DRAFT

ENVIRONMENTAL IMPACT STATEMENT

for

BREMERTON WATERFRONT INFRASTRUCTURE IMPROVEMENTS

at

PUGET SOUND NAVAL SHIPYARD AND INTERMEDIATE MAINTENANCE FACILITY, NAVAL BASE KITSAP-BREMERTON

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APPENDIX A. ENVIRONMENTAL COMMITMENTS, MONITORING, AND REPORTING SUMMARY

1. Introduction

This appendix includes environmental commitments associated with the Bremerton Waterfront Infrastructure Improvements at Puget Sound Naval Shipyard and Intermediate Maintenance Facility on Naval Base Kitsap-Bremerton. Environmental commitments are identified as:

- Best Management Practices (BMPs)
- Mitigation measures, including compensatory mitigation for unavoidable impacts to aquatic resources
- Conditions of approval associated with the project's agreements, authorizations, and permits

Together, these measures are the Navy's environmental commitments. Each commitment shall be tracked, implemented, monitored, and reported as required. This appendix provides a summary of the commitments that are clear at this time (BMPs), and how the Navy will address compliance with the final set of environmental commitments.

1.1 Best Management Practices

BMPs are policies, practices, and measures that the Navy has identified to reduce the environmental impacts of designated activities, functions, or processes. Although BMPs mitigate potential impacts by avoiding, minimizing, or reducing/eliminating impacts, BMPs are distinguished from potential mitigation measures because BMPs are:

- Existing requirements,
- Ongoing, regularly occurring practices, or
- Not unique to this proposed action.

The BMPs identified in this appendix (Table 1 and Table 2) are inherently part of the Proposed Action and are not potential mitigation measures proposed as a function of the National Environmental Policy Act (NEPA) environmental review or regulatory approval process for the proposed action.

1.2 Mitigation Measures

Mitigation measures, including compensatory mitigation, will be implemented to reduce unavoidable environmental impacts from the Proposed Action. Compensatory mitigation refers to the restoration, establishment, enhancement, or in certain circumstances, preservation of wetlands, streams, or other aquatic resources for the purpose of offsetting unavoidable adverse impacts. Compensatory Mitigation must comply with the U.S. Army Corps of Engineers (USACE) and U.S. Environmental Protection Agency (EPA) Compensatory Mitigation for Losses of Aquatic Resources, Final Rule (USACE and EPA 2008). Compensatory mitigation is discussed in Appendix F of the EIS.

1.3 Conditions of Approval

During the NEPA process, the Navy is continuing to conduct all required consultations with agencies and the Suquamish Tribe, Skokomish Tribe, Port Gamble S'Klallam Tribe, Jamestown S'Klallam Tribe, and Lower Elwha Klallam Tribe and obtain required permits and authorizations prior to implementation of

the Proposed Action. Navy obligations associated with these processes will be added to this appendix. Anticipated agreements, authorizations, and permits include:

- Memorandum of Agreement under Section 106 of the National Historic Preservation Act (NHPA)
- Biological Opinions under Section 7 of the Endangered Species Act (ESA)
- Conservation Recommendations under the Magnuson-Stevens Fishery Conservation and Management Act
- Letter of Authorization under the Marine Mammal Protection Act (MMPA)
- Permits/Authorizations under the Clean Water Act and Rivers and Harbor Act

1.4 Monitoring Program

The Navy will conduct required monitoring during both construction and operations. Examples of monitoring activities that are likely to occur during the in-water work phases of construction include water quality, ambient noise, marine mammal (MMPA/ESA consultation), marbled murrelet (ESA consultation), and underwater noise monitoring (MMPA/ESA consultation). Monitoring during upland construction phases that are likely to occur would be for compliance with Section 106 of the NHPA for post review discovery of potential historic properties, as well as for inadvertent discovery of cultural materials subject to the Native American Graves Protection and Repatriation Act. Inadvertent discovery of unknown archaeological resources would require work stoppage if these resources were encountered.

Each construction contractor will submit an Environmental Protection Plan for Construction Management for approval prior to beginning construction activities. This plan will document how the contractor intends to comply with all environmental measures applicable to the contract including application of BMPs. The Navy also will ensure that monitoring is documented through periodic reports and that deficiencies are promptly corrected. The designated environmental monitor(s) will track and document compliance with permit requirements and mitigation measures, note any problems, and take appropriate action to rectify problems.

1.5 Reporting Program

The Navy will report compliance with BMPs (Table 1 and Table 2) and mitigation measures as required by the agreements, permits, and authorizations listed above.

Table 1 Best Management Practices for NAVBASE Kitsap-Bremerton

BMP	*Impacts Reduced or Avoided*	*Description*	*Applicability*
AQ-BREM-1	Impacts from construction activities	Fugitive Dust Reasonable precautions to minimize visible fugitive dust emissions would be implemented, in accordance with PSCAA Regulation I, Article 9, Section 9.15. These include, but are not limited to: 1. The use of control equipment, enclosures, and wet (or chemical) suppression techniques, as practical, and curtailment during high winds; 2. Surfacing roadways and parking areas with asphalt, concrete, or gravel; 3. Treating temporary, low-traffic areas (e.g., construction sites) with water or chemical stabilizers, reducing vehicle speeds, constructing pavement or riprap exit aprons, and cleaning vehicle undercarriages before they exit to prevent the track-out of mud or dirt onto paved public roadways; or 4. Covering or wetting truck loads or allowing adequate freeboard to prevent the escape of dust-bearing materials. Other common aspects of a dust control plan include: • Use water in the demolition of existing structures, construction operations, and grading or clearing of land. • Apply water on roads. • Whenever feasible, pave ingress and egress points to the site. • Establish and monitor speed limits for project rights-of-way. • Cover all moving, open-bodied trucks transporting dusty materials. • Promptly remove soil or other “carry out“ materials from roads adjacent to the site. • Install dust screens or wind barriers around construction site. • During earth-moving activities, pre-apply and re-apply water as necessary to maintain soils in a damp condition, limit the amount of exposed areas through planning and timing of project phases, and cover temporarily exposed areas with mulch. • Stabilize stockpile materials. • Keep stockpiles wet or damp as needed. • Cover non-dredge soil/sand/other dust source stockpiles when not in use. • Stockpiles shall have engineered slopes or benches to keep their height as low as possible.	Construction

BMP	*Impacts Reduced or Avoided*	*Description*	*Applicability*

		• Add or remove soil/sand/other dust sources material from downwind portion of stockpile.
		• For on-site trucks:
		  ○ Provide water while loading and unloading to prevent fugitive dust.
		  ○ Maintain at least 6 inches of freeboard on haul vehicles.
		  ○ Level the height of load.
		  ○ Limit vehicular speed while traveling on-site.
		  ○ Cover loads while traveling. Install a gravel pad and grizzly (i.e., rumble grate) at exit.
		  ○ Reduce carry out with a tire wash or spray system.	

AQ-BREM-2	Impacts from mobile source emissions and construction activities	<u>Mobile Source Emissions</u> • Modify schedules/routes to reduce idling emissions. • Route on-road trucks to avoid areas where sensitive populations are likely to be present (e.g., schools, daycare, nursing homes, residences, playgrounds). • Limit truck idling by posting signage at worksites to serve as a reminder. • To the extent practicable as allowed by space constraints, staging areas/laydown areas shall be located as close as possible to where the construction activity occurs. • Where practicable, require use of newer or higher tier diesel engines during construction. • Require use of ultra low-sulfur diesel fuel. • Perform routine preventive maintenance of diesel engines to minimize emissions. • Where practicable, installing engine exhaust filters, require use of cleaner burning engines, installing diesel oxidation catalysts, and/or use special fuels or fuel additives (e.g., biodiesel) to minimize vehicle emissions.	Construction
AQ-BREM-3	Impacts from demolition	<u>Asbestos Control Standards</u> Asbestos survey, notification, removal, and disposal requirements would be performed in accordance with PSCAA Regulation III, Article 4, including: • Conducting an asbestos survey by an Asbestos Hazard Emergency Response Act building inspector prior to any renovation or demolition activity occurring.	Construction/Demolition

BMP	*Impacts Reduced or Avoided*	*Description*	*Applicability*
		• Notifying PSCAA prior to any work on an asbestos project or demolition in accordance with Section 4.03 (Asbestos Notification Requirements = 10 days). • Completing asbestos removal requirements prior to renovation or demolition projects. • Following all required procedures related to training, work practices for friable asbestos removal, and methods of removal for nonfriable asbestos-containing material for asbestos projects. • Properly disposing of asbestos-containing waste within 10 days of removal at a waste disposal site authorized to accept such waste, following waste tracking, temporary storage site. • Asbestos cement pipe used on public rights-of-way, public easements, or other places receiving the prior written approval from PSCAA may be buried in place if the pipe is covered with at least 3 feet or more of non-asbestos fill material. All asbestos cement pipe fragments that are 1 linear foot or less and other asbestos-containing waste material shall be disposed of at a waste disposal site authorized to accept such waste.	
AQ-BREM-4	Impacts from GHG	<u>GHG Emissions</u> • To the extent practicable, use propane or electric-powered equipment, including vehicles (the availability of equipment would be determined after contract is awarded and winning bidder is selected). • To the extent practicable, use on-site renewable electricity generation and/or grid-based electricity rather than diesel-powered generators or other equipment.	Construction and Operations
AQ-BREM-5	Impacts from GHG and other emissions	<u>GHG and Other Emissions from Operations Power Sources</u> To the extent practicable, support and/or implement resilient energy resources to meet additional power requirements. These actions include installing photovoltaics on new buildings and existing facilities.	Construction and Operations
WATER MGMT BREM-1	Impacts to water quality	<u>Stormwater Pollution Prevention Plan</u> Prior to any ground disturbing activities at NAVBASE Kitsap-Bremerton, the Navy will comply with all NPDES permitting requirements for discharges of construction-generated water associated with construction activities. Construction activities at NAVBASE Kitsap-Bremerton would be covered under a construction stormwater	Construction

BMP	*Impacts Reduced or Avoided*	*Description*	*Applicability*
		NPDES permit. This would include the preparation of a SWPPP and associated BMPs, a dewatering plan, and dewatering contingency plan.	
WATER MGMT BREM-2	Impacts to water quality	<u>Stormwater Management Approach During Construction</u> Stormwater would be diverted to dedicated diversion channels and on to a treatment system designed to remove turbidity (suspended solids) and contaminants regulated by a construction stormwater NPDES permit (see WATER MGMT BREM-1). Treated stormwater would be discharged to Sinclair Inlet. During high flow conditions (i.e., up to 10-year, 24-hour frequency storm) or when stormwater flows exceed treatment rates, water would be stored in holding tanks or an engineered sump prior to treatment and discharge. Construction activities around the site will, to the extent practicable, sequence impervious surface demolition to minimize the area of exposed soil. The following measures and features would be provided as part of the upland stormwater treatment system: • Provide temporary erosion and sediment control measures (common to all components), including perimeter silt fence, construction entrances with wheel wash, interceptor dikes and swales, catch basin inlet protection, plastic sheeting, and erosion blankets. • Provide a treatment system targeting total suspended solids and known contaminants. • Provide pumps and settling tanks.	Construction
WATER MGMT BREM-3	Impacts to groundwater and water quality	<u>Groundwater Management Approach During Construction</u> • *Excavation* – A series of large-diameter deep dewatering wells and shallow sumps would be installed around the inside of the shoring wall and sumps within the excavations. The sumps will capture groundwater and drain the excavation and the deep wells will capture and prevent groundwater at the bottom of the cutoff from moving into the excavation. • *Cofferdams* – Groundwater recovery wells would be installed within the area enclosed by the cofferdam system to limit seawater intrusion into the excavation. The cofferdam wells will draw primarily seawater. • *Water Treatment* – Treatment would be provided prior to discharge to Sinclair Inlet in compliance with a construction stormwater NPDES permit (see WATER MGMT BREM-1).	Construction

BMP	*Impacts Reduced or Avoided*	*Description*	*Applicability*
WATER MGMT BREM-4	Impacts to water quality	Erosion Avoidance Practice Soil exposed as part of the project in the upland construction footprint shall be protected from erosion (with plastic sheeting, filter fabric) after exposure, in compliance with the construction stormwater NPDES permit (see WATER MGMT BREM-1).	Construction
WATER MGMT BREM-5	Impacts to marine waters	Materials- Pollutants Material placed in the water shall first be thoroughly inspected to ensure they are free of hazardous materials.	Construction
WATER MGMT BREM-6	Impacts to marine waters	Equipment Cleaning - Pollutants Project-related equipment (dredges, barges, backhoes) used in the water would be decontaminated prior to use.	Construction
WATER MGMT BREM-7	Impacts to marine waters	Materials and Equipment Cleaning – Aquatic Invasive Species • To prevent the spread of aquatic invasive species, decontamination of vessels and marine equipment (other than equipment that undergoes chemical decontamination) shall follow the Washington State Department of Fish and Wildlife decontamination guidance (https://wdfw.wa.gov/species-habitats/invasive/prevention). Note that per Washington State Department of Fish and Wildlife guidance, all non-Washington registered vessels are required to purchase an annual Aquatic Invasive Species "permit."	Construction
WATER MGMT BREM -8	Impacts to marine waters and shorelines	Stockpiling • No imported materials (fill, riprap, pipe) would be stockpiled or rehandled in the water or along the shoreline. • Stockpiled material would be placed upland, away from marine waters.	Construction
WATER MGMT BREM-9	Impacts to marine waters	Debris Containment and Removal • All trash shall be secured to ensure it does not enter adjacent surface waters. Any floating debris generated during construction shall be retrieved. Debris removed from the marine/aquatic environment shall be disposed of per local, state, and federal regulations at an approved upland disposal facility. • A debris containment boom shall be deployed around marine equipment. Any debris in the containment boom shall be removed immediately and disposed of at an approved upland disposal facility. • Following completion of in-water construction activities, a side scan or hydrographic survey will be conducted to locate any lost construction debris	Construction

BMP	*Impacts Reduced or Avoided*	*Description*	*Applicability*
		and it will be removed by mechanical means or divers at the end of each component and/or at the end of the work season, as appropriate.	
WATER MGMT BREM-10	Impacts from dredging and discharges to waters of the U.S.	CWA Section 404 Permitting • The Navy will implement project-specific BMPs as required by USACE-issued permit(s) under the CWA Section 404 and Rivers and Harbors Act Section 10 permit, and Ecology's CWA Section 401 Water Quality Certification. • The Navy will implement compensatory mitigation actions to mitigate for losses to aquatic resources as required under CWA Section 404.	Construction
WATER MGMT BREM-11	Impacts to marine water quality	Turbidity Reduction Practice – Cofferdams Exterior sheet pile wall or cofferdam would be placed around the M2D2 excavation area, providing a barrier between the excavation area and Sinclair Inlet thus eliminating or substantially reducing turbidity in Sinclair Inlet.	Construction
WATER MGMT BREM-12	Impacts to marine water quality	Turbidity Reduction Practice – Closed Environmental Clamshell Dredge Bucket Mechanical dredging with a closed environmental clamshell dredge bucket would be used to remove dredged material, where practicable. The environmental clamshell dredge bucket is designed to minimize turbidity during dredging and as the bucket is raised through the water column and to minimize spillage during transfer of dredged material to barges.	Construction
WATER MGMT BREM-13	Impacts to marine water quality	Turbidity Reduction Practice – Dredging Production Rate The dredging production rate shall be reduced, as appropriate, to reduce turbidity.	Construction
WATER MGMT BREM-14	Impacts to marine water quality	Turbidity Reduction Practice – Debris Sweeps Debris sweeps prior to dredging would be conducted and can minimize loss of dredged material from dredge bucket and turbidity during dredging.	Construction
WATER MGMT BREM-15	Impacts to marine water quality	Turbidity Reduction Practice – Barge Overflow Barges will be loaded to less than full capacity to prevent overflow of dredged material or water discharge from dredged material barges. Decant water will be removed from barges prior to movement off site to prevent overflow during transport. Barges will not be transported off site during inclement weather. Frequency of decant water removal will match precipitation.	Construction

BMP	*Impacts Reduced or Avoided*	*Description*	*Applicability*
WATER MGMT BREM-16	Impacts to marine water quality	Turbidity Reduction Practice – Dredging Dredging shall be suspended during adverse weather conditions to prevent the accidental release of dredged material.	Construction
WATER MGMT BREM-17	Impacts to marine water quality	Turbidity Reduction Practice – Grounding of Marine Equipment No grounding of marine equipment shall be permitted.	Construction
WATER MGMT BREM-18	Impacts to marine water quality	Marine Construction Equipment All equipment shall be inspected daily by the contractor for cleanliness and leaks. If a leak is detected, the contractor will immediately notify the Navy and construction Contracting Officer's Representative, the equipment will be removed from the water, and the equipment will be repaired in place by the end of the shift or removed from the construction area and will not be used until the leak is repaired and equipment cleaned. For any equipment repaired in place, measures would be implemented to contain leaks and minimize impacts to marine waters.	Construction
WATER MGMT BREM-19	Impacts to water quality	Pile Placement/Removal Perform work in accordance with the best management practices outlined in the *EPA Region 10 Best Management Practices for Piling Removal and Placement in Washington State* (EPA Region 10 2016) and *Washington Department of Natural Resources Derelict Creosote Piling Removal Management Practices for Pile Removal and Disposal* (Washington State Department of Natural Resources 2017).	Construction
WATER MGMT BREM-20	Impacts to water quality	General – Petroleum, Oils, Lubricants • All equipment shall be inspected daily by the contractor. If a leak is detected, the contractor will immediately notify the Navy and construction Contracting Officer's Representative, the equipment will be removed from the water, and the equipment will be repaired in place by the end of the shift or removed from the construction area. An oil boom shall be deployed; equipment will not be reused until it has been repaired, cleaned, and is fully operational. • Wash water resulting from washdown of equipment or work areas shall be contained and collected for treatment prior to disposal in compliance with the construction stormwater NPDES permit (see WATER MGMT BREM-1). • Equipment that enters surface waters shall be maintained to prevent any visible sheen from petroleum products. If a visible sheen occurs, the contractor will immediately notify the Navy. • No oil, fuels, or chemicals shall be discharged to surface waters or onto land where there is a potential for re-entry into surface waters to occur.	Construction

BMP	*Impacts Reduced or Avoided*	*Description*	*Applicability*
		• No cleaning solvents or chemicals used for tools or equipment cleaning shall be discharged to ground or surface waters. • When possible, hydraulic fluids shall be vegetable-based. • Contractor shall be responsible for development of a Spill Plan for approval by the Government to include immediate steps following identification of a spill, spill response materials that would be maintained onboard in-water equipment, the chain of command to be contacted in the event of a spill, and third-party spill response provider that would be responsible for cleanup.	
WATER MGMT BREM-21	Impacts to water quality	<u>General – Refueling (upland)</u> Refueling of equipment shall only be permitted at approved fueling facilities and at least 50 feet from the water.	Construction
WATER MGMT BREM-22	Impacts to water quality	<u>General – Refueling (in-water)</u> Fueling of vessels shall be done at approved fueling facilities. For equipment that cannot be fueled out of the water (e.g., barge crane), spill prevention booms shall be employed.	Construction
WATER MGMT BREM-23	Impacts to water quality	<u>General – Concrete</u> Only tremie, precast (marine grade), or cast-in-place (marine grade) concrete shall be used. No lime, chemicals, or other toxic or harmful materials related to non-marine grade concrete shall be permitted to be discharged to surface waters.	Construction
WATER MGMT BREM-24	Impacts to marine water quality and shorelines	<u>Turbidity Reduction Practice – Propeller Scour</u> • Tug propeller revolutions will be minimized to the extent practicable. • Where appropriate, propeller wash will be positioned into deep water (i.e., reposition tug). • Vessel movements will be minimized to the extent practicable. • Vessel thrust will be minimized to the extent practicable while understanding exemptions may be needed for safety considerations. Vessel propeller wash will be minimized to the extent practicable, with preference to mooring to spudded/anchored vessels or structures when applicable.	Operations
WATER MGMT BREM-25	Impacts to water quality	<u>Work Area Cleanliness</u> • Personnel working in the drydock must clean their work areas at the end of each shift. Each project must have a cleaning crew assigned to maintain the overall cleanliness of the drydock. Keep work areas outside of the drydocks clean to minimize loss into Sinclair Inlet or the storm drain system.	Operations

BMP	*Impacts Reduced or Avoided*	*Description*	*Applicability*
		• Environmental personnel conduct monthly cleanliness inspections of outdoor areas. Remove debris to minimize loss into Sinclair Inlet or the storm drain system. Do not clean paved areas, equipment, buildings, or other structures using wet methods (hosing down) without approval from Navy environmental personnel.	
WATER MGMT BREM-26	Impacts to water quality	<u>OHS Storage and Handling</u> • Store liquid OHS in containers with tight fitting lids and inside secondary containments. Material stockpiles must be covered or stored inside. Covers or other methods to prevent material exposure to stormwater must be in place at all times when work with the stockpiles is not occurring. • Drip pans, secondary containment, or other protective devices must be used at hose connections when transferring oil, fuel, solvent, oily wastewater, and paint. Leaking connections, valves, pipes, and hoses carrying wastewater, fuel, oil, or other hazardous fluids must be immediately repaired, replaced, or isolated. • Conduct regular inspections of storage areas so leaks and spills are detected as soon as possible. Clean all spills and leaks immediately.	Operations
WATER MGMT BREM-27	Impacts to water quality	<u>Containment and Control of Dust and Overspray</u> • Abrasive blasting operations are conducted inside sealed, leak-tight containments. Blasting operations are secured immediately if any containment dust or grit leaks are identified, and all leaks must be repaired before blasting resumes. • Pressure washing and hydroblasting wastewater must be captured inside a leak-tight containment and collected for treatment. Blasting operations are secured immediately if any containment water leaks are identified, and all leaks must be repaired before blasting resumes. • All spray painting application of copper antifouling paint is conducted inside sealed, leak-tight containments. Spray paint operations using other than antifouling paint must be performed within an enclosure to prevent overspray and spillage. Roller or brush applications of antifouling paint must include use of tarps or containments positioned underneath the work area. Painting operations are secured immediately if any containment paint leaks are identified, and all leaks must be repaired before painting resumes.	Operations

BMP	*Impacts Reduced or Avoided*	*Description*	*Applicability*
		• Other activities that generate pollutants (e.g., metal particles, sawdust, paint chips, slag from hot-work processes) must be contained.	
WATER MGMT BREM-28	Impacts to water quality	<u>Vehicle and Equipment Preventive Maintenance</u> • Leaks from vehicles and equipment must be contained using a drip pan or absorbent. Leaking equipment must have the leak secure and cleaned up by the end of the shift. • Vehicles and equipment may be washed only in designated, approved cleaning areas with wastewaters recycled or routed to the City of Bremerton sanitary sewer. • Government vehicles and equipment must be checked for leaks before use. Vehicles and equipment must be maintained in good condition at all times. Routinely inspect infrequently used vehicles and equipment for leaks.	Operations
WATER MGMT BREM-29	Impacts to water quality	<u>Material Loading and Unloading</u> • Discharges to the drydock floor or the drydock drainage system must have prior approval from Navy environmental staff. Use tarps, secondary containments, or other protective devices during operations that could spill significant materials (e.g., liquid hazardous materials, wastes, wastewater, and fuels) on the drydock floor. • Mix paints in a secondary containment designed to prevent spills to the drydock floor. • Equipment and supplies must be on hand for control and cleanup of liquid or debris spills. Design the spill kit for the material being used. Examples of spill kit items are drop cloths, absorbents, rubber mats, tape, tarps, brooms, or vacuums. • When loading and unloading liquids and fine-granulated materials at outdoor loading areas, prevent potential spills to storm drains by using a valved storm drain line, covering drains with a rubber mat, or placing a temporary berm around vulnerable storm drains. Loading and unloading areas must have a stocked spill kit designed for the material being loaded or unloaded at transfer site.	Operations
WATER MGMT BREM-30	Impacts to water quality	<u>Solid Waste</u> • Solid waste containers must be covered. Waste containers with drains must have the drains plugged. Solid waste containers must be closed at all times except when waste is being added.	Operations

BMP	*Impacts Reduced or Avoided*	*Description*	*Applicability*
WATER MGMT BREM-31	Impacts to water quality	Treated Lumber Products • Treated wood must only be used when required by Navy fire prevention requirements. Collect all treated lumber debris including sawdust and drill shavings or dust. Whenever possible, make cuts and perform machining operations in the shop or under cover.	Operations
WATER MGMT BREM-32	Impacts to water quality	Discharges Into Storm Drains • Do not discharge anything to a storm drain unless authorized by Navy environmental staff, any discharges not authorized by the PSNS & IMF NPDES permit will not be approved.	Operations
WATER MGMT BREM-33	Impacts to water quality	Outdoor Work Areas • Mix paints indoors or in a cofferdam designed to prevent spills to Sinclair Inlet or storm drains. • Equipment and supplies must be on hand for control and cleanup of liquid or debris spills. Examples of items needed in a spill kit include drop cloths, absorbents, rubber mats, tape, tarps, brooms, or vacuums. Design the spill kit for the material being used. • Metal work areas on piers must be constructed to prevent rainwater from contacting the work process or debris or both. Navy environmental staff can grant an exemption if the size of the work piece reasonably precludes conducting the work undercover. ○ Metal work areas on piers intended for use for more than 1 month must be completely enclosed. The enclosure must be constructed such that debris cannot be washed out of the enclosure. Exhaust vents from work areas must be filtered to capture particulates.	Operations
WATER MGMT BREM-34	Impacts to water quality	Storm Sewer Systems Cleaning • Inspect catch basins and stormwater treatment systems at least yearly. Clean oils, debris, sludge from catch basins, settling and detention basins, oil and water separators, conveyance systems, and stormwater treatment systems regularly, to prevent stormwater contamination. Clean and maintain stormwater treatment systems per the manufacturers' specifications. Clean catch basins when there is fewer than 6 inches clearance from the debris surface to the invert of the lowest pipe. Label stormwater drains with a warning similar to: “Dump no waste. Drains to the bay.”	Operations

BMP	*Impacts Reduced or Avoided*	*Description*	*Applicability*
WATER MGMT BREM-35	Impacts to water quality	Fueling Operations • All equipment and vehicles must be moved to the inshore end of the pier or mooring for fueling evolutions. • Except in transit to or from a ship or dry dock, portable fuel tanks are not allowed on piers or barges. • All over-water OHS transfers must follow the PSNS & IMF requirements, which includes applicable Coast Guard requirements. Over-water OHS transfers should be performed during daylight and normal working hours. After-hours transfers must meet staffing and lighting requirements and receive concurrence from Navy environmental staff.	Operations
GEO MGMT BREM-1	Minimize the potential effects of seismically induced ground movement	New Structures: • All new structures would be designed and constructed to comply with the seismic design criteria identified in the appropriate DoD UFC(s). The design and construction of dry docks will be consistent with the seismic design criteria under the DoD safety certification program – MIL-STD-1625D(SH) and the DoD UFC.	Construction
GEO MGMT BREM-2	Minimize the potential effects of tsunami inundation	Tsunami Hazards: • Implementation of and adherence to shut-down and safety procedures during construction to minimize the impacts of tsunamis.	Construction and Operations
BIO MGMT BREM-1	Impacts to marine species and EFH	Minimize physical contact by divers and construction-related tools, equipment, and materials with live benthic organisms, regardless of size, especially macroalgae (when present).	Construction
BIO MGMT BREM-2	Impacts to marine mammals	Construction Vessel Movement • Vessels shall operate at a speed of 10 knots or less and shall avoid marine mammals, if observed, to prevent collision. If a marine mammal comes within 10 m of such activity, operations must cease and vessels must reduce speed to the minimum level required to maintain steerage and safe working conditions, as necessary to avoid direct physical interaction. • Vessels shall be placed in neutral/idle if a protected species is within 50 feet (15 meters) of the vessel, until the animal is at least 150 feet away (46 meters), and then shall slowly move away. • Vessel operators shall not encircle or trap marine mammals between multiple vessels or between vessels and the shore.	Construction
BIO MGMT BREM-3	Impacts to EFH (substrates, benthic	Shallow draft, lower horsepower tugboats would be preferentially used in nearshore areas shallower than 30 feet (9 meters) below MLLW, where feasible.	Construction

BMP	*Impacts Reduced or Avoided*	*Description*	*Applicability*
	communities, and macroalgae)		
BIO MGMT BREM-4	Impacts to ESA-listed fishes and non-listed salmonids	In-Water Work Window To minimize exposure of underwater noise and other in-water construction disturbance to juvenile life stages of ESA-listed salmonids, in-water work would occur during the allowable in-water work window of July 16–February 15 (Tidal Reference Area 5; USACE, 2017).	Construction
BIO MGMT BREM-5	Impacts to marine mammals, ESA-listed species, fish, and EFH	Pile Driving • Vibratory installation would be used to the extent possible when driving steel piles to minimize the potential for injury associated with higher sound pressure levels of impact pile driving. • Bubble curtains or a similarly effective attenuation system would be used to attenuate noise in the water column during impact pile driving of all steel pipe piles.	Construction
BIO MGMT BREM-6	Impacts to marine mammals, ESA-listed species, fish, and marbled murrelet	Soft-Start Pile Driving Procedure A soft-start procedure would be used for impact pile driving at the beginning of each day's in-water pile driving activity or anytime that pile driving has ceased for more than 30 minutes. The soft-start is an approach that uses a warning pulse from the pile driver so that unprotected animals in the area have a chance to leave prior to the pile driver operating at full capacity, thereby exposing fewer animals to loud underwater sounds. The contractor shall provide an initial set of strikes from the impact hammer at reduced energy, followed by a 30-second waiting period, followed by two subsequent sets of strikes.	Construction

BIO MGMT BREM-7	Impacts to marine mammals and marbled murrelet	Species Monitoring and Shutdown
		• The following measures would be implemented during pile driving to avoid or minimize marine mammal and marbled murrelet exposure to injurious noise levels generated from impact and vibratory pile driving:
		  ○ A Marine Mammal Monitoring Plan and Marbled Murrelet Monitoring Plan (Plans) would be developed by the Navy in coordination with NMFS and USFWS.
		  ○ These Plans would be updated as needed, and any revised Plans would be submitted to NMFS and USFWS with adequate time for review and finalization prior to the start of the following annual in-water work window.
		  ○ Implementation of these Plans would minimize the unauthorized exposure of ESA-listed species and marine mammals to potentially injurious noise levels.
		  ○ Certified Protected Species Observers (Protected Species Observers are trained professionals who monitor for protected species, or animals federally protected under the ESA and/or the MMPA; observers) would be placed at the best vantage point(s) practicable to monitor for marbled murrelet and marine mammals and implement shutdown/delay procedures when applicable. Separate observers would be dedicated for monitoring marbled murrelet and marine mammals during impact and vibratory pile driving.
		  ○ Impact and vibratory pile driving would only occur when weather conditions permit the certified observers' adequate visibility of all shutdown zones.
		• In accordance with the plans, monitoring would occur within pre-determined shutdown and portions of the behavioral harassment zones for purposes of avoiding injurious effects and minimizing behavioral harassment of whales (i.e., baleen whales and killer whales). Specifics of marine mammal and marbled murrelet monitoring would include:
		  ○ Shutdown zones would be established through coordination with NMFS during the development of the Marine Mammal Monitoring Plan. The shutdown zones would cover, at a minimum, all areas where underwater sound pressure levels are anticipated to equal or exceed the Level A (injury) threshold for cetaceans during impact and vibratory pile driving. The shutdown zones would also encompass areas where underwater noise may exceed peak noise thresholds for all marine mammal hearing groups. For large whales, shutdown zones would include areas where
			Construction

BMP	*Impacts Reduced or Avoided*	*Description*	*Applicability*
		underwater sound pressure levels are anticipated to equal or exceed the Level B (behavioral) threshold. ○ Through coordination with the Orca Network, the position of reported whales in central Puget Sound would be monitored and pile installation and extraction would cease if large whales are likely to enter areas where underwater sound pressure levels may exceed Level B (harassment) thresholds. ○ For all marine mammals, a minimum shutdown zone of 10 meters would be established for all in-water dredging and construction. ○ Marine mammal monitoring would take place from 30 minutes prior to initiation through 30 minutes post-completion of pile driving. ○ Marbled murrelet monitoring would take place from 30 minutes prior to initiation through 30 minutes post-completion of impact pile driving. ○ Should a marine mammal or marbled murrelet enter the relevant shutdown zone, pile driving would be immediately halted until the marine mammal or marbled murrelet has left the area, in accordance with the procedures developed in the plans.	
BIO MGMT BREM-8	Impacts to marine species and EFH	Ensure that all concrete grout, cement, and sealant used are non-toxic and non-hazardous to aquatic organisms.	Construction
BIO MGMT BREM-9	Impacts to marine species and EFH	If feasible, conduct work in the intertidal zone during the low and/or slack tides.	Construction
BIO MGMT BREM-10	Impacts to marine species and EFH	In the event of approaching storms, equipment shall either be removed from the project site or adequately secured.	Construction
BIO MGMT BREM-11	Impacts to marine mammals	<u>Entanglement in Anchor Lines</u> • Anchor lines shall have appropriate tension and kept to minimum length necessary to avoid risk of entanglement. Any lines/equipment that provide a risk of entanglement must be removed when not in use. • In-water tethers and mooring lines for vessels and marker buoys shall be kept to the minimum lengths necessary and shall remain deployed only as long as needed to accomplish the required task. Lines shall be inspected regularly and kept taut. • Before any equipment or material enters the water, a responsible party would verify that no marine mammals are in the area where the equipment, anchor(s), or materials are expected to contact the substrate.	Construction and Operations

BMP	*Impacts Reduced or Avoided*	*Description*	*Applicability*
BIO MGMT BREM-12	Impacts to marine mammals	In order to avoid marine mammal harassment, workers shall not attempt to feed, touch, haze, or otherwise intentionally interact with any marine mammals. Prior to the start of work, project workers shall be briefed on this requirement as well as other relevant BMPs related to marine mammals. Any observation of such activity would be reported to the PSNS & IMF Natural Resources Manager and a report would be submitted to NMFS.	Construction and Operations
BIO MGMT BREM-13	Impacts to marine species and EFH	Dry docks shall be cleaned and undergo regular inspection for cleanliness prior to flooding.	Operations
BIO MGMT BREM-14	Impacts to fishes, and marine mammals	The bubble screen shall be activated at all times when the caisson is removed and a vessel is not actively crossing the caisson seat (entrance structure) into/out of the dry dock. Bubble screens shall be placed across the dry dock floor near the caisson seat to deter fish and marine mammals from entering inside a flooded dry dock. Air is forced through polyvinyl chloride piping fashioned in a U-shape down the walls and across the floor of the dry dock. Small holes in the pipe placed approximately 2 inches apart create a wall of bubbles, forming a bubble screen. These would be used on the new dry dock structures to minimize entrainment/entrapment of fish and marine mammals. These procedures were described in the Terms and Conditions issued in previous NMFS Biological Opinions for drydock operations (NMFS, 2011).	Operations
BIO MGMT BREM-15	Impacts to ESA-listed salmonids	Dry docks shall be monitored for presence of salmonids during pump down for dewatering. If adult salmonids are identified the fish are collected prior to completion of pump down and returned to Sinclair Inlet. Records are kept of date, species, and numbers collected; and whether dead, alive, or injured.	Operations
BIO MGMT BREM-16	Impacts to marine species and EFH	To prevent the spread of aquatic invasive species, decontamination of vessels and marine equipment (other than equipment that undergoes chemical decontamination) shall follow the Washington State Department of Fish and Wildlife decontamination guidance (https://wdfw.wa.gov/species-habitats/invasive/prevention).	Construction and Operations
BIO MGMT BREM-17	Impacts to ESA-listed species and marine mammals during Caisson Transit Delivery and/or Open-Water Dredged Disposal and Contractor	<u>Reduce the potential of ship and tow line strike</u>. Navy ships operate in accordance with the navigation rules established by the U.S. Coast Guard. All ships operating on the water are required to follow the International Navigation Rules (Commandant Instruction M16672.2D). Navigation rules are formalized in the *Convention on the International Regulations for*	Construction

BMP	Impacts Reduced or Avoided	Description	Applicability
	Multi-Use Site(s) Transit Routes	*Preventing Collisions at Sea, 1972*. Applicable navigation requirements include, but are not limited to Rule 5 (Lookouts) and Rule 6 (Safe Speed): • Rule 5 requires that ships at all times maintain a proper lookout by all available means appropriate to the prevailing circumstances and conditions to be alert for collision risks. • Rule 6 requires that all ships must proceed at a safe speed at all times so that proper and effective action can be taken to avoid collision and so they can be stopped within a distance appropriate to the prevailing circumstances and conditions. • Caisson transport would follow typical shipping transit routes. Marine vessels would avoid the Olympic Coast National Marine Sanctuary Area-To-Be-Avoided by staying offshore of the ecologically sensitive Olympic Coast. • Vessels would follow recommendations developed by Washington's Quiet Sound program which includes seasonal voluntary slow down areas to protect Southern Resident killer whale. The seasonal slowdown areas include Admiralty Inlet and portions of northern Puget Sound and are in effect from October 24 to December 22 (recently extended to January 12), when Southern Residents are known to frequent the area. When safe to do so, the caisson transport ship would transit the slowdown area at or below 10 knots (to comply with bulk carrier vessel speed guidelines) to protect Southern Resident killer whale. • Any transport vessels transiting from the East Coast would adhere to vessel speed restrictions to reduce the likelihood of mortalities and serious injuries to endangered North Atlantic right whale (*Eubalaena glacialis*) from vessel collisions (50 CFR 224.105). The caisson transport ship transiting out of Virginia would travel at 10 knots or less within the Mid-Atlantic Seasonal Management Area and any established Dynamic Management Areas between November 1 and April 30 and within established Dynamic Management Areas to protect North Atlantic right whale migratory routes and calving grounds. • Vessels transporting the Caisson would avoid North Atlantic right whale critical habitat that is designated along the coasts of North Carolina, South Carolina, Georgie, and Florida and would also remain in compliance with above stated ship speed regulations. Southern Resident killer whale Washington State distance Regulations:	

BMP	*Impacts Reduced or Avoided*	*Description*	*Applicability*
		• All vessels within Washington State waters must stay 1,000 yards away from Southern Resident killer whales. • All vessels must attempt to navigate out of the path and away from Southern Resident killer whales within 1,000 yards of the vessel while adhering to a 7-knot speed limit. • If a Southern Resident killer whale approaches within 400 yards, vessels must disengage the transmission (if it is safe to do so) and wait for the animal to move away. • While not a strict rule, if vessel operators are unsure if observed killer whales are Southern Resident or transients (Bigg's), they should assume they are Southern Resident and follow the rules for Southern Residents.	
BIO MGMT BREM-18	Impacts to fishes	• Before completion of the outer wall of the cofferdam, the contractor will minimize fish entrainment within the cofferdam, to the extent practicable. Prior to closing the final wall-segment of the cofferdam (approximately 30 feet [9 meters] to allow vessel entrance/exit), a purse seine or drag net will be run through the inside of the cofferdam to minimize fish entrainment, if feasible. After fish netting is complete, a bubble screen will be put in place across the remaining open segment of the cofferdam and used continuously until the final segment of cofferdam is completed. • During dewatering operations, post-completion of the cofferdam, ESA-listed fish species would be netted/captured and removed to the extent practicable.	Construction
BIO MGMT BREM-19	Impacts to marine mammals	• Before completion of the outer wall of the cofferdam structure (i.e., before the interior of the cofferdam structure is functionally disconnected from Sinclair Inlet), a bubble curtain system shall be installed to deter and minimize, to the extent practicable, the number of marine mammals that may inadvertently enter the enclosure. • Complete enclosure of the cofferdam structure would not occur until any marine mammals within the enclosure have left.	Construction
BIO MGMT BREM-20	Impacts to aquatic organisms	Cooling water intake structure, design, operation, and maintenance would comply with the requirements of 40 CFR 125 for minimizing marine species entrainment and impingement.	Operations
CULT MGMT-BREM-1	Impacts to cultural resources	Inform Navy Cultural Resources personnel prior to the start of dredging or ground disturbing activities to ensure compliance with the MOA.	Construction

BMP	*Impacts Reduced or Avoided*	*Description*	*Applicability*
CULT MGMT-BREM-2	Impacts to cultural resources	Follow the Navy's Discovery Plan in the event of post-review discovery of archaeological resources during any project activities.	Construction
CULT MGMT-BREM-3	Impacts to cultural resources	Include Navy Cultural Resources personnel in preconstruction meetings to provide a brief to construction personnel about cultural resources and the Navy's Discovery Plan for NAVBASE Kitsap.	Construction
CULT MGMT-BREM-4	Impacts to cultural resources	Consult with Navy Cultural Resources personnel regarding design of new construction in the NYPS NHL and PSNS Historic District to ensure compliance with the MOA. Include professional(s) on the project design team(s) that meet the Secretary of the Interior's Professional Qualifications Standards for Architectural History (36 CFR Part 61).	Construction
CULT MGMT-BREM-5	Impacts to cultural resources	Where possible, leave fragments of rail system in place as cultural landscape features of PSNS Historic District.	Construction
CULT MGMT-BREM-6	Impacts to cultural resources	Consult with Navy Cultural Resources personnel on any variations from approved plans during project execution, including changes to the demolition schedule, removal of any objects, and design changes.	Construction
CULT MGMT-BREM-7	Impacts to cultural resources	Consult with Navy Cultural Resources personnel to conduct cultural resources desktop analysis of contractor-selected staging and laydown areas.	Construction
VIS MGMT-BREM-1	Impacts from lighting	• Exterior lighting shall be energy-efficient and shielded or recessed so that direct glare and reflections shall be confined, to the maximum extent feasible, within the boundaries of the site. • Industry standards for recommended lighting levels shall be followed to prevent over-lighting.	Operation
VIS MGMT-BREM-2	Impacts from lighting	Construction lighting during nighttime construction activities shall be confined, to the maximum extent feasible, within the boundaries of the site to minimize impacts on aquatic life.	Construction
VIS MGMT-BREM-3	Impacts to the visual environment	New facilities shall be painted/treated using a color palette consistent with existing facilities at the shipyard. This shall include using grays for the M2D2, DD3, and other ancillary facilities.	Construction
NOISE MGMT BREM-1	Reduction of impacts to people at noise sensitive areas on and off the installation.	Because pile driving would pose the greatest risk of generating elevated noise levels at noise sensitive receptors, the window of activity would be limited to daylight hours, 6 days a week within the in-water work window. Dredging, would be conducted up to 24 hours per day, 6 days a week.	Construction
NOISE MGMT BREM-2	Reduction in noise levels to noise sensitive areas	Construction noise would be reduced by ensuring correctly functioning muffler systems are installed on equipment utilizing internal combustion engines.	Construction

BMP	*Impacts Reduced or Avoided*	*Description*	*Applicability*
	in the vicinity of construction equipment.		
NOISE MGMT BREM-3	Reduction in noise levels to noise sensitive areas in the vicinity of construction equipment.	All stationary noise-generating construction equipment, such as air compressors and portable power generators, would be located as far as practical from existing noise sensitive land uses.	Construction
UTIL MGMT BREM-1	Downtime and interruption of utility service	Construction and testing of new utilities would occur prior to the turnover from old utility lines to new utility lines to minimize disruption to services and operational impacts to the shipyard. To help minimize downtime and interruptions, temporary and permanent infrastructure would be built to the fullest extent possible, prior to turnover occurring.	Construction
UTIL MGMT BREM-2	Impacts to shipyard operations and other military operations	Utility turnovers would be made outside of normal working hours or on weekends to minimize disruption to the existing utility services and shipyard operations.	Construction
UTIL MGMT BREM-3	Impacts to shipyard operations and other military operations	Shops, codes, and shipyard employees would be notified a minimum of 72 hours prior to any utility service disruption to allow for adequate planning.	Construction
TRAFFIC MGMT – BREM/BANGOR-1	Impacts to traffic near the Installation	Develop Maintenance of Traffic and Traffic Control Plans in compliance with the Manual on Uniform Traffic Control Devices (MUTCD) and Work Zone Safety Guidelines.	Construction
MARINE NAV MGMT BREM-1	Impacts to marine vessel traffic	Navy security operations protocols and security waterfront barrier operations would be adapted to manage additional vessel traffic during construction. Adaptations may include extending the security barrier hours to accommodate construction and dredging activity without impacting existing marine traffic. The security barrier would be relocated during the construction process to encompass facilitate construction activities.	Construction
MARINE NAV MGMT BREM-2	Impacts to marine vessel traffic	The construction contractor will coordinate with NAVBASE Kitsap-Bremerton and NAVBASE Kitsap-Bangor officials to address routine, unplanned (emergency or other), and construction-oriented vessel and submarine movements to minimize route and travel conflicts involving all vessel types and movements through Rich Passage.	Construction

BMP	*Impacts Reduced or Avoided*	*Description*	*Applicability*
MARINE NAV MGMT BREM-3	Impacts to marine vessel traffic	The construction contractor will coordinate with NAVBASE Kitsap-Bremerton and NAVBASE Kitsap-Bangor officials to coordinate the staging of waterborne equipment and vessels such that, to the extent practicable, construction does not interfere with normal marine traffic flow in Sinclair Inlet.	Construction
PH&S MGMT BREM-1	Impacts to public health and safety	A construction safety plan shall be developed by contractors for its on-site construction personnel to follow that includes evacuation procedures in the event of a tsunami warning.	Construction
PH&S MGMT BREM-2	Impacts to public health and safety	All applicable federal and state regulations for demolition and construction shall be implemented, including construction safety BMPs and preparation of a construction site safety plan.	Construction
PH&S MGMT BREM-3	Impacts to public health and safety	All relevant construction activities shall implement response actions prescribed for Munitions Response.	Construction
HAZ MGMT BREM-1	Impacts on public health and safety and water quality from hazardous materials	<u>Contamination Management</u> • Hazardous materials shall be identified and remediated in compliance with all applicable regulations prior to demolition or renovation. Compliance with regulations shall be included in any construction, demolition, or renovation contract language. Additionally, prior to construction work, it is recommended to consult with the appropriate Navy Remedial Project Manager for the current remediation status of the IR site. No intrusive or construction activities shall occur without the knowledge and concurrence of the Navy Environmental Restoration Program. <u>Spill Response</u> • Training in proper handling of used oil or hazardous substances, aboveground fixed tank construction, inspecting and draining of impervious secondary containment berms/systems, good housekeeping practices, engineering controls such as containments during painting and blasting operations, daily inspections, and drainage control shall be provided prior to initiating work. • Refueling of equipment shall only be permitted at approved fueling facilities and at least 50 feet from the water. A contingency plan to control petroleum products accidentally spilled during the project shall be developed. Absorbent pads and containment booms shall be stored onsite, if appropriate, to facilitate clean-up of accidental petroleum releases. • Fueling of vessels shall be done at approved fueling facilities. With respect to equipment that cannot be fueled out of the water (e.g., barge crane), spill prevention booms shall be employed.	Construction and Operations

BMP	*Impacts Reduced or Avoided*	*Description*	*Applicability*
HAZ BREM MGMT-2	Impacts to water resources	Laydown and construction material areas shall be maintained at least 50 feet from the shoreline when practicable, and operations may be ceased when weather conditions elevate the potential for significant precipitation or floods.	Construction
HAZ BREM MGMT-3	Impacts to public health and safety	During ground disturbance, water shall be used for dust control, along with the implementation of a SWPPP, Erosion Control Plan, Environmental Mitigation plans, and/or Health and Safety Plan to minimize potential impacts.	Construction
HAZ BREM MGMT-4	Impacts to water resources	Prior to soil or sediment disturbance, Land Use Controls or restrictions shall be identified and marked for avoidance as applicable. For any ground disturbance work, the PSNY & IMF (and any applicable IR site) soil management plan would be consulted, and project monitoring shall be required.	Construction
HAZ BREM MGMT-5	Impacts to soils	If contaminated soil or water is encountered, the following BMPs would be followed, and the Navy's Remedial Project Manager shall be notified to address the area under the IR program. The reduction of impacts to soils from petroleum contamination and abandoned fuel lines at the new substation include the following: • Excavated soil that is contaminated shall not be placed into a clean excavation. Redeposited contaminated soil shall be provided with a clean soil or cap of asphalt/concrete once work has been completed. • When excavating, if staining, petroleum odor, or a sheen in the water is observed, the dewatering discharge shall be reinfiltrated within the work area with known or observed contamination where the water was extracted and within the same aquifer. • The contractor shall cut and remove fuel pipelines as needed if they are conflicting with the new underground utility/structure construction. The open ends of pipelines shall be capped and secured.	Construction

BMP	Impacts Reduced or Avoided	Description	Applicability
HAZ BREM MGMT-6	Impacts to soils	Development of a soil and sediment management plan is recommended. The management plan may include, but is not limited to, applicable Environmental Action Levels, pre-determined relocation areas, and various sampling and management plans.	Construction

Legend: BMP = best management practice; CFR = Code of Federal Regulations CWA = Clean Water Act; DD = dry dock; DoD = Department of Defense; DON = Department of the Navy; EFH = Essential Fish Habitat; EPA = U.S. Environmental Protection Agency; ESA = Endangered Species Act; GHG = Greenhouse Gas; IR = Installation Restoration; M2D2 = multi-mission dry dock; MLLW = Mean Lower Low Water; MMPA = Marine Mammal Protection Act; MUTCD = Manual on Uniform Traffic Control Devices; NAVBASE = Naval Base; NHL = National Historic Landmark; NMFS = National Marine Fisheries Service; NPDES = National Pollutant Discharge Elimination System; NYPS = Navy Yard Puget Sound; OHS = oil and hazardous substances; PIC = Person In Charge; PSCAA = Puget Sound Clean Air Agency; psi = pounds per square inch; PSNS & IMF = Puget Sound Naval Shipyard and Intermediate Maintenance Facility; SWPPP = Stormwater Pollution Prevention Plan; T&E = threatened and endangered; U.S. = United States; UFC = Unified Facilities Criteria; USACE = U.S. Army Corps of Engineers; USFWS = U.S. Fish and Wildlife Service

Table 2 Best Management Practices for NAVBASE Kitsap-Bangor

BMP	Impacts Reduced or Avoided	Description	Applicability
AQ-BANGOR-1	Impacts from construction activities	<u>Fugitive Dust</u> Reasonable precautions to minimize visible fugitive dust emissions would be implemented, in accordance with PSCAA Regulation I, Article 9, Section 9.15. These include, but are not limited to: 1. The use of control equipment, enclosures, and wet suppression techniques, as practical, and curtailment during high winds; 2. Surfacing roadways and parking areas with asphalt, concrete, or gravel; 3. Treating temporary, low-traffic areas (e.g., construction sites) with water, reducing vehicle speeds, constructing pavement or riprap exit aprons, and cleaning vehicle undercarriages before they exit to prevent the track-out of mud or dirt onto paved public roadways; or 4. Covering or wetting truck loads and providing adequate freeboard to prevent the escape of fugitive dust. Other common aspects of a fugitive dust control plan include: • Use water in construction operations, and grading or clearing of land. • Apply water on roads. • Whenever feasible, pave ingress and egress points to the site. • Establish and monitor speed limits for project rights-of-way. • Cover all moving, open-bodied trucks transporting materials that can generate fugitive dust. • Promptly remove soil or other “carry out“ materials from roads adjacent to the site. • Install dust screens or wind barriers around construction site.	Construction

BMP	*Impacts Reduced or Avoided*	*Description*	*Applicability*

		• During earth-moving activities, pre-apply and re-apply water as necessary to maintain soils in a damp condition, limit the amount of exposed areas through planning and timing of project phases, and cover temporarily exposed areas.
		• Stabilize stockpile materials.
		• Keep stockpiles wet or damp as needed.
		• Cover non-dredge soil/sand/other dust source stockpiles when not in use.
		• Stockpiles shall have engineered slopes or benches to keep their height as low as possible.
		• Add or remove soil/sand/other dust sources material from downwind portion of stockpile.
		• For on-site trucks:
		  ○ Provide water while loading and unloading to prevent fugitive dust.
		  ○ Maintain at least 6 inches of freeboard on haul vehicles.
		  ○ Level the height of load.
		  ○ Limit vehicular speed while traveling on-site.
		  ○ Cover loads while traveling. Install a gravel pad and grizzly (i.e., rumble grate) at exit.
		  ○ Reduce carry out with a tire wash or spray system.	

AQ-BANGOR -2	Impacts from mobile source emissions and construction activities	<u>Mobile Source Emissions</u> • Modify schedules/routes to reduce idling emissions. • Route on-road trucks to avoid areas where sensitive populations are likely to be present (e.g., schools, daycare, nursing homes, residences, playgrounds). • Limit truck idling by posting signage at worksites to serve as a reminder. • To the extent practicable as allowed by space constraints, staging areas/laydown areas shall be located as close as possible to where the construction activity occurs. • Where practicable, require use of newer or higher tier diesel engines during construction. • Require use of ultra low-sulfur diesel fuel. • Perform routine preventive maintenance of diesel engines to minimize emissions. • Where practicable, installing engine exhaust filters, require use of cleaner burning engines, installing diesel oxidation catalysts, and/or use special fuels or fuel additives (e.g., biodiesel) to minimize vehicle emissions.	Construction
AQ-BANGOR -3	Impacts from demolition	<u>Asbestos Control Standards</u> Asbestos survey, notification, removal, and disposal requirements would be performed in accordance with PSCAA Regulation III, Article 4, including: • Conducting an asbestos survey by an Asbestos Hazard Emergency Response Act building inspector prior to any renovation or demolition activity occurring.	Construction/Demolition

BMP	Impacts Reduced or Avoided	Description	Applicability
		• Notifying PSCAA prior to any work on an asbestos project or demolition in accordance with Section 4.03 (Asbestos Notification Requirements = 10 days). • Completing asbestos removal requirements prior to renovation or demolition projects. • Following all required procedures related to training, work practices for friable asbestos removal, and methods of removal for nonfriable asbestos-containing material for asbestos projects. • Properly disposing of asbestos-containing waste within 10 days of removal at a waste disposal site authorized to accept such waste, following waste tracking, and temporary storage site. • Asbestos cement pipe used on public rights-of-way, public easements, or other places receiving the prior written approval from PSCAA may be buried in place if the pipe is covered with at least 3 feet or more of non-asbestos fill material. All asbestos cement pipe fragments that are 1 linear foot or less and other asbestos-containing waste material shall be disposed of at a waste disposal site authorized to accept such waste.	
AQ-BANGOR -4	Impacts from GHG	<u>GHG Emissions</u> • Use propane or electric-powered equipment, including vehicles, to the extent practicable (the availability of equipment would be determined after contract is awarded and winning bidder is selected). • To the extent practicable, use on-site renewable electricity generation and/or grid-based electricity rather than diesel-powered generators or other equipment.	Construction and Operations
AQ-BANGOR -5	Impacts from GHG and other emissions	<u>GHG and Other Emissions from Operations Power Sources</u> Where feasible, support and/or implement resilient energy resources to meet additional power requirements. These actions include installing photovoltaics on new buildings and existing facilities.	Construction and Operations
WATER MGMT BANGOR-1	Impacts to water quality	<u>Stormwater Pollution Prevention Plan</u> Prior to any ground disturbing activities at NAVBASE Kitsap-Bangor, the Navy will establish compliance with the current EPA Construction Stormwater General Permit. The Construction Stormwater General Permit includes requirements for management and treatment of stormwater and the preparation of a SWPPP and associated BMPs.	Construction
WATER MGMT BANGOR-2	Impacts to water quality	<u>Erosion Avoidance Practice</u> Soil exposed as part of the project shall be protected from erosion (with plastic sheeting, filter fabric) after exposure, in compliance with the construction stormwater NPDES permit (see WATER MGMT BANGOR-1).	Construction

BMP	*Impacts Reduced or Avoided*	*Description*	*Applicability*
WATER MGMT BANGOR-3	Impacts to water quality	General – Petroleum, Oils, Lubricants • All equipment shall be inspected daily by the contractor. If a leak is detected, the contractor will immediately notify the Navy and construction Contracting Officer's Representative, and the equipment shall be removed from the construction area and shall not be used until the leak is repaired and equipment cleaned and shall only be returned once it is repaired and fully operational. • Wash water resulting from washdown of equipment or work areas shall be contained for proper disposal and shall not be discharged unless authorized. • No oil, fuels, or chemicals shall be discharged to surface waters or onto land where there is a potential for re-entry into surface waters to occur. • No cleaning solvents or chemicals used for tools or equipment cleaning shall be discharged to ground or surface waters. • When possible, hydraulic fluids shall be vegetable-based. • Contractor shall be responsible for development of a Spill Plan for approval by the Government to include immediate steps following identification of a spill, spill response materials that would be maintained onboard in-water equipment, the chain of command to be contacted in the event of a spill, and third-party spill response provider that would be responsible for cleanup.	Construction and Operations
WATER MGMT BANGOR-4	Impacts to water quality	General – Refueling Refueling of equipment shall only be permitted at approved fueling facilities and at least 50 feet (15 meters) from any surface water.	Construction and Operations
GEO MGMT BANGOR-1	Minimize the potential effects of seismically induced ground movement	New Structures: All new structures would be designed and constructed to comply with the seismic design criteria identified in the appropriate DoD UFC(s).	Construction
BIO MGMT BANGOR - 1	Impacts to marbled murrelet from visual and noise disturbance	In order to avoid potential impacts to nesting marbled murrelet, all construction would occur from September 24–March 31 to avoid potential noise exposure to nesting murrelets.	Construction
CULT MGMT-BANGOR-1	Impacts to cultural resources	Inform Navy Cultural Resources personnel prior to the start of dredging or ground disturbing activities to ensure compliance with the MOA.	Construction
CULT MGMT-BANGOR-2	Impacts to cultural resources	Follow the Navy's Discovery Plan in the event of post-review discovery of archaeological resources during any project activities.	Construction

BMP	*Impacts Reduced or Avoided*	*Description*	*Applicability*
CULT MGMT-BANGOR-3	Impacts to cultural resources	Include Navy Cultural Resources personnel in preconstruction meetings to provide a brief to construction personnel about cultural resources and the Navy's Discovery Plan for NAVBASE Kitsap.	Construction
CULT MGMT-BANGOR-4	Impacts to cultural resources	Consult with Navy Cultural Resources personnel on any variations from approved plans during project execution, including changes to the demolition schedule, removal of any objects, and design changes.	Construction
CULT MGMT-BANGOR-5	Impacts to cultural resources	Consult with Navy Cultural Resources personnel to conduct cultural resources desktop analysis of contractor-selected staging and laydown areas.	Construction
VIS MGMT-BANGOR-1	Reduce impacts from lighting	Exterior lighting shall be energy efficient and shielded or recessed so that direct glare and reflections shall be confined, to the maximum extent feasible, within the boundaries of the site. Industry standards for recommended lighting levels shall be followed to prevent over-lighting.	Operation
NOISE MGMT BANGOR-1	Reduction in noise levels to noise sensitive areas in the vicinity of construction equipment.	Construction noise would be reduced by ensuring correctly functioning muffler systems are installed on equipment utilizing internal combustion engines.	Construction
NOISE MGMT BANGOR-2	Reduction in noise levels to noise sensitive areas in the vicinity of construction equipment.	All stationary noise-generating construction equipment, such as air compressors and portable power generators, would be located as far as practical from existing noise sensitive land uses.	Construction
UTIL MGMT BANGOR-1	Downtime and interruption of utility service	Construction and testing of new utilities would occur prior to the turnover from old utility lines to new utility lines to minimize disruption to services and operational impacts to the shipyard. To help minimize downtime and interruptions, temporary and permanent infrastructure would be built to the fullest extent possible, prior to turnover occurring.	Construction
UTIL MGMT BANGOR-2	Impacts to military operations	Utility turnovers would be made outside of normal working hours or on weekends to minimize disruption to the existing utility services and shipyard operations.	Construction
UTIL MGMT BANGOR-3	Impacts to military operations	Shops, codes, and shipyard employees would be notified a minimum of 72 hours prior to any utility service disruption to allow for adequate planning.	Construction

BMP	*Impacts Reduced or Avoided*	*Description*	*Applicability*
PH&S MGMT BANGOR-1	Impacts to public health and safety	A construction safety plan shall be developed by contractors for its on-site construction personnel to follow that includes evacuation procedures in the event of a tsunami warning.	Construction
PH&S MGMT BANGOR -2	Impacts to public health and safety	All applicable federal and state regulations for demolition and construction shall be implemented, including construction safety BMPs and preparation of a construction site safety plan.	Construction
PH&S MGMT BANGOR -3	Impacts to public health and safety	All relevant construction activities shall implement response actions prescribed for Munitions Response.	Construction
HAZ MGMT BANGOR-1	Impacts on public health and safety and water quality from hazardous materials	<u>Contamination Management</u> • Hazardous materials shall be identified and remediated in compliance with all applicable regulations prior to demolition or renovation. Compliance with regulations shall be included in any construction, demolition, or renovation contract language. Additionally, prior to construction work, it is recommended to consult with the appropriate Navy Remedial Project Manager for the current remediation status of the IR site. No intrusive or construction activities shall occur without the knowledge and concurrence of the Navy Environmental Restoration Program. • Intrusive construction activities shall require explosive safety protocols, construction support and/or unexploded ordnance qualified personnel to remove explosive hazards in the construction footprint before intrusive construction work occurs. For dredging and in-water work, a non-essential personnel safety zone would be established to keep people safe and clear of potential MEC detonation. Once hardpan is reached, the safety zones would be removed. Dredged material would be screened for contaminants and munitions. <u>Spill Response</u> • Training in proper handling of used oil or hazardous substances, aboveground fixed tank construction, inspecting and draining of impervious secondary containment berms/systems, good housekeeping practices, engineering controls such as containments during painting and blasting operations, daily inspections, and drainage control shall be provided prior to initiating work. • Refueling of equipment shall only be permitted at approved fueling facilities and at least 50 feet from the water. A contingency plan to control petroleum products accidentally spilled during the project shall be developed. Absorbent pads and containment booms shall be stored onsite, if appropriate, to facilitate clean-up of accidental petroleum releases. • Fueling of vessels shall be done at approved fueling facilities. With respect to equipment that cannot be fueled out of the water (e.g., barge crane), spill prevention booms shall be employed.	Construction and Operations

BMP	*Impacts Reduced or Avoided*	*Description*	*Applicability*
HAZ BREM MGMT-2	Impacts to water resources	Laydown and construction material areas shall be maintained at least 50 feet from the shoreline when practicable, and operations may be ceased when weather conditions elevate the potential for significant precipitation or floods.	Construction
HAZ BANGOR MGMT-3	Impacts to public health and safety	During ground disturbance, water shall be used for dust control, along with the implementation of a SWPPP, Erosion Control Plan, Environmental Mitigation plans, and/or Health and Safety Plan to minimize potential impacts.	Construction
HAZ BANGOR MGMT-4	Impacts to water resources	Prior to soil or sediment disturbance, Land Use Controls or restrictions shall be identified and marked for avoidance as applicable. For any ground disturbance work, any applicable IR site management plan would be consulted, and project monitoring shall be required.	Construction
HAZ BANGOR MGMT-5	Impacts to soils	If contaminated soil or water is encountered, the following BMPs would be followed, and the Navy's Remedial Project Manager shall be notified to address the area under the IR program. The reduction of impacts to soils from petroleum contamination and abandoned fuel lines at the new substation include the following: • Excavated soil that is contaminated shall not be placed into a clean excavation. Redeposited contaminated soil shall be provided with a clean soil or cap of asphalt/concrete once work has been completed. • When excavating, if staining, petroleum odor, or a sheen in the water is observed, the dewatering discharge shall be reinfiltrated within the work area with known or observed contamination where the water was extracted and within the same aquifer. • The contractor shall cut and remove fuel pipelines as needed if they are conflicting with the new underground utility/structure construction. The open ends of pipelines shall be capped and secured.	Construction
HAZ BANGOR MGMT-6	Impacts to soils	Development of a soil and sediment management plan is recommended. The management plan may include, but is not limited to, applicable Environmental Action Levels, pre-determined relocation areas, and various sampling and management plans.	Construction

Legend: BMP = best management practice; DoD = Department of Defense; EPA = U.S. Environmental Protection Agency; GHG = Greenhouse Gas; IR = Installation Restoration; MEC = Munitions and Explosives of Concern; NAVBASE = Naval Base; NPDES = National Pollutant Discharge Elimination System; PSCAA = Puget Sound Clean Air Agency; SWPPP = Stormwater Pollution Prevention Plan; UFC = Unified Facilities Criteria

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APPENDIX B
Public and Cooperating Agencies Involvement

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SCOPING SUMMARY REPORT

Bremerton Waterfront Infrastructure Improvements Environmental Impact Statement

July 2025

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Executive Summary

The Department of the Navy (Navy) conducted a public outreach process to announce the Notice of Intent to prepare an Environmental Impact Statement (EIS) and public scoping meeting. In addition to the notification methods listed below, the Navy published a publicly accessible project website, established a project-specific email address, and established information repositories as additional methods to present public scoping information. Scoping notifications included:

1. Publication of the Notice of Intent in the *Federal Register* on June 8, 2022
2. Publication of newspaper advertisements a total of 16 times over four newspapers
3. Mailing of stakeholder letters to 93 interested parties
4. Mailing of postcards to 62 organizations and groups
5. Emailing of a scoping notification to regulatory agencies, local governments, and the Suquamish Tribe

During the scoping period, which ran from June 8, 2022 to July 11, 2022, 26 submittals were received from the public, tribes, and agencies. Of those 26 submittals, 61 comments were received. Comments centered around Tribal rights; Cultural Resources/Hammerhead Crane; Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); Traffic; and Marine resources. The submittals included:

- Six letters via the project email/website (Washington [WA] State Department of Transportation [WSDOT] Ferries, WA State Department of Ecology, United States (U.S.) Environmental Protection Agency [EPA], U.S. National Park Service [NPS], City of Bremerton, Suquamish Tribe)
- Nine comments received at the virtual public scoping meeting
- Seven comments received from private citizens via the project email/website
- Four emails from agencies with "No comment at this time" (U.S. Bureau of Reclamation, U.S. Geological Survey, U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration [NMFS])

Information repositories at local libraries were established to provide a printed reference copy of project information to members of the community who are not able to access information online or who would prefer to access a printed copy. Copies of the project fact sheet and postcard were placed in the information repositories, listed below.

Table ES-1. Information Repositories

Location	Address
Kitsap Regional Library Downtown Bremerton Branch	612 Fifth St. Bremerton, WA 98337
Kitsap Regional Library Port Orchard Branch	87 Sidney Ave. Port Orchard, WA 98366
Kitsap Regional Library Sylvan Way Branch	1301 Sylvan Way Bremerton, WA 98310
Seattle Public Library Central Library Branch	1000 Fourth Ave. Seattle, WA 98104

Below is a summary table of public involvement activities.

Table ES-2. Summary of Public Involvement During Scoping

Public Involvement Action	Date
Notice of Intent Published in *Federal Register*	June 8, 2022
Scoping Period	June 8, 2022, to July 11, 2022
EIS Website (https://www.BremertonWaterfrontImprovementsEIS.com)	Launched June 8, 2022; ongoing
Newspaper advertisements announcing the Notice of Intent to prepare an EIS, scoping period, virtual public scoping meeting, and opportunities for public comment	*Seattle Times* (June 9, 10, and 11, 2022) *Kitsap Sun* (June 9, 10, and 11, 2022)
Newspaper advertisements announcing the virtual public scoping meeting and opportunities for public comment.	*Seattle Times* (June 16, 20, 21, and 22, 2022) *Kitsap Sun* (June 16, 20, 21, and 22, 2022) *North Kitsap Herald* (June 17, 2022) *Port Orchard Independent* (June 17, 2022)
Commander Navy Northwest News Release #22-0608 announcing the intent to prepare an EIS, virtual public scoping meeting, and opportunities for public comment.	June 8, 2022
Email notification to Washington state Congressional staffers announcing the intent to prepare an EIS, virtual public scoping meeting, and opportunities for public comment	June 8, 2022
Posts issued on Navy Facebook and Twitter pages to communicate the virtual public scoping meeting and opportunities for public comment	Commander, Navy Region Northwest (June 8, 15, 20, 23, and July 7, 2022) Naval Base Kitsap (June 8, 16, 23, and July 7, 2022 – Facebook) (June 23, 2022 – Twitter) Puget Sound Naval Shipyard and Intermediate Maintenance Facility (June 8 and 16, 2022)
Stakeholder letter mailed to 93 recipients (elected officials, potential cooperating agencies, non-government organizations, and any state or federal agency managing a resource that could be impacted by the Proposed Action)	June 7, 2022
Postcards mailed to 62 recipients. Postcards were sent to the project interested parties mailing list	June 7, 2022
Virtual Public Scoping Meeting	June 23, 2022, from 5:30 to 6:30 p.m. Pacific Time
Scoping Period (30 days)	June 8, 2022 through July 11, 2022

Scoping Summary Report
Bremerton Waterfront Infrastructure Improvements Environmental Impact Statement

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Scoping Summary Report
Bremerton Waterfront Infrastructure Improvements
Environmental Impact Statement
March 2023

The Department of the Navy (Navy) conducted notification and outreach activities in support of public scoping for the Bremerton Waterfront Infrastructure Improvements Environmental Impact Statement (EIS). The intent of public outreach for this phase of the project was to provide information to the public, agencies, Tribes, and other stakeholders on the Proposed Action, purpose and need, preliminary alternatives, resources to be analyzed, and public comment opportunities for development of the Draft EIS. Another intent of the public scoping period was to obtain public comments on the scope of the EIS, identification of potential alternatives, information, information and analyses relevant to the Proposed Action and the project's potential to cause effects on historic properties pursuant to Section 106 of the National Historic Preservation Act (NHPA). The Navy conducted outreach efforts to notify the public, media, Tribes, government agencies, and elected officials of the public scoping period and scoping meeting as detailed below.

This summary report describes the Navy's notification and outreach activities as well as the results of the public scoping period for the EIS.

1 Summary of Scoping Activities

1.1 Notification Activities

The following notifications were made to inform the public of the scoping meeting and public comment period.

1.1.1 Federal Register

A Notice of Intent (NOI) to prepare the EIS and to hold a public scoping meeting was published in the *Federal Register* on June 8, 2022 (Appendix A).

1.1.2 Newspaper Advertisements

An NOI advertisement and a scoping meeting advertisement (Appendix B) were placed in the four newspapers listed below. The NOI newspaper advertisement was published in conjunction with the beginning of the public scoping period published in the *Federal Register*, and the scoping meeting newspaper advertisement was published in conjunction with the public scoping meeting.

Table 1. Newspaper Advertisements

Newspaper	***Date of Advertisement***
Kitsap Sun (publishes daily)	Thursday, June 9, 2022 Friday, June 10, 2022 Saturday, June 11, 2022 Thursday, June 16, 2022 Monday, June 20, 2022 Tuesday, June 21, 2022 Wednesday, June 22, 2022
North Kitsap Herald (publishes weekly)	Friday, June 17, 2022

Newspaper	*Date of Advertisement*
Port Orchard Independent (publishes weekly)	Friday, June 17, 2022
Seattle Times (publishes daily)	Thursday, June 9, 2022 Friday, June 10, 2022 Saturday, June 11, 2022 Thursday, June 16, 2022 Monday, June 20, 2022 Tuesday, June 21, 2022 Wednesday, June 22, 2022

1.1.3 Postcard Mailer

A postcard mailer (Appendix C) announcing the public scoping meeting, Proposed Action, and public commenting options was mailed to 62 organizations and groups on June 7, 2022.

1.1.4 Stakeholder Letter

A notification letter (Appendix D) was mailed to 93 stakeholders, including the Suquamish Tribe and federal, state, and local elected officials and government agencies on June 7, 2022.

1.1.5 Agency Email

An email notification (Appendix E) was disseminated to staff of regulatory agencies, local governments, and the Suquamish Tribe. The email was disseminated on June 8, 2022, in conjunction with the beginning of the public comment period. It announced the Proposed Action, public scoping meeting, multi-agency scoping meeting, and public commenting options.

1.1.6 News Release

A news release (Appendix F) was distributed by the Navy Region Northwest (NRNW) Public Affairs Officer (PAO) to media outlets on June 8, 2022. It announced the public scoping meeting, Proposed Action, and public commenting options.

1.1.7 Social Media Posts

An announcement of the public scoping period (Appendix G) was posted on the NRNW Facebook page on June 8, June 15, June 20, June 23, and July 7, 2022; on the Naval Base Kitsap Facebook page on June 8, June 16, June 23, and July 7, 2022; on the Naval Base Kitsap Twitter page on June 23, 2022; and on the Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS & IMF) Facebook page on June 8 and June 16, 2022.

1.2 Information Resources

The following information resources were made available to the public.

1.2.1 Public Informational Materials

Public informational materials were developed to support public outreach efforts. A 12-page project fact sheet booklet (Appendix H), Frequently Asked Questions, and a project presentation (Appendix I) were prepared. These materials were posted on the project website.

The materials included information describing the Proposed Action and its purpose and need, preliminary alternatives, the PSNS & IMF mission, the National Environmental Policy Act (NEPA) process, the project schedule, and public involvement opportunities.

1.2.2 Project Website

A project website was launched on June 8, 2022 to provide the public with project information, including the project fact sheet, Frequently Asked Questions, and a pre-recorded presentation about the project. Public scoping comments could be submitted through the website during the public comment period. Questions to be addressed at the virtual public scoping meeting could be submitted through the website prior to the scoping meeting. In addition, requests to be added to the project mailing list could be made through the website. The number of email addresses added to the project mailing list was 23 email addresses and 22 individuals. The project website address is www.BremertonWaterfrontImprovementsEIS.com.

1.2.3 Project Email

A project email address was established by June 8, 2022. The auto reply to the project email address provided information on the public scoping period, public scoping meeting, and how to submit scoping comments. Public scoping comments could be submitted to the project email address. The project email address is info@BremertonWaterfrontImprovementsEIS.com.

1.2.4 Project Information Repositories

Information repositories at local libraries were established to provide a printed reference copy of project information to members of the community who are not able to access information online or who would prefer to access a printed copy. Copies of the project fact sheet and postcard were placed in the information repositories.

Table 2. Information Repositories

Location	*Address*
Kitsap Regional Library Downtown Bremerton Branch	612 Fifth St. Bremerton, WA 98337
Kitsap Regional Library Port Orchard Branch	87 Sidney Ave. Port Orchard, WA 98366
Kitsap Regional Library Sylvan Way Branch	1301 Sylvan Way Bremerton, WA 98310
Seattle Public Library Central Library Branch	1000 Fourth Ave. Seattle, WA 98104

1.3 Virtual Public Scoping Meeting

The Navy held a virtual public scoping meeting on June 23, 2022, from 5:30 to 6:30 p.m. Pacific Time. The meeting was conducted using the Zoom Webinar platform. The meeting notices included language directing people to contact Ms. Julianne Stanford, NRNW PAO, to request an interpreter or other reasonable accommodations.

After opening remarks and instructions on how to participate were provided, a short-pre-recorded video from PSNS & IMF Commanding Officer CAPT Jip Mosman was played to welcome attendees. Following the welcome video, a pre-recorded project presentation with information about the Proposed Action, purpose and need, preliminary alternatives, NEPA, and NHPA was played. The pre-recorded project

presentation was made available on the project website at the beginning of the public scoping period on June 8, 2022.

A question-and-answer session followed the presentation. Attendees were encouraged to submit questions verbally by raising their hand to be called on or to submit questions in writing via the Zoom Q&A function. The Navy responded to six questions that were submitted in writing in advance of the meeting and nine questions that were submitted in writing via the Zoom Q&A function during the meeting. No attendees asked a question verbally. A recording of the project team answering questions during the public scoping meeting, and the Commander's welcome video, were posted on the project website on June 29, 2022.

1.3.1 Attendance

Approximately 30 members of the public participated in the public scoping meeting. The following elected officials, Tribes, groups/organizations, and media participated:

- Bremerton Navy League
- King 5 News
- Representative Derek Kilmer's Office
- Suquamish Tribe
- U.S. Environmental Protection Agency

1.3.2 Questions

Questions were accepted in advance of the scoping meeting and during the scoping meeting. The project team also provided answers to Frequently Asked Questions during periods of the meeting when no questions from the public were being asked.

1.4 Public Comment Period

The public comment period was from June 8, 2022 to July 11, 2022. Throughout the public comment period, written comments were accepted by mail, email, and on the project website.

1.4.1 Comments Summary

During the scoping period, 26 submittals were received. No comments were submitted by mail. The submittals were received in the following manner:

- Project Website Submission: 9
- Email: 9 (5 submittals; 4 "no comments at this time")
- Public Scoping Meeting: 9
- Total Submittals Received: 26 (count comes to 26 since one comment was submitted via both the website and email)

Organizations and agencies that submitted comments include:

- Bureau of Reclamation, Columbia-Pacific Northwest Region (no comment)
- City of Bremerton
- DB Engineering
- NMFS, West Coast Region (no comment)
- Suquamish Tribe
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service, Washington Ecological Services Office (no comment)

- U.S. Geological Survey (no comment)
- U.S. National Park Service
- Washington State Department of Ecology
- Washington State Department of Transportation, Ferries Division

The comments received generally centered around Tribal rights, Cultural Resources/Hammerhead Crane, CERCLA, Traffic, and Marine resources. The topics, number of comments related to that topic, and the commentors are summarized in the table below. A copy of all scoping comments is included as Appendix J.

Table 3. General Summary of Scoping Comments

Topic	*Number of Comments*	*Commentors*
Traffic including Marine	6	Suquamish Tribe, WSDOT-Ferries, Washington Department of Ecology (Ecology), City of Bremerton, Private citizen
NHPA/Section 106/ Hammerhead Crane	6	EPA, NPS, Private citizens (3)
Shipyard work/schedule/ outreach	6	Private citizens (6), includes if work is being done by a local firm, what other nuclear is recycled, were shipyard workers specifically notified of the EIS
Marine Habitat	4	EPA, Suquamish Tribe, WSDOT-Ferries, Ecology
Tribal	3	Suquamish Tribe, EPA, Ecology
CERCLA	3	EPA, Suquamish Tribe, Ecology
Sediments	3	EPA, Suquamish Tribe, Ecology
Marine species/Endangered Species Act	3	EPA, Suquamish Tribe, Ecology
Water Quality	3	EPA, Suquamish Tribe, Ecology
Air Quality/Greenhouse Gas Emissions	2	EPA, Ecology
Sanitary Sewer/Process Water/Dewatering	2	EPA, Ecology
Environmental Justice	2	EPA, City of Bremerton
Cumulative Effects	2	EPA, Suquamish Tribe
Dredging/Turning Basin	2	Private citizens (2)
Coastal Zone Consistency	1	Ecology
Seismic Risk	1	Ecology
Sea Level Rise	1	Ecology
Noise	1	EPA
Climate Change	1	EPA
Utilities	1	City of Bremerton

1.5 Media Coverage

King 5 News attended the public scoping meeting but did not publish a story in local media. The *Kitsap Sun* published an online media article on June 8, 2022 and a video on the proposed project on June 15, 2022.

- Farley, Josh (Reporter, *Kitsap Sun*). (2022, June 8). *The Navy wants to demolish Puget Sound Naval Shipyard's iconic shipyard crane. Here's why.* Retrieved from https://www.kitsapsun.com/story/news/2022/06/08/iconic-shipyard-crane-to-be-razed-to-make-room-for-new-navy-dry-dock/9943614002/.

- Farley, Josh (Reporter, *Kitsap Sun*). (2022, June 15). *Bremerton's Hammerhead Crane* [Video]. *"An important and iconic part of Bremerton's history, the hammerhead crane is now slated for demolition. Josh Farley explains its importance."* Retrieved from https://www.kitsapsun.com/videos/news/2022/06/15/bremertons-hammerhead-crane/7633737001/.

Attachment A: Notice of Intent

Federal Register / Vol. 87, No. 110 / Wednesday, June 8, 2022 / Notices 34863

Electronic Submissions: Submit electronic comments to the Federal eRulemaking Portal at: *https://www.regulations.gov*. Follow the instructions for submitting comments. CPSC typically does not accept comments submitted by electronic mail (email), except as described below. CPSC encourages you to submit electronic comments by using the Federal eRulemaking Portal, as described above.

Mail/Hand Delivery/Courier/Confidential Written Submissions: Submit comments by mail, hand delivery, or courier to: Division of the Secretariat, Consumer Product Safety Commission, 4330 East-West Highway, Bethesda, MD 20814; telephone: (301) 504–7479. If you wish to submit confidential business information, trade secret information, or other sensitive or protected information that you do not want to be available to the public, you may submit such comments by mail, hand delivery, or courier, or you may email them to: *couscous;cpsc.gov*.

Instructions: All submissions must include the agency name and docket number. CPSC may post all comments without change, including any personal identifiers, contact information, or other personal information provided, to: *https://www.regulations.gov*. Do not submit through this website: confidential business information, trade secret information, or other sensitive or protected information that you do not want to be available to the public. If you wish to submit such information, please submit it according to the instructions for mail/hand delivery/courier/confidential written submissions.

Docket: For access to the docket to read background documents or comments received, go to: *https://www.regulations.gov*, and insert the docket number, CPSC–2012–0058, into the "Search" box, and follow the prompts.

FOR FURTHER INFORMATION CONTACT: Cynthia Gillham, Consumer Product Safety Commission, 4330 East-West Highway, Bethesda, MD 20814; (301) 504–7991, or by email to: *cgillham@cpsc.gov*.

SUPPLEMENTARY INFORMATION: CPSC seeks to renew the following currently approved collection of information:

Title: Safety Standard for Walk-Behind Power Lawn Mowers.

OMB Number: 3041–0091.

Type of Review: Renewal of collection.

Frequency of Response: On occasion.

Affected Public: Manufacturers and importers of walk-behind power lawn mowers.

Estimated Number of Respondents: Approximately 29 manufacturers and importers of walk-behind power lawn mowers.

Estimated Time per Response: Walk-behind power lawn mowers are manufactured seasonally to meet demand. They are manufactured during an estimated 130 days out of the year. When they are manufactured, firms are required to test and maintain records of those tests. Staff estimates three hours daily for testing and recordkeeping per firm totaling 390 hours per firm (3 hours × 130 days). In addition, to produce labels and apply labels on the newly manufactured lawn mowers, staff estimates one hour daily for each firm during the production cycle for a total of 130 hours per firm (1 hour × 130 days).

Total Estimated Annual Burden: Staff estimates 11,310 hours on testing and recordkeeping (29 firms × 390 hours) and 3,770 hours for labeling (29 firms × 130 hours). Aggregate annual burden hours related to testing, recordkeeping, and labeling are estimated to be 520 hours (390 + 130) per firm and 15,080 hours (11,310 + 3,770) for the industry. Annual testing, reporting and recordkeeping costs burden is estimated to be $796,224 based on 11,310 hours × $70.40 (total compensation for management, professional, and related workers in goods-producing industries) and annual cost burden related to labeling is estimated to be $132,628.60 based on 3,770 hours × $35.18 (total compensation for all sales and office workers in goods-producing industries).[1] Aggregate annual burden costs related to testing, recordkeeping, and labeling are estimated to be $928,852.60 ($796,224 + $132,628.60) for the industry.

General Description of Collection: In 1979, the Commission issued the Safety Standard for Walk-Behind Power Lawn Mowers (16 CFR part 1205) to address blade contact injuries. Subpart B of the standard sets forth regulations prescribing requirements for a reasonable testing program to support certificates of compliance with the standard for walk-behind power lawn mowers. 16 CFR part 1205, subpart B.

In addition, section 14(a) of the CPSA (15 U.S.C. 2063(a)) requires manufacturers, importers, and private labelers of a consumer product subject to a consumer product safety standard to issue a certificate stating that the product complies with all applicable consumer product safety standards. Section 14(a) of the CPSA also requires that the certificate of compliance must be based on a test of each product or upon a reasonable testing program. The information collection is necessary because these regulations require manufacturers and importers to establish and maintain records to demonstrate compliance with the requirements for testing and labeling to support the certification of compliance.

[1] U.S. Bureau of Labor Statistics, "Employer Costs for Employee Compensation," December 2021, Table 4. Private industry workers by occupational and industry group—2021 Q04 Results (*bls.gov*).

Request for Comments

The CPSC solicits written comments from all interested persons about the proposed collection of information. The CPSC specifically solicits information relevant to the following topics:

—Whether the collection of information described above is necessary for the proper performance of the CPSC's functions, including whether the information would have practical utility;

—Whether the estimated burden of the proposed collection of information is accurate;

—Whether the quality, utility, and clarity of the information to be collected could be enhanced; and

—Whether the burden imposed by the collection of information could be minimized by use of automated, electronic or other technological collection techniques, or other forms of information technology.

Alberta E. Mills,

Secretary, Consumer Product Safety Commission.

[FR Doc. 2022–12323 Filed 6–7–22; 8:45 am]

BILLING CODE 6355–01–P

DEPARTMENT OF DEFENSE

Department of the Navy

Notice of Intent To Prepare an Environmental Impact Statement for Bremerton Waterfront Infrastructure Improvements, Bremerton, Kitsap County, WA, and To Announce a Virtual Public Scoping Meeting

AGENCY: Department of the Navy (DON), Department of Defense (DoD).

ACTION: Notice.

SUMMARY: Pursuant to the National Environmental Policy Act (NEPA) of 1969, as implemented by the Council on Environmental Quality Regulations, the Department of the Navy (DON) announces its intent to prepare an Environmental Impact Statement (EIS) to evaluate the potential environmental impacts associated with construction, modification, replacement, demolition,

and operation of multiple waterfront infrastructure and facilities at the Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS & IMF) at Naval Base (NAVBASE) Kitsap Bremerton, Washington. The DON is initiating a 30-day public scoping period to receive comments on the scope of the EIS including identification of potential alternatives, information, and analyses relevant to the Proposed Action, identification of environmental concerns, issues the public would like to see addressed in the EIS, and the project's potential to affect historic properties pursuant to Section 106 of the National Historic Preservation Act (NHPA) of 1966.

DATES: The public 30-day scoping period begins on June 8, 2022, and extends to July 11, 2022. Comments must be postmarked or submitted electronically via email or the website no later than 11:59 p.m. Pacific Daylight Time (PDT) on July 11, 2022, for consideration in the Draft EIS.

The DON will hold a virtual public scoping meeting, consisting of presentations and a question-and-answer session. The meeting will be held on June 23, 2022, 5:30 p.m. to 6:30 p.m. PDT. Information about how to participate in the meeting, including how to submit questions to be discussed at the meeting, is available at the DON project website address below. The DON will also publish participation details for the virtual public scoping meeting in local newspapers and in press releases.

ADDRESSES: The DON invites all interested parties to submit scoping comments on the Bremerton Waterfront Infrastructure Improvements EIS to the physical and electronic addresses listed in the section below. Please visit the project website at *www.BremertonWaterfront ImprovementsEIS.com* for further information.

Comments may be received:

- *electronically via email: info@ BremertonWaterfront ImprovementsEIS.com;*
- electronically via the project website: *www.BremertonWaterfront ImprovementsEIS.com;* or
- *by mail, postmarked no later than July 11, 2022, to the following address:* Naval Facilities Engineering Systems Command Northwest, Attn: Bremerton EIS Project Manager, 1101 Tautog Circle, Room 210, Silverdale, WA 98315.

FOR FURTHER INFORMATION CONTACT: Naval Facilities Engineering Systems Command Northwest, Attn: Ms. Christine Stevenson, Bremerton EIS Project Manager, 1101 Tautog Circle, Room 210, Silverdale, WA 98315, *info@ BremertonWaterfront ImprovementsEIS.com*, 360–396–0080.

SUPPLEMENTARY INFORMATION: The purpose of the Proposed Action is to address critical deficiencies in dry dock capability, capacity, and seismic survivability at NAVBASE Kitsap Bremerton to enable PSNS & IMF to meet its mission to support the DON's nuclear fleet. The Proposed Action is needed because PSNS & IMF does not have the dry dock capability to support the DON's newest class of nuclear-powered aircraft carrier (CVN), USS Gerald R. Ford (CVN 78); PSNS & IMF does not have the dry dock and pier capacity to conduct the required future overhauling, refueling, inactivating, and recycling of submarines; and Dry Dock (DD) 6, the only dry dock on the West Coast that can accommodate a CVN, and other existing infrastructure do not meet current Department of Defense Unified Facilities Criteria design standards for seismic performance.

The Proposed Action will address critical deficiencies in dry dock capability, capacity, and seismic survivability at NAVBASE Kitsap Bremerton to enable PSNS & IMF to meet its mission to support the DON's nuclear fleet. The DON considers an EIS the appropriate document for comprehensively analyzing the Proposed Action, which will affect existing facilities and construct new infrastructure and facilities at PSNS & IMF.

The Proposed Action would occur along the PSNS & IMF waterfront, beginning as early as 2026. Components include: construction of a new multi-mission dry dock (M2D2) at PSNS & IMF that can accommodate all classes of CVNs along the PSNS & IMF waterfront; seismic upgrade of existing DD6; and modification, demolition, and/or replacement of other piers, wharves, quay walls, buildings, cranes, and utilities. Although the majority of the Proposed Action is expected to occur at NAVBASE Kitsap Bremerton, the DON could replace some demolished facilities at other NAVBASE Kitsap installations.

The DON has identified two preliminary action alternatives to carry forward for analysis in the EIS along with the No Action alternative. These alternatives will be further refined based on input received from the public and resource agencies during scoping.

Under Alternative 1 (No Action Alternative), there would be no change from the status quo. The DON would not build an M2D2, upgrade DD6 to meet current seismic standards, or take other component actions. However, the DON would continue to rely on, maintain, and repair existing facilities to perform its mission.

Under Alternative 2, the DON would construct a new M2D2 on the east side of PSNS & IMF, at the location of existing DD3. Additionally, the DON would seismically upgrade DD6 and construct a new Forge Shop at NAVBASE Kitsap Bangor. The DON would also demolish Piers 4, 5, 6, and 7, including the Hammerhead Crane on Pier 6, and construct a new Pier 2. The DON would replace Piers 4 and 6 with new piers. The DON would dredge bottom sediments to create entrance channels and provide adequate draft at wharves and piers.

Under Alternative 3, the DON would construct an M2D2 in the center of the PSNS & IMF waterfront, at the current location of Mooring A. Additionally, the DON would seismically upgrade DD6. The DON would also demolish Mooring A, the Hammerhead Crane on Pier 6, and Pier 4. The DON would replace Pier 4 with a new pier. The DON would dredge bottom sediments to create entrance channels and adequate draft at wharves and piers.

The environmental issues and resource areas the DON would examine in the EIS include, but are not limited to, the following: Air Quality, Water Quality, Geological Resources, Biological Resources, Cultural Resources, American Indian Traditional Resources, Land Use and Recreation, Visual Resources, Noise, Infrastructure and Utilities, Transportation and Traffic, Marine Navigation, Public Health and Safety, Hazardous Materials and Waste, Socioeconomics, and Environmental Justice. The EIS will also analyze measures that would avoid, minimize, or mitigate environmental effects.

