, the historical practice of maintenance dredging at the Port of Ilwaco was performed to provide minimum required navigation depths to assure safe navigation of small pleasure crafts and commercial fishing vessels. Due to lack of funds, restrictions on disposal sites, and complexity/uncertainties with timely obtaining of the environment permits, the previous dredging efforts were mostly conducted in response to critical shoaling events rather than methodical advanced maintenance dredging. As a result, the dredging depths and volumes in the marinas were defined in terms of environmental permits only and not from the perspective of optimal depths/dimensions that provide maximum benefits to the commerce and the Port's future development.

For the purpose of the current project, the design depths in the Port of Ilwaco Marina were established based on a) review of general information on marina slips (number, location, dimensions, conditions), b) examination of the mix of commercial and

pleasure boats - current occupants of the marina, and c) input from the Port. As a result of the above, two areas of the marina with two different depths, -16 ft and -10 ft MLLW where identified and selected for further analysis. Figure 1 shows these areas overlaid on the bathymetry of the marina from 2013 Department of Ecology (DOE) survey. Please note that the selected design depths indicate the required navigation conditions and do not include 1 ft of allowable over-dredge and/or advanced maintenance dredging clearance. Using the alignment of these two area configurations (confirmed by the Port of Ilwaco) and 2013 DOE bathymetric survey data, the dredging volumes are computed as follows:

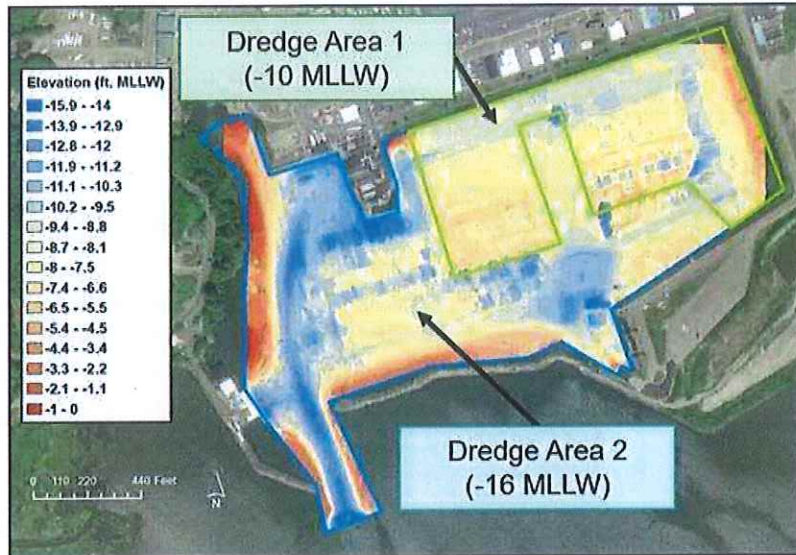


Figure 1. Dredging Depths for Port of Ilwaco

Table 1. Port of Ilwaco Dredging Volumes Estimates

	Dredging to Navigable Depths (CY)	Dredging to Navigable Depths + 1 ft OD (CY)
Dredge Area 1 to - 10 ft MLLW	400,000	450,000
Dredge Area 2 to - 16 ft MLLW		

7.1.2. Port of Chinook

Similar to Port of Ilwaco, the historical practice of maintenance dredging at the Port of Chinook was primarily conducted in response to critical shoaling events rather than methodical advanced maintenance dredging. As a result, the dredging depths and volumes in the marinas were not defined in terms to provide maximum benefits to the commerce and Port’s future development.

For the purpose of the current project the design depths in the Port of Chinook were established based on a) review of general information on marina slips (number, location, dimensions, conditions), b) examination of the mix of commercial and pleasure boats - current occupants of the marina, and c) input from the Port. As a result of the above, three distinct areas with depths at -10 ft and -8 ft MLLW were

identified and selected for further analysis, as shown on Figure 2. Again, it should be noted that the selected design depths indicate the required navigation conditions and do not include 1 ft of allowable over-dredge and/or advanced maintenance dredging clearance. Using the alignment of these three areas (confirmed by the Port of Chinook) and Depth Measurements collected by the Port in May 2016, the dredging volumes are computed as shown in Table 2 **Error! Reference source not found.**

Table 2. Port of Chinook Dredging Volume Estimates

	Dredging Volume to Navigable Depths (CY)	Dredging Volume to Navigable Depths + 1 ft OD (CY)
Dredge Area 1 & 2 to - 8 ft MLLW Dredge Area 3 to - 10 ft MLLW	56,000	67,000

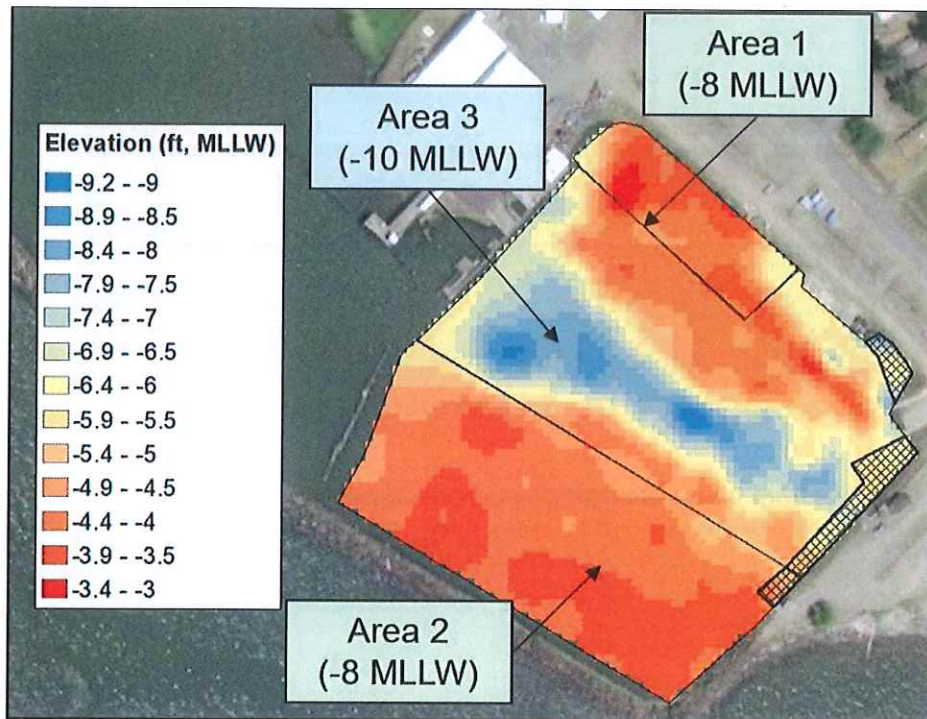


Figure 2. Dredging Depths for Port of Chinook

7.2. Sedimentation Estimates

7.2.1. General

The previous section identified the volume of dredging to bring both Port of Ilwaco and Port of Chinook to the design (desirable) depth/dimensions conditions. The next step of the study was to estimate the yearly rate of sedimentation in the marinas (of the design depths) and establish the required maintenance dredging requirements.

7.2.2. Port of Ilwaco

Estimates of sedimentation in the marina were conducted by compilation, evaluation, and extrapolation of limited data that somehow relate to the project matter, including a University of Washington study on historical bottom depth changes in Baker Bay (Creager, 1984), bathymetric surveys that overlapped in close proximity of the marina¹⁰, and U.S. Corps of Engineers (USACE) navigation channel sedimentation study and data. It should be noted that there were no measurements or other type of data found that directly are applicable to compute rates of sediment deposition in the marina. Thus, further analysis was conducted to interpret and extrapolate available information to develop a range of possible sedimentation rates and, ultimately, select the design rate. For example, the previous UW study of bottom depth changes in Baker Bay indicates the overall trend of deposition of sediment in areas adjacent to the marina (but not inside of the breakwaters) is rounded to 1" per year. This rate of sedimentation reflects the lowest possible rate of sedimentation that may occur in the marina¹¹. The other information that was used in evaluation of sedimentation was a result of the comparison of two overlapped bathymetric surveys: USACE January 2012 and DOE May 2013. Figure 3 shows the area and profile where these two surveys were compared. The area of comparison is a small bottom depression, apparently a remnant of a small tidal channel. The pattern of sediment deposition in this depression is more distinct than that of an open bay and more representative to that of confined marina. The thickness of sedimentation over this area is computed at approximately 0.2 ft per year. This rate was used as another data-point in the determination of sedimentation estimates in the marina.

And finally, the information from a sedimentation study at the Federal Navigation Channel (FNC) (USACE, 2011) and available USACE dredging records and hydrographic surveys were used to develop an upper level of estimate. Specifically, a part of FNC adjacent to the marina was used as a prototype for estimates of the upper level of sedimentation in the marina. Based on the available records, the thickness of sediment deposition at this part of the channel in averaged is estimated at 0.6 ft/year.

As a result of interpretation and extrapolation of the available data, a rate of sedimentation in the marina is estimated in a range of 0.2-0.6 ft/year. This corresponds to a maintenance dredging requirement between 15,000 and 43,000 cy/year, assuming that the marina is dredged to the allowable depths shown in Figure 1. An average and rounded rate of sedimentation of 0.4 ft per year and corresponding volume of sedimentation of 29,000 cy/year were selected and have been used for further analysis.

¹⁰ There is only one detailed bathymetric survey, performed by WA Department of Ecology (DOE) in 2013, that is available for the marina area. No other adequate surveys of the marina have been found. Thus, no sequential surveys in the marina were found to analyze sedimentation.

¹¹ The marina breakwaters restrict flow dynamics inside of the marina and increase sedimentation rates relative to unconfined areas.

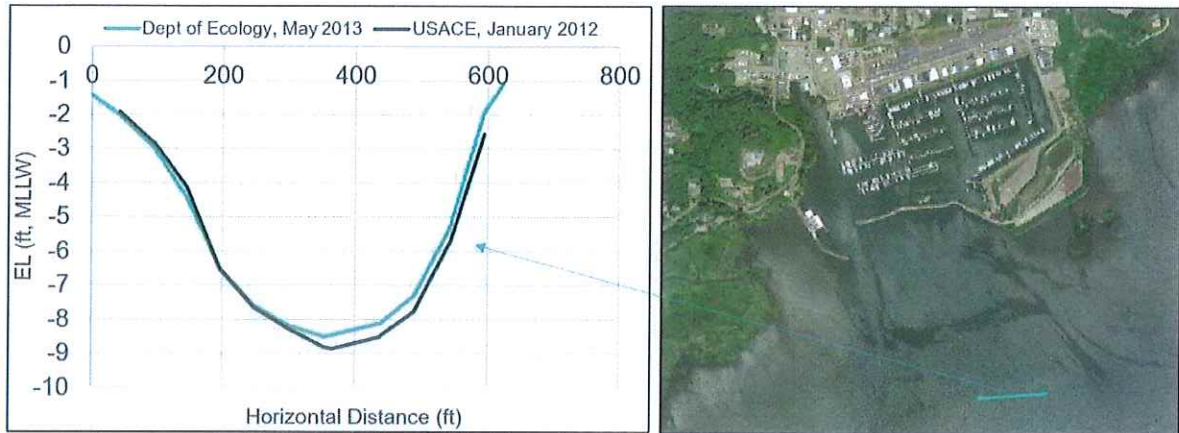


Figure 3. Sedimentation in vicinity of Port of Ilwaco Marina between May 2013 and January 2012.

7.2.3. Port of Chinook

Similar to the Port of Ilwaco analysis, an estimate of sedimentation in the Port of Chinook Marina was conducted by compilation, evaluation, and extrapolation of limited data that somehow relate to the project matter. The lowest possible rate of sedimentation was assumed to be equal to the historical bottom depth change in Baker Bay, representative of the area adjacent to the marina (but not inside of the breakwaters). This value rounds to 1" per year. The upper rate of sedimentation was assumed to be equal to the deposition of sediment in the part of the FNC located in the lee of the breakwater. A series of USACE hydrographic surveys for the period 2015-2018 was compiled and analyzed to determine the rate of sedimentation in this area. Figure 4 shows the result of comparison of two sequential USACE surveys (August 2016 and May 2017) in this part of the channel. The rate of sedimentation in this part of Federal Channel was estimated approximately in a range of 0.6-1.6 ft per year. The average value of this range, 1.1 ft per year was assumed as the upper limit for the Port of Chinook marina sedimentation. And, finally, a design level of sedimentation for further considerations and estimates herein was computed as an average between lower and upper limits that yields approximately 0.6 ft/year. This corresponds to a maintenance dredging requirement of 9,000 cy/year if the marina is dredged to the allowable depths shown in Figure 2.

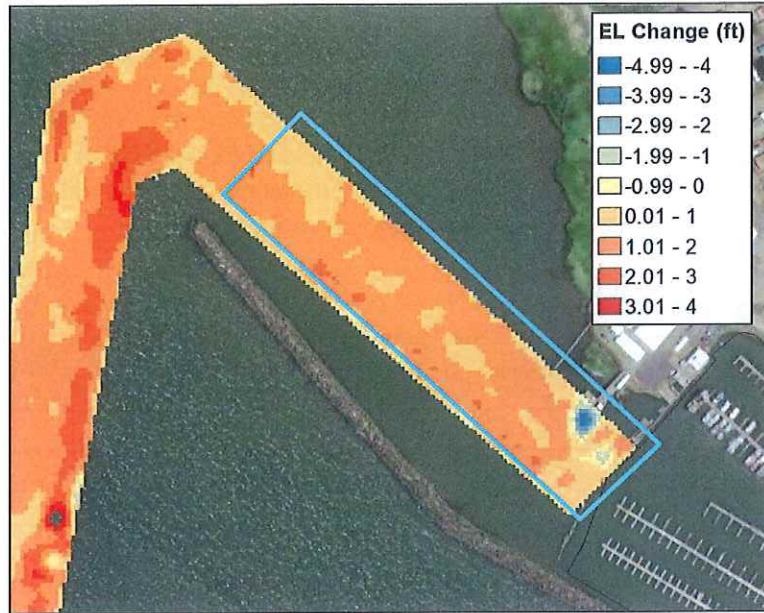


Figure 4. Elevation change between August 2016 and May 2017 USACE surveys (warm colors represent sedimentation and cool colors represent erosion)

Table 3. Estimated Sedimentation Rates for Port of Ilwaco and Port of Chinook

Port	Estimated Sedimentation Rate (CY/year)		Selected Design (CY/year)
	Lower Limit	Upper Limit	
Ilwaco	15,000	43,000	29,000
Chinook	2,000	16,000	9,000

7.3. Summary of Dredging Volumes

Table 4 summarizes the estimated volumes of dredging for the Port of Ilwaco and Port of Chinook marinas to achieve the designed depths (also referenced to as Capital Dredging) and yearly sedimentation volumes that need to be dredged to assure sustainability of these design depths. Please note that Capital volumes, depicted in Tables 1 and 2, include 1 ft over-dredge allowance. It also should be noted that this 1 ft over-dredge is in excess of estimated sedimentation rates (0.4 ft at the Port of Ilwaco and 0.6 ft at the Port of Chinook). Considering this fact and a relatively small volume¹² of sedimentation, conducting annual maintenance in the marinas is not necessary, nor economical. It is recommended that the Port of Ilwaco Marina schedule maintenance dredging of approximately 58,000 cy once every 2 years and the Port of Chinook marina schedule maintenance dredging of approximately 27,000 cy once every 3 years.

¹² A small volume herein is defined in terms of the dredging Contractor. Mobilization and demobilization costs may exceed the cost of dredging if the dredging volume is small. Thus, the total cost of each maintenance dredging event would be high.

Table 4, Column 4 also includes the estimated 10-year cumulative volumes of dredging that need to be performed to maintain navigable conditions in the marinas at the design depths discussed above. Based on industry practice and knowledge, it would be very difficult (if not impossible) to develop an upland disposal site to accommodate these volumes without the possibility of beneficial use of dredged sediment or periodic re-emptying of the upland site.

Table 4. Summary of Dredging Volumes

Port	Capital Dredging (CY)	Yearly Maintenance (CY/yr)	Total Volume for 10 Years (CY)
Ilwaco	450,000	29,000	740,000
Chinook	67,000	9,000	157,000

8. Dredging and Dredge Material Disposal Alternatives

8.1. General

Analysis and development of the dredging methods and dredge material disposal alternatives were conducted to meet the main objective of the project: to identify feasible and cost-effective measures to provide long-term sustainable and navigable depths in the Port of Ilwaco and Port of Chinook Marinas. To identify and engineer these measures, the following criteria were developed and coordinated with the Port of Ilwaco and Port of Chinook:

- Dredging methods provide effective navigable depths for marina users throughout the year.
- Minimize dredging costs and optimize use of dredging equipment.
- No/minimal impact on the FNC.
- Avoid adverse environmental impacts.
- Use dredged sediment to maintain sediment budget in Lower Columbia River Estuary.
- Use dredged sediment to address localized morphology and shoreline erosion issues.

Five alternatives for the Port of Ilwaco and four alternatives for the Port of Chinook were developed and are described below that address the above criteria at different levels.

8.2. Port of Ilwaco

Five potential dredged material alternative disposal sites were developed and are discussed below to accommodate dredging at the Port of Ilwaco to the navigation condition dimensions that are discussed above in Section 2. Each alternative and method of removal is briefly described below.