Additionally, the DON will conduct all coordination, consultation, and permitting activities required by the Clean Water Act, Rivers and Harbors Act, Endangered Species Act, Marine Mammal Protection Act, Magnuson-Stevens Fishery Conservation and Management Act, NHPA, Coastal Zone Management Act, and other laws and regulations applicable to the project. Since project components would be phased over multiple years, the DON will coordinate with each agency regarding timing of consultations and permitting.

The DON encourages federal, state, and local agencies, tribes, and interested persons to provide comments concerning potential alternatives and environmental issues for analysis in the EIS, as well as to identify specific

environmental resources that the DON should consider when developing the Draft EIS. Additionally, the DON encourages interested persons to submit comments concerning historic resources under Section 106 of the NHPA. The DON will prepare the Draft EIS, including analysis of potential effects on those resources that the DON and the public identify. The DON will consider all comments received during the public scoping period during EIS preparation.

The project website is available at *www.BremertonWaterfront ImprovementsEIS.com*. The project website provides information on the Proposed Action, NEPA process and schedule, and includes a document library. The public can use this website to submit scoping comments electronically between June 8, 2022, and July 11, 2022. In addition, the public can submit substantive questions for discussion with DON representatives at the virtual public meeting. Questions should be submitted by email to *info@BremertonWaterfront ImprovementsEIS.com* or by completing the form at *www.BremertonWaterfront ImprovementsEIS.com* between June 8, 2022, and June 22, 2022.

Additional opportunities for public comment will occur after the release of the Draft EIS. The DON intends to publish the Draft EIS in spring 2023, publish the Final EIS in spring 2024, and sign a Record of Decision following the 30-day Final EIS wait period.

Dated: May 27, 2022.

J.M. Pike,

Commander, Judge Advocate General's Corps, U.S. Navy, Federal Register Liaison Officer.

[FR Doc. 2022–11852 Filed 6–7–22; 8:45 am]

BILLING CODE 3810–FF–P

DEPARTMENT OF EDUCATION

Report From the Study of State Policies To Prohibit Aiding and Abetting Sexual Misconduct in Schools

AGENCY: Office of Elementary and Secondary Education, Department of Education.

ACTION: Notice of availability.

SUMMARY: The Department of Education (Department) is announcing the availability of the report entitled "Study of State Policies to Prohibit Aiding and Abetting Sexual Misconduct in Schools." The report and a summary (*i.e.*, a fact sheet summarizing the key findings of the study) are on the Office of Elementary and Secondary Education web page (*https://oese.ed.gov/offices/office-of-formula-grants/safe-supportive-schools/*).

FOR FURTHER INFORMATION CONTACT: Victoria Hammer, U.S. Department of Education, Office of Elementary and Secondary Education, 400 Maryland Avenue SW, Room 5B242, Washington, DC 20202. Telephone: (202) 453–6396. Email: *Victoria.Hammer@ed.gov*.

If you are deaf, hard of hearing, or have a speech disability and wish to access telecommunications relay services, please dial 7–1–1.

SUPPLEMENTARY INFORMATION: The Department announces the availability of the report entitled "Study of State Policies to Prohibit Aiding and Abetting Sexual Misconduct in Schools." Under the Consolidated Appropriations Act, 2022, the Department is required to publish the results of the study in the **Federal Register**. The report and a summary (*i.e.*, a fact sheet summarizing the key findings of the study) are on the Office of Elementary and Secondary Education web page *https://oese.ed.gov/offices/office-of-formula-grants/safe-supportive-schools/*.

Accessible Format: On request to the contact person listed under **FOR FURTHER INFORMATION CONTACT**, individuals with disabilities can obtain this document in an accessible format. The Department will provide the requestor with an accessible format that may include Rich Text Format (RTF) or text format (txt), a thumb drive, an MP3 file, braille, large print, audiotape, or compact disc, or other accessible format.

Ruth Ryder,

Deputy Assistant Secretary for Policy and Programs, Office of Elementary and Secondary Education.

[FR Doc. 2022–12297 Filed 6–7–22; 8:45 am]

BILLING CODE 4000–01–P

DEPARTMENT OF ENERGY

Proposed Subsequent Arrangement

AGENCY: National Nuclear Security Administration, Department of Energy.

ACTION: Proposed subsequent arrangement.

SUMMARY: This document is being issued under the authority of the Atomic Energy Act of 1954, as amended. The Department is providing notice of a proposed subsequent arrangement under the Agreement for Cooperation Concerning Civil Uses of Atomic Energy between the Government of the United States of America and the Government of Canada, as amended.

DATES: This subsequent arrangement will take effect no sooner than June 23, 2022.

FOR FURTHER INFORMATION CONTACT: Ms. Andrea Ferkile, Office of Nonproliferation and Arms Control, National Nuclear Security Administration, Department of Energy. Telephone: 202–586–8868 or email: *andrea.ferkile@nnsa.doe.gov*.

SUPPLEMENTARY INFORMATION: This subsequent arrangement concerns the retransfer of 8,713,018,000 g of U.S.-obligated natural uranium hexafluoride (UF6), 5,890,000,000 g of which is natural uranium, from Cameco Corporation in Port Hope, Ontario, Canada, to Urenco Ltd. Capenhurst Works, Chester, United Kingdom, for toll enrichment. Upon transfer to the United Kingdom, the material will become subject to the Agreement between the Government of the United States of America and the Government of the United Kingdom of Great Britain and Northern Ireland for Cooperation in Peaceful Uses of Nuclear Energy.

Pursuant to the authority in section 131 a. of the Atomic Energy Act of 1954, as delegated, I have determined that this proposed subsequent arrangement concerning the retransfer of U.S.-obligated nuclear material will not be inimical to the common defense and security of the United States of America.

Signing Authority

This document of the Department of Energy was signed on May 31, 2022, by Corey Hinderstein, Deputy Administrator for Defense Nuclear Nonproliferation, pursuant to delegated authority from the Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the **Federal Register**.

Signed in Washington, DC, on June 3, 2022.

Treena V. Garrett,

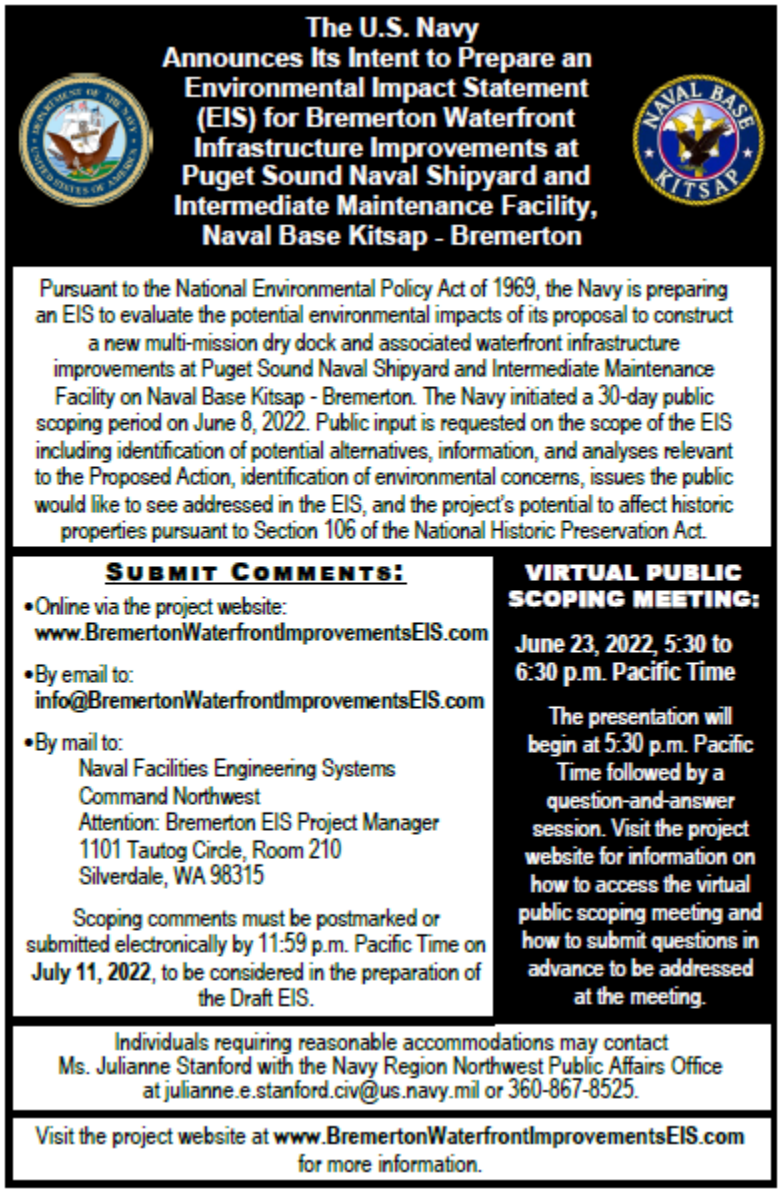
Federal Register Liaison Officer, U.S. Department of Energy.

[FR Doc. 2022–12373 Filed 6–7–22; 8:45 am]

BILLING CODE 6450–01–P

Attachment B: Newspaper Advertisements

Notice of Intent Newspaper Advertisement



The U.S. Navy Announces Its Intent to Prepare an Environmental Impact Statement (EIS) for Bremerton Waterfront Infrastructure Improvements at Puget Sound Naval Shipyard and Intermediate Maintenance Facility, Naval Base Kitsap - Bremerton

Pursuant to the National Environmental Policy Act of 1969, the Navy is preparing an EIS to evaluate the potential environmental impacts of its proposal to construct a new multi-mission dry dock and associated waterfront infrastructure improvements at Puget Sound Naval Shipyard and Intermediate Maintenance Facility on Naval Base Kitsap - Bremerton. The Navy initiated a 30-day public scoping period on June 8, 2022. Public input is requested on the scope of the EIS including identification of potential alternatives, information, and analyses relevant to the Proposed Action, identification of environmental concerns, issues the public would like to see addressed in the EIS, and the project's potential to affect historic properties pursuant to Section 106 of the National Historic Preservation Act.

SUBMIT COMMENTS:

- Online via the project website: **www.BremertonWaterfrontImprovementsEIS.com**
- By email to: **info@BremertonWaterfrontImprovementsEIS.com**
- By mail to:
  Naval Facilities Engineering Systems Command Northwest
  Attention: Bremerton EIS Project Manager
  1101 Tautog Circle, Room 210
  Silverdale, WA 98315

Scoping comments must be postmarked or submitted electronically by 11:59 p.m. Pacific Time on **July 11, 2022**, to be considered in the preparation of the Draft EIS.

VIRTUAL PUBLIC SCOPING MEETING:

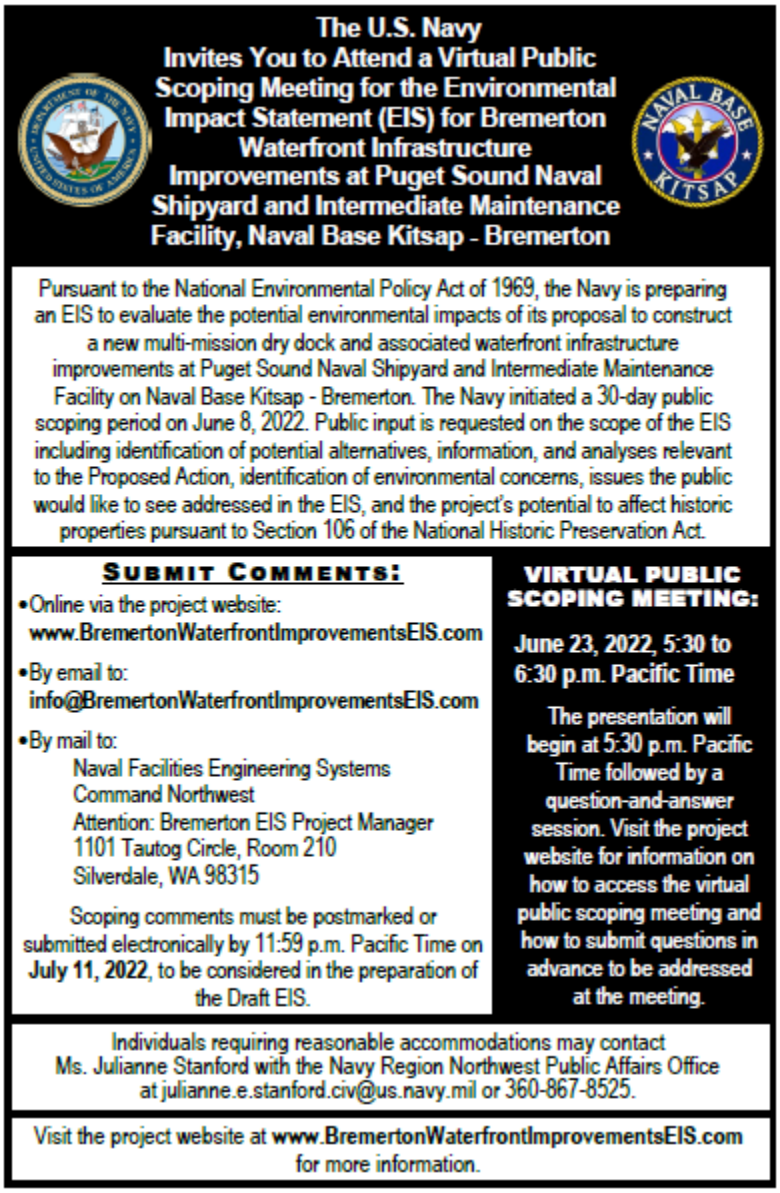
June 23, 2022, 5:30 to 6:30 p.m. Pacific Time

The presentation will begin at 5:30 p.m. Pacific Time followed by a question-and-answer session. Visit the project website for information on how to access the virtual public scoping meeting and how to submit questions in advance to be addressed at the meeting.

Individuals requiring reasonable accommodations may contact Ms. Julianne Stanford with the Navy Region Northwest Public Affairs Office at julianne.e.stanford.civ@us.navy.mil or 360-867-8525.

Visit the project website at **www.BremertonWaterfrontImprovementsEIS.com** for more information.

Scoping Meeting Newspaper Advertisement



The U.S. Navy Invites You to Attend a Virtual Public Scoping Meeting for the Environmental Impact Statement (EIS) for Bremerton Waterfront Infrastructure Improvements at Puget Sound Naval Shipyard and Intermediate Maintenance Facility, Naval Base Kitsap - Bremerton

Pursuant to the National Environmental Policy Act of 1969, the Navy is preparing an EIS to evaluate the potential environmental impacts of its proposal to construct a new multi-mission dry dock and associated waterfront infrastructure improvements at Puget Sound Naval Shipyard and Intermediate Maintenance Facility on Naval Base Kitsap - Bremerton. The Navy initiated a 30-day public scoping period on June 8, 2022. Public input is requested on the scope of the EIS including identification of potential alternatives, information, and analyses relevant to the Proposed Action, identification of environmental concerns, issues the public would like to see addressed in the EIS, and the project's potential to affect historic properties pursuant to Section 106 of the National Historic Preservation Act.

SUBMIT COMMENTS:

- Online via the project website: **www.BremertonWaterfrontImprovementsEIS.com**
- By email to: **info@BremertonWaterfrontImprovementsEIS.com**
- By mail to:
  Naval Facilities Engineering Systems Command Northwest
  Attention: Bremerton EIS Project Manager
  1101 Tautog Circle, Room 210
  Silverdale, WA 98315

Scoping comments must be postmarked or submitted electronically by 11:59 p.m. Pacific Time on **July 11, 2022**, to be considered in the preparation of the Draft EIS.

VIRTUAL PUBLIC SCOPING MEETING:

June 23, 2022, 5:30 to 6:30 p.m. Pacific Time

The presentation will begin at 5:30 p.m. Pacific Time followed by a question-and-answer session. Visit the project website for information on how to access the virtual public scoping meeting and how to submit questions in advance to be addressed at the meeting.

Individuals requiring reasonable accommodations may contact Ms. Julianne Stanford with the Navy Region Northwest Public Affairs Office at julianne.e.stanford.civ@us.navy.mil or 360-867-8525.

Visit the project website at **www.BremertonWaterfrontImprovementsEIS.com** for more information.

Attachment C: Postcard

Bremerton Waterfront Infrastructure Improvements Environmental Impact Statement

Pursuant to the National Environmental Policy Act of 1969, the United States Navy is preparing an Environmental Impact Statement (EIS) to evaluate the potential environmental impacts of its proposal to construct a new multi-mission dry dock and associated waterfront infrastructure improvements at Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS & IMF) on Naval Base Kitsap - Bremerton. The Navy initiated a 30-day public scoping period on June 8, 2022. Public input is requested on the scope of the EIS including identification of potential alternatives, information, and analyses relevant to the Proposed Action, identification of environmental concerns, issues the public would like to see addressed in the EIS, and the project's potential to affect historic properties pursuant to Section 106 of the National Historic Preservation Act.

How to Submit Comments

- Submit comments via the project website: **BremertonWaterfrontImprovementsEIS.com**
- Email comments to: **info@BremertonWaterfrontImprovementsEIS.com**
- Mail comments to:

Naval Facilities Engineering Systems Command Northwest
Attention: Bremerton EIS Project Manager
1101 Tautog Circle, Room 210
Silverdale, WA 98315

SCAN ME

The 30-day public scoping period ends on July 11, 2022.
Scoping comments must be postmarked or submitted electronically by 11:59 p.m. Pacific Time on **July 11, 2022**, to be considered in the preparation of the Draft EIS.

The Navy is holding a virtual public scoping meeting to provide information about the Proposed Action. The presentation will begin at 5:30 p.m. Pacific Time followed by a question-and-answer session.

Visit the project website at **BremertonWaterfrontImprovementsEIS.com** for information on how to access the virtual public scoping meeting and how to submit questions in advance to be addressed at the meeting.

Individuals requiring reasonable accommodations may contact Ms. Julianne Stanford with the Navy Region Northwest Public Affairs Office at julianne.e.stanford.civ@us.navy.mil or 360-867-8525.

Proposed Action

The Navy proposes to construct a new multi-mission dry dock and associated waterfront infrastructure improvements at PSNS & IMF on Naval Base Kitsap - Bremerton. The Proposed Action would address critical deficiencies in dry dock capability, capacity, and seismic survivability at Naval Base Kitsap - Bremerton to enable PSNS & IMF to meet its mission to support the Navy's fleet.

Visit the project website at **BremertonWaterfrontImprovementsEIS.com** for more information.

SCAN ME

Naval Facilities Engineering Systems Command Northwest
Attention: Bremerton EIS Project Manager
1101 Tautog Circle, Room 210
Silverdale, WA 98315

Attachment D: Stakeholder Letter

DEPARTMENT OF THE NAVY
NAVAL BASE KITSAP
120 SOUTH DEWEY STREET
BREMERTON, WA 98314-5020

5090
Ser N00/01116
1 Jun 22

Dear Sir or Madam:

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT FOR BREMERTON WATERFRONT INFRASTRUCTURE IMPROVEMENTS AT PUGET SOUND NAVAL SHIPYARD AND INTERMEDIATE MAINTENANCE FACILITY, NAVAL BASE KITSAP - BREMERTON

Pursuant to the National Environmental Policy Act of 1969, the United States Navy is preparing an Environmental Impact Statement (EIS) to evaluate the potential environmental impacts associated with the construction of a new dry dock and associated waterfront infrastructure improvements at Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS & IMF), Naval Base Kitsap (NBK) - Bremerton.

The Navy is initiating a 30-day EIS public scoping period and is requesting comments on the scope of the EIS including identification of potential alternatives, information, and analyses relevant to the Proposed Action, identification of environmental concerns, issues the public would like to see addressed in the EIS, and the project's potential to affect historic properties pursuant to Section 106 of the National Historic Preservation Act (NHPA) of 1966. The Navy welcomes your input and will accept comments from June 8, 2022, through July 11, 2022.

Background

a. PSNS & IMF is the Navy's primary provider for the maintenance, repair, modernization, inactivation, and recycling of ships, submarines, and aircraft carriers in the Pacific Fleet. PSNS & IMF is the only Navy shipyard on the West Coast with a dry dock that can accommodate the large size of nuclear-powered aircraft carriers for repair and maintenance. Additionally, PSNS & IMF is the only Navy shipyard that is approved to recycle nuclear-powered submarines.

b. Much of the infrastructure at PSNS & IMF dates back to the late 1800s and early 1900s and it was primarily designed for building and maintaining ships that are no longer part of the modern naval fleet. Other than construction of Dry Dock 6 in the early 1960s, the shipyard has had few major infrastructure updates since the mid-1900s, which has led to significant production inefficiencies for maintaining current ships. The shipyard lacks the necessary capacity to accommodate new and future classes of ships.

Proposed Action. The Navy's Proposed Action is to construct a new dry dock at PSNS & IMF. The proposed dry dock would be designed and built to serve multiple missions and therefore would be classified as a multi-mission dry dock. The Navy is also proposing to

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Ser N00/01116
1 Jun 22

upgrade Dry Dock 6 to meet current seismic standards, and to modify, demolish, and/or replace other piers, wharves, quay walls, buildings, cranes, and utilities to make space for the new multi-mission dry dock.

Purpose and Need for the Proposed Action. The purpose of the Proposed Action is to address critical deficiencies in dry dock capability, capacity, and seismic survivability at Naval Base Kitsap - Bremerton to enable PSNS & IMF to meet its mission to support the Navy's nuclear fleet.

The Proposed Action is needed because:

a. PSNS & IMF does not have the dry dock capability to support the Navy's newest USS Gerald R. Ford (CVN 78) class aircraft carriers.

b. PSNS & IMF does not have the dry dock and pier capacity to conduct the required future overhauling, refueling, inactivating, and recycling of nuclear-powered submarines. PSNS & IMF must also maintain the capacity to perform emergent work such as battle damage repair.

c. Dry Dock 6, the only dry dock on the West Coast that can accommodate a nuclear-powered aircraft carrier, does not meet current seismic standards.

Virtual Public Scoping Meeting

a. The Navy will hold a virtual public scoping meeting to provide information about the Proposed Action. The virtual public scoping meeting will be held from 5:30 to 6:30 p.m. Pacific Time on June 23, 2022.

b. The presentation will begin at 5:30 p.m. Pacific Time followed by a question and answer session. Formal scoping comments will not be accepted during the virtual public scoping meeting, but may be submitted as described below. Please visit the project website at **www.BremertonWaterfrontImprovementsEIS.com** for information on how to access the virtual public scoping meeting and how to submit questions in advance to be addressed at the meeting. The project website will also allow visitors to sign up for email notifications related to this EIS. Individuals requiring reasonable accommodations may contact Ms. Julianne Stanford with the Navy Region Northwest Public Affairs Office at (360) 867-8525 or via email at julianne.e.stanford.civ@us.navy.mil.

Submitting Written Scoping Comments. The Navy requests and welcomes your scoping comments. Although scoping comments will not be accepted during the virtual public scoping meeting, comments can be submitted by one of the following methods:

a. Online at **www.BremertonWaterfrontImprovementsEIS.com**,

b. Email to **info@BremertonWaterfrontImprovementsEIS.com**, or

5090
Ser N00/01116
1 Jun 22

c. U.S. Postal Service, mail to:

Naval Facilities Engineering Systems Command Northwest
Attention: Bremerton EIS Project Manager
1101 Tautog Circle, Room 210
Silverdale, WA 98315

The 30-day public scoping period will be open from June 8, 2022 through July 11, 2022. Scoping comments must be postmarked or submitted electronically by 11:59 p.m. Pacific Time on **July 11, 2022**. All relevant scoping comments submitted by this date will be considered in the preparation of the Draft EIS.

For more information, please visit the project website at www.BremertonWaterfrontImprovementsEIS.com or contact Ms. Christine Stevenson, Bremerton EIS Project Manager, at info@BremertonWaterfrontImprovementsEIS.com.

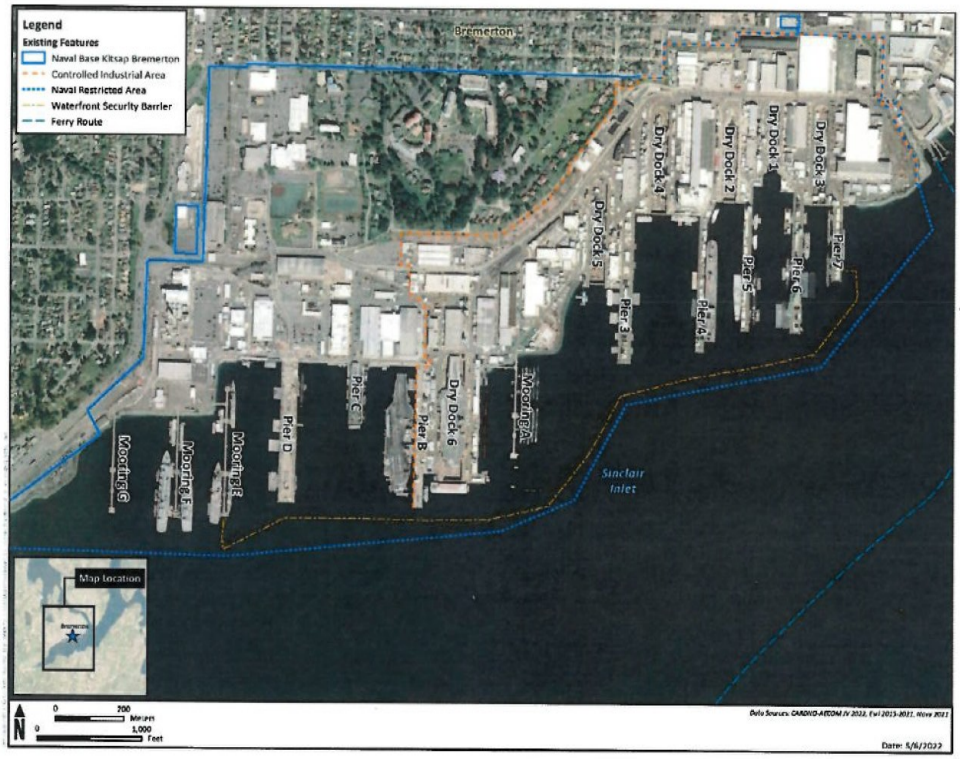
Sincerely,

R. N. MASSIE
Captain, U.S. Navy
Commanding Officer

Enclosure: 1. Project Location Map

3

Project Location Map



Enclosure (1)

Attachment E: Agency Email

Subject: Navy to prepare EIS for infrastructure improvements at Puget Sound Naval Shipyard / Planned Multi-Agency Staff Meeting
Signed By: christine.stevenson@navy.mil

Good Morning All:

The Navy will be preparing an Environmental Impact Statement (EIS) for infrastructure improvements at Puget Sound Naval Shipyard and Intermediate Maintenance Facility at Naval Base Kitsap - Bremerton. The Navy is initiating a 30-day EIS public scoping period and is requesting comments on the scope of the EIS including identification of potential alternatives, information and analyses relevant to the Proposed Action, identification of environmental concerns, issues the public would like to see addressed in the EIS, and the project's potential to affect historic properties pursuant to Section 106 of the National Historic Preservation Act (NHPA) of 1966. The Navy welcomes your input and will accept written comments from June 8, 2022, through July 11, 2022.

The Proposed Action is to construct a new dry dock, seismically upgrade Dry Dock 6, demolish the Hammerhead Crane, and modify, demolish, and/or replace other piers, wharves, quay walls, buildings, and utilities at the shipyard. The Navy needs to improve its capability, capacity, and seismic survivability to enable the shipyard to meet its mission to support the Navy's nuclear fleet.

A Virtual Public Scoping Meeting is scheduled for June 23, 2022. The Navy will be receiving and responding to questions from the public during this meeting. These questions will not be considered as part of the record for formal public comments for this EIS.

The Navy will consider all relevant written comments received in preparation of the environmental analysis. Written comments can be submitted by any of the following methods until 11:59 Pacific Time on July 11, 2022:

- online at www.BremertonWaterfrontImprovementsEIS.com,
- email to info@BremertonWaterfrontImprovementsEIS.com, or
- U.S. Postal Service mail to:
  Naval Facilities Engineering Systems Command Northwest
  Attention: Bremerton EIS Project Manager
  1101 Tautog Circle, Room 210
  Silverdale, WA 98315

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For more information on the Proposed Action and public scoping process, please visit the project website at www.BremertonWaterfrontImprovementsEIS.com. The project website will also allow visitors to sign up for notifications related to this EIS.

During this public scoping process, the Navy will also be hosting a virtual multi-agency meeting for staff from regulatory agencies, the Suquamish Tribe, and local governments. This meeting is tentatively scheduled for the afternoon of 29 June. Please let us know whom from your organization should be included on the invitation for this meeting. You can reply to this email with names and contact information.

Very Respectfully,
Chris Stevenson
Bremerton EIS Project Manager
Naval Facilities Engineering Systems Command Northwest

Attachment F: News Release

COMMANDER,
NAVY REGION NORTHWEST
Public Affairs Office
1100 Hunley Road, Silverdale, WA 98315-1100
Phone: (360) 396-1630 Fax: (360) 396-7127

FOR IMMEDIATE RELEASE **June 8, 2022**
Release #22-0608

NAVY SEEKS PUBLIC INPUT ON PROPOSED WATERFRONT INFRASTRUCTURE IMPROVEMENTS AT PUGET SOUND NAVAL SHIPYARD

SILVERDALE, Wash. — The U.S. Navy is preparing an Environmental Impact Statement (EIS) to evaluate the potential environmental impacts associated with the construction of a new dry dock and associated waterfront infrastructure improvements at Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS & IMF), Naval Base Kitsap - Bremerton.

The Navy is proposing to build a new multi-mission dry dock at PSNS & IMF, which would be designed to fit current and future classes of ships, submarines, and aircraft carriers.

The Navy is also proposing to upgrade Dry Dock 6 to meet current seismic standards, demolish the Hammerhead Crane, and modify, demolish, and/or replace some of the shipyard's waterfront infrastructure to make space for the new multi-mission dry dock.

The Navy requests and welcomes input from the public on the scope of the EIS during a 30-day public scoping period, which is open from **June 8, 2022, through July 11, 2022**. The Navy will hold a virtual public scoping meeting on **June 23, 2022**, to provide more information and answer questions about the proposed infrastructure improvements.

PSNS & IMF is the Navy's primary provider for the maintenance, repair, modernization, inactivation, and recycling of ships, submarines, and aircraft carriers in the Pacific Fleet.

Other than the construction of Dry Dock 6 in the early 1960s, the shipyard has had few major infrastructure updates since the mid-1900s, which has led to significant production inefficiencies for maintaining current ships. The shipyard lacks the necessary capacity to accommodate new and future classes of ships.

The shipyard currently does not have the dry dock capability to support the Navy's newer, larger USS Gerald R. Ford (CVN 78) class aircraft carriers.

PSNS & IMF does not have the dry dock and pier capacity to conduct the required future overhauling, refueling, inactivating, and recycling of nuclear-powered submarines.

Also, if the Navy does not upgrade Dry Dock 6 – the only West Coast dry dock that can service an aircraft carrier – the dry dock will continue to be at risk during future seismic events.

These proposed upgrades would address critical deficiencies in dry dock capability, capacity, and seismic survivability at Naval Base Kitsap - Bremerton and enable PSNS & IMF to meet its mission to support the Navy's fleet.

-more-

There are no other shipyards on the West Coast with the capability and capacity to do the work required. The Pacific Northwest is a strategic location for the U.S. military, and it is important to maintain mission capabilities on the West Coast.

Public Involvement:

The Navy is initiating a 30-day public scoping period and is requesting comments on the scope of the EIS including identification of potential alternatives, information, and analyses relevant to the Proposed Action, identification of environmental concerns, issues the public would like to see addressed in the EIS, and the project's potential to affect historic properties pursuant to Section 106 of the National Historic Preservation Act (NHPA) of 1966.

The Navy welcomes your input and will accept comments from **June 8, 2022, through July 11, 2022**.

The virtual public scoping meeting, which will include a question and answer session with subject matter experts from the Navy, will be held from **5:30 to 6:30 p.m. Pacific Time on June 23, 2022**.

Information is available on the project website at **www.BremertonWaterfrontImprovementsEIS.com** about how to access the virtual public scoping meeting and how to submit questions in advance to be addressed at the meeting.

Media seeking further information should contact Ms. Julianne Stanford with the Navy Region Northwest Public Affairs Office at julianne.e.stanford.civ@us.navy.mil or 360-867-8525.

Please help inform your community by sharing the information in this news release.

-USN-

Attachment G: Social Media Posts

Facebook Post #1 - Navy Region Northwest

Intro

This is the official Facebook page for Commander, Navy Region Northwest. CNRNW supports the Navy's

Page · Government organization

1100 Hunley Rd, Silverdale, WA, United States, Washington

cnrnw.cnic.navy.mil

Always open

Rating · 4.1 (50 Reviews)

Photos See all photos

U.S. Navy Region Northwest
June 8 ·

The U.S. Navy is preparing an Environmental Impact Statement (EIS) to evaluate the potential environmental impacts associated with the construction of a new dry dock and associated waterfront infrastructure improvements at Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS & IMF), Naval Base Kitsap - Bremerton.

The Navy is proposing to build a new multi-mission dry dock at PSNS & IMF, which would be designed to fit current and future classes of ships, submarines, and aircraft carriers.

The Navy is also proposing to upgrade Dry Dock 6 to meet current seismic standards, demolish the Hammerhead Crane, and modify, demolish, and/or replace some of the shipyard's waterfront infrastructure to make space for the new multi-mission dry dock.

The Navy requests and welcomes input from the public on the scope of the EIS during a 30-day public scoping period, which is open from June 8, 2022, through July 11, 2022. The Navy will hold a virtual public scoping meeting on June 23, 2022, to provide more information and answer questions about the proposed infrastructure improvements.

More information is available on the project website at www.BremertonWaterfrontImprovementsEIS.com.

Facebook Post #2 - Navy Region Northwest

Intro

This is the official Facebook page for Commander, Navy Region Northwest. CNRNW supports the Navy's

Page · Government organization

1100 Hunley Rd, Silverdale, WA, United States, Washington

cnrnw.cnic.navy.mil

Always open

Rating · 4.1 (50 Reviews)

Photos See all photos

U.S. Navy Region Northwest
June 15 ·

The U.S. Navy will host a virtual public scoping meeting to provide the public with more information about the proposal to improve waterfront infrastructure at Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS & IMF), Naval Base Kitsap - Bremerton.

The virtual public scoping meeting, which will include a question and answer session with subject matter experts from the Navy, will be held from 5:30 to 6:30 p.m. Pacific Time on June 23, 2022.

Information on how to access the virtual public scoping meeting and submit questions in advance is available on the project website at www.BremertonWaterfrontImprovementsEIS.com.

The Navy is proposing to build a new multi-mission dry dock at PSNS & IMF, which would be designed to fit current and future classes of ships, submarines, and aircraft carriers.
The Navy is also proposing to upgrade Dry Dock 6 to meet current seismic standards, demolish the Hammerhead Crane, and modify, demolish, and/or replace some of the shipyard's waterfront infrastructure to make space for the new multi-mission dry dock.

Facebook Post #3 - Navy Region Northwest

Intro

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1100 Hunley Rd, Silverdale, WA, United States, Washington

cnrnw.cnic.navy.mil

Always open

Rating · 4.1 (50 Reviews)

Photos See all photos

U.S. Navy Region Northwest
June 20 ·

REMINDER - The U.S. Navy will host a virtual public scoping meeting to provide the public with more information about the proposal to improve waterfront infrastructure at Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS & IMF), Naval Base Kitsap - Bremerton.

The virtual public scoping meeting, which will include a question and answer session with subject matter experts from the Navy, will be held from 5:30 to 6:30 p.m. Pacific Time on June 23, 2022.

Information on how to access the virtual public scoping meeting and submit questions in advance is available on the project website at www.BremertonWaterfrontImprovementsEIS.com.

The Navy is proposing to build a new multi-mission dry dock at PSNS & IMF, which would be designed to fit current and future classes of ships, submarines, and aircraft carriers.
The Navy is also proposing to upgrade Dry Dock 6 to meet current seismic standards, demolish the Hammerhead Crane, and modify, demolish, and/or replace some of the shipyard's waterfront infrastructure to make space for the new multi-mission dry dock.

Facebook Post #4 - Navy Region Northwest

Intro

This is the official Facebook page for Commander, Navy Region Northwest. CNRNW supports the Navy's

Page · Government organization

1100 Hunley Rd, Silverdale, WA, United States, Washington

cnrnw.cnic.navy.mil

Always open

Rating · 4.1 (50 Reviews)

Photos

See all photos

U.S. Navy Region Northwest
June 23 at 10:00 AM ·

TODAY - The U.S. Navy will host a virtual public scoping meeting to provide the public with more information about the proposal to improve waterfront infrastructure at Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS & IMF), Naval Base Kitsap - Bremerton.

The virtual public scoping meeting, which will include a question and answer session with subject matter experts from the Navy, will be held from 5:30 to 6:30 p.m. Pacific Time on June 23, 2022.

Information on how to access the virtual public scoping meeting and submit questions in advance is available on the project website at www.BremertonWaterfrontImprovementsEIS.com.

The Navy is proposing to build a new multi-mission dry dock at PSNS & IMF, which would be designed to fit current and future classes of ships, submarines, and aircraft carriers.
The Navy is also proposing to upgrade Dry Dock 6 to meet current seismic standards, demolish the Hammerhead Crane, and modify, demolish, and/or replace some of the shipyard's waterfront infrastructure to make space for the new multi-mission dry dock.

Facebook Post #5 - Navy Region Northwest

Intro

This is the official Facebook page for Commander, Navy Region Northwest. CNRNW supports the Navy's

Page · Government organization

1100 Hunley Rd, Silverdale, WA, United States, Washington

cnrnw.cnic.navy.mil

Always open

Rating · 4.1 (50 Reviews)

Photos

See all photos

U.S. Navy Region Northwest
July 7 at 12:17 PM ·

REMINDER – The 30-day public scoping comment period for the Bremerton Waterfront Infrastructure Improvements Environmental Impact Statement closes on Monday, July 11, 2022.

Comments can be submitted online through the project website at https://bremertonwaterfrontimprovementseis.com/comments/, emailed to info@BremertonWaterfrontImprovementsEIS.com, or mailed to Naval Facilities Engineering Systems Command Northwest, Attention: Bremerton EIS Project Manager; 1101 Tautog Circle, Room 210; Silverdale, WA 98315.

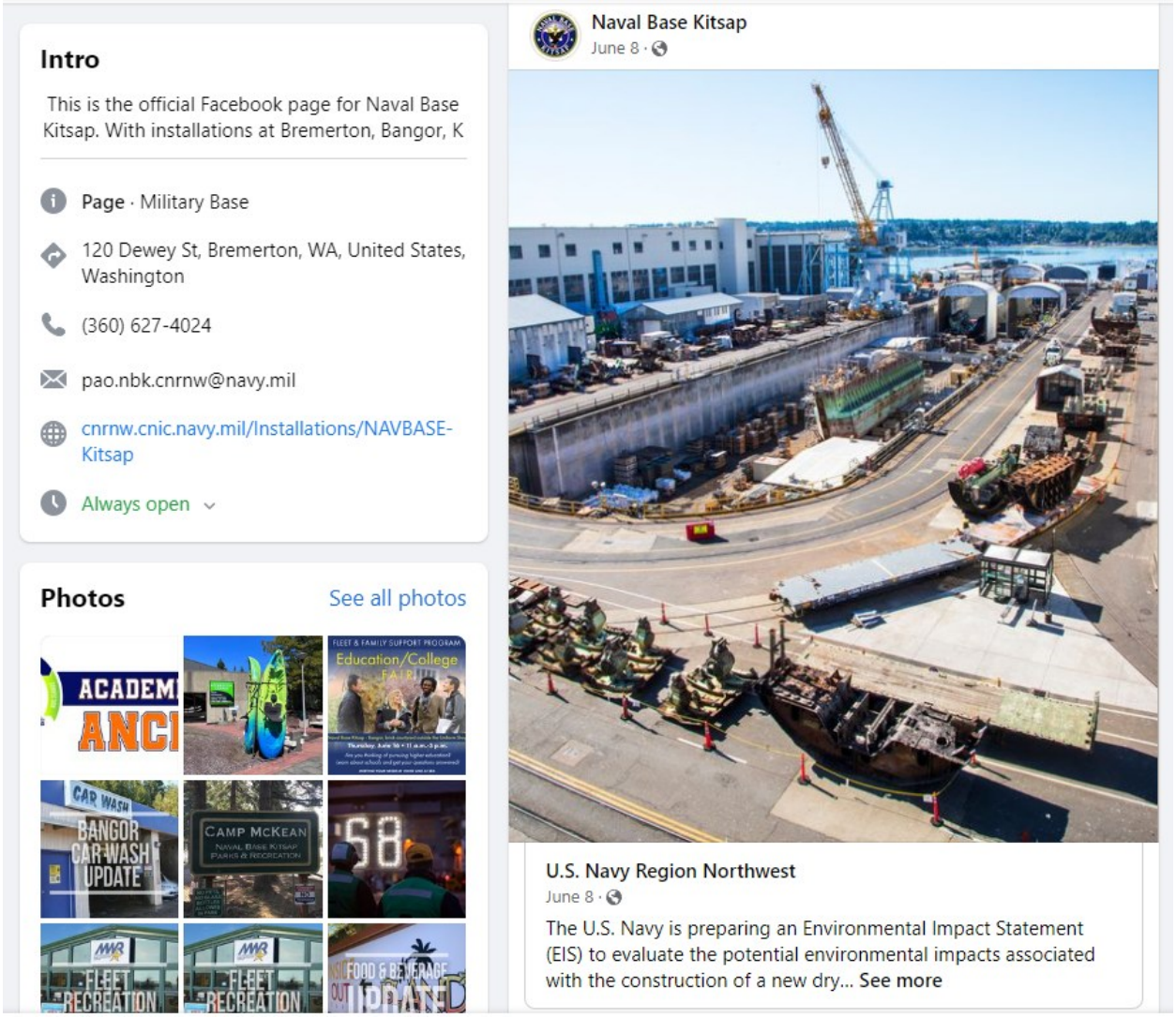
Scoping comments must be postmarked or submitted electronically by 11:59 p.m. Pacific Time on July 11, 2022.

The U.S. Navy is preparing an Environmental Impact Statement (EIS) to evaluate the potential environmental impacts associated with the construction of a new dry dock and associated waterfront infrastructure improvements at Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS & IMF), Naval Base Kitsap - Bremerton.

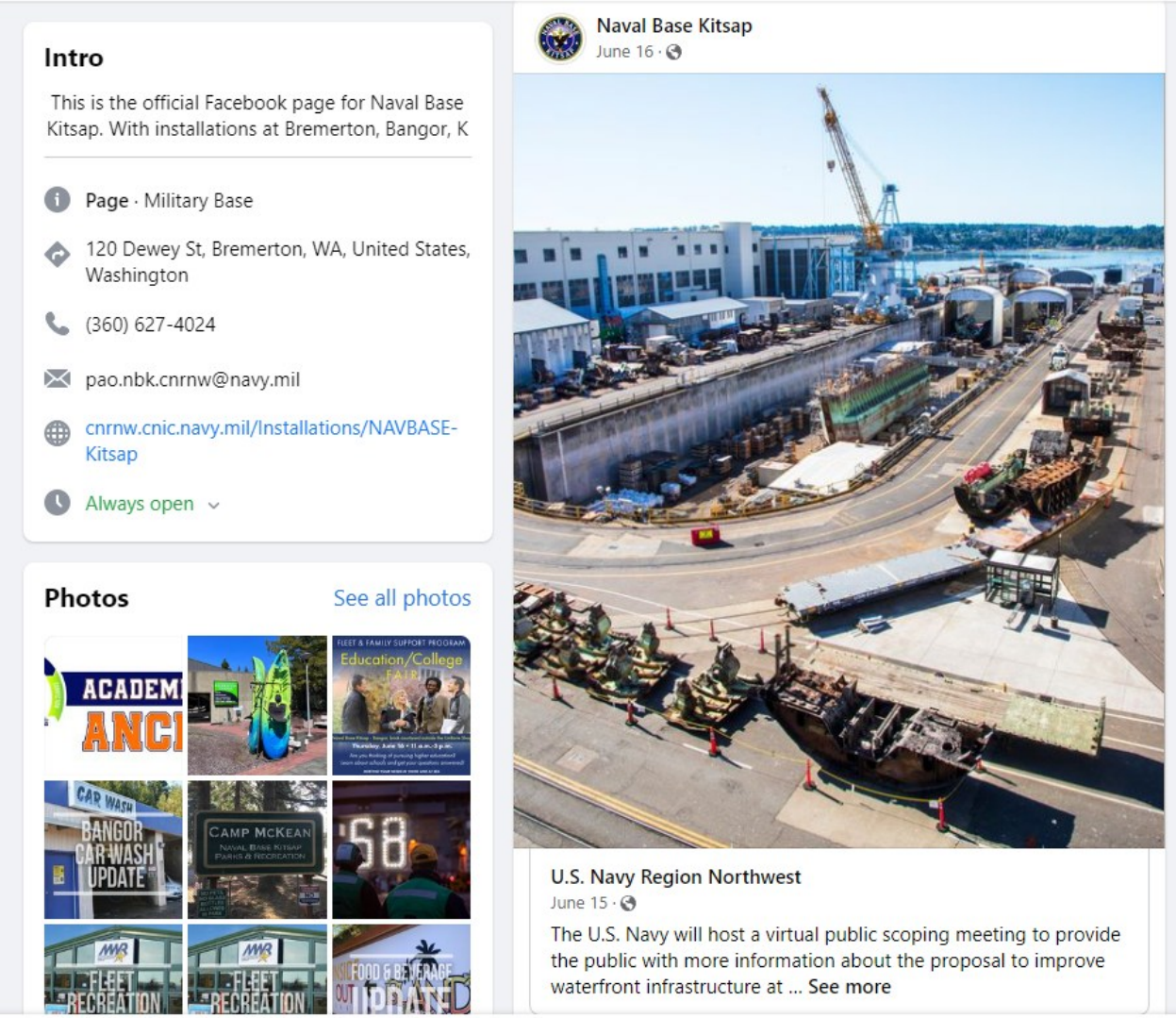
The Navy is proposing to build a new multi-mission dry dock at PSNS & IMF, which would be designed to fit current and future classes of ships, submarines, and aircraft carriers.

The Navy is also proposing to upgrade Dry Dock 6 to meet current seismic standards, demolish the Hammerhead Crane, and modify, demolish, and/or replace some of the shipyard's waterfront infrastructure to make space for the new multi-mission dry dock.

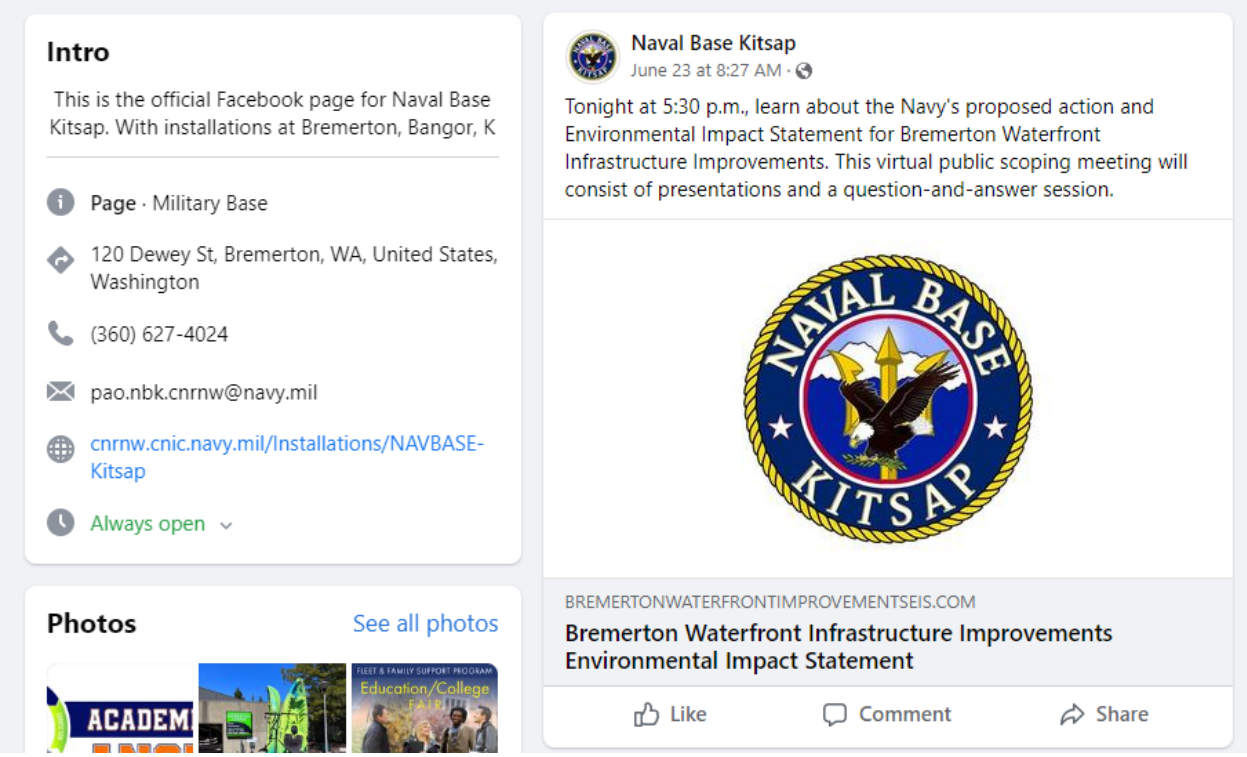
Facebook Post #1 – Naval Base Kitsap



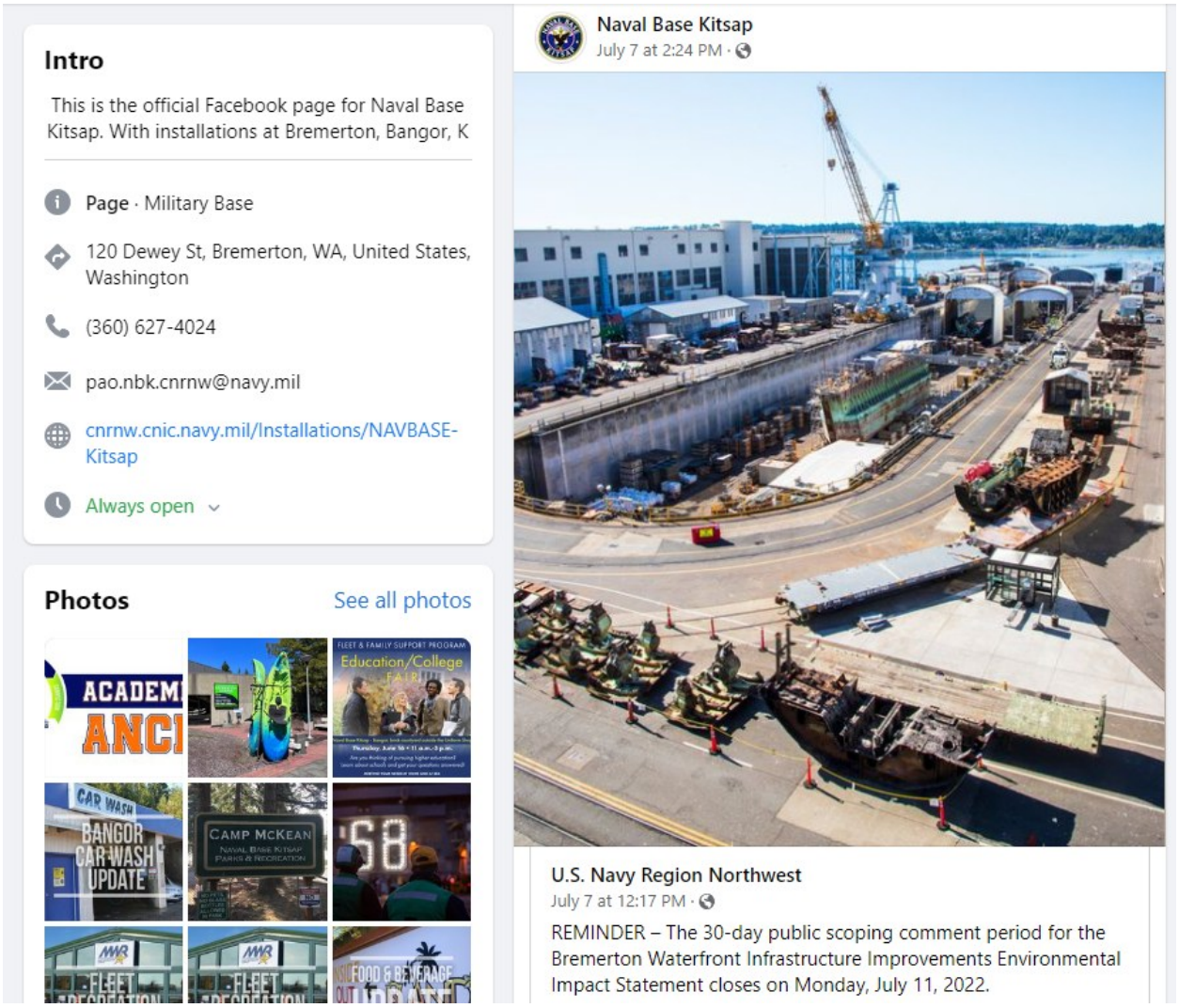
Facebook Post #2 – Naval Base Kitsap



Facebook Post #3 – Naval Base Kitsap

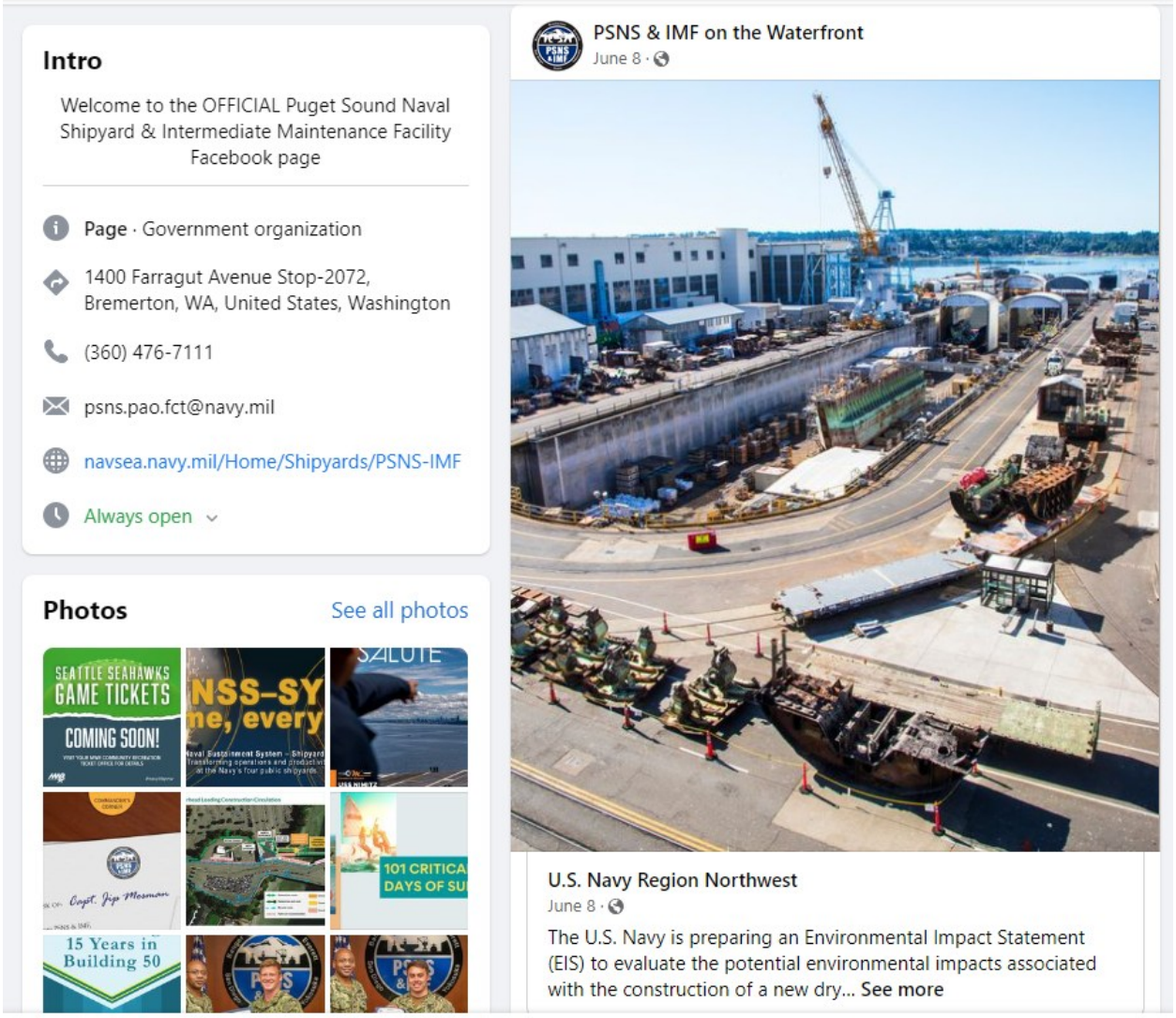


Facebook Post #4 – Naval Base Kitsap

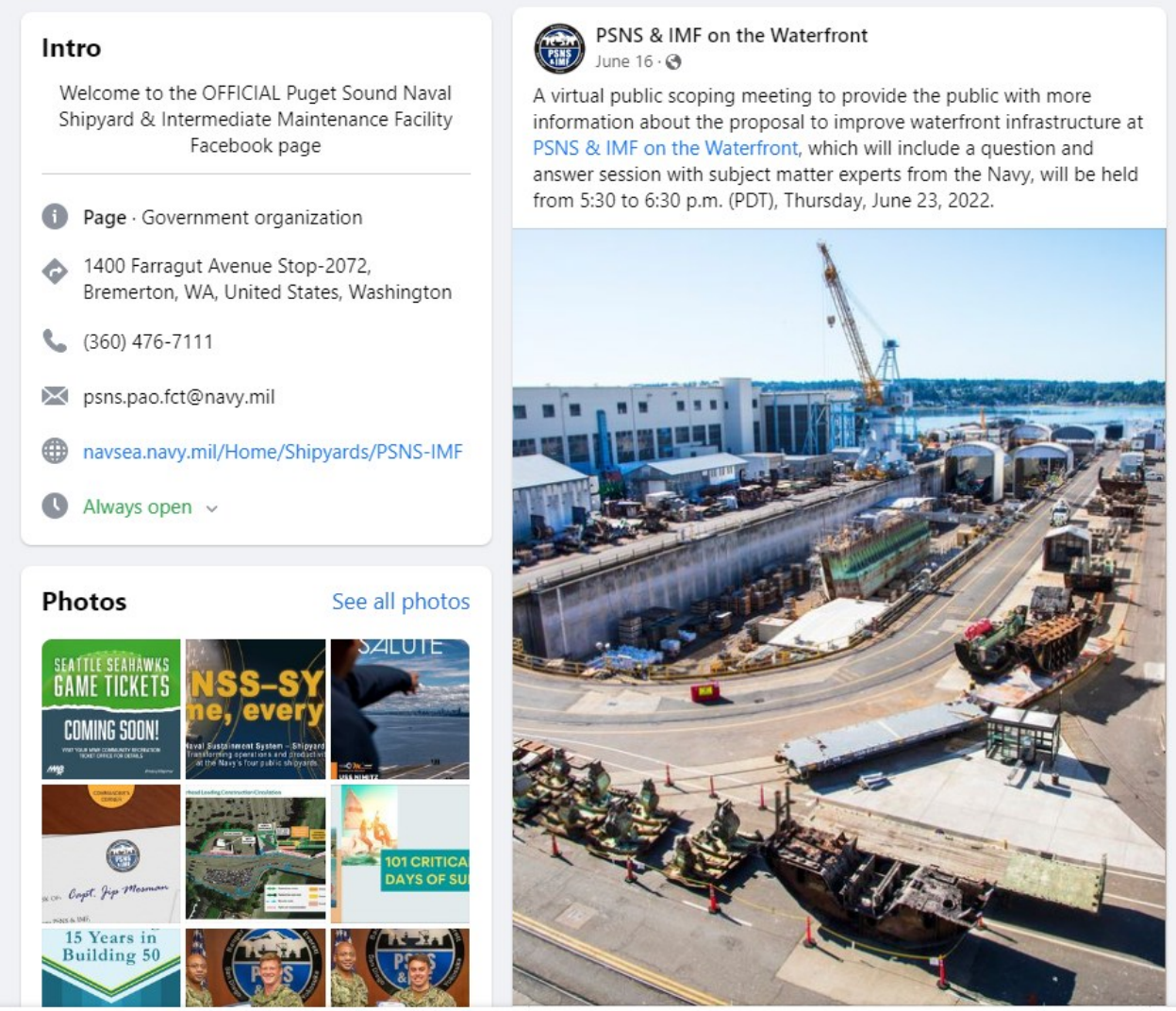


Twitter Post #1 – Naval Base Kitsap

Facebook Post #1 – Puget Sound Naval Shipyard and Intermediate Maintenance Facility



Facebook Post #2 – Puget Sound Naval Shipyard and Intermediate Maintenance Facility



Attachment H: Fact Sheet

INTRODUCTION

Pursuant to the National Environmental Policy Act (NEPA) of 1969, the United States (U.S.) Navy is preparing an Environmental Impact Statement (EIS) to evaluate the potential environmental impacts of constructing a new multi-mission dry dock and associated waterfront infrastructure improvements at Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS & IMF). PSNS & IMF is located on Naval Base Kitsap - Bremerton in Washington state.

The Navy is requesting the public's input on the scope of the EIS including identification of potential alternatives, information, and analyses relevant to the Proposed Action, identification of environmental concerns, issues the public would like to see addressed in the EIS, and the project's potential to affect historic properties pursuant to Section 106 of the National Historic Preservation Act. This fact sheet describes the Navy's Proposed Action and preliminary alternatives being considered for analysis. The fact sheet also describes how the public can be involved in the environmental review process.

The U.S. Navy initiated a 30-day public scoping period on June 8, 2022.

BACKGROUND

PSNS & IMF is the Navy's primary provider for the maintenance, repair, modernization, inactivation, and recycling of ships, submarines, and aircraft carriers in the Pacific Fleet. PSNS & IMF is the only Navy shipyard on the West Coast with a dry dock that can accommodate the large size of nuclear-powered aircraft carriers for repair and maintenance. Additionally, PSNS & IMF is the only Navy shipyard that is approved to recycle nuclear powered submarines.

Much of the infrastructure at PSNS & IMF dates back to the late 1800s and early 1900s and it was primarily designed for building and maintaining ship classes that are no longer part of the modern naval fleet. Other than construction of Dry Dock 6 in the early 1960s, the shipyard has had few major infrastructure updates since the mid-1900s, which has led to significant production inefficiencies for maintaining current ships. The shipyard lacks the necessary capacity to accommodate new and future classes of ships.

A dry dock is a narrow basin constructed near the shoreline that can be flooded to allow a vessel to navigate in, then drained to allow a vessel to come to rest on a dry platform. The purpose of a dry dock is to get a vessel out of the water for repair and maintenance work.

PROPOSED ACTION

The Navy's Proposed Action is to construct a new multi-mission dry dock at PSNS & IMF. The proposed dry dock would be designed and built to serve multiple missions and therefore would be classified as a multi-mission dry dock. The Navy is also proposing to upgrade Dry Dock 6 to meet current seismic standards, and to modify, demolish, and/or replace other piers, wharves, quay walls, buildings, cranes, and utilities to make space for the new multi-mission dry dock.

A quay wall is a retaining structure used to dock a floating vessel.

A wharf is a structure built along or at an angle from the shore so a vessel may be moored.

Figure 1. PSNS & IMF is located at Naval Base Kitsap - Bremerton, which is on the north side of Sinclair Inlet within the City of Bremerton in Kitsap County, Washington

PURPOSE AND NEED FOR THE PROPOSED ACTION

The purpose of the Proposed Action is to address critical deficiencies in dry dock capability, capacity, and seismic survivability at Naval Base Kitsap - Bremerton to enable PSNS & IMF to meet its mission to support the Navy's nuclear fleet.

The Proposed Action is needed because:

- PSNS & IMF does not have the dry dock capability to support the Navy's newest class of nuclear-powered aircraft carrier, USS Gerald R. Ford (CVN 78).
- PSNS & IMF does not have the dry dock and pier capacity to conduct the required future overhauling, refueling, inactivating, and recycling of nuclear-powered submarines. PSNS & IMF must also maintain the capacity to perform emergent work such as battle damage repair.
- Dry Dock 6, the only dry dock on the West Coast that can accommodate a nuclear-powered aircraft carrier, does not meet current Department of Defense Unified Facilities Criteria design standards for seismic performance.

A new multi-mission dry dock and associated waterfront infrastructure improvements are necessary to provide the capacity and capability to meet the fleet's future operational needs.

Resources to be Analyzed in the EIS
The Navy will analyze the potential impacts the Proposed Action and alternatives may have on the environmental resource areas listed below. The public can suggest additional resources and alternatives for consideration.
• Air Quality
• Water Quality
• Geological Resources
• Biological Resources
• Cultural Resources
• American Indian Traditional Resources
• Land Use and Recreation
• Visual Resources
• Noise
• Infrastructure and Utilities
• Transportation and Traffic
• Marine Navigation
• Public Health and Safety
• Hazardous Materials and Wastes
• Socioeconomics
• Environmental Justice
5

PRELIMINARY ALTERNATIVES

The Navy conducted several preliminary studies to determine alternative ways to meet its purpose and need. Several alternatives that meet the purpose and need were evaluated against screening criteria. At this time, two preliminary action alternatives are being considered for further evaluation in the EIS in addition to the No Action Alternative. The public is invited to help identify other alternatives that meet the purpose and need.

Feature	Alternative 1 No Action Alternative	Preliminary Alternative 2 Multi-Mission Dry Dock at Dry Dock 3	Preliminary Alternative 3 Multi-Mission Dry Dock at Mooring A
Multi-Mission Dry Dock Location	No multi-mission dry dock constructed	Dry Dock 3	Mooring A
Multi-Mission Dry Dock Size	No multi-mission dry dock constructed	190 feet x 1,250 feet	190 feet x 1,250 feet
Multi-Mission Dry Dock Wharf	No multi-mission dry dock constructed	No multi-mission dry dock wharf constructed	New nuclear-powered aircraft carrier repair wharf at multi-mission dry dock east wall
Forge Shop	No change	New forge shop at Naval Base Kitsap - Bangor	No change
Dry Dock 6	No change	Seismic upgrade	Seismic upgrade
Pier 2	No new Pier 2 constructed	New Pier 2	No new Pier 2 constructed
Pier 4	No change	Demolish and replace with new pier	Demolish and replace with new pier
Pier 5	No change	Demolish	No change
Pier 6	No change	Demolish and replace with new pier for nuclear-powered aircraft carrier repairs	No change
Hammerhead Crane	No change	Demolish	Demolish
Pier 7	No change	Demolish	No change
Mooring A	No change	No change	Demolish
Dredging	No dredging	Entrance channels and demolition of pier pilings/footers	Entrance channels, new turning basin, and demolition of pier pilings/footers

6

Alternative 1: No Action Alternative

Under the No Action Alternative, the proposed multi-mission dry dock would not be constructed; Dry Dock 6 would not be upgraded to meet current seismic standards; and other component actions would not occur. The Navy would continue to maintain, repair, and operate existing facilities, but would continue to experience production inefficiencies due to the shipyard's limited capacity and capabilities for servicing current and future ships. The No Action Alternative does not meet the purpose and need for the Proposed Action, but as required by NEPA, the No Action Alternative is analyzed to provide a baseline for measuring the environmental impacts of the action alternatives.

Preliminary Alternative 2: Multi-Mission Dry Dock at Dry Dock 3

Under Alternative 2, the Navy would:

- Construct a multi-mission dry dock at the location of Dry Dock 3
- Construct a forge shop at Naval Base Kitsap - Bangor
- Upgrade Dry Dock 6 to meet current seismic standards
- Construct Pier 2
- Demolish Piers 4, 5, 6, and 7, including the Hammerhead Crane on Pier 6, and Dry Dock 3
- Replace Piers 4 and 6 with new piers
- Dredge sediment and demolish pier pilings/footers to create entrance channels and adequate water depth at wharves and piers

Figure 2. Alternative 2

Preliminary Alternative 3: Multi-Mission Dry Dock at Mooring A

Under Alternative 3, the Navy would:

- Construct a multi-mission dry dock at the location of Mooring A
- Construct a wharf (Wharf 2) on the outer east wall of the multi-mission dry dock
- Upgrade Dry Dock 6 to meet current seismic standards
- Demolish Pier 4, the Hammerhead Crane on Pier 6, and Mooring A
- Replace Pier 4 with new pier
- Dredge sediment and demolish pier pilings/footers to create entrance channels, a new turning basin, and adequate water depth at wharves and piers

Figure 3. Alternative 3

NEPA PROCESS AND COMMUNITY INVOLVEMENT

National Environmental Policy Act

NEPA is a U.S. federal environmental law that requires federal agencies to consider the potential environmental impacts of their proposed actions before making a decision. NEPA ensures reasonable alternatives to the proposed action are explored, potential impacts to the environment are thoroughly analyzed, and the public has an opportunity to provide input. In compliance with NEPA, the Navy is preparing an EIS to evaluate the potential environmental impacts associated with constructing a new multi-mission dry dock and associated waterfront infrastructure improvements at PSNS & IMF. The Navy is requesting the public's input on the scope of the EIS including identification of potential alternatives, information, and analyses relevant to the Proposed Action, identification of environmental concerns, and issues the public would like to see addressed in the EIS.

Concurrent with the NEPA process, the Navy is conducting the National Historic Preservation Act (NHPA) Section 106 process. The NHPA requires federal agencies to identify historic properties within the project area, determine potential effects to identified historic properties, and consult with the State Historic Preservation Officer, federally recognized Tribes, and other interested parties. Historic properties include districts, sites, buildings, structures, or objects listed or eligible for listing in the National Park Service's National Register of Historic Places, including National Historic Landmarks. The Navy is also accepting public comments on the project's potential to affect historic properties pursuant to Section 106 of the NHPA.

Community Involvement

Community involvement is an important part of the NEPA process. Public, agency, and Tribal input allows decision makers to benefit from local knowledge and consider local issues and concerns. The public participates in the NEPA process during the following key stages:

- **Public Scoping Period (We are now in the public scoping period, June 8 to July 11, 2022)**: The public helps to identify the scope of analysis, environmental resource areas, and potential alternatives to be analyzed in the EIS. Input received during the public scoping period is considered in the development of the Draft EIS.
- **Draft EIS Public Review and Comment Period**: The public reviews, evaluates, and comments on the environmental impact analysis presented in the Draft EIS. Input received during this period is considered in the development of the Final EIS.

HOW TO PARTICIPATE

The Navy is currently accepting comments during the public scoping period and is holding a virtual public scoping meeting on June 23, 2022. The public, including elected officials, government agencies, non-governmental organizations, Tribes, and interested individuals, are encouraged to participate and comment in any of the following ways:

- Submit comments via the project website: BremertonWaterfrontImprovementsEIS.com
- Email comments to: info@BremertonWaterfrontImprovementsEIS.com
- Mail comments to:

Naval Facilities Engineering Systems Command Northwest
Attention: Bremerton EIS Project Manager
1101 Tautog Circle, Room 210
Silverdale, WA 98315

The 30-day public scoping period ends on July 11, 2022. Scoping comments must be postmarked or submitted electronically by 11:59 p.m. Pacific Time on July 11, 2022, to be considered in the preparation of the Draft EIS.

Individuals unable to attend the virtual public scoping meeting can access project information via the project website: BremertonWaterfrontImprovementsEIS.com.

NEPA Process and Timeline		
Milestone	**Description**	**Current EIS Schedule**
Notice of Intent	Announces an agency's intent to prepare an EIS	June 8, 2022
Public Scoping Period	Public process to review and comment on the scope and issues to be analyzed in the EIS	Comment Period: June 8 – July 11, 2022 Virtual Public Scoping Meeting: June 23, 2022
Draft EIS	Presents the analysis of potential environmental impacts for each identified alternative	Spring 2023
Draft EIS Public Review and Comment Period	Opportunity for public review and comment on the analysis presented in the Draft EIS	Spring 2023
Final EIS	Includes updates to the Draft EIS and responses to public comments received during the Draft EIS comment period	Spring 2024
30-Day Wait Period	Opportunity for the public to see how their comments on the Draft EIS were addressed	Spring 2024
Record of Decision	Announces the Navy's formal decision on the selected alternative	Spring 2024

Opportunity for Public Comment

Visit the project website at BremertonWaterfrontImprovementsEIS.com for more information or to be added to the project mailing list.

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Attachment I: Project Presentation

Public Scoping Meeting for Bremerton Waterfront Infrastructure Improvements Environmental Impact Statement at Puget Sound Naval Shipyard and Intermediate Maintenance Facility, Naval Base Kitsap – Bremerton

National Environmental Policy Act
National Historic Preservation Act

www.BremertonWaterfrontImprovementsEIS.com

Purpose of Today's Meeting

- Provide overview of proposed waterfront infrastructure improvements at Puget Sound Naval Shipyard and Intermediate Maintenance Facility.
- Provide overview of National Environmental Policy Act (NEPA) and development of the Environmental Impact Statement (EIS).
- Provide overview of National Historic Preservation Act (NHPA).
- Provide information and answer questions to help the public formulate substantive written comments for development of the EIS.

www.BremertonWaterfrontImprovementsEIS.com

How to Submit Written Comments

Written comments must be submitted electronically or postmarked by **July 11, 2022** (11:59 p.m. PDT) to be considered in the development of the Draft EIS.

How to submit written comments:

- **Send an electronic comment via email:**
  info@BremertonWaterfrontImprovementsEIS.com
- **Send a comment via the online form:**
  www.BremertonWaterfrontImprovementsEIS.com
- **Mail written comments to:**

  Naval Facilities Engineering Systems Command Northwest
  Attention: Bremerton EIS Project Manager
  1101 Tautog Circle, Room 210
  Silverdale, WA 98315

www.BremertonWaterfrontImprovementsEIS.com

Project Overview: Proposed Action

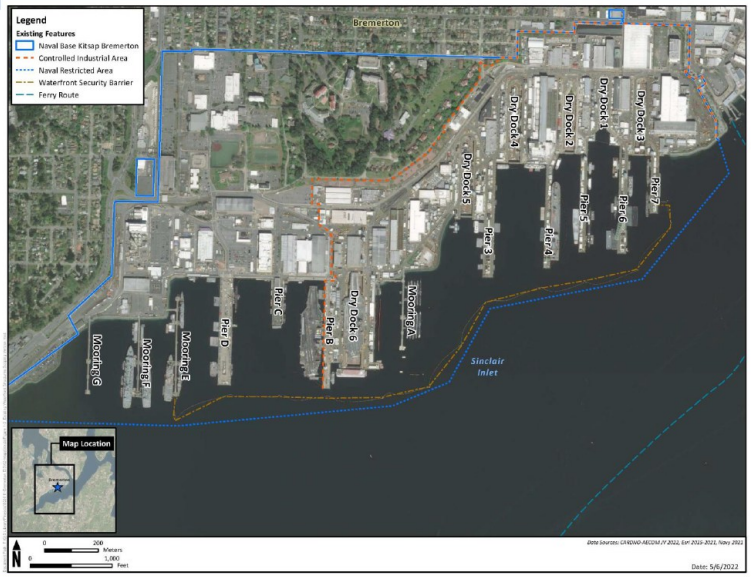
The Navy proposes to:

- Construct a new dry dock. The dry dock would serve multiple missions and be called a multi-mission dry dock.
- Modify, demolish, and/or replace other piers, wharves, quay walls, buildings, cranes, and utilities to make space for the new multi-mission dry dock.
- Upgrade Dry Dock 6 to meet current seismic standards.
- The Proposed Action also includes dredging to create turning basins, entrance channels, and adequate water depth at wharves and piers.

www.BremertonWaterfrontImprovementsEIS.com

Figure 1

PSNS & IMF is located at Naval Base Kitsap – Bremerton, which is located on the north side of Sinclair Inlet within the city of Bremerton in Kitsap County, Washington.



www.BremertonWaterfrontImprovementsEIS.com

Purpose and Need

To address critical deficiencies in dry dock capability, capacity, and seismic survivability at Naval Base Kitsap – Bremerton to enable PSNS & IMF to meet its mission to support the Navy's nuclear fleet.

- ❑ PSNS & IMF does not have the dry dock capability to support the Navy's newest class of aircraft carriers.
- ❑ PSNS & IMF does not have the dry dock and pier capacity for required future overhauling, refueling, inactivating, and recycling of submarines. PSNS & IMF must also maintain the capacity to perform emergent work such as battle damage repair.
- ❑ Dry Dock 6, the only dry dock on the West Coast that can accommodate a nuclear-powered aircraft carrier, does not meet current seismic standards.

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About the Shipyard

- PSNS & IMF is the Navy's primary provider for the maintenance, repair, modernization, inactivation, and recycling of ships, submarines, and aircraft carriers in the Pacific Fleet.
  - PSNS & IMF is the only Navy shipyard on the West Coast with a dry dock that can accommodate nuclear-powered aircraft carriers for repair and maintenance.
  - PSNS & IMF is the only Navy shipyard that is approved to recycle nuclear-powered submarines.
- Most of the infrastructure at PSNS & IMF dates back to the late 1800s and early 1900s.
- Since World War II, few major updates have been made.

www.BremertonWaterfrontImprovementsEIS.com

Preliminary Alternatives

- Alternative 1: No Action Alternative
- Alternative 2: Multi-Mission Dry Dock at Dry Dock 3
- Alternative 3: Multi-Mission Dry Dock at Mooring A

www.BremertonWaterfrontImprovementsEIS.com

Alternative 1 – No Action

- The Proposed Action would not occur.
  - The proposed multi-mission dry dock would not be built.
  - Dry Dock 6 would not be upgraded to meet seismic standards.
  - The Navy would not be able to service the Navy's newest class of aircraft carriers anywhere on the West Coast.
  - The Navy would continue to maintain, repair, and operate existing facilities.
- As required by NEPA, the No Action Alternative will be analyzed to consider the consequences of not executing the Proposed Action and will serve to establish a comparative baseline for analysis.

www.BremertonWaterfrontImprovementsEIS.com

Preliminary Alternative 2 - Multi-Mission Dry Dock at Dry Dock 3

- Construct a new multi-mission dry dock at the location of existing Dry Dock 3.
- Seismically upgrade Dry Dock 6.
- Demolish Piers 4, 5, 6, and 7, including the Hammerhead Crane on Pier 6.
- Replace Piers 4 and 6 with new piers.
- Construct a new Pier 2 west of Pier 3.
- Dredge bottom sediments to create entrance channels and adequate draft at wharves and piers.
- Replace upland buildings and construct a new forge shop at NAVBASE Kitsap – Bangor.

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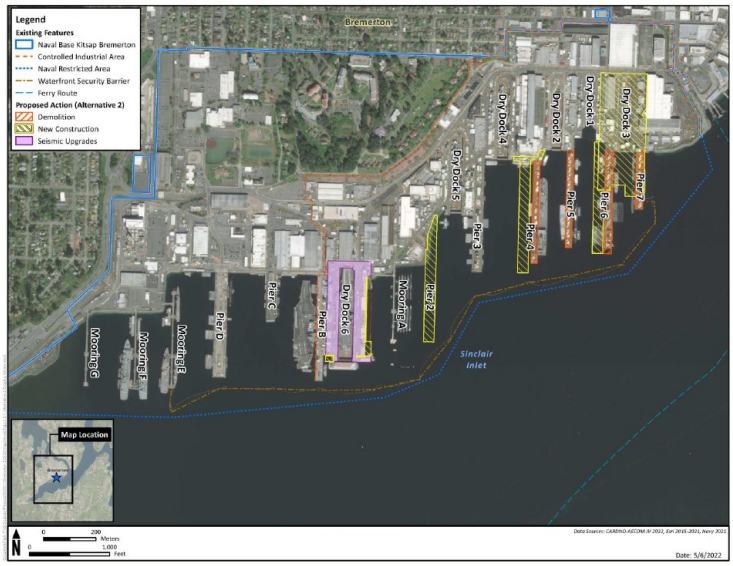
Preliminary Alternative 2 - Multi-Mission Dry Dock at Dry Dock 3



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Preliminary Alternative 3 – Multi-Mission Dry Dock at Mooring A

- ❑ Construct a new multi-mission dry dock at the location of existing Mooring A.
- ❑ Construct a new Wharf 2 on the outer east wall of the multi-mission dry dock.
- ❑ Demolish the Hammerhead Crane on Pier 6.
- ❑ Seismically upgrade Dry Dock 6.
- ❑ Demolish and Replace Pier 4.
- ❑ Dredge bottom sediments to create a new turning basin, entrance channels, and adequate draft at wharves and piers.
- ❑ Replace upland buildings.

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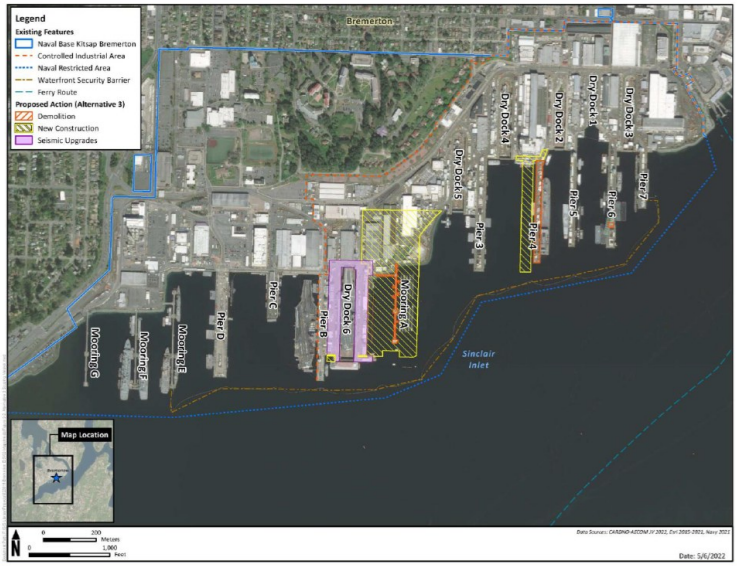
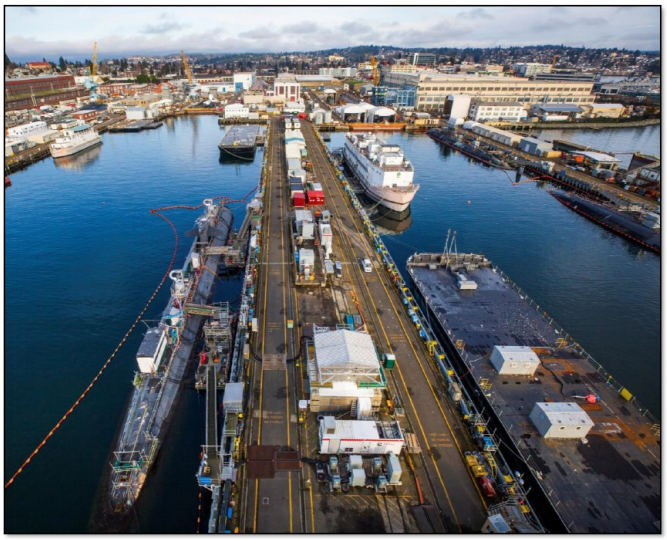
Preliminary Alternative 3 – Multi-Mission Dry Dock at Mooring A



www.BremertonWaterfrontImprovementsEIS.com

Alternatives Considered but Eliminated

- The Navy considered alternatives to meet the purpose and need, such as:
  - Alternative sites and/or Navy locations for a new multi-mission dry dock.
  - Acquisition of a floating dry dock.
  - Seismic upgrades to Dry Dock 6 without building a new multi-mission dry dock.
- The Navy developed screening criteria to evaluate alternatives against the purpose and need.



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Environmental Resources to be Evaluated

- ❑ Air Quality
- ❑ Water Quality
- ❑ Geological Resources
- ❑ Biological Resources
- ❑ Cultural Resources
- ❑ American Indian Traditional Resources
- ❑ Land Use and Recreation
- ❑ Visual Resources
- ❑ Noise
- ❑ Infrastructure and Utilities
- ❑ Transportation and Traffic
- ❑ Marine Navigation
- ❑ Public Health and Safety
- ❑ Hazardous Materials and Wastes
- ❑ Socioeconomics
- ❑ Environmental Justice

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The NEPA process

NEPA Process and Timeline

Milestone	Description	Current EIS Schedule
Notice of Intent	Announces an agency's intent to prepare an EIS	June 8, 2022
Public Scoping Period	Public process to review and comment on the scope and issues to be analyzed in the EIS	***Comment Period:*** June 8 – July 11, 2022 ***Public Scoping Meeting:*** June 23, 2022
Draft EIS	Presents the analysis of potential environmental impacts for each identified alternative	Spring 2023
Draft EIS Public Review and Comment Period	Opportunity for public review and comment on the analysis presented in the Draft EIS	Spring 2023
Final EIS	Includes updates to the Draft EIS and responses to public comments received during the Draft EIS comment period	Spring 2024
30-Day Wait Period	Agencies are generally required to wait 30 days after the Final EIS is published before making a final decision on which alternative in the EIS will be selected	Spring 2024
Record of Decision	Announces the formal decision on the selected alternative	Spring 2024

www.BremertonWaterfrontImprovementsEIS.com

National Historic Preservation Act

Initiate the Process	• Determine undertaking and coordinate with NEPA review • Notify State Historic Preservation Officer (SHPO), federal Tribes, and other consulting parties
Identify Historic Properties	• Determine Area of Potential Effect • Identify historic properties • Consult with SHPO, federal Tribes, and consulting parties
Assess Adverse Effects	• Apply criteria of adverse effect • Consult with SHPO, federal Tribes, and consulting parties
Resolve Adverse Effects	• Avoid, minimize, or mitigate adverse effects • Notify Advisory Council on Historic Preservation • Consult with SHPO, federal Tribes, and consulting parties • Involve the public
Agreement	• Programmatic Agreement • Process is complete with this stage

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Next Steps

NEPA Process and Timeline	
Milestone	**Current EIS Schedule**
Notice of Intent	June 8, 2022
☆ **Public Scoping Period**	***Comment Period:*** June 8– July 11, 2022 ***Public Scoping Meeting:*** June 23, 2022
Draft EIS	Spring 2023
☆ **Draft EIS Public Review and Comment Period**	Spring 2023
Final EIS	Spring 2024
30-Day Wait Period	Spring 2024
Record of Decision	Spring 2024

Community involvement is an important part of the NEPA process. Public input allows decision makers to benefit from local knowledge and consider local issues and concerns.

The public participates in the NEPA process during two key stages:

- Scoping
- Draft EIS Public Review

The Navy is requesting the public's input, including:

- The scope of the EIS and identification of potential alternatives, information, and analyses relevant to the Proposed Action
- Identification of environmental concerns
- Issues the public would like to see addressed in the EIS
- The project's potential to affect historic properties

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Attachment J: Public Scoping Comments

June 9, 2022

Hi Teri,

Thank you for the notice on this upcoming project and thank you for your ongoing coordination and partnership! I will inform Curtis and Lee of the EIS scoping period. I am looking forward to working with you as this progresses.

Thanks,
Brad

Brad Thompson
State Supervisor
US Fish and Wildlife Service
Washington Ecological Services Office
510 Desmond Dr. SE, Suite 102
Lacey, WA 98503

360-753-4652 office
360-790-8187 cell
brad_thompson@fws.gov
(He/His/Him)

June 9, 2022

Hi Ms. Lazo,
Thank you for sharing the information about the EIS public scoping period.
I will make sure our appropriate staff see this as well.
I very much your efforts to keep us informed.
Please don't hesitate to contact me if I can be of any help.
Cheers,
Scott

Scott M. Rumsey, Ph.D.
he/him/his (why is this important?)
Acting Regional Administrator | West Coast Region
NOAA Fisheries | U.S. Department of Commerce
Office: (503) 872-2791
Mobile: (503) 789-1219
www.fisheries.noaa.gov

June 11, 2022

Brett Kopec
USGS
Administrative Operations Assistant

From: Gordon, Alison D <agordon@usgs.gov>
Sent: Friday, June 10, 2022 4:51 PM
To: Kopec, Brett A <bkopec@usgs.gov>
Cc: Janowicz, Jon A <jjanowicz@usgs.gov>
Subject: Fw: ENVIRONMENTAL REVIEW (ER) NEW POSTING NOTIFICATION: ER22/0256 - Notice of Intent by the U.S. Department of the Navy for the Bremerton Waterfront Infrastructure Improvements - Bremerton, Kitsap County, Washington

The USGS has no comment at this time. Thank you.

July 6, 2022

To Whom it May Concern,

On behalf of the Bureau of Reclamation, C-PN Region, we have no comment on Environmental Review ER22/0256 - Notice of Intent by the U.S. Department of the Navy for the Bremerton Waterfront Infrastructure Improvements - Bremerton, Kitsap County, Washington.

Thank you,
Nicole

Nicole Ulacky
Natural Resources Specialist
Environmental Services
Bureau of Reclamation, C-PN Region
Work Cell: 208-914-5421
nulacky@usbr.gov

July 11, 2022

Hello Ms. Stevenson,

Please accept the attached scoping comments from Washington State Ferries regarding the Bremerton Waterfront Improvements EIS project.

Thank you,
Marsha Tolon, PLA, ENV SP
Environmental and Permitting Lead
Office of Sustainability and Environmental Services
Washington State Ferries (WSF)
2901 3rd Avenue, Suite 500
Seattle, Washington 98121
206.515.3876 (office)
206.359.0864 (cell)

Washington State Department of Transportation

WSDOT Ferries Division (WSF)
2901 3rd Avenue, Ste. 500
Seattle, WA 98121-3014
206-515-3400
TTY: 1-800-833-6388
www.wsdot.wa.gov/ferries

July 11, 2022

Naval Facilities Engineering Systems Command Northwest
Attention: Ms. Christine Stevenson, Bremerton EIS Project Manager
1101 Tautog Circle, Room 210
Silverdale, WA 98315

RE: Bremerton Waterfront Infrastructure Improvements Environmental Impact Statement Scoping Comments

Dear Ms. Stevenson:

The Washington State Department of Ferries Divisions (WSF) appreciates the opportunity to participate in the scoping for the Bremerton Waterfront Infrastructure Improvements Environmental Impact Statement at Puget Sound Naval Shipyard & Intermediate Maintenance Facility (PSNS & IMF) Naval Base Kitsap – Bremerton. WSF understands the purpose of the proposed project is to address critical deficiencies in dry dock capability, capacity, and seismic survivability at Naval Base Kitsap – Bremerton to enable PSNS & IMF to meet its mission to support the Navy's nuclear fleet. This is an important and ambitious infrastructure project that is proposed to span implementation over 13 to 14 years ending in 2039 or 2040, with the potential for 5 to 8 years of extensive in-water work.