Alternative 1: Clamshell and bottom dump barges with open water disposal and restoration of existing upland disposal site capacity. The objective of this alternative is to maintain the existing upland disposal site, but periodically, once it is filled up (as estimated to be once every 10-15 years), to empty the site using the operations discussed below. The frequency of emptying the upland disposal site would be reduced (more time between re-empty events) if the opportunity for beneficial use of dredged material occurs¹³. The concept of Alternative 1 is illustrated in Figure 5 (plates “a” and “b”).

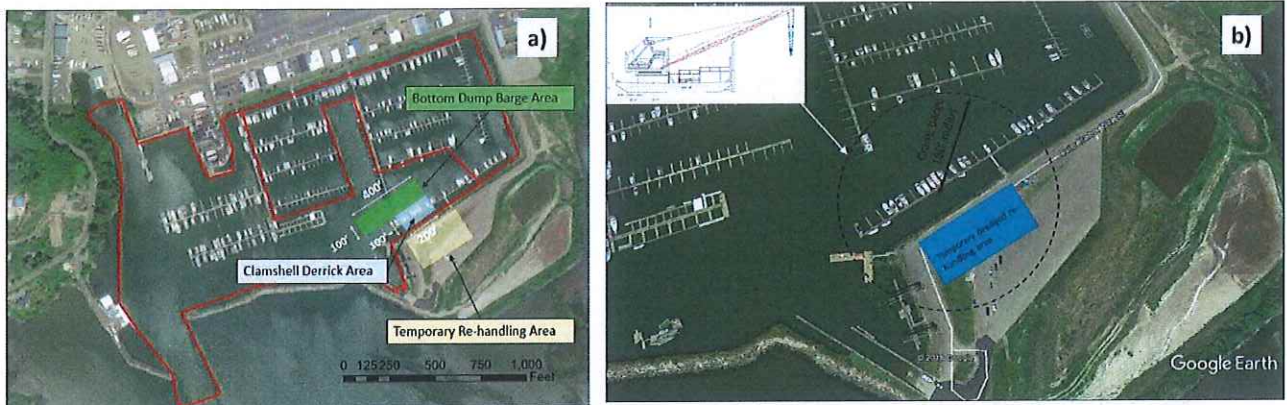


Figure 5. Port of Ilwaco Disposal Alternative 1 schematic

Plate A shows the overall view of the Port of Ilwaco Marina with existing upland site. With Alternative 1 the dredged material from this upland disposal site will be periodically mechanically excavated and placed at the temporary re-handling area, also shown in the figure. It should be noted that the specific location of the re-handling facility may change due to possible remodeling of the adjacent upland area¹⁴, but its location will still be within reach of the clamshell, shown schematically in Figure 5b. The clamshell will be able to reach the temporary re-handling facility and load the excavated sediment to the bottom dump barge, stationed at the temporary offloading facilities (Bottom Dump Barge Area) as shown in Figure 5.

Alternative 1 assumes using a clamshell and bottom dump barge with capacity of 4,000 – 6,000 cy, with a loaded draft of 12-17 ft that will be moored at the temporary loading facility. Additional dredging may be required at this loading facility to accommodate barge loading operations without grounding. The volume of additional dredging and the specific locations of temporary loading and re-handling facilities shall be determined upon preliminary and final design of the dredging operations if Alternative 1 is implemented.

¹³ Based on information from the Port of Ilwaco, there was one example of using a limited amount dredged material (approximately 12,000 cy) from the Port’s upland disposal site for a habitat restoration project. However, long-term and regular users for the dredged material have not been yet identified.

¹⁴ The Port has indicated that the marina restroom facilities may be relocated in the vicinity of the proposed project area. If this occurs, the location of the re-handling area shown in the figure would shift appropriately.

Once loaded with excavated sediment, the bottom dump barge will be towed to the designated open water disposal site, where sediment will be disposed. The specific open water disposal site for placement of excavated sediment shall be determined upon preliminary and final designs, but likely would be one of the USACE's Columbia River Mouth sites, as described in Appendix A.

Alternative 2: Hydraulic dredging and dispersive disposal at Jetty A. The concept of this alternative was recommended by specialists from the Portland District USACE during a joint project meeting in October 2018. The objective of this alternative is to develop an unlimited capacity nearshore open water disposal site and to abandon the existing upland disposal site. It is believed that this alternative would beneficially contribute to the restoration of historical levels of suspended sediment concentration in the Lower Columbia River Estuary that have apparently been depleted during the last century. The concept of Alternative 2 is described in Figure 6a and 6b.

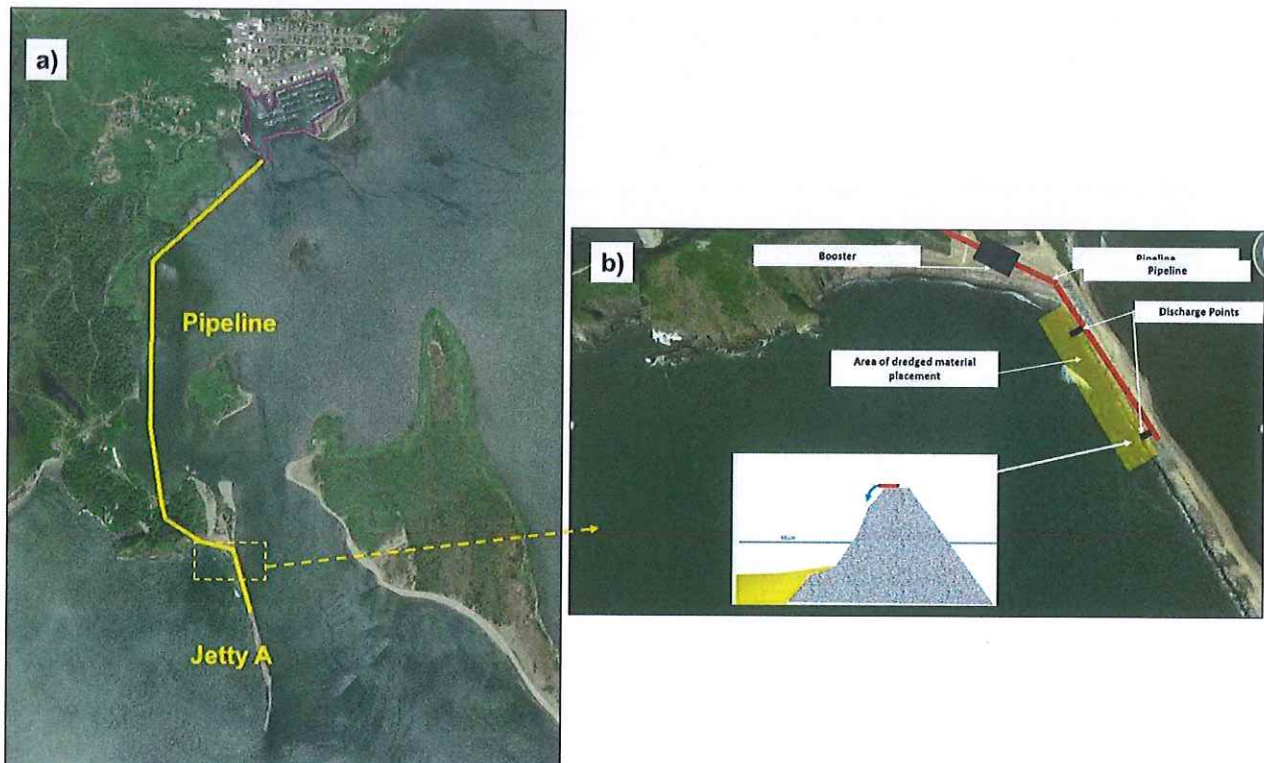


Figure 6. Port of Ilwaco Dredge Material Disposal Alternative 2 Concept

For Alternative 2 it is assumed that dredging in the marina will be conducted by a hydraulic dredge. The dredged sediment will be pumped through a partially floating and partially land-based pipeline and discharged at the nearshore area on a northwest side of Jetty A. The type and dimensions of hydraulic dredge as well as detailed alignment of the pipeline will be determined during preliminary and final designs, should this alternative be chosen. A preliminary assumption is that a portable hydraulic dredge of minimum 12" and maximum 16" discharge pipe diameter would be used for the project. The preliminary length of pipeline was estimated at

approximately 14,000 ft, which indicates a need for one booster pump. Figure 6b shows a preliminary location of the booster pump; this location is subject to modification upon further design efforts.

Single or multiple discharge points are proposed along Jetty A to provide slurry discharge on the armor rock slope and toe of the jetty. Based on experience with similar projects, such type of discharge would result in high dispersion of placed sediment. No accumulation of dredged sediment is expected to occur in the nearshore areas¹⁵. The mobilization of hydraulic dredge, booster pump, installation of pipeline and discharge points, etc. should occur during each dredging event, including capital dredging of 450,000 cy as well as maintenance dredging of 58,000 cy every two years. This mobilization contributes significantly to the dredging cost discussed below in Section 5. However, the expenses of mobilization may be reduced if permanent pipeline and discharge points are secured by the Port and/or the disposal site and methods are used by the USACE for dredging of the FNC.