WSF operates the Bremerton terminal at the eastern vicinity of the PSNS & IMF boundary. The WSF Bremerton terminal operates ferry service as continuation of State route (SR) 304 per RCW 47.17.556 to the Colman terminal in downtown Seattle where it terminates. Transit connections at the Bremerton terminal are effective, making this route one of the two largest walk on passenger routes in the WSF system; the other is the Bainbridge to Seattle route. As a high commuter route, bicycle and walk on passenger ridership is anticipated to increase 67 percent by 2040 (2019 Final WSF 2040 Long Range Plan, page 69). The ferry route is a lifeline for goods, services, employment, and everyday livelihood of Washington's residents.

To maintain reliable service while accommodating the projected increase in ridership, WSF appreciates continued coordination with the Navy throughout the environmental review of the proposed alternatives. Please be aware of the following two areas of WSF's interest.

- **Marine habitat** – Substantial dredging activity is required for the build alternatives of the proposed project. Habitat surveys conducted in 2020 show macroalgae presence at higher concentrations along the eastern boundary of PSNS & IMF than other locations of Sinclair Inlet. As WSF's terminal is located within the same environs and shares responsibility for marine habitat sustainability, we want to be kept informed of subsequent surveys and changes effected by the project.

Ms. Stevenson
July 11, 2022
Page 2 of 2

- **Construction phasing and staging** – WSF operates a ferry route at the mouth of Sinclair Inlet, where vessel activity will increase to accommodate barging and work boat activity for channel dredging and construction of the Bremerton Waterfront Infrastructure Improvements project for more than a decade. At times, there will likely be construction-related traffic along SR 304 leading to the Bremerton terminal. In both cases coordination with WSF is essential that our respective sailing schedules can maintain operations without conflict to construction scheduling or compromise to customer reliance upon ferry service.

Thank you for the opportunity to provide scoping comments. Mutual coordination can lead to stronger partnerships and WSF looks forward to future opportunities for comment and discussion regarding the Bremerton Waterfront Infrastructure Improvements project. If you have any questions about these comments or require further information, please contact Marsha Tolon at 206-359-0864, or by email at tolonm@wsdot.wa.gov.

Sincerely,

David Sowers, P.E.
Director of Terminal Engineering & Construction
Washington State Ferries

MRT:mrt

cc: Kevin Bartoy, WSF Chief Sustainability Officer
Leonard Smith, WSF Design/Operations Liaison Manager
John Vezina, Planning, Customer, and Government Relations Director

July 11, 2022

Hi Christine,

Please find attached the Department of Ecology's comments on the National Environmental Policy Act (NEPA) Environmental Impact Statement (EIS) scoping period for the Bremerton Waterfront Infrastructure Improvements project.

If you have any questions, please contact Ecology's Northwest Region Planner, Meg Bommarito, at 425-681-6236 or by email at meg.bommarito@ecy.wa.gov.

Thank you

Tracy Nishikawa

Administrative Assistant to Northwest Region Director Tom Buroker

P 206-594-0005 / C 425-732-0818 / tracy.nishikawa@ecy.wa.gov

July 11, 2022

Hello,

Attached please find the EPA comments on the subject project. I have also submitted this document on your website. Please let me know if you have any questions.

Thank you!

Emily

Emily Bitalac

Policy and Environmental Review Branch

U.S. Environmental Protection Agency Region 10

1200 6th Ave, Suite 155 Seattle, WA 98101

206-553-2581

bitalac.emily@epa.gov

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 155, 14-D12
Seattle, WA 98101-3144

REGIONAL ADMINISTRATOR'S DIVISION

July 11, 2022

Christine Stevenson, Bremerton EIS Project Manager
Naval Facilities Engineering Systems Command Northwest
1101 Tautog Circle, Room 210
Silverdale, Washington 98315

Dear Christine Stevenson:

The U.S. Environmental Protection Agency has reviewed the Department of the Navy's June 2022 Notice of Intent to prepare an Environmental Impact Statement for the Bremerton Waterfront Infrastructure Improvements (EPA Project Number 22-0029-USN). EPA has conducted its review pursuant to the National Environmental Policy Act and our review authority under Section 309 of the Clean Air Act. The CAA Section 309 role is unique to EPA and requires EPA to review and comment publicly on any proposed federal action subject to NEPA's environmental impact statement requirement.

The Navy proposes to evaluate the potential environmental impacts associated with construction, modification, replacement, demolition, and operation of multiple waterfront infrastructure and facilities at the Puget Sound Naval Shipyard and Intermediate Maintenance Facility at Naval Base Kitsap Bremerton, Washington. The Navy has identified two preliminary action alternatives to carry forward for analysis in the Draft EIS along with the No Action alternative.

EPA has expertise in environmental issues, jurisdiction by law, and is currently involved in regulatory actions that may be affected by the proposed project. The proposed project is complex, with an intent to complete the Record of Decision by the Spring of 2024. EPA therefore encourages the Navy to designate EPA as a cooperating agency in developing this EIS to utilize EPA's technical expertise and assistance. Early engagement will help streamline federal decisions, ensure the EIS sufficiently assesses and characterizes impacts, and informs avoidance and mitigation measures. Lead agencies find EPA's early engagement to be useful, especially when working on projects with tight schedules.

EPA appreciates the information provided about the proposed project in the NOI and the June 29, 2022, interagency scoping meeting. EPA has concerns about the potential impacts from the project activities to Puget Sound Naval Shipyard Complex Superfund cleanup site, water and air quality, aquatic habitat impacts, environmental justice concerns and climate change impacts. EPA emphasizes the importance of continuing to engage early with agencies and tribal and state governments for feedback beyond project scoping. Enclosed are EPA's scoping comments on specific topics important to consider in this project's NEPA analysis.

Thank you for the opportunity to review the NOI for this project. If you have questions about this review, please contact Emily Bitalac of my staff at (206) 553-2581 and bitalac.emily@epa.gov, or me, at (206) 553-1774 or at chu.rebecca@epa.gov.

Sincerely,

Rebecca Chu, Chief
Policy and Environmental Review Branch

Enclosure

U.S. EPA Detailed Comments on the
Bremerton Waterfront Infrastructure Improvements NOI
Bremerton, Washington
July 2022

Aligning Infrastructure Improvements Project with each CERCLA Operable Unit
The project area is located within the Puget Sound Naval Shipyard Complex National Priorities List Superfund (CERCLA) site. Please be aware that EPA is actively involved in cleanup of this site, and we will continue those efforts. The Superfund site has six Operational Units (OU), each with their own cleanup plan known as a Record of Decision. Construction of the infrastructure improvements in the proposed alternatives and operation of the new drydock will impact the Superfund cleanup remedies of OU B Terrestrial and OU B Marine.

In light of these potential impacts to the Superfund cleanup activities, EPA recommends the Draft Environmental Impact Statement:

- Include details of the OU B Terrestrial and OU B Marine Superfund cleanup remedies in the "affected environment" section of the DEIS. Identify the contaminants that are the focus of the remediation as well as the remediation targets for each OU affected by the project.
- Discuss how the project will affect the cleanup remedy in the "environmental consequences" section of the DEIS. Examples of potential impacts: include degradation of pavement that serves as a cap for the Superfund remedy in OU B Terrestrial during construction, excavation of contaminated upland soil; dredging of contaminated sediment including sediment under piers that has not been previously addressed; and pumping and discharging contaminated groundwater during operation of the new drydock (a source control issue for OU B Marine).
- Including maps in the DEIS that clearly show the affected OUs and the areas and depths of dredging including any area beyond the OU B Marine boundary in Outer Sinclair Inlet. As described in the Dredged Sediment Testing and Disposal section, additional testing will likely be needed for sediments that may need to be dredged, both inside and outside these OUs.

The Superfund site project team includes Navy project managers, EPA, Washington Department of Ecology, the Suquamish Tribe, and Washington Department of Natural Resources. The team is currently working on a Focused Feasibility Study to assess alternatives for cleanup of mercury in OU B Marine sediment and refining our understanding of contaminant transport in the upland to the marine environment. The team is also updating the groundwater fate and transport model and the conceptual site model. Given this, it is encouraged that data collected or studies completed for the purposes of the proposed Infrastructure Improvement Project which impact the Superfund site cleanup activities be shared with the Superfund site team. Please coordinate with Anne Christopher, EPA's Remedial Project Manager for the Superfund cleanup. Anne can be reached at (503) 326-6554 or christopher.anne@epa.gov.

Dredged Sediment Testing and Disposal
Because the proposed project involves dredging sediments, including contaminated sediments under piers that have not been previously addressed, EPA recommends the DEIS discuss the options for management and disposal of the dredged material based on the sediment characterization results. If sediment suitability determinations cannot be made, presume that the material to be dredged will not be suitable for all placement options and identify how any toxic or contaminated material that does not meet disposal or placement criteria would be handled. Sediment testing and evaluation is required to determine suitability for open-water disposal. Please coordinate with Erika Hoffman, EPA's staff point

of contact for the Dredged Management Material Program. Erika can be reached at (360) 753-9540 or hoffman.erika@epa.gov.

Impacts to Water Quality and Aquatic Resources

Clean Water Act (CWA) Section 402

In Washington, EPA issues NPDES permits for federally-owned facilities and permits on tribal lands; EPA has delegated authority to issue other NPDES permits to the Washington Department of Ecology.[1] EPA recommends the DEIS identify any discharges to waters of the U.S. that are known, or are likely, to occur during construction and operation of the project and how these discharges would be managed and minimized. Identify the NPDES permits that will be obtained for the construction phase, new (or modifications to) existing permits for operations, and how any previous permit exceedances could be prevented by incorporating pollution prevention measures into the project.

CWA Section 404

The proposed project would require a permit under Section 404 of the CWA from the U.S. Army Corps of Engineers for the discharge of dredged or fill material into waters of the U.S. Wetlands, vegetated shallows, mud flats, cobble substrates and eelgrass and kelp beds are all considered special aquatic sites under the CWA Section 404(b)(1) Guidelines (40 CFR 230).

EPA recommends that the DEIS:

- Clearly identify any discharges to waters of the U.S. that are known, or likely, to occur that will be subject to Section 404 of the CWA. Identify and describe the impact of those discharges, control measures to be employed to address those impacts, and best management practices to prevent discharge of water and pollutants.
- Includes sufficient information that can serve as at basis to determine whether the project would satisfy the requirements for the Section 404 permit or identify appropriate measures to mitigate the project's impacts to all waters of the U.S.
- Structure the alternatives analysis so that it is consistent with meeting requirements of both the CWA and NEPA.
- Describe the regulatory criteria and processes utilized to screen potential alternatives and thoroughly evaluate alternatives that would pose less adverse impacts.
- Describe how compensatory mitigation will be quantified and provided to offset impacts, with specific project examples and options as available. The National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) Conservation Calculator is a tool that can be used to identify, evaluate and determine how much compensatory mitigation to provide for the different alternatives evaluated in the DEIS.

For context on the CWA Section 404(b)(1) analysis, the Guidelines include four main requirements (40 CFR 230.10 (a) through (d)):

Least Environmentally Damaging Practical Alternative (LEDPA) Determination - Section 230.10(a)

A Section 404 permit can be issued only for the LEDPA. Practicable alternatives include those that are capable and feasible of being done after taking into consideration costs, technology and logistics. Costs alone cannot make a project not practicable. Corps permit decisions require a comprehensive evaluation of the range of alternatives to ensure the permitted alternative is the LEDPA. Identification of the

[1] https://www.epa.gov/npdes-permits/washington-npdes-permits.

LEDPA is achieved by performing an alternatives analysis that estimates the direct, indirect, and cumulative impacts to jurisdictional waters of the U.S. that would result from each of the potential project alternatives. Only when this analysis has been performed can the applicant or the permitting authority be assured that no discharge other than the practicable alternative with the least impact on the aquatic ecosystem will be authorized. EPA recommends exploring all avoidance or minimization alternatives for all aspects of the proposed project. There may be avoidance or minimization opportunities in dry dock configuration, dredging, temporary lay down areas, dredge material placement, and beneficial use of clean material options, etc.

Water Quality - Section 230.10(b)
Prohibits permitting projects that would cause or contribute to violations of water quality standards, violates any applicable toxic effluent standard, jeopardizes continued existence of endangered or threatened species and impacts to critical habitat under the Endangered Species Act, or violates any requirements to protect any marine sanctuary designated under Marine Protection, Research, and Sanctuaries Act. Section 230.10(b) requires that a determination be made as to whether the project will cause a violation of water quality standards, during and after construction of the dry dock, turning basin, and any associated channel dredging. Discharges from temporary pier construction, dewatering of dredged materials, and sediment plumes from dredging activity may also impact water quality.

Significant Degradation - Section 230.10(c)
Prohibits permitting a project that causes or contributes to significant degradation of aquatic resources. Effects contributing to significant degradation include: (1) adverse effects on plankton, fish, shellfish, wildlife, and special aquatic sites (40 CFR 230.10(c)(1)), (2) adverse effects on life stages of aquatic life (40 CFR 230.10(c)(2)), (3) aquatic ecosystem diversity, productivity, and stability including loss of fish and wildlife habitat (40 CFR 230.10(c)(3)), and (4) impairment or destruction of endangered species habitat (40 CFR 230.30(2)).

Mitigation - Section 230.10(d)
Requires compensatory mitigation for unavoidable impacts to aquatic resource functions. The 2008 Joint EPA-Corps Federal Mitigation Rule (40 CFR 230.91-98) establishes a preference for compensatory mitigation based on a watershed approach, which can ensure that potential direct and indirect impacts of the project are offset. In addition to identifying all measures to avoid and minimize adverse impacts to the aquatic environment (showing compliance with 40 CFR Part 230.10(a)), for unavoidable impacts compensatory mitigation should be provided.

As previously noted, early engagement with the resource agencies in developing the NEPA analysis is encouraged to streamline regulatory processes. Early engagement with the resource agencies provides an opportunity for the Navy to receive guidance and direction about the nature and extent of concerns regarding the secondary and cumulative impact evaluation.

CWA Section 401
The CWA provides states and authorized tribes the authority to grant, deny, or waive certification of proposed federal licenses or permits that may discharge into waters of the U.S. This section of the CWA is an important tool for states and authorized tribes to help protect the water quality of federally regulated waters within their borders, in collaboration with federal agencies. In developing the DEIS, EPA recommends early coordination with the State, tribes that have treatment in a similar manner as a state and CWA 401 authority and EPA regarding CWA Section 401 for the purposes of streamlining regulatory processes.

CWA Section 303(d)
The CWA requires states to develop a list of impaired waters that do not meet water quality standards, establish priority rankings, and develop action plans called Total Maximum Daily Loads (TMDLs) to improve water quality. EPA recommends the DEIS include information on CWA Section 303(d) impaired waters in the project area and any efforts related to TMDLs. Discuss what effect, if any, project discharges may have on impaired waterbodies. Describe existing restoration and enhancement efforts for those waters, how the proposed project will coordinate with on-going protection efforts, and any mitigation measures that will be implemented to avoid further degradation of impaired waters.

Aquatic Habitat
EPA recommends the DEIS describe aquatic habitats in the affected environment (e.g., habitat type, plant and animal species, functional values, and integrity) and the environmental consequences of the proposed action on these resources. Evaluate impacts to aquatic resources in terms of the impacted acreage and by functions performed. Project construction, operation, and maintenance may affect a variety of aquatic resources. The project has potential to degrade habitat for fish and other aquatic biota, and these resources may experience varying degrees of impacts and alteration of their hydrologic functions. For any impacts that cannot be avoided through siting and design, describe the types, location, and estimated effectiveness of best management practices applied to minimize and mitigate impacts to aquatic resources. Consider cumulative impacts to recreational and subsistence fishers.

EPA also recommends coordinating with the U.S. Fish and Wildlife Service and NOAA/NMFS to devise the best possible mitigation plan to alleviate any noise impacts to aquatic species and birds from construction, operation, and maintenance.

Air Quality
EPA recommends the DEIS discuss the ambient air conditions (baseline or existing conditions), the National Ambient Air Quality Standards, and the potential air quality impacts of the project, from both construction and operations, for each fully evaluated alternative.

Provide an emissions inventory of criteria pollutants, greenhouse gas emissions, and hazardous air pollutant (HAP) emissions for all project components. Based on these estimates, indicate whether the additional HAP emissions would trigger thresholds for the facility to be categorized as a major source under National Emissions Standards for Shipbuilding and Ship Repair (40 CFR Part 63, subpart II) and/or would require a Title V permit.

Evaluate increased emission exposures from HAPs and fuel combustion resulting from the project. EPA recommends the DEIS discuss the cancer and noncancer health effects associated with air toxics and diesel particulate matter, identify nearby sensitive receptors, and indicate whether any populations that have environmental justice (EJ) concerns pursuant to Executive Order 12898 are nearby or on major trucking routes that could be impacted by truck emissions. EPA recommends the Navy evaluate and incorporate best management practices and mitigation measures into the DEIS project description to reduce emissions of criteria pollutants and HAPs, which also have the co-benefits of reducing GHGs.

Construction emissions
EPA recommends the DEIS also address potential air quality impacts during the construction period to reduce construction emissions. EPA suggests the following:

- Identify construction mitigation measures for dust control, indicate whether contaminated soils would be disrupted, and identify any precautions needed to manage dust due to potential contamination of surface soils during construction.
- Stabilize open storage piles and disturbed areas by covering or by applying water, chemical, or organic dust palliative where appropriate to both active and inactive sites to control fugitive dust sources
- Install wind fencing and phase grading operations where appropriate and operate water trucks for stabilization of surfaces under windy conditions and control of fugitive dust.
- Develop a construction traffic and parking management plan that minimizes traffic interference and maintains traffic flow.
- Identify sensitive receptors in the project area, such as daycare centers, schools, nursing homes, hospitals, and other health-care facilities, and minimize impacts to these populations. For example, locate construction equipment and staging zones away from sensitive receptors and fresh air intakes to buildings and air conditioners.
- Utilize cleanest available fuel engines in construction equipment and identify opportunities for electrification. Meet EPA diesel fuel requirements for off-road and on-highway, and, where appropriate, use alternative fuels such as natural gas and electric.[2]
- Include a commitment in the NEPA document to require, or provide contractor incentives to obtain, air quality construction mitigation measures to minimize construction-related emissions of air toxics and diesel particulates.

Coordination with Tribal Governments

EPA encourages the Navy to consult with the Tribes and incorporate feedback from the Tribes when making decisions regarding the project. EPA recommends the DEIS describe the issues raised during the consultations and how those issues were addressed, consistent with Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments.*

National Historic Preservation Act

Puget Sound Naval Shipyard is listed as a National Historic Landmark.[3] Section 106 of the NHPA requires a federal agency, upon determining that activities under its control could affect historic properties, to consult with the appropriate State Historic Preservation Office/Tribal Historic Preservation Office. Under NEPA, any impacts to tribal, cultural, or other treaty resources must be disclosed in the DEIS. Section 106 of the NHPA requires that federal agencies consider the effects of their actions on cultural resources, following the regulation at 36 CFR 800.

EPA recommends the DEIS discuss how the project will avoid or minimize adverse effects on the physical integrity, accessibility, or use of cultural resources or archaeological sites, including traditional cultural properties (TCPs), throughout the project area. Discuss mitigation measures for archaeological sites and TCPs. EPA encourages the Navy to append any Memoranda of Agreements to the DEIS, after redacting specific information about these sites that is sensitive and protected under Section 304 of the NHPA. EPA also recommends providing a summary of all coordination with Tribes and with the State and Tribal Historic Preservation Offices, including identification of NRHP eligible sites and development of a Cultural Resource Management Plan.

[2] https://www.epa.gov/vehicles-and-engines.
[3] Christine Stevenson (Navy) – Personal Communication during June 29, 2022, Agency Scoping Meeting.

7

Pollution Prevention

As described previously, regulatory requirements associated with pollution preventions may apply to the proposed project (e.g., CWA permitting; existing Superfund cleanup plans; and Clean Air Act requirements). EPA therefore recommends including pollution prevention considerations in the early planning and decision-making processes for the proposed project, and, where appropriate, document those considerations in the DEIS.[4] EPA recommends the project be designed to incorporate structural source controls for pollution prevention and to address the pollution prevention from existing sources of contamination to the maximum extent. Specifically:

- Include process water collection and treatment as a component of the project. When designing the project's infrastructure, explore designs that capture and treat 100% process wash water if possible. Such a system could also possibly capture dry dock runoff from small storm events. Identify these features in the project description for the alternatives.
- When designing the project's infrastructure, explore designs that minimize or prevent stormwater from contacting industrial areas. Consider cover and containment options specific to industrial activities being conducted on the dry dock. For example, full tarping of vessels on the dry dock should be considered when pollutant generating activities are occuring (e.g., grinding/sanding, welding, painting).
- Incorporate these additional structural source controls features during project design to the maximum extent practicable: direct deck drainage to a collection system sump, implement diagonal trenches or berms and sumps to collect wash water, use solid decking, gutters, and sumps at lift platforms and collect wash water for possible reuse; enclose, cover, or contain blasting and sanding activities; cover drains, trenches, and drainage channels; enclose, cover, or contain painting activities; cover fueling areas; install covered areas where storage and handling of hazardous materials takes place.
- Address ongoing sources of pollution in or near the project area to the extent possible. Consider using the construction work associated with the project to advance the work needed to address ongoing issues.

Noise

EPA recommends that the DEIS evaluate and address potential noise impacts of the proposed project by:

- Describing how residents living in the vicinity of the proposed facility will be engaged throughout the planned construction activities and establish procedures for complaints investigation.
- Describing a noise monitoring program. Consider establishing baseline noise before beginning construction and designing noise monitoring to assess impacts of noise to workers and adjacent communities in the vicinity of the project and to verify that actual noise levels do not exceed maximum predicted levels.
- Analyzing the potential increase in noise associated with the project and implement best practices for acoustic shielding (i.e., strategic positioning of non-noise generating equipment) and other noise reduction techniques (e.g., mufflers, enclosures, curtains, insulation, and vegetative barriers, and minimizing engine idling during construction and operation).
- Identifying sensitive receptors near the project area and consider noise as an EJ concern.

[4] https://www.energy.gov/sites/prod/files/nepapub/nepa_documents/RedDont/G-CEQ-PollutionPreventionNEPA.pdf.

Large industrial facilities produce mechanical noise and vibrations during operation. Daily operations as well as construction have the potential to produce noise levels exceeding 60 dBA, exceeding the general protective criterion of 55 dBA. Chronic exposure to noise at this level is associated with adverse health outcomes, including sleep disturbance, hypertension, and cardiovascular disease. Commonly used construction equipment has the potential to generate noise well above 55 dBA, which has the potential to create cumulative impacts.

Environmental Justice

Executive Order 12898 directs federal agencies to identify and address the disproportionately high and adverse human health on environmental effects of their actions on minority and low-income populations, to the greatest extent practicable and permitted by law. EO 13985 on *Advancing Racial Equity and Support for Underserved Communities Through the Federal Government* should also be incorporated to the Navy's analysis since it includes a modern definition of equity that clarifies a broader approach.

Assessing EPA's Environmental Justice Screening and Mapping Tool (EJScreen) information is a useful first step in understanding or highlighting locations that may be candidates for further review or outreach.[5] EPA considers a project to be in an area of potential EJ concern when an EJScreen analysis for the impacted area shows one or more of the eleven EJ Indexes at or above the 80th percentile in the nation and/or state. At a minimum, EPA recommends an EJScreen analysis consider EJScreen information for the block group(s) which contains the proposed action(s) and a one-mile radius around those areas.

It is important to consider all impacted areas by the proposed action(s). Areas of impact can be a single block group or span across several block groups and communities.[6] When assessing large geographic areas, consider the individual block groups within the project area in addition to an area wide assessment. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators.[7] As the screening tool does not provide data on every environmental impact and demographic factor that may be relevant to a particular location and/or proposed project, consider additional information in an EJ analysis to supplement EJScreen outputs. Further review or outreach may be necessary for the proposed action(s). To address these potential concerns, EPA recommends:

- Applying methods from "Environmental Justice Interagency Working Group Promising Practices for EJ Methodologies in NEPA Reviews" report, or the Promising Practices Report, to this project.[8] The Promising Practices Report is a compilation of methodologies gleaned from current agency practices concerning the interface of EJ considerations through NEPA processes.
- Characterizing project site(s) with specific information or data related to EJ concerns.[9]
- Describing potential EJ concerns for all EJ Indexes at or above the 80th percentile in the state and/or nation.

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[5] https://ejscreen.epa.gov/mapper/.

[6] Agencies should define community as "either a group of individuals living in geographic proximity to one another, or a geographically dispersed set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions" (Interim Justice40 Guidance – Executive Order 14008 on Tackling the Climate Crisis at Home and Abroad, January 27, 2021).

[7] https://www.epa.gov/ejscreen/technical-documentation-ejscreen.

[8] https://www.epa.gov/sites/default/files/2016-08/documents/nepa_promising_practices_document_2016.pdf.

[9] For more information about potential EJ concerns, refer to the July 21, 2021 Memorandum for the Heads of Departments and Agencies Interim Implementation Guidance for the Justice40 Initiative. https://www.whitehouse.gov/wp-content/uploads/2021/07/M-21-28.pdf.

- Describing block groups which contain the proposed action and at a minimum, a one-mile radius around those areas.
- Describing individual block groups within the project area in addition to an area-wide assessment.
- Supplementing data with county level reports and local knowledge such as Washington's Environmental Health Disparities mapping tool.[10]

Impacts of Climate Change
EPA recommends the DEIS consider ongoing and projected regional and local climate change and ensure robust climate resilience/adaption planning in the project design. EPA also recommends the DEIS include measures to be taken to ensure resilience/adaptation to protect the infrastructure investment from the effects of climate change (on the project). The long-lived nature of infrastructure makes consideration of the ongoing and projected impacts of climate change even more important. It is not sufficient to ensure resilience of the project to risks under current climate conditions. Considering potential climate change impacts helps ensure that investments made today continue to function and provide benefits, even as the climate changes.

EPA recommends that the DEIS specifically discuss how climate resiliency has been considered in the design of the proposed action and alternatives, and related measures should be discussed and included, as appropriate, in the conclusion and recommendations section. This, and consideration of any relevant state, tribal, or local adaptation plans, enables consideration of ongoing and projected regional and local climate impacts, including, but not limited to, rising sea levels, drought, high intensity precipitation events, at-risk areas not yet designated as flood zones, and increased fire risk. Consideration of these impacts helps avoid infrastructure investments in vulnerable locations, and unintended impacts on local communities.

Endangered Species Act
EPA recommends the DEIS identify any endangered, threatened, and candidate species under the ESA, and other sensitive species within the project area and vicinity. Describe the critical habitat for the species; identify any impacts construction, operation, and maintenance of the proposed project would have on the species and their critical habitats; and explain how the proposed program will meet all requirements under ESA, including consultation with the U.S. Fish and Wildlife Service (USFWS) and NOAA/NMFS. Please note that if impacts to listed species are significant, a biological assessment and a description of outcomes of ESA consultation with the NOAA/NMFS and USFWS may be required. EPA recommends that the DEIS discuss how the proposed project will contribute to the recovery of listed or declining species, including candidate for listing species, sensitive, and other species of concern Federal or State fish and wildlife agencies.

Cumulative Effects
Cumulative effects are those that are reasonably foreseeable, related to the proposed action under consideration, and subject to the agency's jurisdiction and control. EPA recommends that the DEIS analysis consider evaluation of impacts over the entire area of impact and consider the effects of projects when added to other past, present, and reasonably foreseeable future projects in the analysis area. Considering all the actions in this area together would help decision makers to understand more clearly what the cumulative impacts on environmental resources are likely to be and identify ways to ensure the project is sustainable. EPA has issued guidance on how to provide comments on the assessment of

[10] https://fortress.wa.gov/doh/wtn/WTNIBL/.

cumulative impacts, *Consideration of Cumulative Impacts in EPA Review of NEPA Documents.*[11] The guidance states that to assess the adequacy of the cumulative impact assessment, there are five key areas to consider:

- Resources, if any, that are being cumulatively impacted.
- Appropriate geographic area and the time over which the effects have occurred and will occur.
- All past, present, and reasonably foreseeable future actions that have affected, are affecting, or would affect resources of concern.
- A benchmark or baseline.
- Scientifically defensible threshold levels.

Monitoring

As the proposed project has the potential to impact many environmental resources for an extended period, EPA recommends that the project be designed to include an monitoring program to ensure compliance with and efficacy of mitigation measures. EPA recommends the DEIS describe the monitoring program and how it will be used as an effective feedback mechanism so that the project can be adaptively managed over time, and any needed adjustments can be made to the project to meet environmental objectives throughout its lifespan.

[11] https://www.epa.gov/sites/production/files/2014-08/documents/cumulative.pdf.

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July 11, 2022

Dear Ms. Stevenson,

Please find attached the Suquamish Tribe's scoping comments on the referenced US Navy proposal.

Sincerely,

Tom Ostrom
Ecosystem Recovery Manager

Suquamish Tribe
PO 498
Suquamish, WA 98392
360-394-8446 (Office)
360-981-5388 (Mobile)
tostrom@suquamish.nsn.us

THE SUQUAMISH TRIBE
NATURAL RESOURCES DEPARTMENT
PO Box 498 Suquamish, WA 98392-0498

July 11, 2022

Naval Facilities Engineering Systems Command Northwest
Attention: Christine Stevenson, Bremerton EIS Project Manager
1101 Tautog Circle, Room 210
Silverdale, WA 98315

SUBJECT: Scoping comments for Bremerton Waterfront Infrastructure Improvements Environmental Impact Statement

Dear Ms. Stevenson:

This letter transmits the Suquamish Tribe's comments concerning the US Navy's above referenced proposal to construct and operate infrastructure improvements at the Bremerton waterfront and the scope of an Environmental Impact Statement that the US Navy intends to complete for the proposal.

I. The Suquamish Tribe's Interest in the proposal

The Suquamish people have lived, fished, hunted, and gathered in and around Puget Sound since time immemorial. The Suquamish Tribe ("Tribe") is a federally-recognized Indian Tribe and pursuant to the 1855 Treaty of Point Elliott, the Tribe reserved the right to fish and gather shellfish at its "usual and accustomed" (U&A) fishing grounds and stations in Puget Sound among other reserved rights. The location of this proposed project, the Puget Sound Naval Shipyard and Intermediate Maintenance Facility, is within the Tribe's exclusive U&A. The Tribe has a strong historical and contemporary association with Sinclair Inlet that is significant and well documented. Ethnographic and archaeological evidence demonstrates that the Suquamish Tribe inhabited Sinclair Inlet and has utilized its natural resources (including fish and shellfish) for thousands of years.[1]

Since time immemorial, the Tribe and its members have depended on access to healthy and abundant fishery resources in Sinclair Inlet and elsewhere in Puget Sound. These resources support the health, economic, cultural, and spiritual wellbeing of the Tribe and its members. When the abundance of these resources or access to them are threatened by water quality and sediment contamination, other pollution, habitat destruction and modification, water quality impairment, or numerous other avoidable and preventable anthropogenic pressures, the Tribe and each of its members are harmed.

As noted above, the Suquamish Tribe is a signatory to the 1855 Treaty of Point Elliott (12 Stat. 927). Article VI, cl. 2 of the United States Constitution provides that all treaties made under the authority of the United States "shall

[1] Lewarch, D., L. Forsman, D. Iversen, S. Kramer, and L. Larson. 2002. Cultural Resources Survey at Bremerton Sub-region (PSNS/NAVSTA & Jackson Park Housing/NAVHOSP), Kitsap County, Washington. Prepared for U.S. Department of the Navy. Engineering Field Activity, NW, Poulsbo Washington. Larson Anthropological Archaeological Services Limited. LAAS Technical Report #2000-19.

be the supreme Law of the Land; and the Judges in every State shall be bound thereby...." *United States v. Washington (Boldt I)*, 384 F.Supp. 312, 330 (W.D.Wash.1974); *Washington v. Washington State Commercial Passenger Fishing Vessel Ass'n*, 443 U.S. 658, 674-76 (1979). Article 5 of the Point Elliott Treaty secures the Tribe's "right of taking fish at usual and accustomed fishing grounds and stations." The right of taking fish also includes a right of access within the Tribe's U&A, including the location for this proposed project. The tremendous importance to the Tribe of fisheries resources and access to them is demonstrated by the terms the Tribe negotiated in the Treaty of Point Elliott when Tribe agreed to cede its aboriginal title to a vast territory in exchange for reserving its existing rights to "take fish at all usual and accustomed grounds and stations." This right has been acknowledged by the Navy in prior dealings with the Tribe concerning proposed Navy projects in Sinclair Inlet and within the restricted area established by regulation.

It is a firmly established principle that treaty rights held by tribes are a property right which may not be abrogated without specific and express Congressional authority. *Menominee Tribe of Indians v. United States*, 391 U.S. 404, 411-13 (1968); *Fishing Vessel,* 443 U.S. at 690; *United States v. Eberhardt*, 789 F.2d 1354, 1361 (9th Cir. 1986). If Congress expressly authorizes the taking of tribes' treaty rights, that loss must be compensated under the Fifth Amendment of the U.S. Constitution. *Menominee*, 391 U.S. at 413; *Whitefoot v. United States*, 293 F.2d 658, 659 (Ct. Cl. 1961); *Muckleshoot v. Hall*, 698 F. Supp. 1504, 1511 (W.D. Wash. 1988) (citing *Menominee*); *Umatilla v. Alexander*, 440 F. Supp. 553, 555 (D. Or. 1977).

The Navy is aware that the Supreme Court has recognized the "undisputed existence of a general trust relationship between the United States and the Indian people." *United States v. Mitchell*, 463 U.S. 206, 225 (1983). The obligation of the trust relationship has been interpreted to impose the highest fiduciary duty owed in conducting "any Federal government action" which relates to Indian tribes. *Nance v. Environmental Protection Agency*, 645 F.2d 701, 711 (9th Cir. 1981) (EPA owes a fiduciary duty in its action); *Pyramid Lake Tribe v. Navy*, 898 F. 2d 1410, 1420 (9th Cir. 1990) (Navy owes fiduciary duty in its action); *Northwest Sea Farms v. United States Army Corps of Eng'r*, 931 F. Supp. 1515, 1520 (1996) (fiduciary duty applies to permit decisions by the Corps); *Muckleshoot v. Hall*, 698 F. Supp. 1504, 1510-11(1988) (fiduciary duty applies to permit decisions by the Corps).

In carrying out its fiduciary duty, it is the government's responsibility to ensure that Indian treaty rights are given full effect. See *Seminole Nation v. United States*, 316 U.S. 286, 296-97 (1942). Federal agencies have a duty to investigate potential adverse impacts of treaty-secured resources thoroughly, and not simply make a "judgment call" or balance competing interests in choosing the appropriate course of action. See *Pyramid Lake Paiute Tribe v. Morton*, 354 F. Supp. 252, 256 (D.D.C. 1973); *Northwest Sea Farms*, 931 F. Supp. at 1521.

Treaty-reserved fishing rights in Sinclair Inlet coincide with the Navy's water-dependent military activities associated with the Bremerton Waterfront Infrastructure Improvements project proposal. This proposal, if constructed, will impact the treaty-reserved rights and resources of the Tribe and the Tribe's protected property right.

II. Potential Impacts of the Project on Tribe's Resources and Rights

As part of the Bremerton Waterfront Infrastructure Improvements project, the US Navy proposes to: construct a new dry dock to serve multiple missions; modify, demolish, and or replace other piers, wharves, quay walls, buildings, cranes, and utilities to make space for the new multi-mission dry dock; upgrade dry dock 6 to meet current seismic standards; and dredge to create new turning basins, entrance channels, and adequate water

depth at wharves and piers. This proposal, if constructed, will impact the Tribe's treaty rights and resources including but not limited to:

a. Salmon Enhancement Program

As part of the Tribe's Salmon Enhancement Program, the Tribe operates its principle salmon rearing and release facility in Gorst Creek at the head of Sinclair Inlet. This salmon rearing facility has been in operation since 1982 first as a cooperative with the Washington Department of Fish & Wildlife and now solely financed and operated by the Suquamish Tribe on property owned by the City of Bremerton. Annually returning adult hatchery Chinook salmon migrate through Sinclair Inlet bound for Gorst Creek at the western end of the Inlet. These returning salmon provide an important terminal fishing opportunity for the Suquamish from late July through mid-September each year. Chinook salmon migrate along the shoreline and hide and congregate in shady areas. Chinook are harvested by tribal fishers primarily at night to maximize the catch and to avoid vessel traffic in and near Sinclair Inlet associated with Naval vessels, Washington State ferries, recreational boaters, and other non-tribal commercial and sports fisherman. Tribal fishers have fished, continue to fish, and plan to fish for Chinook salmon primarily on the PSNS side of Sinclair Inlet.

Due to the generally low abundance of natural Chinook populations within the Puget Sound and throughout the Tribe's U&A, hatchery supplementation provides important, but limited opportunities for target fisheries on returning hatchery fish. The Sinclair Inlet Chinook fishery for the Tribe connected to the Gorst Creek rearing facility is the only directed Chinook salmon fishery remaining in the Tribe's exclusive U&A. In the most recent decade, the Sinclair fishery provides over 90% of the Tribe's Chinook harvest annually. Chinook are the most valuable salmon on the market and remain an important summer fishery for the Tribe.

In addition to the enhanced Chinook salmon returning to Sinclair Inlet, natural populations of Coho and Chum salmon utilize local Sinclair Inlet streams to spawn each fall. The Tribe provides fall fishing opportunities for migrating adult salmon returning to local Sinclair Inlet drainages (Blackjack creek, Ross creek, Anderson creek, and Gorst creek). These net fisheries occur in the marine waters of Catch Management Area 10E, which includes Sinclair Inlet.

Annually the Tribe promulgates preseason regulations describing the management periods and geographic areas of its fisheries. For salmon in the vicinity of Sinclair Inlet, fishing may begin as early as mid- July and extend through mid- December. During the salmon migration in-season regulations are utilized to specify dates, types of legal gear, duration of openings, limitations on gear length by subarea, and specific area restrictions which may apply.

Salmon fishing within Sinclair Inlet includes set nets and beach seines as legal gear types; set nets are anchored to the shore or bottom and checked periodically, beach seines use the shoreline to be deployed and retrieved from. Other finfish fisheries such as surf smelt occur from the shoreline particularly in the vicinity of Ross Point where fish congregate each fall. Net lengths used in Sinclair Inlet range from 900 feet up to 1800 feet.

The construction and operation of the proposed project will interfere with the treaty-reserved fishing activities in Sinclair Inlet.

b. Habitat

The US Navy has industrialized much of the northern shore of Sinclair Inlet during its approximately 130-year history developing and operating the Puget Sound Naval Shipyard. It is estimated that 416 acres of the Tribe's U&A in this area is currently occupied by Navy activities and marine structures. The result is a highly modified marine environment characterized by hardened shorelines (vertical concrete, riprap, etc.), a challenging light environment with overwater piers and moored vessels, numerous stormwater outfalls, and a nearly complete lack of intertidal and shallow subtidal habitats preferred by early life-stage juvenile fish, particularly chum and Chinook salmon.[2] Early life stage chum and ocean type Chinook salmon are highly dependent on intertidal and shallow subtidal habitats which they utilize for foraging, avoiding predation, and migrating. Although details are lacking in the scoping materials provided the Tribe to date, both action alternatives of the proposal appear to increase the footprint of wharfs, dry docks, and piers, thus eliminating or degrading additional habitat within the shipyard boundary.

The Tribe expects to be involved in discussions with the US Navy and state and federal regulatory agencies regarding mitigation of habitat impacts, once a full accounting of habitat impacts from fill, overwater coverage, and temporary construction is completed. To reiterate the Tribe's past stated position: the US Navy should avoid all impacts to marine habitat. If mitigation is necessary for unavoidable impacts, it should be conducted on-site and in-kind. If on-site mitigation is not possible, then in-kind mitigation should be as close to the site as possible.

c. CERCLA and water quality

The Suquamish Tribe has spent more than two decades participating in CERCLA issues tied to the US Navy in Sinclair Inlet. The proposed project is located within the boundary of a CERCLA Superfund cleanup site (Operable Unit B, Marine and potentially several terrestrial operable units). Remedial actions for Operable Unit B Marine have occurred and the site has been monitored for nearly 20 years with the goal of achieving remedial objectives through a "natural recovery" process. The 2018 Long-term Monitoring Report confirmed continued decline in the concentrations of PCBs. Results for mercury indicated ongoing sources of contamination.

The success of "natural recovery" depends on the natural deposition of "clean" sediments atop contaminated sediments and over time burying the contamination below the biologically active zone of sediment. Activities associated with the proposed project have a very high likelihood of impacting the OUB Marine remedy and efforts to address ongoing sources of mercury pollution. The Notice of Intent and call for scoping comments indicated extensive in-water construction activities, including the construction of a new multi-mission dry dock, modification, demolition, and/or replacement of piers, wharves, quay walls, buildings, cranes, and utilities. In addition, the Navy anticipates dredging subtidal sediments to create turning basins and entrance channels. Disturbance of sediments associated with such activities risk resuspending PCB and mercury contaminated sediment thus increasing their concentrations in surface sediments within and near the final project footprint. This raises a number of issues including but not limited to: 1) the impact of the project on the effectiveness and success of the CERCLA cleanup plan; 2) compliance with anti-degradation provisions of the state's water quality standards; 3) potential for post-construction remobilization of contaminated sediments from operation of vessels at new or reconstructed facilities; and 4) ongoing recontamination in the future from maintenance

[2] Juvenile salmonids, including both hatchery and natural origin Chinook salmon are documented to use the northern shore of Sinclair Inlet. See Kurt Fresh, Doris Small, Hwa Kim, Chris Waldbillig, Michael Mizell, Mark I. Carr, and Lia Stamatiou. Juvenile Salmon use of Sinclair Inlet, Washington in 2001 and 2002. Washington Department of Fish and Wildlife. Technical Report No. FPT 05—08. Olympia, Washington.

activities at new or reconstructed facilities, including maintenance dredging to keep channels and turning basins at their required depth. The latest Long-term Monitoring Report for OU B Marine and OUA intertidal came to the same conclusion:

> "The 2018 data indicate that the current understanding of sediment natural recovery processes may need to be re-evaluated. While declining PCB concentrations in sediment confirm natural recovery processes have been occurring since 2003, there are also indications that natural recovery processes can be affected by extreme weather events or shipyard activities as seen in the increase in PCB sediment and English sole tissue concentrations observed in 2012. Data collected during the dry dock saltwater main construction project indicate PCBs are still present in buried sediment, and *there is potential for these sediments to be exposed during construction projects. As stated in the **OU B Marine ROD**, PCBs are known to be present under existing piers, which could be exposed or disturbed during pier maintenance or construction projects."*[3] [emphasis added]

Due to the importance and exclusive nature of the Tribe's U&A harvesting rights in Sinclair Inlet, the success of ongoing cleanup and source control efforts under CERCLA is enormously consequential for the Tribe. Currently, due to high concentrations of PCBs and mercury in resident fish (e.g. rockfish) and shellfish tissue in Sinclair Inlet the Tribe currently only permits harvest and retention of migratory finfish species. The Tribe requests that the US Navy initiate an ongoing dialogue with the CERCLA project team in order to coordinate remediation planning with the proposed project. Such coordination is essential to the success and efficiency of CERCLA-related actions as well as to the proposed project. The Tribe requests an initial briefing of the CERCLA project team as soon as possible.

The Tribe has also recently learned that the US Navy project team for this proposal has been in discussions with the Dredge Material Management Office (DMMO) regarding the US Navy's initial sampling effort scheduled for September 2022 in support of project-related dredging. The Tribe requests that the US Navy include the Tribe in all such discussions with the DMMO. The Tribe further requests that all such DMMO business is well-coordinated with the interagency CERCLA project team for Bremerton Naval Complex. In addition to the need of the CERCLA team to understand how this project may affect the remedy (and long-term monitoring) at OU B Marine, sampling should be coordinated with efforts to characterize PFAS contamination at the Bremerton Naval Complex, including the current work to prepare a site assessment and remedial investigation.

The Tribe is also concerned about construction related impacts on water quality in Sinclair Inlet. The scale of marine disturbance called for in this proposal is monumental. The Tribe requires detailed information on how the US Navy intends to protect water quality of Sinclair Inlet during construction. The use of cofferdams and other means to separate the construction area from Sinclair Inlet can be effective in protecting water quality, but likely will have temporary impacts on habitat.

d. Fishing access

Both action alternatives of the proposal appear to enlarge the US Navy's in-water footprint within the U&A of the Suquamish Tribe, a protected property right under the 5th Amendment of the United States Constitution. In addition, the Tribe needs to understand how the proposal will affect vessel traffic (volume, location, and timing).

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3 CH2M HILL, Inc. 2020. FINAL – 2018 OU B Marine Long-term Monitoring and OU A Intertidal Sediment Sampling Report. Puget Sound Naval Shipyard Superfund Site. Naval Base Kitsap Bremerton. Bremerton, Washington.

Both the facility footprint and vessel traffic can impact the Tribe's access and ability to exercise treaty fishing rights in the vicinity of the proposed project. Government-to-government consultation is required to resolve any and all treaty access issues associated with this proposal. The Tribe will require a Memorandum of Agreement with the US Navy to resolve impacts of the proposal on the exercise of treaty rights and other legal rights.

e. *Cumulative effects*

NEPA requires that the US Navy consider the effects of the proposal when summed with all past, present, and foreseeable future actions, regardless of who undertakes such actions (40 CFR 1508.7). The US Navy has communicated verbally to the Tribe that its MILCON projects are planned well in advance of construction. All such planned actions need to be disclosed so that a proper cumulative effects analysis can be completed. Other US Navy actions at the site (such as remedial actions under CERCLA) should be included in the analysis of Cumulative effects.

III. Tribe requests meaningful pre-decisional consultation

Tribal consultation is an enhanced form of communication that emphasizes trust, respect, and shared responsibility. For Tribal consultation to be meaningful, it must occur throughout the decision-making process and be based on an open and free exchange of information and opinion among parties, which leads to mutual understanding and comprehension.

The US Navy's responsibility to engage in meaningful consultation with the Suquamish Tribe arises from numerous federal laws, executive orders, and Department of Defense Policies, including but not limited to: the National Historic Preservation Act, Archeological Resources Protection Act, Native American Graves Protection and Repatriation Act, Religious Freedom Restoration Act, National Environmental Policy Act, Executive Order 13007 (Indian Sacred Sites), Executive Order 13175 (Consultation and Coordination with Indian Tribal Governments), and Department of Defense Instruction 4710.02 (DOD Interactions with Federally Recognized Tribes).

Furthermore, the National Defense Authorization Act (NDAA) for Fiscal Year 2020 amended 10 US Code Section 2802 (Military construction projects) conveying a statutory requirement on the US Navy to consult with the Suquamish Tribe on this proposal. 10 US Code Section 2802 now includes the following language concerning military construction projects (such as the proposed project) that may affect tribes:

"In addition to any other applicable consultation requirement pursuant to law or Department of Defense policy, if a proposed military construction project is likely to significantly impact tribal lands, known sacred sites, or tribal treaty rights, the Secretary concerned shall initiate consultation with the tribal government of each impacted Indian tribe—

(A) to determine the nature and extent of such impact;

(B) to determine whether such impact can be avoided or mitigated in the design and implementation of the project; and

> (C) if such impact cannot be avoided, to develop feasible measures consistent with applicable law to mitigate the impact and estimate the cost of the mitigation measures."

The US Navy, in several communications with the Tribe, has acknowledged that the action alternatives of this proposal will likely impact the Suquamish Tribe's treaty rights and resources. This should underscore for the US Navy, the need for immediate and meaningful consultation with the Tribe. However, government-to-government consultation on this proposal to date has not provided sufficient project details for the Tribe to understand the complete nature and extent of the impacts to its treaty-reserved rights and resources.

In addition, the US Navy has not consulted with the Tribe in a meaningful manner on a number of studies and investigations in support of this project and for which the Tribe has a direct interest:

- Fish entrainment study – The US Navy has not yet consulted with the Tribe on this study, although the Tribe did learn recently that the US Navy had contracted with the Tribe's comanager of fishery resources in Sinclair Inlet (Washington Department of Fish and Wildlife – WDFW) to conduct this work. The Tribe first learned of this study in March 2021 when a US Navy staff member inquired with staff of the Tribe's Fisheries Department regarding the release timing of juvenile salmon from the Tribe's Gorst Chinook salmon rearing facility. The US Navy failed to consult with the Tribe regarding this study when it had a clear responsibility and requirement to do so.

  Related to the US Navy's failure to consult the Tribe on the above study, , the US Navy has on numerous occasions indicated that it will not share certain environmental analysis (such as its biological assessment that it will prepare in accordance with Section 7 of the Endangered Species Act and Essential Fish Habitat of the Magnusson-Stevens Act) with the Tribe. The refusal to share public documents with the Tribe hampers the Tribe's ability to assess the potential impact of the project on its treaty rights and resources and casts a dark shadow over the prospects for an effective and meaningful consultation process. The US Navy's stance is incomprehensible, since most (if not all) of this information is publicly releasable, and would be released under a Freedom of Information Act request. Furthermore, this position is clearly at odds with the intent of recent congressional amendments to 10 US Code Section 2802 referenced above. Other studies that the US Navy has completed and/or is undertaking for which there has been no consultation with the Tribe include: a maritime context study; a marine habitat study; compensatory mitigation research; and a final feasibility and engineering study (completed in April 2021).

- The US Navy has not yet completed consultation under requirements of Section 106 of the NHPA. Tribe's point of contact for Section 106 Consultation is:

  Dennis Lewarch, Archaeologist
  Tribal Historic Preservation Office
  Suquamish Tribe
  PO 498
  Suquamish, WA 98392
  Phone: 360-394-8529

July 11, 2022
Ms. Stevenson
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IV. Summary

The proposed project will likely create significant environmental impacts including impacts to sediment and water quality, fish habitat, and nearshore ecological functions. In addition, the project will likely create impacts on tribal-treaty fishing rights. The Tribe requires transparency from the US Navy concerning all information and planned studies needed to fully understand these impacts. Resolving the issues created by this project will require a full commitment on the part of the US Navy and the Suquamish Tribe to meaningful and ongoing consultation, throughout the decision-making process. The Tribe urges the Navy to "catch up" on needed government-to-government consultation to fully inform the Tribe on the full scope of the proposed project.

Thank you for the opportunity to comment on this proposal. The Tribe looks forward to working with the Navy to resolve the issues raised in this letter. If you have any questions, please contact me directly at 360-394-8446. The Tribe will comment further as more information becomes available.

Sincerely,

Tom Ostrom
Ecosystem Recovery Manager
Suquamish Tribe

Copy to: Captain Richard Massie, Commanding Officer, Naval Base Kitsap
Jenny Dellert, Archaeologist/Tribal Liaison, Naval Base Kitsap and Naval Magazine Indian Island
Scott Horwitz, Environmental Director, Naval Base Kitsap
Danielle Page-Pattison, Tribal Liaison, Navy Region Northwest
Chairman Leonard Forsman, Suquamish Tribe
Catherine Edwards, Executive Director, Suquamish Tribe
Rob Purser, Fisheries Director, Suquamish Tribe

July 12, 2022

Please find attached the National Park Service's comments. Thank you for the opportunity to review and comment of the Navy's Bremerton Waterfront Infrastructure Improvements project.

Danette Woo

Regional Environmental Coordinator

National Park Service, Interior Regions 8, 9, 10 & 12

United States Department of the Interior

NATIONAL PARK SERVICE
Interior Regions 8, 9, 10, and 12
333 Bush Street, Suite 500
San Francisco, CA 94104-2828

IN REPLY REFER TO:
1.D (PW-CR)

July 11, 2022

Naval Facilities Engineering Systems Command Northwest
Attn: Ms. Christine Stevenson, Bremerton EIS Project Manager
1101 Tautog Circle, Room 210
Silverdale, WA 98315
info@BremertonWaterfrontImprovementsEIS.com

Dear Ms. Stevenson:

Thank you for the opportunity to comment on the Navy's Notice of Intent to prepare an Environmental Impact Statement (EIS) under the National Environmental Policy Act (NEPA) for proposed infrastructure improvements at Puget Sound Naval Shipyard and Intermediate Maintenance Facility at Naval Base Kitsap – Bremerton. The Navy has invited comments on the scope of the EIS including identification of potential alternatives, information, and analyses relevant to the Proposed Action; identification of environmental concerns; issues the public would like to see addressed in the EIS; and the project's potential to affect historic properties pursuant to Section 106 of the National Historic Preservation Act of 1966.

The National Park Service (NPS) offers the following comments to address potential impacts of the project to the Navy Yard Puget Sound National Historic Landmark (NHL) in accordance with our role in Section 106 consultation under 36 CFR 800.10(c). The comments are based on information provided on the project website, https://bremertonwaterfrontimprovementseis.com/, and during the multi-agency meeting held June 29, 2022.

NPS Comments

The Navy's proposed project involves multiple components including construction, demolition, dredging, and related activities occurring within the NHL and the surrounding Puget Sound Naval Shipyard Historic District. Proposed activities with potential to adversely affect the NHL include:

- Demolition of numerous contributing resources to the NHL including Dry Dock #3, the Hammerhead Crane, several upland buildings, and Piers 4, 5, 6, and 7;
- Construction of new facilities within the NHL boundary;
- Excavation associated with construction of new facilities;
- Dredging of submerged areas that are part of the NHL; and
- Construction of new facilities immediately adjacent to the NHL that may result in adverse visual effects.

The NPS seeks viable ways for the Navy to meet its mandate and minimize harm to the NHL in accordance with 36 CFR 800.10. This could include minimizing the number of historic resources demolished and considering rehabilitating historic resources to accommodate project needs as well as other possibilities.

Although the information available at this time does not allow the NPS to make a fully informed recommendation regarding the proposed alternatives, the NPS urges the Navy to develop alternatives that would concentrate demolition, new construction, and dredging activities outside the NHL boundary and, to the extent possible, in locations that would avoid or minimize impacts to other historic shipyard properties.

Hammerhead Crane

The NPS acknowledges the costs of maintaining the Hammerhead Crane and that it is no longer needed for the Navy's mission. Nonetheless, given the crane's importance both as an iconic local historic resource and a nationally significant contributing resource to the NHL, the NPS urges the Navy to consider alternatives for its preservation. Demolition of the crane also does not appear to contribute directly to the stated purpose of the proposed action, particularly under preliminary alternative 3 which retains the NHL-contributing Pier #6 where the crane is located.

Cumulative Effects

Other projects within and adjacent to the NHL have impacted its historic character and resulted in adverse effects. The NPS anticipates that the Navy will provide a robust cumulative impacts and cumulative effects assessment addressing past and current projects, as well as any future projects planned for the shipyard, including those anticipated under the national Shipyard Improvement and Optimization Program (SIOP).

Cultural Resource Inventory and Survey

The NPS requests that the Navy provide copies of relevant shipyard cultural resource inventories and surveys to inform our understanding of resources potentially affected by the proposed action. This includes the architectural survey, maritime context study, and underwater archaeological surveys mentioned at the June 29, 2022, multi-agency meeting, as well as any other relevant studies completed since the NHL designation in 1992. The NPS has a particular interest in up-to-date surveys of the NHL but would welcome the opportunity to review documentation of adjacent areas within the larger Puget Sound Naval Shipyard Historic District.

Section 106 Timeline and Scope

Given the multiple components of the proposed action and the extent of the potential adverse effects to the NHL and other historic properties, the NPS strongly urges the Navy to formally initiate Section 106 consultation as soon as possible. This is necessary for a full evaluation of the proposed undertaking and for the Navy to meet its responsibility to minimize harm to the NHL in accordance with 36 CFR 800.10. Early initiation of Section 106 will also ensure that the process,

including the development of a Programmatic Agreement (PA) as proposed by the Navy to resolve adverse effects, can conclude prior to the Navy's anticipated timeline for release of a Record of Decision (ROD) under the NEPA EIS process.

The Navy should also be aware that the definition of an "undertaking" under Section 106 differs from the definition of a "major federal action" under NEPA, and that consulting parties may request expansion of the scope of the Section 106 review beyond the action defined in the project EIS. For example, the NPS supports the recommendation of the Advisory Council for Historic Preservation (ACHP) to include preparation of a Dredge Materials Management Plan (DMMP) as part of the undertaking for the purpose of Section 106 review.

The NPS also urges the Navy to consider expanding the scope of Section 106 review to include anticipated future projects under SIOP with potential to adversely affect the NHL and other historic properties. With consultation toward the development of a nationwide PA for SIOP on hold, a broader shipyard PA that covers projects, actions, and programs beyond the current proposed action can establish procedures for Section 106 review and resolution of adverse effects, including cumulative effects, resulting from the current project as well as future projects.

Thank you for the opportunity to provide comments at this stage in the project. If you have questions about these comments, please contact Christopher Johnson, Ph.D., Historian, Preservation Partnerships Program, by email at christopher_e_johnson@nps.gov.

Sincerely,

for Frank Lands
Regional Director

cc:
Christopher Johnson, Historian, Preservation Partnerships Program, National Park Service

Name: Tom Knuckey
Email: thomas.knuckey@ci.bremerton.wa.us
Organization/Affiliation: City of Bremerton
Comments

See attached letter

Attachments

- PDF
  220711_Response-EIS for Waterfront Infrastructure Improvements at NBK.pdf

July 7, 2022

Naval Facilities Engineering Systems Command Northwest
Attention: Bremerton EIS Project Manager
1101 Tautog Circle, Room 210
Silverdale, WA 98315

Subject: City of Bremerton Comments on Navy's EIS for Bremerton Waterfront Infrastructure Improvements at PSNS and IMF

Dear Sir or Madam:

Thank you for this opportunity to comment on the scope of the EIS for the Navy's upcoming drydock and associated waterfront infrastructure improvements at PSNS & IMF at Naval Base Kitsap – Bremerton.

First let me say that the City of Bremerton strongly supports the modernization improvements and pledges to be an active and productive partner as the series of projects moves forward. We value the role of PSNS and NBK in our community and want to collaborate on the challenges presented by the modernization improvements with the shared goals of meeting the Navy's infrastructure needs, minimizing municipal impacts and strengthening the overall landscape for the Shipyard within the City of Bremerton.

The City has identified some preliminary topics to be considered as the modernization improvements start the planning process. These issues are well understood by the Navy as they have been the areas of focus through our recent JLUS and the Joint Compatibility Transportation Plan that is currently underway. Bremerton asks that the topics outlined below be considered within the scope of the EIS for the drydock and waterfront improvement project.

Resiliency

Severe traffic congestion, lack of access control resulting in high accident volumes, subsidence concerns due to liquefaction, and flooding resulting from sea level rise are all transportation challenges that mutually affect access to NBK-Bremerton along with the entire Kitsap region. The Gorst Coalition, with the US Navy as an active member, was formed to address the challenges with this corridor, and preliminary work has begun on this multi-million dollar project. The City encourages the Navy to consider addressing this regional concern as part of the multi-billion dollar base expansion project.

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Transportation

Currently, approximately 60% of all in-bound vehicle traffic into Bremerton during the peak period is from Navy employees going to work, and there are approximately 10,100 in-bound pedestrian trips into NBK-Bremerton through the various gates as identified in the figures below. The high level of pedestrian trips results from a lack of on-base parking which has been identified as between 2,500 and 3,500 needed parking spaces. As a result, workers park throughout the City, both legally in pay lots downtown as well as on-street in residential neighborhoods, with much of this parking in violation of City parking laws.

With this current status defined, please ensure the following topics are included in the EIS scope:

- Please evaluate traffic and parking impacts resulting from all alternatives being considered, and also identify whether a new carrier will be homeported in Bremerton, how that will affect traffic and parking, and how the Navy proposes to mitigate the impacts.
- Identify any off-base sites and staging areas that will be used during construction and evaluate any impacts associated with or resulting from that use.
- Evaluate freight operations, including modes of delivery (e.g. trucking, rail, airfreight, etc.,) proposed haul routes, and impacts on City streets.
- Many City streets (and City streets as State Routes) have aging structural pavement sections that will have reduced service life resulting from increased heavy freight. Construction of the magnitude the Navy is proposing is a concern that should be evaluated with the EIS.
- There are approximately 4,000 pedestrian trips into the Shipyard at the State Street gate. This gate has the highest pedestrian usage of all gates because of its proximity to the active dry docks. A new dry dock at the east end of the shipyard will likely shift the workforce east increasing pressure on the Burwell and Bremerton gates, as well as increasing parking pressure in Bremerton's downtown core. Please ensure the EIS evaluates the following:
    - How much of the workforce will shift entry locations into the shipyard with either alternative, and quantify the new number of pedestrian trips at each gate.
    - How the Navy will mitigate added parking pressure on downtown Bremerton resulting from construction at the east end of the shipyard.
    - How the Navy will mitigate increased traffic into downtown Bremerton resulting from construction at the east end of the shipyard.
- Please identify whether any on-base parking be eliminated either permanently or during construction with either alternative, and if so how will the Navy mitigate the impacts.
- Evaluate how the Navy will plan for and address parking during and following construction. Will additional on-base or off-base parking be constructed with either alternative?
- The Joint Compatibility Transportation Plan (JCTP) that the City and Navy are coordinating on is studying ways to address traffic, safety, parking, and livability issues resulting from Navy commuters while at the same time preserving and improving accessibility to the installation as Bremerton grows. The Puget Sound region is expected to continue to grow over the next 30 years and Bremerton is projected to absorb a substantial amount of that growth through development outside of the urban core, as well as through in-fill development that will increase Bremerton's urban density.
    - The City requests the Navy utilize the study's findings to mitigate traffic increases and/or changes due to construction. This may include funding programs to incentivize

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and encourage the use of alternative modes of transportation to alleviate traffic and parking issues resulting from single occupancy vehicles, constructing bike/pedestrian lanes or other improvements inside the base to connect parking to work areas, and constructing transportation improvements including active transportation improvements in the City that are primarily used by Navy workforce commuters.

- Using information supplied by the Navy, the City utilized a small number of increased permanent jobs at the installation for future year land use and traffic model assumptions for the study out-year of 2050. An increase in workforce, either temporary or permanently, could significantly accelerate and potentially exceed traffic volume assumptions much sooner than 2050.
  - Please evaluate what the expected increase in workforce needed for either alternative is, and in what years that increase will occur.
  - Identify how the Navy will mitigate traffic impacts to Bremerton streets.

- For the Drydock work, please evaluate where excavated materials will be stored, and whether they will be hauled by truck, train, or barge. For all spoils handling, please identify expected truck traffic, truck routes, and how the Navy will mitigate wear and tear of heavy trucks on Bremerton streets.

Inbound Pedestrian Traffic Data:

Navy's Alternative 2:

Navy's Alternative 3:

Utilities

Please ensure the EIS Scope addresses the following topics:

- An evaluation of the long-term and short-term/construction impacts to the City's Water, Wastewater and Stormwater utilities, and also third-party utilities including PSE, Cascade Natural Gas, etc.
- There is significant existing saltwater inflow and infiltration conveyed into the City's wastewater collection system due to defects in the Navy's wastewater collection system. The City has communicated concerns related to its physical plant due to the corrosive nature of saltwater, and also to its treatment processes. The impacts to our treatment processes will become more acute as the City moves forward in implementing optimization for compliance with the Washington State Department of Ecology's Puget Sound Nutrient General Permit. Please identify how the Navy will investigate and monitor its wastewater collection system and correct the sources of inflow and infiltration.
- Drydock dewatering operations introduce saltwater into the City's wastewater collection and treatment systems and have a direct impact on those systems. Please identify whether construction of either alternative will increase or decrease this inflow to the City, and how the Navy will mitigate impacts.
- The Puget Sound Nutrient General Permit limits the total inorganic nitrogen (TIN) discharge from the City's wastewater treatment plant. Please identify whether construction of either of the alternatives, including any future increase in home porting resulting from the improvements, will increase TIN discharge from the Navy to the City. Identify how the Navy will mitigate any increase in TIN loading.
- Identify whether either of the proposed alternatives will increase sewer strength or volume, and if so how the Navy will mitigate that increase. Also identify whether the Navy proposes to increase any stormwater, dewatering water, or other source of inflow into the City's wastewater collection system during construction.

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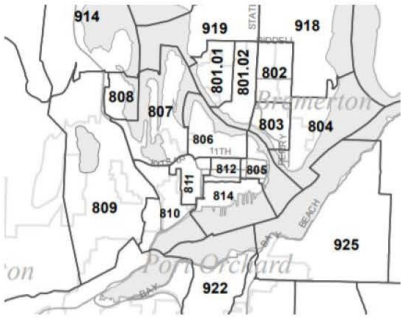
Environmental Justice and Community Impacts

Finally, we request the Navy consider the following as planning moves forward for this important project:

- As the Navy moves this project forward it is probable that off-site mitigation may be required to secure permits for the improvements. If that is the case, the City requests the Navy first consider improvements within Bremerton City Limits. There are two projects in the City that may serve as mitigation; removal of an abandoned coal dock at Lions Park in East Bremerton, and shoreline restoration at Evergreen Rotary Park in West Bremerton. The abandoned coal dock is an overwater structure within Lions Park that is constructed of creosote coated wood, is failing, and has been fenced off to preclude public access due to safety concerns. The Evergreen Rotary Park site was historically used for bulk fuel storage; currently this is the site of the Kitsap County 9-11 memorial. While the City has completed soil remediation at this site, there remains hardscape consisting of failing retaining walls, concrete and other debris along the shoreline. A note that improvements at this site could be considered near shovel ready as the City has already completed design. Both of these waterfront community parks are signature parks within the City limits, and are regularly used by Navy active duty and employees.
- Census tract 805, located in Bremerton and abutting the installation fence line, is an area of "persistent poverty" per the US Census. Several other tracts, including 801.2, 802, and 803, are classified as "historically disadvantaged" and are adjacent to major transportation corridors leading to the installation. Special care should be given to ensuring environmental justice issues are addressed and mitigated through the EIS process. How will the Navy mitigate impacts to those communities resulting from increased traffic, construction noise, air pollution or any other impacts?



Contact me at (360) 473-2376, or at thomas.knuckey@ci.bremerton.wa.us if you have any questions or concerns on these comments. Thank you for this opportunity to comment on the Navy's EIS scope development, and we wish you great success in completing this important project.

Sincerely,

Tom Knuckey, P.E.
Director of Public Works & Utilities

Public Works & Utilities | 100 Oyster Bay Ave. N., Bremerton, WA 98312 * Phone (360) 473-5920 * Fax (360) 473-5360

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Name: Redacted
Email: Redacted
Organization/Affiliation: Private Citizen
Comments

In the past we were told that ships with active nuclear reactors had to be a distance away from the general public which precluded using DD#3. What distance is required if any such limitation exists. Would an enlarged drydock where DD#3 currently exists require shipyard boundaries to be expanded?

Name: Redacted
Email: Redacted
Organization/Affiliation: Private Citizen
Comments

A concern I have is for the additional workers/sailors that will be in the area after completion. Currently parking on base is limited and parking outside of base is for profit and also limited. The neighborhood also has an increased crime rate within the last few years. I have no concerns with the modifications proposed but I would like to see additional infrastructure to support the capabilities that come after the modifications. I've witness 3 carriers in port with the current infrastructure on base and it affects everyone in the county. Traffic alone is horrific and what would happen if there is a security or safety issue. Adding a 4th carrier to dry dock 3 could bring thousands of additional vehicles to the area where parking and traffic already is beyond capacity. More parking structures should be built on and off base. 24/7 shuttle service to allow for remote parking while delivering personnel to the job site should be implemented.

Name: Redacted
Email: Redacted
Organization/Affiliation: Private Citizen
Comments

I totally understand the logic, reasoning and need to upgrade and add various things. I also understand that the Hammerhead currently interferes with those needs. However, would it be possible to move it to another location rather than destroy one of the most iconic things in the county. Just a thought.

Name: Redacted
Email: Redacted
Organization/Affiliation: Redacted
Comments

Hello, When you tear down the crane, it would be nice to make token pieces available to people who would want a piece of the crane as a memento. thanks,

---

Name: Redacted
Email: Redacted
Organization/Affiliation: Private Citizen
Comments

I have viewed the proposed actions and am in full support of alternatives 2 and 3, of whichever one would best suit the projected needs of the Navy. The dismantling of the Hammer Head crane will be met, understandably, with opposition. It should be made clear to the public that not only does the crane not meet current and future capacity needs. I again reaffirm my support for the proposed changes and that we need to have modern facilities to operate, maintain, and repair current and future vessels so as to properly provide for the security of the nation.

Name: Redacted
Email: Redacted
Organization/Affiliation: Private Citizen

Comments

Thank you for the opportunity to comment on this important project. I appreciate the hard work that took to get the project to this point. It appears that the scope of the planned EIS will sufficiently address areas of concern. In making decisions about the preferred alternative and, ultimately, the selected alternative, I urge the decision makers to take into account improvements in overall shipyard productivity that could be achieved with improved facilities, and not make decisions based on the relative simplicity of permitting and construction of one alternative over another. Investments in efficient facilities now will more than pay for themselves over the 50+ year life of the structures.

Name: Redacted
Email: Redacted
Organization/Affiliation: Private Citizen
Comments

Rebuild DD3 for Ford-class carriers, keep pier 6, keep crane 28, demolish pier 5, rebuild DD1. Then seismic upgrade DD6.

	Name	Agency/Affiliation	Comment
Scoping Meeting June 23		Private Citizen	How would work at the shipyard continue during construction
Scoping Meeting June 23	Anne Christopher	EPA	Will the draft EIS in spring 2023 include the Navy's preferred alternative? If not, when will the Navy decide which alternative is the preferred alternative?
Scoping Meeting June 23		Private Citizen	Does the public involvement plan include outreach specifically to the workers at the shipyard?
Scoping Meeting June 23	Anne Christopher	EPA	Will the Navy provide more info about the extra dredging for the turning basins, etc. (areal extent, depth)?
Scoping Meeting June 23		Private Citizen	Would the turning basins required for either dry dock location require the shipyard to increase their footprint in Sinclair inlet?
Scoping Meeting June 23		Private Citizen	Are NAVSEA and NAVFAC working together on all steps of this process? How much of the engineering and study labor is performed locally? What firm has been hired as consultant?
Scoping Meeting June 23		Private Citizen	How long could this project take?
Scoping Meeting June 23		Private Citizen	You've said PSNS & IMF is the only one approved to recycle nuclear submarines, are other types of nuclear ships recycled elsewhere? Isn't there another EIS in progress about a nuclear aircraft carrier that could go elsewhere for recycling?
Scoping Meeting June 23		Private Citizen	Will exEnterprise work interfere with starting on site work for infrastructure improvements?

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Northwest Region Office
PO Box 330316, Shoreline, WA 98133-9716 • 206-594-0000

July 11, 2022

Christine Stevenson, Bremerton EIS Project Manager
Naval Facilities Engineering Systems Command Northwest
U.S. Navy
1101 Tautog Circle, Room 210
Silverdale, WA 98315

Re: Bremerton Waterfront Infrastructure Improvements
Ecology Reference #202203333

Dear Christine Stevenson:

Thank you for the opportunity to provide comments on the National Environmental Policy Act (NEPA) Environmental Impact Statement (EIS) scoping period for the Bremerton Waterfront Infrastructure Improvements project. The Department of Ecology (Ecology) is the agency in Washington State responsible for protecting air, land, and water for the 7.5 million residents we serve. We hope to ensure that economic growth and revitalization work is combined seamlessly with our goal to protect and restore the environment for current and future generations.

Greenhouse Gas Emissions and Analysis
The state of Washington and its agencies are working to eliminate carbon emissions in all sectors consistent with RCW 70A.45.020, which establishes greenhouse gas limits in order to combat climate change and requires the state to reduce emission levels. The scope of this EIS should include an analysis of all GHG emissions occurring during the construction phase and on-going operations.

This could include, but is not limited to:

- emissions from operating or idling marine vessels;
- consideration of infrastructure to support alternative fuel vehicles, ships and equipment;

- emissions from fuel consumed during operation of the completed docks, including pump operations, machining and repair equipment, maintenance and landscape equipment, etc.;
- on-site transportation;
- permanent or portable back up generation;
- construction vehicles, tools and equipment; and
- embodied carbon of construction materials.

As the state seeks to rapidly decrease or eliminate the use of fossil fuels, we recommend the Navy take this opportunity to electrify operations and fleets. This project provides a rare opportunity to integrate electrification with the large-scale construction work necessary to build the new dry dock and renovate the existing dry dock. Installing electrification infrastructure as part of the project would be significantly less expensive than electrifying the base after construction is completed. We also recommend reviewing opportunities for energy efficiency and self-generating renewable energy on site.

Tribal Resources
We recommend an assessment of how the project and alternatives will impact tribal resources in the project area during construction and operations. Potential areas to consider include:

- How will construction impact areas of cultural significance to tribes?
- How will changes in vessel traffic impact tribal fishing areas in terms of safety, access, and spill risk?
- How will the changes in vessel traffic impact availability of tribal fishing areas during fishing seasons with high trafficked navigation channels?
- Will construction and/or operations limit access to culturally significant tribal areas?
- Ensure all tribes in the project area are consulted during the EIS scoping, drafting, and project approval process. This should be a collaborative and inclusive process.

Environmental Justice
All members of the community surrounding the project area need to be included in the scoping process.

- Ensure the EIS scoping process is inclusive and accessible to impacted communities. Information about this project should be accessible, include translations as requested, and consider the timing and location of public meetings based on the community's needs.
- Include an assessment of how the project and alternatives will impact marginalized communities near the project area.
- Include mitigation measures to ensure there is no unfair distribution of harm to these communities.
- Ensure all those in the community are involved in a meaningful way.

Upland Excavation and Soil Disturbance
As part of the CERCLA ROD, Bremerton Naval Complex has institutional controls including but not limited to soil excavation management due to contaminants left in place and ground water use restriction. As such, the EIS needs to evaluate the implication of excavation and disturbance of contaminated soil and groundwater, including proper disposal. No excavated material should be beneficially reused within the site or outside the site without proper characterization. The following guidance may be used to characterize soil, stockpile and ground water characterization: Guidance for Remediation of Petroleum Contaminated Sites (wa.gov).

A sampling and analysis plan should be prepared following the Environmental Protection Agency's seven step data quality objectives (DQO) process. Reuse of excavated soil should not occur unless the excavated material meets Model Toxics Control Act (MTCA) soil cleanup standards.

The alternatives evaluation should also include the environmental benefit of removing contaminated fill material currently present in the upland soils. These soils, if not properly contained, pose threats to marine environment.

Sediment Characterization and Transport
As part of the multi-agency Dredged Materials Management Program (DMMP), Ecology is reviewing the Sediment and Analysis Plan submitted on June 27, 2022, for a preliminary Suitability Determination to aid in project design. Please note that by the time the project is authorized, this determination will probably be out of date and additional sampling will be required with refinements from the current round. Additionally, the final Suitability Determination and a Dredging Plan will need to be included as part of the Navy's Section 401 Water Quality Certification Request submitted to Ecology, so planning for this is needed as the project schedule is developed.

The Navy has indicated that a Sediment Transport Study is in process. The EIS should address effects on longshore drift that would result from each alternative.

Marine Habitat Survey
The U.S. Navy prepared its Marine Habitat Survey in 2020. While it is prudent to conduct habitat surveys early in the process, note that submerged aquatic vegetation surveys should be conducted per the requirements of the natural resource agencies before beginning construction at specific locations (e.g., Washington Department of Fish and Wildlife [WDFW] guidelines can be found at WAC 220-660-350(3)). Additionally, forage fish spawning surveys should be conducted and information on WDFW requirements can be found at WAC 220-660-340(3). The EIS should include estimates of potential impacts to submerged aquatic vegetation (e.g., direct impact and overwater shading) as well as forage fish spawning habitat. Note that such impacts should be avoided to the extent practical, then minimized and mitigated for following appropriate guidance.

Christine Stevenson, Bremerton EIS Project Manager
July 11, 2022
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Coastal Zone Management (CZM) Consistency
As noted in the scoping document, a CZM Consistency Determination will need to be submitted to Ecology for a decision. It should address the current enforceable policies of Washington's CZM Program. Please note that the timing of submittal is critical, as a decision will not be made prior to the Section 401 Water Quality Certification.

Vessel Traffic
The EIS should include information about the potential changes in vessel traffic under the proposed action and two preliminary alternative actions. It is not clear in the project description how the proposal and preliminary alternatives will change vessel traffic to and from the naval base.

Southern Resident Killer Whales
The EIS should also include information about the potential impact each action will have on Southern Resident Killer Whales (SRKWs), in addition to other threatened and endangered species present in the project area. Additional areas to consider include:

- The impact of potential changes in vessel traffic under each action during operations. Potential impacts include underwater noise pollution, vessel strikes, and spill risk. Include measures to mitigate those impacts on SRKWs.
- The impact of construction activities (including underwater noise) and measures to mitigate those impacts on SRKWs.
- Measures to successfully implement Washington State's Be Whale Wise laws (RCW 77.15.740).

Risk of Oil Spills
The EIS should include an analysis regarding the risk of potential oil spills and what prevention, preparedness, and response measures need to be in place to mitigate this risk. Considerations for oil spills include:

- Vessel traffic, operations, fueling, and maintenance.
- Construction equipment design, operations, fueling, and maintenance.
- Best Management Practices and staff training regarding these practices.

Earth: Seismic and Earthquake Risk
The proposed action includes upgrading Dry Dock 6 to meet current seismic standards. The EIS scope should describe these standards and how they would be met for each alternative action.

Sea Level Rise
The EIS scope should consider how sea level rise could impact the project and alternative actions. How will each action safeguard against sea level rise?

Christine Stevenson, Bremerton EIS Project Manager
July 11, 2022
Page 5

Water Quality
Any potential impacts to waters of the state should be addressed in this section, including wetlands and streams, creeks, and ditches in the upland areas of the project. The proposed seismic upgrades at Dry Dock 6 may impact both Sinclair Inlet and groundwater as a result of ground improvement activities and therefore should be included in this section. A Water Quality Monitoring and Protection Plan will need to be developed and submitted to Ecology as part of the Navy's WQC Request to address any in-water activity. Additionally, not only should construction-related impacts be addressed in the EIS, but also potential operational impacts related to stormwater and spills. Finally, in-water work related to mitigation activities also should be considered.

While in-water work will be addressed by the 404 permit and 401 certification and stormwater discharges will be covered by EPA's construction stormwater general permit, these permits do not necessarily cover dewatering water discharge. If dewatering water is generated, the Navy will need to propose a discharge option for this water and work with EPA to secure a proper discharge permit, allowing time for 401 certification as required. Dewatering water must be authorized to discharge and meet the state's regulations and water quality standards.

The Puget Sound Naval Shipyard & Intermediate Maintenance Facility has a state waste discharge permit from Ecology to authorize industrial process wastewater discharge to the City of Bremerton municipal sewer system. Ecology is currently working with the Navy and the City to address high saline discharges, which occur from normal shipyard operations and infiltration into degraded infrastructure. The EIS should evaluate impacts to saline concentration of process wastewater to sanitary sewer from improved infrastructure as well as opportunities to reduce high saline inputs and reduce slugs or spikes of high saline wastewaters.

Additionally, any changes to infrastructure or processes that would impact or influence discharges to the sanitary sewer of any contaminants must be evaluated for compliance with the state waste discharge permit, or alternatively, necessary modifications to the permit.

Thank you for considering these comments from the Department of Ecology. If you have questions or would like to respond to these comments, please contact Ecology's Northwest Region Planner, Meg Bommarito, at meg.bommarito@ecy.wa.gov, or 425-681-6236.

Sincerely,

Tom Buroker
Northwest Region Director

Sent by email: info@BremertonWaterfrontImprovementsEIS.com

ecc: Meg Bommarito, Ecology

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APPENDIX C
Regulatory Setting

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Appendix C
Regulatory Setting

The United States (U.S.) Department of the Navy (Navy) has prepared this Environmental Impact Statement (EIS) based upon federal and state laws, statutes, regulations, and policies pertinent to the implementation of the proposed action. This appendix lists the applicable principal federal, state, and local laws and regulations; identifies the names of the regulatory agencies responsible for their implementation; describes how the law, plan, policy, or guidance is applicable to the proposed action; and identifies the relevant resources from the EIS. The table below follows the order of resources assessed in the EIS.

Relevant Resources	*Federal, State, Local Laws, Plans; Policies, and Guidance*	*Applicability to the Proposed Action*	*Agency*	*Resource Section Number*
All resources	OPNAVINST 5090.1E; Environmental Readiness Program Manual (OPNAV M-5090.1)	Navy's policy guidance for environmental readiness. It discusses requirements, delineates responsibilities, and issues policy guidance for the management of the environmental, natural, and cultural resources for all Navy ships and shore activities.	Navy	
All resources	National Environmental Policy Act (NEPA), 42 U.S.C. section 4321 et seq., as amended by the Fiscal Responsibility Act of 2023; Navy procedures for implementing NEPA, 32 CFR part 775	Statute applicable to and binding on all federal agencies. Navy procedures for implementing the procedural provisions of NEPA.	All federal agencies, Navy	
Air Quality – GHG	40 CFR part 50	National primary and secondary ambient air quality standards under Section 109 of the Act are set forth in this part.	EPA	Section 3.2
Air Quality – GHG	40 CFR part 60	Provides standards of performance for new stationary sources.	EPA	Section 3.2
Air Quality – GHG	40 CFR parts 61–63	NESHAPs are stationary source standards for hazardous air pollutants.	EPA	Section 3.2
Air Quality – GHG	40 CFR part 70	The regulations here establish a comprehensive State air quality operating permit system.	EPA	Section 3.2
Air Quality – GHG	40 CFR part 89	This Part adopted emissions standards for nonroad engines produced after model year 1996.	EPA	Section 3.2

Relevant Resources	*Federal, State, Local Laws, Plans; Policies, and Guidance*	*Applicability to the Proposed Action*	*Agency*	*Resource Section Number*
Air Quality – GHG	33 U.S.C. sections 1901–1905	This annex addresses air pollution requirements of certain vessels and engines.	EPA	Section 3.2
Air Quality – GHG	Regulation I, Articles 5, 6, 7	These articles outline requirements for Registration, New Source Review, and Operating Permits.	Puget Sound Clean Air Agency	Section 3.2
Air Quality – GHG	Regulation I, Article 9, Section 9.03, 9.09, 9.15, 9.16	Sets forth visual emission standards, particulate matter standards, fugitive dust control measures, and requirements for spray coating operations.	Puget Sound Clean Air Agency	Section 3.2
Air Quality – GHG	Regulation I, Article 15	Defines nonroad engines, emission standards, and other regulations.	Puget Sound Clean Air Agency	Section 3.2
Air Quality – GHG	Regulation III, Articles 2, 3, 4	This regulation outlines control and enforcement of regulations for toxic air contaminants. Article 2 addresses toxic air contaminants and Article 4 addresses asbestos in building materials and demolition and construction activities.	Puget Sound Clean Air Agency	Section 3.2
Air Quality – GHG	WAC Title 173, Chapter 400	These general regulations provide systematic control over air pollution sources.	Ecology	Section 3.2
Air Quality – GHG	WAC Title 173, Chapter 401	This chapter establishes operating permit regulations.	Ecology	Section 3.2
Air Quality – GHG	WAC Title 173, Chapter 441	This chapter establishes a reporting system for emissions of GHGs.	Ecology	Section 3.2
Air Quality – GHG	WAC Title 173, Chapter 460	This chapter establishes systematic controls for new or modified sources of toxic air pollutants.	Ecology	Section 3.2
Air Quality – GHG	WAC Title 173, Chapter 476	This chapter establishes maximum acceptable levels of particulate matter and other pollutants in ambient air.	Ecology	Section 3.2
Air Quality – GHG	WAC Title 173, Chapter 480	This chapter establishes ambient air quality standards and emissions limits for radionuclides.	Ecology	Section 3.2
Air Quality – GHG	WAC Title 173, Chapter 490	This chapter establishes emission standards and controls for sources emitting VOC.	Ecology	Section 3.2

Relevant Resources	*Federal, State, Local Laws, Plans; Policies, and Guidance*	*Applicability to the Proposed Action*	*Agency*	*Resource Section Number*
Water Resources	UNDS for Vessels of the Armed Forces – 64 FR 25126; 81 FR 69753; 82 FR 3173; 85 FR 43465; 88 FR 1368; 40 CFR part 1700; DoD Manual 4715.06, Vol 4, Regulations on Vessels Owned/Operated by DoD: Discharges Incidental to Normal Operations	Amendment to CWA section 312 (by section 325) to regulate the design, construction, installation, and use of MPCDs to meet performance standards for discharges incidental to the normal operation of a vessel of the Armed Forces into the navigable WOTUS, the territorial seas, and the contiguous zone. Not applicable to vessels in dry dock.	DoD, EPA, USACE	Section 3.3
Water Resources	Protection of Wetlands, EO 11990; CWA Section 230 Subpart E	Requires federal agencies to "take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands."	EPA	Section 3.3
Water Resources	EO 12088, Federal Compliance with Pollution Control Standards	Related to sediment resuspension and runoff due to construction and operations.	EPA	Section 3.3
Water Resources	EO 11988 – Floodplain Management	Related to the occupancy and modification of floodplains, to avoid direct or indirect support of floodplain development wherever there is a practicable alternative.	EPA	Section 3.3
Water Resources	CWA section 316(b)	Requires EPA to issue regulations on the design and operation of Cooling Water Intake Structure to minimize adverse impacts.	EPA	Section 3.3
Water Resources	CWA section 320	Possible conflicts between the proposed action and the objectives of the Comprehensive Conservation and Management Plan under CWA section 320	EPA	Section 3.3
Water Resources	40 CFR part 125.94	This Part requires compliance with the best technology available for minimizing adverse environmental impacts from Cooling Water Intake Structure.	EPA	Section 3.3
Water Resources	Floodplain Management, EO 11988	Requires federal agencies to avoid long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain	FEMA	Section 3.3

Relevant Resources	*Federal, State, Local Laws, Plans; Policies, and Guidance*	*Applicability to the Proposed Action*	*Agency*	*Resource Section Number*
		development. Flood potential of a site is usually determined by the 100-year floodplain, which is defined as the area that has a 1 percent chance of inundation by a flood event in a given year.		
Water Resources	Submerged Lands Act (as amended)	Related to jurisdiction of the state over submerged lands within 3 miles of the coast.	NMFS	Section 3.3
Water Resources	VIDA for commercial vessel incidental discharge	Establishes a framework for the regulation of discharges incidental to the normal operation of a vessel under a new CWA section 312(p). VIDA intends to streamline requirements for commercial vessels.	USCG, EPA	Section 3.3
Water Resources	Wetland Ratings System	This rating system differentiates wetlands based on various ecological parameters.	Ecology	Section 3.3
Water Resources	Water Quality Assessment 305(B) reports and 303(d) list	These sections establish the process to identify and clean up polluted waters of the State.	Ecology	Section 3.3
Water Resources	Water Code (90.03 RCW)	This policy reduces wasteful practices and increases efficiency of use of water resources.	Ecology	Section 3.3
Water Resources	Puget Sound Water Quality Authority Act – Sediment Management Standards	This Act established marine, low salinity, and freshwater surface sediment management standards for the State.	Ecology	Section 3.3
Water Resources	Western Washington Stormwater Management Manual	This manual provides guidance for stormwater permit implementation and management.	Ecology	Section 3.3
Water Resources	Section 401 of the Clean Water Act	This section requires certification from the State of Washington that discharges would comply with applicable water quality standards before the Section 404 permit can be issued.	Ecology	Section 3.3
Water Resources	Water Quality Standards for Surface Waters of the State of Washington	Sets water quality standards for surface water to help protect and regulate the quality of water in Washington by setting pollution limits.	Ecology	Section 3.3
Water Resources	Water Quality Standards for Groundwater of the State of Washington	Sets water quality standards for groundwater to help protect and regulate the quality of water in Washington by setting pollution limits.	Ecology	Section 3.3

Relevant Resources	*Federal, State, Local Laws, Plans; Policies, and Guidance*	*Applicability to the Proposed Action*	*Agency*	*Resource Section Number*
Water Resources	Sediment Management Standards	Set standards for sediment quality and standards to reduce pollutant discharges.	Ecology	Section 3.3
Water Resources; Geological Resources	Water Resources Act of 1971	Providing sufficient water for residential, commercial, and industrial needs; productive fish populations; and productive agriculture.	Washington State Water Resources Data Program	Sections 3.3; 3.4
Water Resources; Geological Resources; Biological Resources	CWA section 404 (33 U.S.C. section 1344); Water Pollution Control Act (33 U.S.C. section 1251 et seq.)	This Act sets a requirement for a permit to discharge or place dredged or fill material into WOTUS.	USACE	Sections 3.3; 3.4; 3.5
Water Resources; Infrastructure – Utilities; Hazardous Materials and Wastes	CWA (CFR Title 33 U.S.C. sections 1313, 1314, 303(d), 305(b), and most recent 304(a) list)/Rivers and Harbors Act 40 CFR 116.4, Section 307, 311, 401, 404	These sections mitigate impacts to surface water from construction activities and discharge to navigable waters.	EPA	Sections 3.3; 3.11; 3.15
Water Resources; Geological Resources; Land Use – Recreation; Hazardous Materials and Wastes	National Coastal Zone Management Act (16 U.S.C. section 1451, 15 CFR part 930); Coastal Zone Management Act section 307(c)(1), HRS Chapter 205A – Coastal Zone Management	Actions or activities that affect any land or water use or natural resource of the coastal zone are to be carried out in a manner consistent to the maximum extent practicable with the enforceable policies of federally approved state coastal management program.	Navy; Ecology	Sections 3.3; 3.4; 3.8; 3.15
Water Resources; Biological Resources	CWA section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material (40 CFR part 230)	These are regulations that constitute the environmental criteria used in evaluating activities regulated under section 404 of the CWA.	EPA; USACE	Sections 3.3; 3.5
Water Resources; Public Health and Safety	National Primary Drinking Water Regulations 40 CFR part 141	Affects management of water sources by way of setting standards for drinking water quality. Groundwater quality and quantity are regulated under several statutes and regulations, including the Safe Drinking Water Act.	EPA	Sections 3.3; 3.14
Water Resources; Public Health and Safety	Energy Independence and Security Act; PL 110–140 section 438	Federal agencies are required to reduce stormwater runoff from federal development	EPA	Sections 3.3; 3.14

Relevant Resources	*Federal, State, Local Laws, Plans; Policies, and Guidance*	*Applicability to the Proposed Action*	*Agency*	*Resource Section Number*
		and redevelopment projects to protect water resources.		
Geological Resources	Washington State Uniform Building Code	Provides building codes that are the primary vehicle for determining minimum structural and egress standards for new buildings and buildings that are being substantially remodeled and brought "up to code."	Washington State Building Code Council	Section 3.4
Geological Resources	EPA in coordination under the ESA (16 U.S.C. section 1531 et seq.)	Outlines interagency cooperation procedures for federal action agencies to consult the Services to ensure the actions do not jeopardize the existence of any listed species or adversely modify designated critical habitat.	NMFS, USFWS	Section 3.4
Geological Resources	Dredged Material Management Program User Manual	Interagency approach to the management of dredged material in Washington State.	USACE	Section 3.4
Geological Resources	UFC requirements for seismic design and NAVFAC P-355 Seismic Design Manual	Provide building codes designed to protect property and life in buildings in case of earthquake or liquefaction.	Navy	Section 3.4
Geological Resources; Public Health and Safety; Hazardous Materials and Wastes	RCRA 42 U.S.C. section 6901 et seq. and 40 CFR parts 260–272 as relates to hazardous waste management	Hazardous materials and wastes exposure. The EPA controls hazardous waste including generation, transportation, treatment, storage, and disposal of hazardous waste.	EPA	Sections 3.4; 3.14; 3.15
Geological Resources; Biological Resources; Hazardous Materials and Wastes	CERCLA 42 U.S.C. section 9601 et seq.; 40 CFR 302.4	Provides a federal "Superfund" to clean up uncontrolled or abandoned hazardous waste sites and accidents, spills, and other emergency releases of pollutants and contaminants into the environment.	EPA	Sections 3.4; 3.5; 3.15
Biological Resources; Water Resources	EO 12088, Federal Compliance with Pollution Control Standards	Ensures federal compliance with applicable pollution control standards. Related to impacts from sediment resuspension and runoff due to construction and operations.	NMFS	Section 3.5

Relevant Resources	*Federal, State, Local Laws, Plans; Policies, and Guidance*	*Applicability to the Proposed Action*	*Agency*	*Resource Section Number*
Biological Resources	Section 305 of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. section 1801 et seq.)	As required by this Act, the Navy would consult with NMFS regarding EFH in the study area.	NMFS	Section 3.5
Biological Resources	Bald and Golden Eagle Protection Act	This Act prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald or golden eagles, including their parts (including feathers), nests, or eggs.	USFWS	Section 3.5
Biological Resources	ESA	As required by this Act, the Navy would consult with NMFS and USFWS on ESA-listed species potentially occurring in the project area.	NMFS, USFWS	Section 3.5
Biological Resources	MMPA	As required by this Act, the Navy would consult with NMFS regarding protected marine mammals present in the project area.	NMFS, USFWS	Section 3.5
Biological Resources	National Defense Authorization Act (PL 108-136, as amended by PL 115-232)	This Act, in part, amended language in the MMPA to provide additional clarity regarding the intersection of military readiness activities and marine mammal protection.	NMFS, USFWS	Section 3.5
Biological Resources	Fish and Wildlife Coordination Act	This Act requires mitigation of impacts due to the project's modification of a waterbody.	NMFS, USFWS	Section 3.5
Biological Resources	EO 13112, National Invasive Species Council	This order mitigates primary and subsequent introduction of exotic species via vessel fouling and ballast water transfer.	NMFS	Section 3.5
Biological Resources	EO 13751, Safeguarding the Nation from the Impacts of Invasive Species	This order amends EO 13112 (above) to include emerging priorities as further considerations.	NMFS	Section 3.5
Biological Resources	Nonindigenous Aquatic Nuisance Prevention and Control Act	Presence of invasive species were confirmed as part of this Act.	NMFS	Section 3.5
Biological Resources	EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds	Potential impacts to migratory birds were confirmed as part of this EO.	USFWS	Section 3.5
Biological Resources	Sikes Act 16 U.S.C. sections 670a-670o, 74 Stat. 1052, 1960	As required by this Act, the DoD is required to prepare and implement an INRMP to address natural resources management on military lands and near-shore areas. A Sikes Act-compliant INRMP is in place for NAVBASE Bremerton.	USFWS; NMFS; WDFW	Section 3.5

Relevant Resources	*Federal, State, Local Laws, Plans; Policies, and Guidance*	*Applicability to the Proposed Action*	*Agency*	*Resource Section Number*
Biological Resources	Marine Protection, Research and Sanctuaries Act (33 U.S.C. sections 103 – 107)	Regulates the transportation and disposition of materials in the ocean to protect marine resources and human health.	USACE, EPA	Section 3.5
Biological Resources; Land Use – Recreation	Migratory Bird Treaty Act of 1918 (16 U.S.C. sections 703–712)	As required by this Act, the Navy would consult with USFWS regarding potential impacts to migratory birds present in the project area.	USFWS	Sections 3.5; 3.8
Biological Resources; Public Health and Safety; Hazardous Materials and Wastes	Rivers and Harbors Act of 1899, section 10 (33 U.S.C. section 403 et seq.)	This Act puts forth a requirement for a permit for work (e.g., dredging) or structures in or affecting the course, condition, location, or capacity of navigable WOTUS.	USACE, USCG	Sections 3.5; 3.14; 3.15
Cultural Resources	Archaeological and Historic Preservation Act (also known as the Archaeological Data Recovery Act) (54 U.S.C. 312501–312508)	Provides for the preservation of historical and archaeological data that might otherwise be irreparably lost or destroyed as a result of federal construction projects or a federally funded activity or program.	Secretary of the Interior	Section 3.6
Cultural Resources	NHPA (54 U.S.C. 300101 et seq.). Section 106 of the NHPA, 54 U.S.C. 306108, is implemented by 36 CFR part 800.	Establishes national policy for the preservation of cultural and historic properties. Section 106 of the NHPA requires federal agencies to consider the effects of proposed undertakings avoid, minimize, or mitigate adverse effects on historic properties, and afford the ACHP, the public, and interested parties the opportunity to comment.	ACHP	Section 3.6
Cultural Resources	NAGPRA of 1990 (25 U.S.C. sections 3001–3013)	Provides for the protection and repatriation of Native American human remains and cultural items discovered on federal or tribal lands or currently curated by federal or federally assisted curation facilities.	National NAGPRA Program Department of Interior	Section 3.6
Cultural Resources	Archaeological Resources Protection Act of 1979 (16 U.S.C. sections 470aa–470mm), 32 CFR part 229 (DoD version – Protection of Archaeological Resources: Uniform Regulations)	Provides for the protection of archaeological resources and sites on public and Indian lands by requiring permits from the federal land manager for excavation or removal of archaeological resources.	Secretary of the Interior	Section 3.6

Relevant Resources	*Federal, State, Local Laws, Plans; Policies, and Guidance*	*Applicability to the Proposed Action*	*Agency*	*Resource Section Number*
Cultural Resources	American Indian Religious Freedom Act of 1978 (42 U.S.C. section 1966)	Establishes the policy of the United States to protect and preserve the rights of American Indians to believe, express, and exercise their traditional religions.	N/A	Section 3.6
Cultural Resources	DoD Directive 4710.1, *Archaeological and Historic Resource Management* (June 21, 1984)	Provides policy, prescribes procedures, and assigns responsibilities for the management of archaeological and historic resources located in and on waters and lands under DoD control. It is the policy of DoD to integrate historic preservation requirements with the planning and management of activities under DoD control.	DoD	Section 3.6
Cultural Resources Management	SECNAVINST 4000.35B Department of the Navy Cultural Resource Program	Provides clarification on the responsibilities for management of historic buildings, structures, districts, archaeological sites and artifacts, historic ships and aircraft, and other cultural resources.	Navy	Section 3.6
American Indian Traditional Resources	SECNAVINST 11010.14B Department of the Navy Policy for Consultation with Federally Recognized Indian Tribes	Provides policy, procedures, and responsibilities when consulting with representatives of federally recognized Indian tribes.	Navy	Section 3.7
American Indian Traditional Resources	Tribal Consultation and Strengthening Nation-to-Nation Relationships (January 26, 2021), Uniform Standards for Tribal Consultation (December 5, 2022)	Provides standards when consulting with representatives of federally recognized Indian tribes.	Navy	Section 3.7
American Indian Traditional Resources	Treaties between the United States and Pacific Northwest Indian tribes (1854–1856)	As part of these treaties, most tribes relinquished their right to much of their territory in exchange for monetary payments and other guarantees, such as use of their aboriginal fishing, hunting, gathering, and pasturing areas throughout their ceded lands. Most treaties negotiated in the Pacific Northwest specifically established reservations and retained tribal rights to fish at off-reservation “usual and accustomed” grounds and stations.	Federal agencies	Section 3.7

Relevant Resources	*Federal, State, Local Laws, Plans; Policies, and Guidance*	*Applicability to the Proposed Action*	*Agency*	*Resource Section Number*
		The Suquamish Tribe ceded the lands at NAVBASE Kitsap-Bremerton under the Treaty of Point Elliott (1855). The Tribe's Port Madison Reservation was established, and the Tribe has reserved treaty rights. The Navy has a federal trust responsibility to protect and assist Indian tribes, based in part on their expressed reserved treaty rights.		
American Indian Traditional Resources	Presidential Memorandum, Government-to-Government Relations with Native American Governments (1994)	This Presidential Memorandum requires federal agencies, including the Navy, to consult with federally recognized tribal governments, assess the impact of federal government projects such as the proposed action on tribal trust resources, and ensure that tribal rights and concerns are considered during the development of such projects.	Federal agencies	Section 3.7
American Indian Traditional Resources	EO 13007 Indian Sacred Sites	This EO directs federal land managing agencies to accommodate access to, and ceremonial use of, Indian sacred sites by Indian religious practitioners and to avoid adversely affecting the physical integrity of such sacred sites.	Federal agencies	Section 3.7
American Indian Traditional Resources	EO 13175, Consultation and Coordination with Indian Tribal Governments (2000)	This EO requires federal agencies, including the Navy, to work with Indian tribes on a government-to-government basis to address issues concerning Indian self-government, trust resources, and tribal treaty rights.	Federal agencies	Section 3.7
American Indian Traditional Resources	Articles of the U.S. Constitution (1787)	The U.S. Constitution authorizes the President to enter into treaties (to be ratified by Congress) with Indian tribes as sovereign nations. Many Pacific Northwest Indian tribes have treaties with the United States that were executed under this authority, considered the "supreme law of the land."	U.S. President and Congress	Section 3.7

Relevant Resources	*Federal, State, Local Laws, Plans; Policies, and Guidance*	*Applicability to the Proposed Action*	*Agency*	*Resource Section Number*
American Indian Traditional Resources	DoD American Indian and Alaska Native Policy (as amended in 1999), and DoD Instruction 4710.02, DoD Interactions with Federally Recognized Tribes, which implements this policy (latest version September 24, 2018)	This policy and instruction require DoD to consult with tribes when its proposed actions may have the potential to significantly affect protected tribal resources, Indian lands, or tribal rights protected by statute, regulation, or EO, and to consider these tribal interests in a manner consistent with tribal sovereign authority.	DoD	Section 3.7
American Indian Traditional Resources	Memorandum for Deputy Chief of Naval Operations Installations and Logistics (N4) Deputy Commandant of the Marine Corps Installations and Logistics, January 17, 2025	Establishes the Navy's Tribal Liaison Program Supplemental Tribal Nation Consultation Standards and Best Practices	Navy	Section 3.7
American Indian Traditional Resources	COMNAVREGNWINST 11010.14B, Policy for Consultation with Federally Recognized American Indian and Alaska Native Tribes.	Sets forth policy, procedures, and responsibilities for consultations with federally recognized American Indian and Alaska Native tribes to the Navy Region Northwest area of responsibility.	Navy	Section 3.7
Land Use – Recreation	ESA of 1973	Environmental land use constraints are in place as part of this Act to protect endangered species.	USFWS	Section 3.8
Land Use – Recreation	Comprehensive Plan and Zoning Ordinance	Land use and zoning constraints on lands within the city limits, outside of Navy property.	City of Bremerton	Section 3.8
Land Use – Recreation	Shoreline Master Plan	Land use constraints on shorelines within the city limits, outside of Navy property.	City of Bremerton	Section 3.8
Land Use – Recreation	Comprehensive Plan	Land use constraints and recreation on lands within the County, outside of Navy property.	County of Kitsap	Section 3.8
Land Use – Recreation	DoD Directive O-2000.16, DoD Antiterrorism Program	This program outlines design requirements for inhabited buildings.	DoD	Section 3.8
Land Use – Recreation	Washington State Shoreline Management Act of 1971 – Chapter 90.58 RCW	This Act outlines constraints for shoreline land use.	Washington State Legislature	Section 3.8
Land Use – Recreation	NAVBASE Kitsap Joint Land Use Study	This Study outlines constraints for land use.	Navy	Section 3.8
Land Use – Recreation	NAVBASE Kitsap Bremerton INRMP	This Plan outlines constraints on land use and recreation.	Navy	Section 3.8

Relevant Resources	*Federal, State, Local Laws, Plans; Policies, and Guidance*	*Applicability to the Proposed Action*	*Agency*	*Resource Section Number*
Land Use – Recreation	OPNAVINST 11010.40	Establishes an encroachment management program to ensure operational maintenance that has direct bearing on land use planning on installations.	Navy	Section 3.8
Noise	Noise Control Act of 1972	The Noise Control Act of 1972 established a national policy to promote an environment for all Americans free from noise that jeopardizes their health and welfare.	Federal Government	Section 3.10
Noise	Kitsap County Code 10.28	Specifies maximum permissible environmental noise levels on lands within Kitsap County, outside of Navy property by property class type (A, B, C) and restricts allowable construction noise to 7 a.m. to 10 p.m.	Kitsap County	Section 3.10
Noise	WAC 173-60	Describes environmental noise levels appropriate for noise sensitive land uses.	Washington State	Section 3.10
Noise	City of Bremerton Municipal Code 6.32	Provides maximum permissible noise levels and restricts construction activity to 7 a.m. to 10 p.m. if activity would cause elevated noise levels on lands within the city limits. Permissible noise levels are based on the land use zones designated in the Bremerton zoning ordinance.	City of Bremerton	Section 3.10
Noise	Port Orchard Municipal Code 9.24.050	Restricts allowable construction noise on lands within the city limits to 7 a.m. to 9 p.m. Monday through Friday and 8 a.m. to 9 p.m. on Saturday, Sunday, and a list of specified holidays.	City of Port Orchard	Section 3.10
Noise; Visual Resources	NAVBASE Kitsap IAP	The IAP provides standards and guidelines for the appearance and design of buildings, site features, and landscaping. It encourages the use of gabled, ridged, or hipped roofs in most cases and prohibits the use of barn roofs. The plan also encourages additional architectural roof elements to break up the scale of larger buildings that house warehouse or industrial	NAVBASE Kitsap	Section 3.10 Section 3.9

Relevant Resources	*Federal, State, Local Laws, Plans; Policies, and Guidance*	*Applicability to the Proposed Action*	*Agency*	*Resource Section Number*
		activities and includes a recommended palette of materials to promote consistency, organized around the installation's primary building types.		
Noise; Land Use and Recreation; Visual Resources	NAVBASE Kitsap-Bremerton IDP	The NAVBASE Kitsap-Bremerton IDP recommends planning projects demolish or relocate buildings, upgrade dry docks, and construct a continuous integrated pedestrian network. The IDP also promotes planning projects that would enhance the natural and human-made environments by adhering to UFC 2-100-101, which are developed to: • Meet sustainability and energy efficiency requirements, • Promote visual order and architectural consistency, • Enhance the natural and human-made environments through consistent architectural themes and standards, and • Improve the functional aspects of the installation.	NAVBASE Kitsap	Sections 3.8; 3.9; 3.10
Noise; Land Use and Recreation; Visual Resources	NAVBASE Kitsap-Bremerton Area Development Plan	The NAVBASE Kitsap Bremerton ADP is a Navy planning document that guides installation physical development in accordance with UFC 2-100-01, Installation Master Planning, and the U.S. Navy's Installation Development Plan Consistency Guide. The ADP presents the detailed development plan for the IDP district. The ADP focuses on NAVBASE Kitsap Bremerton Waterfront Operations and Industrial Support Districts within the Controlled Industrial Use Area.	NAVBASE Kitsap	Sections 3.8; 3.9; 3.10
Noise; Public Health and Safety	OPNAVINST 5100.23G, Navy Safety and Occupational Health Program Manual	This manual outlines standards related to occupational health and safety.	Navy	Sections 3.10; 3.14

Relevant Resources	*Federal, State, Local Laws, Plans; Policies, and Guidance*	*Applicability to the Proposed Action*	*Agency*	*Resource Section Number*
Noise; Public Health and Safety	Occupational Safety and Health Act of 1970 (PL 91-596); OSHA Occupational Noise Exposure (29 CFR section 1910.95)	This Act sets forth standards for workforce safety, including occupational noise exposure limits.	OSHA	Sections 3.10; 3.14
Noise; Public Health and Safety	OPNAVINST 5530.14E, Navy Physical Security and Law Enforcement Program	This instruction identifies responsibilities and provides guidance for force protection and security within the Navy.	Navy	Sections 3.10; 3.14
Noise; Public Health and Safety	SECNAVINST 5510.30B, Department of the Navy Personnel Security Program	Establishes policy and procedures for the force protection and personnel security program.	Navy	Sections 3.10; 3.14
Noise; Public Health and Safety	Noise Control Act of 1972 (PL 92-574, 42 U.S.C. section 4901 et seq.) and Amendments of 1978 (PL 95-609)	Establishes a national policy to promote an environment for all Americans free from noise that jeopardizes their health and welfare.	EPA	Sections 3.10; 3.14
Infrastructure – Utilities	UFC 4-152-01, Design: Piers and Wharves, January 24, 2017	These criteria provide utilities design guidance for piers and wharves.	DoD	Section 3.11
Infrastructure – Utilities	UFC 4-213-10, Design: Graving Drydocks, with Change 1, September 1, 2012	These criteria provide design guidance for graving drydocks.	DoD	Section 3.11
Infrastructure – Utilities	UFC 3-580-01, Telecommunication Interior Infrastructure Planning and Design, with Change 1, June 1, 2016	These criteria provide design guidance for telecommunications design criteria.	DoD	Section 3.11
Infrastructure – Utilities	40 CFR section 240–258	This subchapter provides guidelines for solid waste management.	EPA	Section 3.11
Infrastructure – Utilities	National Pollutant Discharge Elimination System, CFR Title 40	This program enforces a permitting process for pollution discharge permits.	EPA	Section 3.11
Infrastructure – Utilities	PW6 600-01, Public Works Utilities Criteria for Design and Construction of Electrical, Sewer, and Water, April 10, 2006	Outlines criteria for utilities design criteria.	NAVFAC	Section 3.11
Infrastructure – Utilities	User Guide P-603 Utilities Infrastructure Management Manual October 2018	This manual is a guide for utilities infrastructure management.	NAVFAC	Section 3.11
Transportation	RCW Title 46 – Motor Vehicles, Chapter 46.44, Size, weight, load	Compliance to vehicular size and weight limits including required transportation permits.	Washington Department of Transportation	Section 3.12

Relevant Resources	*Federal, State, Local Laws, Plans; Policies, and Guidance*	*Applicability to the Proposed Action*	*Agency*	*Resource Section Number*
Transportation	RCW Title 46 – Motor Vehicles, Chapter 46.48, Transportation of hazardous materials	46.48.170 permits Washington State Patrol and Emergency Management Council to create additional rules consistent with 49 CFR, Parts 100-199. Chapter 46.48 does not make explicit additional rules. Project would follow federal law as it pertains to transportation of hazardous materials during construction and operation.	Washington Department of Transportation	Section 3.12
Transportation	RCW Section 46.48.175 – Rules—Penalties—Responsibility for compliance	Not applicable unless actions violate rules or regulations from RCW 46.48.170.	Washington Department of Transportation	Section 3.12
Transportation	Chapter 11.12 TRANSPORTATION DEVELOPMENT CODE, 11.12.060 TRAFFIC IMPACT ANALYSIS REPORTS:	Existing and planned traffic/LOS levels would help to identify impacts to access for alternatives and guide future improvements. For projects within the city limits, outside of Navy property, traffic impact analysis reports are required for proposed development projects when the City Engineer has reason to believe that the impact on the City's existing or planned future transportation facilities would be significant (more than 2 percent increase from baseline). The traffic impact analysis shall be prepared by a Washington Registered Professional Engineer who is qualified in traffic engineering (Ordinance 4856 Section 5 [in part], 2003).	City of Bremerton	Section 3.12
Transportation	Chapter 11.12 TRANSPORTATION DEVELOPMENT CODE, 11.12.070 TRAFFIC IMPACT MITIGATION	Requires existing LOS/traffic volumes within project area outside of base. For projects within the city limits, outside of Navy property, (a) The City Engineer shall impose conditions necessary to mitigate all impacts of traffic, circulation, and parking resulting from a project. For segments, intersections, or other	City of Bremerton	Section 3.12

Relevant Resources	*Federal, State, Local Laws, Plans; Policies, and Guidance*	*Applicability to the Proposed Action*	*Agency*	*Resource Section Number*
		portions of the street system for which a LOS standard has been adopted within the current comprehensive plan of the city, mitigation measures shall be sufficient to assure that such segments, intersections, or other portions of the street system continue to meet or exceed the adopted LOS standards after full project occupancy and operation. For segments, intersections, or other portions of the street system where the LOS is below standard, the mitigation measure shall be sufficient to maintain or exceed the present LOS. (Ordinance 4856 Section 5 [in part], 2003).		
Marine Navigation	33 CFR 334.1240 Sinclair Inlet; naval restricted areas	Provides the rules and regulations as they relate to navigation in naval restricted areas in Sinclair Inlet.	USACE	Section 3.13
Marine Navigation	CFR Title 33 – Navigation and Navigable Waters	Provides the rules and regulations as they relate to navigation and vessel movements.	USCG	Section 3.13
Marine Navigation	U.S. Coast Pilot 10, Chapter 8	Provides guidance on navigation, safety, weather, traffic control systems, and other information needed to navigate Puget Sound and interior waterways.	NOAA	Section 3.13
Public Health and Safety	USDOT Hazardous Materials Ground Transport Regulations/Hazardous Materials Transportation Act (49 CFR parts 100–185)	This Act outlines protocols governing transportation safety where hazardous materials and waste exposure are involved.	USDOT	Section 3.14
Public Health and Safety	Federal Insecticide, Fungicide, and Rodenticide Act of 1996 (7 U.S.C. section 136 et seq.)	This Act provides federal regulations for insecticides, fungicides, and rodenticides.	EPA	Section 3.14
Public Health and Safety	Federal Environmental Pesticide Control Act of 1972 (7 U.S.C. sections 136–136y)	This Act controls the sale, distribution, and application of pesticides through a registration process.	EPA	Section 3.14
Public Health and Safety	Federal Water Pollution Control Act or CWA (Sections 401 and 404; 33 U.S.C. 1251 et seq.)	This Act makes it unlawful to discharge contaminants into WOTUS.	EPA/Ecology	Section 3.14

Relevant Resources	*Federal, State, Local Laws, Plans; Policies, and Guidance*	*Applicability to the Proposed Action*	*Agency*	*Resource Section Number*
Public Health and Safety	Oil Pollution Act of 1990 (33 U.S.C. section 2701 et seq.)	Amended the CWA to include problems associated with hazardous materials and waste exposure.	EPA	Section 3.14
Public Health and Safety	Pollution Prevention Act of 1990 (42 U.S.C. sections 13101–13109)	Declares that pollution should be prevented or reduced wherever feasible.	EPA	Section 3.14
Public Health and Safety	Federal Facilities Compliance Act of 1992 (PL 102-386)	Amends the Solid Waste Disposal Act with various provisions.	EPA	Section 3.14
Public Health and Safety	Underground Storage Tank Regulations of 1988 as revised (40 CFR parts 280, 281, 282, and 283)	Outlines financial responsibility requirements for owners of underground storage tanks.	EPA	Section 3.14
Public Health and Safety	Indoor Radon Abatement Act of 1988 (15 U.S.C. section 53)	This Act seeks to eliminate radon as an indoor air pollutant.	EPA	Section 3.14
Public Health and Safety	SECNAV M-5510.36A, Department of the Navy Information Security Program	Outlines ways for the Navy to maintain a secure web presence.	Navy	Section 3.14
Public Health and Safety	Danger Zone and Restricted Area Regulations (33 CFR part 334)	Prescribes procedures for establishing, amending, and disestablishing danger zone and restricted areas.	DoD	Section 3.14
Public Health and Safety	Final Military Munitions Rule (40 CFR part 266, Subpart M)	These regulations define which military munitions are considered solid wastes.	DoD	Section 3.14
Public Health and Safety	Naval Ordnance Safety and Security Activity Instruction 8020.15E. Explosives Safety Review, Oversight, and Verification of Munitions Responses	Assigns responsibility and establishes procedures and reporting requirements to enable the Naval Ordnance Safety and Security Activity to provide effective review, oversight, and verification of the explosives safety aspects of munitions responses.	DoD	Section 3.14
Public Health and Safety	5220.22-M, National Industrial Security Program Operating Manual	Prescribes requirements, restrictions, and other safeguards that are necessary to prevent unauthorized disclosure of classified information and to control authorized disclosure of classified information released by the U.S. government.	DoD	Section 3.14
Public Health and Safety	6055.06, Fire and Emergency Services	Establishes policy, assigns responsibilities, and provides procedures for the allocation, assignment, operation, and administration of the DoD Fire and Emergency Services Program.	DoD	Section 3.14

Relevant Resources	*Federal, State, Local Laws, Plans; Policies, and Guidance*	*Applicability to the Proposed Action*	*Agency*	*Resource Section Number*
Public Health and Safety	MIL-STD-1625D(SH), DoD Standard Practice, Safety Certification Program for Drydocking Facilities and Shipbuilding Ways for U.S. Navy Ships	Establishes a safety certification program at drydocking facilities.	DoD	Section 3.14
Public Health and Safety	Toxic Substances and Disease Registry – CERCLA 42 U.S.C. sections 9601–9675; 40 CFR parts 300–311; 40 CFR part 373	This subchapter provides a comprehensive outline for environmental response, compensation, and liability concerning hazardous materials and waste exposure.	EPA, Agency for Toxic Substances and Disease Registry	Section 3.14
Public Health and Safety; Hazardous Materials and Wastes	Title 40 CFR et seq.: Protection of the Environment	EPA protects human health and the environment.	EPA	Sections 3.14; 3.15
Public Health and Safety; Hazardous Materials and Wastes	TSCA of 1976 (15 U.S.C. section 2601 et seq.; 40 CFR parts 700–723; 40 CFR parts 745–766; 40 CFR parts 790–799)	Hazardous materials and waste exposure. Requires materials with PCB concentrations above 50 mg/kg to be taken off-site and disposed of in a landfill permitted under section 3004 of RCRA (Title C landfill) or a permitted PCB disposal facility.	EPA	Sections 3.14; 3.15
Public Health and Safety; Hazardous Materials and Wastes	Emergency Planning and Community Right-to-Know Act of 1986 (42 U.S.C. section 11001 et seq.; 40 CFR parts 350–372)	Hazardous materials and wastes exposure. Helps communities plan for chemical emergencies and requires industry to report on the storage, use, and releases of hazardous substances to federal, state, and local government.	EPA	Sections 3.14; 3.15
Public Health and Safety	EO 13045, Protection of Children from Environmental Health Risks and Safety Risks	This order identifies and addresses environmental health or safety risks, specifically those that disproportionately affect the health and safety of children (vulnerable population).	EPA	Sections 3.14; 3.17
Hazardous Materials and Wastes	DoD Inst. 4715.06 – Environmental Compliance in the United States	Establishes policies, assigns responsibilities, and provides procedures for achieving and maintaining environmental compliance in the United States.	DoD	Section 3.15

Relevant Resources	*Federal, State, Local Laws, Plans; Policies, and Guidance*	*Applicability to the Proposed Action*	*Agency*	*Resource Section Number*
Hazardous Materials and Wastes	DoD Inst. 6050.05 – DoD Hazard Communication Program	Manages hazardous substances to minimize health and environmental risks and operational costs. Provides known hazard information to military personnel and civilian employees using hazardous chemicals, including engineered nanomaterials.	DoD	Section 3.15
Hazardous Materials and Wastes	10 U.S.C. section 2710 et. seq.; Title 16, Section 1531 et. seq., Chapter 38, Section 1801 et. seq.	Outlines steps to secure a given inventory of unexploded ordnance, discarded military munitions, and munitions constituents at defense sites.	DoD	Section 3.15
Hazardous Materials and Wastes	NAVSUP Pub. 573 (DLA Instruction 4145.11) – Storage and Handling of Hazardous Materials	Defines procedures for the receipt, storage, and handling of hazardous materials and wastes by DoD components, installation, and activities.	DoD	Section 3.15
Hazardous Materials and Wastes	Defense Explosives Safety Regulation 6055.09	Establishes explosives safety standards for the DoD that are designed to manage explosives-related risk associated with DoD operations and installations by providing protection criteria.	DoD	Section 3.15
Hazardous Materials and Wastes	TSCA (40 CFR sections 761.60–761.79; 761.180–761.185)	Discusses storage and disposal, and records and reports when handing PCB-contaminated materials.	EPA	Section 3.15
Hazardous Materials and Wastes	TSCA 15 U.S.C. section 2601 et seq.; Section 7; Section 402, 403, 405, and 406; 40 CFR 761	Applies to renovation and remodeling activities that create lead-based paint hazards.	EPA	Section 3.15
Hazardous Materials and Wastes	TSCA 15 U.S.C. section 2601 et seq.	Requires disposal of materials with PCB concentrations above 50 mg/kg to be taken off-site and disposed of in a landfill permitted under Section 3004 of RCRA (Title C landfill) or a permitted PCB disposal facility.	EPA	Section 3.15
Hazardous Materials and Wastes	CWA Section 401 33 U.S.C. section 1341, 40 CFR section 121.2(a)(3), (4), and (5) Water Quality Certification	Any federally authorized activity that may result in any discharge into state waters requires a Water Quality Certification.	EPA and State of Washington	Section 3.15
Hazardous Materials and Wastes	RCRA Non-Hazardous Waste – Disposal 40 CFR parts 257 and 258	Requires RCRA non-hazardous waste generated during construction activities to be disposed of in approved Subtitle D landfill.	EPA	Section 3.15

Relevant Resources	*Federal, State, Local Laws, Plans; Policies, and Guidance*	*Applicability to the Proposed Action*	*Agency*	*Resource Section Number*
Hazardous Materials and Wastes	RCRA Hazardous Waste Determination (40 CFR section 262.11, 40 CFR section 264.13 (a) and (b))	Requires generators of solid waste to determine if waste is regulated as hazardous waste under RCRA.	EPA	Section 3.15
Hazardous Materials and Wastes	RCRA Hazardous Land Disposal – Subtitle C 40 CFR parts 261, 264, and 268	Requirements that regulate classification, management, and disposal of hazardous waste. It specifies design and operation requirements for on-site temporary storage for Investigation-Derived Waste.	EPA	Section 3.15
Hazardous Materials and Wastes	National Emission Standards for Hazardous Air Pollutants (Title 40, Chapter I, Subchapter C, part 61, Subpart M)	National emission standard for asbestos activities, which includes demolition work.	EPA	Section 3.15
Hazardous Materials and Wastes	Occupational Safety and Health Standards, Toxic and Hazardous Substances, Asbestos (Title 29, Volume 6, Chapter 17, Section 1910.1001) (a through o)	Regulates occupational exposures to asbestos in all industries.	OSHA	Section 3.15
Hazardous Materials and Wastes	49 CFR part 107, sections 171.1–172.558	Regulates and ensures the safe and secure movement of hazardous materials to industry and consumers by all modes of transportation, including pipelines.	USDOT	Section 3.15
Hazardous Materials and Wastes	Hazardous Materials Transportation Act [49 U.S.C. sections 1801–1819 and 49 CFR parts 101, 106, 107, and 171–180]	Regulation of the transportation of hazardous materials.	USDOT	Section 3.15

Relevant Resources	*Federal, State, Local Laws, Plans; Policies, and Guidance*	*Applicability to the Proposed Action*	*Agency*	*Resource Section Number*
Socioeconomics	NEPA Section 101 (42 U.S.C. 433(a))	Section 101 of NEPA sets forth a national policy "to use all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans."	Federal Agencies	Section 3.16

Legend: ACHP = Advisory Council on Historic Preservation; ADP = Area Development Plan; CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act; CFR = Code of Federal Regulations; CWA = Clean Water Act; DLA = Defense Logistics Agency; DoD = Department of Defense; EFH = Essential Fish Habitat; EIS = Environmental Impact Statement; EO = Executive Order; EPA = U.S. Environmental Protection Agency; ESA = Endangered Species Act; FEMA = Federal Emergency Management Agency; FR = Federal Register; GHG = greenhouse gas; HRS = Hawaii Revised Statutes; IAP = Installation Appearance Plan; IDP = Installation Development Plan; Inst. = Instruction; INRMP = Integrated Natural Resources Management Plan; LOS = Level of Service; mg/kg = milligrams per kilogram; MMPA = Marine Mammal Protection Act; MPCD = marine pollution control device; N/A = Not Applicable; Navy = U.S. Department of the Navy; NAGPRA = Native American Graves Protection and Repatriation Act; NAVBASE = Naval Base; NAVFAC = Naval Facilities Engineering Systems Command; NAVSUP = Naval Supply Systems Command; NEPA = National Environmental Policy Act; NESHAP = National Emission Standards for Hazardous Air Pollutant; NHPA = National Historic Preservation Act; NMFS = National Marine Fisheries Service; NOAA = National Oceanic and Atmospheric Administration; OPNAVINST = Office of the Chief of Naval Operations Instruction; OSHA = Occupational Safety and Health Administration; PCB = polychlorinated biphenyl; PL = Public Law; Pub. = Publication; RCRA = Resource Conservation and Recovery Act; RCW = Revised Code of Washington; SECNAV = Secretary of the Navy; SECNAVINST = Secretary of the Navy Instructions; TSCA = Toxic Substances Control Act; U.S. = United States; U.S.C. = United States Code; UFC = Unified Facilities Criteria; UNDS = Uniform National Discharge Standards; USACE = U.S. Army Corps of Engineers; USCG = U.S. Coast Guard; USDOT = U.S. Department of Transportation; EPA = U.S. Environmental Protection Agency; USFWS = U.S. Fish and Wildlife Service; VIDA = Vessel Incidental Discharge Act; VOC = Volatile Organic Compound; WAC = Washington Administrative Code; WDFW = Washington Department of Fish and Wildlife; WOTUS = Waters of the U.S.

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APPENDIX D
Alternatives Considered but not Carried Forward

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1 Alternatives Considered but not Carried Forward for Detailed Analysis

The United States (U.S.) Department of the Navy (Navy) considered numerous alternatives to meet the purpose and need, such as alternative sites and/or Navy locations for a new multi-mission dry dock (M2D2), acquisition of a floating dry dock, and upgrading Dry Dock (DD) 6 without building a new M2D2. Potential alternatives considered but not carried forward for detailed analysis in the Environmental Impact Statement (EIS) are listed in Chapter 2 of the EIS. This appendix provides further details about why each of the alternatives were eliminated from further analysis.

The Navy only considered M2D2 designs that were large enough to accommodate the Navy's newest class of nuclear-powered aircraft carriers (CVNs) (USS Gerald R. Ford-class). The Navy did not consider alternatives to modernize or replace DD2 or DD4. As noted in EIS Table 1-1, these dry docks are sufficiently sized to perform maintenance and inactivation on current and anticipated future classes of Naval submarines and are vital to support the foreseeable workload without major modification.

1.1 Screening Factors

The Council on Environmental Quality's (CEQ's) National Environmental Policy Act (NEPA) implementing regulations provide guidance on the consideration of alternatives to a federally proposed action and require rigorous exploration and objective evaluation of reasonable alternatives. Only those alternatives determined to be reasonable and to meet the purpose and need require detailed analysis. Under the Clean Water Act Section 404 (b)(1) Guidelines, the U.S. Army Corps of Engineers (USACE), a Cooperating Agency for this EIS, is also required to evaluate alternatives to a proposed project. Under the Section 404 (b)(1) Guidelines, a practicable alternative is defined as an alternative that is available and capable of being done after taking into consideration cost, existing technology, and logistics considering the overall project purpose.

After compiling a list of potential project alternatives, the Navy conducted an initial analysis that included developing criteria to screen out alternatives that would clearly not be reasonable, practicable, or able to achieve the overall project purpose. Potential alternatives that meet the purpose and need were evaluated against the following screening factors:

- Size: Would the dry dock be adequately sized to support USS Gerald R. Ford-class CVN maintenance per Department of Defense (DoD) Unified Facilities Criteria (UFC) 4-213-10, Graving Dry Docks?
- Location: Would the dry dock location have reasonable access to an available and proficient CVN maintenance workforce and associated CVN maintenance facilities, equipment, and utilities?
- Mission: Could construction be sequenced to avoid unacceptable impacts to achieving mission requirements?
- Practicable: Would the alternative utilize proven designs, materials, and construction techniques to minimize the risk of failure?

1.2 Alternatives Eliminated from Further Analysis

1.2.1 M2D2 at DD1

In this alternative, the existing DD1, Pier 5, Pier 6, and other structures would be demolished and a new M2D2 would be built in the DD1 location. Additional facilities would be constructed to replace demolished facilities and to support the new M2D2. Two streets would be replaced with the new dry dock yard.

This alternative would unacceptably impact the Navy's ability to maintain operations at DD2 and DD3 both during and after construction. This alternative is not considered a practicable alternative because it would have unacceptable impacts to achieving mission requirements during construction, and would not meet the mission screening factor.

1.2.2 M2D2 at DD5

This alternative would expand DD5 to create a M2D2 capable of supporting all submarine and CVN classes. Existing Pier 3 to the east of DD5 would be demolished, and a new pier/wharf would be constructed adjacent to the east side of M2D2. The new pier/wharf would meet UFC requirements for a CVN repair pier and would provide a single CVN berth. Following certification of the new M2D2 at the DD5 location, the existing DD6 would be repaired and upgraded.

DD5 is currently one of the most heavily utilized dry docks at Puget Sound Naval Shipyard (PSNS) because it can accommodate all classes of submarines in service. Construction of this alternative would impact the shipyard's ability to maintain active submarines.

The existing DD5 submarine refueling/defueling complex (upgraded in 2013) is the newest in the Navy's program and is one of the shipyard's most capable dry docks. These facilities would need to be removed to convert DD5 to M2D2, significantly impacting dry dock availability for inactivation of submarines.

This alternative would modify an existing highly capable dry dock and create a shortfall in overall dry dock and pier-side capacity during the construction period. After construction was complete, this alternative would result in less submarine dry dock capacity. This alternative would have unacceptable impacts to achieving mission requirements during construction and would not meet the mission screening factor and the shipyard's ability to maintain active submarines.

1.2.3 Upgrade of DD6 to Support USS Gerald Ford-class CVNs Without Constructing a New M2D2

This alternative would complete upgrades of DD6 without constructing a new M2D2 at PSNS & Intermediate Maintenance Facility (IMF). This alternative was determined infeasible because there would be no CVN-capable dry dock to conduct required CVN work during the years DD6 would be out of service for upgrades. As stated in the EIS, PSNS & IMF is the only Navy shipyard on the west coast with a dry dock that can accommodate nuclear-powered aircraft carriers for repair and maintenance. Conducting required work at an east coast shipyard would not be practical because there is no CVN-capable dry dock on the east coast that could accommodate all of the work that would be displaced for the duration of DD6 upgrades. It would have unacceptable impacts to achieving mission requirements during construction, and would not meet the mission screening factor.

1.2.4 M2D2 West of Pier D

This alternative would create a new M2D2 capable of supporting all submarine and aircraft carrier classes on the west side of the Bremerton waterfront, west of Pier D. M2D2 would include two new

wharves along the eastern and western walls of the dry dock. Moorings E and F would be demolished to make room for the new M2D2 and wharves. A satellite Controlled Industrial Area (CIA) would be constructed around the new M2D2 due to its location, which is a significant distance away from the existing CIA.

The Mooring E/F location of the new M2D2 would be the furthest distance away from the existing CIA of any alternative. One of the major problems with the existing shipyard layout that the Shipyard Infrastructure Optimization Program (SIOP) program intends to improve is the distance traveled between the dry docks and the production maintenance shops. The distance between the two ends of the shipyard is over one mile, which creates significant time and distance challenges for the movement of vehicles, people, and material. While some production and support functions would be located close to a new M2D2 under this alternative, others would remain centralized within the CIA, even in the optimized shipyard layout. Thus, this alternative would not meet the location screening factor.

1.2.5 Floating Dry Dock

In this alternative, the Navy would acquire a new purpose-built floating dry dock, construct a new wharf to dock the floating dry dock, and dredge bottom sediments to create a sinking basin, entrance channels, and adequate draft at wharves and piers.

The Navy does not currently possess any floating dry docks that could support a CVN and acquiring a floating dry dock of this scope and scale would include significant technical, operational, and cost risks. Shipyard operations within a floating dry dock would be significantly different than operating in the other graving dry docks, and would not meet the practicable screening factor.

1.2.6 M2D2 at Naval Base Coronado, San Diego

In this alternative, the Navy would build a new M2D2 at Naval Base Coronado, San Diego, California, upgrade utility distribution systems, and relocate displaced buildings and functions. M2D2 would be operated by PSNS & IMF workforce temporarily assigned to Naval Base Coronado. After M2D2 completion, the Navy would seismically upgrade DD6 at PSNS & IMF.

This alternative would not meet the location screening factor because Naval Base Coronado does not have a nuclear-capable CVN-proficient workforce, facilities, and equipment, resulting in an alternative that would be significantly more costly than the alternatives located at PSNS & IMF.

1.2.7 M2D2 at Naval Station Pearl Harbor

In this alternative, the Navy would upgrade DD4 at Naval Station Pearl Harbor to support USS Gerald R. Ford-class CVNs, upgrade utility distribution systems, and relocate displaced buildings and functions. M2D2 would be operated by PSNS & IMF workforce temporarily assigned to Naval Station Pearl Harbor. After M2D2 completion, the Navy would seismically upgrade DD6 at PSNS & IMF.

This alternative would not meet the location screening factor because Naval Station Pearl Harbor does not have a nuclear-capable CVN-proficient workforce, facilities, and equipment, resulting in an alternative that would be significantly more costly than the alternatives located at PSNS & IMF.

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APPENDIX E
Reserved for Future Appendix

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APPENDIX F
Compensatory Mitigation

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Appendix F
Compensatory Mitigation

1 Introduction

The Navy has identified three potential mitigation actions for permittee-responsible compensatory mitigation that could be used to offset nearshore aquatic and marine riparian impacts associated with the proposed Bremerton Waterfront Infrastructure Improvements (Proposed Action) (Figure 1):

- Restoration of Keyport Lagoon at Naval Base (NAVBASE) Kitsap-Keyport
- Removal of Jackson Park Pier at the Jackson Park Housing Complex in Bremerton
- Shoreline Restoration of the Evergreen Rotary Park in Bremerton

The three mitigation actions are located within the East Kitsap Watershed, which is the portion of Kitsap County Water Resource Inventory Area (WRIA) 15 that flows to the Puget Sound. All three locations are in the same WRIA as the Proposed Action. Evergreen Rotary Park is the closest to the Proposed Action site (approximately 1 mile away), then Jackson Park Pier (3 miles), then Keyport Lagoon (9 miles).

Potential aquatic impacts from the Proposed Action include changes to water quality, physical removal or alteration of shoreline habitat, and changes in estuarine circulation and currents. The Navy anticipates that all three of these mitigation actions may be required to offset impacts.

For each proposed action, this appendix presents an environmental analysis of the potential impacts due to construction of the mitigation actions and potential impacts after completion of the mitigation actions.

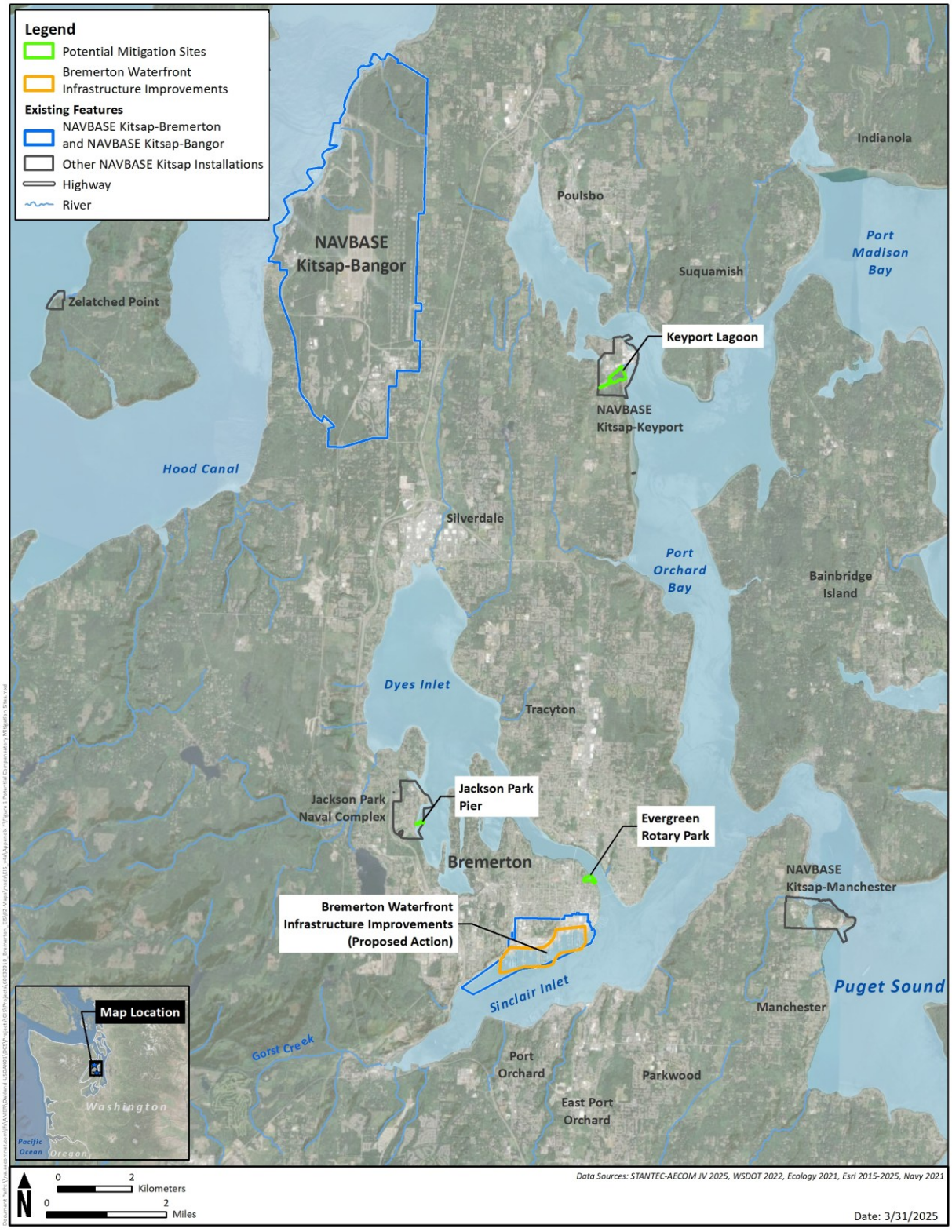

Figure 1 Location of Proposed Permittee-Responsible Mitigation Actions

1.1 Keyport Lagoon Restoration

1.1.1 Site Description

Keyport Lagoon is a shallow 24-acre brackish water body connected to Liberty Bay/Port Orchard Passage. It is in the southeast part of NAVBASE Kitsap-Keyport on the central Kitsap Peninsula approximately 9 miles north of the Puget Sound Naval Shipyard. C Street crosses a sand spit/causeway that separates the Lagoon from Liberty Bay/Port Orchard Passage. Freshwater input to the Lagoon occurs primarily from two perennial streams flowing through freshwater wetlands at its west end. There is a park on the north shore, but there is no public access to the Lagoon. The Navy uses the Lagoon for recreational boating.

Prior to construction of a causeway, bridge, and spillway across the approximately 200-foot-wide (61-meter-wide) mouth of the Lagoon (circa 1960), this site was a natural pocket estuary protected by a long sand spit but fully open to tidal exchange with Liberty Bay/Port Orchard Passage (Figure 2, Figure 3). Pocket estuaries are a unique and threatened habitat in Puget Sound. Although small in area, they can provide significant functions that outweigh their geographic scope. Keyport Lagoon historically experienced wide tidal fluctuations of at least 15 feet, facilitated by a network of dendritic tidal channels. These channels provided important habitat for native fish, especially juvenile salmonids, and other marine organisms. The tidal exchange contributed to an expansive and dynamic range of habitats constituted by differences in sediment types, flooding depths and frequencies, vegetation structure, and water quality characteristics.

1.1.2 Site History and Restoration Need

Prior to European contact, the Keyport Peninsula, adjacent to the Lagoon, was the location of a large Suquamish longhouse village (Jones and Chidley 2013), and the area is within the usual and accustomed (U&A) fishing grounds and stations of the Suquamish Tribe. Two pre-contact archaeological sites have been found in the vicinity (Jones and Chidley 2013). Acquisition of Keyport Lagoon and surrounding property by the Navy began in 1913. Numerous structures have been built near the north Lagoon shore, including manufacturing facilities at NAVBASE Kitsap-Keyport, and antenna tower foundations (from the former radio station) within the Lagoon.

Stormwater discharges into the Lagoon. Contaminated Lagoon sediment originated from watershed developments are a concern, especially with potential mobilization after tidal exchange restoration.

Currently, tidal connectivity is limited except during higher spring tides (greater than +11.5 feet mean lower low water [MLLW]) (Thom et al. 2010). Lagoon drainage is minimal at low tide. Water levels do not fluctuate substantially from the elevation of the concrete spillway (+10.5 feet above MLLW). Based on previous shoreline investigations, the water level typically does not rise more than 0.3 feet (0.09 meter) above the spillway elevation, even during periods of high tides (NAVFAC NW 2008). Freshwater entering the Lagoon through streams or as groundwater maintains a near-constant water level.

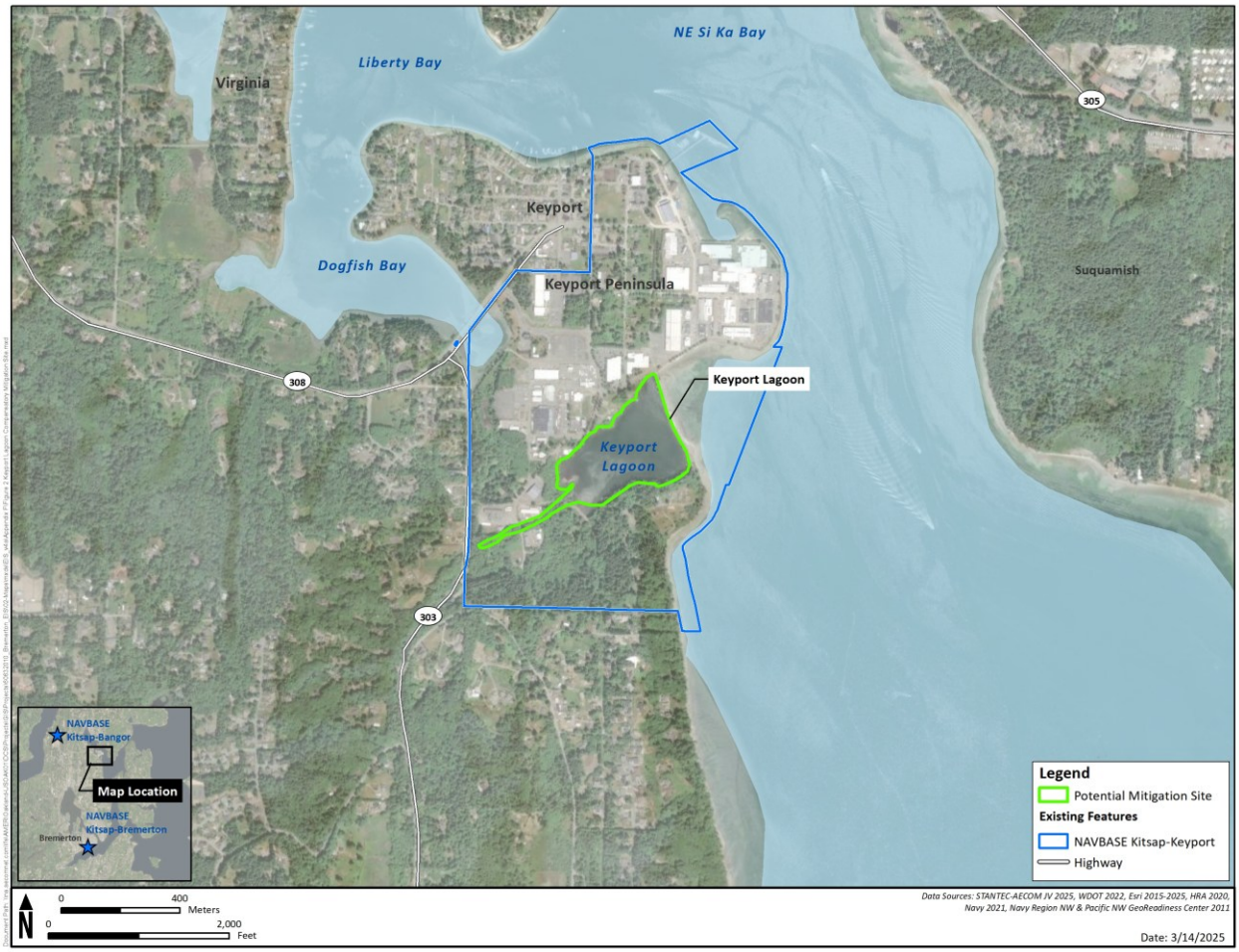

Figure 2 Location of Keyport Lagoon

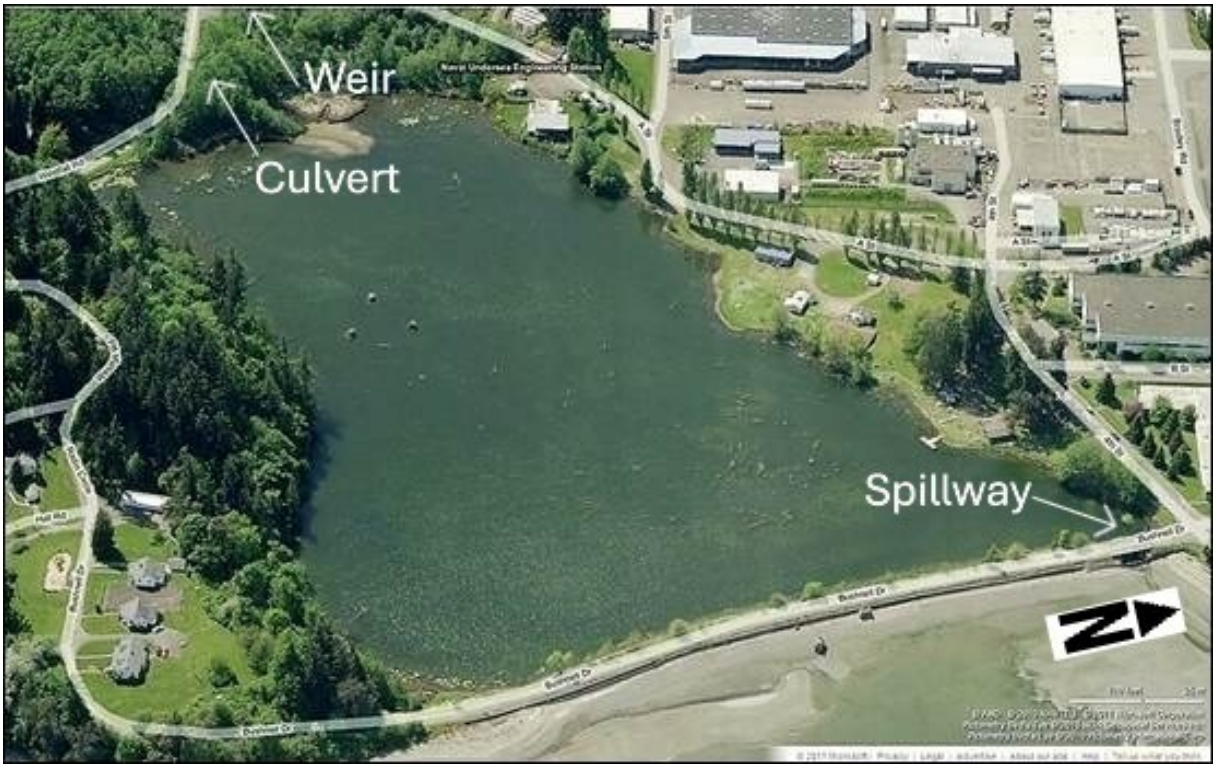

Figure 3 Oblique Aerial Photo of Keyport Lagoon in 2011

Construction of blockages (including a spillway at the Lagoon mouth, a failed culvert near the mouth of Keyport Creek, and a concrete weir upstream of the culvert) limits fish passage and tidal exchange, which has transformed a once dynamic intertidal habitat of mudflats, salt marsh, and tidal channels into a brackish pond. Development within the watershed has resulted in a reduction of the marine riparian area. Restoring a natural tidal regime to the Keyport Lagoon was listed as a priority action item in the WRIA 15 (East Kitsap) Limiting Factors Report (Haring 2000).

Combined with the loss of marine riparian area and watershed development, fundamental changes to nearshore ecosystem processes, composition, structure, and function, include:

- Decreased tidal channel network complexity
- Reduced sediment transport/flushing
- Reduced organic matter production and transport
- Restricted fish and aquatic organism access and loss of habitat, especially for juvenile salmonids (e.g., Chinook, chum, coho, steelhead), forage and flatfish, and crustaceans (e.g., Dungeness crab, bay shrimp)
- Reduced water quality (lower salinity, reduced dissolved oxygen, algae blooms, excess nutrient loading, elevated water temperatures)
- Altered sediment characteristics (contaminated sediment)
- Loss of salt marsh vegetation due to transition from salt tolerant plant dominance to freshwater and brackish marsh plant dominance
- Loss of buffer functions including shading, recruitment of woody debris, and screening

1.1.3 Proposed Mitigation

The Navy proposes to restore key biological and physical function to the 24-acre Lagoon.

The Navy proposed Keyport Lagoon restoration in 2008 as potential mitigation for the construction of a new pier at Puget Sound Naval Shipyard in Bremerton. A stakeholder group formed in 2009 to develop approaches that would maximize ecosystem benefits and address uncertainties, such as ecological risks associated with sediment quality and its remobilization. Sediment sampling was conducted within Keyport Lagoon in July 2011 (Anchor QEA 2011). Of the 33 surface sediment samples, three exceeded Washington Sediment Quality Standards (SQS): one for PCBs, one for zinc, and one for bis(2-ethylhexyl)phthalate. Four surface samples were also tested for and found to contain dioxins and furans. The 2011 sediment characterization investigation was a preliminary sediment investigation and serves as an indicator of chemicals of concern in the Keyport Lagoon. Further investigation is necessary to characterize the sediment in order to determine the specifics of the restoration construction, including Lagoon dredging details, prior to restoring tidal flushing.

The proposed mitigation plan would maximize tidal exchange restoration and includes:

- Demolition and removal of the existing bridge, 30-foot-wide (9-meter-wide) concrete spillway, and bridge foundation at the mouth of the Lagoon
- Removal of concrete antenna tower footings
- Construction of a new single-span 80-foot-wide (24-meter-wide) bridge with footings located closer to the original Lagoon mouth
- Excavation of a new tidal channel under the bridge to match the bottom elevation of the Lagoon
- Removal of sediment (unsuitable and suitable for open water disposal) as determined by future studies
- Replacement of a failed culvert near the mouth of Keyport Creek and demolishing an existing concrete weir located upstream of the culvert crossing; both structures currently block nearly all fish passage; culvert replacement could open up an estimated 1,400 linear feet of the Creek
- Monitoring of near shore processes and adaptive management to address restoration uncertainties inherent to variable and dynamic estuarine systems

Aside from mobilization of contaminated sediment, other challenges associated with restoration (and its success and sustainability) include:

- Tidal channel formation and tidal exchange may not respond as predicted by modeling due to natural variability or natural hazard-related factors (e.g., sea level rise)
- Erosion and sedimentation (e.g., from wave energy or watershed sources) could impact shoreline of picnic area
- Contaminated surface water (e.g., stormwater) and groundwater entering the Lagoon
- Potential mobilization of contaminated sediment
- Spread of aquatic invasive species
- Noise and other disturbances in adjacent area

While these challenges with restoration exist, implementation of best management practices (BMPs), monitoring, and adaptive management would be implemented to address them.

1.1.4 Ecological Benefits

Approximately 26 acres of estuarine habitats would be restored, including over 16 acres of tidal channel habitat, 3 acres of salt marsh, and at least 1,400 linear feet of Keyport Creek. The ecological benefits and net functional lift of this mitigation action would likely be substantial and include:

- Restored sediment dynamics
- Improved sediment quality (assuming removal of contaminated sediment and natural flushing)
- Improved water temperature, salinity, dissolved oxygen, and nutrient status
- Transition of wetland vegetation toward native estuarine salt marsh in restored Lagoon, with increased species richness, structural complexity, and extent of salt marsh
- Improved production and transport of organic matter
- Increased aquatic habitat extent for a range of fish and invertebrates associated with pocket estuaries
- Significant improvement of fish and aquatic organism access to quality habitat
- Significant improvement of feeding and refuge habitat for juvenile salmonids and migrating salmon, including Endangered Species Act (ESA)-listed Puget Sound Chinook salmon

1.2 Environmental Analysis of Restoration of Keyport Lagoon

1.2.1 Air Quality

Restoration of Keyport Lagoon would not impact air quality in the long term. The proposed mitigation action would not result in long-term emissions of greenhouse gases (GHGs), criteria pollutants or hazardous air pollutants. Kitsap County is currently in attainment with United States Environmental Protection Agency (EPA) air quality standards (EPA 2023).

During construction, operation of heavy machinery and an increase in truck traffic would have temporary adverse impacts to air quality. Excavation and grading activities have the potential to generate dust (though this is unlikely unless the Lagoon is isolated from stormwater and tidal interaction during construction). Construction BMPs would be employed to minimize these potential impacts. All construction contractors would also be required to follow all local, state, and federal air quality regulations. Thus, no long-term air quality impacts are anticipated as a result of this mitigation action.

1.2.2 Water Resources

1.2.2.1 Water Quality

No long-term adverse impacts to water quality are expected from the restoration of Keyport Lagoon.

Water quality in the Lagoon is currently degraded. Increasing tidal exchange between Keyport Lagoon and Liberty Bay is likely to improve water quality in the Lagoon, including increases in dissolved oxygen, reduction in nutrient loading and algal blooms, and reduction in water temperatures. Removal of contaminated sediment is also anticipated to have a long-term beneficial impact on water quality.

Dredging and excavation may cause a temporary increase in turbidity within the Lagoon. Operation of heavy machinery during construction could result in minor releases of fuel, oil and lubricants. Dredging of contaminated sediment has the potential to mobilize contaminants and further degrade water quality (unless the Lagoon is isolated from adjacent marine waters). Construction BMPs would be implemented

during in-water work to minimize these potential impacts, and any short-term adverse impacts would be outweighed by the long-term water quality benefits associated with the mitigation action.

1.2.2.2 Surface Water and Groundwater

The proposed mitigation would have a beneficial impact on surface water flow conditions.

The concrete spillway currently restricts tidal exchange between the Lagoon and Liberty Bay/Port Orchard Passage and has changed the natural pocket estuary into a brackish pond. Removal of the concrete spillway and construction of a new channel would increase tidal exchange between the Lagoon and Liberty Bay, restoring surface water flow to more natural, pre-disturbance conditions. Impacts to groundwater would likely be minimal.

Freshwater input to the Lagoon is primarily through Keyport Creek and one unnamed perennial stream that flow through freshwater wetlands at the upper (west) end of the Lagoon. Stormwater from developed areas north of the Lagoon also discharges to the Lagoon through 19 outfalls. These inputs are unlikely to be impacted from the proposed action.

Excavation of a new tidal channel would modify surface water in the long term. In the long term, a beneficial impact to surface water conditions is expected from the restoration activities.

1.2.3 Geological Resources

With removal of the concrete spillway and construction of a new channel, tidal exchange between the Lagoon and Liberty Bay/Port Orchard Passage would be restored close to pre-disturbance conditions. This would result in restoration of sediment dynamics, including natural sedimentation and erosion, with expected improvements to sediment quality. The expanded opening of the bridge would increase the potential for shoreline erosion. Fully restoring sediment dynamics may require deepening or creating primary tidal channel(s) to maximize tidal prism. This would also improve sediment quality through increased natural flushing of sediment with improved tidal exchange.

Temporary impacts to soil and sediment could occur during demolition and construction. Ground- and sediment-disturbing activities including demolition and removal of the existing bridge, concrete spillway, and bridge foundation, removal of the concrete antennae foundations, construction of the new bridge, construction of a new tidal channel and replacement of the failed culvert could have temporary potential impacts on sedimentation and soil at the site, including increased erosion and soil loss. Dredging of contaminated sediment could also increase the potential for erosion and mobilization of contaminated sediment. Construction BMPs would be implemented to minimize these potential impacts.

Dredged material would be sampled and disposed of at an approved disposal facility. Dredged material would be dewatered as necessary to meet the disposal facility's acceptance criteria. Decanted water would be treated (at minimum) and discharged in accordance with the project's water quality certification and National Pollutant Discharge Elimination System permit. Removal of contaminated sediment would improve sediment quality, providing a beneficial impact in the long term.

1.2.4 Biological Resources

1.2.4.1 Vegetation

1.2.4.1.1 Shoreline Vegetation

There is limited wetland vegetation present around the Lagoon's shoreline, with the exception of a patch of emergent and riparian wetland at the southwestern corner of the Lagoon (Navy 2018).

Construction impacts could temporarily impact vegetation through activity such as increased foot and vehicle traffic, dredging and excavation, soil compaction, and burial. Construction BMPs would be implemented to minimize these impacts.

Post construction, long term changes in vegetation associated with the mitigation action would be beneficial. Wetland vegetation over time would trend toward native estuarine salt marsh, which is a limited habitat within the watershed. Species richness would increase, and vegetation structure would become more diverse due to a wider range in salinity and flooding depths and frequencies. Salt marsh habitat would expand by approximately 1.7 acres due to expanded tidal influence. Freshwater wetlands would remain where stream flooding and groundwater are primary hydrology sources. Riparian and upland vegetation would also be likely to benefit from the improved water and sediment quality and the increased diversity of the habitat.

1.2.4.1.2 Aquatic Vegetation

Based on data from the Washington Marine Vegetation Atlas (Washington State Department of Natural Resources [WDNR] 2024), eelgrass was observed in Keyport Lagoon during herring spawning vegetation surveys occurring between 1975 and 1989. No eelgrass, surfgrass, or seagrass were documented at the site during any of the other survey results incorporated into the Vegetation Atlas. The Puget Sound Eelgrass Monitoring Data Viewer (WDNR 2023) identifies the long-term trend for the area as "no Seagrass." Green macroalgae (*Ulva sp*.) is mapped as occurring at the site (WDNR 2023).

If any aquatic vegetation is present currently, it could be temporarily impacted by dredging and excavation activities. It is unknown whether there is potential for eelgrass or other aquatic vegetation to colonize the restored area, although eelgrass is present east and south of the Lagoon. Mitigation actions to restore the natural tidal regime and improve water quality would likely improve conditions for native aquatic vegetation that could facilitate future colonization.

1.2.4.2 Fish and Wildlife

The proposed restoration of Keyport Lagoon is expected to have long-term beneficial impacts to fish and wildlife. Removal of the concrete antenna foundations would increase the total area of habitat available.

Restored tidal exchange would likely increase habitat value for native fish and other marine organisms, especially juvenile salmonids. It would also diversify the range of habitats and increase fish and aquatic organism access to the habitats. Feeding and refuge habitat for juvenile salmonids would likely improve significantly.

The improvement in water quality from increased tidal exchange would benefit salmonids, aquatic invertebrates, and other native marine nearshore organisms. Aquatic habitat area would increase in locations with restored tidal exchange.

Fish and aquatic organism access would improve with removal of the concrete spillway at the mouth of the Lagoon. Replacement of the failed culvert would open up an estimated 1,400 linear feet of Keyport Creek to utilization by anadromous fish.

Habitat for a range of other fish and invertebrates typically associated with pocket estuaries would improve, most notably the nursery functions of these habitats would improve for important invertebrates such as Dungeness crab and bay shrimp; anadromous fish such as Chinook salmon, coho salmon, and steelhead trout; and species of forage fish, flatfish, and rockfish (Hughes et al. 2014). This would also be a long-term beneficial impact to marine mammals and birds, as many of these species are potential prey. Major functions of pocket estuaries include provision of food to juveniles leading to enhanced growth rates and provision of refuge from environmental stress and predation.

Temporary adverse impacts such as noise and temporary increases in turbidity could occur to wildlife including marine mammals, fish, birds and aquatic invertebrates during construction activities, including demolition, construction, and dredging. Construction BMPs would be implemented to minimize impacts to wildlife and fish. Any potential adverse impacts from construction would be temporary and outweighed by the long-term benefits of the mitigation action.

1.2.4.3 Threatened and Endangered Species

ESA consultation with National Marine Fisheries Service (NMFS) and United States (U.S.) Fish and Wildlife Service (USFWS) would be required prior to mitigation activities.

The following federally listed threatened species may be present within the vicinity of the mitigation action site:

- Bull trout (*Salvelinus confluentus*) Coterminous U.S. Distinct Population Segment (DPS), Coastal Recovery Unit
- Marbled murrelet (*Brachyramphus marmoratus*)
- Chinook salmon (*Oncorhynchus tshawytscha*), Puget Sound Evolutionarily Significant Unit (ESU)
- Steelhead (*Oncorhynchus mykiss*), Puget Sound DPS
- Bocaccio rockfish (*Sebastes paucispinis*), Puget Sound/Georgia Basin DPS
- Yelloweye rockfish (*Sebastes ruberrimus*) Puget Sound/Georgia Basin DPS
- Humpback whale (*Megaptera novaeangliae*), Mexico DPS and Central America DPS
- Killer whale (*Orcinus orca*), Southern Resident DPS

Due to limited tidal exchange, none of these species are likely to be present within the Lagoon during implementation of the restoration action, but could be affected by the construction if there are water quality or noise impacts to the waters of Puget Sound east of the Lagoon.

Any in-water work would be conducted during the NMFS--approved in-water work window (July 16–February 15), and construction BMPs would be implemented to minimize potential impacts to ESA-listed species and juvenile salmonids. BMPs would also be employed to minimize noise or other construction-related disturbances.

The long-term effects of this restoration to ESA-listed species are expected to be beneficial through the improvement of intertidal and subtidal habitat within the restored pocket estuary, which would support the productivity of prey species and provide increased forage for listed species (Hughes et al. 2014).

1.2.5 Cultural Resources

The Washington Information System for Archaeological and Architectural Resources Data (WISAARD) predictive model shows the project area as having "very high risk" for archaeological resources, and a survey is "highly advised." An archaeological survey (Jones and Chidley 2013) identified two archaeological sites in the vicinity. The Navy has an Inadvertent Discovery Plan for NAVBASE Kitsap (Navy 2023). A project-specific cultural resources monitoring plan would be prepared, and monitoring conducted during construction.

A cultural resources survey of the project area conducted in 2025 involved pedestrian survey with limited subsurface investigation and architectural survey of 16 resources. No historic properties were identified. One archaeological site, HEG-01 was recorded and recommended as not eligible for the NRHP. All 16 architectural resources were recommended not eligible for the NRHP. The report recommended that the proposed action at Keyport Lagoon would have no effect on historic properties (WSM Pacific 2025).The Navy will evaluate this action as part of its Section 106 consultation under the National Historic Preservation Act.

1.2.6 American Indian Traditional Resources

Keyport Lagoon is within the U&A fishing grounds and stations of the Suquamish Tribe.

Construction activities could temporarily impact tribal access to traditional resources.

After construction, the improved ecological function of the Lagoon could benefit tribal traditional resources.

1.2.7 Land Use and Recreation

The Navy acquired Keyport Lagoon and the surrounding property beginning in 1913. NAVBASE Kitsap-Keyport has been used for the manufacture and testing of various undersea warfare weapons.

The Lagoon is currently used for recreational paddling and boating by Navy employees and NAVBASE Kitsap residents; there is no public access to the Lagoon. There is a large park along the north shoreline, with a gazebo and numerous picnic tables. The park is used during seasonal events at the base. The waters of adjacent Port Orchard Passage are part of the Kitsap Peninsula National Water Trail, which was included in the Department of Interior's National Water Trails Systems. Port of Keyport and the Keyport Saltwater Park are two access points to the water trail.

There would be a temporary disturbance of recreational use during construction. Recreational use of the site would be altered after construction because the waterbody would be changed from a brackish pond to an active estuary.

Previous modeling identified areas along the north shore of the Lagoon that would be exposed to periodic inundation and erosion once full tidal exchange is restored (Anchor QEA 2011). Flooding from high tides could be compounded by increased wave energy within the Lagoon. Although beneficial from an ecological perspective, the flooding and bank erosion could impact infrastructure at NAVBASE Kitsap-Keyport, including operational buildings near the northwest corner of the Lagoon and recreational buildings and facilities in park areas along the northern shoreline. Contingencies may include providing shoreline protection near sensitive areas and/or raising or moving potentially impacted structures.

The Keyport Lagoon mitigation action would be identified in the update to the NAVBASE Kitsap Integrated Natural Resources Management Plan (INRMP; Navy 2018). This INRMP outlines a strategy for

sustaining biodiversity and the ecosystems of Keyport as well as complying with applicable regulations, while meeting the needs of the military mission. The INRMP is managed by the NAVBASE Kitsap environmental staff. The INRMP would document restrictions on any future activities or development of the site, in accordance with U.S. Army Corps of Engineers (USACE) permit conditions.

This approach of including mitigation site protections in an updated base management plan is consistent with the federal Mitigation Rule (USACE and EPA 2008), which states that for government property, "long-term protection may be provided through federal facility management plans or integrated natural resources management plans."

In addition, the Navy would prepare a coastal consistency determination per the Coastal Zone Management Act (CZMA). When the Navy's Proposed Action may have affects to any land or water use or natural resource of the coastal zone, the action shall be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of the Washington State Coastal Zone Management Program.

1.2.8 Visual Resources

The proposed restoration of Keyport Lagoon would alter visual resources. Removal of the existing bridge, concrete spillway and bridge foundation, and construction of the new, longer bridge would result in views consistent with the existing site, which already includes a road and a bridge. The new bridge structure would be located closer to the original mouth of the Lagoon.

The presence of construction equipment would temporarily impact visual resources during construction.

The completed action would transform the isolated brackish pond into an active pocket estuary, more closely resembling the natural, pre-development visual condition of the Lagoon area.

1.2.9 Noise

Restoration of Keyport Lagoon is not likely to cause any appreciable increase in long term noise above existing conditions.

Excavation, dredging, and other construction activities would generate temporary noise that may be perceptible in surrounding areas. Noise impacts would continue throughout the construction duration. BMPs would be implemented to minimize noise disturbance, including use of effective muffler systems and placement of stationary noise-generating construction equipment, such as air compressors and portable power generators, as far as practical from existing noise sensitive land uses.

Post construction, noise levels are likely to be similar to existing conditions.

1.2.10 Utilities and Infrastructure

Restoration of Keyport Lagoon is not likely to have an adverse impact on utilities. If construction activities take place near a structure, the restoration activities may cause a temporary disruption to utilities in that location. However, long-term impacts to utilities are not anticipated.

Previous hydrodynamic modeling identified areas along the north shore of the Lagoon that would be exposed to periodic inundation and erosion once full tidal exchange is restored (Anchor QEA 2011). Flooding from high tides could be compounded by increased wave energy within the Lagoon. Although beneficial from an ecological perspective, the flooding and bank erosion could impact infrastructure at NAVBASE Kitsap-Keyport, including operational buildings near the northwest corner of the Lagoon and

recreational buildings and facilities in park areas along the northern shoreline. Contingencies may include providing shoreline protection near sensitive areas and/or raising or moving potentially impacted structures.

1.2.11 Transportation

During removal of dredged and excavated sediment and other construction activities, there would be short-term impacts to local traffic from an increase in truck traffic.

The amount of sediment to be dredged is not yet known. The maximum anticipated amount of contaminated sediment to be removed would be the surface 2 feet (0.60 meter) of sediment over the entire 24-acre Lagoon. This would generate approximately 2,900 cubic yards of material to be hauled off by truck.

The new bridge would restore emergency vehicle access from the north side of the Lagoon to the housing area on the south side of the Lagoon.

1.2.12 Marine Navigation

Impacts to marine navigation from the restoration of the Keyport Lagoon would include slight bathymetry changes on the east side of the new bridge and potential removal of antenna foundations east of the existing causeway. Removing the spillway and widening the bridge would allow increased accessibility to the marine environment from the base to the Puget Sound. However, post-construction navigation within the Lagoon would be limited based on tidal cycles whereas at present, the water depth remains relatively constant.

1.2.13 Public Health and Safety

A beneficial impact to public health and safety from the proposed mitigation action would be restoration of emergency vehicle access across the new bridge from the north side of the Lagoon to the housing area on the south side of the Lagoon.

There could be a slight increase in health and safety hazard potential associated with construction activity due to the presence of heavy equipment and machinery on-site. There is no public access to the proposed mitigation action site. BMPs such as fences and signs would be used to prevent worksite access by base residents and employees. All applicable federal and state regulations for demolition and construction would be implemented, including construction safety BMPs and preparation of a construction site safety plan.

1.2.14 Hazardous Materials and Wastes

Based on past sample collection and analysis, results indicate hazardous waste is not expected to be generated as a result of this mitigation action.

Nineteen outfalls discharge stormwater into the Lagoon. Given the presence of contaminated sediment in the immediate watershed, characterization of sediment and potential mobilization of contaminants have been concerns associated with restoration of tidal exchange.

Numerous contaminants have been detected in sediment samples in recent decades. Further investigation would be necessary to characterize the sediment that could be flushed out (or dredged so it would not be flushed out) when the concrete spillway is removed and the Lagoon is subject to

complete tidal flushing, and to characterize what the surface sediment would be after either flushing or dredging.

Dredging of contaminated sediments could increase the potential for mobilization of contaminants. Construction BMPs would be implemented to minimize these potential impacts.

Dredged material would be sampled and based on laboratory analytical results demonstrating compliance with an approved disposal facility's acceptance criterion, disposed of. Dredged material would be dewatered as necessary to meet the disposal facility's acceptance criteria. Decanted water would be treated (at minimum) and discharged in accordance with the project's water quality certification and National Pollutant Discharge Elimination System permit.

In the long term, removal of contaminated sediment would improve surface sediment quality and surface water quality and reduce ecological risk.

1.2.15 Socioeconomics

Construction- and restoration-related hiring/spending could have short-term beneficial impacts to socioeconomics within the area.

Restoration of the lagoon would increase opportunities for salmonids to forage, rear, and avoid predators, and may result in higher survival rates for commercially/recreationally important salmonids, as well as an increase in returning adults that would be available for harvest by tribal and state commercial fishermen, as well as recreationists, in the surrounding area. More fish could provide more income for fishermen, more fish for tribal subsistence, and more spending by recreationists.

1.3 Jackson Park Pier Removal

1.3.1 Site Description

Jackson Park Pier is a 600-foot-long (183-meter-long) concrete pier in Ostrich Bay (Dyes Inlet), adjacent to the Jackson Park Housing Complex within the City of Bremerton (Figure 1, Figure 4). The Navy owns Jackson Park Pier and surrounding tidelands, which are part of NAVBASE Kitsap and are also accessible to the public. The pier is no longer used due to its deteriorating condition. The pier covers approximately 32,000 square feet (0.7 acre) of intertidal and shallow subtidal waters, with approximately two-thirds of the areal coverage over subtidal waters. There is a dense system of 500 supporting concrete piles (Figure 5). Bathymetry around the pier reflects previous dredging efforts by the Navy. In contrast to adjacent undisturbed bottom profiles which have gradual slopes, there are steep drop-offs on either side of the pier beginning approximately 300 feet offshore. Substrates are small gravel and coarse sand in intertidal zones, with fine sand and silt at deeper depths.

Ostrich Bay is shallow, with depths less than 35 feet. The bay locally supports higher quality intertidal, subtidal, tidal fringe, and adjacent freshwater habitats. A survey of undeveloped intertidal and shallow subtidal approximately 0.5 mile (0.8 kilometer) north of the Jackson Park Pier found patches of both red and green macroalgae species (e.g., seaweed, sea lettuce, green string lettuce) of variable density within the middle intertidal zone, and patchy eelgrass (URS 2007). Twenty-seven species of marine invertebrates (e.g., crab, clam, oyster, mussel, barnacle, sand dollar, shrimp, sea cucumber, marine worm species) and 16 fish species were observed, including abundant juvenile chum salmon and other salmonids (URS 2007). The most recent (2023) survey of submerged aquatic vegetation documented several patches of macroalgae in the vicinity of the pier, including one patch immediately south of the

pier (Navy 2024). Research shows that shading, habitat displacement, and bottom modification associated with large overwater structures such as Jackson Park Pier likely contribute to loss or decreased productivity of native aquatic vegetation, macroalgae, and other benthic species that support nearshore food webs and salmonid populations.

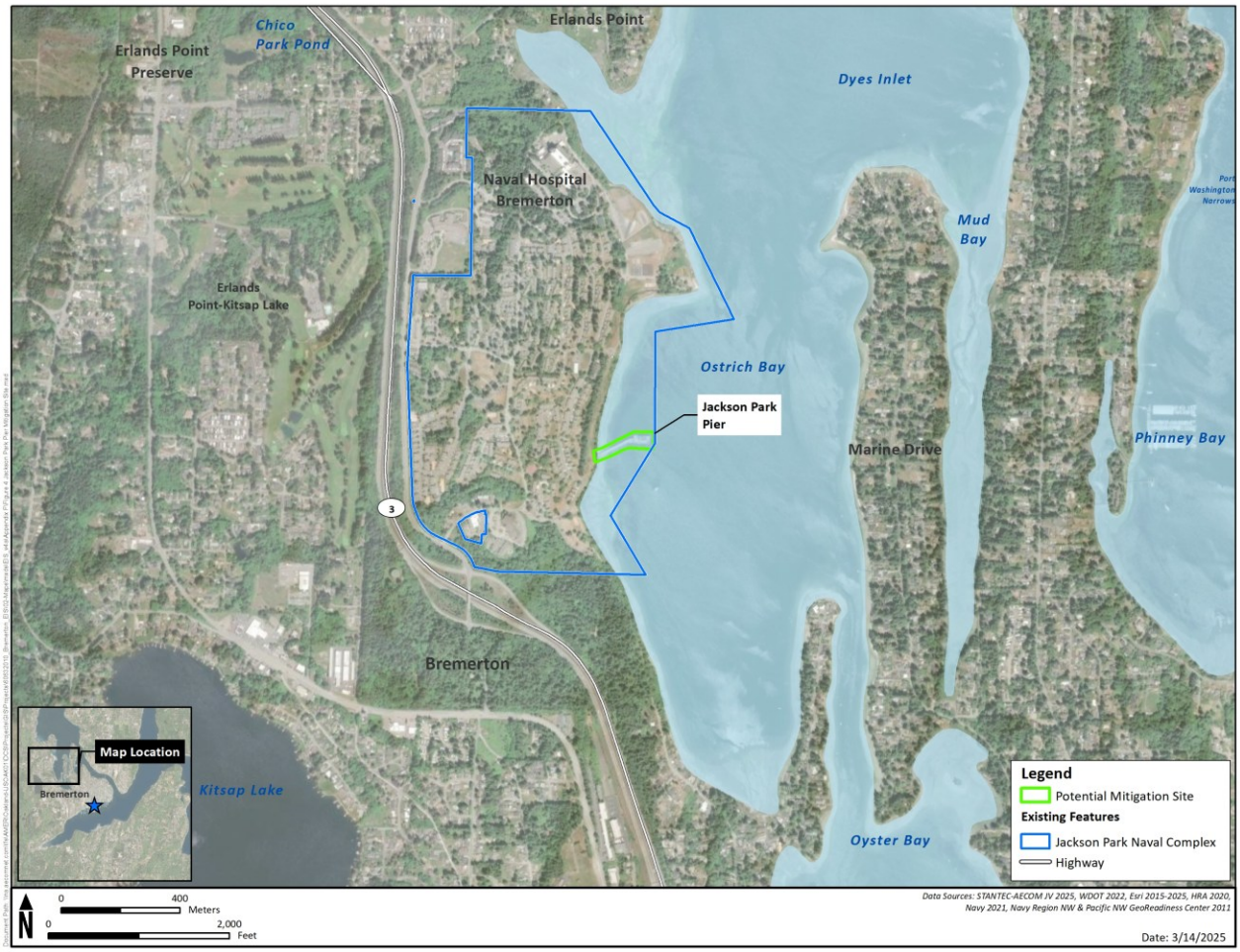

Figure 4 Location of Jackson Park Pier

Figure 5 Photo of Jackson Park Pier and Shoreline

1.3.2 Site History and Restoration Need

Ostrich Bay is within the homelands of the Suquamish people, who harvested fish and shellfish from its rich waters and tributary streams. There is a known pre-contact archaeological site (45KP00116) in close proximity to Jackson Park, but outside of the project area (Department of Archaeology and Historic Preservation [DAHP] 2024). Estuarine wetlands provided abundant plant resources. This area is within the tribe's U&A fishing grounds and stations. The Suquamish Tribe is supportive of pier removal and habitat restoration in the bay. The United States government acquired uplands adjacent to the pier site in 1904 and the Navy constructed Jackson Park Pier in 1943. This and an adjacent (now demolished) pier were used for loading and unloading munitions and other materials from barges at the former Naval Ammunitions Depot. During barge transfers, metals, munitions, and chemicals were accidentally released into adjacent nearshore areas. Contaminants also entered the bay through contaminated groundwater, stormwater, and soil erosion. After closure of the depot in 1959, the pier became a recreation pier. Water quality in the western half of Ostrich Bay is impaired due to elevated levels of mercury and sometimes fecal coliform bacteria. These water quality issues have led to closure of fishing and shellfish harvesting in the area.

Shading resulting from Jackson Park Pier and similar large overwater structures in Puget Sound is known to impair the survival and productivity of eelgrass, macroalgae, and phytoplankton. Eelgrass and marine algae support nearshore food webs and provide structural habitat for vertebrate and invertebrate species, including salmonids. Shading and displacement by piles can also reduce productivity of other

benthic organisms. Structures can alter behavior and fitness of juvenile salmon and other fish by creating migration barriers. This can result in increased stress, reduced prey availability, increased energy consumption, and increased predation risk. Piles also disrupt sediment transport processes and historic dredging alters benthic habitat, both observed at Jackson Park Pier. In contrast to more diverse undeveloped sites, surveys did not detect green macroalgae and eelgrass species around the pier (URS 2007). Piles do support a dense community of mussels, with sea cucumbers, horse clams, and moon snails underneath the pier (URS 2007).

There are known munitions within the marine sediment surrounding the pier. These munitions would be removed as part of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)/Munitions Response Program. The Operable Unit 3 Marine Removal Action is scheduled for summer of 2026 and will include dredging, sediment screening, removal of munitions and explosives of concern, and diver verification. The Removal Action is expected to last three seasons. The proposed removal of the pier would not commence until after all munitions have been removed. This analysis therefore assumes no presence of munitions.

1.3.3 Proposed Mitigation

The Navy is proposing to demolish the Jackson Park Pier, including the demolition of piles, existing structures on the pier, and any existing utilities.

Removal of the pier provides an opportunity to restore nearshore intertidal and subtidal ecological functions, habitat, and productivity by removing a large, unused overwater structure. Removal of the pier would restore natural light conditions, which should support recovery of benthic primary producers as well as native benthic assemblages and fish populations. Dredging and cleanup of munitions (starting in 2025) by the Navy would occur before pier removal and is not considered part of the compensatory mitigation action. Therefore, pier removal would not likely begin until 2028 at the earliest. Demolition and removal of the pier and pilings would be performed during the in-water work window (July 16 to February 15) to protect juvenile salmonid migration, feeding, and rearing. Work is expected to last one in-water work window. Although marine riparian habitat is limited near the pier due to fill, a concrete seawall, and adjacent lawns and paths, Land Use Controls require that these features remain in place to prevent erosion and exposure of potential contaminants from uplands. Once munitions cleanup and removal of the pier have occurred, the area would be used for estuarine habitat preservation and passive recreation.

1.3.4 Ecological Benefits

Approximately 0.7 acre of estuarine habitat would be restored through removal of 10,000 square feet of cover from the intertidal zone and 22,000 square feet of cover from the shallow subtidal zone. Removal of the Jackson Park Pier structure and piles would improve nearshore functions and ecological benefits including:

- Improved benthic organism productivity
- Potential for eelgrass or macroalgae establishment
- Establishment and growth of benthic organisms
- Improved sediment transport processes

- Improved migration, feeding opportunities, and habitat structure for juvenile salmonids and other fish
- Decreased stress, energy consumption, and predation exposure for migrating fish

This proposed mitigation, combined with current, past, and future cleanup actions at Jackson Park, provides an additional ecological benefit.

1.4 Environmental Analysis of Removal of Jackson Park Pier

1.4.1 Air Quality

Kitsap County is currently in attainment with EPA air quality standards (EPA 2023). The removal of Jackson Park Pier would not impact air quality in the long term. The proposed mitigation action would not result in long-term emissions of GHGs, criteria pollutants or hazardous air pollutants.

During the demolition of the pier and removal of the piles, operations of heavy machinery and an increase in truck traffic would have temporary adverse impacts to air quality. All construction contractors would also be required to follow all local, state, and federal air quality regulations. Thus, no long-term air quality impacts are likely as a result of the mitigation action.

1.4.2 Water Resources

1.4.2.1 Water Quality

No long-term impacts to water quality are expected from the removal of Jackson Park Pier.

Demolition of the pier and removal of piles would likely cause a temporary increase in turbidity within the work area in Ostrich Bay. Operation of heavy machinery during construction could result in minor releases of fuel, oil and lubricants. Construction BMPs would be implemented during in-water work, and the contractor would comply with project water quality certification to minimize these potential impacts to water quality.

1.4.2.2 Surface Water and Groundwater

Pier removal would not negatively impact surface water or groundwater conditions. Pier removal would restore the Bay to a more natural condition, and surface flow conditions would not be adversely impacted.

1.4.3 Geological Resources

Removal of pilings would improve sediment transport processes, both on-site and along down-current shorelines, restoring sediment “drift cells” to a more natural state.

Temporary impacts to soil and sediment could occur during demolition of the pier and removal of pilings, including increased erosion, temporary suspension of sediment, and soil loss. Construction BMPs would be implemented to minimize these potential impacts.

No long-term adverse impact to geology and soil would be anticipated from the proposed mitigation.

1.4.4 Biological Resources

1.4.4.1 Vegetation

A survey of undeveloped intertidal and shallow subtidal approximately one-half mile north of the Jackson Park Pier found patches of both red and green macroalgae species (e.g., seaweed, sea lettuce, green string lettuce) of variable density within the middle intertidal zone, and small, intermittent patches of eelgrass (URS 2007).

Removal of Jackson Park Pier and pilings would remove shading from the intertidal and shallow subtidal zones, which would result in improved photosynthetic productivity, including the potential for eelgrass or macroalgae establishment and growth.

Construction may involve the use of barges for piling removal, etc., and could temporarily impact nearby submerged aquatic vegetation through increased turbidity and siltation. Munitions cleanup would precede the pier demolition, so there would be no submerged aquatic vegetation within the munitions cleanup area at the time of construction. Construction BMPs would be implemented to minimize any of these impacts as needed.