Alternative 3: Dredging with a small hydraulic dredge and placement of sediment into bottom dump barge with further open water disposal. The objective of this alternative is to abandon the existing upland disposal site and use the unlimited capacity of the existing open water disposal sites. The concept of Alternative 3 is described in Figure 7 (plates “a” and “b”).

Figure 7a shows the bottom depths in the vicinity of the Port of Ilwaco Marina in color format. Red color indicates shallower depths, while yellow and blue colors indicate deeper depths. The figure shows a localized and relatively deep-water area (17 ft MLLW and deeper), located not far (approximately 2,000 ft) from the entrance to the marina. The location of this deep-water area is adjacent to the FNC. Based on review of the dredging data, this area has not been dredged previously, meaning that the deep-water area represents a natural bottom depression that likely has been maintained by strong localized tidal currents¹⁶.

Alternative 3 consists of dredging the marina by small hydraulic dredge and pumping dredged sediment through a floating pipeline to the bottom dump barge, stationed in the bottom depression area, as shown in Figure 7b. Once filled up to capacity with dredged sediment, the barge is towed to the designated open water disposal site where said sediment is released from the bottom dump barge. A specific open water disposal site for placement of excavated sediment shall be determined upon preliminary and final design, but likely would be one of USACE’s Columbia River Mouth designated disposal sites, as described in Appendix A.

¹⁵ For example, the Port of Orford, OR has conducted disposal of dredged material on the slope of a breakwater exposed to the ocean waves for more than a decade, and no accumulation of sediment has been observed.

¹⁶ It was confirmed by further analysis (See Section 4).

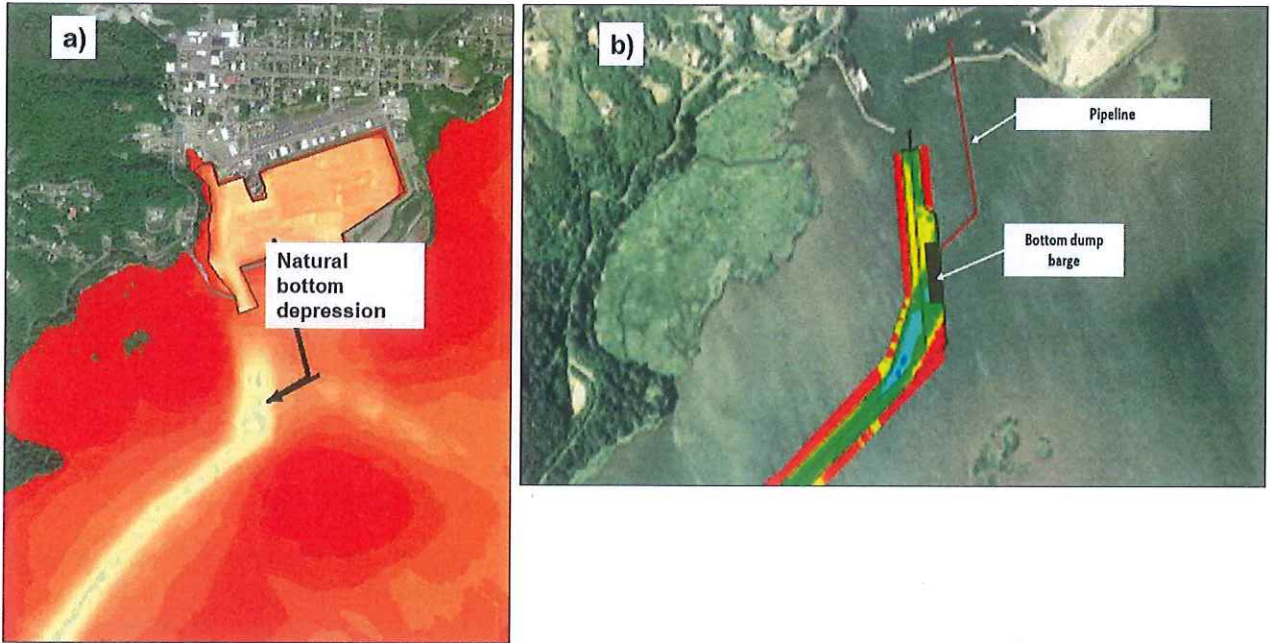


Figure 7. Port of Ilwaco Dredge Material Disposal Alternative 3 Concept

Alternative 4: Dredging with small hydraulic dredge and placement of sediment into nearshore beneficial use disposal site. The objective of this alternative is to develop an unlimited capacity nearshore open water disposal site with several beneficial uses including: a) minimize shoreline erosion and b) restore historical level of suspended sediment concentration in the Lower Columbia River Estuary that has apparently been depleted during the last century. With Alternative 4, there is no need to maintain the upland disposal site, and this site could be abandoned. The concept of Alternative 4 is described in Figure 8 (a and b).

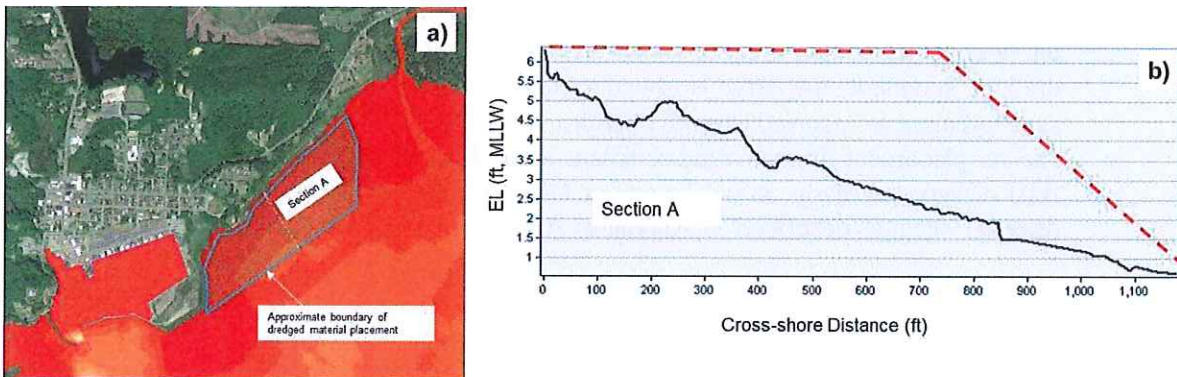


Figure 8. Port of Ilwaco Dredge Material Disposal Alternative 4 Concept

Figure 8a shows the boundary of the proposed nearshore and beneficial use dredged material placement area overlaid on the bathymetric survey data. The boundary of the landward part of the proposed placement site is aligned along the eroding shoreline and armor rock revetment that was placed at some locations to stop the shoreline

erosion. Figure 8b shows in black the existing depths (elevations) along Section A and proposed vertical limits (red dashed line) of the placement the dredged material. The geometric volume confined by the boundaries of the proposed site and existing configuration of the bed is estimated in excess of 600,000 cy, which would be sufficient for first time placement and long-term maintenance dredging requirements. Please note a steep drop of existing elevations at the landward part of the section that indicates the presence of armor rock and concrete slabs that were built and maintained historically to stop shoreline erosion at this site.

With Alternative 4, the marina would be dredged by small hydraulic dredge with placement of sediment through hydraulic pipeline directly at the nearshore disposal area. No confinement for placement of dredged sediment is assumed at this time¹⁷. Once placed, the dredged material will be subject to erosion from energy produced by waves and tidal currents. However, by eroding and absorbing wave and tidal current energy, the dredged sediment provides protection from shoreline erosion. In other words, placement of dredged material at the proposed Alternative 4 site should be considered as a sacrificial measure to minimize shoreline erosion and to avoid the need to place armor rock. It is expected that sediment to be placed at the Alternative 4 Disposal Site would be constantly eroding, providing space and capacity for upcoming maintenance dredging events.

Alternative 5: Dredging with hydraulic dredge and Sand Island disposal. The objective of this alternative is to abandon the existing upland disposal site and form a new, unlimited capacity nearshore disposal site. The concept of Alternative 5 is described in Figure 9 (plates “a” and “b”).