Once munitions cleanup and removal of the pier are complete, the former pier area would be used for estuarine habitat preservation and passive recreation. No long-term adverse impacts to vegetation would be anticipated from the mitigation action. Overall, there would be a long-term benefit for increasing the area available for submerged aquatic vegetation in Ostrich Bay, and the benefit of restoration of shoreline vegetation.

1.4.4.2 Fish and Wildlife

The proposed removal of the Jackson Park Pier would have an overall beneficial impact to wildlife, fish, and aquatic invertebrates.

Removal of the pier provides an opportunity to restore nearshore functions, habitats, and ecosystem productivity. Removal of the pier would restore natural light conditions, which should result in support of benthic primary producers as well as native benthic assemblages. Removal of pier and pilings would improve habitat for juvenile salmonids and other fish species by removing overwater shading and barriers to shoreline migration that can cause migrating fish to experience increased stress and migration distance, causing an associated increase in energy consumption, coupled with reduced feeding opportunities and an increased exposure to predation. Aquatic invertebrates that live on the pier would be impacted by pier removal.

Olympia oysters, a state species of concern, are known to occur on both sides of the pier, and sunflower star (proposed for ESA listing) could be present under the pier, on pilings, or nearby. Neither species is known to have high abundance in the area (Foster Wheeler Environmental, 2002; NAVFAC NW, 2018; P. Rudell, pers. comm., January 18, 2023).

Temporary adverse impacts such as noise and increased turbidity could impact wildlife, including marine mammals, birds, fish, and invertebrates during pier demolition and pile removal activities. Construction BMPs would be implemented to minimize impacts to wildlife and fish. Short-term adverse impacts from construction would be outweighed by the long-term benefits of the mitigation action.

1.4.4.3 Threatened and Endangered Species

ESA consultation with NMFS and USFWS would be required prior to mitigation activities.

The following federally listed threatened species that may be present within the vicinity of the mitigation action site:

- Bull trout (*Salvelinus confluentus*) Coterminous U.S. DPS, Coastal Recovery Unit
- Marbled murrelet (*Brachyramphus marmoratus*)
- Chinook salmon (*Oncorhynchus tshawytscha*), Puget Sound ESU
- Steelhead (*Oncorhynchus mykiss*), Puget Sound DPS
- Bocaccio rockfish (*Sebastes paucispinis*), Puget Sound/Georgia Basin DPS
- Yelloweye rockfish (*Sebastes ruberrimus*) Puget Sound/Georgia Basin DPS
- Humpback whale (*Megaptera novaeangliae*), Mexico DPS and Central America DPS
- Killer whale (*Orcinus orca*), Southern Resident DPS

The above species may occasionally be present in Ostrich Bay and may be exposed to noise and increased turbidity during construction.

All in-water work would be conducted during the NMFS approved in-water work (July 16–February 15) window, and construction BMPs would be implemented in order to minimize potential impacts to ESA-listed species and juvenile salmonids. BMPs would also be implemented to minimize noise or other construction-related disturbances.

In addition to salmonids, other sensitive species may be disturbed by the demolition work. Olympia oysters (*Ostrea lurida*), a state species of concern, are known to occur on both sides of the pier (Foster Wheeler Environmental, 2002; NAVFAC Northwest, 2018; P. Rudell, pers. comm., January 18, 2023). However, the Olympia oyster population is small and density is too low to calculate abundance using the standard methodology for calculating oyster abundance in Puget Sound (Campbell 1996). The sunflower sea star (*Pycnopodia helianthoides*) is proposed for listing under the ESA in March 2023 and could be present under the pier, on pilings or nearby. While Olympia oysters would take time to recolonize (years), sea stars can recolonize an area relatively rapidly (day or days) if individuals are present nearby. However, sunflower sea stars are likely to be quite rare. The Navy is conferencing with NMFS under the ESA for potential effects to sunflower sea stars in a Biological Assessment that includes impacts associated with compensatory mitigation projects. The Navy will coordinate with NMFS to minimize impacts to this species.The long-term effects to threatened and ESA species is expected to be beneficial through the restoration of natural light conditions to support benthic habitat, removal of overwater shading and barriers to shoreline migration, and resulting improvement of intertidal and subtidal habitat, which may be utilized as a foraging or migration area for ESA-listed species.

1.4.5 Cultural Resources

There is a known pre-contact archaeological site (Smithsonian site 45KP00116) in close proximity to Jackson Park, but outside of the project area (DAHP 2024). The WISAARD predictive model shows the Jackson Park Pier area as having “very high risk” for archaeological resources, and survey is “highly advised.” Prior to commencement of construction, the Navy would conduct an archaeological survey and complete the Section 106 process for the proposed undertaking. The pier would need to be

evaluated for eligibility for inclusion in the NRHP. The Navy will evaluate this action as part of its Section 106 consultation under the National Historic Preservation Act.

If needed, a project-specific discovery plan would be prepared.

1.4.6 American Indian Traditional Resources

Jackson Park Pier is within the U&A fishing grounds and stations of the Suquamish Tribe. The Suquamish Tribe continues to have an interest in the area and is supportive of the pier removal and habitat restoration in the bay.

Shellfish harvesting has been closed in Ostrich Bay due to chemical contamination per Kitsap County Health Department advisories (as early as 1969) (Washington State Department of Health 2023). The Navy banned fishing and shellfish harvesting from the shoreline adjacent to the Jackson Park Housing Complex in 1991. The Navy has not determined if restrictions on shellfish harvesting would be removed after munitions cleanup and site restoration.

Construction activities could temporarily impact tribal access to traditional resources at the Pier site.

After construction, the improved ecological function of Ostrich Bay could benefit tribal traditional resources.

1.4.7 Land Use and Recreation

Jackson Park is part of NAVBASE Kitsap and is accessible to the public. However, access to Jackson Park Pier is restricted due to its deteriorating condition. The waters of Ostrich Bay are part of the Kitsap Peninsula National Water Trail, which was included in the Department of Interior's National Water Trails Systems. The N.A.D Marine Park, Chico Boat Launch, and Port of Tracyton Boat Ramp are the three closest access points to the water trail near Jackson Park.

The pier has not been in use for several years. There are currently no military uses for Ostrich Bay. Once munitions cleanup and removal of the pier have occurred, the area would be used for estuarine habitat preservation and passive recreation.

There would be a temporary disturbance of recreational use during demolition activities.

The Jackson Park Housing Complex area is included in the INRMP for NAVBASE Kitsap (Navy 2018). If the Navy removes the Jackson Park Pier as compensatory mitigation, it would be identified in an update to the INRMP. The INRMP would document restrictions on any future activities or development of the site, in accordance with USACE permit conditions. Passive recreation is expected to be compatible with the restored on-site habitat.

This approach of incorporating mitigation action site protection within an updated INRMP (Navy 2018) is the same as what is proposed for the Keyport Lagoon potential mitigation action site and is in line with the federal Mitigation Rule (USACE and EPA 2008), which states that for government property, "long-term protection may be provided through federal facility management plans or integrated natural resources management plans."

The Navy would prepare a coastal consistency determination per the CZMA. When the Navy's Proposed Action may have affects to any land or water use or natural resource of the coastal zone, the action shall be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of the Washington State Coastal Zone Management Program.

1.4.8 Visual Resources

The proposed mitigation action at Jackson Park would remove the Pier and pilings from Ostrich Bay and change the visual character to a more natural setting.

The presence of construction equipment would temporarily impact visual resources during construction.

Pier removal would convert the Bay to a more natural state, which would enhance the visual resource.

1.4.9 Noise

Removal of the pier would not cause any increase in long term noise above existing conditions.

The Pier is adjacent to the Jackson Park Housing Complex. Demolition of the pier is likely to generate temporary noise that may be perceptible at the Housing Complex and in the surrounding area. Noise impacts could last for months. BMPs would be implemented to minimize noise disturbance, including use of effective muffler systems and placement of stationary noise-generating construction equipment, such as air compressors and portable power generators, as far as practical from existing noise sensitive land uses.

There would be no anticipated post-construction noise impact as a result of the pier removal.

1.4.10 Utilities and Infrastructure

Removal of Jackson Park Pier is not likely to have an adverse impact on utilities. Any utilities currently extending to the pier (e.g., electrical) would need to be disconnected before construction began. The shoreline path near the pier has a series of electric lights along its length and there are residences located less than 300 feet from the pier. If construction activities take place near a structure or utility line, the removal activities may cause a temporary disruption to utilities in that location. Therefore, coordination with the utility owner would need to occur before mitigation activities begin. However, long-term impacts to utilities are not anticipated.

1.4.11 Transportation

No long-term impact to traffic would occur as a result of the mitigation action.

During construction activities, there would be short-term impacts to local traffic from an increase in truck traffic.

It is expected that demolition of the pier and removal of the pilings could be completed during one in-water work window (July 16 through February 15) (USACE 2017), so transportation impacts would likely be limited to one in-water work window.

1.4.12 Marine Navigation

Jackson Park Pier is abandoned and deteriorating; the pier is not currently in use. Removal of the pier would remove a structure that could be struck by vessels and therefore would improve marine navigation.

Construction activities would mostly include floating equipment, with some use of land-based vehicles. Construction boats or other floating equipment operating in the near shore waters would not be likely to impact navigation outside of the immediate work area. Barges may be used to transport demolition debris off-site for disposal. The small number of vessel trips would not be likely to impact local marine traffic.

1.4.13 Public Health and Safety

Removal of the deteriorating pier would improve public safety. Removal of contaminants and improvement of water quality would also be beneficial to the health of recreational users in the long term.

Construction equipment on site has the potential to temporarily increase risks to public safety; however standard construction BMPs such as fences and signs would be implemented to prevent worksite access by base residents and the public. All applicable federal and state regulations for demolition and construction would be implemented, including construction safety BMPs and preparation of a construction site safety plan.

1.4.14 Hazardous Materials and Wastes

Construction equipment would require the use of standard hazardous materials such as fuel, oil, and lubricants. BMPs would be implemented during construction activities to minimize the risk of spills and releases of these materials.

The proposed mitigation is unlikely to have any impacts on hazardous materials and wastes.

1.4.15 Socioeconomics

Demolition- and restoration-related hiring/spending could have short-term beneficial impacts to socioeconomics within the area.

1.5 Evergreen Rotary Park Shoreline Restoration

1.5.1 Site Description

Evergreen Rotary Park is a City of Bremerton public park on the west shoreline of Port Washington Narrows, north of its entrance at Sinclair Inlet (Figure 1, Figure 6). It is approximately 1 mile from the Puget Sound Naval Shipyard. The park is 10.3 acres and is situated on the remediated site of a former fuel tank farm. The park includes publicly owned tidelands and approximately 2,300 feet of shoreline. Proposed restoration would occur to shoreline and beach areas south of the boat ramp (Figure 7). The existing shoreline is armored with rock, concrete debris, and a pile bulkhead, with fill located behind the armoring structures. Maintained lawn and park paths extend to near the top of the shoreline bank. The shoreline is classified as a sediment transport zone. Substrate is mostly gravels, with scattered concrete debris. Marine sediment is contaminated by metals. Due to its position in a heavily developed watershed, the water quality of Port Washington Narrows is impaired by bacteria from wastewater treatment and non-point pollution. Due to these impairments, shellfish harvest is not allowed (Washington State Department of Health 2023).

Shoreline armoring, such as at Evergreen Rotary Park, is typical along the heavily used corridor of Port Washington Narrows. However, shoreline armoring reduces habitat and habitat connectivity (Shipman et al. 2010). With removal of shoreline armoring and restoration, the area has the potential to support functioning marine habitats for a variety of species. Several types of macroalgae do occur, including kelp in the shallow subtidal zone. Rock crab and other species use is concentrated around kelp beds. Port Washington Narrows is priority habitat for hardshell clams and wintering waterfowl and beaches are mapped as surf smelt spawning habitat. Smelt are an important prey resource for numerous species including salmonids. There is no eelgrass in the area, as the high currents, substrate composition, and bathymetry are unfavorable (Hurn 2016; Battelle 2007).

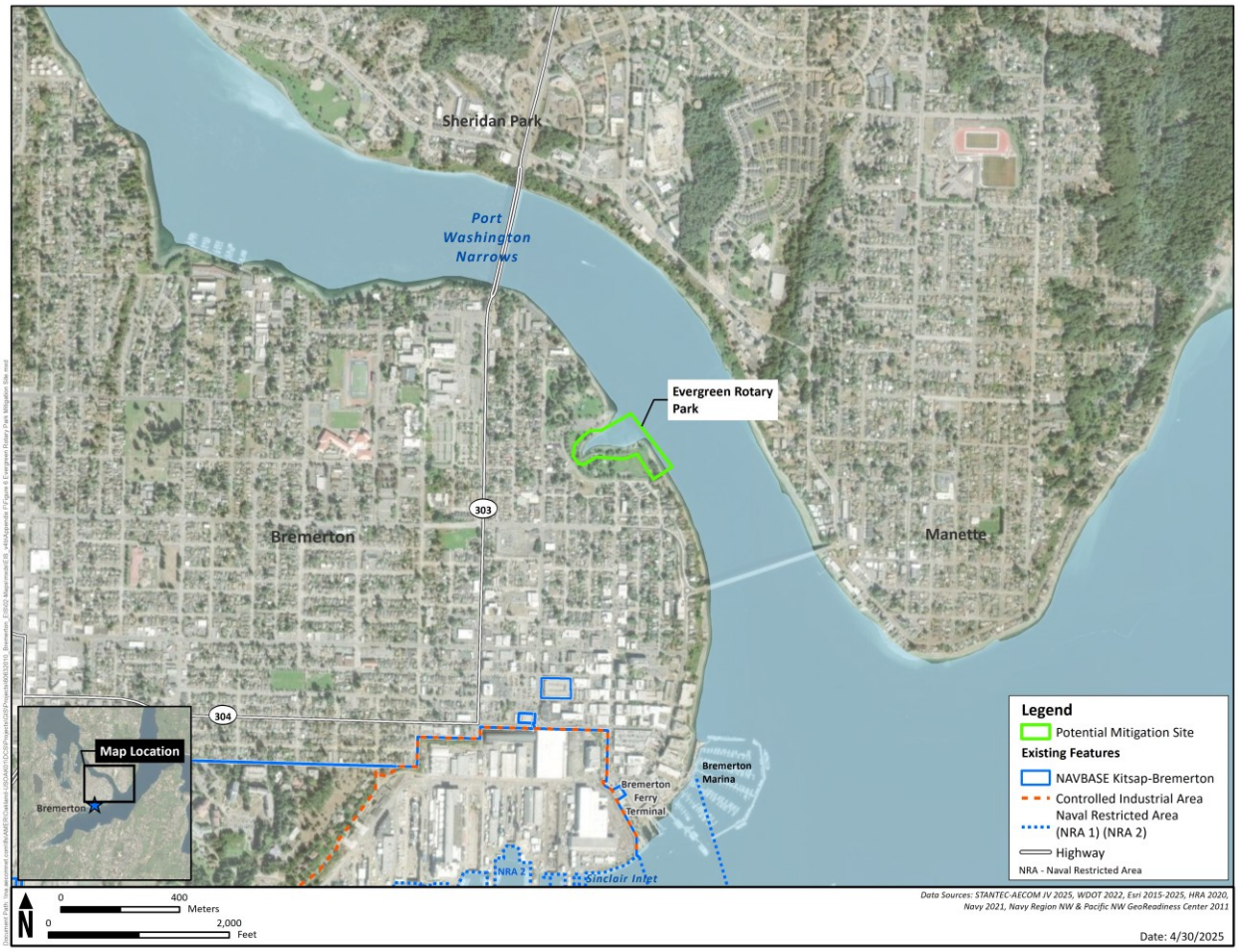

Figure 6 Location of Evergreen Rotary Park

Figure 7 Evergreen Rotary Park Facing Southeast (July 2016)

1.5.2 Site History and Restoration Need

Evergreen Rotary Park is within the Suquamish Tribe's U&A fishing grounds and stations and the area is used by tribal members. An archaeological site has been found in the vicinity. A fuel company began operations at the site in 1909. It became a Chevron Corporation fuel tank farm in 1946. Between 1946 and 1963 the facility expanded by placing fill and a timber bulkhead in the intertidal zone of Smith Bay, decreasing the extent of the bay and shallow intertidal habitat to the shape and size of present-day Smith Cove. Chevron removed tanks and structures from the site in 1988. Cleanup of fuel-contaminated soil and debris began in 1998. Remediation (e.g., removal and capping of contaminated soil) continued after the City of Bremerton acquired the property in 2005 and the park was made accessible to the public (Parametrix 2017).

The ecological impacts of shoreline filling and armoring, such as has occurred at Evergreen Rotary Park, are well documented within Puget Sound (Shipman et al. 2010). Direct and indirect impacts to the nearshore environment include:

- Loss of intertidal habitat
- Loss or impairment of beach habitat, including forage fish spawning habitat
- Loss of terrestrial and aquatic habitat connectivity
- Coarser and steeper beach profiles
- Loss of riparian vegetation
- Impaired sediment and woody debris recruitment, transport, and deposition
- Impoverished invertebrate species richness
- Impaired water quality
- Reduced shallow-water salmonid use

1.5.3 Proposed Mitigation

The Navy proposes to restore the shoreline at Evergreen Rotary Park. The restoration project was designed to restore nearshore ecosystem processes and habitats while maintaining and improving recreational opportunities in the park and providing long-term shoreline stability. The following restoration actions are proposed (Parametrix 2017):

(1) Remove approximately 250 linear feet of creosote-treated timber and sheet pile bulkheads from the toe of the bluff along the south shoreline.

(2) Remove concrete rubble and rock armoring from the beach and intertidal zone south of the cove (approximately 600 linear feet); recontour the shoreline to a more natural shape; and nourish the restored beach with appropriately-sized sediment to support forage fish (surf smelt) spawning habitat.

(3) Excavate old non-native fill south of the cove. Excavate fill that is contaminated with low levels of residual petroleum to prevent discharge into waters. Dispose of fill in compliance with Ecology standards. Recontour the shoreline in this area and nourish the restored beach with appropriately-sized sediment.

(4) In Smith Cove, remove concrete rubble and riprap from intertidal zone (approximately 1,000 linear feet) and nourish the beach where needed; remove anchored logs.

(5) Remove most concrete slurry.

(6) Restore approximately 35,000 square feet of beach. Beach nourishment material would have grain sizes that match native beaches to the south, and different grain sizes would be placed as appropriate on slopes of varying steepness (ranging from 6:1 intertidal to 8:1 upper beach and 5:1 in steeper transitional areas).

(7) On the south shoreline, plant dune grass (*Leymus mollis*) on approximately 3,500 square feet of back beach to stabilize this area from wave erosion; plant native shrub and grass riparian species at transition from beach to a developed trail; install vegetated coir logs to protect riparian plantings; remove and control invasive vegetation.

(8) In Smith Cove, plant native trees and shrubs to augment existing native vegetation at the top of the bank (approximately 0.5 acre) and in riprap to provide shade and supply organic matter to the intertidal beach; remove and control invasive vegetation.

(9) Place logs with root wads at the toe of the bank and along the shoreline of the beach where recruitment would normally occur.

Shoreline restoration at Evergreen Rotary Park would result in moderate functional lift, limited by numerous site constraints, including the narrow riparian buffer area, disturbance from public shoreline use, and lack of habitat connectivity. There would be little temporal loss, as most of the mitigation actions (fill, debris, and bulkhead removal; regrade of shoreline; beach nourishment; woody debris placement) would result in immediate improvements to nearshore processes. Restoration of marine riparian vegetation would take several years.

1.5.4 Ecological Benefits

The proposed project would restore approximately 1,600 feet of shoreline, one acre of intertidal and beach habitat, and 0.5 acre of marine riparian habitat, including removal of 12,000 cubic yards of

concrete, fill, bulkhead and debris. The potential ecological benefits and net functional lift of the mitigation plan include:

- Restored intertidal habitat
- Reconnected shoreline riparian vegetation and nearshore environments
- Restored natural sediment and woody debris recruitment
- Restore natural sediment functions, including erosion, transport, and deposition
- Expanded and enhanced potential forage fish beach spawning habitat
- Improved water quality by removal of impervious surfaces and establishment of a native riparian buffer vegetation
- Improved Chinook, chum, coho, steelhead, and cutthroat trout migratory habitat
- Removal of potential contamination sources from the nearshore environment

1.6 Environmental Analysis of Shoreline Restoration of the Evergreen Rotary Park

1.6.1 Air Quality

Kitsap County is currently in attainment with EPA air quality standards (EPA 2023). Restoration of the shoreline at Evergreen Rotary Park would not impact air quality in the long term. The proposed mitigation action would not result in long-term emissions of GHGs, criteria pollutants or hazardous air pollutants.

During construction, operations of heavy machinery and an increase in truck traffic would have temporary adverse impacts to air quality. Excavation and grading activities have the potential to generate dust, though this may not be likely within the intertidal/subtidal zones. Construction BMPs would be implemented to minimize these potential impacts. All construction contractors would also be required to follow all local, state, and federal air quality regulations. Thus, no long-term air quality impacts are likely as a result of the mitigation action.

1.6.2 Water Resources

1.6.2.1 Water Quality

No long-term adverse impacts to water quality are expected from shoreline restoration at Evergreen Rotary Park.

Removal of the bulkhead, armoring, fill material, concrete debris, scattered rubble, concrete slurry, and dredging would likely cause a temporary increase in turbidity in the nearshore waters. Operation of heavy machinery during construction could result in minor releases of fuel, oil and lubricants. Disturbance of contaminated sediment has the potential to mobilize contaminants and further degrade water quality. Construction BMPs would be implemented during in-water work to minimize these potential impacts, and any short-term adverse impacts would be outweighed by the long-term water quality benefits associated with the mitigation action.

Shoreline restoration at the Evergreen Rotary Park would be anticipated to have an overall beneficial impact to water quality from the removal of impervious surfaces and restoration of native riparian buffer vegetation. Removal of contaminated sediment is also anticipated to have a long-term beneficial impact on water quality.

1.6.2.2 Surface Water and Groundwater

Shoreline restoration at Evergreen Rotary Park would slightly modify the marine water flow conditions by setting back and regrading the shoreline to a more natural shape. Groundwater flow would not be expected to be adversely impacted. No streams or freshwater habitats are known to occur near the potential mitigation action site. No adverse impacts to surface water conditions would be expected from the mitigation action.

1.6.3 Geological Resources

The mitigation action at Evergreen Rotary Park would have a beneficial impact on geology, soil, and sediment through the restoration of approximately 1,600 linear feet of marine shoreline within Port Washington Narrows.

Beneficial impacts to soil and sediment would be expected from the restoration of natural sediment and woody debris recruitment through the removal of hard shoreline armoring and upland fill; and the restoration of natural sediment functions, including erosion, transport, and deposition of sediment, and woody debris recruitment.

Ground-disturbing activities including removal of bulkhead, fill, concrete debris, armoring, and other rubble would have temporary effects on sedimentation and soil at the site, including increased potential for erosion and soil and sediment loss.

Ground-disturbing activities also have the potential to disturb contaminated sediment. Construction BMPs would be implemented to minimize erosion and soil and sediment loss and minimize the generation and migration of suspended sediment.

The design includes placement of a minimum 15-inch layer of topsoil/mulch or beach nourishment over all exposed site soil and sediment. Long-term impacts to shoreline sediment would likely be beneficial by helping restore more natural sedimentation along the shoreline. However, given the currents and wave action that the restored beach would be exposed to, along with the hardened shorelines adjacent to the site, it is uncertain whether sands or fine gravels used to nourish the beach would remain in place long-term.

1.6.4 Biological Resources

1.6.4.1 Vegetation

There is no eelgrass in Evergreen Rotary Park, but several types of macroalgae occur, including kelp in the shallow subtidal zone.

Mitigation action at Evergreen Rotary Park would be anticipated to have an overall benefit to vegetation by restoring native shoreline riparian vegetation and improving nearshore habitats.

Construction impacts could temporarily impact vegetation through activity such as increased foot and vehicle traffic, soil compaction, and burial. Construction BMPs would be implemented to minimize these impacts. Macroalgae in the intertidal zone would be temporarily affected by the removal of concrete and other debris.

No long-term adverse impacts to vegetation would be anticipated from the mitigation action. Post-construction, the proposed mitigation action would likely have a beneficial impact to vegetation at the site by stabilizing the restored shoreline with large woody debris and native vegetation; removing and

controlling invasive vegetation (e.g., Himalayan blackberry); and establishing native riparian vegetation. These potential beneficial impacts may be limited, however, by the continued public use at the Park (i.e., foot traffic damage to plant habitats).

1.6.4.2 Fish and Wildlife

The proposed mitigation action at Evergreen Rotary Park would have a beneficial impact to wildlife, fish, and aquatic invertebrates through restoration of intertidal habitat; reconnection of upland and nearshore environments; and expansion and enhancement of potential forage fish beach spawning habitat by removing fill and nourishing beach with appropriately sized gravels and sands in key locations.

Improved functions and habitats would benefit Chinook, chum, coho, steelhead, and cutthroat trout migrating between Dyes and Sinclair Inlets by providing a restored resting area in an otherwise heavily modified shoreline. Improved functions and habitats would also benefit invertebrate species such as rock crabs and clams and could lead to increased invertebrate diversity. These habitat improvements would also benefit marine mammals and birds by improving habitat for prey species.

Beach nourishment (the placement of additional sediment along the shoreline) would be expected to support forage fish (such as smelt and sand lance) spawning habitat, however, forage fish spawning habitat may diminish over time if finer beach substrate is eroded and not replenished.

Temporary adverse impacts such as noise and increased turbidity could impact wildlife, including marine mammals, fish, birds and aquatic invertebrates during construction activities, including removal of bulkhead, fill, concrete debris, armoring, and other rubble. Construction BMPs would be implemented to minimize impacts to wildlife and fish. Any potential adverse impacts from construction would be outweighed by the long-term benefits of the mitigation action.

1.6.4.3 Threatened and Endangered Species

ESA consultation with NMFS and USFWS would be required prior to mitigation activities.

The following federally listed threatened species that may be present within the vicinity of the mitigation action site:

- Bull trout (*Salvelinus confluentus*) Coterminous U.S. DPS, Coastal Recovery Unit
- Marbled murrelet (*Brachyramphus marmoratus*)
- Chinook salmon (*Oncorhynchus tshawytscha*), Puget Sound ESU
- Steelhead (*Oncorhynchus mykiss*), Puget Sound DPS
- Bocaccio rockfish (*Sebastes paucispinis*), Puget Sound/Georgia Basin DPS
- Yelloweye rockfish (*Sebastes ruberrimus*) Puget Sound/Georgia Basin DPS
- Humpback whale (*Megaptera novaeangliae*), Mexico DPS and Central America DPS
- Killer whale (Orcinus orca), Southern Resident DPS

The above species may occasionally be present in Dyes Inlet and may be exposed to noise, vessels, or floating equipment and other disturbance during construction.

All in-water work would be conducted during the NMFS approved in-water work window (July 16–February 15) and construction BMPs would be implemented in order to minimize potential impacts to ESA-listed species and juvenile salmonids. BMPs would also be implemented to minimize noise or other construction-related disturbances.

The sunflower sea star (*Pycnopodia helianthoides*) was proposed for listing under the ESA in March 2023 and could be present in rocky intertidal and subtidal areas of the restoration area. However, sunflower sea stars are likely to be quite rare.

The long-term effects to threatened and ESA species is expected to be beneficial through the improvement of intertidal and subtidal habitat, which may be utilized as a foraging or migration area for ESA-listed species.

1.6.5 Cultural Resources

Cultural resources surveys and archaeological monitoring have occurred since 2001 at and around the site associated with the Evergreen Park Restoration Project and remediation of the former Chevron property. The WISAARD predictive model shows the project area as having "very high risk" for archaeological resources, and survey is "highly advised." The most recent cultural resources analysis was in 2016, during which no cultural resources eligible for the NRHP were identified, but archaeological monitoring was recommended for ground-disturbing activities due to a nearby archaeological site (45KP121) and the potential for fill material to contain cultural resources (Cultural Resource Consultants 2016). A project-specific discovery plan would be prepared.

No historic architectural resources in the project area have been previously identified. A 2009 report stated that observed bulkheads and pipeline remnants likely associated with the bulk fuel facility were not eligible for the NRHP, although no determination was made (Chambers 2009). The Navy would complete consultation with the Washington State Historic Preservation Officer prior to construction activities.

1.6.6 American Indian Traditional Resources

The site is in the Suquamish Tribe's adjudicated U&A fishing grounds and stations and is used by tribal members (Cultural Resources Consultants 2016). The Navy is in ongoing consultation with the Suquamish Tribe.

Construction activities could temporarily impact tribal access to traditional resources.

After construction, the improved ecological function of the Park could benefit tribal traditional resources.

1.6.7 Land Use and Recreation

Evergreen Rotary Park is located in a residential area within the City of Bremerton and is owned by the City.

The park is a heavily used recreation site throughout the year, especially for water and shoreline recreation during the summer. The park is an access point to the Kitsap Peninsula National Water Trail, which was included in the Department of Interior's National Water Trails Systems. Park infrastructure includes a boat ramp adjacent parking areas, paved paths landscaping, a picnic shelter, a viewing platform with concrete vertical walls, and a transmission tower. The restoration design attempts to balance improvements to the nearshore ecosystem with public uses of the park.

There would be a temporary disturbance of some public access to the Park during construction. Post construction, however, the land use of the area would not change. The Washington Department of Natural Resources manages state-owned tidelands adjacent to the park, and no impacts to adjacent land uses are anticipated.

In addition, the Navy would prepare a coastal consistency determination per the CZMA. When the Navy's Proposed Action may have affects to any land or water use or natural resource of the coastal zone, the action shall be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of the Washington State Coastal Zone Management Program.

1.6.8 Visual Resources

The proposed mitigation action at Evergreen Rotary Park would restore approximately 1,600 linear feet of marine shoreline to a more natural shape and appearance.

The presence of construction equipment would temporarily impact visual resources during construction.

The removal of a bulkhead, riprap, fill material, concrete debris, scattered rubble, and concrete slurry; regrading of the shoreline to a more natural shape; beach nourishment; placement of woody debris; and establishment of native riparian vegetation would beneficially impact the natural visual resources.

1.6.9 Noise

Restoration of the shoreline at Evergreen Rotary Park would not cause any increase in long term noise above existing conditions.

Construction of the mitigation action would generate temporary noise that would likely last for months. BMPs would be implemented to minimize noise disturbance, including the use of effective muffler systems and placement of stationary noise-generating construction equipment, such as air compressors and portable power generators, as far as practical from existing noise sensitive land uses.

Evergreen Rotary Park is a heavily used recreation site throughout the year, and visitors would likely continue to generate similar levels of human noise after the shoreline restoration.

1.6.10 Utilities and Infrastructure

No long-term impacts to utilities are expected from this mitigation. Electric transmission lines extend through the southern shore of the Park, and coordination with the utility owner would need to occur before mitigation activities begin.

1.6.11 Transportation

No long-term impacts to traffic or transportation would be anticipated from the proposed restoration. During construction activities, there would be short-term impacts to local traffic from an increase in truck traffic.

It is estimated that the complete project would remove approximately 12,000 cubic yards of concrete debris, armoring, the bulkhead, and other rubble. This would generate increased truck traffic to and from the site during the weeks to months of construction.

During this phase of construction, a traffic control plan may be required. The plan would be coordinated with the city of Bremerton. With implementation of traffic control measures, this short-term increase in truck trips would not cause a significant impact.

There would be no long-term impact to traffic.

1.6.12 Marine Navigation

No impacts to marine navigation would be expected from the mitigation action. The proposed shoreline restoration is not directly adjacent to the existing boat ramp, such that access to the boat ramp should not be impacted. Vessel access to Smith Cove would continue, with potential for temporary restrictions around small localized areas in the intertidal zone during removal of rubble.

1.6.13 Public Health and Safety

Public health and safety would be unlikely to be impacted during the proposed mitigation action.

There could be a slight increase in health and safety hazard potential associated with construction activity due to the presence of heavy equipment and machinery on-site; however, standard construction BMPs would be implemented, such as fences to keep the public out of work zones and signage to warn of potentially dangerous working areas. All applicable federal and state regulations for demolition and construction would be implemented, including construction safety BMPs and preparation of a construction site safety plan.

Removal of contamination and improvement of water quality would benefit environmental public health and safety in the long term. The removal of an aging bulkhead, riprap, fill material, concrete debris, scattered rubble, and concrete slurry from the Park would also be beneficial to public safety.

1.6.14 Hazardous Materials and Wastes

Overall, the mitigation action is likely to benefit the environment through the removal of potential sources of contamination from the nearshore environment.

Soil in some areas contains low levels of petroleum contamination. This soil has been capped with 5 to 8 feet of clean soil. Beach construction would result in excavation of a significant amount of the cap and underlying contaminated soil. There is some potential for exposure and mobilization of contaminants during earthwork. BMPs would be implemented to properly handle and dispose of all contaminated soil and demolition debris. All excavated soil would be disposed of at a permitted upland disposal facility(ies). The design includes placement of a minimum 15-inch (38-centimeter) layer of topsoil/mulch or beach nourishment over all exposed site soil, which would provide a physical barrier or “cap” that would prevent direct contact (Draft JARPA, June 22, 2017). The removal of contaminated sediment would likely have a beneficial impact to the environment post-construction.

Construction equipment would require the use of standard hazardous materials such as fuel, oil, and lubricants. BMPs would be implemented during construction activities to minimize the risk of spills and releases of these materials.

The mitigation action would remove derelict creosote-treated pilings and timbers. Removal of these pilings and timbers would follow construction BMPs to minimize any release of creosote to the environment and would have a beneficial impact on water and sediment quality.

1.6.15 Socioeconomics

Restoration-related hiring/spending could have short-term beneficial impacts to socioeconomics within the area.

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APPENDIX G
Air Quality and Greenhouse Gases

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654,027 Analysis Notes

1 ton = 0.907185 metric ton

From ER Appendix B, Cost Estimate

Concrete:		CY		
C2	M2D2	262,656	2029-2032	
	Quaywalls	11,100		
	Pump well	16,900		
	Entrance wall	28,100		
		318,756		
C3	M2D2 floor	353,423	2030-2035	
	M2D2 tremie	260,212		
	portal crane	1,192		
	Pump well	16,400		
	Entrance wall	22,800		
		654,027	2.05 times concrete required for C2	
Other concrete used				
	Laydown Area	**3,973**		

Embodied carbon emission factors — 907.185 kg per ton

Concrete: 406 kg CO2e/m3 = 0.44753826 tons CO2e/m3; 0.342 ton CO2e/CY = 0.342168 ton CO2e/CY

from Material Baselines Report V2 (2021)

110,427 Total tons embodied CO2e for Alt 2 concrete

(batch plant + Forge Shop and Laydown Area)

100,178 Total metric tons embodied CO2e for Alt 2 concrete

225,146 Total tons embodied CO2e for Alt 3 concrete

204,249 Total metric tons embodied CO2e for Alt 3 concrete

Ballast Rock	CY
C2, Ph8	**679,439**
C3	**1,790,000**

Rip Rap	CY
C3	**49,074**

Hauled Fill	CY
C2, Ph8	**1,313,159**
C3	**1,866,778**

Cement powder	Tons
C5	**130,000**

average passenger vehicle

369 grams of CO2 per mile

0.81 lb of CO2 per mile

	Alt 2			
CO2 emissions	41,666 ton/yr	7,604	cars driving	13,476 miles per year
	Alt 3			
	46,032 ton/yr	8,401	cars driving	13,476 miles per year

2017 Kitsap County CO2e	1,105,899
Alt 2 %	3.8%
Alt 3 %	4.2%

Tab B **Assumptions**

Work duration based on

10	hr/day		
7	days/wk		
70	hr/wk		
304	hr/month	based on average month =	30.4 days

Note: MOVES 3 does not calculate N2O for nonroad equipment. The ratio of N2O to CH4 has been used to derive emission values for nonroad equipment (lb):

0.45614

The ratio is from EPA. 2016. Direct Emissions from Mobile Combustion Sources, Table B-8. January.

Equipment hours estimated from Alternative 2 Schedule 04.04.22 (Navy edits).pdf and M2D2 Construction Usage Rates.xlsx and FullAlt2BremertonConstructionSchedule_6-16-22.pdf

Hazardous Air Pollutant (HAP) Speciation Profiles/Emission Factors from USEPA Port Emissions Inventory Guidance (2020), Appendix D.
Benzene = 0.004739 X VOC
Formaldehyde = 0.042696 X VOC

Std dump truck capacity =	12	CY
Std concrete truck capacity =	9	CY

weight of CY asphalt = 3960 lbs

Onsite truck hours split 50/50 between idle and onsite movement (10 mph)

For Component 2, dredging hours in Phases 2 and 10 split 80%/20%
For Component 2, excavation:

611,000	CY	Phase 5	62%
287,700	CY	Phase 6	29%
88,700	CY	Phase 10	9%
987,400			

Universal conversion factor: 1 cubic yard of dredged material =

0.81 tons of sediment based on bulk density value of 1600 kilograms/meter^3.

17 miles one way to Industrial Area West, Terminal 5; used as surrogate for potential staging/laydown area for materials to be transported to/from Bremerton Shipyard

4.25 hrs for RT to/from Terminal 5.

Tow Boats assumed for transport of waste materials to Industrial Area West

speed of Tugs and Towboats assumed at 8 mph or 7 knots

1,500 Tons of cargo = typical barge capacity

5,000 CY = M72 scow capacity, from 3/21/22 email from Christine Stevenson, US Navy
used for transport of dredge material to Elliot Bay Open Disposal Area

32 miles from Shipyard construction areas to Elliott Bay Open Disposal Area and back (RT).

4 hr RT

Transport of water-based crews estimated at 1 hr per day

Rail Transport of waste materials uses Industrial Area West, Terminal 5 to Columbia Ridge Commercial Landfill & Recycling, Arlington, OR.
Estimated distance = **307** miles one-way

Daily truck traffic estimated at 25-50 trucks/day (from Bremerton EIS Traffic Report)

50 trucks/day maximum used for conservative estimate

18,250 trucks per year

For CO2e calculations, CH4 is 28 times CO2, and N2O is 265 times CO2
CO2e emission factor for Onroad Trucks includes CH4 and N2O

Tab C **Emissions Summary** 1 ton = 0.907185 metric ton

Alternative 2 - M2D2@ DD3; Pier 2; Piers 4 & 6

Emissions by	tons/yr								Metric tons/yr
Year	VOCs	CO	NOx	SO2	PM10	PM2.5	HAPs	CO2e	CO2e
2027	7.93	286.68	66.11	0.21	186.52	29.29	0.46	31,575	28,644
2028	8.29	287.56	71.30	0.22	188.15	29.61	0.48	34,077	30,914
2029	10.60	297.53	113.84	0.27	196.41	31.65	0.77	44,900	40,732
2030	13.77	314.61	196.11	0.34	195.01	33.18	1.56	50,853	46,133
2031	7.73	287.22	70.30	0.21	185.96	29.11	0.56	30,429	27,605
2032	7.72	287.20	70.21	0.21	185.96	29.11	0.56	30,417	27,594
2033	7.63	286.63	67.56	0.21	182.70	28.74	0.56	30,470	27,642
2034	8.70	289.95	87.91	0.23	183.24	29.25	0.61	32,583	29,559
2035	6.94	282.84	48.96	0.20	180.72	28.18	0.36	29,416	26,686
2036	6.68	281.59	44.83	0.19	180.44	27.99	0.31	27,772	25,195
2037	8.92	291.05	90.57	0.24	184.28	29.50	0.62	34,405	31,211
2038	8.71	290.26	86.79	0.23	184.04	29.37	0.60	33,648	30,525
2039	7.41	284.49	58.72	0.21	180.91	28.40	0.38	30,133	27,336
2040	5.38	277.67	19.38	0.16	179.82	27.38	0.26	25,132	22,800
2041	5.94	279.75	29.47	0.17	180.36	27.72	0.32	7,090	6,432
							Subtotal GHGs	472,901	429,008
							Total GHGs	**583,328**	**539,436**
							includes embodied carbon from concrete		
							Avg annual GHGs from construction	41,666	37,799
							Comparative GHG emissions:	7,604	13,476
								13,476	miles/year

Alternative 3 - M2D2@ Mooring A; Mooring A Demolition; Pier 4

Emissions by	tons/yr								Metric tons/yr
Year	VOCs	CO	NOx	SO2	PM10	PM2.5	HAPs	CO2e	CO2e
2027	7.86	285.82	64.37	0.21	188.64	29.47	0.44	31,142	28,252
2028	8.66	288.61	79.03	0.23	196.87	30.19	0.53	36,610	33,212
2029	10.18	297.64	118.35	0.26	192.90	30.65	0.90	39,509	35,842
2030	8.44	291.77	88.37	0.22	185.63	29.45	0.82	32,639	29,610
2031	7.30	284.66	58.95	0.20	184.61	28.67	0.43	29,956	27,175
2032	6.44	281.00	40.02	0.19	180.49	27.98	0.34	27,893	25,304
2033	6.36	280.63	38.68	0.18	181.57	27.97	0.31	27,456	24,908
2034	7.57	284.56	61.35	0.21	182.36	30.07	0.38	30,593	27,753
2035	8.04	287.75	74.02	0.22	182.81	28.92	0.52	31,829	28,874
2036	7.24	283.80	54.60	0.20	182.24	28.47	0.39	30,398	27,576
2037	7.59	285.18	62.06	0.21	181.14	28.51	0.40	30,810	27,950
2038	7.38	284.39	58.29	0.21	180.90	28.38	0.38	30,053	27,264
2039	7.41	284.49	58.72	0.21	180.91	28.40	0.38	30,133	27,336
2040	7.18	283.27	53.77	0.20	180.72	28.26	0.35	29,276	26,559
2041	5.94	279.75	29.47	0.17	180.36	27.72	0.32	27,041	24,531
							Subtotal GHGs	465,337	422,147
							Total GHGs	**690,483**	**626,396**
							includes embodied carbon from concrete		
							Average annual GHGs from construction	46,032	41,760
							Comparative GHG emissions:	8,401	cars driving
								13,476	miles/year

Tab D ALTERNATIVE 2 Construct M2D2 at DD3, New Pier 2, Demo Pier 6, Replace Pier 4

Alternative 2 - M2D2@ DD3; Pier 2; Piers 4 & 6

Activity by Year	tons/year												
	VOCs	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	CO2e	Benzene	Formaldehyde	Total HAPs
2027													
Pier 2	0.70	2.82	13.72	0.01	0.87	0.43	2,141	0.04	0.01	2,146	0.01	0.07	0.08
Batch Plant Ops	0.34	1.07	5.93	0.01	2.92	0.48	775.49	0.01	0.00	776	0.00	0.03	0.03
Bremerton Subtotal	**1.04**	**3.89**	**19.65**	**0.02**	**3.79**	**0.91**	**2917**	**0.04**	**0.02**	**2922**	**0.01**	**0.10**	**0.11**
Radio Hill Expansion	0.20	1.07	2.07	0.00	1.92	0.34	959.75	0.01	0.00	961	0.01	0.04	0.05
Forge Shop	0.11	0.58	1.12	0.00	0.63	0.13	352.99	0.01	0.00	353	0.00	0.01	0.01
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Materials Movement - Barges	1.76	5.48	33.67	0.04	0.88	0.86	4,055	0.02	0.01	4,057	0.01	0.08	0.08
Grand Total	**7.93**	**286.68**	**66.11**	**0.21**	**186.52**	**29.29**	**31,509**	**0.84**	**0.15**	**31,575**	**0.12**	**0.34**	**0.46**
2028													
Pier 2	0.70	2.54	12.83	0.01	0.60	0.40	2,156	0.02	0.01	2,159	0.01	0.05	0.06
M2D2 @ DD3	0.72	2.32	12.54	0.01	4.83	0.85	1,775	0.01	0.01	3,329	0.01	0.06	0.07
Bremerton Subtotal	**1.42**	**4.85**	**25.37**	**0.03**	**5.43**	**1.25**	**3,931**	**0.03**	**0.01**	**5,488**	**0.02**	**0.11**	**0.13**
Radio Hill Expansion	0.20	1.07	2.07	0.00	1.92	0.34	960	0.01	0.00	961	0.01	0.04	0.05
Forge Shop	0.11	0.58	1.12	0.00	0.63	0.13	352.99	0.01	0.00	353	0.00	0.01	0.01
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Materials Movement - Barges	1.74	5.40	33.15	0.04	0.87	0.84	3,992	0.02	0.01	3,994	0.01	0.07	0.08
Total	**8.29**	**287.56**	**71.30**	**0.22**	**188.15**	**29.61**	**32,460**	**0.83**	**0.15**	**34,077**	**0.12**	**0.35**	**0.48**
2029													
Pier 2	0.03	0.13	0.44	0.00	0.22	0.04	144	0.002	0.001	144	0.001	0.01	0.01
M2D2 @ DD3	4.05	15.77	73.99	0.09	13.63	3.42	15,383	0.13	0.05	16,953	0.05	0.38	0.43
Bremerton Subtotal	**4.08**	**15.90**	**74.43**	**0.09**	**13.85**	**3.45**	**15,527**	**0.13**	**0.05**	**17,097**	**0.06**	**0.39**	**0.44**
Radio Hill Expansion	0.20	1.07	2.07	0.00	1.92	0.34	959.75	0.01	0.00	961	0.006	0.040	0.05
Forge Shop	0.11	0.58	1.12	0.00	0.63	0.13	352.99	0.01	0.00	353	0.00	0.01	0.01
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Materials Movement - Barges	1.39	4.33	26.61	0.03	0.70	0.68	3,205	0.01	0.01	3,207	0.01	0.06	0.07
Total	**10.60**	**297.53**	**113.84**	**0.27**	**196.41**	**31.65**	**43,269**	**0.93**	**0.19**	**44,900**	**0.16**	**0.61**	**0.77**
2030													
M2D2 @ DD3-Bremerton	**8.06**	**36.21**	**169.72**	**0.17**	**15.27**	**5.70**	**25,467**	**0.68**	**0.24**	**25,549**	**0.14**	**1.17**	**1.30**
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Materials Movement - Barges	0.88	2.74	16.80	0.02	0.44	0.43	2,023	0.01	0.00	2,024	0.00	0.04	0.04
Total	**13.77**	**314.61**	**196.11**	**0.34**	**195.01**	**33.18**	**50,714**	**1.46**	**0.37**	**50,853**	**0.24**	**1.32**	**1.56**
2031													
M2D2 @ DD3-Bremerton	1.90	8.46	41.67	0.04	6.16	1.57	4,834	0.18	0.06	4,856	0.03	0.28	0.31
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Materials Movement - Barges	1.00	3.10	19.03	0.02	0.50	0.48	2,291	0.01	0.00	2,293	0.00	0.04	0.05
Total	**7.73**	**287.22**	**70.30**	**0.21**	**185.96**	**29.11**	**30,350**	**0.95**	**0.19**	**30,429**	**0.13**	**0.43**	**0.56**
2032													
M2D2 @ DD3	1.90	8.46	41.67	0.04	6.16	1.57	4,834	0.18	0.06	4,855	0.03	0.28	0.31
Bremerton Subtotal	**1.90**	**8.46**	**41.67**	**0.04**	**6.16**	**1.57**	**4,834**	**0.18**	**0.06**	**4,855**	**0.03**	**0.28**	**0.31**
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Materials Movement - Barges	0.99	3.08	18.94	0.02	0.50	0.48	2,280	0.01	0.00	2,282	0.00	0.04	0.05
Total	**7.72**	**287.20**	**70.21**	**0.21**	**185.96**	**29.11**	**30,339**	**0.95**	**0.19**	**30,417**	**0.13**	**0.43**	**0.56**
2033													
M2D2 @ DD3	1.79	7.82	38.58	0.04	2.90	1.19	4,486	0.17	0.06	4,855	0.03	0.27	0.30
Bremerton Subtotal	**1.79**	**7.82**	**38.58**	**0.04**	**2.90**	**1.19**	**4,486**	**0.17**	**0.06**	**4,855**	**0.03**	**0.27**	**0.30**
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Materials Movement - Barges	1.02	3.16	19.38	0.02	0.51	0.49	2,333	0.01	0.00	2,335	0.00	0.04	0.05
Total	**7.63**	**286.63**	**67.56**	**0.21**	**182.70**	**28.74**	**30,044**	**0.94**	**0.19**	**30,470**	**0.13**	**0.43**	**0.56**
2034													
M2D2 @ DD3	1.79	7.82	38.58	0.04	2.90	1.19	4,486	0.17	0.06	4,505	0.03	0.27	0.30
Bremerton Subtotal	**1.79**	**7.82**	**38.58**	**0.04**	**2.90**	**1.19**	**4,486**	**0.17**	**0.06**	**4,505**	**0.03**	**0.27**	**0.30**
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Materials Movement - Barges	1.76	5.47	33.57	0.04	0.88	0.85	4,043	0.02	0.01	4,046	0.01	0.08	0.08
Caisson Delivery	0.32	1.00	6.16	0.01	0.16	0.16	742	0.003	0.04	751	0.002	0.01	0.02
Total	**8.70**	**289.95**	**87.91**	**0.23**	**183.24**	**29.25**	**32,495**	**0.95**	**0.23**	**32,583**	**0.13**	**0.47**	**0.61**
2035													
M2D2 @ DD3	0.42	1.94	7.17	0.008	0.57	0.31	2,252	0.03	0.010	2,256	0.010	0.06	0.07
Bremerton Subtotal	**0.42**	**1.94**	**7.17**	**0.01**	**0.57**	**0.31**	**2,252**	**0.03**	**0.01**	**2,256**	**0.01**	**0.06**	**0.07**
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Materials Movement - Barges	1.69	5.24	32.20	0.04	0.84	0.82	3,878	0.02	0.01	3,880	0.01	0.07	0.08
Total	**6.94**	**282.84**	**48.96**	**0.20**	**180.72**	**28.18**	**29,354**	**0.81**	**0.14**	**29,416**	**0.11**	**0.25**	**0.36**
2036													
Pier 4 Demolition	0.01	0.05	0.12	0.00	0.13	0.02	72.59	0.00	0.00	73	0.00	0.00	0.00
M2D2 @ DD3	0.18	0.72	3.36	0.003	0.18	0.11	593	0.01	0.003	594	0.003	0.02	0.02
Bremerton Subtotal	**0.19**	**0.77**	**3.49**	**0.00**	**0.31**	**0.13**	**665**	**0.01**	**0.00**	**667**	**0.00**	**0.02**	**0.02**
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Materials Movement - Barges	1.66	5.17	31.75	0.04	0.83	0.81	3,823	0.02	0.01	3,825	0.01	0.07	0.08
Total	**6.68**	**281.59**	**44.83**	**0.19**	**180.44**	**27.99**	**27,713**	**0.79**	**0.14**	**27,772**	**0.10**	**0.21**	**0.31**
2037													
Pier 4 Demolition	1.00	4.05	18.85	0.02	0.96	0.60	3473.24	0.04	0.02	3,478	0.01	0.09	0.11
M2D2 @ DD3	1.33	5.87	28.51	0.027	3.14	0.99	3,581	0.12	0.041	3,595	0.022	0.20	0.22
Bremerton Subtotal	**2.33**	**9.92**	**47.35**	**0.05**	**4.10**	**1.59**	**7054.11**	**0.16**	**0.06**	**7073.43**	**0.03**	**0.29**	**0.32**
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Materials Movement - Barges	1.76	5.47	33.62	0.04	0.88	0.86	4,048	0.02	0.01	4,051	0.01	0.08	0.08
Total	**8.92**	**291.05**	**90.57**	**0.24**	**184.28**	**29.50**	**34,327**	**0.94**	**0.19**	**34,405**	**0.14**	**0.48**	**0.62**

Activity by Year	tons/year												
	VOCs	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	CO2e	Benzene	Formaldehyde	Total HAPs
2038													
Pier 4 Demolition	0.75	3.14	14.30	0.02	0.70	0.45	2624.80	0.03	0.01	2,629	0.01	0.08	0.09
M2D2 @ DD3	1.33	5.87	28.51	0.027	3.14	0.99	3,581	0.12	0.041	3,595	0.022	0.20	0.22
Bremerton Subtotal	**2.08**	**9.01**	**42.81**	**0.04**	**3.84**	**1.44**	**6205.67**	**0.15**	**0.05**	**6224.32**	**0.03**	**0.27**	**0.30**
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Materials Movement - Barges	1.80	5.60	34.39	0.04	0.90	0.88	4,141	0.02	0.01	4,143	0.01	0.08	0.09
Total	**8.71**	**290.26**	**86.79**	**0.23**	**184.04**	**29.37**	**33,571**	**0.94**	**0.19**	**33,648**	**0.13**	**0.46**	**0.60**
2039													
Pier 4 Demolition	0.78	3.23	14.74	0.02	0.71	0.47	2704.34	0.04	0.01	2,709	0.01	0.08	0.09
Bremerton Subtotal	**0.78**	**3.23**	**14.74**	**0.02**	**0.71**	**0.47**	**2,704**	**0.04**	**0.01**	**2,709**	**0.01**	**0.08**	**0.09**
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Materials Movement - Barges	1.80	5.60	34.39	0.04	0.90	0.88	4,141	0.02	0.01	4,143	0.01	0.08	0.09
Total	**7.41**	**284.49**	**58.72**	**0.21**	**180.91**	**28.40**	**30,070**	**0.82**	**0.15**	**30,133**	**0.11**	**0.27**	**0.38**
2040													
Pier 4 Construction-Bremerton	**0.55**	**2.02**	**9.78**	**0.01**	**0.52**	**0.33**	**1849.70**	**0.01**	**0.01**	**1,852**	**0.01**	**0.05**	**0.05**
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Total	**5.38**	**277.67**	**19.38**	**0.16**	**179.82**	**27.38**	**25,074**	**0.78**	**0.13**	**25,132**	**0.10**	**0.16**	**0.26**
2041													
Pier 4 Construction-Bremerton	**1.11**	**4.09**	**19.87**	**0.02**	**1.06**	**0.67**	**3756.22**	**0.03**	**0.01**	**3,761**	**0.01**	**0.09**	**0.11**
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	3,329	0.09	0.12	0.21
Total	**5.94**	**279.75**	**29.47**	**0.17**	**180.36**	**27.72**	**26,981**	**0.80**	**0.14**	**7,090**	**0.11**	**0.21**	**0.32**

New Forge Shop at NAVBASE Kitsap Bangor

1 pound= 453.59 grams

			Asphalt (CY)	Gravel (CY)	Concrete (CY)	
Structure	117,188	SF		2,170	4,340	concrete assumed 1' depth; gravel 6" depth
Expansion capability	35,000	SF		648	1,296	concrete assumed 1' depth; gravel 6" depth
Open storage	1,332	SY	148	148		asphalt and gravel each assumed 4" depth
Apron	5,000	SY	556	556		asphalt and gravel each assumed 4" depth
Covered storage	1,000	SF		12	25	concrete assumed 8' depth; gravel 4" depth
Parking lot	19,965	SY	2,218	2,218		asphalt and gravel each assumed 4" depth
New road	37,000	SF	343	343		asphalt and gravel each assumed 4" depth
Total project size	10	acres				
	47,429	SY				
		Totals	3,264	6,095	5,661	6,463 Tons asphalt
		Truck Trips	272	508	629	
Soil excavation	2,000	M^3	2,620	CY		
Soil fill	5,200	M^3	6,812	CY		
			349	Truck trips for additional fill brought in (excavated soil assumed for re-use as fill)		
General Materials Trips	24.9	Trips/day	based on 0.1639 vendor trips/1000 SF (from Scouth Coast AQMD Field Survey 2008/2010 and used in CALEEMOD).			
	10.0	month construction window		304	days total	

Truck Transport

Task	Vehicle Type	Assumed Avg. Speed (mph)	Round Trip Distance (miles)	Total Project Trips (trucks)	Total Project VMT (miles)	Total Travel Time (hours)	Fraction Time in Idle	Total Time in Idle (hours)	Total Project Emissions (tons)											
									VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Total GHGs (CO2e)	Benzene	Formaldehyde
Gravel Delivery	Dump Truck	35	25.2	508	12,799	366	0.1	37	0.005	0.03	0.05	0.00005	0.02	0.005	13.96	0.0002	0.00004	14	0.00003	0.00036
Asphalt Delivery	Dump Truck	35	12	272	3,264	93	0.1	9	0.0012	0.006	0.0118	0.0000	0.0050	0.0012	3.56	0.00006	0.000009	4	0.000009	0.00009
Concrete Delivery	Concrete Truck	35	24.6	629	15,474	442	0.1	44	0.005	0.03	0.06	0.00006	0.02	0.006	16.87	0.00026	0.00004	17	0.00004	0.0004
Soil Delivery	Dump Truck	35	24.4	349	8,524	244	0.1	24	0.003	0.02	0.03	0.00003	0.01	0.003	9.29	0.00014	0.00002	9	0.00002	0.0002
General Materials Delivery	Delivery Truck	35	100	7,583	758,286	21,665	0.1	2167	0.27	1.51	2.75	0.00	1.15	0.28	826.81	0.01281	0.00217	828	0.002	0.02
								Totals	**0.28**	**1.58**	**2.89**	**0.00**	**1.21**	**0.30**	**870.49**	**0.01**	**0.002**	**871**	**0.00**	**0.02**

Notes: The following area businesseswere used for estimating distance and travel time -
Gravel - Sageser Sand & Gravel
Asphalt - Pyramid Materials
Concrete - CalPortland
Soil - Indigo Topsoil
General - from South Tacoma area

Construction **Paving** 273,673 SF 2.31 acres

70,000 SF Foundation
70,000 SF Total

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	Annual Emissions											Notes on Hour Estimates
				VOC	CO	NOx	SO_2	PM	$PM_{2.5}$	CO_2	CH_4	N_2O	Benzene	Formaldehyde	
				lb	lb	lb	lb	lb	lb	lb	lb	lb	lb	lb	
Excavator	42	450	0.53	0.70	4.48	12.10	0.03	0.72	0.70	11,831	0.06	0.03	0.03	0.18	based on 500 CY/day productivity rate
Grader	32	145	0.58	0.12	0.78	2.70	0.01	0.18	0.18	3,147	0.01	0.00	0.006	0.03	based on 3000 SY/day productivity rate for 2 passes
Roller	207	401	0.58	4.92	32.38	90.55	0.16	4.52	4.39	56,915	0.37	0.17	0.2	1.27	based on paving machine productivity X 2 pc equip.
Paving Machine	103	164	0.58	1.20	5.94	18.87	0.03	1.33	1.29	11,638	0.09	0.04	0.06	0.33	based on 500 tons/day productivity rate
Asphalt Curbing Machine	207	130	0.58	1.90	9.06	29.62	0.05	2.00	1.94	18,451	0.15	0.07	0.09	0.52	based on paving machine productivity X 2 pc equip.
Dozer	24	275	0.58	0.17	0.75	2.47	0.01	0.14	0.14	4,530	0.01	0.01	0.01	0.04	based on estimated use
Compactor	207	19	1	3.21	13.51	33.24	0.02	1.58	1.53	5,105	0.27	0.12	0.2	0.92	based on paving machine productivity X 2 pc equip.
Skidsteer Loader	767	95	0.23	27.16	143.73	140.86	0.08	20.49	19.88	25,651	1.06	0.48	0.9	6.56	based on loader activity X 2 pc equip
Loader	384	300	0.48	4.22	20.20	60.48	0.18	3.75	3.64	65,381	0.37	0.17	0.2	1.09	based on 350 CY/day productivity rate for soil fill and equip use otherwise for 25% of total construction days
25 ton Crane	304	150	1	4.16	17.63	86.82	0.15	4.09	3.97	53,375	0.36	0.16	0.2	1.16	based on 4 hr/day usage for 25% of total construction days
Telehandler	304	130	0.48	0.40	2.47	7.85	0.06	0.47	0.46	22,450	0.03	0.01	0.02	0.09	based on 4 hr/day usage for 25% of total construction days
Forklift	1,216	74	0.48	4.87	18.58	242.55	0.15	1.51	1.46	56,753	0.85	0.39	0.2	1.39	based on 4 hr/day usage for 100% of total construction days
Concrete Truck	566	300	0.21	11.35	51.39	214.46	0.13	6.87	6.66	41,724	0.69	0.31	0.5	2.96	based on 6 min/truck productivity at pour site
			Subtotal (lbs):	**64.38**	**320.90**	**942.56**	**1.07**	**47.66**	**46.23**	**376,949**	**4.31**	1.97	**2.58**	**16.54**	
			Construction Grand Total in Tons	**0.03**	**0.16**	**0.47**	**0.0005**	**0.02**	**0.02**	**188**	**0.002**	**0.001**	**0.001**	**0.008**	

Construction worker commuter emissions are covered under the project bounding case of 300 workers per day.

0.42 worker trips/day/1000(worker rate from CALEEMOD 2020, App A)
29 worker trips/day on average

Year	PM 10 tons/acre-mo	acres	months of disturbance	PM10 Total Tons	PM2.5/ PM10 Ratio	PM2.5 Total Tons	
2027	0.11	2.0	3	**0.66**	0.1	**0.07**	based on productivity estimate that impervious surface completion is 3 months and allowing that approx 2 acres are disturbed at any time.

Emission factor and ratio from WRAP Fugitive Dust Handbook, 2006

Total construction emissions for Forge Shop at Bangor:

Activity	tons/year											
	VOCs	CO	NOx	SOx	PM10	PM2.5	CO2	CH4	N2O	CO2e	Benzene	Formaldehyde
Truck Transport	0.28	1.58	2.89	0.00	1.21	0.30	870.49	0.01	0.00	871.50	0.00	0.02
Construction	0.03	0.16	0.47	0.0005	0.02	0.02	188	0.002	0.001	189	0.001	0.01
Fugitive Dust	NA	NA	NA	NA	0.66	0.07	NA	NA	NA	NA	NA	NA
Annual Total	**0.32**	**1.75**	**3.36**	**0.004**	**1.90**	**0.39**	**1059**	**0.02**	**0.003**	**1060**	**0.003**	**0.03**

Annual emissions

Year	tons/year											
	VOCs	CO	NOx	SOx	PM10	PM2.5	CO2	CH4	N2O	CO2e	Benzene	Formaldehyde
2027	0.11	0.58	1.12	0.00	0.63	0.13	352.99	0.01	0.00	353.43	0.00	0.01
2028	0.11	0.58	1.12	0.00	0.63	0.13	352.99	0.01	0.00	353.43	0.00	0.01
2029	0.11	0.58	1.12	0.00	0.63	0.13	352.99	0.01	0.00	353.43	0.00	0.01

Annual emissions are calculated by dividing the total emissions by 3 years of activity.

Laydown Area Expansion at NAVBASE Kitsap-Bangor

1 pound= 453.59 grams

			Asphalt (CY)	Gravel (CY)	Concrete (CY)	
Concrete storage area	23,000	SY concrete		2,556	3,833	concrete assumed 6" depth; gravel 4" depth
Laydown paved area	31,000	SY asphalt	3,444	3,444		asphalt and gravel each assumed 4" depth
44-space parking lot	1,540	SY asphalt	171	171		asphalt and gravel each assumed 4" depth
150' loading apron	6,000	SY asphalt	667	667		asphalt and gravel each assumed 4" depth
New Pavement	56,250	SF asphalt	694	694		asphalt and gravel each assumed 4" depth
Employee building	10,500	SF single story		130	130	concrete assumed 4" depth; gravel 4" depth
Work building	800	SF single story		10	10	concrete assumed 4" depth; gravel 4" depth

Total project size	14	acres	**Totals**	**4,977**	**7,672**	**3,973**	9,854 Tons asphalt
	69,046	SY	Truck Trips	415	639	441	
Fill	62,000	CY (assume removed)					
Excavation	108,000	CY (assume all is brought in)					
	14,167	Total truck trips for removal of excavated material and fill brought in					

General Materials Trips 1.9 Trips/day based on 0.1639 vendor trips/1000 SF (from South Coast AQMD Field Survey 2008/2010 and used in CALEEMOD).
24.0 month construction window 730 days total

Truck Transport

Task	Vehicle Type	Assumed Avg. Speed (mph)	Round Trip Distance (miles)	Total Project Trips (trucks)	Total Project VMT (miles)	Total Travel Time (hours)	Fraction Time in Idle	Total Time in Idle (hours)	Total Project Emissions (tons)											
									VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Total GHGs (CO2e)	Benzene	Formaldehyde
Gravel Delivery	Dump Truck	35	25.2	639	16,111	460	0.1	46	0.006	0.03	0.06	0.00006	0.02	0.006	17.57	0.0003	0.00005	18	0.00004	0.00045
Asphalt Delivery	Dump Truck	35	12	415	4,977	142	0.1	14	0.0018	0.010	0.0180	0.0000	0.0076	0.0019	5.43	0.00008	0.000014	5	0.000013	0.00014
Concrete Delivery	Concrete Truck	35	24.6	441	10,859	310	0.1	31	0.004	0.02	0.04	0.00004	0.02	0.004	11.84	0.00018	0.00003	12	0.00003	0.0003
Soil Delivery	Dump Truck	35	24.4	14,167	345,667	9,876	0.1	988	0.123	0.69	1.25	0.00128	0.53	0.129	376.90	0.00584	0.00099	377	0.00092	0.0096
General Materials Delivery	Delivery Truck	35	100	1,351	135,127	3,861	0.1	386	0.05	0.27	0.49	0.00	0.21	0.05	147.34	0.00228	0.00039	148	0.000	0.00
								Totals	**0.18**	**1.02**	**1.86**	**0.00**	**0.78**	**0.19**	**559.07**	**0.01**	**0.00**	**560**	**0.00**	**0.01**

Notes: The following area businesses were used for estimating distance and travel time -
Gravel - Sageser Sand & Gravel
Asphalt - Pyramid Materials
Concrete - CalPortland
Soil - Indigo Topsoil
General - from South Tacoma area

Construction **Paving** 346,860 SF 2.31 acres

11,300 SF Foundation
11,300 SF Total

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	Annual Emissions											Notes on Hour Estimates
				VOC	CO	NOx	SO2	PM	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	
				lb	lb	lb	lb	lb	lb	lb	lb	lb	lb	lb	
Excavator	1,728	450	0.53	29.04	184.71	498.61	1.34	29.59	28.70	487,673	2.56	1.17	1.33	7.42	based on 500 CY/day productivity rate*2 pc of equip
Grader	46	145	0.58	0.17	1.14	3.93	0.01	0.26	0.26	4,581	0.01	0.01	0.008	0.05	based on 3000 SY/day productivity rate for 2 passes
Roller	315	401	0.58	7.51	49.37	138.06	0.25	6.90	6.69	86,774	0.56	0.25	0.3	1.94	based on paving machine productivity X 2 pc equip.
Paving Machine	158	164	0.58	1.83	9.06	28.76	0.05	2.03	1.97	17,744	0.14	0.06	0.09	0.50	based on 500 tons/day productivity rate
Asphalt Curbing Machine	315	130	0.58	2.90	13.81	45.16	0.08	3.05	2.96	28,130	0.22	0.10	0.14	0.79	based on paving machine productivity X 2 pc equip.
Dozer	24	275	0.58	0.17	0.75	2.47	0.01	0.14	0.14	4,530	0.01	0.01	0.01	0.04	based on estimated use
Compactor	315	19	1	4.89	20.60	50.67	0.03	2.40	2.33	7,784	0.41	0.19	0.3	1.40	based on paving machine productivity X 2 pc equip.
Skidsteer Loader	13,778	95	0.23	487.71	2,580.61	2,529.04	1.48	367.96	356.92	460,545	18.96	8.65	15.5	117.79	based on loader activity X 2 pc equip
Loader	6,889	300	0.48	75.72	362.67	1,085.87	3.22	67.32	65.30	1,173,870	6.57	3.00	3.5	19.49	based on 350 CY/day productivity rate for soil fill and equip use (3 pcs) otherwise for 25% of total construction days
25 ton Crane	730	150	1	9.99	42.31	208.38	0.36	9.83	9.53	128,099	0.86	0.39	0.5	2.78	based on 4 hr/day usage for 25% of total construction days
Telehandler	730	130	0.48	0.97	5.92	18.83	0.14	1.13	1.09	53,879	0.07	0.03	0.04	0.23	based on 4 hr/day usage for 25% of total construction days
Forklift	2,918	74	0.48	11.68	44.59	582.12	0.36	3.62	3.51	136,206	2.05	0.93	0.6	3.34	based on 4 hr/day usage for 100% of total construction days
Concrete Truck	397	300	0.21	7.97	36.06	150.50	0.09	4.82	4.68	29,280	0.48	0.22	0.3	2.08	based on 6 min/truck productivity at pour site
			Subtotal (lbs):	**640.54**	**3,351.59**	**5,342.40**	**7.42**	**499.05**	**484.08**	**2,619,095**	**32.92**	**15.02**	**22.61**	**157.84**	
			Construction Grand Total in Tons	**0.32**	**1.68**	**2.67**	**0.0037**	**0.25**	**0.24**	**1,310**	**0.016**	**0.008**	**0.011**	**0.079**	

Construction worker commuter emissions are covered under the project bounding case of 300 workers per day.

0.42 worker trips/day/1000 (worker rate from CALEEMOD 2020, App A)
5 worker trips/day on average

Fugitive Dust

Year	PM 10 tons/acre-mo	acres	months of disturbance	PM10 Total Tons	PM2.5/ PM10 Ratio	PM2.5 Total Tons
2027	0.11	2.0	12	**2.64**	0.1	**0.26**
2028	0.11	2.0	9	**1.98**	0.1	**0.20**

Emission factor and ratio from WRAP Fugitive Dust Handbook, 2006

Based on productivity estimate allowing that approx 2 acres are disturbed at any time.

Total construction emissions for Laydown Area at Bangor:

	tons/year											
Activity	**VOCs**	**CO**	**NOx**	**SOx**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**CO2e**	**Benzene**	**Formaldehyde**
Truck Transport	0.18	1.02	1.86	0.00	0.78	0.19	559.07	0.01	0.00	559.75	**0.001**	**0.014**
Construction	0.32	1.68	2.67	0.004	0.25	0.24	1,309.55	0.02	0.008	1312.2459	0.011	0.079
Fugitive Dust-2027	NA	NA	NA	NA	2.64	0.26	NA	NA	NA	NA	NA	NA
Fugitive Dust-2028	NA	NA	NA	NA	1.98	0.20	NA	NA	NA	NA	NA	NA
2027	**0.17**	**0.90**	**1.51**	**0.00**	**1.88**	**0.30**	**622.87**	**0.01**	**0.00**	**624.00**	**0.00**	**0.03**
2028	**0.17**	**0.90**	**1.51**	**0.00**	**1.88**	**0.30**	**622.87**	**0.01**	**0.00**	**624.00**	**0.00**	**0.03**
2029	**0.17**	**0.90**	**1.51**	**0.00**	**1.88**	**0.30**	**622.87**	**0.01**	**0.00**	**624.00**	**0.00**	**0.03**

Original schedule was 2 years, updated schedule is 3 years. Total emissions were divided among 3 years instead of 2. Total emissions remain the same.

Operations at Laydown Area: 24 hours per day 6 hours per day per forklift (4 total: 2 10-17 ton forklifts and 2 7 ton forklifts)

				Annual Emissions											
Off-road Equipment	**Hours of Operation**	**Engine HP**	**Load Factor**	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb	**PM2.5** lb	**CO_2** lb	**CH4** lb	**N2O** lb	**Benzene** lb	**Formaldehyde** lb	Notes on Hour Estimates
Forklift - 10-17 ton	4,378	164	0.48	38.91	204.16	674.78	1.14	46.60	45.20	407,735	3.17	1.44	1.9	10.74	based on productivity per forklift for 2 pc equipment for one year of activity
Forklift - 7 ton	4,378	107	0.48	25.38	133.20	440.25	0.74	30.40	29.49	266,022	2.07	0.94	1.2	7.00	based on productivity per forklift for 2 pc equipment for one year of activity
			Annual Total in Tons	**0.03**	**0.17**	**0.56**	**0.001**	**0.04**	**0.04**	**337**	**0.003**	**0.001**	**0.002**	**0.009**	

Delivery of caisson for construction of M2D2 - Norfolk, VA 1 pound= 453.59 grams

Average trip rate

2,129 NM total one-way trip distance from Norfolk VA to NAVBASE Bremerton

8 mph speed of Ocean Tugs assumed 1.15 mi per NM

7 knots 2,450 total miles for route

306 Total Travel Time Hours 2 trips total

Off-road Equipment	Hours of Operation	Engine kW	Load Factor	VOC (g/kWh)	CO (g/kWh)	NOx (g/kWh)	SO2 (g/kWh)	PM10 (g/kWh)	PM2.5 (g/kWh)	CO_2 (g/kWh)	CH_4 (g/kWh)	N_2O (g/kWh)	Benzene (g/kWh)	Formaldehyde (g/kWh)
Ocean Tug- propulsion	613	1,118	0.7	0.30	0.919	5.6423	0.00625	0.1480	0.1436	679	0.00268	0.0332	0.00140	0.01262
Ocean Tug- propulsion	613	1,118	0.7	0.30	0.919	5.6423	0.00625	0.1480	0.1436	679	0.00268	0.0332	0.00140	0.01262
Ocean Tug- auxiliary	613	224	0.4	0.30	0.919	5.6423	0.00625	0.1480	0.1436	679	0.00268	0.0332	0.00140	0.01262

d Equipment	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb	CH_4 lb	N_2O lb	Benzene lb	Formaldehyde lb
Ocean Tug- propulsion	303.47	943.16	5,792.28	6.41	151.98	147.43	697,534	2.75	34.11	1.44	12.96
Ocean Tug- propulsion	303.47	943.16	5,792.28	6.41	151.98	147.43	697,534	2.75	34.11	1.44	12.96
Ocean Tug- auxiliary	38.45	119.50	733.86	0.81	19.26	18.68	88,375	0.35	4.32	0.18	1.64
2034 Tons/year:	**0.32**	**1.00**	**6.16**	**0.01**	**0.16**	**0.16**	**742**	**0.003**	**0.04**	**0.002**	**0.01**

Tab E **Component 14:** **New Pier 2** 1 pound= 453.59 grams

C14 **Construct Pier 2**

2026

Mobilization 107 days from Alternative 2 Schedule 04.24.22 (Navy edits). Pdf

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
25 ton Crane	1,070	150	1.00	14.65	62.05	305.60	0.52	14.41	13.98	187,865	1.27	0.58	0.73	4.07	Based on 107 day mobilization duration
Loader	1,070	300	0.48	11.76	56.33	168.65	0.50	10.46	10.14	182,322	1.02	0.47	0.54	3.03	
Forklift	1,070	74	0.48	4.28	16.35	213.43	0.13	1.33	1.29	49,938	0.75	0.34	0.22	1.22	
Telehandler	1,070	130	0.48	1.42	8.69	27.62	0.21	1.65	1.60	79,017	0.10	0.05	0.06	0.33	
Skidsteer Loader	1,070	95	0.23	37.87	200.41	196.40	0.11	28.58	27.72	35,765	1.47	0.67	1.20	9.15	
			Subtotal	**69.99**	**343.82**	**911.70**	**1.48**	**56.42**	**54.73**	**534,907**	**4.62**	**2.11**	**2.75**	**17.80**	

Dredging 115 days from Alternative 2 Schedule 04.24.22 (Navy edits). Pdf

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
60 ton derrick	1,154	230	1.00	22.18	318.28	318.28	0.86	13.60	13.19	310,597	1.86	0.85	1.01	5.73	Based on 83% of 139 day dredging duration
25 ton Crane	1,154	150	1.00	15.80	66.90	329.50	0.56	15.54	15.07	202,560	1.37	0.62	0.79	4.39	
			Subtotal	**37.98**	**385.18**	**647.78**	**1.42**	**29.14**	**28.26**	**513,157**	**3.23**	**1.47**	**1.80**	**10.11**	

Pile driving 84 days from Alternative 2 Schedule 04.24.22 (Navy edits). Pdf

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
160 ton derrick	840	470	1.00	45.07	202.44	857.56	1.32	30.69	29.76	462,085	3.29	1.50	2.02	11.70	Based on 28% of 300 day pile driving duration
160 ton derrick generator	840	94	1.00	55.00	277.39	588.47	0.33	47.26	45.85	102,612	2.18	0.99	0.45	2.62	
			Subtotal	**100.07**	**479.83**	**1,446.03**	**1.65**	**77.95**	**75.61**	**564,696**	**5.47**	**2.49**	**2.47**	**14.32**	

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	Notes on Hour Estimates
Tow Boat - propulsion	2,127	671	0.68	632.44	1,965.55	12,071.18	13.36	316.74	307.24	1,453,670	5.73	2.62	3.00	27.00	Based on 83% of 139 day dredge duration, 28% of 300 day pile driving duration, and 83% total trip time for dredge material disposal transport
Tow Boat - auxiliary	2,127	149	0.43	88.81	276.00	1,695.01	1.88	44.48	43.14	204,122	0.81	0.37	0.42	3.79	
Skiff	1,994	75	0.45	43.85	136.29	837.00	0.93	21.96	21.30	100,795	0.40	0.18	0.21	1.87	Based on 83% of 139 day dredge duration, 28% of 300 day pile driving duration
Crew boat	199	149	0.45	8.71	27.08	166.28	0.18	4.36	4.23	20,025	0.08	0.04	0.04	0.37	Based on daily trips for dredging and pile driving durations
Site tug - propulsion	1,994	112	0.50	72.76	226.14	1,388.80	1.54	36.44	35.35	167,246	0.66	0.30	0.34	3.11	Based on 83% of 139 day dredge duration, 28% of 300 day pile driving duration
Site tug - auxiliary	1,994	19	0.43	10.62	32.99	202.62	0.26	5.32	5.16	28,409	0.10	0.04	0.05	0.45	
Ocean Tug- propulsion	39	1,118	0.68	19.48	60.53	371.73	0.41	9.75	9.46	44,766	0.18	0.08	0.09	0.83	Based on trip transport time for material to be disposed at Elliot Bay
Ocean Tug- auxiliary	39	224	0.43	2.47	7.67	47.10	0.05	1.24	1.20	5,672	0.02	0.01	0.01	0.11	
Pier 2 hours pile driving for 2026 estimated at 28% of total hours			**Subtotal**	**879.14**	**2,732.24**	**16,779.71**	**18.61**	**440.29**	**427.08**	**2,024,704**	**7.97**	**3.64**	**4.17**	**37.54**	

Dredging hours for 2026 = 83% of total

Demo debris transport

Rail Equipment	Tons Waste	Gal Fuel Consumed	Emissions in lb VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde
Large Line Haul, Tier 1+	46,978	28,844	308.70	1,693.06	7,662.78	5.97	193.45	187.64	645,454	50.87	16.53	6.95	68.84

83% of waste moved in 2026

Waste transport to Columbia Ridge Commercial Landfill & Recycling, Arlington, OR

Factor ratios for benzene (0.0225) and formaldehyde (0.223) from USEPA 2017 Rail_HAP_AugmentationProfileAssignmentFactors_20200128.xlsx

2027

Dredging 24 days from Alternative 2 Schedule 04.24.22 (Navy edits). Pdf

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
60 ton derrick	236	230	1.00	4.54	65.19	65.19	0.18	2.78	2.70	63,616	0.38	0.17	0.21	1.17	Based on 17% of 139 day dredging duration
25 ton Crane	236	150	1.00	3.24	13.70	67.49	0.12	3.18	3.09	41,488	0.28	0.13	0.16	0.90	
			Subtotal	**7.78**	**78.89**	**132.68**	**0.29**	**5.97**	**5.79**	**105,105**	**0.66**	**0.30**	**0.37**	**2.07**	

Pile driving/Construction 216 days for pile driving and 91 days for construction from Alternative 2 Schedule 04.24.22 (Navy edits). Pdf

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
160 ton derrick	2,160	470	1.00	115.89	520.56	2,205.15	3.39	78.91	76.54	1,188,218	8.45	3.85	5.18	30.10	Based on 72% of 300 day pile driving duration
160 ton derrick generator	2,160	94	1.00	141.44	713.28	1,513.22	0.85	121.54	117.89	263,858	5.61	2.56	1.16	6.73	
25 ton Crane	910	150	1.00	12.46	52.77	259.90	0.44	12.26	11.89	159,773	1.08	0.49	0.62	3.46	Based on 50% of 182 day construction duration
Vibrators/equipment	910	18	0.58	7.41	31.47	78.88	0.05	3.60	3.49	12,465	0.65	0.30	0.40	2.22	
Misc Curing Equipment	910	60	0.58	7.79	48.77	197.87	0.12	5.59	5.42	41,598	0.84	0.38	0.35	2.13	
Concrete Finisher	910	74	0.58	9.61	60.15	244.04	0.14	6.89	6.69	51,305	1.04	0.47	0.44	2.63	
			Subtotal	**294.60**	**1,427.01**	**4,499.06**	**4.98**	**228.78**	**221.91**	**1,717,217**	**17.67**	**8.06**	**8.15**	**47.27**	

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	Notes on Hour Estimates
Tow Boat - propulsion	2,424	671	0.68	720.69	2,239.81	13,755.50	15.23	360.93	350.11	1,656,504	6.53	2.98	3.42	30.77	Based on dredging and pile driving duration, dredge material disposal transport time
Tow Boat - auxiliary	2,424	149	0.43	101.20	314.51	1,931.52	2.14	50.68	49.16	232,603	0.92	0.42	0.48	4.32	
Skiff	3,306	75	0.45	72.72	226.02	1,388.05	1.54	36.42	35.33	167,156	0.66	0.30	0.34	3.11	Based on dredging, pile driving and construction duration
Crew boat	331	149	0.45	14.45	44.90	275.76	0.31	7.24	7.02	33,208	0.13	0.06	0.07	0.62	Based on daily trips for dredging, pile driving and construction duration
Site tug - propulsion	2,396	112	0.50	87.46	271.80	1,669.24	1.85	43.80	42.49	201,019	0.79	0.36	0.41	3.73	
Site tug - auxiliary	2,396	19	0.43	12.76	39.65	243.53	0.31	6.39	6.20	34,146	0.12	0.05	0.06	0.54	Based on dredging and pile driving duration
Ocean Tug- propulsion	8	1,118	0.68	3.99	12.40	76.14	0.08	2.00	1.94	9,169	0.04	0.02	0.02	0.17	Based on dredge material disposal transport to Elliot Bay
Ocean Tug- auxiliary	8	224	0.43	0.51	1.57	9.65	0.01	0.25	0.25	1,162	0.00	0.00	0.00	0.02	
			Subtotal	**1,013.77**	**3,150.66**	**19,349.39**	**21.47**	**507.71**	**492.48**	**2,334,967**	**9.19**	**4.19**	**4.80**	**43.28**	

Rail Equipment	Tons Waste	Gal Fuel Consumed	Emissions in lb VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde
Large Line Haul, Tier 1+	9,622	5,908	63.23	346.77	1,569.49	1.22	39.62	38.43	132,201	10.42	3.39	1.42	14.10

17% of waste moved in 2027
Waste transport to Columbia Ridge Commercial Landfill & Recycling, Arlington, OR
Factor ratios for benzene (0.0225) and formaldehyde (0.223) from USEPA 2017 Rail_HAP_AugmentationProfileAssignmentFactors_20200128.xlsx

ONSITE MATERIAL MOVEMENT

Equipment	Activity	Operating Hours	g/hr-vehicle Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	Idle	455	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41
			Annual Emissions in Pounds VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
			5.24	22.05	34.28	0.02	2.55	2.34	5,746	0.27	0.08	0.04	0.41

Equipment	MPH	Miles	g/VMT Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	10	4,550	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
			Annual Emissions in Pounds VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
			8.50	44.91	73.62	0.06	9.91	4.57	17,063	0.44	0.08	0.06	0.66

Pier 2 hours pile driving for 2027 estimated at 72% of total hours
Dredging hours for 2027 = 17% of total
Construction hours for 2027 = 0.5 of total
Onsite truck hours split 50/50 between idle and movement

2028

Construction — 91 days for construction from Alternative 2 Schedule 04.24.22 (Navy edits). Pdf

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
25 ton Crane	910	150	1.00	12.46	52.77	259.90	0.44	12.26	11.89	159,773	1.08	0.49	0.62	3.46	Based on 50% of 182 day construction duration
Vibrators/equipment	910	18	0.58	7.41	31.47	78.88	0.05	3.60	3.49	12,465	0.65	0.30	0.40	2.22	
Misc Curing Equipment	910	60	0.58	7.79	48.77	197.87	0.12	5.59	5.42	41,598	0.84	0.38	0.35	2.13	
Concrete Finisher	910	74	0.58	9.61	60.15	244.04	0.14	6.89	6.69	51,305	1.04	0.47	0.44	2.63	
			Subtotal	**37.28**	**193.17**	**780.69**	**0.75**	**28.33**	**27.48**	**265,141**	**3.61**	**1.65**	**1.81**	**10.44**	

ONSITE MATERIAL MOVEMENT

Equipment	Activity	Operating Hours	g/hr-vehicle Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
Onsite trucks	Idle	455	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41	Based on 25-ton crane activity
			Annual Emissions in Pounds VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	
			5.24	22.05	34.28	0.02	2.55	2.34	5,746	0.27	0.08	0.04	0.41	

Equipment	MPH	Miles	g/VMT Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	10	4,550	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
			Annual Emissions in Pounds VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
			8.50	44.91	73.62	0.06	9.91	4.57	17,063	0.44	0.08	0.06	0.66

Construction hours for 2028 = 0.5 of total
Onsite truck hours split 50/50 between idle and movement

Fugitive Dust — months of disturbance based on estimated annual % of construction schedule for disturbance activity

Year	PM 10 tons/acre-mo	acres	months of disturbance	**PM10 Total Tons**	PM2.5/ PM10 Ratio	**PM2.5 Total Tons**	
2026	0.11	2.4	2	**0.47**	0.1	**0.05**	Based on 50% mobilization activities
2027	0.11	2.4	1	**0.20**	0.1	**0.02**	Assume 50% of time involves upland activity
2028	0.11	2.4	1	**0.20**	0.1	**0.02**	Assume 50% of time involves upland activity

Emission factor and ratio from WRAP Fugitive Dust Handbook, 2006
50% of acreage for each phase per year is assumed to have active dust generating activity at any time of the disturbance period.

Totals by Year

Year	Annual Emissions in Tons VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde
2027	0.70	2.82	13.72	0.01	0.87	0.43	2,141.46	0.04	0.01	0.01	0.07
2028	0.70	2.54	12.83	0.01	0.60	0.40	2,156.15	0.02	0.01	0.01	0.05
2029	0.03	0.13	0.44	0.00	0.22	0.04	143.97	0.00	0.00	0.00	0.01

Tab F **Component 2:** **1250' X 190' M2D2 at Dry Dock 3** 1 pound= 453.59 grams

Phase 1: 1 acre = 43560 sq ft

Building Demolition 158 days

Facility		Footprint (SF)
B58/B452	Marine Machine Shop 38/Forge Shop	69,400
B357	Pumpwell 3 (Subsurface)	100
B421	Latrine (Waterfront Support Facility)	1,100
B495	David Taylor R & D	10,900
B495A	Annex Enclosure	3,600
B560	Canteen	1,700
B697	Material Shed	700
B734	Substation 7	2,000
B773	Pumpwell 3A	300
B923	East Air Compressor	5,600
B946	Lead Working/Storage	900
B952	Electrical Substation B	200
B960	Electrical Substation A	8,700
B972	Lead Storage Facility	2,600
B994	Hazardous Waste	1,000
B1003	Saltwater Pump Station	1,500
B1148	WPC Enclosure	700
B9001	C350 Demil Worksite	3,800
B1016	Project Kitting pp	1,800
B1149	Facility)	1,625
B1150	Facility)	1,625
B1151	Facility)	667
B1152	Facility)	775
B1154	Facility)	1,070
B1155	Facility)	200
		122,562
	In the Engineering Report but not in Table 2-4	

2.8 acres

Other Demolition 30 days

Phase	Structure/Type		Footprint (SF)	
Phase 1	Impervious Surfaces	Asphalt and paving in the yard	421,600	9.7 acres
Phase 2	Pier 7	Pier superstructure	65,000	1.5 acres
Phase 2	Pier 6 (see Tab H)	Pier superstructure	135,000	3.1 acres
				14.3

	2026	2027	2028	2029	2030	2031	2032	2033	2034
Acreage	0.7	10.5	9.5	14.1	14.1	3.7	3.7	1.0	0.5

Phase 2:

Dredging Quantities

Dredge Type	Approximate Quantity (CY)	Area (SF)
Dredging of Unsuitable Material (top 3' of Sediment)*	19,600	-
Dredging of Suitable Material (below top 3' of Sediment)**	69,000	184,000
Temporary Cofferdam Fill Removal ***	18,000	-

* Sediment and debris removal for cofferdam construction included in volume

** 1-foot overdredge allowance included in volume

*** Material unsuitable for open-water disposal

Portal Crane Trackage				
Rail	**Length (ft)**	Phase 8 now		
Demolished Rail	8,715		0.60	
Standard Gauge Track				
Rail	**Length (ft)**			
Demolished Rail	4,935		0.34	
			0.94	acres

Phase 3:

Temporary In-water Cofferdams

Structure	Pile Type	Pile Material	Pile Size (in.)	Pile Wall Thickness (in.)	Length Above EL -30 MLLW (feet)	Length Below EL -30 MLLW (feet)	Total Length (feet)
Cellular Cofferdam	Sheet – Straight Web	Steel	20	1/2	0	5,500	5,500

Temporary In-water Piles

Structure	Pile Type	Pile Material	Pile Size (in.)	Pile Wall Thickness (in.)	Piles Above EL -30	Piles Below EL -30 MLLW	Spacing of Piles (feet)	
Fender System	Fender – Square	Prestressed Concrete		NA	0	70	10	70
Work Platform	Plumb – Pipe	Steel		3/4	0	64	10	64
3-Pile Dolphin	Plumb/Batter	Steel		3/4	0	24	NA	24
Cofferdam Template*	Plumb – Pipe	Steel		1/2	64	640	Varies	704

* assumes 8 piles per template location

862

Permanent In-water Sheet Piles

Structure	Pile Type	Pile Material	Pile Size (in.)	Pile Wall Thickness (in.)	Length Above EL -30 MLLW (feet)	Length Below EL -30 MLLW (feet)	Total Length (feet)
East Cellular Cofferdam	Sheet – Straight Web	Steel	20		500	1,200	1,700
West Cellular Cofferdam	Sheet – Straight Web	Steel	20		900	3,000	3,900
							5,600

Permanent In-water Piles

Structure	Pile Type	Pile Material	Pile Size (in.)	Pile Wall Thickness (in.)	Piles Below EL -30 MLLW (ft)	Spacing of Piles (ft)
Saltwater Pumpwell A	Plumb-Pipe	Steel	48	2	15	10-12
Saltwater Pumpwell B	Plumb-Pipe	Steel	48	2	9	10-12
					24	**210**

Upland Piles

Structure	Pile Type	Pile Material	Pile Size (in.)	Pile Wall Thickness (in.)	No. Piles	Spacing of Piles (ft)	
Secant Pile Wall	Drilled Shaft	Concrete	60	NA	520	4.25	
Portal Crane Track Foundations	Auger Cast	Concrete	24	NA	1045	10	
Dewatering Pumpwell and Discharge Culvert	Plumb – Pipe	Steel	36	1/2	120	10	**150**
Quay Wall	Plumb – Pipe	Steel	36	1/2	50	10	Phase 8 **140**
					1735		

Upland Sheet Piles

Structure	Pile Type	Pile Material	Pile Size (in.)	Pile Wall Thickness (in.)	Total Length (ft)	
Entrance Wall	Z-sheet	Steel	27.56	1/2	266	
Quay Wall	Z-sheet	Steel	27.56	1/2	145	Phase 8
Dewatering Pumpwell	Z-sheet	Steel	27.56	1/2	166	
					577	

Pile-driving Data for Phase 3

Structure	Pile Type	Pile Material	Pile Size (in.)	Total Depth Driven (ft)	Pile-Driving Production per Day		
Cofferdams	Flat Sheet	Steel	AS500*	30	##########		
Pumpwell	Steel Pipe	Steel	48	30	#		245 days based on V3A Table 2-10
Pumpwell	Steel Pipe	Steel	36	30	#		
Quay Wall	Steel Pipe	Steel	36	30	#	Phase 8	
Quay Wall	Sheet	Steel	AZ28-700*	30	#		365 days
							610 days

Fill Discharged above MHHW

Fill Type	Volume (CY)	Area (SF)	
Permanent Cofferdams, Angular Ballast Rock Backfill	49,600	17,200	0.39 acres
Temporary Cofferdams, Angular Ballast Rock Backfill	0	0	

Fill Discharged below MHHW

Fill Type	Volume (CY)	Area (SF)
Permanent Cofferdams, Angular Ballast Rock Backfill	211,000	73,100
Temporary Cofferdams, Angular Ballast Rock Backfill	426,000	117,400

Phase 5

Excavation Quantities

Phase	Location	Scope of Work	Quantity	Unit	
5	Dry Dock Walls	Behind Exist Walls Upland	611,000	CY	used 287,700 plus 611,000 for upland excavation

Other Demolition

Structure/Type		Footprint (SF)	
DD3	Dry dock area, including utility tunnels	167,400	3.8

Phase 6

Excavation Quantities

Phase	Location	Scope of Work	Quantity	Unit
6	DD3 Floor	Floor Excavation	287,700	CY

Phase 7

Building Construction - Phase 7 190 days; 8/28-3/29

Structure Name	Description	Footprint Dimensions (FT)	Approx. Footprint (SF)
	Provides saltwater for fire protection and cooling/flushing for M2D2 and the PSNS saltwater loops. Houses		
Saltwater Pumphouse A		38'x30'	1,140
	Provides saltwater for fire protection and cooling/flushing for	82'x40'	3,280
Saltwater Pumphouse B	Location of dewatering, groundwater relief		
Dry Dock Pumphouse	Location of treatment for process water.	160'x65'	10,400
PWCS Plant	Location of treatment for oily water.	54'x33.5'	1,810
OWTS Plant	Location of tanks and treatment for process water.	54'x33.5'	1,810
PWCS Storage Tanks	Location of tanks and treatment for oily water.	72'x48'	3,500
OWTS Storage Tanks	Houses equipment to generate low-pressure compressed air.	63'x42'	2,700
Low-pressure Compressed Air Utility Building (CAUB)	Houses equipment needed to generate HPCA.	160'x64'	10,200
HPCA Utility Building (High-pressure CAUB)	Houses equipment to generate cooling water.	42'x28'	1,200
Closed-loop Cooling System	Houses control equipment and monitoring for new utilities.	186'x42'	7,800
Control Center Building	Provides 480V and 13.8kV power to vessels in the dry dock.	42'x28'	1,200
Shore Power Substation	Provides 480V power to all supporting elements	13'x32' ea	420 ea
Industrial Power Substation	Provides distribution level power to the industrial and shore power substations.	13'x40' ea	520 ea
		East Substation: 249'x111'	
Medium Voltage Substations		West Substation:	
		196'x88'	
Fire Pump House	Houses the fire pump for the non- potable	20'x25'	500
Shipfitter-welder shop			148881
Shipyard support building			73160
	Not listed in Table 2-4		

313,578 SF

7.2 acres

Modifications/Renovations

Structure/Type	Desc	Footprint (SF)
B147	Storage facility	unk
B368	Ship recycle disposal facility	unk
B460	Shipfitter-welder Shop	unk
B851	Woodworking and boat shop	unk

Data in this table from Table 2-4 of DOPAA

New Bangor Forge Shop	with parking area; on undeveloped land; replaces bldg 452	75,000 SF with parking	

Fill Discharged above MHHW

Fill Type	Volume (CY)	Area (SF)	
Drainage Course	71,500	206,100	4.7
Angular Ballast Rock Backfill (not including cofferdam)	494,200	171,100	3.9

Fill Discharged below MHHW

Fill Type	Volume (CY)	Area (SF)
Drainage Course	38,500	97,900
Angular Ballast Rock Backfill (not including cofferdams)	27,400	9,500

Phase 8

Roads

Structure/Type		Footprint (SF)
Section of Farragut Ave & Tunnel	Demolish and replace tunnel; remove asphalt, regrade and resurface	4,413 SF tunnel; Avenue unknown

Portal Crane Trackage

Rail	Length (ft)		
New Rail	15,800	**1.1**	acre

Standard Gauge Track

Rail	Length (ft)		
New Rail	9,130	**0.63**	acre

Phase 9

Roads

Structure/Type		Footprint (SF)	
Streets E, F, and H	remove asphalt, regrade and resurface	unk	**1.31** acres

Demo Temporary In-water Cofferdams

Structure	Pile Type	Pile Material	Pile Size (in.)	Pile Wall Thickness (in.)	Length Above EL -30 MLLW (feet)	Length Below EL -30 MLLW (feet)	Total Length (feet)
Cellular Cofferdam	Sheet – Straight Web	Steel	20	1/2	0	5,500	5,500

Demo Temporary In-water Piles

Structure	Pile Type	Pile Material	Pile Size (in.)	Pile Wall Thickness (in.)	Piles Above EL -30	Piles Below EL -30 MLLW	Spacing of Piles (feet)
Fender System	Fender – Square	Prestressed Concrete		NA	0	70	10
Work Platform	Plumb – Pipe	Steel		3/4	0	64	10
3-Pile Dolphin	Plumb/Batter	Steel		3/4	0	24	NA
Cofferdam Template*	Plumb – Pipe	Steel		1/2	64	640	Varies

* assumes 8 piles per template location

Phase 10

Structure Construction

Structure Name	Description	Footprint Dimensions (FT)	Approx. Footprint (SF)	
Pier 7	Replacement of existing Pier 7 east of M2D2. Provides a pile-supported apron	562'x112'	58,000	
East Apron	Pile-supported concrete deck adjacent to M2D2 entrance. Provides	122'x126.5'	13,700	
West Apron	Pile-supported concrete deck adjacent to M2D2 entrance. Provides	153.5'x50'	9,000	
			80,700	1.9 acres

Permanent In-water Piles

Structure	Pile Type	Pile Material	Pile Size (in.)	Pile Wall Thickness (in.)	Piles Below EL -30 MLLW (ft)	Spacing of Piles (ft)
West Apron	Plumb – Octagonal	Prestressed Concrete	24	NA	35	15 +/-
West Apron Crane Beam	Plumb – Octagonal	Prestressed Concrete	24	NA	10	10
Fender System	Fender – Square	Prestressed Concrete	18	NA	110	10
East Apron/Pier 7	Plumb – Octagonal	Prestressed Concrete	24	NA	200	15
East Apron/Pier 7 Crane Beam	Plumb – Octagonal	Prestressed Concrete	24	NA	165	10

Pile-driving Data

Structure	Pile Type	Pile Material	Pile Size (in.)	Total Depth Driven (ft)	Pile-Driving Production per Day
Pier 7	Octagonal	Concrete	24	50	#
Pier 7	Square	Concrete	18	20	#
East Apron	Octagonal	Concrete	24	50	#
East Apron	Square	Concrete	18	20	#
West Apron	Octagonal	Concrete	24	50	#
West Apron	Square	Concrete	18	20	#

Excavation Quantities

Phase	Location	Scope of Work	Quantity	Unit
10	Offshore of DD3	Sediment 'Excavation'	88,700	CY

All Phases

Staging and Laydown Areas

Phase	Approximate Location	Approximate Area (SF)	
Phase 1	West of Dry Dock 3	29,000	0.7 acres
Phase 2	North End of Pier 7	29,000	0.7 acres
Phase 3	South of Building 460	30,000	0.7 acres
Phase 4	North of Pier 7 and Along B460	24,000	0.6 acres
Phase 5	Inside of Cofferdam	214,000	4.9 acres
Phase 6	Dry Dock Floor	600,000	13.8 acres
Phase 7	North of Pier 7/Along B460	58,000	1.3 acres
Phase 8 and 9	North of Pier 7/Along B460	51,000	1.2 acres
Phase 10	Barges	42,000	Offshore

Construction Workers

Phase	Estimated Number of Workers
Phase 1	70
Phase 2	70
Phase 3	70
Phase 4	50
Phase 5	80
Phase 6	80
Phase 7	210
Phase 8	90
Phase 9	80
Phase 10	170

Construction Traffic Round Trip

Phase	Type of	Estimated Total Number	Frequency*
Phase 1	Pickups/Utility Vehicles	10	Daily
	Tractor w/Low Boy	1	Daily
	Tractor Trailer	2	Twice Daily
Phase 2	Pickups/Utility Vehicles	10	Daily
	Tractor w/Low Boy	1	Daily
	Tractor Trailer	2	Twice Daily
Phase 3	Pickups/Utility Vehicles	10	Daily
	Tractor w/Low Boy	1	Daily
	Tractor Trailer	2	Twice Daily
Phase 4	Pickups/Utility Vehicles	10	Daily
	Tractor w/Low Boy	1	Daily
	Tractor Trailer	2	Twice Daily
Phase 5	Pickups/Utility Vehicles	10	Daily
	Tractor w/Low Boy	1	Daily
	Tractor Trailer	2	Twice Daily
Phase 6	Pickups/Utility Vehicles	10	Daily
	Tractor w/Low Boy	1	Daily
	Tractor Trailer	2	Twice Daily
Phase 7	Pickups/Utility Vehicles	10	Daily
	Tractor w/Low Boy	1	Daily
	Tractor Trailer	2	Twice Daily
	Tractor and Asphalt Trailer	3	Approximately 4 times per day each to deliver asphalt
Phase 8	Pickups/Utility Vehicles	10	Daily
	Tractor w/Low Boy	1	Daily
	Tractor Trailer	2	Twice Daily
Phase 9	Pickups/Utility Vehicles	10	Daily
	Tractor w/Low Boy	1	Daily
	Tractor Trailer	2	Twice Daily
Phase 10	Pickups/Utility Vehicles	10	Daily
	Tractor w/Low Boy	1	Daily
	Tractor Trailer	2	Twice Daily
	Tractor and Asphalt Trailer	3	Approximately 4 times per day each to deliver asphalt

duration based on schedule in Alternative 2 Schedule 04.04.22 (Navy edits). pdf, durations in M2D2 Construction Usage Rates.xlsx, and FullAlt2BremertonConstructionSchedule 6-16-22.pdf

2028

Phase 1, C2 Mobilization 71 days

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH_4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
25 ton Crane	710	150	1	9.72	41.17	202.78	0.35	9.56	9.28	124,658	0.84	0.38	0.48	2.70	Based on # equip, total duration (71 days)
Loader	710	300	0.48	7.80	37.38	111.91	0.33	6.94	6.73	120,980	0.68	0.31	0.36	2.01	
Forklift	710	74	0.48	2.84	10.85	141.62	0.09	0.88	0.85	33,137	0.50	0.23	0.14	0.81	
Telehandler	710	130	0.48	0.94	5.76	18.33	0.14	1.10	1.06	52,432	0.07	0.03	0.04	0.22	
Skidsteer Loader	710	95	0.23	25.13	132.98	130.32	0.08	18.96	18.39	23,732	0.98	0.45	0.80	6.07	
			Subtotal	**46.44**	**228.14**	**604.96**	**0.98**	**37.44**	**36.32**	**354938.34**	**3.06**	**1.40**	**1.83**	**11.81**	

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	Notes on Hour Estimates
Tow Boat - propulsion	118	671	0.68	35.19	109.36	671.63	0.74	17.62	17.09	80,881	0.32	0.15	0.17	1.50	Based on # equip, 17% of total duration to haul mobilization materials
Tow Boat - auxiliary	118	149	0.43	4.94	15.36	94.31	0.10	2.47	2.40	11,357	0.04	0.02	0.02	0.21	
			Subtotal	**40.13**	**124.72**	**765.94**	**0.85**	**20.10**	**19.49**	**92237.91**	**0.36**	**0.17**	**0.19**	**1.71**	

2029

Phase 1, C2 Building Demolition 68 days FullAlt2BremertonConstructionSchedule 6-16-22.pdf

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH_4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
25 ton Crane	1,360	150	1	18.63	78.87	388.42	0.66	18.32	17.77	238781.19	1.61	0.74	0.93	5.17	Based on 2 equip, total task duration (68 days)
Loader	680	300	0.48	7.47	35.80	107.18	0.32	6.64	6.45	115868.09	0.65	0.30	0.35	1.92	Based on 1 equip, total task duration (68 days)
Excavator	1,360	450	0.53	22.86	145.37	392.42	1.06	23.29	22.59	383816.89	2.02	0.92	1.05	5.84	Based on 2 equip, total task duration (68 days)
Hydraulic Hammer	1,360	114	1	18.88	90.07	294.50	0.51	19.92	19.32	183438.38	1.44	0.66	0.89	5.14	
100 ton Crane	680	480	1	37.26	167.37	708.98	1.09	25.37	24.61	382027.42	2.72	1.24	1.67	9.68	Based on 1 equip, total task duration (68 days)
			Subtotal	**105.10**	**517.47**	**1891.51**	**3.64**	**93.54**	**90.73**	**1303931.96**	**8.44**	**3.85**	**4.87**	**27.76**	

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	Notes on Hour Estimates
Tow Boat - propulsion	30	671	0.68	8.98	27.90	171.33	0.19	4.50	4.36	20,633	0.08	0.04	0.04	0.38	Based on 14 trips and trip time for disposal
Tow Boat - auxiliary	30	149	0.43	1.26	3.92	24.06	0.03	0.63	0.61	2,897	0.01	0.01	0.01	0.05	
			Subtotal	**10.24**	**31.82**	**195.39**	**0.22**	**5.13**	**4.97**	**23530.05**	**0.09**	**0.04**	**0.05**	**0.44**	

Towboat activity includes moving demo debris to Terminal 5 area at Industrial Area West in Seattle.

ONSITE MATERIAL MOVEMENT

Equipment	Activity	Operating Hours	g/hr-vehicle Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
Onsite trucks	Idle	1,360	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41	Based on excavator activity

Annual Emissions in Pounds VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
15.68	65.92	102.46	0.06	7.61	7.01	17,174	0.81	0.25	0.12	1.22

Equipment	MPH	Miles	g/VMT Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	10	13,600	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07

Annual Emissions in Pounds VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
25.39	134.25	220.05	0.17	29.62	13.65	51,003	1.31	0.25	0.19	1.99

Phase 2, C2 Pier Demo and Dredging

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
25 ton Crane	1,140	150	1	15.61	66.11	325.59	0.55	15.36	14.89	200,155	1.35	0.62	0.78	4.34	Based on # equip, 50% of phase 2 dredging duration (76 days)
60 ton derrick	2,940	230	1	56.51	811.07	811.07	2.18	34.65	33.61	791,502	4.74	2.16	2.58	14.59	Based on # equip, 50% of dredging duration, 60% pier demo duration (150 days)
160 ton derrick	1,800	470	1	96.58	433.80	1837.62	2.82	65.75	63.78	990,181	7.04	3.21	4.32	25.08	Based on # equip, 60% pier demo duration
160 ton derrick generator	1,800	94	1	117.86	594.40	1261.02	0.70	101.28	98.24	219,882	4.67	2.13	0.97	5.61	
2027 Pier demo hours represent 60% of total			**Subtotal**	**286.57**	**1,905.38**	**4,235.30**	**6.27**	**217.04**	**210.53**	**2,201,720.39**	**17.81**	**8.12**	**8.65**	**49.62**	
2027 Dredging hours represent 50% of total for Phase 2															

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	Notes on Hour Estimates
Tow Boat - propulsion	3,495	671	0.68	1039.34	3230.13	19837.43	21.96	520.52	504.91	2,388,920	9.42	4.30	4.93	44.38	Based on # equip, pier demo duration and disposal trip time
Tow Boat - auxiliary	3,495	149	0.43	145.94	453.57	2785.54	3.08	73.09	70.90	335,448	1.32	0.60	0.69	6.23	
Skiff	2,940	75	0.45	64.67	200.98	1234.27	1.37	32.39	31.41	148,637	0.59	0.27	0.31	2.76	Based on # equip, 40% of dredging duration, 60% pier demo duration
Crew boat	90	149	0.45	3.93	12.22	75.06	0.08	1.97	1.91	9,040	0.04	0.02	0.02	0.17	Based on 60% pier demo duration
Site tug - propulsion	1,800	112	0.5	65.69	204.17	1253.87	1.39	32.90	31.91	150,997	0.60	0.27	0.31	2.80	Based on # equip, 60% pier demo duration
Site tug - auxiliary	1,800	19	0.43	9.58	29.79	182.93	0.24	4.80	4.66	25,649	0.09	0.04	0.05	0.41	
Ocean Tug- propulsion	95	1118	0.68	47.05	146.23	898.07	0.99	23.56	22.86	108,150	0.43	0.19	0.22	2.01	Based on # disposal trips, distance and tugboat speed
Ocean Tug- auxiliary	95	224	0.43	5.96	18.53	113.78	0.13	2.99	2.90	13,702	0.05	0.02	0.03	0.25	
			Subtotal	**1382.17**	**4295.61**	**26380.96**	**29.24**	**692.22**	**671.45**	**3180543.49**	**12.53**	**5.72**	**6.55**	**59.01**	

Waste transport to Industrial Area West, Terminal 5 includes debris and unsuitable dredge material from Pier 6 demo

Phase 3, C2 Construct secant walls, cofferdam

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
60 ton derrick	7,320	230	1	140.71	2019.40	2019.40	5.43	86.26	83.67	1970678.74	11.81	5.39	6.43	36.33	Based on # equip, 60% cofferdam/secant pile wall construction duration (610 days)
100 ton Crane	7,320	480	1	401.10	1801.64	7632.00	11.73	273.09	264.90	4112412.83	29.25	13.34	17.93	104.16	from Table 2-10
160 ton derrick	7,320	470	1	392.74	1764.11	7473.00	11.48	267.40	259.38	4026737.56	28.64	13.06	17.56	101.99	
160 ton derrick generator	7,320	94	1	479.31	2417.24	5128.13	2.87	411.88	399.52	894187.13	19.00	8.67	3.93	22.81	
Excavator	7,320	450	0.53	123.02	782.44	2112.15	5.70	125.33	121.57	2065837.95	10.86	4.96	5.65	31.45	
2027 hrs represent 60% of total hours for phase			**Subtotal**	**1536.88**	**8784.84**	**24364.69**	**37.20**	**1163.96**	**1129.05**	**13069854.21**	**99.56**	**45.41**	**51.50**	**296.75**	

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	Notes on Hour Estimates
Tow Boat - propulsion	7,324	671	0.68	2178.00	6768.93	41570.50	46.02	1090.78	1058.06	5,006,122	19.75	9.01	10.32	92.99	Based on # equip, barge round trip duration, 60% cofferdam/secant pile wall construction duration (537 days)
Tow Boat - auxiliary	7,324	149	0.43	305.83	950.48	5837.25	6.46	153.17	148.57	702,950	2.77	1.26	1.45	13.06	
Skiff	7,320	75	0.45	161.01	500.39	3073.09	3.40	80.64	78.22	370,077	1.46	0.67	0.76	6.87	Based on # equip, 60% cofferdam/secant pile wall construction duration (537 days)
Crew boat	366	149	0.45	15.99	49.71	305.26	0.34	8.01	7.77	36,761	0.14	0.07	0.08	0.68	Based on 60% cofferdam/secant pile wall construction duration (537 days)
Site tug - propulsion	7,320	112	0.5	267.15	830.28	5099.06	5.65	133.80	129.78	614,053	2.42	1.10	1.27	11.41	Based on # equip, 60% cofferdam/secant pile wall construction duration (537 days)
Site tug - auxiliary	7,320	19	0.43	38.98	121.13	743.92	0.96	19.52	18.93	104,307	0.35	0.16	0.18	1.66	
			Subtotal	**2966.96**	**9220.92**	**56629.07**	**62.83**	**1485.90**	**1441.33**	**6834269.52**	**26.90**	**12.27**	**14.06**	**126.68**	

Phase 5, C2 Dry dock demolition, Excavation

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
160 ton derrick	18	470	1	0.94	4.22	17.87	0.03	0.64	0.62	9626.76	0.07	0.03	0.04	0.24	Based on # equip, 5% of total dry dock demolition duration (35 days)
160 ton derrick generator	18	94	1	1.15	5.78	12.26	0.01	0.98	0.96	2137.74	0.05	0.02	0.01	0.05	
Hydraulic Hammer	18	114	1	0.24	1.16	3.79	0.01	0.26	0.25	2360.42	0.02	0.01	0.01	0.07	
Welder	18	10	0.19	0.09	0.39	0.35	0.00	0.04	0.04	50.77	0.01	0.00	0.00	0.02	
Excavator	353	450	0.53	5.94	37.78	101.97	0.27	6.05	5.87	99735.95	0.52	0.24	0.27	1.52	Based on # equip, 5% of total excavation duration (3 days)
Loader	88	300	0.48	0.97	4.65	13.93	0.04	0.86	0.84	15054.33	0.08	0.04	0.04	0.25	
Phase 5 hrs estimated 5% of total for 2027;			**Subtotal**	**9.32**	**53.97**	**150.16**	**0.36**	**8.84**	**8.57**	**128965.98**	**0.75**	**0.34**	**0.38**	**2.16**	
Total excavation hours for Ph 5 are 62% of total for Ph 5, 6, and 10.															

ONSITE MATERIAL MOVEMENT

Equipment	Activity	Operating Hours	g/hr-vehicle Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
Onsite trucks	Idle	177	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41	Based on excavator activity during excavation phase

Annual Emissions in Pounds VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
2.04	8.56	13.31	0.01	0.99	0.91	2,231	0.11	0.03	0.02	0.16

Equipment	MPH	Miles	g/VMT Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	10	237	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07

Annual Emissions in Pounds VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
0.44	2.34	3.84	0.00	0.52	0.24	890	0.02	0.00	0.00	0.03

Onsite truck hours split 50/50 between idle and movement

Rail Equipment	Tons Waste	Gal Fuel Consumed	Emissions in lb VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde
Large Line Haul, Tier 1+	61,811	37,952	406	2,228	10,082	8	255	247	849,247	67	22	9.14	90.58

Waste transport to Columbia Ridge Commercial Landfill & Recycling, Arlington, OR

100% Phase 1 and 50% Phase 2 waste

2030

Phase 2, C2 Pier Demo and Dredging

Construction Equipment	Hours	HP	Load Factor	Emissions in lb												Notes on Hour Estimates
				VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde		
25 ton Crane	1,140	150	1	15.61	66.11	325.59	0.55	15.36	14.89	200154.82	1.35	0.62	0.78	4.34	Based on # equip, 50% of phase 2 dredging duration (76 days)	
60 ton derrick	2,340	230	1	44.98	645.55	645.55	1.74	27.58	26.75	629971.07	3.78	1.72	2.06	11.61	Based on # equip, 40% of phase 2 pier demo duration (150 days) and 50% of phase 2 dredging (76 days)	
160 ton derrick	1,200	470	1	64.38	289.20	1225.08	1.88	43.84	42.52	660120.91	4.69	2.14	2.88	16.72	Based on # equip, 40% of phase 2 pier demo duration (150 days)	
160 ton derrick generator	1,200	94	1	78.58	396.27	840.68	0.47	67.52	65.50	146588.05	3.11	1.42	0.64	3.74		
2028 Pier demo hours represent 40% of total			**Subtotal**	**203.55**	**1397.12**	**3036.89**	**4.64**	**154.29**	**149.66**	**1636834.86**	**12.94**	**5.90**	**6.36**	**36.41**		
2028 Dredging hours represent 50% of total for Phase 2																

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb											Notes on Hour Estimates
				VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	
Tow Boat - propulsion	2,468	671	0.68	734.03	2281.26	14010.09	15.51	367.61	356.59	1,687,163	6.65	3.04	3.48	31.34	Based on 60-ton derrick activity (pier demo and dredging), and debris disposal trip time
Tow Boat - auxiliary	2,468	149	0.43	103.07	320.33	1967.27	2.18	51.62	50.07	236,908	0.93	0.43	0.49	4.40	
Skiff	2,340	75	0.45	51.47	159.96	982.38	1.09	25.78	25.00	118,303	0.47	0.21	0.24	2.20	Based on # equip, 40% of phase 2 pier demo duration (150 days) and 50% of phase 2 dredging (76 days)
Crew boat	60	149	0.45	2.62	8.15	50.04	0.06	1.31	1.27	6,026	0.02	0.01	0.01	0.11	Based on 1 hr per day, 40% of phase 2 pier demo duration (150 days)
Site tug - propulsion	1,200	112	0.5	43.80	136.11	835.91	0.93	21.93	21.28	100,664	0.40	0.18	0.21	1.87	Based on # equip, 40% of phase 2 pier demo duration (150 days)
Site tug - auxiliary	1,200	19	0.43	6.39	19.86	121.95	0.16	3.20	3.10	17,099	0.06	0.03	0.03	0.27	
Ocean Tug- propulsion	7	1118	0.68	3.61	11.22	68.91	0.08	1.81	1.75	8,298	0.03	0.01	0.02	0.15	Based on # disposal trips, distance and tugboat speed
Ocean Tug- auxiliary	7	224	0.43	0.46	1.42	8.73	0.01	0.23	0.22	1,051	0.00	0.00	0.00	0.02	
			Subtotal	**945.44**	**2938.32**	**18045.28**	**20.00**	**473.49**	**459.29**	**2175514.22**	**8.57**	**3.91**	**4.48**	**40.37**	

Phase 3, C2 Construct secant walls, cofferdam

Construction Equipment	Hours	HP	Load Factor	Emissions in lb											Notes on Hour Estimates
				VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	
60 ton derrick	4,880	230	1	93.80	1346.27	1346.27	3.62	57.51	55.78	1313785.83	7.87	3.59	4.29	24.22	Based on # equip, 40% of total duration (610 days)
100 ton Crane	4,880	480	1	267.40	1201.10	5088.00	7.82	182.06	176.60	2741608.55	19.50	8.89	11.96	69.44	
160 ton derrick	4,880	470	1	261.83	1176.07	4982.00	7.65	178.27	172.92	2684491.71	19.09	8.71	11.71	67.99	
160 ton derrick generator	4,880	94	1	319.54	1611.50	3418.75	1.91	274.59	266.35	596124.76	12.67	5.78	2.62	15.21	
Excavator	4,880	450	0.53	82.01	521.63	1408.10	3.80	83.56	81.05	1377225.30	7.24	3.30	3.76	20.97	
2027 hrs represent 40% of total hours for phase			**Subtotal**	**1024.58**	**5856.56**	**16243.13**	**24.80**	**775.98**	**752.70**	**8713236.14**	**66.37**	**30.28**	**34.33**	**197.83**	

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb											Notes on Hour Estimates
				VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	
Tow Boat - propulsion	4,880	671	0.68	1451.16	4510.00	27697.58	30.66	726.76	704.96	3,335,478	13.16	6.00	6.88	61.96	Based on # equip, 40% of total duration (610 days)
Tow Boat - auxiliary	4,880	149	0.43	203.77	633.29	3889.24	4.31	102.05	98.99	468,362	1.85	0.84	0.97	8.70	
Skiff	4,880	75	0.45	107.34	333.59	2048.73	2.27	53.76	52.14	246,718	0.97	0.44	0.51	4.58	
Crew boat	244	149	0.45	10.66	33.14	203.51	0.23	5.34	5.18	24,507	0.10	0.04	0.05	0.46	
Site tug - propulsion	4,880	112	0.5	178.10	553.52	3399.37	3.76	89.20	86.52	409,369	1.61	0.74	0.84	7.60	
Site tug - auxiliary	4,880	19	0.43	25.98	80.75	495.94	0.64	13.01	12.62	69,538	0.24	0.11	0.12	1.11	
			Subtotal	**1977.01**	**6144.29**	**37734.38**	**41.86**	**990.12**	**960.42**	**4553971.16**	**17.92**	**8.18**	**9.37**	**84.41**	

Phase 4, C2

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb											Notes on Hour Estimates
				VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	
Tow Boat - propulsion	380	671	0.68	113.08	351.43	2158.26	2.39	56.63	54.93	259,909	1.03	0.47	0.54	4.83	Based on # equip, phase 4 debris quantity and disposal trip time
Tow Boat - auxiliary	380	149	0.43	15.88	49.35	303.06	0.34	7.95	7.71	36,496	0.14	0.07	0.08	0.68	
Demo Debris transport			**Subtotal**	**128.96**	**400.78**	**2461.32**	**2.72**	**64.58**	**62.65**	**296404.59**	**1.17**	**0.53**	**0.61**	**5.51**	

Phase 5, C2 Excavation, Demo DD3

Construction Equipment	Hours	HP	Load Factor	Emissions in lb											Notes on Hour Estimates
				VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	
160 ton derrick	252	470	1	13.52	60.73	257.27	0.40	9.21	8.93	138625.39	0.99	0.45	0.60	3.51	Based on # equip, and 72% duration of dry dock wall demolition (35 days)
160 ton derrick generator	252	94	1	16.50	83.22	176.54	0.10	14.18	13.75	30783.49	0.65	0.30	0.14	0.79	
Hydraulic Hammer	252	114	1	3.50	16.69	54.57	0.09	3.69	3.58	33990.05	0.27	0.12	0.16	0.95	
Welder	252	10	0.19	1.24	5.56	5.02	0.00	0.65	0.63	731.13	0.08	0.04	0.05	0.33	
Excavator	5,845	450	0.53	98.23	624.77	1686.53	4.55	100.08	97.08	1649554.67	8.68	3.96	4.51	25.11	Based on # equip, and 72% duration of dry dock wall demolition (35 days) and phase 5 excavation (59 days)
Loader	1,272	300	0.48	13.98	66.97	200.53	0.59	12.43	12.06	216782.38	1.21	0.55	0.65	3.60	Based on # equip, and 72% duration phase 5 excavation
			Subtotal	**146.97**	**857.95**	**2380.46**	**5.73**	**140.23**	**136.03**	**2070467.12**	**11.88**	**5.42**	**6.11**	**34.30**	

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb										Notes on Hour Estimates
				VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	
Tow Boat - propulsion	2,456	671	0.68	730.37	2269.88	13940.19	15.43	365.78	354.81	1,678,746	6.62	3.02	3.46	31.18	
Tow Boat - auxiliary	2,456	149	0.43	102.56	318.73	1957.46	2.17	51.36	49.82	235,726	0.93	0.42	0.49	4.38	
Demo Debris transport			**Subtotal**	**832.92**	**2588.62**	**15897.65**	**17.60**	**417.14**	**404.63**	**1914471.95**	**7.55**	**3.44**	**3.95**	**35.56**	

Phase 5 hrs estimated 72% of total for 2028; Total excavation hours for Ph 5 are 62% of total for Ph 5, 6, and 10.

ONSITE MATERIAL MOVEMENT

Equipment	Activity	Operating Hours	g/hr-vehicle Emission Rate											Notes on Hour Estimates
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	
Onsite trucks	Idle	636	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41	Based on # equip, and duration of excavation (59 days)
			Annual Emissions in Pounds											
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	
			7.33	30.83	47.92	0.03	3.56	3.28	8,033	0.38	0.12	0.05	0.57	

Equipment	MPH	Miles	g/VMT Emission Rate										
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	10	6,361	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
			Annual Emissions in Pounds										
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
			11.88	62.79	102.92	0.08	13.85	6.38	23,856	0.61	0.12	0.09	0.93

Onsite truck hours split 50/50 between idle and movement

Phase 7, C2 M2D2 Construction

Construction Equipment	Hours	HP	Load Factor	Emissions in lb											Notes on Hour Estimates
				VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	
25 ton Crane	1,188	150	1	16.26	68.86	339.15	0.58	16.00	15.52	208494.60	1.41	0.64	0.81	4.52	Based on # equip, 62% of total bldg construction duration (190 days)
Loader	1,188	300	0.48	13.05	62.51	187.18	0.56	11.60	11.26	202343.17	1.13	0.52	0.60	3.36	
100 ton Crane	7,740	480	1	424.11	1905.02	8069.91	12.40	288.76	280.10	4348370.94	30.93	14.11	18.96	110.14	Based on # equip, 75% of Ph 7 dry dock construction (258 days)
Excavator	7,740	450	0.53	130.08	827.33	2233.34	6.02	132.52	128.55	2184369.63	11.49	5.24	5.97	33.26	
Vibrators/equipment	3,768	18	0.58	30.70	130.29	326.59	0.19	14.88	14.44	51607.29	2.71	1.23	1.66	9.21	
Misc Curing Equipment	3,768	60	0.58	32.26	201.93	819.19	0.48	23.14	22.44	172221.93	3.49	1.59	1.46	8.82	Based on # equip, 62% of total bldg construction duration (190 days) and 75% of Ph 7 dry dock construction (258 days)
Concrete Finisher	16,668	74	0.58	176.00	1101.79	4469.77	2.63	126.25	122.46	939693.30	19.04	8.68	7.98	48.11	
			Subtotal	**822.46**	**4297.73**	**16445.12**	**22.86**	**613.16**	**594.76**	**8107100.87**	**70.19**	**32.01**	**37.45**	**217.41**	

ONSITE MATERIAL MOVEMENT

			g/hr-vehicle Emission Rate											
Equipment	Activity	Operating Hours	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
Onsite trucks	Idle	8,334	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41	Based on # equip, 62% of total bldg construction duration (190 days) and 75% of Ph 7 dry dock construction (258 days)
			Annual Emissions in Pounds											
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	
			96.06	403.93	627.84	0.36	46.66	42.93	105,236	4.97	1.52	0.71	7.47	

			g/VMT Emission Rate										
Equipment	MPH	Miles	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	10	83,338	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
			Annual Emissions in Pounds										
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
			155.60	822.65	1,348.40	1.06	181.49	83.63	312,532	8.02	1.52	1.16	12.16

				Emissions in lb											
Marine Equipment	Hours	Engine kW	Load Factor	VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	Notes on Hour Estimates
Tow Boat - propulsion	7,227	671	0.68	2149.08	6679.05	41018.53	45.41	1076.30	1044.01	4,939,651	19.48	8.89	10.18	91.76	Based on # equip and 33% total days of batch plant (1,095)
Tow Boat - auxiliary	7,227	149	0.43	301.77	937.86	5759.75	6.38	151.13	146.60	693,617	2.74	1.25	1.43	12.88	
			Subtotal	**2,450.85**	**7,616.91**	**46,778.28**	**51.79**	**1,227.43**	**1,190.61**	**5,633,268.20**	**22.22**	**10.13**	**11.61**	**104.64**	

M2D2 construction hours for 2028 are based on 80% of total hours for Ph 7 and 9 and 75% of Ph 7 total.
Miscellaneous building construction hours are based on 5/8 of total (based on information provided in ER schedule)
Onsite truck hours split 50/50 between idle and movement

			Emissions in lb										
Rail Equipment	Tons Waste	Gal Fuel Consumed	VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde
Large Line Haul, Tier 1+	1,041,572	639,525	6,844	37,538	169,895	132	4,289	4,160	14,310,681	1,128	367	154.00	1526.29

Waste transport to Columbia Ridge Commercial Landfill & Recycling, Arlington, OR
50% Phase 2, 100% Phases 4 & 5

2031 and 2032 evenly divided across the years

Phase 5, C2 Excavation, Demo DD3

				Emissions in lb											
Construction Equipment	Hours	HP	Load Factor	VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
160 ton derrick	81	470	1	4.32	19.40	82.18	0.13	2.94	2.85	44283.11	0.31	0.14	0.19	1.12	Based on # equip, and 23% duration of dry dock wall demolition (35 days)
160 ton derrick generator	81	94	1	5.27	26.58	56.40	0.03	4.53	4.39	9833.62	0.21	0.10	0.04	0.25	
Hydraulic Hammer	81	114	1	1.12	5.33	17.43	0.03	1.18	1.14	10857.93	0.09	0.04	0.05	0.30	
Welder	81	10	0.19	0.39	1.78	1.60	0.00	0.21	0.20	233.56	0.03	0.01	0.02	0.11	
Excavator	1,867	450	0.53	31.38	199.58	538.75	1.45	31.97	31.01	526941.07	2.77	1.26	1.44	8.02	Based on # equip, and 23% duration of Phase 5 excavation (59 days)
Loader	406	300	0.48	4.47	21.39	64.06	0.19	3.97	3.85	69249.93	0.39	0.18	0.21	1.15	Based on # equip, and 23% duration of drydock wall demolition and Phase 5 excavation
Phase 5 hrs estimated 23% of total for 2029;			**Subtotal**	**46.95**	**274.07**	**760.43**	**1.83**	**44.80**	**43.45**	**661399.22**	**3.79**	**1.73**	**1.95**	**10.96**	
Total excavation hours for Ph 5 are 62% of total for Ph 5, 6, and 10.															

ONSITE MATERIAL MOVEMENT

			g/hr-vehicle Emission Rate											
Equipment	Activity	Operating Hours	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
Onsite trucks	Idle	934	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41	Based on excavator activity
			Annual Emissions in Pounds											
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	
			10.76	45.25	70.33	0.04	5.23	4.81	11,789	0.56	0.17	0.08	0.84	

			g/VMT Emission Rate										
Equipment	MPH	Miles	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	10	9,336	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
			Annual Emissions in Pounds										
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
			17.43	92.16	151.05	0.12	20.33	9.37	35,011	0.90	0.17	0.13	1.36

Onsite truck hours split 50/50 between idle and movement

Phase 6, C2 Excavation

				Emissions in lb											
Construction Equipment	Hours	HP	Load Factor	VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
Excavator	3,306	450	0.53	55.56	353.38	953.93	2.57	56.61	54.91	933013.70	4.91	2.24	2.55	14.21	Based on # equip, and 29% duration of excavation (95 days)
Loader	827	300	0.48	9.08	43.51	130.27	0.39	8.08	7.83	140830.85	0.79	0.36	0.42	2.34	
Total excavation hours for Ph 6 are 29% of total for Ph 5, 6, and 10.			**Subtotal**	**64.65**	**396.89**	**1084.20**	**2.96**	**64.68**	**62.74**	**1073844.54**	**5.70**	**2.60**	**2.97**	**16.54**	

				Emissions in lb											
Marine Equipment	Hours	Engine kW	Load Factor	VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	Notes on Hour Estimates
Tow Boat - propulsion	5,572	671	0.68	1656.92	5149.50	31624.96	35.01	829.82	804.92	3,808,431	15.02	6.85	7.85	70.74	Based on # equip, 29% of dredge activity (95 days), waste quantity and disposal trip time
Tow Boat - auxiliary	5,572	149	0.43	232.66	723.08	4440.72	4.92	116.52	113.03	534,773	2.11	0.96	1.10	9.93	
			Subtotal	**1889.58**	**5872.58**	**36065.67**	**39.93**	**946.34**	**917.95**	**4343204.06**	**17.13**	**7.81**	**8.95**	**80.68**	

Phase 7, C2 M2D2 Construction

				Emissions in lb											
Construction Equipment	Hours	HP	Load Factor	VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
25 ton Crane	713	150	1	9.76	41.32	203.49	0.35	9.60	9.31	125096.76	0.84	0.39	0.49	2.71	Based on # equip, 37% of total bldg construction duration (190 days)
Loader	713	300	0.48	7.83	37.51	112.31	0.33	6.96	6.75	121405.90	0.68	0.31	0.36	2.02	
100 ton Crane	2,580	480	1	141.37	635.01	2689.97	4.13	96.25	93.37	1449456.98	10.31	4.70	6.32	36.71	Based on # equip, 25% of Ph 7 dry dock construction (430 days)
Excavator	2,580	450	0.53	43.36	275.78	744.45	2.01	44.17	42.85	728123.21	3.83	1.75	1.99	11.09	
Vibrators/equipment	1,573	18	0.58	12.81	54.38	136.31	0.08	6.21	6.03	21540.13	1.13	0.52	0.69	3.84	Based on # equip, 37% of total bldg construction duration, 25% of Ph 7 dry dock construction
Misc Curing Equipment	1,573	60	0.58	13.46	84.28	341.92	0.20	9.66	9.37	71882.94	1.46	0.66	0.61	3.68	
Concrete Finisher	5,873	74	0.58	62.01	388.20	1574.84	0.93	44.48	43.15	331084.38	6.71	3.06	2.81	16.95	
			Subtotal	**290.61**	**1,516.47**	**5,803.29**	**8.03**	**217.34**	**210.82**	**2,848,590.31**	**24.96**	**11.38**	**13.27**	**77.00**	

ONSITE MATERIAL MOVEMENT

			g/hr-vehicle Emission Rate											
Equipment	Activity	Operating Hours	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
Onsite trucks	Idle	2,943	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41	Based on Phase 6 and Phase 7 excavator activity
			Annual Emissions in Pounds											
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	
			33.92	142.65	221.72	0.13	16.48	15.16	37,163	1.75	0.54	0.25	2.64	

			g/VMT Emission Rate										
Equipment	MPH	Miles	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	10	29,430	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
			Annual Emissions in Pounds										
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
			54.95	290.51	476.18	0.38	64.09	29.53	110,368	2.83	0.54	0.41	4.30

				Emissions in lb												
Marine Equipment	Hours	Engine kW	Load Factor	VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	Notes on Hour Estimates
Tow Boat - propulsion	7,227	671	0.68	2149.08	6679.05	41018.53	45.41	1076.30	1044.01	4,939,651	19.48	8.89	10.18	91.76	Based on # equip and 33% total days of batch plant (1,095)
Tow Boat - auxiliary	7,227	149	0.43	301.77	937.86	5759.75	6.38	151.13	146.60	693,617	2.74	1.25	1.43	12.88	
Crew boat	258	149	0.45	11.27	35.04	215.18	0.24	5.65	5.48	25,913	0.10	0.05	0.05	0.48	Based on # equip, 25% of Ph 7 dry dock construction (344 days)
			Subtotal	**2,462.12**	**7,651.95**	**46,993.46**	**52.03**	**1,233.07**	**1,196.08**	**5,659,181.66**	**22.32**	**10.18**	**11.67**	**105.12**	

M2D2 construction hours for 2028 are based on 80% of total hours for Ph 7 and 9 and 25% of Ph 7 total.
Miscellaneous building construction hours are based on 3/8 of total (based on information provided in ER schedule)
Onsite truck hours split 50/50 between idle and movement
Movement of batch plant barges based on 1/3 of total hours.

			Emissions in lb										
Rail Equipment	Tons Waste	Gal Fuel Consumed	VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde
Large Line Haul, Tier 1+	800,760	491,667	5,262	28,859	130,615	102	3,297	3,198	11,002,042	867	282	118.39	1173.41

Waste transport to Columbia Ridge Commercial Landfill & Recycling, Arlington, OR
Phase 6 waste

2033 and 2034 evenly divided across the years

Phase 7, C2 M2D2 Construction

				Emissions in lb												
Marine Equipment	Hours	Engine kW	Load Factor	VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	Notes on Hour Estimates
Tow Boat - propulsion	7,227	671	0.68	2149.08	6679.05	41018.53	45.41	1076.30	1044.01	4,939,651	19.48	8.89	10.18	91.76	Movement of batch plant barges based on 33% of totalduration (1095 days)
Tow Boat - auxiliary	7,227	149	0.43	301.77	937.86	5759.75	6.38	151.13	146.60	693,617	2.74	1.25	1.43	12.88	
Crew boat	258	149	0.45	11.27	35.04	215.18	0.24	5.65	5.48	25,913	0.10	0.05	0.05	0.48	
			Subtotal	**2462.12**	**7651.95**	**46993.46**	**52.03**	**1233.07**	**1196.08**	**5659181.66**	**22.32**	**10.18**	**11.67**	**105.12**	

Asphalt demo 60 days Farragut Ave 20,800 SF Total

Phase 8, C2 Fill; Demo asphalt, standard gauge and crane rai Rail demo 60 days Farragut Ave Tunnel

				Emissions in lb											
Construction Equipment	Hours	HP	Load Factor	VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
Excavator	1,200	450	0.53	20.17	128.27	346.25	0.93	20.55	19.93	338661.96	1.78	0.81	0.93	5.16	Based on total duration of asphalt and rail demo (120 days)
Loader	600	300	0.48	6.59	31.59	94.57	0.28	5.86	5.69	102236.55	0.57	0.26	0.30	1.70	Based on total duration of asphalt demo (60 days)
Dozer	600	275	0.58	4.13	18.63	61.83	0.30	3.49	3.39	113250.04	0.33	0.15	0.17	0.94	
Air Compressor	600	173	1	14.52	54.69	238.66	0.35	13.24	12.85	121483.48	1.13	0.52	0.69	3.99	
			Subtotal	**45.40**	**233.18**	**741.32**	**1.86**	**43.15**	**41.85**	**675632.03**	**3.82**	**1.74**	**2.09**	**11.78**	

				Emissions in lb											
Marine Equipment	Hours	Engine kW	Load Factor	VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	Notes on Hour Estimates
Tow Boat - propulsion	1,697	671	0.68	504.58	1568.17	9630.73	10.66	252.70	245.12	1,159,779	4.57	2.09	2.39	21.54	Baed on estimated trips for Phase 8 and trip duration
Tow Boat - auxiliary	1,697	149	0.43	70.85	220.20	1352.33	1.50	35.48	34.42	162,854	0.64	0.29	0.34	3.03	
Fill and Demo Debris transport			**Subtotal**	**575.43**	**1788.37**	**10983.06**	**12.16**	**288.19**	**279.54**	**1322633.20**	**5.22**	**2.38**	**2.73**	**24.57**	

ONSITE MATERIAL MOVEMENT

			g/hr-vehicle Emission Rate										
Equipment	Activity	Operating Hours	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
Onsite trucks	Idle	600	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41	Based on excavator activity
			Annual Emissions in Pounds										
			VOC	**CO**	**NOx**	**SO2**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**Benzene**	**Formaldehyde**	
			6.92	29.08	45.20	0.03	3.36	3.09	7,577	0.36	0.11	0.05	0.54	

			g/VMT Emission Rate										
Equipment	MPH	Miles	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	10	6,000	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
			Annual Emissions in Pounds										
			VOC	**CO**	**NOx**	**SO2**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**Benzene**	**Formaldehyde**
			11.20	59.23	97.08	0.08	13.07	6.02	22,501	0.58	0.11	0.08	0.88

Onsite truck hours split 50/50 between idle and movement

Replace Farragut Ave/tunnel 200 days

Phase 8, C2 Replace Farragut Ave; Install Portal Crane Construct Portal Crane and Rail Tracks 60 days

				Emissions in lb											
Construction Equipment	Hours	HP	Load Factor	VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
Auger Rig	2,600	300	1	362.58	962.51	4510.83	2.93	200.41	194.39	912155.26	21.45	9.78	14.84	94.42	Based on total duration for replacement of Farragut Ave/tunnel and installation of portal crane
Excavator	2,600	450	0.53	43.70	277.92	750.22	2.02	44.52	43.18	733767.58	3.86	1.76	2.01	11.17	
Loader	2,600	300	0.48	28.58	136.87	409.81	1.22	25.41	24.64	443025.05	2.48	1.13	1.32	7.36	
Dozer	2,600	275	0.58	17.88	80.74	267.95	1.32	15.14	14.69	490750.17	1.44	0.66	0.72	4.06	
Air Compressor	2,600	173	1	62.90	237.00	1034.18	1.50	57.38	55.66	526428.41	4.92	2.24	3.00	17.30	
			Subtotal	**515.63**	**1695.05**	**6972.99**	**8.98**	**342.86**	**332.57**	**3106126.48**	**34.15**	**15.58**	**21.89**	**134.31**	

ONSITE MATERIAL MOVEMENT

			g/hr-vehicle Emission Rate										
Equipment	Activity	Operating Hours	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
Onsite trucks	Idle	1,300	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41	Based on excavator activity
			Annual Emissions in Pounds										
			VOC	**CO**	**NOx**	**SO2**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**Benzene**	**Formaldehyde**	
			14.98	63.01	97.94	0.06	7.28	6.70	16,416	0.77	0.24	0.11	1.16	

			g/VMT Emission Rate										
Equipment	MPH	Miles	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	10	13,000	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
			Annual Emissions in Pounds										
			VOC	**CO**	**NOx**	**SO2**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**Benzene**	**Formaldehyde**
			24.27	128.33	210.34	0.17	28.31	13.05	48,753	1.25	0.24	0.18	1.90

Onsite truck hours split 50/50 between idle and movement

Street E = 25,480 SF Street H = 6,240 SF

Phase 9, C2 M2D2 Construction; Demo Asphalt - Streets E, F, Street F = 25,480 SF

				Emissions in lb											
Construction Equipment	Hours	HP	Load Factor	VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
100 ton Crane	516	480	1	28.27	127.00	537.99	0.83	19.25	18.67	289891.40	2.06	0.94	1.26	7.34	Based on # equip, 20% of total phase 9 dry dock construction duration (86 days)
Excavator	516	450	0.53	8.67	55.16	148.89	0.40	8.83	8.57	145624.64	0.77	0.35	0.40	2.22	
Vibrators/equipment	172	18	0.58	1.40	5.95	14.91	0.01	0.68	0.66	2356.06	0.12	0.06	0.08	0.42	
Misc Curing Equipment	172	60	0.58	1.47	9.22	37.40	0.02	1.06	1.02	7862.55	0.16	0.07	0.07	0.40	
Concrete Finisher	1,032	74	0.58	10.90	68.22	276.75	0.16	7.82	7.58	58182.90	1.18	0.54	0.49	2.98	
			Subtotal	**50.72**	**265.54**	**1,015.95**	**1.42**	**37.64**	**36.51**	**503,917.55**	**4.29**	**1.96**	**2.30**	**13.36**	

ONSITE MATERIAL MOVEMENT

Equipment	Activity	Operating Hours	g/hr-vehicle Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
Onsite trucks	Idle	258	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41	Based on excavator activity for Phase 9
			Annual Emissions in Pounds											
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	
			2.97	12.51	19.44	0.01	1.44	1.33	3,258	0.15	0.05	0.02	0.23	

Equipment	MPH	Miles	g/VMT Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	10	2,580	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
			Annual Emissions in Pounds										
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
			4.82	25.47	41.74	0.03	5.62	2.59	9,675	0.25	0.05	0.04	0.38

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	Notes on Hour Estimates
Tow Boat - propulsion	2,039	671	0.68	606.39	1884.57	11573.83	12.81	303.69	294.58	1,393,778	5.50	2.51	2.87	25.89	Based on Phase 9 waste generated and disposal trip time
Tow Boat - auxiliary	2,039	149	0.43	85.15	264.63	1625.18	1.80	42.64	41.36	195,712	0.77	0.35	0.40	3.64	
M2D2 construction hours for 2030 are based on 20% of total hours for Ph 7 ar			**Subtotal**	**691.53**	**2149.20**	**13199.01**	**14.61**	**346.33**	**335.94**	**1589489.20**	**6.27**	**2.86**	**3.28**	**29.53**	
Onsite truck hours split 50/50 between idle and movement															
Marine Equipment hours based on waste transport.															

Phase 10, C2 M2D2 Construction

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
160 ton derrick	368	470	1	19.74	88.69	375.69	0.58	13.44	13.04	202437.08	1.44	0.66	0.88	5.13	Based # pcs of equipment, 8% of duration for construction of new pile supported structures (230 days).
160 ton derrick generator	368	94	1	24.10	121.52	257.81	0.14	20.71	20.09	44953.67	0.96	0.44	0.20	1.15	
25 ton Crane	368	150	1	5.04	21.34	105.10	0.18	4.96	4.81	64611.38	0.44	0.20	0.25	1.40	
Vibrators/equipment	368	18	0.58	3.00	12.73	31.90	0.02	1.45	1.41	5040.87	0.26	0.12	0.16	0.90	
Misc Curing Equipment	368	60	0.58	3.15	19.72	80.02	0.05	2.26	2.19	16822.21	0.34	0.16	0.14	0.86	
Concrete Finisher	368	74	0.58	3.89	24.33	98.69	0.06	2.79	2.70	20747.39	0.42	0.19	0.18	1.06	
			Subtotal	**58.92**	**288.33**	**949.21**	**1.02**	**45.61**	**44.24**	**354612.60**	**3.86**	**1.76**	**1.81**	**10.50**	

ONSITE MATERIAL MOVEMENT

Equipment	Activity	Operating Hours	g/hr-vehicle Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
Onsite trucks	Idle	184	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41	Based on 25-ton crane activity
			Annual Emissions in Pounds											
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	
			2.12	8.92	13.86	0.01	1.03	0.95	2,323.51	0.11	0.03	0.02	0.16	

Equipment	MPH	Miles	g/VMT Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	10	1,840	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
			Annual Emissions in Pounds										
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
			3.44	18.16	29.77	0.02	4.01	1.85	6,900	0.18	0.03	0.03	0.27

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	Notes on Hour Estimates
Tow Boat - propulsion	368	671	0.68	109.43	340.10	2088.67	2.31	54.81	53.16	251,528	0.99	0.45	0.52	4.67	Based # pcs of equipment, 8% of duration for construction of new pile supported structures (230 days).
Tow Boat - auxiliary	368	149	0.43	15.37	47.76	293.29	0.32	7.70	7.46	35,319	0.14	0.06	0.07	0.66	
Skiff	368	75	0.45	8.09	25.16	154.49	0.17	4.05	3.93	18,605	0.07	0.03	0.04	0.35	
Crew boat	368	149	0.45	16.08	49.98	306.93	0.34	8.05	7.81	36,962	0.15	0.07	0.08	0.69	
Site tug - propulsion	368	112	0.5	13.43	41.74	256.35	0.28	6.73	6.52	30,870	0.12	0.06	0.06	0.57	
Site tug - auxiliary	368	19	0.43	1.96	6.09	37.40	0.05	0.98	0.95	5,244	0.02	0.01	0.01	0.08	
Ocean Tug- propulsion	18	1,118	0.68	9.03	28.05	172.26	0.19	4.52	4.38	20,745	0.08	0.04	0.04	0.39	Based on # trips to disposal site for Phase 10 dredge materials
Ocean Tug- auxiliary	18	224	0.43	1.14	3.55	21.83	0.02	0.57	0.56	2,628	0.01	0.00	0.01	0.05	
Ph 10 hours for 2030 estimated at 8% of total			**Subtotal**	**174.53**	**542.42**	**3331.21**	**3.69**	**87.41**	**84.79**	**401901.12**	**1.58**	**0.72**	**0.83**	**7.45**	
Onsite truck hours split 50/50 between idle and movement															

Rail Equipment	Tons Waste	Gal Fuel Consumed	Emissions in lb VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde
Large Line Haul, Tier 1+	741,950	455,557	4,875	26,739	121,023	94	3,055	2,964	10,194,022	803	261	109.70	1087.23
Waste transport to Columbia Ridge Commercial Landfill & Recycling, Arlington, OR													
Phase 8 and 9 waste													

Phase 9, C2 M2D2 Construction - remove temp cofferdam, wharves and fendering

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
100 ton Crane	1,450	480	1	79.45	356.88	1511.80	2.32	54.10	52.47	814617.30	5.79	2.64	3.55	20.63	Based on # equip, total phase 9 temp cofferdam, wharves and fender removal (145 days)
Excavator	1,450	450	0.53	24.37	154.99	418.39	1.13	24.83	24.08	409216.53	2.15	0.98	1.12	6.23	
			Subtotal	**103.82**	**511.87**	**1,930.19**	**3.45**	**78.92**	**76.55**	**1,223,833.83**	**7.95**	**3.62**	**4.67**	**26.86**	

ONSITE MATERIAL MOVEMENT

Equipment	Activity	Operating Hours	g/hr-vehicle Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
Onsite trucks	Idle	725	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41	Based on excavator activity for Phase 9
			Annual Emissions in Pounds											
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	
			8.36	35.14	54.62	0.03	4.06	3.73	9,155.12	0.43	0.13	0.06	0.65	

Equipment	MPH	Miles	g/VMT Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	10	7,250	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
			Annual Emissions in Pounds										
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
			13.54	71.57	117.30	0.09	15.79	7.28	27,188.90	0.70	0.13	0.10	1.06

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde
Tow Boat - propulsion	645	671	0.68	191.80	596.10	3660.85	4.05	96.06	93.18	440,857	1.74	0.79	0.91	8.19
Tow Boat - auxiliary	645	149	0.43	26.93	83.70	514.05	0.57	13.49	13.08	61,904	0.24	0.11	0.13	1.15
Crew boat	129	149	0.45	5.64	17.52	107.59	0.12	2.82	2.74	12,957	0.05	0.02	0.03	0.24
			Subtotal	**224.37**	**697.32**	**4282.49**	**4.74**	**112.37**	**109.00**	**515718.31**	**2.03**	**0.93**	**1.06**	**9.58**

M2D2 construction hours for 2031 are based on 20% of total hours for Ph 7 and 9 and 80% of Ph 9 total.
Onsite truck hours split 50/50 between idle and movement
Marine Equipment hours based on 129 days of activity (Alternative 2 Schedule 04.04.22 (Navy edits). Pdf) and Construction Marine Traffic Activity every other day (50% of time)

Phase 10, C2 M2D2 Construction; Excavation; Dredging

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
160 ton derrick	3,542	470	1	190.04	853.62	3616.04	5.56	129.39	125.51	1948456.89	13.86	6.32	8.50	49.35	Based # pcs of equipment, 77% of duration for construction of new pile supported structures (230 days).
160 ton derrick generator	3,542	94	1	231.93	1169.66	2481.40	1.39	199.30	193.32	432679.07	9.19	4.19	1.90	11.04	
25 ton Crane	3,542	150	1	48.51	205.40	1011.61	1.72	47.71	46.28	621884.53	4.20	1.91	2.42	13.48	
Vibrators/equipment	3,542	18	0.58	28.86	122.49	307.04	0.18	13.99	13.57	48518.38	2.54	1.16	1.56	8.66	
Misc Curing Equipment	3,542	60	0.58	30.33	189.84	770.16	0.45	21.75	21.10	161913.76	3.28	1.50	1.37	8.29	
Concrete Finisher	3,542	74	0.58	37.40	234.14	949.87	0.56	26.83	26.02	199693.64	4.05	1.85	1.70	10.22	
Excavator	1,026	450	0.53	17.24	109.67	296.05	0.80	17.57	17.04	289555.97	1.52	0.69	0.79	4.41	Based # pcs of equipment, 9% of total duration for excavation (95 days).
Loader	257	300	0.48	2.82	13.50	40.43	0.12	2.51	2.43	43706.13	0.24	0.11	0.13	0.73	
60 ton derrick	285	230	1	5.48	78.62	78.62	0.21	3.36	3.26	76727.25	0.46	0.21	0.25	1.41	Based # pcs of equipment, 10% of total duration for dredging (95 days).
25 ton Crane	285	150	1	3.90	16.53	81.40	0.14	3.84	3.72	50038.70	0.34	0.15	0.19	1.08	
			Subtotal	**596.51**	**2,993.47**	**9,632.61**	**11.13**	**466.25**	**452.26**	**3,873,174.32**	**39.68**	**18.10**	**18.82**	**108.67**	

ONSITE MATERIAL MOVEMENT

Equipment	Activity	Operating Hours	g/hr-vehicle Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
Onsite trucks	Idle	2,284	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41	Based on Phase 10 25-ton crane and excavator activity
			Annual Emissions in Pounds											
			VOC	**CO**	**NOx**	**SO2**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**Benzene**	**Formaldehyde**	
			26.33	110.70	172.07	0.10	12.79	11.76	28,842	1.36	0.42	0.20	2.05	

Equipment	MPH	Miles	g/VMT Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	10	22,840	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
			Annual Emissions in Pounds										
			VOC	**CO**	**NOx**	**SO2**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**Benzene**	**Formaldehyde**
Onsite truck hours split 50/50 between idle and movement			42.65	225.46	369.55	0.29	49.74	22.92	85,654	2.20	0.42	0.32	3.33

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	Notes on Hour Estimates
Tow Boat - propulsion	60	671	0.68	17.81	55.36	339.96	0.38	8.92	8.65	40,939	0.16	0.07	0.08	0.76	Based on # trips forPhase 10 construction debris disposal
Tow Boat - auxiliary	60	149	0.43	2.50	7.77	47.74	0.05	1.25	1.21	5,749	0.02	0.01	0.01	0.11	
Skiff	285	75	0.45	6.27	19.48	119.65	0.13	3.14	3.05	14,409	0.06	0.03	0.03	0.27	Based # pcs of equipment, 10% of duration for dredging (10 days).
Crew boat	10	149	0.45	0.42	1.29	7.92	0.01	0.21	0.20	954	0.00	0.00	0.00	0.02	Based 10% of duration for dredging (95 days).
Site tug - propulsion	285	112	0.5	10.40	32.33	198.53	0.22	5.21	5.05	23,908	0.09	0.04	0.05	0.44	Based # pcs of equipment, 10% of duration for dredging (95 days).
Site tug - auxiliary	285	19	0.43	1.52	4.72	28.96	0.04	0.76	0.74	4,061	0.01	0.01	0.01	0.06	
			Subtotal	**38.92**	**120.94**	**742.76**	**0.83**	**19.49**	**18.90**	**90,019.80**	**0.35**	**0.16**	**0.18**	**1.66**	

Ph 10 M2D2 hours for 2031 estimated at 77% of total
Dredging hours for 2031 = 10% of Ph 10 total
Onsite truck hours split 50/50 between idle and movement

Rail Equipment	Tons Waste	Gal Fuel Consumed	Emissions in lb VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde
Large Line Haul, Tier 1+	11,075	6,800	73	399	1,806	1	46	44	152,165	12	4	1.64	16.23

Waste transport to Columbia Ridge Commercial Landfill & Recycling, Arlington, OR
50% Phase 10 waste

2036

Phase 10, C2 M2D2 Construction; Yard Paving; Navigational Dredging; Remove concrete batch plants

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
160 ton derrick	690	470	1	37.02	166.29	704.42	1.08	25.21	24.45	379569.52	2.70	1.23	1.66	9.61	Based # pcs of equipment, 15% of duration for new pile supported structures (230 days).
160 ton derrick generator	690	94	1	45.18	227.85	483.39	0.27	38.82	37.66	84288.13	1.79	0.82	0.37	2.15	
25 ton Crane	690	150	1	9.45	40.01	197.07	0.34	9.29	9.02	121146.34	0.82	0.37	0.47	2.63	
Vibrators/equipment	690	18	0.58	5.62	23.86	59.81	0.03	2.73	2.64	9451.63	0.50	0.23	0.30	1.69	
Misc Curing Equipment	690	60	0.58	5.91	36.98	150.03	0.09	4.24	4.11	31541.64	0.64	0.29	0.27	1.61	
Concrete Finisher	690	74	0.58	7.29	45.61	185.04	0.11	5.23	5.07	38901.36	0.79	0.36	0.33	1.99	
60 ton derrick	285	230	1	5.48	78.62	78.62	0.21	3.36	3.26	76727.25	0.46	0.21	0.25	1.41	Based # pcs of equipment, 10% of duration for dredging (95 days).
25 ton Crane	285	150	1	3.90	16.53	81.40	0.14	3.84	3.72	50038.70	0.34	0.15	0.19	1.08	
			Subtotal	**119.85**	**635.76**	**1,939.78**	**2.27**	**92.71**	**89.93**	**791,664.58**	**8.03**	**3.66**	**3.84**	**22.18**	

ONSITE MATERIAL MOVEMENT

Equipment	Activity	Operating Hours	g/hr-vehicle Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
Onsite trucks	Idle	345	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41	Based on Phase 10 25-ton crane activity
			Annual Emissions in Pounds											
			VOC	**CO**	**NOx**	**SO2**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**Benzene**	**Formaldehyde**	
			3.98	16.72	25.99	0.01	1.93	1.78	4,356.57	0.21	0.06	0.03	0.31	

Equipment	MPH	Miles	g/VMT Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	10	3,450	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
			Annual Emissions in Pounds										
			VOC	**CO**	**NOx**	**SO2**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**Benzene**	**Formaldehyde**
			6.44	34.06	55.82	0.04	7.51	3.46	12,938.17	0.33	0.06	0.05	0.50

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb											Notes on Hour Estimates
				VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	
Tow Boat - propulsion	690	671	0.68	205.18	637.68	3916.26	4.34	102.76	99.68	471,615	1.86	0.85	0.97	8.76	Based # pcs of equipment, 15% of duration for new pile supported structures (230 days).
Tow Boat - auxiliary	690	149	0.43	28.81	89.54	549.91	0.61	14.43	14.00	66,223	0.26	0.12	0.14	1.23	
Skiff	975	75	0.45	21.45	66.65	409.33	0.45	10.74	10.42	49,293	0.19	0.09	0.10	0.92	Based on 15% of duration for new pile supported structures (230 days) and 10% of duration for dredging (95 days).
Crew boat	44	149	0.45	1.92	5.98	36.70	0.04	0.96	0.93	4,419	0.02	0.01	0.01	0.08	
Site tug - propulsion	285	112	0.5	10.40	32.33	198.53	0.22	5.21	5.05	23,908	0.09	0.04	0.05	0.44	Based # pcs of equipment, 10% of duration for dredging (95 days).
Site tug - auxiliary	285	19	0.43	1.52	4.72	28.96	0.04	0.76	0.74	4,061	0.01	0.01	0.01	0.06	
			Subtotal	**269.28**	**836.90**	**5,139.69**	**5.70**	**134.86**	**130.82**	**619,519.25**	**2.44**	**1.11**	**1.28**	**11.50**	

Ph 10 M2D2 hours for 2032 estimated at 15% of total
Dredging hours for 2032 = 10% of Ph 10 total
Onsite truck hours split 50/50 between idle and movement

Rail Equipment	Tons Waste	Gal Fuel Consumed	Emissions in lb										
			VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde
Large Line Haul, Tier 1+	11,075	6,800	73	399	1,806	1	46	44	152,165	12	4	1.64	16.23

Waste transport to Columbia Ridge Commercial Landfill & Recycling, Arlington, OR
50% Phase 10 waste

Fugitive Dust — months of disturbance based on estimated annual % of construction schedule for disturbance activity

Year	PM 10 tons/acre-mo	acres	months of disturbance	PM10 Total Tons	PM2.5/ PM10 Ratio	PM2.5 Total Tons	PM10 Total Tons (Updated Timeline)	PM2.5 Total Tons (Updated Timeline)
2028	0.11	0.7	1	0.09	0.1	0.01	0.09	0.01
2029	0.11	10.5	6	6.94	0.1	0.69	6.94	0.69
2030	0.11	9.5	8	8.52	0.1	0.85	8.52	0.85
2031	0.11	14.1	9	6.74	0.1	0.67	5.05	0.51
2032	0.11	14.1	9	6.74	0.1	0.67	5.05	0.51
2033	0.11	3.7	12	2.48	0.1	0.25	1.86	0.19
2034	0.11	3.7	12	2.48	0.1	0.25	1.86	0.19
2035	0.11	1.0	3	0.36	0.1	0.04	0.27	0.03
2036	0.11	0.5	2	0.10	0.1	0.01	0.07	0.01
2037							2.36	0.24
2038							2.36	0.24

acres = L11, which is area of DD3 demo, fill and ballast discharge above MHHW and staging and lawdown areas

Emission factor and ratio from WRAP Fugitive Dust Handbook, 2006
50% of acreage for each phase per year is assumed to have active dust generating activity at any time of the disturbance period
except fpr total M2D2 construction acreage, which is evenly divided across 4 years of construction (25%)
2025 construction schedule update shows 8 years of construction for M2D2, rather than 6 years in previous data. Emissions were calculated by factoring the
PM10 and PM2.5 emissions by 75% (6 years / 8 years = .75) for 2031-2036, and then distributing the remaining emissions evenly over the last two years (2037-2038). Total project emissions are unchanged

Totals by Year

Year	Annual Emissions in Tons										
	VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde
2028	0.04	0.18	0.69	0.00	0.12	0.04	223.59	0.00	0.00	0.00	0.01
2029	3.37	13.62	62.13	0.07	8.92	2.61	13,831.68	0.12	0.05	0.05	0.33
2030	7.89	35.68	166.75	0.16	13.25	5.39	25,079.01	0.68	0.24	0.14	1.15
2031	1.90	8.46	41.67	0.04	6.16	1.57	4,834.24	0.18	0.06	0.03	0.28
2032	1.90	8.46	41.67	0.04	6.16	1.57	4,834.24	0.18	0.06	0.03	0.28
2033	1.79	7.82	38.58	0.04	2.90	1.19	4,485.92	0.17	0.06	0.03	0.27
2034	1.79	7.82	38.58	0.04	2.90	1.19	4,485.92	0.17	0.06	0.03	0.27
2035	0.42	1.94	7.17	0.01	0.57	0.31	2,252.16	0.03	0.01	0.01	0.06
2036	0.18	0.72	3.36	0.00	0.18	0.11	592.74	0.01	0.00	0.00	0.02
2037	1.33	5.87	28.51	0.03	3.14	0.99	3,580.87	0.12	0.04	0.02	0.20
2038	1.33	5.87	28.51	0.03	3.14	0.99	3,580.87	0.12	0.04	0.02	0.20

2025 construction schedule update shows 8 years of construction for M2D2, rather than 6 years in previous data. Emissions were calculated by factoring the construction
emissions by 75% (6 years / 8 years = .75) for 2031-2036, and then distributing the remaining emissions evenly over the last two years (2037-2038). Total project emissions are unchanged

Tab H **Component 12: Demolition of Pier 6**

NOTE: This activity is captured under Component 2: M2D2 @ DD3, Tab F.

Construction Workers

20 per day primarily arrive by vehicle

Tab J **Component 6:** **New Pier 4** 1 pound= 453.59 grams
Component 10: **Demo Pier 4** 1 acre = 43560 sq ft

2036

Mobilization 29 days from Alternative 2 Schedule 04.24.22 (Navy edits). Pdf

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
25 ton Crane	290	150	1	3.98	16.84	82.94	0.14	3.91	3.79	50,987	0.34	0.16	0.20	1.10	Based on 29-day duration for mobilization
Loader	290	300	0.48	3.19	15.29	45.77	0.14	2.84	2.75	49,482	0.28	0.13	0.15	0.82	
Forklift	290	74	0.48	1.16	4.44	57.93	0.04	0.36	0.35	13,553	0.20	0.09	0.06	0.33	
Telehandler	290	130	0.48	0.38	2.36	7.50	0.06	0.45	0.44	21,445	0.03	0.01	0.02	0.09	
Skidsteer Loader	290	95	0.23	10.28	54.39	53.30	0.03	7.76	7.52	9,707	0.40	0.18	0.33	2.48	
33% Mobilization time			**Subtotal**	**19.00**	**93.31**	**247.44**	**0.40**	**15.31**	**14.85**	**145174.78**	**1.25**	**0.57**	**0.75**	**4.83**	

2037

Mobilization 59 days from Alternative 2 Schedule 04.24.22 (Navy edits). Pdf

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
25 ton Crane	590	150	1	8.07	34.19	168.39	0.29	7.94	7.70	103,519	0.70	0.32	0.40	2.24	Based on 59-day duration for mobilization
Loader	590	300	0.48	6.48	31.04	92.93	0.28	5.76	5.59	100,464	0.56	0.26	0.30	1.67	
Forklift	590	74	0.48	2.36	9.01	117.61	0.07	0.73	0.71	27,518	0.41	0.19	0.12	0.67	
Telehandler	590	130	0.48	0.78	4.79	15.22	0.11	0.91	0.88	43,541	0.06	0.03	0.03	0.18	
Skidsteer Loader	590	95	0.23	20.87	110.43	108.22	0.06	15.75	15.27	19,708	0.81	0.37	0.66	5.04	
67% mobilization time			**Subtotal**	**38.57**	**189.45**	**502.37**	**0.81**	**31.09**	**30.16**	**294748.79**	**2.54**	**1.16**	**1.52**	**9.81**	

Dredging 97 days from Alternative 2 Schedule 04.24.22 (Navy edits). Pdf

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
60 ton derrick	970	230	1	18.65	267.60	267.60	0.72	11.43	11.09	261,142	1.56	0.71	0.85	4.81	Based on 97-day duration for dredging
25 ton Crane	970	150	1	13.28	56.25	277.04	0.47	13.07	12.67	170,307	1.15	0.52	0.66	3.69	
50% dredging in 2034			**Subtotal**	**31.93**	**323.85**	**544.63**	**1.19**	**24.50**	**23.76**	**431449.03**	**2.71**	**1.24**	**1.51**	**8.50**	

Pier Demo 239 days from Alternative 2 Schedule 04.24.22 (Navy edits). Pdf

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
60 ton derrick	2,393	230	1	45.99	660.03	660.03	1.78	28.19	27.35	644,105	3.86	1.76	2.10	11.87	Based on 33% duration for pier demo (725 days)
25 ton Crane	2,393	150	1	32.77	138.74	683.31	1.16	32.23	31.26	420,062	2.84	1.29	1.63	9.10	
160 ton derrick	2,393	470	1	128.37	576.59	2442.51	3.75	87.40	84.78	1,316,116	9.36	4.27	5.74	33.34	
160 ton derrick generator	2,393	94	1	156.66	790.06	1676.10	0.94	134.62	130.58	292,260	6.21	2.83	1.28	7.46	
33% demo in 2034			**Subtotal**	**363.78**	**2165.42**	**5461.94**	**7.63**	**282.44**	**273.97**	**2672542.80**	**22.27**	**10.16**	**10.76**	**61.77**	

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	Notes on Hour Estimates
Tow Boat - propulsion	3,463	671	0.68	1029.86	3200.68	19656.57	21.76	515.77	500.30	2,367,140	9.34	4.26	4.88	43.97	Based on activiy of 160 and 60 ton derricks, and 33% of construction debris disposal trips for C6 and C10
Tow Boat - auxiliary	3,463	149	0.43	144.61	449.43	2760.14	3.06	72.42	70.25	332,389	1.31	0.60	0.69	6.17	
Skiff	3,363	75	0.45	73.96	229.86	1411.65	1.56	37.04	35.93	169,998	0.67	0.31	0.35	3.16	Based on dredging and pier demo activity
Crew boat	336	149	0.45	14.69	45.67	280.45	0.31	7.36	7.14	33,773	0.13	0.06	0.07	0.63	Daily trips based on dredging and pier demo activity
Site tug - propulsion	970	112	0.5	35.40	110.02	675.69	0.75	17.73	17.20	81,370	0.32	0.15	0.17	1.51	Based on dredging duration
Site tug - auxiliary	970	19	0.43	5.16	16.05	98.58	0.13	2.59	2.51	13,822	0.05	0.02	0.02	0.22	
Ocean Tug- propulsion	47	1,118	0.68	23.41	72.74	446.74	0.49	11.72	11.37	53,798	0.21	0.10	0.11	1.00	Based on 50% of trips to Elliot Bay for dredge disposal for C6 and C10
Ocean Tug- auxiliary	47	224	0.43	2.97	9.22	56.60	0.06	1.49	1.44	6,816	0.03	0.01	0.01	0.13	
			Subtotal	**1330.07**	**4133.67**	**25386.42**	**28.12**	**666.12**	**646.14**	**3059106.78**	**12.06**	**5.50**	**6.30**	**56.79**	

Rail Equipment	Tons Waste	Consumed	Emissions in lb VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde
Large Line Haul, Tier 1+	35,564	21,836	234	1,282	5,801	5	146	142	488,633	39	13	5.26	52.11

Waste transport to Columbia Ridge Commercial Landfill & Recycling, Arlington, OR
33% waste transported in 2034

2038

Pier Demo 239 days from Alternative 2 Schedule 04.24.22 (Navy edits). Pdf

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
60 ton derrick	2,393	230	1	45.99	660.03	660.03	1.78	28.19	27.35	644,105	3.86	1.76	2.10	11.87	Based on 33% duration for pier demo (725 days)
25 ton Crane	2,393	150	1	32.77	138.74	683.31	1.16	32.23	31.26	420,062	2.84	1.29	1.63	9.10	
160 ton derrick	2,393	470	1	128.37	576.59	2442.51	3.75	87.40	84.78	1,316,116	9.36	4.27	5.74	33.34	
160 ton derrick generator	2,393	94	1	156.66	790.06	1676.10	0.94	134.62	130.58	292,260	6.21	2.83	1.28	7.46	
			Subtotal	**363.78**	**2165.42**	**5461.94**	**7.63**	**282.44**	**273.97**	**2672543**	**22.27**	**10.16**	**10.76**	**61.77**	

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	Notes on Hour Estimates
Tow Boat - propulsion	2,493	671	0.68	741.42	2304.23	14151.11	15.67	371.31	360.18	1,704,146	6.72	3.07	3.51	31.66	Based on pier demo duration and 33% of trips for dredge material disposal for C6 and C10
Tow Boat - auxiliary	2,493	149	0.43	104.11	323.56	1987.07	2.20	52.14	50.58	239,293	0.94	0.43	0.49	4.45	
Skiff	2,393	75	0.45	52.62	163.55	1004.42	1.11	26.36	25.56	120,957	0.48	0.22	0.25	2.25	Based on pier demo duration
Crew boat	239	149	0.45	10.45	32.49	199.55	0.22	5.24	5.08	24,030	0.09	0.04	0.05	0.45	Daily trips based on pier demo duration
			Subtotal	**908.61**	**2823.82**	**17342.15**	**19.20**	**455.04**	**441.40**	**2088426**	**8.24**	**3.76**	**4.31**	**38.79**	

Rail Equipment	Tons Waste	Consumed	Emissions in lb VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde
Large Line Haul, Tier 1+	35,564	21,836	234	1,282	5,801	5	146	142	488,633	39	13	5.26	52.11

Waste transport to Columbia Ridge Commercial Landfill & Recycling, Arlington, OR
33% waste transported in 2035

2039

Pier Demo — 247 days from Alternative 2 Schedule 04.24.22 (Navy edits). Pdf

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH_4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
60 ton derrick	2,465	230	1	47.38	680.03	680.03	1.83	29.05	28.18	663,623	3.98	1.81	2.17	12.23	Based on 34% duration for pier demo (725 days)
25 ton Crane	2,465	150	1	33.76	142.95	704.01	1.20	33.20	32.21	432,791	2.92	1.33	1.68	9.38	
160 ton derrick	2,465	470	1	132.26	594.06	2516.52	3.87	90.05	87.35	1,355,998	9.64	4.40	5.91	34.35	
160 ton derrick generator	2,465	94	1	161.41	814.00	1726.89	0.97	138.70	134.54	301,116	6.40	2.92	1.32	7.68	
			Subtotal	**374.80**	**2231.04**	**5627.46**	**7.86**	**291.00**	**282.27**	**2753529**	**22.94**	**10.46**	**11.09**	**63.64**	

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	Notes on Hour Estimates
Tow Boat - propulsion	2,569	671	0.68	763.88	2374.05	14579.93	16.14	382.57	371.09	1,755,786	6.93	3.16	3.62	32.61	Based on pier demo duration and 34% of trips for dredge material disposal for C6 and C10
Tow Boat - auxiliary	2,569	149	0.43	107.26	333.36	2047.29	2.27	53.72	52.11	246,544	0.97	0.44	0.51	4.58	
Skiff	2,465	75	0.45	54.22	168.51	1034.86	1.15	27.15	26.34	124,623	0.49	0.22	0.26	2.31	Based on pier demo duration
Crew boat	247	149	0.45	10.77	33.48	205.59	0.23	5.39	5.23	24,758	0.10	0.04	0.05	0.46	Daily trips based on pier demo duration
			Subtotal	**936.14**	**2909.39**	**17867.67**	**19.78**	**468.83**	**454.77**	**2151712**	**8.49**	**3.87**	**4.44**	**39.97**	

Rail Equipment	Tons Waste	Consumed	Emissions in lb VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde
Large Line Haul, Tier 1+	36,642	21,836	241	1,321	5,977	5	151	146	503,440	40	13	5.42	53.69

Waste transport to Columbia Ridge Commercial Landfill & Recycling, Arlington, OR
34% waste transported in 2036

2040

Pier Construction & Timber Pile Extraction — 202 days from Alternative 2 Schedule 04.24.22 (Navy edits). Pdf & Table 2-10

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH_4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
160 ton derrick	2,023	470	1	108.54	487.52	2065.18	3.17	73.90	71.68	1,112,799	7.91	3.61	4.85	28.19	Based on 33% of duration of pier construction and timber pile extraction
160 ton derrick generator	2,023	94	1	132.46	668.01	1417.17	0.79	113.82	110.41	247,111	5.25	2.39	1.09	6.30	
25 ton Crane	2,023	150	1	27.70	117.31	577.75	0.98	27.25	26.43	355,169	2.40	1.09	1.38	7.70	
Vibrators/equipment	2,023	18	0.58	16.48	69.95	175.36	0.10	7.99	7.75	27,710	1.45	0.66	0.89	4.94	
Misc Curing Equipment	2,023	60	0.58	17.32	108.42	439.85	0.26	12.42	12.05	92,472	1.87	0.85	0.79	4.73	
Concrete Finisher	2,023	74	0.58	21.36	133.72	542.49	0.32	15.32	14.86	114,049	2.31	1.05	0.97	5.84	
			Subtotal	**323.86**	**1584.94**	**5217.80**	**5.63**	**250.71**	**243.19**	**1949309**	**21.20**	**9.67**	**9.97**	**57.71**	

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	Notes on Hour Estimates
Tow Boat - propulsion	2,023	671	0.68	601.55	1869.52	11481.44	12.71	301.26	292.23	1,382,651	5.45	2.49	2.85	25.68	Based on 33% of duration of pier construction and timber pile extraction
Tow Boat - auxiliary	2,023	149	0.43	84.47	262.52	1612.20	1.78	42.30	41.03	194,149	0.77	0.35	0.40	3.61	
Skiff	2,023	75	0.45	44.49	138.28	849.26	0.94	22.28	21.62	102,272	0.40	0.18	0.21	1.90	
Crew boat	202	149	0.45	8.84	27.47	168.72	0.19	4.43	4.29	20,318	0.08	0.04	0.04	0.38	Daily trips based on 33% of duration of pier construction and timber pile extraction
			Subtotal	**739.35**	**2297.80**	**14111.62**	**15.62**	**370.28**	**359.17**	**1699390**	**6.70**	**3.06**	**3.50**	**31.57**	

ONSITE MATERIAL MOVEMENT

Equipment	Activity	Operating Hours	g/hr-vehicle Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
Onsite trucks	Idle	1,011	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41	Based on 160 ton derrick activity
			Annual Emissions in Pounds VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	
			11.66	49.02	76.20	0.04	5.66	5.21	12,772	0.60	0.18	0.09	0.91	

Equipment	MPH	Miles	g/VMT Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	10	10,115	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
			Annual Emissions in Pounds VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
			18.89	99.84	163.65	0.13	22.03	10.15	37,931	0.97	0.18	0.14	1.48

2037 = 33% of total construction hours

2041

Pier Construction & Timber Pile Extraction — 202 days from Alternative 2 Schedule 04.24.22 (Navy edits). Pdf & Table 2-10

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH_4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
160 ton derrick	2,023	470	1	108.54	487.52	2065.18	3.17	73.90	71.68	1,112,799	7.91	3.61	4.85	28.19	Based on 33% of duration of pier construction and timber pile extraction
160 ton derrick generator	2,023	94	1	132.46	668.01	1417.17	0.79	113.82	110.41	247,111	5.25	2.39	1.09	6.30	
25 ton Crane	2,023	150	1	27.70	117.31	577.75	0.98	27.25	26.43	355,169	2.40	1.09	1.38	7.70	
Vibrators/equipment	2,023	18	0.58	16.48	69.95	175.36	0.10	7.99	7.75	27,710	1.45	0.66	0.89	4.94	
Misc Curing Equipment	2,023	60	0.58	17.32	108.42	439.85	0.26	12.42	12.05	92,472	1.87	0.85	0.79	4.73	
Concrete Finisher	2,023	74	0.58	21.36	133.72	542.49	0.32	15.32	14.86	114,049	2.31	1.05	0.97	5.84	
			Subtotal	**323.86**	**1584.94**	**5217.80**	**5.63**	**250.71**	**243.19**	**1949309**	**21.20**	**9.67**	**9.97**	**57.71**	

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	Notes on Hour Estimates
Tow Boat - propulsion	2,023	671	0.68	601.55	1869.52	11481.44	12.71	301.26	292.23	1,382,651	5.45	2.49	2.85	25.68	Based on 33% of duration of pier construction and timber pile extraction
Tow Boat - auxiliary	2,023	149	0.43	84.47	262.52	1612.20	1.78	42.30	41.03	194,149	0.77	0.35	0.40	3.61	
Skiff	2,023	75	0.45	44.49	138.28	849.26	0.94	22.28	21.62	102,272	0.40	0.18	0.21	1.90	
Crew boat	202	149	0.45	8.84	27.47	168.72	0.19	4.43	4.29	20,318	0.08	0.04	0.04	0.38	Daily trips based on 33% of duration of pier construction and timber pile extraction
			Subtotal	**739.35**	**2297.80**	**14111.62**	**15.62**	**370.28**	**359.17**	**1699390**	**6.70**	**3.06**	**3.50**	**31.57**	

ONSITE MATERIAL MOVEMENT

Equipment	Activity	Operating Hours	g/hr-vehicle Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
Onsite trucks	Idle	1,011	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41	Based on 160 ton derrick activity
			Annual Emissions in Pounds											
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	
			12.01	50.51	78.51	0.04	5.83	5.37	13,159	0.62	0.19	0.09	0.91	

Equipment	MPH	Miles	g/VMT Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	10	10,115	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
			Annual Emissions in Pounds										
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
			19.46	102.87	168.61	0.13	22.69	10.46	39,081	1.00	0.19	0.14	1.48

2038 = 33% of total construction hours

2041

Pier Construction & Timber Pile Extraction — 208 days from Alternative 2 Schedule 04.24.22 (Navy edits). Pdf & Table 2-10

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
160 ton derrick	2,084	470	1	111.82	502.29	2127.76	3.27	76.14	73.85	1,146,520	8.15	3.72	5.00	29.04	Based on 34% of duration of pier construction and timber pile extraction
160 ton derrick generator	2,084	94	1	136.47	688.25	1460.12	0.82	117.27	113.75	254,599	5.41	2.47	1.12	6.50	
25 ton Crane	2,084	150	1	28.54	120.86	595.25	1.01	28.07	27.23	365,932	2.47	1.13	1.42	7.93	
Vibrators/equipment	2,084	18	0.58	16.98	72.07	180.67	0.10	8.23	7.99	28,549	1.50	0.68	0.92	5.09	
Misc Curing Equipment	2,084	60	0.58	17.84	111.71	453.18	0.27	12.80	12.42	95,274	1.93	0.88	0.81	4.88	
Concrete Finisher	2,084	74	0.58	22.01	137.77	558.93	0.33	15.79	15.31	117,505	2.38	1.09	1.00	6.02	
			Subtotal	**333.68**	**1632.96**	**5375.92**	**5.80**	**258.30**	**250.56**	**2008379**	**21.84**	**9.96**	**10.27**	**59.45**	

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	Notes on Hour Estimates
Tow Boat - propulsion	2,084	671	0.68	619.77	1926.18	11829.37	13.10	310.39	301.08	1,424,550	5.62	2.56	2.94	26.46	Based on 34% of duration of pier construction and timber pile extraction
Tow Boat - auxiliary	2,084	149	0.43	87.03	270.47	1661.06	1.84	43.58	42.28	200,033	0.79	0.36	0.41	3.72	
Skiff	2,084	75	0.45	45.84	142.47	874.99	0.97	22.96	22.27	105,371	0.42	0.19	0.22	1.96	
Crew boat	208	149	0.45	9.11	28.31	173.83	0.19	4.56	4.42	20,934	0.08	0.04	0.04	0.39	Daily trips based on 34% of duration of pier construction and timber pile extraction
			Subtotal	**761.75**	**2367.43**	**14539.25**	**16.10**	**381.50**	**370.06**	**1750887**	**6.91**	**3.15**	**3.61**	**32.52**	

ONSITE MATERIAL MOVEMENT

Equipment	Activity	Hours	g/hr-vehicle Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
Onsite trucks	Idle	1,042	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41	Based on 160 ton derrick activity
			Annual Emissions in Pounds											
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	
			12.01	50.51	78.51	0.04	5.83	5.37	13,159	0.62	0.19	0.09	0.93	

Equipment	MPH	Miles	g/VMT Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	10	10,421	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
			Annual Emissions in Pounds										
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
			19.46	102.87	168.61	0.13	22.69	10.46	39,081	1.00	0.19	0.15	1.52

2039 = 33% of total construction hours

Fugitive Dust Alt 2 — months of disturbance based on % of construction schedule

Year	PM 10 tons/acre-mo	acres	months of disturbance	PM10 Total Tons	PM2.5/ PM10 Ratio	PM2.5 Total Tons
2036	0.11	1.2	1	0.12	0.1	0.01
2037	0.11	1.2	3	0.38	0.1	0.04
2038	0.11	1.2	2	0.26	0.1	0.03
2039	0.11	1.2	2	0.26	0.1	0.03
2040	0.11	1.1	2	0.20	0.1	0.02
2041	0.11	1.1	1.7	0.20	0.1	0.02
2041	0.11	1.1	1.7	0.20	0.1	0.02

Fugitive Dust Alt 3 — months of disturbance based on % of construction schedule

Year	PM 10 tons/acre-mo	acres	months of disturbance	PM10 Total Tons	PM2.5/ PM10 Ratio	PM2.5 Total Tons
2036	0.11	1.2	1	0.12	0.1	0.01
2037	0.11	1.2	3	0.38	0.1	0.04
2038	0.11	1.2	2	0.26	0.1	0.03
2039	0.11	1.2	2	0.26	0.1	0.03
2040	0.11	1.1	2	0.20	0.1	0.02
2041	0.11	1.1	3	0.40	0.1	0.04

Emission factor and ratio from WRAP Fugitive Dust Handbook, 2006

50% of acreage for each phase per year is assumed to have active dust generating activity at any time of the disturbance period.