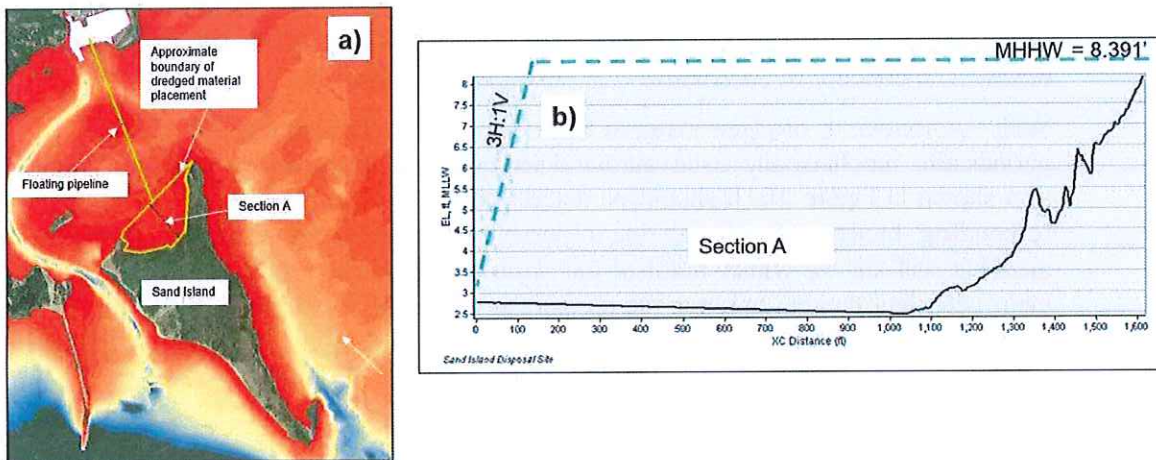


Figure 9. Port of Ilwaco Dredge Material Disposal Alternative 5 concept

Figure 9a shows the boundary of the proposed Sand Island nearshore placement area overlaid on bathymetric survey data. Figure 9b shows in black the existing depths (elevations) along Section A and proposed vertical limits (blue dashed line) of the dredged material placement. The geometric volume confined by the boundaries of the

¹⁷The final decision regarding the need of a confinement berm would be made during the permitting process and upon consultation with the agencies and USACE.

proposed site and existing configuration of the bed is estimated in excess of 600,000 cy, which would be sufficient for first time placement and long-term maintenance dredging requirements.

With Alternative 5, dredging in the marina would be conducted by a hydraulic dredge. The dredged sediment would be pumped through a floating pipeline and discharged directly at the proposed nearshore placement area of Sand Island. The type and dimensions of the hydraulic dredge and detailed alignment of the pipeline should be determined during preliminary and final design, if this alternative is selected. Preliminarily, it is expected that a portable hydraulic dredge of a minimum 12" and maximum 16" discharge pipe diameter would be used for the project. The length of pipeline was estimated at approximately 7,000 ft, which indicates a possible need for one booster pump. The need for a booster pump and specific location would be determined during the next phase of design.

No confinement for placement of dredged sediment is assumed at this time¹⁸. It is expected that sediment to be placed at the Sand Island Disposal Site would be constantly eroding, providing space and capacity for upcoming maintenance dredging events.

8.3. Port of Chinook

Three potential disposal sites were considered for sediments dredged from the Port of Chinook. Each alternative is briefly described below.

Alternative 1: Clamshell and bottom dump barges with open water disposal and restoration of existing upland disposal site capacity. The objective of this alternative is to maintain the existing upland disposal site, but periodically, once it is filled up (estimated once every 10-15 years) to empty the site using the operations discussed below. The concept of Alternative 1 is described in Figure 10.

With Alternative 1, dredged material from this upland disposal site will be periodically mechanically excavated and placed at the temporary re-handling area, also shown in Figure 10. It should be noted that the specific location of the re-handling facility may change due to possible remodeling of the adjacent upland area, but will still be within reach of the clamshell to be used for the project. The clamshell shall be able to reach the temporary re-handling facility and load the excavated sediment to the bottom dump barge, stationed at the temporary offloading facility (over-dredge area) shown in the figure.

¹⁸The final decision regarding the need for a confinement berm would be made during the permitting process and upon consultation with the agencies and USACE.



Figure 10. Port of Chinook Disposal Alternative 1 schematic

Alternative 1 assumes the use of a middle or large-scale clamshell and bottom dump barge with a capacity of 2,000 – 6,000 cy, with a loaded draft of 10-17 ft that will be moored at the temporary loading facility. Additional dredging may be required at this loading facility to accommodate barge loading operations without grounding. The volume of additional dredging and the specific locations of temporary loading and re-handling facilities shall be determined upon preliminary and final design of the dredging operations, if Alternative 1 is implemented for Port of Chinook.

Once loaded with excavated sediment, the bottom dump barge will be towed to the designated open water disposal site and sediment will be disposed. The specific open water disposal site for placement of excavated sediment shall be determined upon preliminary and final design, but likely would be one of USACE's Columbia River Mouth sites, as described in Appendix A.

Alternative 2: The objective of this alternative is to develop an unlimited capacity nearshore open water disposal site with beneficial use of dredged material to minimize bottom scour in the vicinity of the USACE Pile Dike. Upon implementation of Alternative 2 there would be no need for the upland disposal site currently in use, and the upland disposal site would be abandoned. As discussed above, it is believed that placement of sediment at the Pile Dike site would also help to restore historical levels of suspended sediment concentration in the Lower Columbia River Estuary that have apparently been depleted during the last century. The concept of Alternative 2 is described in Figure 11.



Figure 11. Port of Chinook Disposal Alternative 2 schematic

With Alternative 2, dredging in the marina would be conducted by a hydraulic dredge. The dredged sediment would be pumped through a floating pipeline and discharged at the proposed placement area eastward of the pile-dike structure. The type and dimensions of hydraulic dredge as well as detailed alignment of the pipeline would be determined during preliminary and final design. Preliminarily, it is expected that a portable hydraulic dredge of a minimum 10" and maximum 16" discharge pipe diameter would be used for the project. The length of pipeline was estimated at approximately 6,500 ft, which indicates a possible need for one booster pump. The need for a booster pump and specific location (if needed) would be determined during the next phase of design.

The proposed area of placement is located in close proximity to the USACE Pile Dike. It is very likely (based on previous experience) that a scour hole has been formed and has progressed along at least some length of the toe, which is detrimental to the Pile Dike's integrity and performance. Placement of dredged material at the Alternative 2 Disposal Area would minimize scour effects and may be beneficial for the stability and performance of the Pile Dike. The proposed Alternative 2 Disposal Area is preliminarily identified with dimensions 4,000' x 1,000' that would be sufficient for placement of sediment from the capital and subsequent maintenance dredging events.

Alternative 3: Dredging with hydraulic dredge and placement of sediment at the nearshore beneficial use disposal sites. The concept of this alternative was recommended by specialists from the Portland District USACE during a joint project meeting in October 2018. The objective of this alternative is to develop an unlimited capacity nearshore open water disposal site, restore the eroded bottom slope, and abandon the existing upland disposal site. Also, as discussed above, it is believed that this alternative would beneficially contribute to restoration of historical levels of suspended sediment concentration in the Lower Columbia River Estuary that apparently have been depleted during last century. The concept of Alternative 3 is described in Figure 12.



Figure 12. Port of Chinook Disposal Alternative 3 schematic

The Alternative 3 Nearshore Disposal Area is preliminary identified with dimensions at approximately 3,000 ft long (along the shore) and 500 ft wide (perpendicular to the shore) as shown on Figure 12. The location of the disposal area was selected along the nearshore bottom slope that has recently been subjected to scour and deepening (trenching) as a result of landward migration of the tidal channel. Formation of the trench in the nearshore area has contributed to an acceleration of shoreline erosion, thus several erosion mitigation measures have recently been undertaken at this site.

With Alternative 3 dredging in the marina would be conducted by a hydraulic dredge. The dredged sediment would be pumped through a short length of pipeline and discharged directly at the proposed nearshore placement area, shown in Figure 12. The type and dimensions of the hydraulic dredge as well as detailed alignment of the pipeline would be determined during preliminary and final design. Preliminarily, it is expected that a portable hydraulic dredge of a minimum 10" and maximum 16" discharge pipe diameter would be used for the project. The length of pipeline would not exceed 4,000 ft; thus, it is assumed that a booster pump would not be needed.

Placement of dredged material at the proposed placement site for Alternative 3 would minimize scour effects and preclude further formation of a trench. The placement area would be sufficient for placement of sediment from capital and subsequent maintenance dredging events.

9. Environmental Permit and Regulatory Requirements Considerations

9.1. General Overview

A conceptual level investigation of permitting requirements and possible regulatory concerns has been conducted for the purpose of evaluating the developed dredging

and dredged material disposal alternatives and selection of the preferred option(s)¹⁹. The regulatory-related investigation was conducted by specialists from BergerABAM and a full report on this investigation is attached (Appendix A).