Totals by Year

ALT 2 and ALT 3

Original Alt 2 schedule was 7 years, new schedule is 6 years, which matches Alt 3. Construction distributed differently by year

Year	Annual Emissions in Tons VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde
2036	0.01	0.05	0.12	0.00	0.13	0.02	72.59	0.00	0.00	0.00	0.00
2037	1.00	4.05	18.85	0.02	0.96	0.60	3,473.24	0.04	0.02	0.01	0.09
2038	0.75	3.14	14.30	0.02	0.70	0.45	2,624.80	0.03	0.01	0.01	0.08
2039	0.78	3.23	14.74	0.02	0.71	0.47	2,704.34	0.04	0.01	0.01	0.08
2040	0.55	2.02	9.78	0.01	0.52	0.33	1,849.70	0.01	0.01	0.01	0.05
2041	1.11	4.09	19.87	0.02	1.06	0.67	3,756.22	0.03	0.01	0.01	0.09

Tab M ALTERNATIVE 3 **Construct M2D2 at Mooring A, Replace Pier 4**

Activity by Year	tons/year												
	VOCs	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	CO2e	Benzene	Formaldehyde	Total HAPs
2027													
M2D2 @ Mooring A	0.70	2.23	12.32	0.01	6.29	1.02	1,723	0.01	0.01	1,725	0.01	0.057	0.06
Mooring A Demolition	0.36	1.38	6.71	0.01	0.24	0.21	1,116	0.01	0.005	1,118	0.00	0.03	0.04
Bremerton Subtotal	**1.07**	**3.61**	**19.03**	**0.02**	**6.53**	**1.23**	**2,840**	**0.03**	**0.01**	**2,844**	**0.01**	**0.09**	**0.10**
Radio Hill Expansion	0.20	1.07	2.07	0.00	1.92	0.34	959.75	0.01	0.00	961	0.01	0.04	0.05
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23225	0.77	0.13	23281	0.09	0.12	0.21
Materials Movement - Barges	1.76	5.48	33.67	0.04	0.88	0.86	4,055	0.02	0.01	4,057	0.01	0.08	0.08
Total	**7.86**	**285.82**	**64.37**	**0.21**	**188.64**	**29.47**	**31,079**	**0.82**	**0.15**	**31,142**	**0.12**	**0.32**	**0.44**
2028													
M2D2 @ Mooring A	1.53	5.11	27.50	0.03	14.54	1.75	4,100	0.04	0.02	7,256	0.02	0.14	0.16
Mooring A Demolition	0.36	1.38	6.71	0.01	0.24	0.21	1,116	0.01	0.005	1,118	0.00	0.03	0.04
Bremerton Subtotal	**1.90**	**6.49**	**34.21**	**0.04**	**14.78**	**1.96**	**5,217**	**0.05**	**0.02**	**8,374**	**0.02**	**0.17**	**0.19**
Radio Hill Expansion	0.20	1.07	2.07	0.00	1.92	0.34	960	0.01	0.00	961	0.01	0.04	0.05
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Materials Movement - Barges	1.74	5.40	33.15	0.04	0.87	0.84	3,992	0.02	0.01	3,994	0.01	0.07	0.08
Total	**8.66**	**288.61**	**79.03**	**0.23**	**196.87**	**30.19**	**33,393**	**0.84**	**0.16**	**36,610**	**0.13**	**0.40**	**0.53**
2029													
M2D2 @ Mooring A-Bremerton	**3.75**	**16.58**	**80.07**	**0.07**	**10.99**	**2.58**	**8,869**	**0.35**	**0.12**	**12,060**	**0.48**	**0.10**	0.58
Radio Hill Expansion	0.20	1.07	2.07	0.00	1.92	0.34	959.75	0.01	0.00	961	0.006	0.040	0.05
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Materials Movement - Barges	1.39	4.33	26.61	0.03	0.70	0.68	3,205	0.01	0.01	3,207	0.01	0.06	0.07
Total	**10.18**	**297.64**	**118.35**	**0.26**	**192.90**	**30.65**	**36,258**	**1.14**	**0.25**	**39,509**	**0.58**	**0.32**	**0.90**
2030													
M2D2 @ Mooring A-Bremerton	**2.73**	**13.37**	**61.97**	**0.05**	**5.89**	**1.97**	**6,509**	**0.33**	**0.11**	**7,335**	**0.47**	**0.10**	0.57
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Materials Movement - Barges	0.88	2.74	16.80	0.02	0.44	0.43	2,023	0.01	0.00	2,024	0.00	0.04	0.04
Total	**8.44**	**291.77**	**88.37**	**0.22**	**185.63**	**29.45**	**31,756**	**1.10**	**0.24**	**32,639**	**0.56**	**0.26**	**0.82**
2031													
M2D2 @ Mooring A-Bremerton	**1.47**	**5.91**	**30.32**	**0.03**	**4.81**	**1.13**	**3,584**	**0.09**	**0.03**	**4,383**	**0.14**	**0.03**	0.17
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Materials Movement - Barges	1.00	3.10	19.03	0.02	0.50	0.48	2,291	0.01	0.00	2,293	0.00	0.04	0.05
Total	**7.30**	**284.66**	**58.95**	**0.20**	**184.61**	**28.67**	**29,100**	**0.87**	**0.16**	**29,956**	**0.24**	**0.18**	**0.43**
2032													
M2D2 @ Mooring A-Bremerton	0.62	2.26	11.48	0.01	0.70	0.44	2,316	0.12	0.04	2,331	0.02	0.06	0.08
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Materials Movement - Barges	0.99	3.08	18.94	0.02	0.50	0.48	2,280	0.01	0.00	2,282	0.00	0.04	0.05
Total	**6.44**	**281.00**	**40.02**	**0.19**	**180.49**	**27.98**	**27,821**	**0.90**	**0.17**	**27,893**	**0.12**	**0.21**	**0.34**
2033													
M2D2 @ Mooring A-Bremerton	0.52	1.81	9.71	0.01	1.76	0.42	1,839	0.01	0.01	1,841	0.01	0.04	0.05
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Materials Movement - Barges	1.02	3.16	19.38	0.02	0.51	0.49	2,333	0.01	0.00	2,335	0.00	0.04	0.05
Total	**6.36**	**280.63**	**38.68**	**0.18**	**181.57**	**27.97**	**27,397**	**0.79**	**0.13**	**27,456**	**0.10**	**0.20**	**0.31**
2034													
M2D2 @ Mooring A-Bremerton	0.66	2.43	12.02	0.01	2.02	2.00	2,513	0.02	0.01	2,515	0.01	0.06	0.07
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Materials Movement - Barges	1.76	5.47	33.57	0.04	0.88	0.85	4,043	0.02	0.01	4,046	0.01	0.08	0.08
Caisson Delivery	0.32	1.00	6.16	0.01	0.16	0.16	742	0.003	0.04	751	0.002	0.01	0.02
Total	**7.57**	**284.56**	**61.35**	**0.21**	**182.36**	**30.07**	**30,522**	**0.80**	**0.18**	**30,593**	**0.11**	**0.27**	**0.38**
2035													
M2D2 @ Mooring A-Bremerton	1.52	6.85	32.23	0.03	2.67	1.05	4,665	0.02	0.01	4,668	0.01	0.22	0.23
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Materials Movement - Barges	1.69	5.24	32.20	0.04	0.84	0.82	3,878	0.02	0.01	3,880	0.01	0.07	0.08
Total	**8.04**	**287.75**	**74.02**	**0.22**	**182.81**	**28.92**	**31,767**	**0.80**	**0.14**	**31,829**	**0.11**	**0.41**	**0.52**
2036													
M2D2 @ Mooring A-Bremerton	0.74	2.93	13.13	0.02	1.98	0.59	3,215	0.03	0.01	3,219	0.01	0.08	0.09
Pier 4 Demolition	0.01	0.05	0.12	0.00	0.13	0.02	73	0.001	0.0003	73	0.0004	0.002	0.00
Bremerton Subtotal	**0.75**	**2.98**	**13.25**	**0.02**	**2.11**	**0.61**	**3,288**	**0.03**	**0.01**	**3,292**	**0.01**	**0.08**	0.10
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Materials Movement - Barges	1.66	5.17	31.75	0.04	0.83	0.81	3,823	0.02	0.01	3,825	0.01	0.07	0.08
Total	**7.24**	**283.80**	**54.60**	**0.20**	**182.24**	**28.47**	**30,335**	**0.81**	**0.14**	**30,398**	**0.11**	**0.27**	**0.39**
2037													
Pier 4 Demolition	1.00	4.05	18.85	0.02	0.96	0.60	3,473	0.04	0.02	3,478	0.01	0.09	0.11
Bremerton Subtotal	**1.00**	**4.05**	**18.85**	**0.02**	**0.96**	**0.60**	**3,473**	**0.04**	**0.02**	**3,478**	**0.01**	**0.09**	0.11
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Materials Movement - Barges	1.76	5.47	33.62	0.04	0.88	0.86	4,048	0.02	0.01	4,051	0.01	0.08	0.08
Total	**7.59**	**285.18**	**62.06**	**0.21**	**181.14**	**28.51**	**30,746**	**0.82**	**0.15**	**30,810**	**0.11**	**0.29**	**0.40**
2038													
Pier 4 Demolition	0.75	3.14	14.30	0.02	0.70	0.45	2,625	0.03	0.01	2,629	0.01	0.08	0.09
Bremerton Subtotal	**0.75**	**3.14**	**14.30**	**0.02**	**0.70**	**0.45**	**2,625**	**0.03**	**0.01**	**2,629**	**0.01**	**0.08**	0.09
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Materials Movement - Barges	1.80	5.60	34.39	0.04	0.90	0.88	4,141	0.02	0.01	4,143	0.01	0.08	0.09
Total	**7.38**	**284.39**	**58.29**	**0.21**	**180.90**	**28.38**	**29,990**	**0.82**	**0.15**	**30,053**	**0.11**	**0.27**	**0.38**
2039													
Pier 4 Construction	0.78	3.23	14.74	0.02	0.71	0.47	2,704	0.04	0.01	2,709	0.01	0.08	0.09
Bremerton Subtotal	**0.78**	**3.23**	**14.74**	**0.02**	**0.71**	**0.47**	**2,704**	**0.04**	**0.01**	**2,709**	**0.01**	**0.08**	0.09
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Materials Movement - Barges	1.80	5.60	34.39	0.04	0.90	0.88	4,141	0.02	0.01	4,143	0.01	0.08	0.09
Total	**7.41**	**284.49**	**58.72**	**0.21**	**180.91**	**28.40**	**30,070**	**0.82**	**0.15**	**30,133**	**0.11**	**0.27**	**0.38**

Activity by Year	tons/year												
	VOCs	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	CO2e	Benzene	Formaldehyde	Total HAPs
2040													
Pier 4 Construction	0.55	2.02	9.78	0.01	0.52	0.33	1,850	0.01	0.01	1,852	0.01	0.05	0.05
Bremerton Subtotal	**0.55**	**2.02**	**9.78**	**0.01**	**0.52**	**0.33**	**1,850**	**0.01**	**0.01**	**1,852**	**0.01**	**0.05**	0.05
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Materials Movement - Barges	1.80	5.60	34.39	0.04	0.90	0.88	4,141	0.02	0.01	4,143	0.01	0.08	0.09
Total	**7.18**	**283.27**	**53.77**	**0.20**	**180.72**	**28.26**	**29,215**	**0.80**	**0.14**	**29,276**	**0.11**	**0.24**	**0.35**
2041													
Pier 4 Construction - Bremerton	1.11	4.09	19.87	0.02	1.06	0.67	3,756	0.03	0.01	3,761	0.01	0.09	0.11
Onroad Vehicles	4.83	275.66	9.60	0.15	179.30	27.05	23,225	0.77	0.13	23,281	0.09	0.12	0.21
Total	**5.94**	**279.75**	**29.47**	**0.17**	**180.36**	**27.72**	**26,981**	**0.80**	**0.14**	**27,041**	**0.11**	**0.21**	**0.32**

Tab N **Component 3** **M2D2 @ Mooring A** 1 pound= 453.59 grams

2027

Phase 1, C3 Mobilization 60 days duration based on schedule for Phase 1 in ER schedule

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
25 ton Crane	600	150	1	8.22	34.79	171.36	0.29	8.08	7.84	105,345	0.71	0.32	0.41	2.28	Duration based on mobilization (60 days)
Loader	600	300	0.48	6.59	31.59	94.57	0.28	5.86	5.69	102,237	0.57	0.26	0.30	1.70	
Forklift	600	74	0.48	2.40	9.17	119.68	0.07	0.74	0.72	28,003	0.42	0.19	0.12	0.69	
Telehandler	600	130	0.48	0.79	4.87	15.49	0.12	0.93	0.90	44,309	0.06	0.03	0.03	0.19	
Skidsteer Loader	600	95	0.23	21.24	112.38	110.13	0.06	16.02	15.54	20,055	0.83	0.38	0.67	5.13	
			Subtotal	**39.25**	**192.80**	**511.23**	**0.83**	**31.64**	**30.69**	**299,947.89**	**2.59**	**1.18**	**1.54**	**9.98**	

2028

Phase 1, C3 Bulding Demolition 255 days total for all building-related demolition in M2D2 Construction Usage Rates.xlsx

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
25 ton Crane	1,030	150	1	14.11	59.73	294.17	0.50	13.87	13.46	180841.63	1.22	0.56	0.70	3.92	Duration based on building demolition (103 days)
100 ton Crane	660	480	1	36.16	162.44	688.13	1.06	24.62	23.88	370791.32	2.64	1.20	1.62	9.39	Duration based on building pile demolition (66 days)
Loader	1,030	300	0.48	11.32	54.22	162.35	0.48	10.06	9.76	175506.08	0.98	0.45	0.52	2.91	Duration based on building demolition (103 days)
Excavator	1,690	450	0.53	28.40	180.65	487.64	1.31	28.94	28.07	476948.93	2.51	1.14	1.30	7.26	Duration based on building demolition (103 days) and building founddation demolition (86 days)
Hydraulic Hammer	1,690	114	1	23.47	111.93	365.96	0.64	24.75	24.01	227949.16	1.79	0.82	1.10	6.39	
			Subtotal	**113.46**	**568.97**	**1,998.25**	**3.99**	**102.25**	**99.18**	**1,432,037.12**	**9.14**	**4.17**	**5.25**	**29.87**	

100-ton crane hours based on 66 days of building pile demolition from M2D2 Construction Usage Rates.xlsx

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	Notes on Hour Estimates
Tow Boat - propulsion	159	671	0.68	47.32	147.07	903.20	1.00	23.70	22.99	108,768	0.43	0.20	0.22	2.02	Duration based on mobilization transport 17% of total duration and trip time for construction debris transport
Tow Boat - auxiliary	159	149	0.43	6.64	20.65	126.83	0.14	3.33	3.23	15,273	0.06	0.03	0.03	0.28	
			Subtotal	**53.97**	**167.72**	**1,030.03**	**1.14**	**27.03**	**26.22**	**124,040.86**	**0.49**	**0.22**	**0.26**	**2.30**	

Towboat activity includes moving mobilization equipment/materials from and demo debris to Terminal 5 area at Industrial Area West in Seattle.

ONSITE MATERIAL MOVEMENT

Equipment	Activity	Operating Hours	g/hr-vehicle Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
Onsite trucks	Idle	1,275	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41	Duration based on all demolition (255 days)
			Annual Emissions in Pounds VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	
			14.70	61.80	96.05	0.05	7.14	6.57	16,100.38	0.76	0.23	0.11	1.14	

Equipment	MPH	Miles	g/VMT Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	10	12,750	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
			Annual Emissions in Pounds VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
			23.81	125.86	206.29	0.16	27.77	12.79	47,814.96	1.23	0.23	0.18	1.86

Rail Equipment	Tons Waste	Gal Fuel Consumed	Emissions in lb VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde
Large Line Haul, Tier 1+	20,871	12,815	137	752	3,404	3	86	83	286,754	23	7	3.09	30.58

Waste transport to Columbia Ridge Commercial Landfill & Recycling, Arlington, OR
Bldg demo waste

2029 & 2030 divided evenly across both years

Phase 1, C3 Pier demo 232 days

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
60 ton derrick	2,320	230	1	44.60	640.03	640.03	1.72	27.34	26.52	624,587	3.74	1.71	2.04	11.51	Based on pier demo duration (232 days)
160 ton derrick	2,320	470	1	124.48	559.12	2368.49	3.64	84.75	82.21	1,276,234	9.08	4.14	5.57	32.33	
160 ton derrick generator	2,320	94	1	151.91	766.12	1625.31	0.91	130.54	126.62	283,404	6.02	2.75	1.24	7.23	
			Subtotal	**320.98**	**1965.27**	**4633.83**	**6.27**	**242.63**	**235.35**	**2184224.04**	**18.84**	**8.59**	**8.85**	**51.07**	

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	Notes on Hour Estimates
Tow Boat - propulsion	59	671	0.68	17.45	54.22	332.97	0.37	8.74	8.47	40,097	0.16	0.07	0.08	0.74	Based on construction debris transport
Tow Boat - auxiliary	59	149	0.43	2.45	7.61	46.75	0.05	1.23	1.19	5,630	0.02	0.01	0.01	0.10	
			Subtotal	**19.89**	**61.83**	**379.72**	**0.42**	**9.96**	**9.66**	**45,727.82**	**0.18**	**0.08**	**0.09**	**0.85**	

Towboat activity includes moving pier and impervious surface waste to Terminal 5 area at Industrial Area West in Seattle.

Phase 2, C3 Pile driving, track demo, excavation 327 days total from M2D2 construction usage rates.xlsx

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
25 ton Crane	892	150	1	12.22	51.73	254.76	0.43	12.02	11.65	156612.37	1.06	0.48	0.61	3.39	Based on 2 pcs equip, 20% new pile supported structures duration (397 days), hazardous material removal/demo haul (98 days)
Loader	1,500	300	0.48	16.49	78.96	236.43	0.70	14.66	14.22	255591.37	1.43	0.65	0.76	4.24	Based onduration of excavation (150 days)
Excavator	1,500	450	0.53	25.21	160.34	432.82	1.17	25.68	24.91	423327.45	2.23	1.02	1.16	6.45	
160 ton derrick	794	470	1	42.60	191.35	810.60	1.25	29.00	28.13	436,780	3.11	1.42	1.90	11.06	Based on # pcs equip, 20% new pile supported structures duration (397 days)
160 ton derrick generator	794	94	1	51.99	262.20	556.25	0.31	44.68	43.34	96,992	2.06	0.94	0.43	2.47	
Vibrators/equipment	794	18	0.58	6.47	27.46	68.83	0.04	3.14	3.04	10,876	0.57	0.26	0.35	1.94	
Misc Curing Equipment	794	60	0.58	6.80	42.56	172.65	0.10	4.88	4.73	36,296	0.74	0.34	0.31	1.86	
Concrete Finisher	794	74	0.58	8.38	52.49	212.93	0.13	6.01	5.83	44,765	0.91	0.41	0.38	2.29	
			Subtotal	**170.16**	**867.08**	**2,745.25**	**4.13**	**140.06**	**135.86**	**1,461,240.34**	**12.09**	**5.52**	**5.90**	**33.71**	

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	Notes on Hour Estimates
Tow Boat - propulsion	4,022	671	0.68	1195.94	3716.81	22826.29	25.27	598.94	580.98	2,748,853	10.84	4.95	5.67	51.06	Based on # pcs equip, 20% new pile supported structures duration (397 days) and transport of excavated material for disposal
Tow Boat - auxiliary	4,022	149	0.43	167.93	521.91	3205.23	3.55	84.10	81.58	385,989	1.52	0.69	0.80	7.17	
Skiff	794	75	0.45	17.46	54.28	333.34	0.37	8.75	8.48	40,142	0.16	0.07	0.08	0.75	Based on # pcs equip, 20% new pile supported structures duration (397 days)
Crew boat	79	149	0.45	3.47	10.78	66.22	0.07	1.74	1.69	7,975	0.03	0.01	0.02	0.15	Based on daily trip for 20% new pile supported structures duration (397 days)
			Subtotal	**1384.80**	**4303.78**	**26431.08**	**29.26**	**693.53**	**672.73**	**3182959.02**	**12.55**	**5.73**	**6.56**	**59.13**	

Towboat activity includes excavation waste to Terminal 5 area at Industrial Area West in Seattle.

Equipment	Activity	Operating Hours	g/hr-vehicle Emission Rate											Notes on Hour Estimates
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	
Onsite trucks	Idle	1,635	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41	Total duration of phase 2 activities (327 days)
			Annual Emissions in Pounds											
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	
			14.70	61.80	96.05	0.05	7.14	6.57	16,100.38	0.76	0.23	0.11	1.14	

Equipment	MPH	Miles	g/VMT Emission Rate										
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	10	16,350	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
			Annual Emissions in Pounds										
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
			30.53	161.40	264.54	0.21	35.61	16.41	61,315.65	1.57	0.30	0.23	2.39

Rail Equipment	Tons Waste	Gal Fuel Consumed	Emissions in lb										
			VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde
Large Line Haul, Tier 1+	1,159,905	712,182	7,622	41,802	189,197	147	4,776	4,633	15,936,519	1,256	408	171.49	1699.69

Waste transport to Columbia Ridge Commercial Landfill & Recycling, Arlington, OR
Pier demo waste

2031

C3, Ph3 Dredging/water work 262 days total from Alternative 3 Schedule 04.24.22 (Navy edits). Pdf durations from M2D2 construction usage rates.xlsx

Construction Equipment	Hours	HP	Load Factor	Emissions in lb										Notes on Hour Estimates
				VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	
25 ton Crane	1,590	150	1	21.78	92.20	454.11	0.77	21.42	20.77	279,163	1.88	0.86	1.09	6.05	Based on 50% total dredging duration (318 days)
60 ton derrick	1,590	230	1	30.56	438.64	438.64	1.18	18.74	18.18	428,057	2.57	1.17	1.40	7.89	
			Subtotal	**52.34**	**530.85**	**892.75**	**1.95**	**40.15**	**38.95**	**707,220.57**	**4.45**	**2.03**	**2.48**	**13.94**	

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb											Notes on Hour Estimates
				VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	
Tow Boat - propulsion	2,002	671	0.68	595.32	1850.18	11362.63	12.58	298.15	289.20	1,368,343	5.40	2.46	2.82	25.42	Based on dredging duration and trip time for dredge material disposal transport
Tow Boat - auxiliary	2,002	149	0.43	83.59	259.80	1595.52	1.77	41.87	40.61	192,140	0.76	0.35	0.40	3.57	
Crew boat	159	149	0.45	6.95	21.59	132.61	0.15	3.48	3.38	15,970	0.06	0.03	0.03	0.30	Based on daily trips for dredging duration
Site tug - propulsion	1,590	112	0.5	58.03	180.35	1107.58	1.23	29.06	28.19	133,380	0.53	0.24	0.28	2.48	
Site tug - auxiliary	1,590	19	0.43	8.47	26.31	161.59	0.21	4.24	4.11	22,657	0.08	0.04	0.04	0.36	
Ocean Tug- propulsion	902	1,118	0.68	446.91	1388.94	8529.98	9.44	223.82	217.11	1,027,221	4.05	1.85	2.12	19.08	Based on transport trips for dredge material to Elliot Bay disposal
Ocean Tug- auxiliary	902	224	0.43	56.62	175.97	1080.72	1.20	28.36	27.51	130,146	0.51	0.23	0.27	2.42	
			Subtotal	**1255.89**	**3903.14**	**23970.63**	**26.57**	**628.97**	**610.10**	**2889857.83**	**11.39**	**5.19**	**5.95**	**53.62**	

Rail Equipment	Tons Waste	Gal Fuel Consumed	Emissions in lb										
			VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde
Large Line Haul, Tier 1+	145,400	89,276	955	5,240	23,717	18	599	581	1,997,723	157	51	21.50	213.07

Waste transport to Columbia Ridge Commercial Landfill & Recycling, Arlington, OR
100% Phase 3 waste

2032

Phases 4 & 5, C3 - Construct M2D2 262 days total from Alternative 3 Schedule 04.24.22 (Navy edits). Pdf durations from M2D2 construction usage rates.xlsx and ER.

Construction Equipment	Hours	HP	Load Factor	Emissions in lb										Notes on Hour Estimates
				VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	
100 ton Crane	1,806	480	1	98.96	444.50	1882.98	2.89	67.38	65.36	1,014,620	7.22	3.29	4.42	25.70	Based on 20% total dry dock construction duration (903 days)
Excavator	1,806	450	0.53	30.35	193.04	521.11	1.41	30.92	29.99	509,686	2.68	1.22	1.39	7.76	
160 ton derrick	794	470	1	42.60	191.35	810.60	1.25	29.00	28.13	436,780	3.11	1.42	1.90	11.06	Based on 20% total new pile supported structures duration (397 days)
160 ton derrick generator	794	94	1	51.99	262.20	556.25	0.31	44.68	43.34	96,992	2.06	0.94	0.43	2.47	
25 ton Crane	794	150	1	10.87	46.04	226.77	0.39	10.70	10.37	139,406	0.94	0.43	0.54	3.02	
Vibrators/equipment	2,600	18	0.58	21.19	89.91	225.39	0.13	10.27	9.96	35,615	1.87	0.85	1.15	6.36	Based on 20% total new pile supported structures and dyr dock construction durations (260 days)
Misc Curing Equipment	2,600	60	0.58	22.26	139.35	565.34	0.33	15.97	15.49	118,853	2.41	1.10	1.01	6.09	
Concrete Finisher	2,600	74	0.58	27.45	171.87	697.25	0.41	19.69	19.10	146,585	2.97	1.35	1.24	7.51	
			Subtotal	**305.68**	**1,538.28**	**5,485.67**	**7.12**	**228.61**	**221.75**	**2,498,536.88**	**23.25**	**10.60**	**12.09**	**69.96**	

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb											Notes on Hour Estimates
				VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	
Tow Boat - propulsion	2,620	671	0.68	779.10	2421.35	14870.42	16.46	390.19	378.48	1,790,769	7.06	3.22	3.69	33.26	Based on 262 days duration
Tow Boat - auxiliary	2,620	149	0.43	109.40	340.00	2088.08	2.31	54.79	53.15	251,456	0.99	0.45	0.52	4.67	
Crew boat	262	149	0.45	11.45	35.58	218.52	0.24	5.73	5.56	26,315	0.10	0.05	0.05	0.49	Based on daily trips for 262 day duration
			Subtotal	**899.95**	**2796.94**	**17177.02**	**19.02**	**450.71**	**437.19**	**2,068,540.58**	**8.16**	**3.72**	**4.26**	**38.42**	

Equipment	Activity	Operating Hours	g/hr-vehicle Emission Rate											Notes on Hour Estimates
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	
Onsite trucks	Idle	1,300	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41	Based on 20% total new pile supported structures and dyr dock construction durations (260 days)
			Annual Emissions in Pounds											
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	
			14.70	61.80	96.05	0.05	7.14	6.57	16,100.38	0.76	0.23	0.11	1.14	

Equipment	MPH	Miles	g/VMT Emission Rate										
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	10	13,000	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
			Annual Emissions in Pounds										
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
			24.27	128.33	210.34	0.17	28.31	13.05	48,752.51	1.25	0.24	0.18	1.90

2033

Phase 5, C3 - Construct M2D2 240 days total from Alternative 3 Schedule 04.24.22 (Navy edits). Pdf durations from M2D2 construction usage rates.xlsx and ER.

Construction Equipment	Hours	HP	Load Factor	Emissions in lb										Notes on Hour Estimates
				VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	
100 ton Crane	1,806	480	1	98.96	444.50	1882.98	2.89	67.38	65.36	1014619.89	7.22	3.29	4.42	25.70	Based on 20% total dry dock construction duration (903 days)
Excavator	1,806	450	0.53	30.35	193.04	521.11	1.41	30.92	29.99	509686.25	2.68	1.22	1.39	7.76	
Vibrators/equipment	1,806	18	0.58	14.72	62.45	156.56	0.09	7.14	6.92	24,739	1.30	0.59	0.80	4.41	
Misc Curing Equipment	1,806	60	0.58	15.46	96.80	392.69	0.23	11.09	10.76	82,557	1.67	0.76	0.70	4.23	
Concrete Finisher	1,806	74	0.58	19.07	119.38	484.32	0.29	13.68	13.27	101,820	2.06	0.94	0.86	5.21	
			Subtotal	**178.56**	**916.18**	**3,437.66**	**4.91**	**130.21**	**126.30**	**1,733,421.65**	**14.93**	**6.81**	**8.18**	**47.31**	

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb											Notes on Hour Estimates
				VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	
Tow Boat - propulsion	2,400	671	0.68	713.68	2218.03	13621.76	15.08	357.42	346.70	1,640,399	6.47	2.95	3.38	30.47	Based on 240 day operations duration
Tow Boat - auxiliary	2,400	149	0.43	100.21	311.45	1912.74	2.12	50.19	48.68	230,342	0.91	0.41	0.47	4.28	
Crew boat	240	149	0.45	10.49	32.59	200.17	0.22	5.25	5.09	24,106	0.10	0.04	0.05	0.45	Based on daily trips for 240 day duration
			Subtotal	**824.39**	**2562.08**	**15734.68**	**17.42**	**412.87**	**400.48**	**1894846.33**	**7.47**	**3.41**	**3.91**	**35.20**	

Equipment	Activity	Operating Hours	g/hr-vehicle Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
Onsite trucks	Idle	903	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41	Based on 20% total dry dock construction duration (903 days)
			Annual Emissions in Pounds VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	
			14.70	61.80	96.05	0.05	7.14	6.57	16,100.38	0.76	0.23	0.11	1.14	

Equipment	MPH	Miles	g/VMT Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	10	9,030	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
			Annual Emissions in Pounds VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
			16.86	89.14	146.11	0.12	19.66	9.06	33,864.24	0.87	0.16	0.13	1.32

2034

Phases 5, 6 - Construct M2D2, new pile structures — 240 days total from Alternative 3 Schedule 04.24.22 (Navy edits). Pdf — durations from M2D2 construction usage rates.xlsx and ER.

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
100 ton Crane	1,806	480	1	98.96	444.50	1882.98	2.89	67.38	65.36	1,014,619.89	7.22	3.29	4.42	25.70	Based on 20% total dry dock construction duration (903 days)
Excavator	1,806	450	0.53	30.35	193.04	521.11	1.41	30.92	29.99	509,686.25	2.68	1.22	1.39	7.76	
Vibrators/equipment	2,997	18	0.58	24.42	103.64	259.80	0.15	11.84	11.49	41,053	2.15	0.98	1.32	7.33	Based on 20% total dry dock construction duration (903 days) and 50% phase 6 new pile supported structures (238 days)
Misc Curing Equipment	2,997	60	0.58	25.66	160.63	651.66	0.38	18.41	17.85	137,000	2.78	1.27	1.16	7.01	
Concrete Finisher	2,997	74	0.58	31.65	198.11	803.71	0.47	22.70	22.02	168,967	3.42	1.56	1.43	8.65	
160 ton derrick	1,191	470	1	63.90	287.03	1215.89	1.87	43.51	42.20	655,170	4.66	2.13	2.86	16.59	Based on 50% phase 6 new pile supported structures (238 days)
160 ton derrick generator	1,191	94	1	77.99	393.30	834.37	0.47	67.01	65.00	145,489	3.09	1.41	0.64	3.71	
25 ton Crane	1,191	150	1	16.31	69.07	340.15	0.58	16.04	15.56	209,109	1.41	0.64	0.81	4.53	
			Subtotal	**369.24**	**1,849.33**	**6,509.68**	**8.22**	**277.81**	**269.48**	**2,881,094.49**	**27.41**	**12.50**	**14.05**	**81.29**	

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	Notes on Hour Estimates
Tow Boat - propulsion	2,400	671	0.68	713.68	2218.03	13621.76	15.08	357.42	346.70	1,640,399	6.47	2.95	3.38	30.47	Based on 240 days duration
Tow Boat - auxiliary	2,400	149	0.43	100.21	311.45	1912.74	2.12	50.19	48.68	230,342	0.91	0.41	0.47	4.28	
Site tug - propulsion	1,191	112	0.5	43.47	135.09	829.64	0.92	21.77	21.12	99,909	0.39	0.18	0.21	1.86	Based on 50% phase 6 new pile supported structures (238 days)
Site tug - auxiliary	1,191	19	0.43	6.34	19.71	121.04	0.16	3.18	3.08	16,971	0.06	0.03	0.03	0.27	
Skiff	1,191	75	0.45	26.20	81.42	500.01	0.55	13.12	12.73	60,213	0.24	0.11	0.12	1.12	
Crew boat	240	149	0.45	10.49	32.59	200.17	0.22	5.25	5.09	24,106	0.10	0.04	0.05	0.45	Based on daily trips for 240 day duration
			Subtotal	**900.39**	**2798.29**	**17185.36**	**19.05**	**450.93**	**437.40**	**2071940.28**	**8.16**	**3.72**	**4.27**	**38.44**	

Equipment	Activity	Operating Hours	g/hr-vehicle Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
Onsite trucks	Idle	1,499	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41	Based on 20% total dry dock construction duration (903 days) and 50% phase 6 new pile supported structures (238 days)
			Annual Emissions in Pounds VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	
			14.70	61.80	96.05	0.05	7.14	6.57	16,100.38	0.76	0.23	0.11	1.14	

Equipment	MPH	Miles	g/VMT Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	10	14,985	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
			Annual Emissions in Pounds VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
			27.98	147.92	242.46	0.19	32.63	15.04	56,196.64	1.44	0.27	0.21	2.19

2035

Phases 5, 6 & 7 - Construct M2D2, pile structures, dredging — 240 days total from Alternative 3 Schedule 04.24.22 (Navy edits). Pdf — durations from M2D2 construction usage rates.xlsx and ER.

Construction Equipment	Hours	HP	Load Factor	Emissions in lb VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
25 ton Crane	2,781	150	1	38.09	161.27	794.26	1.35	37.46	36.34	488,272.41	3.30	1.50	1.90	10.58	Based on 50% phase 6 new pile supported structures (238 days)
60 ton derrick	1,590	230	1	30.56	438.64	438.64	1.18	18.74	18.18	428,057.27	2.57	1.17	1.40	7.89	Based on 50% total dredging (318 days)
Excavator	1,806	450	0.53	30.35	193.04	521.11	1.41	30.92	29.99	509,686.25	2.68	1.22	1.39	7.76	Based on 20% total dry dock construction duration (903 days)
100 ton Crane	1,806	480	1	98.96	444.50	1882.98	2.89	67.38	65.36	1,014,619.89	7.22	3.29	4.42	25.70	
160 ton derrick	1,191	470	1	63.90	287.03	1215.89	1.87	43.51	42.20	655,170	4.66	2.13	2.86	16.59	Based on 50% total dredging (318 days) and 50% phase 6 new pile supported structures (238 days)
160 ton derrick generator	1,191	94	1	77.99	393.30	834.37	0.47	67.01	65.00	145,489	3.09	1.41	0.64	3.71	
Vibrators/equipment	2,997	18	0.58	24.42	103.64	259.80	0.15	11.84	11.49	41,053	2.15	0.98	1.32	7.33	Based on 20% total dry dock construction duration (903 days)and 50% phase 6 new pile supported structures (238 days)
Misc Curing Equipment	2,997	60	0.58	25.66	160.63	651.66	0.38	18.41	17.85	137,000	2.78	1.27	1.16	7.01	
Concrete Finisher	2,997	74	0.58	31.65	198.11	803.71	0.47	22.70	22.02	168,967	3.42	1.56	1.43	8.65	
			Subtotal	**421.58**	**2,380.17**	**7,402.43**	**10.17**	**317.97**	**308.43**	**3,588,315.06**	**31.86**	**14.53**	**16.53**	**95.23**	

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	Notes on Hour Estimates
Tow Boat - propulsion	3,339	671	0.68	992.96	3085.99	18952.22	20.98	497.29	482.37	2,282,319	9.00	4.11	4.71	42.40	Based on 50% phase 6 new pile supported structures (238 days), 50% total dredging (318 days) and trip time for dredge disposal transport
Tow Boat - auxiliary	3,339	149	0.43	139.43	433.33	2661.24	2.95	69.83	67.73	320,479	1.26	0.58	0.66	5.95	
Site tug - propulsion	1,191	112	0.5	43.47	135.09	829.64	0.92	21.77	21.12	99,909	0.39	0.18	0.21	1.86	Based on 50% phase 6 new pile supported structures (238 days)
Site tug - auxiliary	1,191	19	0.43	6.34	19.71	121.04	0.16	3.18	3.08	16,971	0.06	0.03	0.03	0.27	
Skiff	1,191	75	0.45	26.20	81.42	500.01	0.55	13.12	12.73	60,213	0.24	0.11	0.12	1.12	
Crew boat	240	149	0.45	10.49	32.59	200.17	0.22	5.25	5.09	24,106	0.10	0.04	0.05	0.45	Based on daily trips for 240 day duration
Ocean Tug- propulsion	123	1,118	0.68	61.12	189.95	1166.58	1.29	30.61	29.69	140,486	0.55	0.25	0.29	2.61	Based on transport trips for dredge material to Elliot Bay disposal
Ocean Tug- auxiliary	123	224	0.43	7.74	24.07	147.80	0.16	3.88	3.76	17,799	0.07	0.03	0.04	0.33	
			Subtotal	**1287.75**	**4002.15**	**24578.70**	**27.23**	**644.93**	**625.58**	**2962282.24**	**11.67**	**5.33**	**6.10**	**54.98**	

Towboat activity waste transport to Terminal 5 area at Industrial Area West in Seattle.

Equipment	Activity	Operating Hours	g/hr-vehicle Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	Notes on Hour Estimates
Onsite trucks	Idle	1,499	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41	Based on 20% total dry dock construction duration (903 days)and 50% phase 6 new pile supported structures (238 days)
			Annual Emissions in Pounds VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	
			14.70	61.80	96.05	0.05	7.14	6.57	16,100.38	0.76	0.23	0.11	1.14	

Equipment	MPH	Miles	g/VMT Emission Rate VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	10	14,985	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
			Annual Emissions in Pounds VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
			27.98	147.92	242.46	0.19	32.63	15.04	56,196.64	1.44	0.27	0.21	2.19

Rail Equipment	Tons Waste	Gal Fuel Consumed	Emissions in lb VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde
Large Line Haul, Tier 1+	197,000	120,958	1,295	7,100	32,134	25	811	787	2,706,682	213	69	29.13	288.68

Waste transport to Columbia Ridge Commercial Landfill & Recycling, Arlington, OR
100% Phase 7 waste

2036

Phases 5, 7, 8 - Construct M2D2, bldg & crane rail — 240 days total from Alternative 3 Schedule 04.24.22 (Navy edits). Pdf — durations from M2D2 construction usage rates.xlsx and ER.

Construction Equipment	Hours	HP	Load Factor	Emissions in lb											Notes on Hour Estimates
				VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	
25 ton Crane	2,400	150	1	32.87	139.18	685.45	1.17	32.33	31.36	421378.56	2.84	1.30	1.64	9.13	Based on 240 day duration
Loader	2,400	300	0.48	26.38	126.34	378.29	1.12	23.45	22.75	408946.20	2.29	1.04	1.22	6.79	
Excavator	1,806	450	0.53	30.35	193.04	521.11	1.41	30.92	29.99	509686.25	2.68	1.22	1.39	7.76	Based on 20% total dry dock construction duration (903 days)
100 ton Crane	1,806	480	1	98.96	444.50	1882.98	2.89	67.38	65.36	1,014,619.89	7.22	3.29	4.42	25.70	
160 ton derrick	2,280	470	1	122.33	549.48	2327.66	3.58	83.29	80.79	1,254,230	8.92	4.07	5.47	31.77	Based on crane rail construction duration (228 days)
160 ton derrick generator	2,280	94	1	149.29	752.91	1597.29	0.89	128.29	124.44	278,517	5.92	2.70	1.22	7.11	
Vibrators/equipment	4,206	18	0.58	34.27	145.45	364.60	0.21	16.62	16.12	57,614	3.02	1.38	1.86	10.28	Based on 20% total dry dock construction duration (903 days) and 240 day duration for phases 5,7,8
Misc Curing Equipment	4,206	60	0.58	36.01	225.43	914.54	0.54	25.83	25.06	192,267	3.90	1.78	1.63	9.84	
Concrete Finisher	4,206	74	0.58	44.41	278.03	1127.93	0.66	31.86	30.90	237,129	4.80	2.19	2.01	12.14	
			Subtotal	**574.88**	**2,854.37**	**9,799.85**	**12.47**	**439.96**	**426.77**	**4,374,387.82**	**41.59**	**18.97**	**20.87**	**120.52**	

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb											Notes on Hour Estimates
				VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	
Tow Boat - propulsion	2,400	671	0.68	713.68	2218.03	13621.76	15.08	357.42	346.70	1,640,399	6.47	2.95	3.38	30.47	Based on 240 day duration
Tow Boat - auxiliary	2,400	149	0.43	100.21	311.45	1912.74	2.12	50.19	48.68	230,342	0.91	0.41	0.47	4.28	
Crew boat	240	149	0.45	10.49	32.59	200.17	0.22	5.25	5.09	24,106	0.10	0.04	0.05	0.45	Based on daily trips for 240 day duration
			Subtotal	**824.39**	**2562.08**	**15734.68**	**17.42**	**412.87**	**400.48**	**1,894,846.33**	**7.47**	**3.41**	**3.91**	**35.20**	

Equipment	Activity	Operating Hours	g/hr-vehicle Emission Rate										Notes on Hour Estimates
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	
Onsite trucks	Idle	3,873	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41	Based on 20% total dry dock construction duration (903 days), crane rail construction (228 days) and new buidling construction (366 days)
			Annual Emissions in Pounds										
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
			14.70	61.80	96.05	0.05	7.14	6.57	16,100.38	0.76	0.23	0.11	1.14

Equipment	MPH	Miles	g/VMT Emission Rate										
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	10	38,730	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
			Annual Emissions in Pounds										
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
			72.31	382.31	626.65	0.49	84.34	38.86	145,244.97	3.73	0.71	0.54	5.65

Fugitive Dust — months of disturbance based on estimated annual % of construction schedule for disturbance activity

Year	PM 10 tons/acre-mo	acres	months of disturbance	PM10 Total Tons	PM2.5/ PM10 Ratio	PM2.5 Total Tons
2027	0.11	2.7	1	0.30	0.1	0.03
2028	0.11	7.7	6	5.32	0.1	0.53
2029	0.11	3.9	2	0.42	0.1	0.04
2030	0.11	3.9	2	0.42	0.1	0.04
2031	0.11	0.7	2	0.17	0.1	0.02
2032	0.11	1.4	2	0.34	0.1	0.03
2033	0.11	6.7	2	1.48	0.1	0.15
2034	0.11	7.4	2	1.64	0.1	0.16
2035	0.11	8.0	2	1.76	0.1	0.18
2036	0.11	6.8	2	1.51	0.1	0.15

Emission factor and ratio from WRAP Fugitive Dust Handbook, 2006
50% of acreage for each phase per year is assumed to have active dust generating activity at any time of the disturbance period
except fpr total M2D2 construction acreage, which is evenly divided across 4 years of construction (25%)

Totals by Year

Year	Annual Emissions in Tons										
	VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde
2027	0.02	0.10	0.26	0.00	0.32	0.05	149.97	0.00	0.00	0.00	0.00
2028	0.17	0.84	3.37	0.00	5.44	0.65	953.37	0.02	0.01	0.00	0.03
2029	2.39	12.31	55.94	0.05	1.89	1.47	5,722.02	0.33	0.11	0.05	0.46
2030	2.39	12.31	55.94	0.05	1.89	1.47	5,722.02	0.33	0.11	0.05	0.46
2031	1.13	4.84	24.29	0.02	0.80	0.63	2,797.40	0.09	0.03	0.01	0.14
2032	0.62	2.26	11.48	0.01	0.70	0.44	2,315.97	0.12	0.04	0.02	0.06
2033	0.52	1.81	9.71	0.01	1.76	0.42	1,839.12	0.01	0.01	0.01	0.04
2034	0.66	2.43	12.02	0.01	2.02	2.00	2,512.67	0.02	0.01	0.01	0.06
2035	1.52	6.85	32.23	0.03	2.67	1.05	4,664.79	0.02	0.01	0.01	0.22
2036	0.74	2.93	13.13	0.02	1.98	0.59	3,215.29	0.03	0.01	0.01	0.08

Tab O **Component 15:** **Demo Mooring A** 1 pound= 453.59 grams

2027 & 2028 **split evenly across both years**

4 days dredging
42 days excavation
250 days pier demo

Dredging, Excavation, Demolition — days from M2D2 Construction Usage Rates.xlsx

Construction Equipment	Hours	HP	Load Factor	Emissions in lb											Notes on Hour Estimates
				VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde	
60 ton derrick	40	230	1	0.77	11.03	11.03	0.03	0.47	0.46	10,769	0.06	0.03	0.04	0.20	Based on 4 days dredging
25 ton Crane	40	150	1	0.55	2.32	11.42	0.02	0.54	0.52	7,023	0.05	0.02	0.03	0.15	
Excavator	420	450	0.53	7.06	44.89	121.19	0.33	7.19	6.98	118,532	0.62	0.28	0.32	1.80	Based on 42 days excavation
Loader	420	300	0.48	4.62	22.11	66.20	0.20	4.10	3.98	71,566	0.40	0.18	0.21	1.19	
160 ton derrick	2,500	470	1	134.13	602.50	2552.26	3.92	91.33	88.59	1,375,252	9.78	4.46	6.00	34.83	Based on 250 days pier demo
160 ton derrick generator	2,500	94	1	163.70	825.56	1751.41	0.98	140.67	136.45	305,392	6.49	2.96	1.34	7.79	
			Subtotal	**310.82**	**1508.42**	**4513.52**	**5.47**	**244.30**	**236.97**	**1888533**	**17.41**	**7.94**	**7.94**	**45.97**	

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb											Notes on Hour Estimates
				VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	
Tow Boat - propulsion	2,607	671	0.68	775.12	2408.97	14794.37	16.38	388.19	376.55	1,781,610	7.03	3.21	3.67	33.09	Based on dredging and excavation duration, and trip time for debris disposal
Tow Boat - auxiliary	2,607	149	0.43	108.84	338.26	2077.40	2.30	54.51	52.87	250,170	0.99	0.45	0.52	4.65	
Skiff	2,500	75	0.45	54.99	170.90	1049.55	1.16	27.54	26.71	126,392	0.50	0.23	0.26	2.35	Based on 250 days pier demo
Crew boat	296	149	0.45	12.93	40.20	246.88	0.27	6.48	6.28	29,730	0.12	0.05	0.06	0.55	Based on daily trips for dredging, excavation and pier demo
Site tug - propulsion	40	112	0.5	1.46	4.54	27.86	0.03	0.73	0.71	3,355	0.01	0.01	0.01	0.06	Based on 4 days dredging
Site tug - auxiliary	40	19	0.43	0.21	0.66	4.07	0.01	0.11	0.10	570	0.00	0.00	0.00	0.01	
			Subtotal	**953.56**	**2963.53**	**18200.13**	**20.15**	**477.56**	**463.23**	**2191829**	**8.64**	**3.94**	**4.52**	**40.71**	

Rail Equipment	Tons Waste	Gal Fuel Consumed	Emissions in lb										
			VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde
Large Line Haul, Tier 1+	23,506	14,433	154	847	3,834	3	97	94	322,961	25	8	3.48	34.45

Waste transport to Columbia Ridge Commercial Landfill & Recycling, Arlington, OR

ONSITE MATERIAL MOVEMENT

Equipment	Activity	Operating Hours	g/hr-vehicle Emission Rate											Notes on Hour Estimates
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	
Onsite trucks	Idle	1,250	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41	Based on excavator activity
			Annual Emissions in Pounds											
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde	
			14.41	60.59	94.17	0.05	7.00	6.44	15,784.68	0.74	0.23	0.11	1.12	

Equipment	MPH	Miles	g/VMT Emission Rate										
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
Onsite trucks	10	12,500	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
			Annual Emissions in Pounds										
			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
			23.34	123.39	202.25	0.16	27.22	12.54	46,877	1.20	0.23	0.17	1.82

Fugitive Dust — months of disturbance based on estimated annual % of construction schedule for disturbance activity

Year	PM 10 tons/acre-mo	acres	months of disturbance	**PM10 Total Tons**	PM2.5/ PM10 Ratio	**PM2.5 Total Tons**
2027	0.11	0.2	2.4	0.03	0.1	0.00
2028	0.11	0.2	2.4	0.03	0.1	0.00

Emission factor and ratio from WRAP Fugitive Dust Handbook, 2006
50% of acreage for each phase per year is assumed to have active dust generating activity at any time of the disturbance period.

Totals by Year

Year	Annual Emissions in Tons										
	VOC	CO	NOx	SO_2	PM10	PM2.5	CO_2	CH4	N2O	Benzene	Formaldehyde
2027	0.36	1.38	6.71	0.01	0.24	0.21	1,116.50	0.01	0.01	0.00	0.03
2028	0.36	1.38	6.71	0.01	0.24	0.21	1,116.50	0.01	0.01	0.00	0.03

Tab P: BATCH PLANT OPERATIONS

Onsite truck trips are calculated in individual tabs.
Reference for use in batch plant calculations: EPA. 2018. Potential To Emit Calculator for Concrete Batch Plants.
Accessed at https://www.epa.gov/sites/production/files/2018-05/concrete batch plants pte calculator version 1.0 1-1.xlsx.

1 CY= 0.764556 M3
90 M3/hr = 117.7154 CY/hr

2 batch plants, one upland and one on barge

Assume 50% throughput from land=based plant and 50% barge based plant
1 pound= 453.59 grams

BATCH PLANTS - C2
ALTERNATIVE 2

318,756	CY concrete					
318,756	subtotal					
31,876	10% tolerance/buffer					
350,632	total CY	200	CY/hr combined capacity on average			
		8,599	Total operating hours	Phase Schedule	%	Annual Operating Hours
19,480	# trucks transporting concrete	9	CY (avg concrete truck)	156 days 2027	0.18	1563
				313 days 2028	0.36	3127
3,542	truck trips 2027			313 days 2029	0.36	3127
7,083	truck trips 2028			78 days 2030	0.09	782
7,083	truck trips 2029			860 Total days		
1,771	truck trips 2030					

Barge concrete plant - Generator operations 145 kW 195 HP

Load Factor	Annual Hours	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO2 g/hp-hr	CH4 g/hp-hr	N2O g/hp-hr	Benzene g/hp-hr	Formaldehyde g/hp-hr
		Emissions Factors										
0.75	1563	0.21	0.67	2.57	0.00	0.13	0.13	530.42	0.01	0.00	0.01	0.05
	3127	0.21	0.67	2.57	0.00	0.13	0.13	530.42	0.01	0.00	0.01	0.05
	3127	0.21	0.67	2.57	0.00	0.13	0.13	530.42	0.01	0.00	0.01	0.05
	782	0.21	0.67	2.57	0.00	0.13	0.13	530.42	0.01	0.00	0.01	0.05
	YEAR	**VOC**	**CO**	**NOx**	**SO2**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**Benzene**	**Formaldehyde**
		Emissions in Pounds										
	2027	108.05	338.70	1296.09	0.85	67.32	65.30	267,383	5.17	2.36	3.85	26.73
	2028	216.10	677.41	2592.19	1.70	134.64	130.60	534,767	10.34	4.72	7.70	53.46
	2029	216.10	677.41	2592.19	1.70	134.64	130.60	534,767	10.34	4.72	7.70	53.46
	2030	54.03	169.35	648.05	0.43	33.66	32.65	133,692	2.58	1.18	1.92	13.37

From EPA's MOVES 3 - Commercial Equipment
Size from model FHZS90

POTENTIAL TO EMIT
Vehicle Traffic
Controlled Emissions PM/PM10

The source will use periodic watering to control the fugitive dust emissions.
Control Efficiency From watering (%): 50% [Assume 50% control from following fugitive dust control plan for roadways.]

Road Type	Vehicle Type	Avg. Wt. (tons)	Trips/year	RT Distance (miles)	Uncontrolled Pollutant PM_{10}	Uncontrolled Pollutant $PM_{2.5}$	**Controlled Pollutant** PM_{10}	**Controlled Pollutant** $PM_{2.5}$
Unpaved Roads PTE (ton/yr)	Transit Mix Truck	33			7.302	0.730		
		YEAR			PTE (T/YR)	PTE (T/YR)	**PTE (T/YR)**	**PTE (T/YR)**
		2027	3,542	0.25	3.23	0.32	1.62	0.16
		2028	7,083	0.25	6.47	0.65	3.23	0.32
		2029	7,083	0.25	6.47	0.65	3.23	0.32
		2030	1,771	0.25	1.62	0.16	0.81	0.08

EPA. 2018. Potential To Emit Calculator for Concrete Batch Plants.

Methodology:
PTE (tons/yr) = Trips/yr x Distance (miles) x Emission Factor (lb/mile) x 1 ton/2,000 lbs

Controlled Emissions from Concrete Batch Mix Materials Handling - Criteria Pollutants
Annual throughput (yards mix/yr) = total CY of concrete

EPA. 2018. Potential To Emit Calculator for Concrete Batch Plants. - Batch Mix Oper. Tab

	CY Mix/yr	Controlled?	Emission Factor (lb/CY) PM10	Emission Factor (lb/CY) PM2.5	**Potential to Emit PM10**	**Potential to Emit PM2.5**
Plant Maximum Production Capacity	127,502					
Railcar/Barge/Truck Sand Unloading	127,502	y	0.0007	0.000091	0.04	0.006
Railcar/Barge/Truck Aggregate Unloading	127,502	y	0.0031	0.000403	0.20	0.026
Cement - Unloading to Elevated Storage	127,502	y	0.0001	0.000013	0.01	0.001
Cement Supplement - Unloading to Elevated Storage	127,502	y	0.0002	0.000026	0.01	0.002
Sand - Transfer to Conveyor	127,502	y	0.0007	0.000091	0.04	0.006
Aggregate - Transfer to Conveyor	127,502	0	0.0031	0.000403	0.20	0.026
Sand - Transfer to Elevated Storage	127,502	y	0.00007	0.0000091	0.00	0.001
Aggregate - Transfer to Elevated Storage	127,502	y	0.00031	0.0000403	0.02	0.003
Weigh Hopper Loading	127,502	y	0.00038	0.0000494	0.02	0.003
Mixer Loading	127,502	y	0.001551	0.00020163	0.10	0.013
Truck Loading	127,502	y	0.0074166	0.000964158	0.47	0.061
PTE (ton/yr)	**Maximum Emissions from materials handling and loading**				**1.12**	**0.15**

Note:
Assume that transfer of sand and aggregate to elevated storage and weigh hopper loading has a capture/control efficiency of 90%.
Emission factors are from AP-42, Chapter 11.12, Concrete Batching, Tables 11.12-2, 11.12-3, 11.12-4, and 11.12-6. (June 2006)
PM 2.5 emission factors are from AP-42, Chapter 11.12, Concrete Batching, Background Document, Table 17.1. (June 2006)
Assumes equipment is controlled

Methodology
PTE (ton/yr) = CY mix/yr x EF (lb/CY mix) x 1 ton/2000 lb

ONSITE MATERIAL MOVEMENT

Year	Equipment	Activity	Operating Hours	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
				g/hr-vehicle Emission Rate										
2027	Onsite trucks	Idle	782	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41
2028	Onsite trucks	Idle	1,563	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41
2029	Onsite trucks	Idle	1,563	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41
2030	Onsite trucks	Idle	391	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41
				Annual Emissions in Pounds										
				VOC	**CO**	**NOx**	**SO2**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**Benzene**	**Formaldehyde**
			2027	18.49	77.74	120.84	0.07	8.98	8.26	20,254	0.96	0.29	0.14	1.44
			2028	36.98	155.48	241.67	0.14	17.96	16.52	40,508	1.91	0.59	0.27	2.87
			2029	36.98	155.48	241.67	0.14	17.96	16.52	40,508	1.91	0.59	0.27	2.87
			2030	9.24	38.87	60.42	0.03	4.49	4.13	10,127	0.48	0.15	0.07	0.72

Year	Equipment	MPH	Miles	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
				MT Emission Rate										
2027	Onsite trucks	10	885	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
2028	Onsite trucks	10	1,771	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
2029	Onsite trucks	10	1,771	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
2030	Onsite trucks	10	443	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
				Annual Emissions in Pounds										
				VOC	**CO**	**NOx**	**SO2**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**Benzene**	**Formaldehyde**
			2027	6.61	34.96	57.31	0.05	7.71	3.55	13,282	0.34	0.06	0.05	0.52
			2028	13.23	69.92	114.61	0.09	15.43	7.11	26,564	0.68	0.13	0.10	1.03
			2029	13.23	69.92	114.61	0.09	15.43	7.11	26,564	0.68	0.13	0.10	1.03
			2030	3.31	17.48	28.65	0.02	3.86	1.78	6,641	0.17	0.03	0.02	0.26

Marine Equipment	Hours	Engine kW	Load Factor	VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	
				Emissions in lb											
Tow Boat - propulsion	1,563	671	0.68	464.91	1444.89	8873.61	9.82	232.84	225.85	1,068,603	4.21	1.92	2.20	19.85	based on 10 hrs of operation/day
Tow Boat - auxiliary	1,563	149	0.43	65.28	202.89	1246.02	1.38	32.69	31.71	150,051	0.59	0.27	0.31	2.79	
Crew boat	313	149	0.45	13.66	42.47	260.79	0.29	6.84	6.64	31,406	0.12	0.06	0.06	0.58	based on 2 hrs of operation/day
		2027	**Subtotal**	**543.86**	**1690.24**	**10380.41**	**11.49**	**272.37**	**264.20**	**1,250,060**	**4.93**	**2.25**	**2.58**	**23.22**	

Marine Equipment	Hours	Engine kW	Load Factor	VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	
				Emissions in lb											
Tow Boat - propulsion	3,127	671	0.68	929.83	2889.78	17747.21	19.65	465.67	451.70	2,137,206	8.43	3.85	4.41	39.70	based on 10 hrs of operation/day
Tow Boat - auxiliary	3,127	149	0.43	130.56	405.78	2492.03	2.76	65.39	63.43	300,102	1.18	0.54	0.62	5.57	
Crew boat	625	149	0.45	27.33	84.93	521.59	0.58	13.69	13.28	62,812	0.25	0.11	0.13	1.17	based on 2 hrs of operation/day
		2028	**Subtotal**	**1087.72**	**3380.49**	**20760.83**	**22.98**	**544.75**	**528.41**	**2,500,120**	**9.86**	**4.50**	**5.15**	**46.44**	

Marine Equipment	Hours	Engine kW	Load Factor	VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	
				Emissions in lb											
Tow Boat - propulsion	3,127	671	0.68	929.83	2889.78	17747.21	19.65	465.67	451.70	2,137,206	8.43	3.85	4.41	39.70	based on 10 hrs of operation/day
Tow Boat - auxiliary	3,127	149	0.43	130.56	405.78	2492.03	2.76	65.39	63.43	300,102	1.18	0.54	0.62	5.57	
Crew boat	625	149	0.45	27.33	84.93	521.59	0.58	13.69	13.28	62,812	0.25	0.11	0.13	1.17	based on 2 hrs of operation/day
		2029	**Subtotal**	**1087.72**	**3380.49**	**20760.83**	**22.98**	**544.75**	**528.41**	**2,500,120**	**9.86**	**4.50**	**5.15**	**46.44**	

Marine Equipment	Hours	Engine kW	Load Factor	VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	
				Emissions in lb											
Tow Boat - propulsion	782	671	0.68	232.46	722.45	4436.80	4.91	116.42	112.93	534,301	2.11	0.96	1.10	9.92	based on 10 hrs of operation/day
Tow Boat - auxiliary	782	149	0.43	32.64	101.44	623.01	0.69	16.35	15.86	75,026	0.30	0.13	0.15	1.39	
Crew boat	156	149	0.45	6.83	21.23	130.40	0.14	3.42	3.32	15,703	0.06	0.03	0.03	0.29	based on 2 hrs of operation/day
		2030	**Subtotal**	**271.93**	**845.12**	**5190.21**	**5.75**	**136.19**	**132.10**	**625,030**	**2.47**	**1.12**	**1.29**	**11.61**	

Total Maximum Emissions for Alt 2

Year	VOC tons	CO tons	NOx tons	SO2 tons	PM_{10} tons	$PM_{2.5}$ tons	CO2 tons	CH4 tons	N2O tons	CO2e tons	Benzene tons	Formaldehyde tons
2027	0.34	1.07	5.93	0.01	2.92	0.48	775	0.01	0.00	776	0.00	0.03
2028	0.68	2.14	11.85	0.01	4.71	0.81	1551	0.011	0.00	1553	0.01	0.05
2029	0.68	2.14	11.85	0.01	4.71	0.81	1551	0.011	0.00	1553	0.01	0.05
2030	0.17	0.54	2.96	0.00	2.02	0.31	388	0.003	0.00	388	0.00	0.01

BATCH PLANTS - C3
ALTERNATIVE 3

654,027 CY concrete

654,027 subtotal
65,403 10% tolerance/buffer

719,430 total CY — 200 CY/hr combined capacity on average
17,643 Total operating hours

39,968 # trucks transporting concrete — 9 CY (avg concrete truck)

7,267 truck trips 2027
14,534 truck trips 2028
14,534 truck trips 2029
3,633 truck trips 2030

Phase Schedule		%	Annual Operating Hours
321	days 2027	0.18	3208
642	days 2028	0.36	6416
642	days 2029	0.36	6416
160	days 2030	0.09	1604
1,764	Total days		
2	shifts operating in 2028-2029		

Barge concrete plant - Generator operations — 145 kW, 195 HP

Load Factor	Annual Hours	Emissions Factors: VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO2 g/hp-hr	CH4 g/hp-hr	N2O g/hp-hr	Benzene g/hp-hr	Formaldehyde g/hp-hr
0.75	3208	0.21	0.67	2.57	0.00	0.13	0.13	530.42	0.01	0.00	0.01	0.05
	6416	0.21	0.67	2.57	0.00	0.13	0.13	530.42	0.01	0.00	0.01	0.05
	6416	0.21	0.67	2.57	0.00	0.13	0.13	530.42	0.01	0.00	0.01	0.05
	1604	0.21	0.67	2.57	0.00	0.13	0.13	530.42	0.01	0.00	0.01	0.05

	Emissions in Pounds										
YEAR	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
2027	221.70	694.96	2659.34	1.75	138.13	133.98	548,620	10.61	4.84	7.90	54.85
2028	443.40	1389.92	5318.68	3.50	276.26	267.97	########	21.22	9.68	15.79	109.70
2029	443.40	1389.92	5318.68	3.50	276.26	267.97	########	21.22	9.68	15.79	109.70
2030	110.85	347.48	1329.67	0.87	69.06	66.99	274,310	5.30	2.42	3.95	27.42

From EPA's MOVES 3 - Commercial Equipment
Size from model FHZS90

POTENTIAL TO EMIT
Vehicle Traffic
Controlled Emissions PM/PM10

The source will use periodic watering to control the fugitive dust emissions.
Control Efficiency From watering (%): 50% [Assume 50% control from following fugitive dust control plan for roadways.]

					Uncontrolled Pollutant (lb/mi)		Controlled Pollutant (lb/mi)	
Road Type	Vehicle Type	Avg. Wt. (tons)	Trips/year	RT Distance (miles)	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Unpaved Roads PTE (ton/yr)	Transit Mix Truck	33			7.302	0.730		
		YEAR			PTE (T/YR)	PTE (T/YR)	**PTE (T/YR)**	**PTE (T/YR)**
		2027	7,267	0.25	6.63	0.66	3.32	0.33
		2028	14,534	0.25	13.27	1.33	6.63	0.66
		2029	14,534	0.25	13.27	1.33	6.63	0.66
		2030	3,633	0.25	3.32	0.33	1.66	0.17

EPA. 2018. Potential To Emit Calculator for Concrete Batch Plants.

Methodology:
PTE (tons/yr) = Trips/yr x Distance (miles) x Emission Factor (lb/mile) x 1 ton/2,000 lbs

Controlled Emissions from Concrete Batch Mix Materials Handling - Criteria Pollutants
Annual throughput (yards mix/yr) = total CY of concrete

EPA. 2018. Potential To Emit Calculator for Concrete Batch Plants. - Batch Mix Oper. Tab

	CY Mix/yr		Emission Factor (lb/CY)		Potential to Emit	
Plant Maximum Production Capacity	261,611	Controlled?	PM10	PM2.5	**PM10**	**PM2.5**
Railcar/Barge/Truck Sand Unloading	261,611	y	0.0007	0.000091	0.09	0.012
Railcar/Barge/Truck Aggregate Unloading	261,611	y	0.0031	0.000403	0.41	0.053
Cement - Unloading to Elevated Storage	261,611	y	0.0001	0.000013	0.01	0.002
Cement Supplement - Unloading to Elevated Storage	261,611	y	0.0002	0.000026	0.03	0.003
Sand - Transfer to Conveyor	261,611	y	0.0007	0.000091	0.09	0.012
Aggregate - Transfer to Conveyor	261,611	0	0.0031	0.000403	0.41	0.053
Sand - Transfer to Elevated Storage	261,611	y	0.00007	0.0000091	0.01	0.001
Aggregate - Transfer to Elevated Storage	261,611	y	0.00031	0.0000403	0.04	0.005
Weigh Hopper Loading	261,611	y	0.00038	0.0000494	0.05	0.006
Mixer Loading	261,611	y	0.001551	0.00020163	0.20	0.026
Truck Loading	261,611	y	0.0074166	0.000964158	0.97	0.126
PTE (ton/yr)	**Maximum Emissions from materials handling and loading**				**2.31**	**0.30**

Note:
Assume that transfer of sand and aggregate to elevated storage and weigh hopper loading has a capture/control efficiency of 90%.
Emission factors are from AP-42, Chapter 11.12, Concrete Batching, Tables 11.12-2, 11.12-3, 11.12-4, and 11.12-6. (June 2006)
PM 2.5 emission factors are from AP-42, Chapter 11.12, Concrete Batching, Background Document, Table 17.1. (June 2006)
Assumes equipment is controlled

Methodology
PTE (ton/yr) = CY mix/yr x EF (lb/CY mix) x 1 ton/2000 lb

ONSITE MATERIAL MOVEMENT

Year	Equipment	Activity	Operating Hours	g/hr-vehicle Emission Rate: VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
2027	Onsite trucks	Idle	1,604	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41
2028	Onsite trucks	Idle	3,208	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41
2029	Onsite trucks	Idle	3,208	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41
2030	Onsite trucks	Idle	802	5.23	21.99	34.17	0.02	2.54	2.34	5,728	0.27	0.08	0.04	0.41

	Annual Emissions in Pounds: VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
2027	18.49	77.74	120.84	0.07	8.98	8.26	20,254	0.96	0.29	0.14	1.44
2028	36.98	155.48	241.67	0.14	17.96	16.52	40,508	1.91	0.59	0.27	2.87
2029	36.98	155.48	241.67	0.14	17.96	16.52	40,508	1.91	0.59	0.27	2.87
2030	9.24	38.87	60.42	0.03	4.49	4.13	10,127	0.48	0.15	0.07	0.72

Year	Equipment	MPH	Miles	g/VMT Emission Rate: VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
2027	Onsite trucks	10	3,542	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
2028	Onsite trucks	10	7,083	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
2029	Onsite trucks	10	7,083	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07
2030	Onsite trucks	10	1,771	0.85	4.48	7.34	0.01	0.99	0.46	1,701	0.04	0.01	0.01	0.07

	Annual Emissions in Pounds: VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Benzene	Formaldehyde
2027	6.61	34.96	57.31	0.05	7.71	3.55	13,282	0.34	0.06	0.05	0.52
2028	13.23	69.92	114.61	0.09	15.43	7.11	26,564	0.68	0.13	0.10	1.03
2029	13.23	69.92	114.61	0.09	15.43	7.11	26,564	0.68	0.13	0.10	1.03
2030	3.31	17.48	28.65	0.02	3.86	1.78	6,641	0.17	0.03	0.02	0.26

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb: VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	
Tow Boat - propulsion	3,208	671	0.68	953.92	2964.64	18206.96	20.16	477.74	463.41	2,192,571	8.65	3.94	4.52	40.73	based on 10 hrs of operation/day
Tow Boat - auxiliary	3,208	149	0.43	133.95	416.29	2556.59	2.83	67.08	65.07	307,877	1.21	0.55	0.63	5.72	
Crew boat	642	149	0.45	28.04	87.13	535.10	0.59	14.04	13.62	64,439	0.25	0.12	0.13	1.20	based on 2 hrs of operation/day
		2027	**Subtotal**	**1115.90**	**3468.06**	**21298.65**	**23.58**	**558.86**	**542.10**	**2,564,887**	**10.12**	**4.61**	**5.29**	**47.64**	

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb: VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	
Tow Boat - propulsion	6,416	671	0.68	1907.83	5929.28	36413.92	40.31	955.47	926.81	4,385,141	17.30	7.89	9.04	81.46	based on 2 shifts/day
Tow Boat - auxiliary	6,416	149	0.43	267.89	832.58	5113.18	5.66	134.17	130.14	615,753	2.43	1.11	1.27	11.44	
Crew boat	1,283	149	0.45	56.07	174.26	1070.20	1.18	28.08	27.24	128,879	0.51	0.23	0.27	2.39	based on 2 shifts/day
		2028	**Subtotal**	**2231.80**	**6936.12**	**42597.29**	**47.16**	**1117.72**	**1084.19**	**5,129,773**	**20.23**	**9.23**	**10.58**	**95.29**	

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb											
				VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	
Tow Boat - propulsion	6,416	671	0.68	1907.83	5929.28	36413.92	40.31	955.47	926.81	4,385,141	17.30	7.89	9.04	81.46	based on 2 shifts/day
Tow Boat - auxiliary	6,416	149	0.43	267.89	832.58	5113.18	5.66	134.17	130.14	615,753	2.43	1.11	1.27	11.44	
Crew boat	1,283	149	0.45	56.07	174.26	1070.20	1.18	28.08	27.24	128,879	0.51	0.23	0.27	2.39	based on 2 shifts/day
		2029	**Subtotal**	**2231.80**	**6936.12**	**42597.29**	**47.16**	**1117.72**	**1084.19**	**5,129,773**	**20.23**	**9.23**	**10.58**	**95.29**	

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb											
				VOC	CO	Nox	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde	
Tow Boat - propulsion	1,604	671	0.68	476.96	1482.32	9103.48	10.08	238.87	231.70	1,096,285	4.32	1.97	2.26	20.36	based on 10 hrs of operation/day
Tow Boat - auxiliary	1,604	149	0.43	66.97	208.14	1278.29	1.42	33.54	32.54	153,938	0.61	0.28	0.32	2.86	
Crew boat	321	149	0.45	14.02	43.57	267.55	0.30	7.02	6.81	32,220	0.13	0.06	0.07	0.60	based on 2 hrs of operation/day
		2030	**Subtotal**	**557.95**	**1734.03**	**10649.32**	**11.79**	**279.43**	**271.05**	**1,282,443**	**5.06**	**2.31**	**2.64**	**23.82**	

Total Maximum Emissions for Alt 3

Year	VOC tons	CO tons	NOx tons	SO2 tons	PM_{10} tons	$PM_{2.5}$ tons	CO2 tons	CH4 tons	N2O tons	CO2e tons	Benzene tons	Formaldehyde tons
2027	0.68	2.14	12.07	0.01	5.98	0.98	1,574	0.01	0.00	1575	0.01	0.05
2028	1.36	4.28	24.14	0.03	9.09	1.11	3,147	0.02	0.01	3150	0.01	0.10
2029	1.36	4.28	24.14	0.03	9.09	1.11	3,147	0.02	0.01	3150	0.01	0.10
2030	0.34	1.07	6.03	0.01	4.00	0.50	787	0.01	0.00	788	0.00	0.03

453.590 g/lb

EQUIPMENT DATA AND EMISSION FACTORS

Construction Equipment	HP	Load Factor	Emissions Factors VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr	CH4 g/hp-hr	Benzene g/hp-hr	Formaldehyde g/hp-hr	
Excavator	450	0.53	0.03	0.20	0.55	0.001	0.03	0.03	536.74	0.003	0.001	0.01	
Grader	145	0.58	0.02	0.13	0.46	1.44E-03	0.03	0.03	536.77	0.002	0.001	0.01	
Roller	401	0.58	0.05	0.31	0.85	1.52E-03	0.04	0.04	537	0.003	0.002	0.01	
Paving Machine	164	0.58	0.06	0.27	0.87	1.50E-03	0.06	0.06	537	0.004	0.003	0.02	
Asphalt Curbing Machine	130	0.58	0.06	0.26	0.86	1.50E-03	0.06	0.06	537	0.004	0.003	0.02	
Dozer	275	0.58	0.02	0.09	0.29	1.44E-03	0.02	0.02	536.77	0.002	0.001	0.00	
Compactor	19	1	0.37	1.56	3.84	2.17E-03	0.18	0.18	589.31	0.031	0.019	0.11	
Skidsteer Loader	95	0.23	0.73	3.89	3.81	0.002	0.55	0.54	693.89	0.029	0.023	0.18	
Loader	300	0.48	0.03	0.17	0.50	0.001	0.03	0.03	536.73	0.003	0.002	0.01	
Hydraulic Hammer	114	1	0.06	0.26	0.86	0.001	0.06	0.06	536.67	0.004	0.003	0.02	Other Construction Equipment
25 ton Crane	150	1	0.04	0.18	0.86	0.001	0.04	0.04	530.93	0.004	0.002	0.01	
100 ton Crane	480	1	0.05	0.23	0.99	0.002	0.04	0.03	530.89	0.004	0.002	0.01	
160 ton derrick	470	1	0.05	0.23	0.99	0.002	0.04	0.03	530.89	0.004	0.002	0.01	
160 ton derrick generator	94	1	0.32	1.59	3.38	0.002	0.27	0.26	589.46	0.013	0.003	0.02	
60 ton derrick	230	1	0.04	0.54	0.54	0.001	0.02	0.02	530.93	0.003	0.002	0.01	
Vibrators/equipment	18	0.58	0.35	1.50	3.77	0.002	0.17	0.17	595.14	0.031	0.019	0.11	
Misc Curing Equipment	60	0.58	0.11	0.70	2.83	0.002	0.08	0.08	595.83	0.012	0.005	0.03	
Concrete Finisher	74	0.58	0.11	0.70	2.83	0.002	0.08	0.08	595.83	0.012	0.005	0.03	
Telehandler	130	0.48	0.01	0.06	0.19	0.001	0.01	0.01	536.80	0.001	0.0004	0.002	
Forklift	74	0.48	0.05	0.20	2.55	0.002	0.02	0.02	595.99	0.009	0.003	0.01	
Air Compressor	173	1	0.06	0.24	1.04	0.002	0.06	0.06	530.86	0.005	0.003	0.02	
Welder	10	0.19	1.17	5.27	4.76	0.003	0.61	0.59	692.63	0.077	0.052	0.32	
Auger Rig	300	1	0.21	0.56	2.62	0.002	0.12	0.11	530.44	0.012	0.009	0.05	
Pile Drivers	350	0.59	0.03	0.20	0.55	0.001	0.03	0.03	537	0.005	0.001	0.01	
Forklift - 10-17 ton	164	0.48	0.05	0.27	0.89	0.001	0.06	0.06	537	0.004	0.002	0.01	
Forklift - 7 ton	107	0.48	0.05	0.27	0.89	0.001	0.06	0.06	537	0.004	0.002	0.01	

Note: The MOVES model does not include emission factors for N2O for nonroad equipment. N2O for nonroad equipment is estimated using ratio
N2O/CH4 ratio of 0.26/0.57 from EPA (2016), Table B-8.

Boat Equipment	Engine kW	Load Factor	Emissions Factors VOC (g/kWh)	CO (g/kWh)	NOx (g/kWh)	SO_2 (g/kWh)	PM10 (g/kWh)	PM2.5 (g/kWh)	CO_2 (g/kWh)	CH4 (g/kWh)	N_2O (g/kWh)	BSFC (g/kWh)
Tow Boat - propulsion	671	0.68	0.30	0.92	5.64	0.006	0.15	0.14	679	2.68E-03	0.03	213
Tow Boat - auxiliary	149	0.43	0.30	0.92	5.64	0.006	0.15	0.14	679	2.68E-03	0.03	213
Crew boat	149	0.45	0.30	0.92	5.64	0.006	0.15	0.14	679	2.68E-03	0.03	213
Site tug - propulsion	112	0.5	0.30	0.92	5.64	0.006	0.15	0.14	679	2.68E-03	0.03	213
Site tug - auxiliary	19	0.43	0.30	0.92	5.64	0.007	0.15	0.14	791	2.68E-03	0.04	248
Ocean Tug- propulsion	1118	0.68	0.30	0.92	5.64	0.006	0.15	0.14	679	2.68E-03	0.03	213
Ocean Tug- auxiliary	224	0.43	0.30	0.92	5.64	0.006	0.15	0.14	679	2.68E-03	0.03	213
SUV - propulsion	10784	0.68	0.63	1.40	17.00	0.362	0.15	0.14	590	0.01	0.03	185
SUV - auxiliary 1	1368	0.32	0.42	1.10	10.90	0.424	0.15	0.14	692	8.00E-03	0.03	217
SUV - auxiliary 2	1368	0.32	0.42	1.10	10.90	0.424	0.15	0.14	692	8.00E-03	0.03	217
SUV - auxiliary 3	658	0.46	0.42	1.10	10.90	0.424	0.15	0.14	692	8.00E-03	0.03	217
SUV - auxiliary 4	658	0.46	0.42	1.10	10.90	0.424	0.15	0.14	692	8.00E-03	0.03	217
Worker Ferry (50-person cap.)	560	0.42	0.30	0.92	5.64	0.006	0.15	0.14	679	2.68E-03	0.03	213
Worker Ferry (325-passenger cap.)	700	0.42	0.30	0.92	5.64	0.006	0.15	0.14	679	2.68E-03	0.03	213
Skiff	75	0.45	0.30	0.92	5.64	0.006	0.15	0.14	679	2.68E-03	0.03	213

For Harborcraft:
SO2 Emission factor calculated based on equation 4.5 in EPA (2020), Port Emission Guidance
CO2 Emission factor calculated based on equation 4.4 in EPA (2020)
CH4 Emission factor calculated based on 4.5.4 in EPA (2020)
N2O Emission factor calculated based on equation 4.3 in EPA (2020)

For ocean going vessels:
SUV engine power, load factors and propulsion engine type from Port of Oakland (2020).
CO2 Emission factor calculated based on equation 3.4 in EPA (2020)
PM2.5 calculated as 92% of PM10 as per 3.5.3 in EPA (2020)

Rail Movement of Waste

Locomotives - EPA Tier 1 engines assumed

	g/gal VOC	CO	Nox	SO2	PM10	PM2.5	CO2	CH4	N20
Large Line Haul, Tier 1+	4.85	26.62	120.5	0.0939	3.042	2.951	10,150	0.8	0.26

diesel fuel density assumed at 3200 g/gal.
Sulfur content assumed at 15 ppm
Carbon content assumed at 87 % by mass

Emission data from EPA, 2020 National Emissions Inventory: 453.59 g/lb
Locomotive Component, Table 5. ERG 2022.
No EFs for formaldehyde or benzene

The fraction of fuel sulfur converted to SO2 is conservatively assumed at 95%

0.002 gal/ton-miles of freight transported from EPA 2021 SmartWay Rail Carrier Partner Tool: Technical Documentation.

307 miles one way to landfill

Component/Phase	Tons Waste	Gal Fuel Consumed	Total emissions in pounds VOC	CO	Nox	SO2	PM10	PM2.5	CO2	CH4	N20	CO2e
14 - Pier 2	56,600	34,752	372	2,040	9,232	7	233	226	777,656	61	20	784,651
2 - M2D2 @ DD3, Ph 1	21,309	13,083	140	768	3,476	3	88	85	292,768	23	7	295,402
2 - M2D2 @ DD3, Ph 2	81,004	49,737	532	2,919	13,213	10	334	324	1,112,958	88	29	1,122,969
2 - M2D2 @ DD3, Ph 4	134,210	82,405	882	4,837	21,892	17	553	536	1,843,978	145	47	1,860,565
2 - M2D2 @ DD3, Ph 5	866,860	532,252	5,696	31,241	141,397	110	3,570	3,462	11,910,223	939	305	12,017,357
2 - M2D2 @ DD3, Ph 6	800,760	491,667	5,262	28,859	130,615	102	3,297	3,198	11,002,042	867	282	11,101,007
2 - M2D2 @ DD3, Ph 8	22,240	13,655	146	802	3,628	3	92	89	305,566	24	8	308,315
2 - M2D2 @ DD3, Ph 9	719,710	441,902	4,729	25,938	117,395	91	2,964	2,875	9,888,456	779	253	9,977,403
2 - M2D2 @ DD3, Ph 10	22,150	13,600	146	798	3,613	3	91	88	304,330	24	8	307,067
12 - Pier 6 demo	105,310	64,660	692	3,795	17,178	13	434	421	1,446,907	114	37	1,459,922
6/10 - Pier 4	107,770	66,171	708	3,884	17,579	14	444	430	1,480,706	117	38	1,494,025
3 - M2D2 @ Mooring A	1,523,176	935,230	10,009	54,894	248,452	194	6,272	6,084	20,927,677	1,649	536	21,115,923
15 - Demo Mooring A	23,506	14,433	154	847	3,834	3	97	94	322,961	25	8	325,866

Annual General Materials Movements

Time for barge movement Bremerton to PoS 4.25 RT Port of Seattle is used as envelope location of transload facility, which has not currently been selected

Barge movements per year 2,500

Total hours per year 10,625

	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
Trips specified by Component per year	52	90	565	1,279	1,117	1,123	1,091	59	159	192	56		
Trips Delta	2,448	2,410	1,935	1,221	1,383	1,377	1,409	2,441	2,341	2,308	2,444	2,500	2,500
Hours Delta	10,404	10,243	8,224	5,190	5,879	5,851	5,987	10,374	9,949	9,809	10,387	10,625	10,625

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde
Tow Boat - propulsion	10,404	671	0.68	3093.82	9615.17	59050.34	65.37	1549.44	1502.96	7,111,130	28.05	12.79	14.66	132.09
Tow Boat - auxiliary	10,404	149	0.43	434.43	1350.15	8291.74	9.18	217.57	211.04	998531.76	3.94	1.80	2.06	18.55
2027 Total in Tons				**1.76**	**5.48**	**33.67**	**0.04**	**0.88**	**0.86**	**4054.83**	**0.02**	**0.01**	**0.01**	**0.08**

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde
Tow Boat - propulsion	10,243	671	0.68	3045.79	9465.92	58133.71	64.36	1525.38	1479.63	7,000,744	27.61	12.60	14.43	130.04
Tow Boat - auxiliary	10,243	149	0.43	427.68	1329.19	8163.03	9.04	214.19	207.77	983031.67	3.88	1.77	2.03	18.26
2028 Total in Tons				**1.74**	**5.40**	**33.15**	**0.04**	**0.87**	**0.84**	**3991.89**	**0.02**	**0.01**	**0.01**	**0.07**

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde
Tow Boat - propulsion	8,224	671	0.68	2445.48	7600.23	46675.82	51.67	1224.74	1188.00	5,620,930	22.17	10.11	11.59	104.41
Tow Boat - auxiliary	8,224	149	0.43	343.39	1067.21	6554.13	7.26	171.98	166.82	789280.62	3.11	1.42	1.63	14.66
2029 Total in Tons				**1.39**	**4.33**	**26.61**	**0.03**	**0.70**	**0.68**	**3205.11**	**0.01**	**0.01**	**0.01**	**0.06**

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde
Tow Boat - propulsion	5,190	671	0.68	1543.45	4796.84	29459.19	32.61	772.99	749.80	3,547,619	13.99	6.38	7.31	65.90
Tow Boat - auxiliary	5,190	149	0.43	216.73	673.56	4136.61	4.58	108.54	105.29	498150.16	1.96	0.90	1.03	9.25
2030 Total in Tons				**0.88**	**2.74**	**16.80**	**0.02**	**0.44**	**0.43**	**2022.88**	**0.01**	**0.00**	**0.00**	**0.04**

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde
Tow Boat - propulsion	5,879	671	0.68	1748.19	5433.14	33366.93	36.94	875.52	849.26	4,018,209	15.85	7.23	8.28	74.64
Tow Boat - auxiliary	5,879	149	0.43	245.48	762.91	4685.32	5.19	122.94	119.25	564229.47	2.23	1.02	1.16	10.48
2031 Total in Tons				**1.00**	**3.10**	**19.03**	**0.02**	**0.50**	**0.48**	**2291.22**	**0.01**	**0.00**	**0.00**	**0.04**

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde
Tow Boat - propulsion	5,851	671	0.68	1739.98	5407.61	33210.14	36.77	871.41	845.27	3,999,327	15.77	7.20	8.25	74.29
Tow Boat - auxiliary	5,851	149	0.43	244.32	759.33	4663.31	5.16	122.36	118.69	561578.14	2.22	1.01	1.16	10.43
2032 Total in Tons				**0.99**	**3.08**	**18.94**	**0.02**	**0.50**	**0.48**	**2280.45**	**0.01**	**0.00**	**0.00**	**0.04**

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde
Tow Boat - propulsion	5,987	671	0.68	1780.42	5533.30	33982.04	37.62	891.66	864.92	4,092,283	16.14	7.36	8.44	76.02
Tow Boat - auxiliary	5,987	149	0.43	250.00	776.98	4771.70	5.28	125.21	121.45	574630.84	2.27	1.03	1.18	10.67
2033 Total in Tons				**1.02**	**3.16**	**19.38**	**0.02**	**0.51**	**0.49**	**2333.46**	**0.01**	**0.00**	**0.00**	**0.04**

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde
Tow Boat - propulsion	10,374	671	0.68	3084.97	9587.68	58881.49	65.19	1545.01	1498.66	7,090,795	27.97	12.76	14.62	131.72
Tow Boat - auxiliary	10,374	149	0.43	433.19	1346.28	8268.03	9.15	216.95	210.44	995676.48	3.93	1.79	2.05	18.50
2034 Total in Tons				**1.76**	**5.47**	**33.57**	**0.04**	**0.88**	**0.85**	**4043.24**	**0.02**	**0.01**	**0.01**	**0.08**

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde
Tow Boat - propulsion	9,949	671	0.68	2958.59	9194.90	56469.30	62.52	1481.71	1437.27	6,800,308	26.82	12.23	14.02	126.32
Tow Boat - auxiliary	9,949	149	0.43	415.44	1291.13	7929.32	8.78	208.06	201.82	954886.78	3.77	1.72	1.97	17.74
2035 Total in Tons				**1.69**	**5.24**	**32.20**	**0.04**	**0.84**	**0.82**	**3877.60**	**0.02**	**0.01**	**0.01**	**0.07**

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde
Tow Boat - propulsion	9,809	671	0.68	2916.88	9065.29	55673.28	61.63	1460.82	1417.00	6,704,447	26.44	12.06	13.82	124.54
Tow Boat - auxiliary	9,809	149	0.43	409.58	1272.93	7817.54	8.65	205.13	198.97	941426.18	3.71	1.69	1.94	17.49
2036 Total in Tons				**1.66**	**5.17**	**31.75**	**0.04**	**0.83**	**0.81**	**3822.94**	**0.02**	**0.01**	**0.01**	**0.07**

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde
Tow Boat - propulsion	10,387	671	0.68	3088.76	9599.46	58953.85	65.27	1546.90	1500.50	7,099,510	28.00	12.77	14.64	131.88
Tow Boat - auxiliary	10,387	149	0.43	433.72	1347.94	8278.19	9.16	217.21	210.70	996900.17	3.93	1.79	2.06	18.52
2037 Total in Tons				**1.76**	**5.47**	**33.62**	**0.04**	**0.88**	**0.86**	**4048.21**	**0.02**	**0.01**	**0.01**	**0.08**

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb											
				VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde
Tow Boat - propulsion	10,625	671	0.68	3159.54	9819.42	60304.68	66.76	1582.35	1534.88	7,262,183	28.64	13.07	14.97	134.90
Tow Boat - auxiliary	10,625	149	0.43	443.66	1378.82	8467.87	9.37	222.19	215.53	1019742.40	4.02	1.83	2.10	18.94
2038 Total in Tons				**1.80**	**5.60**	**34.39**	**0.04**	**0.90**	**0.88**	**4140.96**	**0.02**	**0.01**	**0.01**	**0.08**

Marine Equipment	Hours	Engine kW	Load Factor	Emissions in lb										
				VOC	CO	NOx	SO2	PM10	PM2.5	CO_2	CH_4	N_2O	Benzene	Formaldehyde
Tow Boat - propulsion	10,625	671	0.68	3159.54	9819.42	60304.68	66.76	1582.35	1534.88	7,262,183	28.64	13.07	14.97	134.90
Tow Boat - auxiliary	10,625	149	0.43	443.66	1378.82	8467.87	9.37	222.19	215.53	1019742.40	4.02	1.83	2.10	18.94
2039 Total in Tons				**1.80**	**5.60**	**34.39**	**0.04**	**0.90**	**0.88**	**4140.96**	**0.02**	**0.01**	**0.01**	**0.08**

TAB R **GENERATORS (OPERATIONS)**

Mechanical Facility	Pumphouse A Normal	Pumphouse B Normal	Pumphouse A Alternate
Number of 2500kW Generators required	3	3	4
Number of 2800kW Generators required	2	3	3

2500 kW is 3353 HP — 10 — 3353 HP generators — Fuel consumption @ 75% load= 134.9 gal/hr

2800 kW is 3755 HP — 8 — 3755 HP generators — Fuel consumption @ 75% load= 136 gal/hr

Note: Preliminary sizing based on the mechanical equipment estimates. The Pumphouse A Normal and Pumphouse B Normal columns are the anticipated normal configuration of the pumphouses. If one of the pumphouses is not available, Pumphouse A (or B) could operate as the Pumphouse A Alternate configuration shown in the Pumphouse A Alternate Column.

Note: mobile generators are indicated for construction phases, but no further info.
Source: Volume 6, C2 drawings, Phase 1 (page 72).

Default High Heat Value (HHV) 0.139 mmBtu/gallon
2.20462 lbs per kg

Emissions factors from 40 CFR 1039.101 (criteria pollutants) and 40 CFR 98.33 (GHGs-Distillate Fuel Oil No. 2)

				Emissions Factors										Annual Emissions (lbs) - subtotals by equipment								
Equipment	kW	Load Factor	Annual Hours	VOC g/kw-hr	CO g/kw-hr	NOx g/kw-hr	PM g/kw-hr	CO2 kg/mmBtu	CH4 kg/mmBtu	N2O kg/mmBtu	Benzene lb/mmBtu	Formaldehyde lb/mmBtu	VOC lb	CO lb	NOx lb	PM lb	CO2 lb	CH4 lb	N2O lb	CO2e lb	Benzene lb	Formaldehyde lb
Emergency Generator - 2500 kW	2,500	0.75	500	0.20	3.50	0.67	0.03	73.25	3.00E-03	6.00E-04	7.76E-04	7.89E-05	413.51	7,233.96	1,384.79	62.01	1,514,042.71	62.01	12.40	1,519,065	7.28	0.74
Emergency Generator - 2800 kW	2,800	0.75	500	0.20	3.50	0.67	0.03	73.25	3.00E-03	6.00E-04	7.76E-04	7.89E-05	463.14	8,102.03	1,550.96	69.45	1,526,388.50	62.51	12.50	1,531,452	7.33	0.75

(i) Use Equation C-1 for CO2

$$CO_2 = 1 x 10^{-3} * Fuel * HHV * EF$$

where:

CO_2 = Annual CO_2 mass emissions for the specific fuel type (metric tons

Fuel = Mass or volume of fuel combusted per year, from company record mass in short tons for solid fuel, volume in standard cubic feet for gaseo for liquid fuel).