In general, the report has identified a scope of regulatory studies and requirements that shall be completed and addressed during the process of obtaining the environmental permits as follows:

- Clean Water Act Section 404b1- Alternatives Analysis: This analysis is required for dredging or filling of waters of the United States. This evaluation assumes that alternatives analysis would not be required if the alternative is using existing permitted disposal sites. Establishing a new in-water disposal site or beneficial use site is assumed to require the 404b1 analysis.
- Section 408 review: Section 408 review by the USACE Navigation group is needed for all in-water work to evaluate potential impacts to the FNCs. A checklist is submitted for USACE review. Additional analysis is typically required if any activities will occur within or near a FNC, including hydraulic analysis, sediment fate and transport evaluation and/or other studies as determined by USACE.
- Existing Upland Disposal Site Restoration: Relocation of previously dredged material from the existing marina upland disposal site to an open-water site may trigger additional dredged material characterization by the DMMP.
- Beneficial Use: Establishing a new in-water beneficial use site will likely require 404b1 analysis, baseline studies of the proposed site, documentation of the benefits (i.e., beach nourishment or erosion control), sediment fate and transport analysis and use/lease agreements with DNR or other owners.

The investigation also pointed out possible complexities and uncertainties with obtaining the environmental permits, including potential needs for specific additional studies that may affect permitting difficulty, schedule, and cost. Tables 1 and 2 of Appendix A summarize the permitting requirements, relative permitting difficulty, and anticipated regulatory review timelines estimated for each alternative at the Port of Ilwaco and at the Port of Chinook. The color scheme in the table indicates the category of difficulty (or uncertainty) associated with the permitting process for each alternative- yellow color indicates more complexities and uncertainties.

In general, the tables indicate that alternatives which include dredged material disposal at non-established disposal sites are generally more difficult to permit than those alternatives which use active and established disposal sites. For example, the Port of Ilwaco Alternatives 2, 4, and 5, and Port of Chinook Alternatives 2 and 3 may require a step further in the Section 408 process by providing a hydraulic analysis demonstrating sediment fate and transport. It should be noted that Section 408 is a relatively new regulatory permit and there are uncertainties with the requirements related to this process. In order to assess and minimize possible risks in the future, a simplified level of hydraulic analysis was performed for the alternatives ranked (by

¹⁹ It should be noted that assessments and preparation of environmental permits is not a part of the scope of work for the current project. However, upon meetings and consultations with the Portland District USACE (predominately with specialists from Engineering and Navigation Branches) a concern has been raised that some of the alternatives, though technically feasible and economical, may be viewed differently by environmental regulatory bodies.

BergerABAM specialists) as being more complex and uncertain from the perspective of the Section 408 permitting process. Alternative 4 for the Port of Ilwaco, dredging with small hydraulic dredge and placement of sediment into nearshore beneficial use disposal sites, was selected for this analysis. The location of the dredged sediment placement site for this alternative is the shortest distance to the FNC (in comparison to other alternatives); thus, a more rigorous USACE regulatory branch review is expected.

9.2. Alternative 4, Port of Ilwaco, Section 408 Related Hydraulic Analysis

The Port of Ilwaco FNC extends from Fort Canby (RM 01+50) to the Port of Ilwaco (RM 03+10), with a total length of 1.3 miles and is maintained by the USACE at a depth of -16 ft MLLW (with advanced maintenance dredging to -18 ft MLLW) and a width of 150 ft (USACE, 2016a). Figure 13 shows the location of the Port of Ilwaco FNC and the boundaries of the proposed Alternative 4 nearshore beneficial use disposal site.

A part of the FNC near the entrance to the Port (further referenced as “entrance channel”) of approximately 1,000 ft long, from RM 03+00 to RM 03+10, is located in close proximity to the proposed placement site and would be at the highest risk of impact. The Port of Ilwaco FNC has been subjected to sedimentation and was regularly dredged by the USACE. For example, between August 11 and September 4, 2015, the Corps dredged 92,104 cy of material from the Port of Ilwaco FNC (USACE, 2016a). Review of hydrographic survey data indicates that the thickness of deposition (prior to the dredging) was in a range of 2-5 ft in average over the width of the channel.

The possible impact analysis was evaluated thorough review and analysis of morphology, hydrodynamics, and lithology (sediment composition) at the adjacent bottom slope.

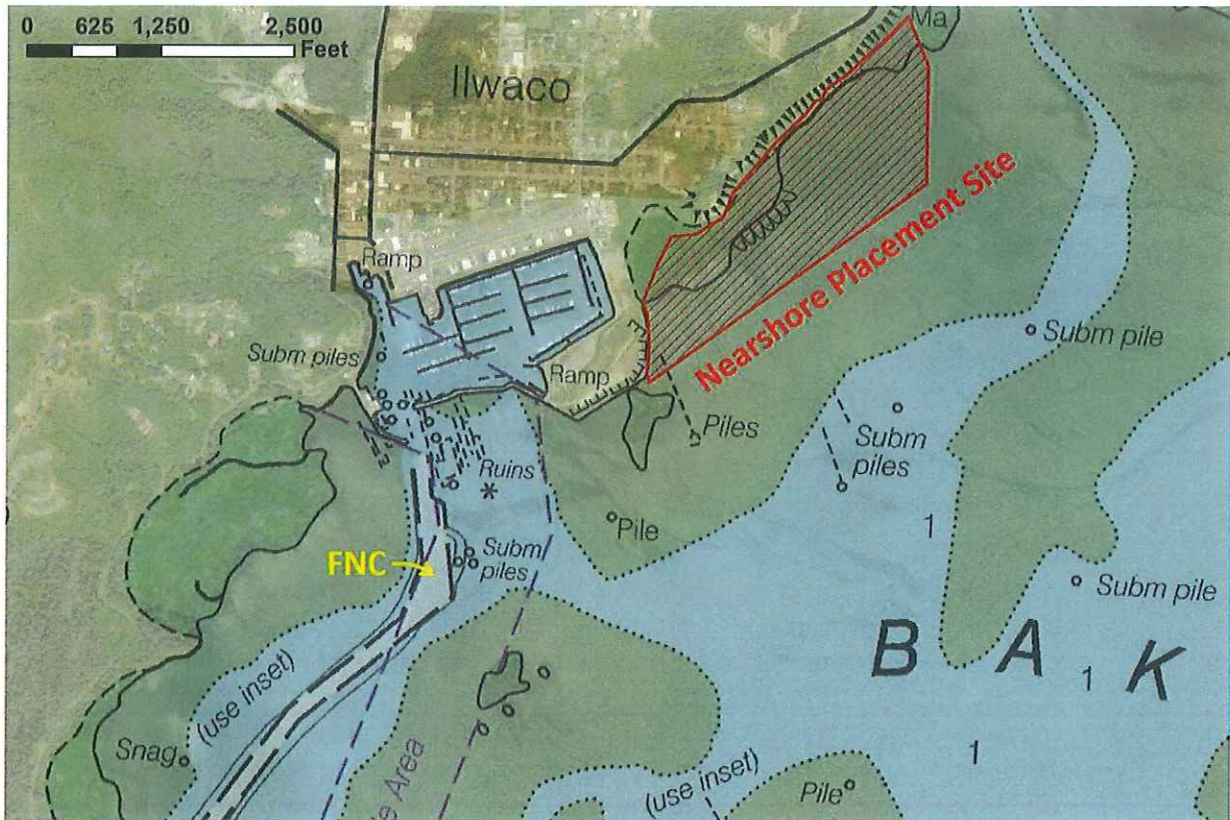


Figure 13. Location of proposed nearshore disposal site relative to FNC

Hydrodynamics: Hydrodynamic conditions described herein are governed by tidal circulation and Columbia River flows and do not include the local wave component. Analysis of hydrodynamic conditions was conducted based on results of numerical modeling by USACE (USACE, 2019). Figure 14 shows a snapshot of this numerical modeling that was provided by USACE to describe the representative ebb tide conditions in the vicinity of the Port of Ilwaco FNC. A location of the proposed beneficial use disposal site is also plotted in the figure.

The figure shows a spatial distribution of apparently depth-averaged velocities over an area of the FNC and proposed location of disposal site. Results of the modeling demonstrate low velocities at the proposed nearshore disposal site that, at peak values, are less than 10 cm/s. At the same time, the figure shows high velocities (> 80 cm/s) at the areas adjacent to the FNC. The current flow of these high velocities is aligned close to perpendicular to the Entrance Channel. While currents are crossing the channel, the flow velocity reduces dramatically to a negligible value.

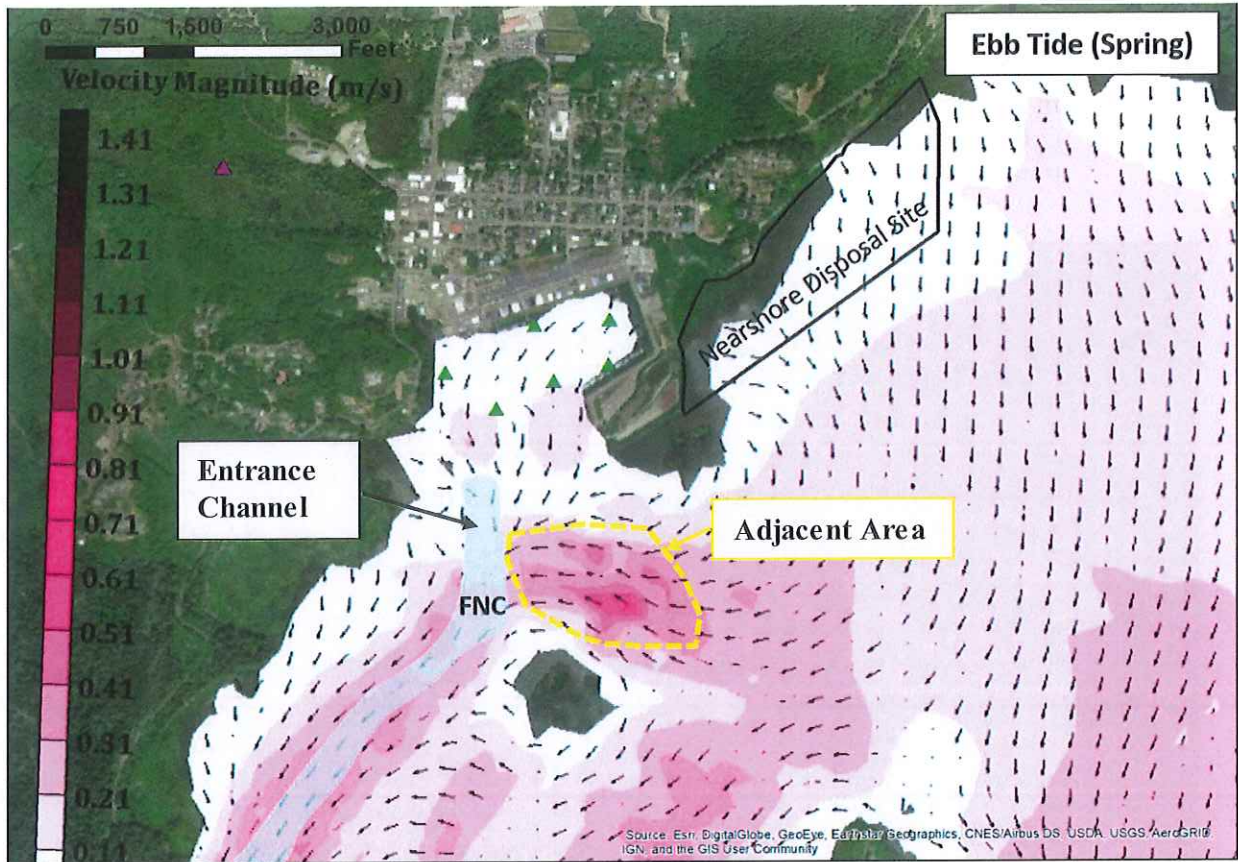


Figure 14. Results of USACE hydrodynamic numerical modeling during spring ebb tide

Interpretation of the modeling results suggests the following: a) High velocities resuspend bottom sediment in the vicinity of the channel; b) Reduction of flow velocity, while crossing the channel results in deposition of resuspended sediment. Considering the significant gradient of flow velocities crossing the channel area it is likely that most of resuspended nearby sediments are deposited in the channel cut. In other words, most of the material contributing to sedimentation in the FNC originates in the adjacent areas; c) Flow velocities at the proposed beneficial use site are insufficient to resuspend any significant amount of sediment. Sediment that can be resuspended by such small velocities (less than 10 cm/s) would be very fine (small) with no, or limited, ability to settle in the Adjacent Area and FNC. In other words, based on hydrodynamic conditions, it is unlikely that the proposed beneficial use disposal site would result in an increase of sedimentation in the FNC of any detectable amount.

Morphology: The proposed beneficial use disposal site is separated from the Entrance Channel by a headland-type feature that is composed of an extensive tidal flat and a shallow mass of land jutting out seawards, as shown in Figure 15. This morphological feature would preclude direct sediment transport (if any may occur) from the proposed disposal site towards the FNC. As shown above, tidal currents traveling from the proposed Placement Site toward the channel are weak and would

not be able to transport any significant amount of sediment from the disposal site (if indeed this sediment is resuspended during a wave storm event).

In addition, the path through the bifurcated channel (from the proposed disposal site to the FNC) is over 1 mile; therefore, the risk of significant alternation of sediment transport conditions at the FNC due to placed sediment at the Nearshore Site is low.



Figure 15. Google Earth Aerial (2016) image showing shoal between proposed nearshore placement site and FNC at Ilwaco

Lithology: The data on sediment characteristics at the nearshore bottom area of Baker Bay is limited and not sufficient to directly predict possible sediment pathways from the proposed beneficial use site. For this purpose, an indirect comparison of dredged sediment at the Port of Ilwaco Marina (sediment to be placed at the proposed disposal site) and sediment currently dredged from the FNC was conducted. The Port of Ilwaco Marina dredged sediment consists predominately (> 99%) of silt and clay. The amount of sand in the sediment grain size composition is minimal, less than 1%. On the other hand, the sediment deposited in the FNC includes significant amount of sand particles. Depending on the location of the sediment samplings, it may be up to 80-90%, as shown in Figure 16, which is taken from Table 5 of the USACE Sediment Quality Evaluation Report, July 2016.

SAMPLE ID:	080315- BBWC- COMP-01	Q	080315- BBWC- COMP-02	Q	101615- BBWC-PG- 1.1	Q	101615- BBWC-PG- 1.2	Q	101615- BBWC-PG- 1.3	Q	101615- BBWC-PG- 2.1	Q	101615- BBWC-PG- 2.2	Q	101615- BBWC-PG- 2.3	Q	101615- BBWC-PG- 2.4	Q	
DMMU/NSM ID:	DMMU 1		DMMU 2		DMMU 1		DMMU 1		DMMU 1		DMMU 2		DMMU 2		DMMU 2		DMMU2		
Conventional Parameters																			
Total Organic Carbon (%)	2.20		0.04	J	--		--		--		--		--		--		--		--
Total Solids (%)	43.6		80.9		38.9		44.6		49.8		76.8		77.3		49.2		78.7		
Total Sulfides (mg/kg)	--		--		--		--		--		--		--		--		--		--
Ammonia (NH3) as Nitrogen(N) (mg/kg)	--		--		--		--		--		--		--		--		--		--
Particle Size (% retained)																			
Gravel (>2.00 mm)	0.00		0.08		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Sand, Very Coarse (1.00 to 2.00 mm)	0.07		0.02		0.00		0.00		0.03		0.03		0.03		0.01		0.01		0.01
Sand, Coarse (0.500 to 1.00 mm)	0.08		0.43		0.03		0.03		0.17		2.62		1.52		1.31		2.72		
Sand, Medium (0.250 to 0.500 mm)	0.09		64.37		0.03		0.27		0.62		65.31		62.82		61.61		66.81		
Sand, Fine (0.125 to 0.250 mm)	0.38		33.59		0.28		1.20		3.92		30.24		33.67		35.55		29.00		
Sand, Very Fine (0.0625 to 0.125 mm)	8.16		0.14		0.50		2.70		5.00		0.06		0.15		0.12		0.10		
Silt (0.039 to 0.0625 mm)	82.24		0.09		2.50		9.20		14.70		0.00		0.00		0.00		0.00		
Clay (<0.0039 mm)	18.10		0.39		97.16		89.3		80.56		1.99		2.05		10.41		8.75		
% Sand	8.78		98.55		0.84		4.20		9.74		98.26		98.19		98.6		98.64		
% Fines	100.34		0.48		99.66		98.5		95.26		1.99		2.05		10.41		8.75		

Figure 16. Table 5 of USACE report Sediment Quality Evaluation Report, July 2016

Other information used in the evaluation of possible sediment pathways from the Nearshore Disposal site and possible deposition in the FNC is based on modeling results with the Particle Tracing Model²⁰ (PTM) from the USACE report: *Assessment of Sedimentation in the Federally Maintained Channels for the Ports of Chinook and Ilwaco*, 2011. The PTM modeling results (relevant to the current project) indicate that only a small amount of sediment resuspended from the bottom of Baker Bay would settle in the Ilwaco FNC. For example, Figure 14, from the USACE report (Figure 17 in this report) shows results of PTM modeling of sediment that was released into the system just upstream of Baker Bay. Sediments deposited in the bed are depicted by red color. Blue color indicates sediment that is active and was not deposited during the 5-day simulation period. The figure shows non-detectable sediment deposition in FNC Entrance Channel. Most sediment shown on the figure (even inside of FNC) is the “active” sediment, those that move through the channel area without settling. An interpretation of the Port of Ilwaco Marina and FNC dredged sediment composition in combination with PTM modeling results suggest that placement of dredged sediment at Nearshore Disposal Site would not result in additional sedimentation in the FNC of any significance.

²⁰ PTM model is governed by combined tidal currents and wave hydrodynamics.



Figure 17. Results of 5 days PTM modeling at Baker Bay (from USACE's *Assessment of Sedimentation in the Federally Maintained Channels for the Ports of Chinook and Ilwaco, Baker Bay, WA Report, Figure 14*)

In summary, three methods of analysis, directly or non-directly, have indicated that placement of sediment from the Port of Ilwaco Marina at the Nearshore Disposal site would most likely not significantly increase the existing level of sedimentation and maintenance dredging requirements at the FNC. As discussed above, analysis of impact was conducted for the alternative that was ranked as more complex and uncertain from the perspective of the Section 408 permitting process. Thus, the results of this analysis may be applicable to all other dredging/disposal alternatives, excluding Port of Ilwaco Alternative 3 and Port of Chinook Alternative 2. Upon meetings with the Portland District USACE, it was pointed out that the Port of Ilwaco Alternative 3 involves temporary stationing of the barge in the FNC. The location of this stationing is of concern to the engineering staff of USACE and most likely will require a thorough Section 408 review. Similarly, the Port of Chinook Alternative 2 disposal site is located in the vicinity of the pile dike and in close proximity to the FNC. Thus, these concerns may require additional Section 408 studies. All other alternatives would likely be able to sustain review of a Section 408 permit, if required.

The data and conclusions of this section are applied below in the evaluation and selection of the preferred alternative, and would also be helpful in the future during a Section 408 review process (if required) of the preferred alternative²¹.

²¹ It should be understood that conclusions in this section do not warrant a decision of the USACE regulatory branch on the likelihood of a Section 408 review process or (if required) do not warrant a simple and straightforward obtaining of this permit.

10. Port of Ilwaco and Port of Chinook Dredging and Dredged Material Disposal Alternatives Preliminary Cost Estimates

The cost estimates for implementation of each of the above dredging and dredged material placement alternatives were developed at the preliminary level²² based on the general assumptions as follows:

- All dredged and excavated sediment are suitable for open water disposal.
- Open water disposal sites at the Mouth of Columbia River will be available for placement of sediment from the Port of Chinook and the Port of Ilwaco.
- Costs for permitting and related mitigation measures (if required) are not included.
- Costs for acquiring land or leases of nearshore areas (if required) are not included.
- All dredging work will be performed by the Contractor.
- All costs are in 2018 money values.
- Dredging cost estimates for hydraulic dredging work were computed using the Corps of Engineering Dredging Software (Dredging Cost Spreadsheet).

In addition to these general assumptions, the following explicit assumptions were used in developing the preliminary level of cost estimates:

- Port of Ilwaco Alternative 1: Cost estimate for capital dredging consists of two elements: 1) Dredging and open water disposal of 450,000 of sediment to bring the marina to the design depth conditions indicated by Figure 1 above and 2) Excavate 250,000 cy of sediment from the upland disposal to provide capacity for next 10-15 years of maintenance dredging events.
- Port of Chinook Alternative 1: Cost estimate for capital dredging consists of two elements: 1) Dredging and open water disposal of 67,000 cy of sediment to bring the marina to the design depth conditions indicated by Figure 1 and 2) Excavate 40,000 cy of sediment from the upland disposal to provide capacity for next 10-15 years of maintenance dredging events.
- Port of Ilwaco Alternative 1: Maintenance dredging includes dredging of 58,000 cy one time per 2 years with small hydraulic dredge and placement of dredging sediment at the upland disposal site. No expenses on construction and maintenance of upland disposal site are included.
- Port of Chinook Alternative 1: Maintenance dredging includes dredging of 27,000 cy one time per 3 years with small hydraulic dredge and placement of dredging sediment at the upland disposal site. No expenses on construction and maintenance of upland disposal site are included.
- Port of Ilwaco Alternatives 2, 3, and 5, and Port of Chinook Alternative 2 maintenance dredging events cost estimates include mobilization/demobilization similar to capital dredging works of pipeline.

The results of cost estimates are presented in Tables 5 and 6.

²² Level of accuracy of preliminary cost estimates corresponds to an order of magnitude and is used herein for comparative analysis and selection of the preferred alternative. More accurate cost estimates will be developed during the next phases of the project, preliminary and final design.

Table 5. Port of Ilwaco Dredging and Disposal Alternatives Preliminary Cost Estimates

Alternative	First Time Dredging Costs	Design Maintenance Dredging Event Costs ²³
1. Clamshell dredging and restoration the existing upland site capacity	\$11,000,000	\$460,000
2. Hydraulic dredging and Jetty A disposal	\$6,300,000	\$1,200,000
3. Hydraulic dredge, bottom dump barge, and open water disposal	\$7,100,000	\$1,400,000
4. Small hydraulic dredge and nearshore beneficial use disposal site	\$2,800,000	\$420,000
5. Hydraulic dredge and Sand Island disposal	7,600,000	\$1,100,000

Table 6. Port of Chinook Dredging and Disposal Alternatives Preliminary Cost Estimates

Alternative	First Time Dredging	Design Maintenance Dredging Event Costs
1. Clamshell dredging and restoration the existing upland site capacity	\$3,000,000	\$270,000
2. Hydraulic dredging with placement at the Corps pile dike	\$1,000,000	\$650,000
3. Hydraulic dredge and nearshore disposal	\$500,000	\$250,000

11. Summary of Alternative Evaluation

The dredging and dredge material disposal alternatives were developed based on data collected and analyzed throughout the project and the alternative development criteria discussed in Section 3. In addition, the evaluation and selection of the preferred alternatives included preliminary feedback obtained from the USACE specialists during two joint meetings in Portland, October 1, 2018 and January 19, 2019. The evaluation criteria were organized and tabulated in Tables 7 and 8.

Considering the complexity and diversity of the evaluation criteria, a color scheme of three colors was applied to objectively evaluate the various alternatives: green color means “preferred,” yellow color means “moderately preferred,” and red color means “less preferred.” Using this color scheme, the evaluation of the alternatives was conducted in a matrix form in Tables 7 and 8.

Based on review of the tables and upon consultation with the Ports, the following two alternatives were selected as preferred and are recommended for implementation:

- Port of Ilwaco: Alternative 4 and/or Alternative 1
- Port of Chinook: Alternative 3

²³ Maintenance dredging event for the Port of Ilwaco Marina is assumed 1 time per 2 years with volume of 58,000 cy

The approach of selecting two preferred alternatives for the Port of Ilwaco is justified by the risks associates with obtaining environmental permits. In the case that Alternative 4 requires a complex and lengthy process of permitting, the funds secured should be used to implement Alternative 1.

Table 7. Port of Ilwaco Marina

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Performance ¹⁴	Green	Green	Green	Green	Green
Constructability ¹⁵	Green	Green	Green	Green	Yellow
Capital Cost ¹⁶	Red	Red	Red	Green	Red
Maintenance Cost	Green	Red	Red	Green	Red
Environmental Permit Risks and Uncertainties	Green	Yellow	Red	Red	Yellow
USACOE Dredging Experts Initial Feedback ¹⁷	Green	Green	Red	Yellow	Red
Use dredged sediment for shoreline protection	Light Green	Red	Red	Green	Red
Use dredged sediment to maintain sediment budget in LCR Estuary	Yellow	Yellow	Yellow	Green	Green

Table 8. Port of Chinook Marina

	Alternative 1	Alternative 2	Alternative 3
Performance ¹⁴	Green	Green	Green
Constructability ¹⁵	Green	Yellow	Green
Capital Cost ¹⁶	Red	Red	Green
Maintenance Cost	Green	Yellow	Green
Environmental Permit Risks and Uncertainties	Green	Yellow	Yellow
USACOE Dredging Experts Initial Feedback ¹⁷	Green	Red	Green
Use dredged sediment for shoreline protection	Red	Yellow	Green
Use dredged sediment to maintain sediment budget in LCR Estuary	Yellow	Green	Green

12. Recommendations

Port Ilwaco

- a. Proceed with design, permitting, and implementation for the Preferred Alternative 1 (early referenced as Alternative 4) of dredging and dredged material disposal.
- b. Secure the funds for Preferred Alternative 1 (\$11,000,000) in case the permitting process for Preferred Alternative 2 (early referenced as Alternative 1) requires unreasonable amounts of time and resources.
- c. Bathymetric and topographic surveys of the bottom slope of Preferred Alternative 1 has been completed under this study effort and the results, xyz format survey data are stored in a separate digital file. These survey data of the disposal site are prepared to support future permitting process.

Port of Chinook

- a. Proceed with obtaining funds for design, permitting, and implementation of the recommended Preferred Alternative (early referenced as Alternative 3) of dredging and dredged material disposal.
- b. Bathymetric and topographic surveys of the bottom slope of Preferred Alternative has been completed under this study effort and the results, xyz format survey data are stored in a separate digital file. These survey data of the disposal site are prepared to support future permitting process.

13. References

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