HHV = Default high heat value of the fuel, from Table C-1 of this subpart : volume, as applicable).

EF = Fuel-specific default CO_2 emission factor, from Table C-1 of this sub

1×10^{-3} = Conversion factor from kilograms to metric tons.

(1) Use Equation C-8 of this section to estimate CH4 and N2O emissions

$$CH_4 \text{ or } N_2O = 1 x 10^{-3} * Fuel * HHV * EF \quad \text{(Eq. C-8)}$$

Where:

CH_4 or N_2O = Annual CH_4 or N_2O emissions from the combustion of a particular type of fuel (metric tons).

Fuel = Mass or volume of the fuel combusted, either from company records or directly measured by a fuel flow meter, as applicable (mass or volume per year).

HHV = Default high heat value of the fuel from Table C-1 of this subpart; alternatively, for Tier 3, if actual HHV data are available for the reporting year, you may average these data using the procedures specified in paragraph (a)(2)(ii) of this section, and use the average value in Equation C-8 (mmBtu per mass or volume).

EF = *Fuel-specific default emission* factor for CH_4 or N_2O, from Table C-2 of this subpart (kg CH_4 or N_2O per mmBtu).

1×10^{-3} = Conversion factor from kilograms to metric tons.

Total Annual Emissions	VOC tons	CO tons	NOx tons	PM tons	CO2 tons	CH4 tons	N2O tons	CO2e tons	Benzene tons	Formaldehyde tons
(10) 2500-kW Generators	2.07	36.17	6.92	0.31	7,570.21	0.31	0.06	7,595.33	0.04	0.00
(8) 2800-kW generators	1.85	32.41	6.20	0.28	6105.55	0.25	0.05	6125.81	0.03	0.00
Grand Total	**3.92**	**68.58**	**13.13**	**0.59**	**13,675.77**	**0.56**	**0.11**	**13,721.14**	**0.07**	**0.01**

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Worker Commutes

Scenario	Description	Annual Emissions (tons per year)												
		VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Total GHGs (CO2e)	Benzene	Formaldehyde	Total HAPs
Worker Transit[1]														
Mode 1	Drive alone from all geographies to Bremerton. Park in City of Bremerton. Walk to NAVBASE Kitsap-Bremerton.	0.38	34.52	0.85	0.02	26.20	3.94	2,941.18	0.11	0.02	2,948.94	0.01	0.00	0.02
Mode 2	Drive alone from Bremerton/Kitsap County area to the Bremerton Airport parking area via SR 3 or SR 304. Ride contractor-provided shuttle to NAVBASE Kitsap-Bremerton.	0.29	28.12	1.14	0.02	21.07	3.19	2,514.85	0.09	0.01	2,521.32	0.01	0.01	0.02
Mode 3	Drive alone from the south through Tacoma on SR 16 to SR 3, or US 101 to SR, to the Bremerton Airport parking area. Ride contractor-provided shuttle to NAVBASE Kitsap-Bremerton.	0.96	101.93	3.19	0.06	76.71	11.56	8,772.86	0.31	0.05	8,795.40	0.04	0.02	0.06
Mode 4	Drive alone to Port Orchard Marina. Ride contractor-provided ferry to temporary ferry dock at NAVBASE Kitsap-Bremerton.	0.37	41.83	1.01	0.02	32.56	4.89	3,562.57	0.13	0.02	3,572.16	0.02	0.01	0.02
Mode 5	Drive alone short local distance - via taxi, etc.	0.00	0.15	0.00	0.00	0.16	0.02	12.17	0.00	0.00	12.21	0.00	0.00	0.00
Mode 6	Drive alone to an existing Kitsap Transit Park and Ride lot. Transit to Bremerton via Kitsap Transit bus and/or Kitsap Transit's Ferry from Annapolis or Port Orchard. Walk to NAVBASE Kitsap-Bremerton. (90% from North Kitsap)	0.11	12.45	0.26	0.01	11.50	1.73	1,024.66	0.04	0.01	1,027.74	0.00	0.00	0.01
Mode 7	Drive alone, walk, or use public transit to arrive at Seattle Ferry Dock. Transit to Bremerton via Seattle-Bremerton Ferry to Bremerton (WSF or Kitsap Transit). Walk to NAVBASE Kitsap-Bremerton.	0.13	14.32	0.35	0.01	11.02	1.66	1,235.94	0.04	0.01	1,239.28	0.01	0.00	0.007
All Modes	**Total Annual Worker Commuting Emissions**	**2.24**	**233.32**	**6.81**	**0.13**	**179.22**	**26.99**	**20,064.23**	**0.72**	**0.12**	**20,117.05**	**0.09**	**0.04**	**0.12**

MOVES3.0.1 Emission Factors

Road Type	Vehicle Type	Speed (MPH)	Emission Factor Units	Emission Factor											
				VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Total GHGs (CO2e)	Benzene	Formaldehyde
Highway	Passenger Car	35	g/VMT	0.0276	4.1309	0.0676	0.0020	3.4459	0.5175	297.8770	0.0112	0.0012	298.5200	0.0012	0.0004
Sidestreets	Passenger Car	15	g/VMT	0.0430	6.5931	0.0844	0.0031	6.9147	1.0377	469.0130	0.0173	0.0029	470.2970	0.0018	0.0006
Idle	Passenger Car	0	g/hr	0.1700	1.9367	0.2963	0.0209	0.0219	0.0000	3151.2200	0.0623	0.0432	3165.6400	0.0071	0.0024
Highway	Passenger Truck	35	g/VMT	0.0428	4.5170	0.1319	0.0026	3.0120	0.4532	386.2690	0.0142	0.0020	387.2170	0.0018	0.0006
Sidestreets	Passenger Truck	15	g/VMT	0.0673	6.8668	0.1584	0.0040	6.3331	0.9513	595.2660	0.0218	0.0047	597.1980	0.0028	0.0009
Idle	Passenger Truck	0	g/hr	0.2009	4.0675	0.5445	0.0266	0.0132	0.0116	4000.8500	0.0687	0.0701	4023.4500	0.0085	0.0029

Truck/Transit Emission Factors

Road Type	Vehicle Type	Speed (MPH)	Emission Factor Units	Maximum Emission Factor											
				VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Total GHGs (CO2e)	Benzene	Formaldehyde
Highway	SUSH Truck	35	g/VMT	3.07E-01	1.74E+00	3.19E+00	3.31E-03	1.37E+00	3.33E-01	9.73E+02	1.46E-02	2.36E-03	9.74E+02	2.30E-03	2.41E-02
Sidestreets	SUSH Truck	15	g/VMT	6.07E-01	3.40E+00	5.80E+00	4.92E-03	4.37E+00	8.88E-01	1.45E+03	3.12E-02	5.52E-03	1.45E+03	4.52E-03	4.74E-02
Idle	SUSH Truck	0	g/hr	5.23E+00	2.20E+01	3.42E+01	1.95E-02	2.54E+00	2.34E+00	5.73E+03	2.70E-01	8.27E-02	5.76E+03	3.88E-02	4.06E-01

SUSH = Single Unit Short Haul

Mode Choice Assumptions (consistent with Traffic sectionTable 3.12-5 - Construction Worker Traffic Assignment to NAVBASE)
SHIFT 1 - 0300 - 1500

Mode #	% of workers	# daily trips	Begin Location	End Location	Distance in miles (approx from google maps)	Mode
1	15.0%	150	Franklin Pierce High School (Tacoma)	~4th Street and Park Blvd (Bremerton - numerous lots around), 0.5 mile walk to State Street gate	41	Drive alone from all geographies to Bremerton. Park in City of Bremerton. Walk to NAVBASE Kitsap-Bremerton.
2	30.0%	300	Central Kitsap High School	Z Lot at PSNS&IMF	22	Drive alone from Bremerton/Kitsap County area to the Bremerton Airport parking area via SR 3 or SR 304. Ride contractor-provided shuttle to NAVBASE Kitsap-Bremerton.
3	40.0%	400	Franklin Pierce High School	Z Lot at PSNS&IMF	52	Drive alone from the south through Tacoma on SR 16 to SR 3, or US 101 to SR, to the Bremerton Airport parking area. Ride contractor-provided shuttle to NAVBASE Kitsap-Bremerton.
4	14.0%	140	Franklin Pierce High School	Port Orchard Marina	36	Drive alone to Port Orchard Marina. Ride contractor-provided ferry to temporary ferry dock at NAVBASE Kitsap-Bremerton.
5	1.0%	10	Bremerton High School	State St Gate	1.4	Drive alone short local distance - via taxi, etc.
	100.0%	1000				

Mode 4				**Mode 5**				Short distance motorized transport (e.g., taxis)
Start	Franklin Pierce High School			Bremerton High School				
End	Port Orchard Marina			PSNS				
Distance	35.8	mile		**Distance**	1.4	mile		
Time	55	min		**Time**	8	min		assume average speed 25 mph
Direction	**Dist**	**Unit**	**Type**	**Direction**	**Dist**	**Unit**	**Type**	
Sidestreets to I-5	4.3	mi	s	13th st to Linden Ave	0.1	mi	s	
I-5 to WA-16	5.0	mi	h	Linden Ave to 11th St	0.1	mi	s	
WA-16 to Tremont St SW	24.3	mi	h	11th to Washington Ave	1.2	mi	s	
Tremont St SW to Port Orchard Blvd	0.7	mi	s					
Port Orchard Blvd to WA-166	1.1	mi	s					
WA-166 to Port Orchard Marina	0.4	mi	s					
Sum Highway	29.3	mi	h	Sum Highway	0	mi	h	
Sum Sidestreet	6.5	mi	s	Sum Sidestreet	1.4	mi	s	
Sum Total	35.8	mi		Sum Total	1.4	mi		
Average idle time	12	min		Average idle time	2	min		
Max time during morning (arrive by 3 am)	40	min		Max time during morning (arrive by at 7 am)	7.5	min		
Max time during afternoon (leave at 3:30 pm)	65	min		Max time during afternoon (leave at 3:30 pm)	10	min		
estimated additional time in traffic	10	min		estimated additional time in traffic	2.5	min		
%	15%			%	25%			

Mode 1 Shift 1

Total Workers Shift	150

Fraction of Vehicle Types	Percentage
Passenger Car	33%
Passenger Truck	67%

Transit Distance

Road Type	Vehicle Type	Distance Round Trip Per Worker/Shift (miles)	Total Distance per Day (miles)
Highway	Passenger Car	80.4	4,002.1
Sidestreets	Passenger Car	11.0	547.5
Highway	Passenger Truck	80.4	8,057.9
Sidestreets	Passenger Truck	11.0	1,102.5
	TOTAL RT =	91.4	

Idle/Traffic Time

Road Type	Vehicle Type	Time Round Trip Per Worker/Shift (min)	Total Time per Day (min)
Idle	Passenger Car	30.4	1,513.2
Idle	Passenger Truck	30.4	3,046.8

365 work days per year[1]

Road Type	Vehicle Type	Emissions (tons per year)											
		VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Total GHGs (CO2e)	Benzene	Formaldehyde
Highway	Passenger Car	0.044	6.651	0.109	0.0032	5.548	0.833	479.635	0.018	0.0020	480.670	0.0019	0.00063
Sidestreets	Passenger Car	0.009	1.452	0.019	0.0007	1.523	0.229	103.323	0.004	0.0006	103.605	0.0004	0.00014
Idle	Passenger Car	0.0017	0.020	0.003	0.00021	0.000	0.000	31.976	0.0006	0.0004	32.122	0.00007	0.000024
Highway	Passenger Truck	0.139	14.644	0.428	0.0083	9.765	1.469	1,252.286	0.046	0.0065	1,255.359	0.0057	0.0019
Sidestreets	Passenger Truck	0.030	3.046	0.070	0.0018	2.809	0.422	264.035	0.010	0.0021	264.892	0.0012	0.0004
Idle	Passenger Truck	0.004	0.083	0.011	0.0005	0.00027	0.000	81.740	0.001	0.0014	82.201	0.00017	0.000058
Total Emissions per shift		0.23	25.90	0.64	0.0147	19.65	2.95	2,212.99	0.08	0.0131	2,218.85	0.0095	0.0032

Note: [1]Workers travel to the site 7 days per week, 52 weeks per year = 365 working days per year.

Mode 2 Shift 1

		Shuttle Bus Capacity
Total Workers Shift	**300**	**30**

Fraction of Vehicle Types	**Percentage**
Passenger Car	33%
Passenger Truck	67%

Transit Distance

Road Type	**Vehicle Type**	**Distance Round Trip Per Worker/Shift (miles)**	**Total Distance per Day (miles)**
Highway	Passenger Car	26.2	2,608.3
Sidestreets	Passenger Car	2.6	258.8
Highway	Passenger Truck	26.2	5,251.7
Sidestreets	Passenger Truck	2.6	521.2
Highway	Shuttle Bus	12.3	123.2
Sidestreets	Shuttle Bus	3.3	32.8
	TOTAL RT	44.4	

Idle/Traffic Time

Road Type	**Vehicle Type**	**Time Round Trip Per Worker/Shift (min)**	**Total Time per Day (min)**
Idle	Passenger Car	10.6	1,059.3
Idle	Passenger Truck	10.6	2,132.7
Idle	Shuttle Bus	10.6	106.4

365 work days per year

		Emissions (tons per year)											
Road Type	**Vehicle Type**	**VOC**	**CO**	**NOx**	**SO2**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**Total GHGs (CO2e)**	**Benzene**	**Formaldehyde**
Highway	Passenger Car	0.029	4.335	0.071	0.002	3.616	0.543	312.598	0.012	0.001	313.273	0.001	0.000
Sidestreets	Passenger Car	0.004	0.687	0.009	0.000	0.720	0.108	48.843	0.002	0.000	48.977	0.000	0.000
Idle	Passenger Car	0.001	0.014	0.002	0.000	0.000	0.000	22.383	0.000	0.000	22.485	0.000	0.000
Highway	Passenger Truck	0.090	9.544	0.279	0.005	6.364	0.958	816.166	0.030	0.004	818.170	0.004	0.001
Sidestreets	Passenger Truck	0.014	1.440	0.033	0.001	1.328	0.199	124.817	0.005	0.001	125.222	0.001	0.000
Idle	Passenger Truck	0.003	0.058	0.008	0.000	0.000	0.000	57.218	0.001	0.001	57.541	0.000	0.000
Highway	Shuttle Bus	0.015	0.086	0.158	0.000	0.068	0.016	48.219	0.001	0.000	48.272	0.000	0.001
Sidestreets	Shuttle Bus	0.008	0.045	0.076	0.000	0.058	0.012	19.071	0.000	0.000	19.103	0.000	0.001
Idle	Shuttle Bus	0.004	0.016	0.024	0.000	0.002	0.002	4.087	0.000	0.000	4.109	0.000	0.000
Total Emissions per shift		0.17	16.22	0.66	0.01	12.16	1.84	1,453.40	0.05	0.01	1,457.15	0.01	0.00

Mode 3 Shift 1

		Shuttle Bus Capacity
Total Workers Shift	**400**	**30**

Fraction of Vehicle Types	**Percentage**
Passenger Car	33%
Passenger Truck	67%

Transit Distance

Road Type	**Vehicle Type**	**Distance Round Trip Per Worker/Shift (miles)**	**Total Distance per Day (miles)**
Highway	Passenger Car	80.4	10,672.2
Sidestreets	Passenger Car	8.8	1,168.1
Highway	Passenger Truck	80.4	21,487.8
Sidestreets	Passenger Truck	8.8	2,351.9
Highway	Shuttle Bus	12.3	164.3
Sidestreets	Shuttle Bus	3.3	43.7
	TOTAL RT	104.8	

Idle/Traffic Time

Road Type	**Vehicle Type**	**Time Round Trip Per Worker/Shift (min)**	**Total Time per Day (min)**
Idle	Passenger Car	22.8	3,026.4
Idle	Passenger Truck	22.8	6,093.6
Idle	Shuttle Bus	10.6	141.9

365 work days per year

		Emissions (tons per year)											
Road Type	**Vehicle Type**	**VOC**	**CO**	**NOx**	**SO2**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**Total GHGs (CO2e)**	**Benzene**	**Formaldehyde**
Highway	Passenger Car	0.118	17.737	0.290	0.008	14.796	2.222	1,279.026	0.048	0.005	1,281.787	0.005	0.002
Sidestreets	Passenger Car	0.020	3.099	0.040	0.001	3.250	0.488	220.422	0.008	0.001	221.025	0.001	0.000
Idle	Passenger Car	0.003	0.039	0.006	0.000	0.000	0.000	63.951	0.001	0.001	64.244	0.000	0.000
Highway	Passenger Truck	0.370	39.051	1.141	0.022	26.040	3.918	3,339.429	0.123	0.017	3,347.625	0.015	0.005
Sidestreets	Passenger Truck	0.064	6.498	0.150	0.004	5.993	0.900	563.274	0.021	0.004	565.103	0.003	0.001
Idle	Passenger Truck	0.008	0.166	0.022	0.001	0.001	0.000	163.479	0.003	0.003	164.403	0.000	0.000
Highway	Shuttle Bus	0.020	0.115	0.211	0.000	0.091	0.022	64.292	0.001	0.000	64.362	0.000	0.002
Sidestreets	Shuttle Bus	0.011	0.060	0.102	0.000	0.077	0.016	25.428	0.001	0.000	25.470	0.000	0.001
Idle	Shuttle Bus	0.005	0.021	0.033	0.000	0.002	0.002	5.449	0.000	0.000	5.479	0.000	0.000
Total Emissions per shift		0.62	66.79	1.99	0.04	50.25	7.57	5,724.75	0.21	0.03	5,739.50	0.02	0.01

Mode 4 Shift 1

Total Workers Shift	**140**

Fraction of Vehicle Types	**Percentage**
Passenger Car	33%
Passenger Truck	67%

Transit Distance

Road Type	**Vehicle Type**	**Distance Round Trip Per Worker/Shift (miles)**	**Total Distance per Day (miles)**
Highway	Passenger Car	58.6	2,722.5
Sidestreets	Passenger Car	13.0	604.0
Highway	Passenger Truck	58.6	5,481.5
Sidestreets	Passenger Truck	13.0	1,216.0
	TOTAL RT	71.6	

Idle/Traffic Time

Road Type	**Vehicle Type**	**Time Round Trip Per Worker/Shift (min)**	**Total Time per Day (min)**
Idle	Passenger Car	24.7	1,147.5
Idle	Passenger Truck	24.7	2,310.5

365 work days per year

Road Type	**Vehicle Type**	**Emissions (tons per year)**											
		VOC	**CO**	**NOx**	**SO2**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**Total GHGs (CO2e)**	**Benzene**	**Formaldehyde**
Highway	Passenger Car	0.030	4.525	0.074	0.002	3.774	0.567	326.279	0.012	0.001	326.983	0.001	0.000
Sidestreets	Passenger Car	0.010	1.602	0.021	0.001	1.680	0.252	113.968	0.004	0.001	114.280	0.000	0.000
Idle	Passenger Car	0.001	0.015	0.002	0.000	0.000	0.000	24.248	0.000	0.000	24.359	0.000	0.000
Highway	Passenger Truck	0.094	9.962	0.291	0.006	6.643	1.000	851.887	0.031	0.004	853.977	0.004	0.001
Sidestreets	Passenger Truck	0.033	3.360	0.077	0.002	3.099	0.465	291.239	0.011	0.002	292.184	0.001	0.000
Idle	Passenger Truck	0.003	0.063	0.008	0.000	0.000	0.000	61.986	0.001	0.001	62.336	0.000	0.000
Total Emissions per shift		0.17	19.53	0.47	0.01	15.20	2.28	1,669.61	0.06	0.01	1,674.12	0.01	0.00

Mode 5 Shift 1 and Shift 2

Total Workers Shift	**10**

Fraction of Vehicle Types	**Percentage**
Passenger Car	100%

Transit Distance

Road Type	**Vehicle Type**	**Distance Round Trip Per Worker/Shift (miles)**	**Total Distance per Day (miles)**
Highway	Passenger Car	0.0	0.0
Sidestreets	Passenger Car	2.8	28.0
	TOTAL RT	2.8	

Idle/Traffic Time

Road Type	**Vehicle Type**	**Time Round Trip Per Worker/Shift (min)**	**Total Time per Day (min)**
Idle	Passenger Car	3.8	38.0

365 work days per year

		Emissions (tons per year)											
Road Type	**Vehicle Type**	**VOC**	**CO**	**NOx**	**SO2**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**Total GHGs (CO2e)**	**Benzene**	**Formaldehyde**
Highway	Passenger Car	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sidestreets	Passenger Car	0.00048	0.074	0.001	0.0000351	0.078	0.012	5.284	0.000	0.0000	5.298	0.00002	0.00001
Idle	Passenger Car	0.00004	0.0005	0.0001	0.0000053	0.000006	0.0000	0.803	0.000016	0.000011	0.807	0.0000018	0.0000006
Total Emissions per shift		0.00	0.07	0.00	0.00	0.08	0.01	6.09	0.00	0.00	6.10	0.0000	0.0000

Mode 6 Shift 2

		Shuttle Bus Capacity
Total Workers Shift	**100**	**30**

Fraction of Vehicle Ty	**Percentage**
Vehicle Type	33%
Passenger Car	67%

Transit Distance

Road Type	**Vehicle Type**	**Distance Round Trip Per Worker/Shift (miles)**	**Total Distance per Day (miles)**
Highway	Passenger Car	11.20	371.7
Sidestreets	Passenger Car	38.40	1,274.3
Highway	Passenger Truck	11.20	748.3
Sidestreets	Passenger Truck	38.40	2,565.7
Highway	Shuttle Bus	8.20	27.3
Sidestreets	Shuttle Bus	0.00	0.0
	TOTAL RT	57.80	

Idle/Traffic Time

Road Type	**Vehicle Type**	**Time Round Trip Per Worker/Shift (min)**	**Total Time per Day (min)**
Idle	Passenger Car	11.4	378.3
Idle	Passenger Truck	11.4	761.7
Idle	Shuttle Bus	9.88	32.9

365 work days per year

		Emissions (tons per year)											
Road Type	**Vehicle Type**	**VOC**	**CO**	**NOx**	**SO2**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**Total GHGs (CO2e)**	**Benzene**	**Formaldehyde**
Highway	Passenger Car	0.004	0.618	0.010	0.000	0.515	0.077	44.543	0.002	0.000	44.639	0.000	0.000
Sidestreets	Passenger Car	0.022	3.380	0.043	0.002	3.545	0.532	240.460	0.009	0.001	241.118	0.001	0.000
Idle	Passenger Car	0.0004	0.0049	0.0008	0.0001	0.0001	0.0000	7.9939	0.0002	0.0001	8.0305	0.0000	0.0000
Highway	Passenger Truck	0.013	1.360	0.040	0.001	0.907	0.136	116.299	0.004	0.001	116.584	0.001	0.000
Sidestreets	Passenger Truck	0.069	7.089	0.163	0.004	6.538	0.982	614.481	0.023	0.005	616.476	0.003	0.001
Idle	Passenger Truck	0.00004	0.0009	0.00012	0.00001	0.00000	0.00000	0.88354	0.00002	0.00002	0.88853	0.00000	0.00000
Highway	Shuttle Bus	0.003	0.019	0.035	0.000	0.015	0.004	10.698	0.000	0.000	10.710	0.000	0.000
Sidestreets	Shuttle Bus	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Idle	Shuttle Bus	0.00115	0.00486	0.00755	0.00000	0.00056	0.00052	1.26492	0.00006	0.00002	1.27181	0.00001	0.00009
Total Emissions per shift		0.11	12.45	0.26	0.01	11.50	1.73	1,024.66	0.04	0.01	1,027.74	0.00	0.00

Mode 7 Shift 2

Total Workers Shift	200

Fraction of Vehicle Type	Percentage
Passenger Car	33%
Passenger Truck	67%

Transit Distance

Road Type	Vehicle Type	Distance Round Trip Per Worker/Shift (miles)	Total Distance per Day (miles)
Highway	Passenger Car	31.4	2,084.0
Sidestreets	Passenger Car	5.8	384.9
Highway	Passenger Truck	31.4	4,196.0
Sidestreets	Passenger Truck	5.8	775.1
	TOTAL RT	37.2	

Idle/Traffic Time

Road Type	Vehicle Type	Time Round Trip Per Worker/Shift (min)	Total Time per Day (min)
Idle	Passenger Car	15.2	1,008.8
Idle	Passenger Truck	15.2	2,031.2

365 work days per year[1]

Emissions (tons per year)

Road Type	Vehicle Type	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O	Total GHGs (CO2e)	Benzene	Formaldehyde
Highway	Passenger Car	0.023	3.464	0.057	0.002	2.889	0.434	249.760	0.009	0.001	250.299	0.001	0.000
Sidestreets	Passenger Car	0.007	1.021	0.013	0.000	1.071	0.161	72.639	0.003	0.000	72.838	0.000	0.000
Idle	Passenger Car	0.001	0.013	0.002	0.000	0.000	0.000	21.317	0.000	0.000	21.415	0.000	0.000
Highway	Passenger Truck	0.072	7.626	0.223	0.004	5.085	0.765	652.102	0.024	0.003	653.703	0.003	0.001
Sidestreets	Passenger Truck	0.021	2.141	0.049	0.001	1.975	0.297	185.625	0.007	0.001	186.227	0.001	0.000
Idle	Passenger Truck	0.00274	0.05540	0.00742	0.00036	0.00018	0.00016	54.49303	0.00094	0.00096	54.80085	0.00012	0.00004
Total Emissions per shift		0.13	14.32	0.35	0.01	11.02	1.66	1,235.94	0.044	0.01	1,239.28	0.01	0.00

453.59 g/lb

100% HDDV grams/mile

VOC	CO	NO_x	SO_x	PM 10	PM 2.5	CO2	CH4	N2O	CO_2e	Benzene	Formaldehyde
0.798	13.035	0.859	0.006	0.024	0.021	973.00	0.01	0.002	973.99	0.002	0.02

Assumed distance breakout:

25%	3	miles	Representative Location from Seattle Industrial Area
40%	33	miles	from Port of Tacoma/NAVBASE Kitsap Bangor (RT)
25%	150	miles	Vancouver CA
10%	1100	miles	LA
100%			

Onroad Truck Traffic 18,250 trips per year

Origination	# trips	Distance miles	Pounds per year VOC	CO	NO_x	SO_x	PM 10	PM 2.5	CO2	CH4	N2O	CO_2e	Benzene	Formaldehyde
NAVBASE Kitsap-Bangor (RT)	730	33.2	0.06	0.95	0.06	0.00	0.00	0.00	71	0.00	0.00	71.29	0.00	0.00
SIA	4,563	13,688	24.08	393.34	25.92	0.18	0.72	0.63	29361	0.44	0.07	29,391	0	1
PoT	7,300	240,900	423.81	6922.84	456.21	3.19	12.75	11.15	516757	7.75	1.25	517,283	1	13
Vancouver	4,563	684,375	1204.02	19667.16	1296.06	9.05	36.21	31.68	1468059	22.03	3.56	1,469,553	3	36
LA	1,825	2,007,500	3531.79	57690.34	3801.76	26.55	106.22	92.94	4306306	64.62	10.44	4,310,690	10	107
		Total in Tons	**2.59**	**42.34**	**2.79**	**0.02**	**0.08**	**0.07**	**3,160.28**	**0.05**	**0.01**	**3,163.49**	**0.01**	**0.08**

APPENDIX H
Hydrodynamic and Sediment Transport Modeling Study

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FINAL (V.3)

HYDRODYNAMIC AND SEDIMENT TRANSPORT MODELING STUDY

PUGET SOUND NAVAL SHIPYARD AND INTERMEDIATE MAINTENANCE FACILITY, NAVAL BASE KITSAP BREMERTON

BREMERTON, WA

June 2025

Prepared by:
Cardno GS-AECOM Pacific Joint Venture

Under Contract No.: N62742-18-D-1802
Task Order: N4425520F4153

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Signature Sheet

Final
Hydrodynamic and Sediment Transport Modeling Study
Puget Sound Naval Shipyard and Intermediate Maintenance Facility
Naval Base Kitsap Bremerton

Prepared by:
Cardno GS-AECOM Pacific Joint Venture
Under Contract No.: N62742-18-D-1802
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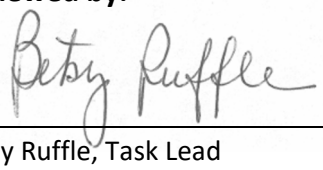

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EXECUTIVE SUMMARY

A hydrodynamic and sediment transport modeling study was conducted to support the Environmental Impact Statement (EIS) for the Proposed Action at Puget Sound Naval Shipyard and Intermediate Maintenance Facility at Naval Base Kitsap Bremerton. The study assessed potential impacts of in-water construction activities associated with the two action alternatives in the EIS on water quality in Sinclair Inlet. The model predicted turbidity impacts from construction activities with the potential to disturb sediment, including dredging and pile installation and removal.

Time periods with multiple concurrent construction activities occurring within the in-water work window (July 16 to February 15) were modeled for both action alternatives (EIS Alternatives 2 and 3). Model inputs were based on site-specific data, published guidance, and literature.

The impacts of sediment-disturbing activities were evaluated at six areas of interest (AOIs) including within the boundary of Operable Unit (OU) B Marine, at portions of Sinclair Inlet adjacent to OU B Marine, and at four locations identified as AOIs due to their proximity to construction activities and/or the presence of sensitive marine life:

- Charleston Beach
- Marine vegetation east of Pier 7 (Alternative 3 only)
- Port Orchard Marina
- Marine vegetation along the southern shoreline of Sinclair Inlet near the mouth of Blackjack Creek

None of the modeled activities resulted in the exceedance of the state of Washington's turbidity water quality criteria for aquatic life at the 150-foot compliance boundary.[1] Maximum predicted total suspended solids (TSS) levels for some pile-related activities are higher than for dredging; however, the peaks are brief and TSS disperses rapidly from the pile-related activities. Sediment releases from dredging dominate the spatial extent of the distribution of TSS.

TSS from modeled activities is rapidly dispersed and well mixed both laterally and vertically by the time it reaches Port Orchard Marina, Charleston Beach, and the area of marine vegetation along the southern shoreline of Sinclair Inlet near the mouth of Blackjack Creek (maximum TSS below 1.0 milligrams per liter [mg/L]). Accumulated sedimentation at these three AOIs was on the order of 0.2 millimeters (mm) or less after 28 days of simulated construction activities for both action alternatives. The natural amount of sedimentation that would be expected to occur in Sinclair Inlet over the same 28-day period is about 0.21 mm. Predicted impacts at the area of marine vegetation east of Pier 7 are also low (maximum TSS of 1.6 mg/L and accumulated sedimentation of 0.3 mm) under Alternative 3 (this area would be dredged/removed under Alternative 2).

The modeling results indicate that construction activities for both action alternatives (EIS Alternatives 2 and 3) are not expected to result in exceedances of the aquatic life turbidity criterion at the 150-foot compliance radius under a range of tide and wind conditions. During the busiest in-water construction

[1] For marine waters designated as Extraordinary or Excellent quality for aquatic life, which includes Sinclair Inlet (WAC 173-201A-612), the state of Washington's turbidity water quality criteria are:

- 5 NTU over background when the background is 50 NTU or less; or
- A 10 percent increase in turbidity when the background turbidity is more than 50 NTU

The point of compliance is a radius of 150 feet from the activity causing the turbidity (WAC 173-201A and 40 CFR 131.45).

years when multiple concurrent activities would occur, turbidity impacts were primarily localized within the OU B Marine boundary for Alternative 2. For Alternative 3, turbidity impacts extended into Sinclair Inlet during dredging for the turning basin, which is located outside of OU B Marine. However, dredging for this component is scheduled to be completed in one season. In years without dredging for the turning basin, turbidity impacts for Alternative 3 are predicted to be within the OU B Marine boundary. The modeling analysis also found that impacts on wave action and longshore drift in Sinclair Inlet as a result of changes to the waterfront configuration would be negligible for both action alternatives.

The modeling analysis did not consider the impact that best management practices and controls, such as pre-dredge debris sweeps or early warning monitors, would have on reducing the generation and dispersion of turbidity during in-water construction activities. Thus, the modeling results are considered conservative and impacts under actual operational conditions are expected to be less than predicted.

Hydrodynamic and Sediment Transport Modeling Study

Puget Sound Naval Shipyard and Intermediate Maintenance Facility, Naval Base Kitsap Bremerton

Bremerton, WA

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Abbreviations and Acronyms

Acronym	Definition
ADCP	Acoustic Doppler Current Profiler
AOI	area of interest
BMP	best management practice
BNC	Bremerton Naval Complex
bss	below sediment surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfs	cubic feet per second
cy/day	cubic yard per day
DD3	dry dock 3
DD6	dry dock 6
DEM	Digital Elevation Model
EIS	environmental impact statement
fps	feet per second
HST	hydrodynamic and sediment transport
M2D2	multi-mission dry dock
m^3/s	cubic meter per second
mg/L	milligram per liter
MLLW	mean lower low water
mm	Millimeter
NAVBASE	Naval Base
NAVD88	North American Vertical Datum of 1988
Navy	Department of the Navy, United States
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
NTU	nephelometric turbidity units
OU	operable unit
PFCF	percent fines conversion factor
PSDEM	Puget Sound Digital Elevation Model
PSNS	Puget Sound Naval Shipyard
SRR	sediment release rate
TSS	total suspended solids
U.S.	United States
USGS	United States Geological Survey
WAC	Washington Administrative Code
WC	water content
WWTP	waste water treatment plant

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1 Introduction

The United States (U.S.) Department of the Navy (Navy) proposes to construct a dry dock and associated waterfront infrastructure improvements at Puget Sound Naval Shipyard and Intermediate Maintenance Facility at Naval Base (NAVBASE) Kitsap Bremerton in Bremerton, Washington. The Proposed Action will include the demolition of existing in-water structures, construction of new in-water structures, upgrade or replacement of existing in-water structures, and demolition or modification of upland facilities required to support the in-water structures. The Environmental Impact Statement (EIS) identifies two action alternatives (EIS Alternatives 2 and 3) with multi-year construction schedules involving in-water construction activities that will disturb sediment and generate turbidity in the water column (Navy 2022).

This report presents the development of a hydrodynamic and sediment transport (HST) model for Sinclair Inlet and its application to simulate water column turbidity and sedimentation related to in-water construction activities associated with the two action alternatives. The model was used to simulate the hydrodynamics and sediment transport response to construction activities under a range of wind and tide conditions. The impact of the Proposed Action on sediment transport was evaluated at six areas of interest (AOIs) including within the boundary of Operable Unit (OU) B Marine, portions of Sinclair Inlet adjacent to OU B Marine, Charleston Beach, Port Orchard Marina, and two areas of marine vegetation (discussed in Section 3). The impact of the final project configuration on wave action and longshore drift in Sinclair Inlet was also evaluated. The report presents the environmental conditions in Sinclair Inlet and a conceptual model of the study area system, the development and calibration of the hydrodynamic model, the identification of the sediment release activities, rates, and timeline for each alternative, and the prediction of suspended sediment concentrations and sedimentation at points of interest under various tide and wind scenarios.

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2 Site Setting and Action Alternatives

NAVBASE Kitsap Bremerton is located on the north side of Sinclair Inlet in Puget Sound (Figure 2-1). It is surrounded to the west and north by the City of Bremerton's commercial and residential areas, to the northeast by a Washington State Ferry System Bremerton terminal and the Bremerton Marina, and to the southeast by Sinclair Inlet. The active industrial shipyard site contains approximately 380 acres of terrestrial area and 270 acres of submerged land.

Sinclair Inlet is a relatively small tidal inlet near Bremerton, Washington, and the Naval shipyard occupies almost half of the northwestern shore of this inlet. The inlet is approximately 4.3 miles long and 1.2 miles wide, with water depths in the center of the inlet generally between 35 and 65 feet (Noble et al. 2013).

Sinclair Inlet connects to Puget Sound via two passages: Rich Passage to the south of Bainbridge Island and Port Orchard Passage that extends along the west side of Bainbridge Island and connects to Puget Sound north of the island (Figure 2-1). Thus, exchange and flushing of the estuary has two pathways, although most exchange with Puget Sound occurs through Rich Passage, which is closer and deeper than Port Orchard Passage (Noble et al. 2013). Another small inlet, Dyes Inlet, approximately the same size as Sinclair Inlet, connects to Sinclair Inlet via Port Washington Narrows to the east of the City of Bremerton.

Sediment within the Naval Restricted Area at NAVBASE Kitsap Bremerton is within the footprint of Operable Unit (OU) B Marine, one of the six OUs that comprise Puget Sound Naval Shipyard (PSNS) Complex Superfund Site, referred to as the Bremerton Naval Complex (BNC) National Priorities List (NPL) site in Bremerton, Washington (Figure 2-2). BNC was listed on the NPL by the U.S. Environmental Protection Agency in May 1994, and is managed under the Navy's Environmental Restoration Program, similar to the Superfund cleanup program, in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

The primary components of the two action alternatives (EIS Alternatives 2 and 3) are summarized below (Navy 2022).

2.1 Alternative 2 – Multi-Mission Dry Dock at Dry Dock 3

Under Alternative 2, the Navy would construct a new multi-mission dry dock (M2D2) at the location of the existing dry dock 3 (DD3). For this alternative, dimensions of M2D2 would be 190 feet by 1,250 feet. Dry dock 6 (DD6) would be seismically upgraded. The Navy would construct a new Forge Shop at NAVBASE Kitsap Bangor (upland component). The Navy would demolish Piers 4, 5, 6, and 7, including the Hammerhead Crane on Pier 6. Piers 4 and 6 would be replaced with new piers. A new Pier 2 would be constructed to the east of Mooring A. Moorings E, F, and G would be upgraded. The Navy would dredge bottom sediment to create adequate draft at wharves and piers. Components of Alternative 2 are shown in Figure 2-3.

2.2 Alternative 3 – Multi-Mission Dry Dock at Mooring A

Under Alternative 3, the Navy would construct a new M2D2 in the center of the Bremerton Waterfront, in the location of the existing Mooring A. A new Wharf 2 would be constructed on the outer east wall of M2D2. Dimensions of M2D2 would be the same as Alternative 2, at 190 feet by 1,250 feet. DD6 would be seismically upgraded. The Navy would demolish Mooring A, Pier 4, and the Hammerhead Crane on Pier 6. Pier 4 would be replaced with a new pier. Moorings E, F, and G would be upgraded. The Navy would dredge bottom sediment to create a new turning basin and adequate draft at wharves and piers. Components of Alternative 3 are shown in Figure 2-4.

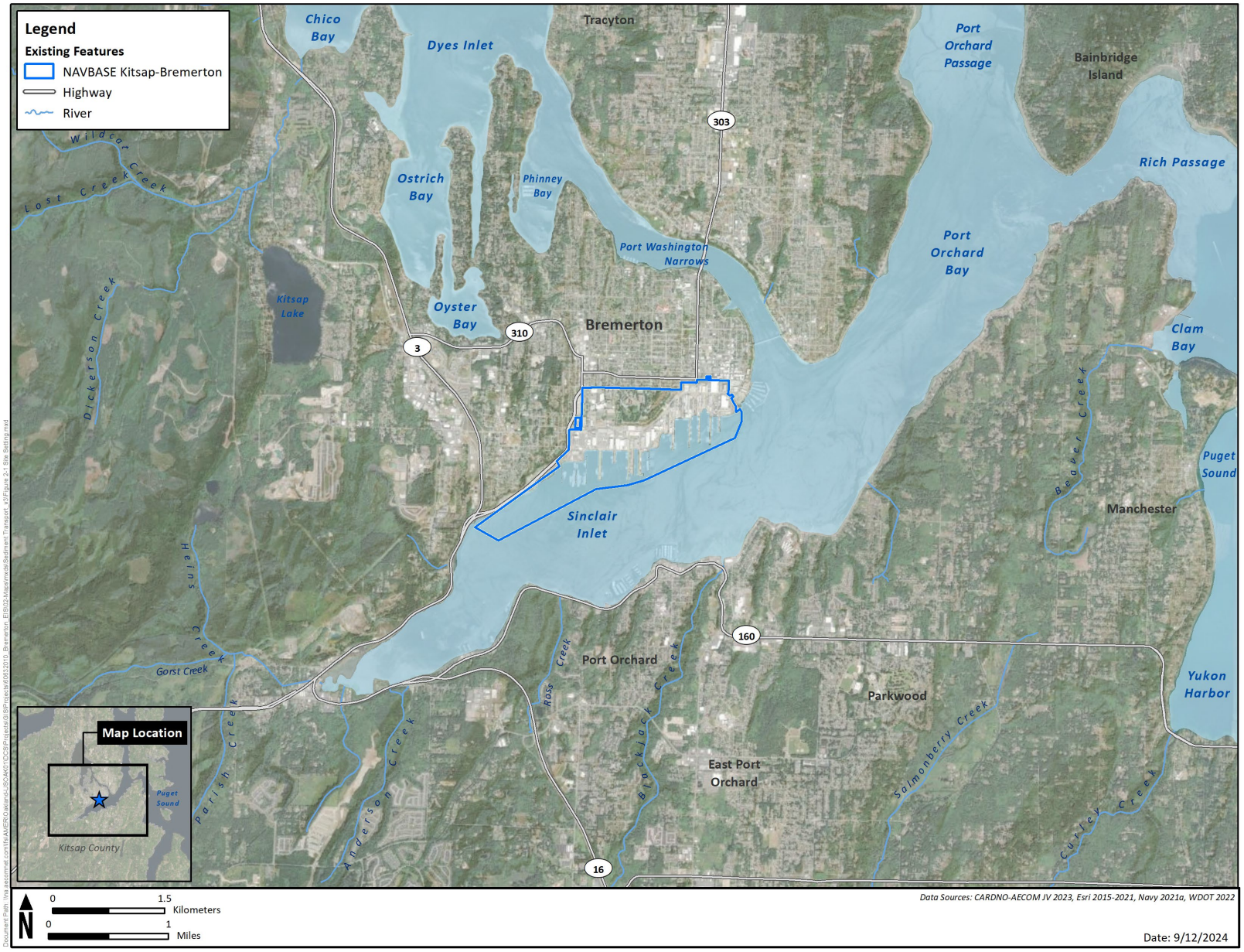

Figure 2-1 Site Setting

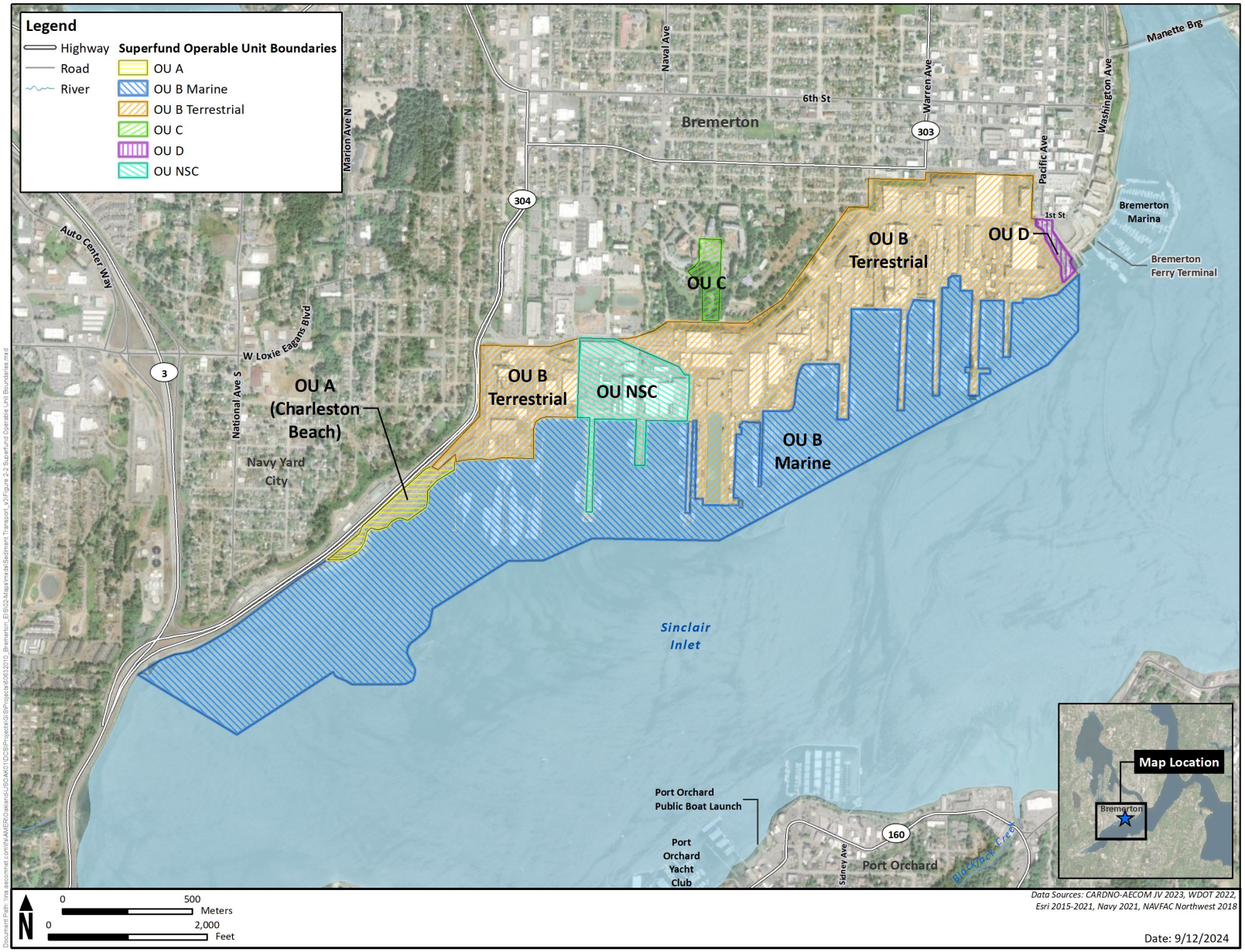

Figure 2-2 Superfund Operable Unit Boundaries

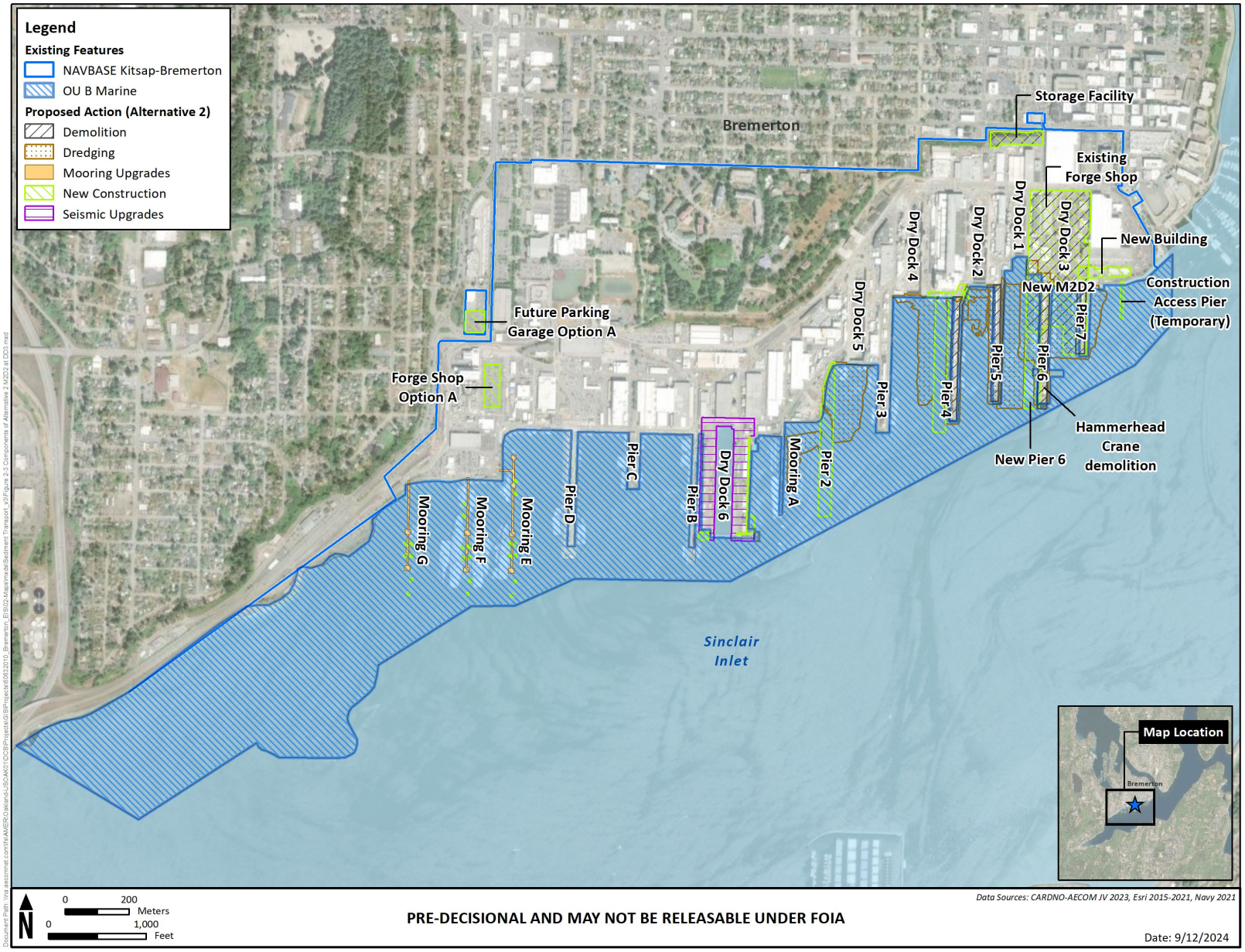

Figure 2-3 Components of Alternative 2 – M2D2 at DD3

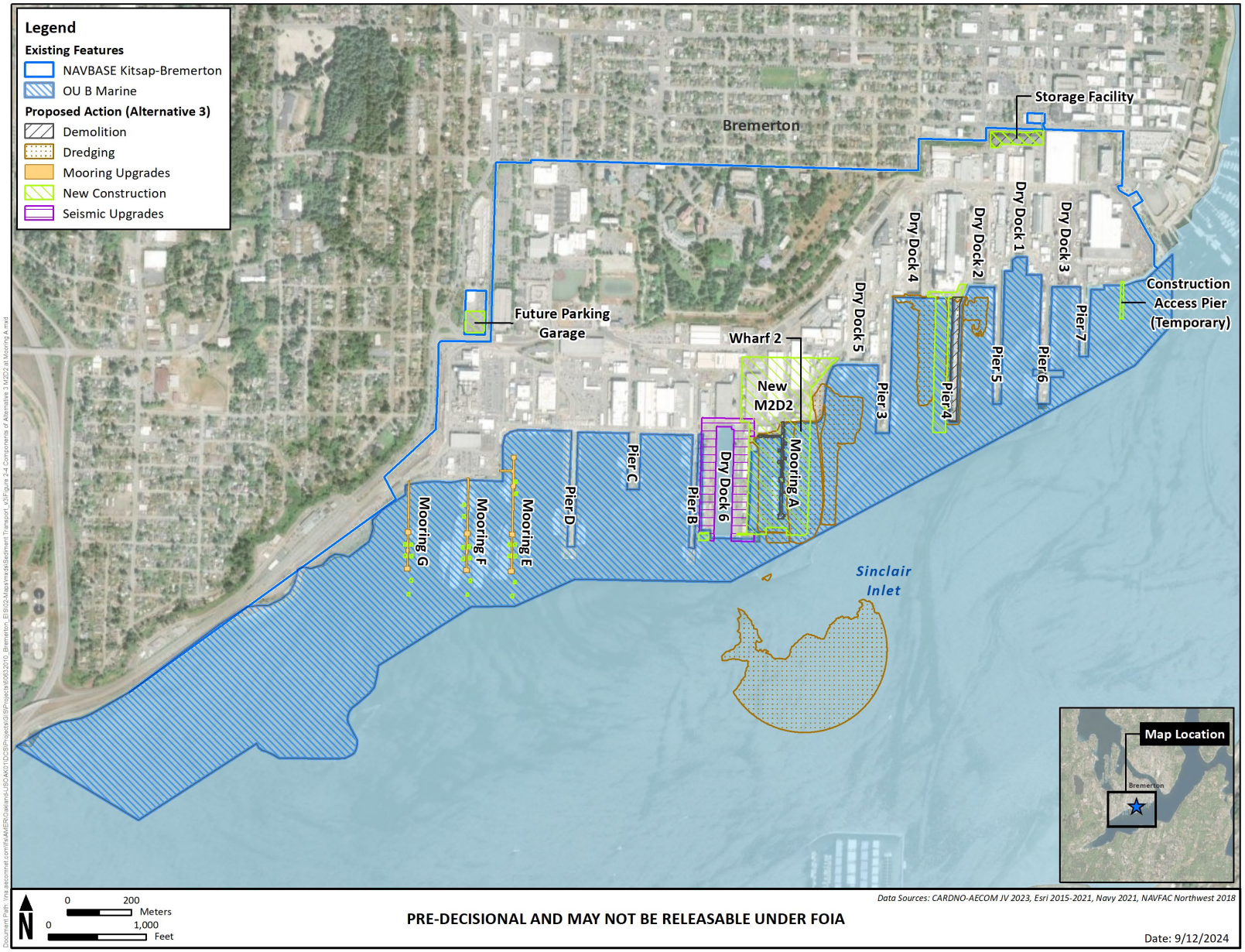

Figure 2-4 Components of Alternative 3 – M2D2 at Mooring A

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3 Study Objectives

The HST modeling study has been conducted to support the analysis of the two action alternatives (Alternatives 2 and 3) in the EIS. The primary objective of the HST modeling study is to identify and quantify the potential impacts of in-water construction activities associated with the two action alternatives on water quality in Sinclair Inlet. This includes evaluating the impacts of the action alternatives on AOIs (Figure 3-1) including:

- OU B Marine
- Portions of Sinclair Inlet adjacent to OU B Marine
- Charleston Beach
- Marine vegetation east of Pier 7
- Port Orchard Marina
- Marine vegetation along the southern shoreline of Sinclair Inlet near the mouth of Blackjack Creek

3.1 In-Water Construction Activities

The in-water construction activities that will disturb sediment include dredging, removal of pilings, sheet pile, and pile foundations, and installation of pilings, sheet pile, and concrete foundations. The potential for vessel wake, propeller wash, and thruster-induced scour were not considered because water depths are too great (at least 30 feet) for these processes to impact bottom sediment.

3.2 Assessment of Water Quality Impacts

The predicted turbidity associated with construction activities was compared to the applicable Washington State water quality standard (Chapter 173-201A of the Washington Administrative Code [WAC]). The designated uses for the marine waters of Sinclair Inlet (west of longitude 122°37' W, as specified in WAC 173-201A-612) consist of excellent quality salmonid and other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (e.g., crabs, shrimp, crayfish, scallops) rearing and spawning; primary contact recreation; wildlife habitat; harvesting; commercial boating and navigation; recreational boating; and aesthetics.

For Dyes and Sinclair Inlets (west of longitude 122°37' W), the water quality designation for aquatic life is Excellent (WAC 173-201A-612). For marine waters designated as Extraordinary or Excellent quality for aquatic life, the applicable turbidity criteria are:

- 5 nephelometric turbidity units (NTU) over background when the background is 50 NTU or less; or
- A 10 percent increase in turbidity when the background turbidity is more than 50 NTU

The point of compliance is a radius of 150 feet from the activity causing the turbidity (WAC 173-201A-21). The criterion applies throughout the water column, and turbidity is monitored near the water surface, mid-water column, and near the sediment surface. Turbidity measurements conducted during a fall 2023 test pile study found site conditions do not exceed 50 NTU (WSM 2024). Therefore, the criterion used to evaluate turbidity impacts for this modeling analysis is 5 NTU at a 150-foot radius from the construction activity.

3.3 Assessment of Shoreline Impacts

In addition, as the Proposed Action would alter the shoreline configuration and the local bathymetry under both action alternatives, the impact of these changes on wave action and longshore drift was assessed.

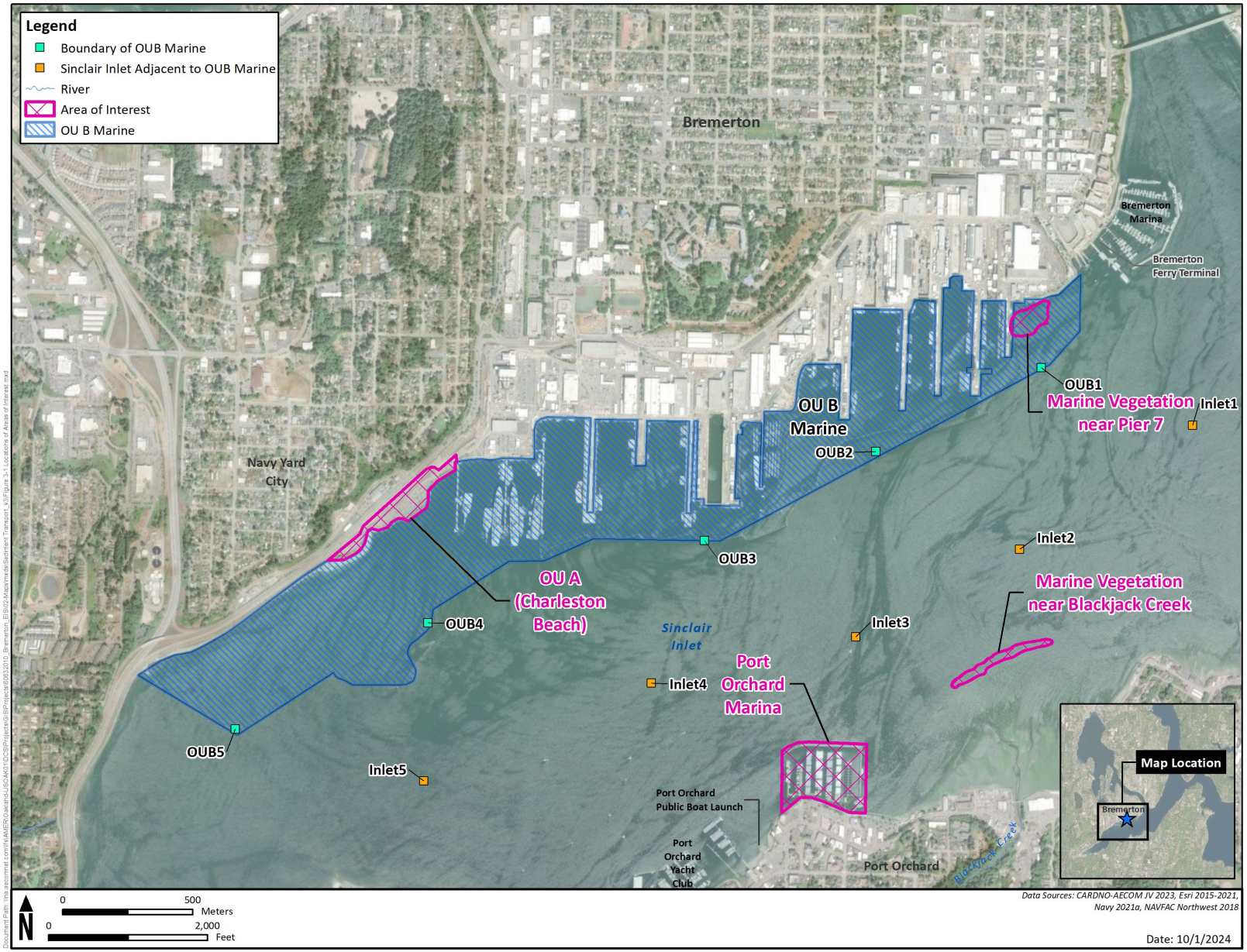

Figure 3-1 Locations of Areas of Interest

4 Summary of Available Data

The environmental data were compiled and reviewed to configure the HST model. These include previous study reports and bathymetric, wind, freshwater flows, tide, and sediment data. A 1994 study of Sinclair Inlet hydrodynamics and sediment transport conducted by the U.S. Geological Survey (USGS) provided data for model calibration. The available data sets and studies used to configure, parameterize, and calibrate the HST model are discussed below.

4.1 Bathymetry Data

Bathymetric data from two sources were acquired and used to provide the model bottom elevation data: the Puget Sound Digital Elevation Model (PSDEM) 2005 data and the NAVBASE Kitsap Bremerton bathymetric data (Navy 2021). The PSDEM2005 is available from the University of Washington School of Oceanography (UW 2005). The Digital Elevation Model (DEM) is in Washington State Plane North (feet), North American Datum of 1983 (NAD83), and North American Vertical Datum of 1988 (NAVD88) (feet), and is provided in an American Standard Code for Information Interchange raster format. It has 30-foot (9.14-meter) spacing. The PSDEM2005 covers the entirety of Puget Sound.

The NAVBASE Kitsap Bremerton bathymetric data was processed into a 0.5-meter (1.64-foot) spacing and provided in American Standard Code for Information Interchange xyz file format. The bathymetry data encompasses Sinclair Inlet, Dyes Inlet to the north, and the Port Orchard Bay to the east, and is presented in Figure 4-1. Figure 4-2 presents the bathymetry data for Sinclair Inlet. The seafloor in Sinclair Inlet off NAVBASE Kitsap Bremerton is relatively flat, with elevations ranging from approximately -30 to -60 feet mean lower low water (MLLW), then transitions to steep shorelines along the shipyard waterfront (Figure 4-2). Sinclair Inlet is deepest near its mouth where depths are typically about -60 feet MLLW; water depths decrease moving toward the head of the inlet where tide flats are exposed at low tide.

4.2 Wind Data

Three sources of meteorological data are available in the Bremerton area:

1. **Bremerton National Airport (National Weather Service/Federal Aviation Administration):** The Bremerton National Airport is located 7.5 miles southwest of the site at an elevation of 443 feet. Hourly data are available from 2006 to the present (NCEI 2021).
2. **Spruce Avenue Monitoring Station (Washington State Department of Ecology and Puget Sound Clean Air Agency):** The Spruce Avenue monitor is closer to NAVBASE Kitsap Bremerton and at a lower elevation than the Bremerton National Airport data. Wind speeds are lower than at the Bremerton National Airport station. Hourly data are available from 2012 to the present (Ecology and Puget Sound Clean Air Agency 2021).
3. **Port Orchard Marina Station:** Wind was measured every 15 minutes from March 10, 1994, to March 31, 1994, and from July 26, 1994, to September 1, 1994, near the site of an Acoustic Doppler Current Profiler (ADCP) mooring as part of a USGS study to determine circulation patterns in Sinclair Inlet (Gartner et al. 1998). These data were used for velocity calibration and are discussed in Section 4.6.

Two of the stations (Bremerton National Airport and Spruce Avenue Monitoring Station) are long-term meteorological stations with over 10 years of data. It was determined that the Bremerton National Airport wind data should be used as these data were collected and reported in accordance with the

established data quality protocols of National Oceanic and Atmospheric Administration (NOAA)/National Weather Service sources. Hourly wind speed and direction data from the Bremerton National Airport station were obtained for the 10-year period between January 1, 2011, and December 31, 2020 (NCEI 2021).

Quarterly wind roses for the Bremerton National Airport are provided in Figure 4-3 for January to March (first quarter), April to June (second quarter), July to September (third quarter), and October to December (fourth quarter). The winds are mostly from either the southwest or the northeast. The fourth quarter has the larger percentage of winds from the southwest, whereas the largest percentage of winds from the northeast occurs in the third quarter. During the remaining periods, the percentage of northeast and southwest winds transitions from the fourth quarter to third quarter patterns.

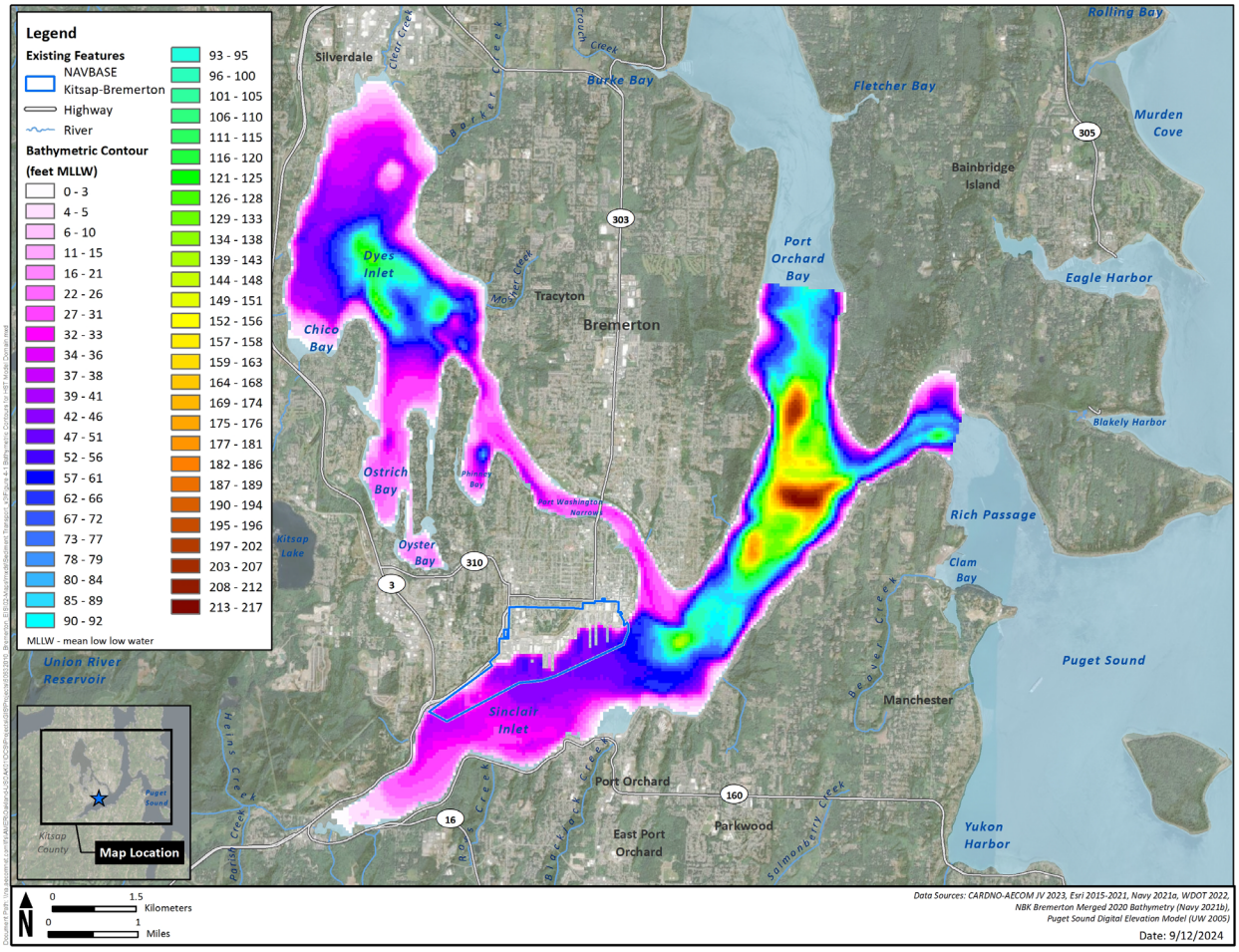

Figure 4-1 Bathymetric Contours for HST Model Domain

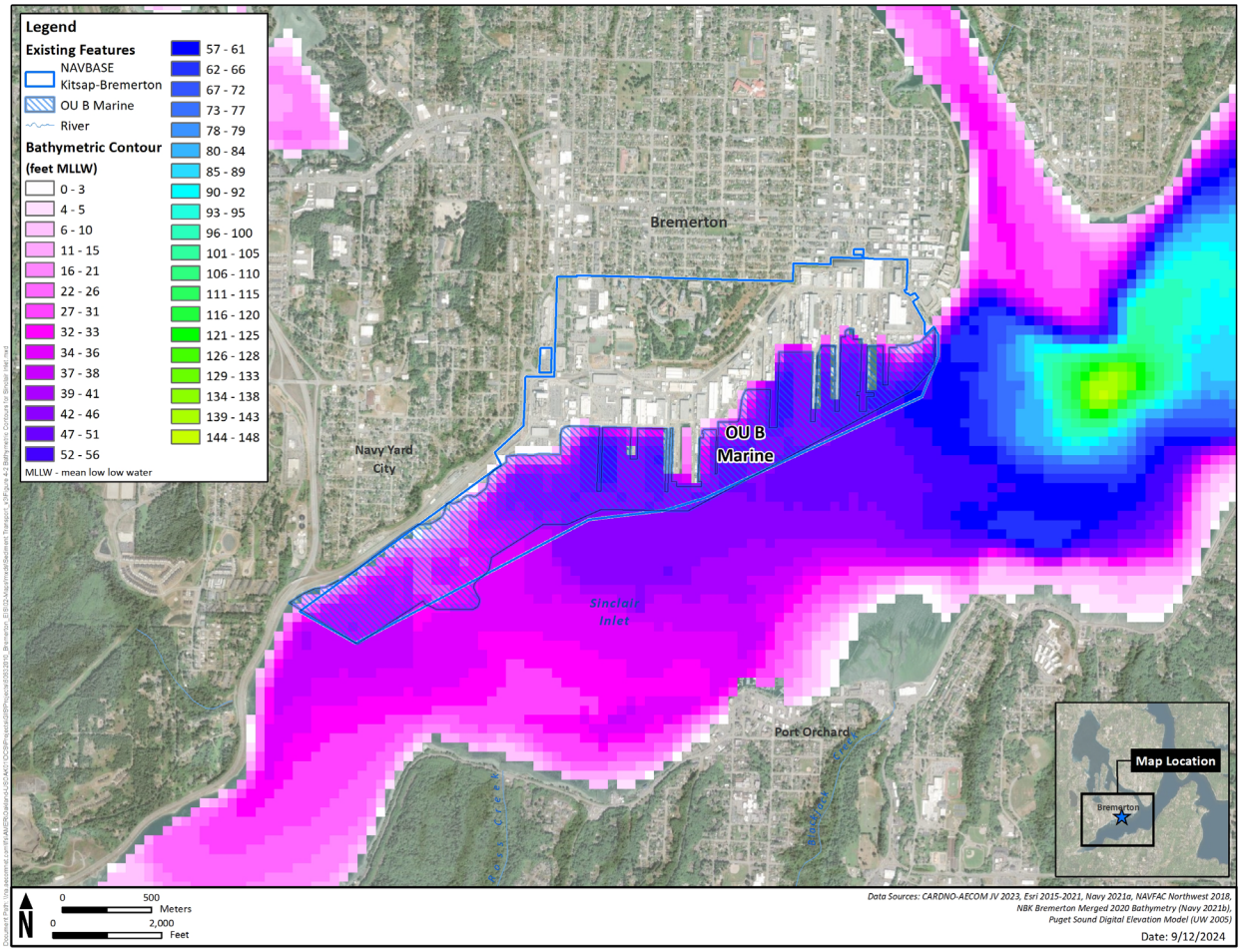

Figure 4-2 Bathymetric Contours for Sinclair Inlet

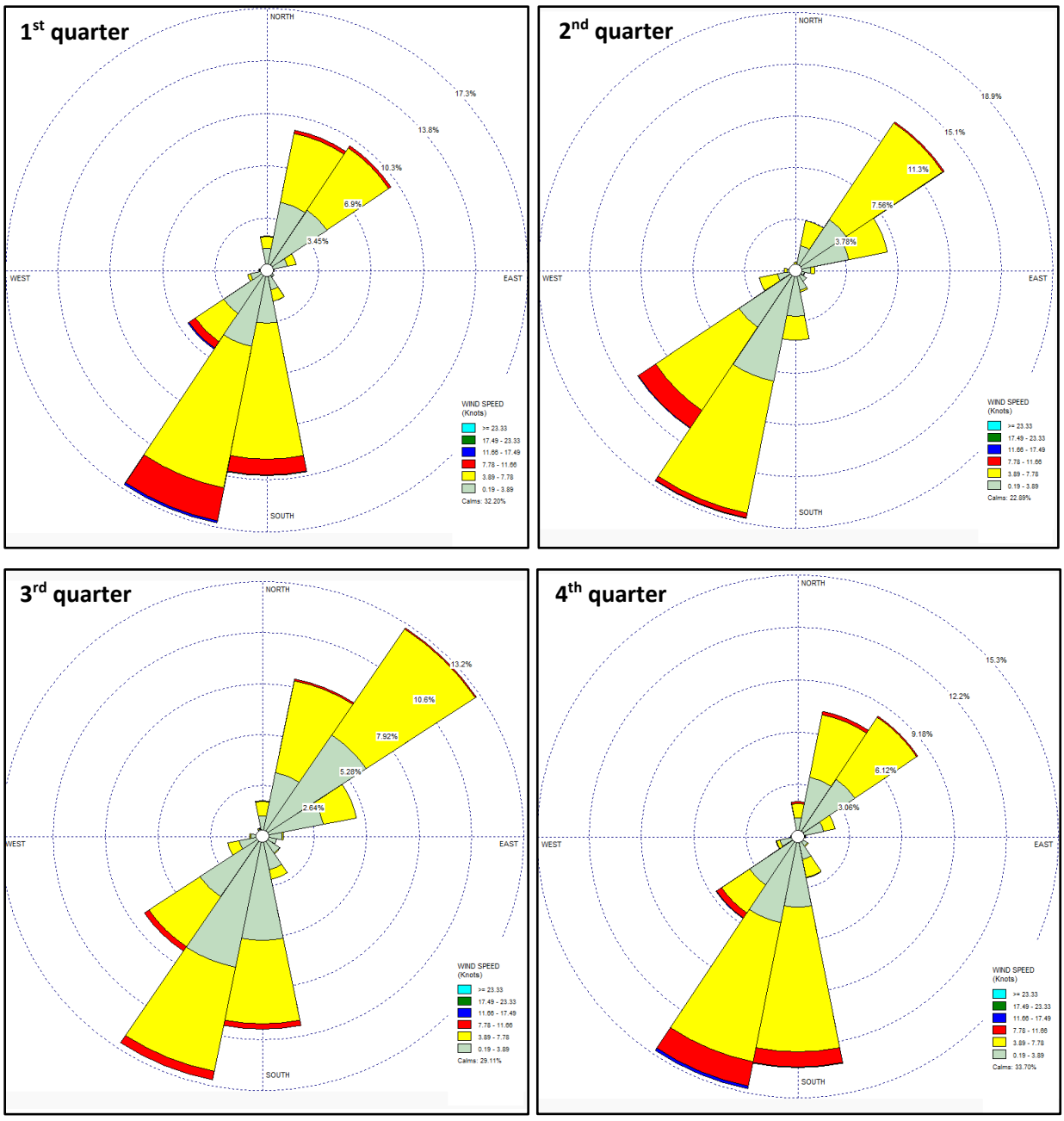

Figure 4-3 Bremerton National Airport Wind Roses (2011–2020)

4.3 Tides

Seven tide stations are present in the Sinclair and Dyes Inlet area (Clam Bay, Brownsville, Bremerton, Trackton, Eagle Harbor, Port Blakely, and Harper [Figure 4-4]). Except for Bremerton Station, they are subordinate stations with only daily high/low tide predictions. The Bremerton tide station (NOAA Station 9445958) is a primary tide station and data are available for 10 months in 1977–78, for one month in 1998, and from August 2012 to present. Port Madison and Poulsbo are too distant for their data to be of value.

Figure 4-4 NOAA Tide Station Locations

A plot of the predicted tides at the Bremerton station (Figure 4-5) demonstrates the mixed diurnal and semidiurnal tide characteristics yielding a distinct spring-neap cycle. The tide range varies from approximately 8 to 15 feet (2.4 to 4.6 meters) throughout the cycle. The surface area of Sinclair Inlet is approximately 2,640 acres, yielding a tidal prism of 919 million cubic feet (26,023,182 cubic meters) for an 8-foot (2.4-meter) tide range. The average flood tide flow over a 6-hour tide period at the entrance to the inlet is 40,800 cubic feet per second (cfs) (1,155 cubic meters per second [m^3/s]).

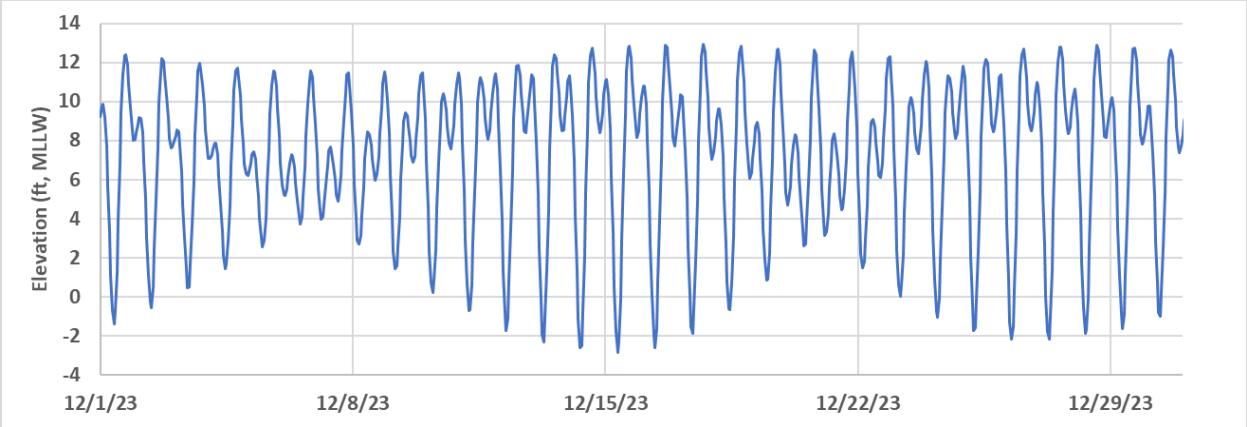

Figure 4-5 Typical Tides at Bremerton (NOAA Station 9445959)

4.4 Freshwater Flows

The watershed area that drains into Sinclair and Dyes Inlets is approximately 250 acres (252.3 square kilometers) (Johnston et al. 2009), and runoff enters the inlets through a series of small creeks with generally low flow. The creeks that flow into Sinclair Inlet include Gorst Creek at the head of the inlet and Anderson Creek, Ross Creek, and Blackjack Creek on the southern side of the inlet (Figure 2-1). The Blackjack Creek flow is small and ranges from 3.5 to 46 cfs (0.1 to 1.3 m^3/s) (Noble et al. 2013). No flow data are available for Gorst Creek, Anderson Creek, and Ross Creek; however, their influence on the hydrodynamics is assumed to be negligible given their small sizes. Major inflows to Dyes Inlet are Chico Creek with flows ranging from 0 to 413 cfs (11.7 m^3/s) and Clear Creek with flows ranging from 3.5 to 141 cfs (0.1 to 4 m^3/s) (Albertson et al. 1995). For comparison, the tidal flow between peak flood and ebb tides near Blackjack Creek is on the order of 35,000 cfs (990 m^3/s). Freshwater input to Sinclair Inlet has a large seasonal variability. Approximately 85 percent of the total precipitation occurs between October and April. Sinclair Inlet is isolated from any direct input from rivers that deliver snowmelt. Because land use around Sinclair Inlet, and to a lesser extent Dyes Inlet, is significantly urbanized, much of the runoff occurs via multiple stormwater and combined sewer overflows and four wastewater treatment plants (WWTPs). Although peak flows from a single combined sewer overflow or WWTP may be low compared to the creeks (daily peak of 59.7 million gallons per day [2.6 m^3/s] in 2003 at Bremerton WWTP [Ecology 2006] with a design peak flow for primary treatment of 22.8 million gallons per day [1.42 m^3/s] [Ecology 2018]), the input from the WWTPs combined can be as large as the freshwater input from the creeks. However, these flows are minor in comparison to the tidal flows and do not have a significant impact on the hydrodynamics in Sinclair Inlet; thus, they are not included in the HST model configuration.

4.5 Sediment Characteristics

Data on sediment characteristics (e.g., grain size, porosity) were compiled from several sources (Table 4-1). Based on six studies conducted between 1994 and 2022, a total of 55 marine sediment samples were identified from locations across the waterfront and a range of depths below sediment surface (bss). A total of 42 samples represent sediment from the top 10 feet; the remaining 13 samples were collected at depths ranging from approximately 11 to 22 feet bss. Much of the dredging associated with both action alternatives will occur within the top 25 feet, although dredge cuts in some areas may occur to 30 to 40 feet bss (e.g., end of Piers 6 and 7 under Alternative 2).

In fall 2023, a sediment investigation conducted near Piers 6 and 7 included 32 cores ranging in maximum depth from 9 to 45 feet bss (WSP 2024). The grain size data from this study are discussed in a sensitivity analysis presented in Section 11.5. Grain size data from 2018 OU B Marine long-term monitoring (CH2M 2020) were also reviewed but not included in the data set for HST modeling as these data are not representative of sediment in the footprint of the action alternatives. Appendix B provides a summary of the compiled sources and samples with grain size and porosity data when available.

Table 4-1 Sediment Data Sets Reviewed

Study/Author	*Collection Date*	*Sample Depth (ft bss)*	*Number of Samples*	*General Location*	*Data on Grain Size?*	*Data on Porosity?* [a]
Marine Sediment Physical Characterization, Appendix P of the Remedial Investigation Report (URS 2002)	1994	2–4	3	Mooring G, DD4, and DD3	Yes	Yes
Draft Technical Memorandum for Results of Feasibility Study Sediment Sampling, OU B Marine (Navy 1999)	1999	0–2 4–6	10 (0–2 ft) 6 (4–6 ft)	Piers B, C, and D, Moorings A and E, and DD5	Yes	No
Sediment Characterization at Puget Sound Naval Shipyard, Phase II Bremerton Naval Complex (SAIC 2000)	1999	7–13	8	Piers B and D	Yes	Yes
Geotechnical Report, Volume 4 (WSP 2021)	2020	0–1	2	New Pier 2	Yes	Yes
Sediment Grain Size Characterization (HC 2022)	2022	5–22	9	Piers 5, 6, and 7	Yes	Yes
Sediment Characterization Report (WSP 2023)	2022	0–8	17	Piers 5, 6, and 7	Yes	Yes
Sediment Delineation Report (WSP 2024)	2023	9–45	32	Piers 6 and 7	Yes	Yes

Legend: bss = below sediment surface; ft = foot or feet.
[a] Porosity as reported in source or calculated from water content (WC) or total solids (TS) (Section 9 and Appendix B).

The data indicate a large range of sediment grain sizes. The percentage of particles classified as silt and clay, referred to as percent fines, ranges from 3.4 percent to 92 percent. A trend analysis was conducted to evaluate whether percent fines vary spatially along the shoreline and with depth. A plot of percent fines by location along the shoreline from west to east (Figure 4-6) did not suggest a significant trend (R^2 value of 0.0512). A plot of percent fines with depth bss (Figure 4-7) indicated a possible trend of decreasing percent fines with increasing depth bss (R^2 value of 0.1497).

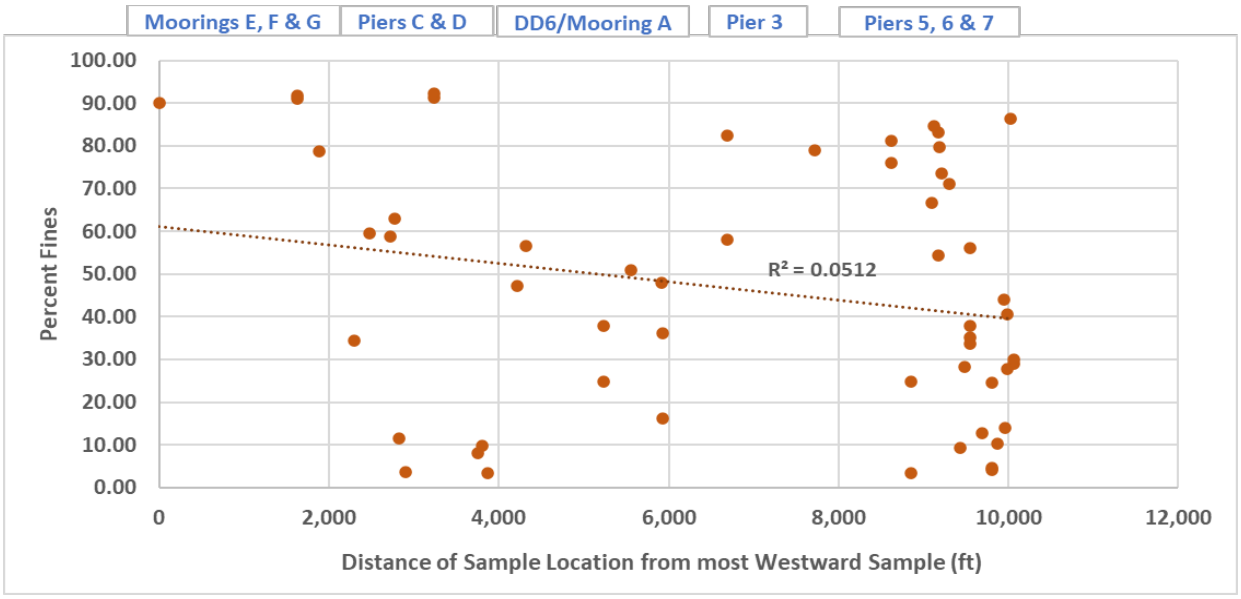

Figure 4-6 Correlation of Percent Fines with Sample Location along Shoreline

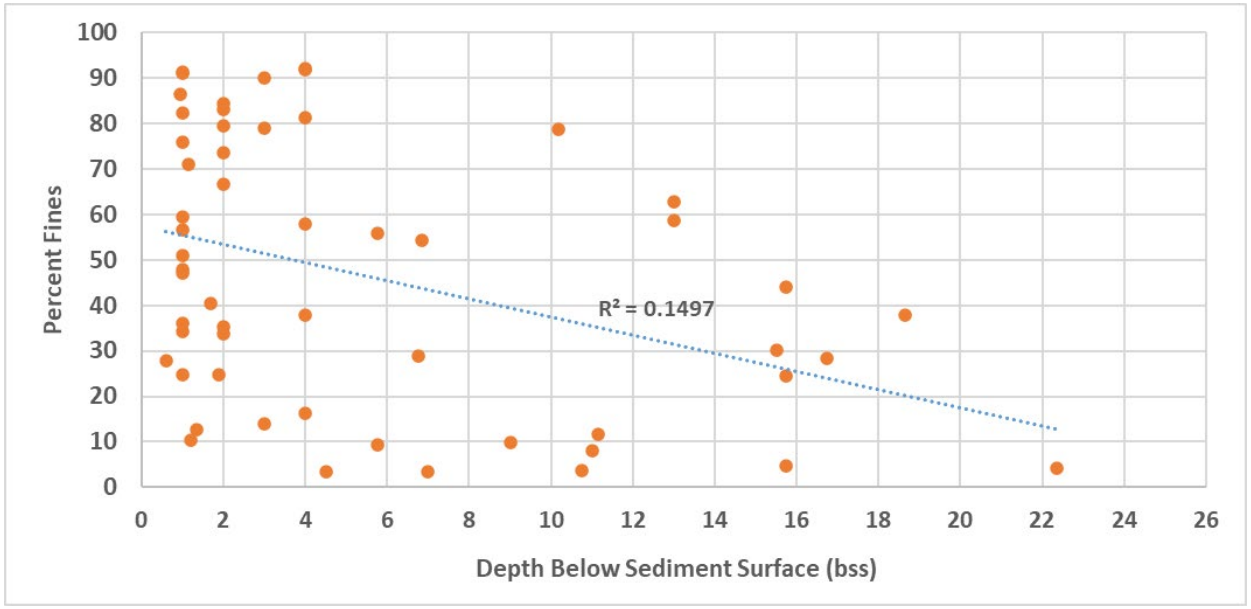

Figure 4-7 Correlation of Percent Fines with Sediment Sample Depth

A subset of the samples (n=39) had data on porosity, or water content (WC) or total solids (TS) from which porosity could be estimated. A significant trend of percent fines with porosity was evident (R^2 value of 0.7083) (Figure 4-8). This trend is discussed further in Section 9.

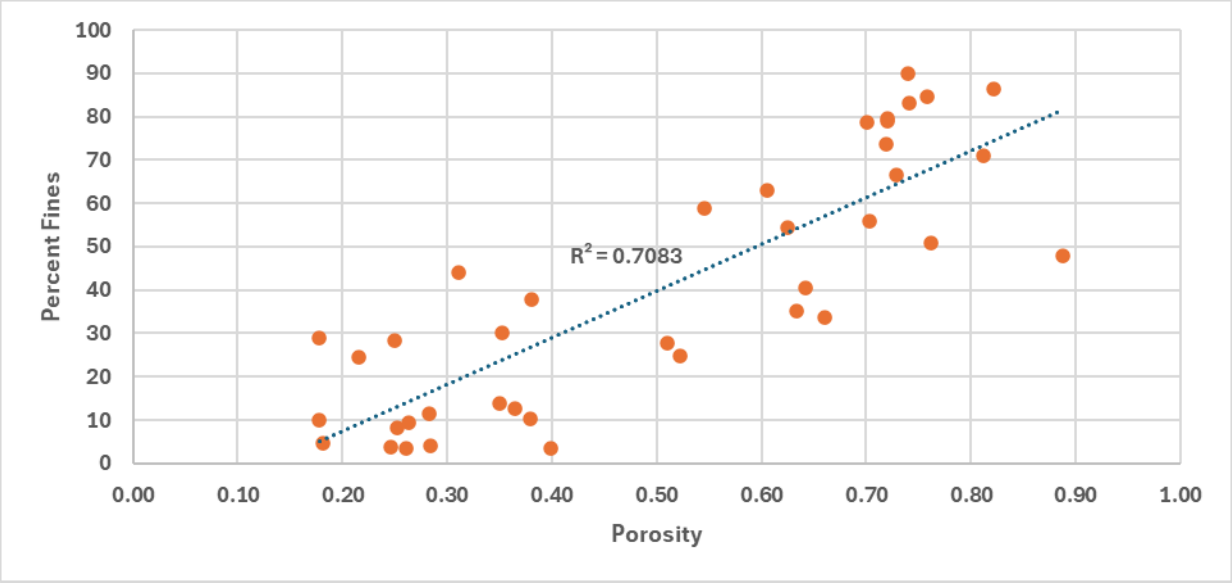

Figure 4-8 Correlation of Percent Fines with Porosity in Sediment Samples

4.6 United States Geological Survey Study of Sinclair Inlet

The most useful model calibration wind and tide data were collected in March 1994 by the USGS in cooperation with the Navy. USGS deployed moorings in Sinclair Inlet to determine circulation patterns in the inlet. Extensive descriptions of the program and the resultant information have been reported in Gartner et al. (1998). This report focused on the bottom boundary layer and the potential for the resuspension and transport of sediment on the seabed in Sinclair Inlet as a result of tides and waves.

Three tripods supporting bottom-mounted, upward-facing ADCPs and conductivity/temperature/depth recorders were deployed in the inlet for short periods during the late winter and summer seasons and set to collect data at 10-minute intervals. Two tripods were deployed on each side of the shipyard at an East site and a West site, and a third tripod was deployed in the middle of the inlet at a Center site. The water depths at these sites were 59, 43, and 46 feet (18, 13, and 14 meters), respectively. The locations of the 1994 ADCP and wind stations are presented in Figure 4-9.

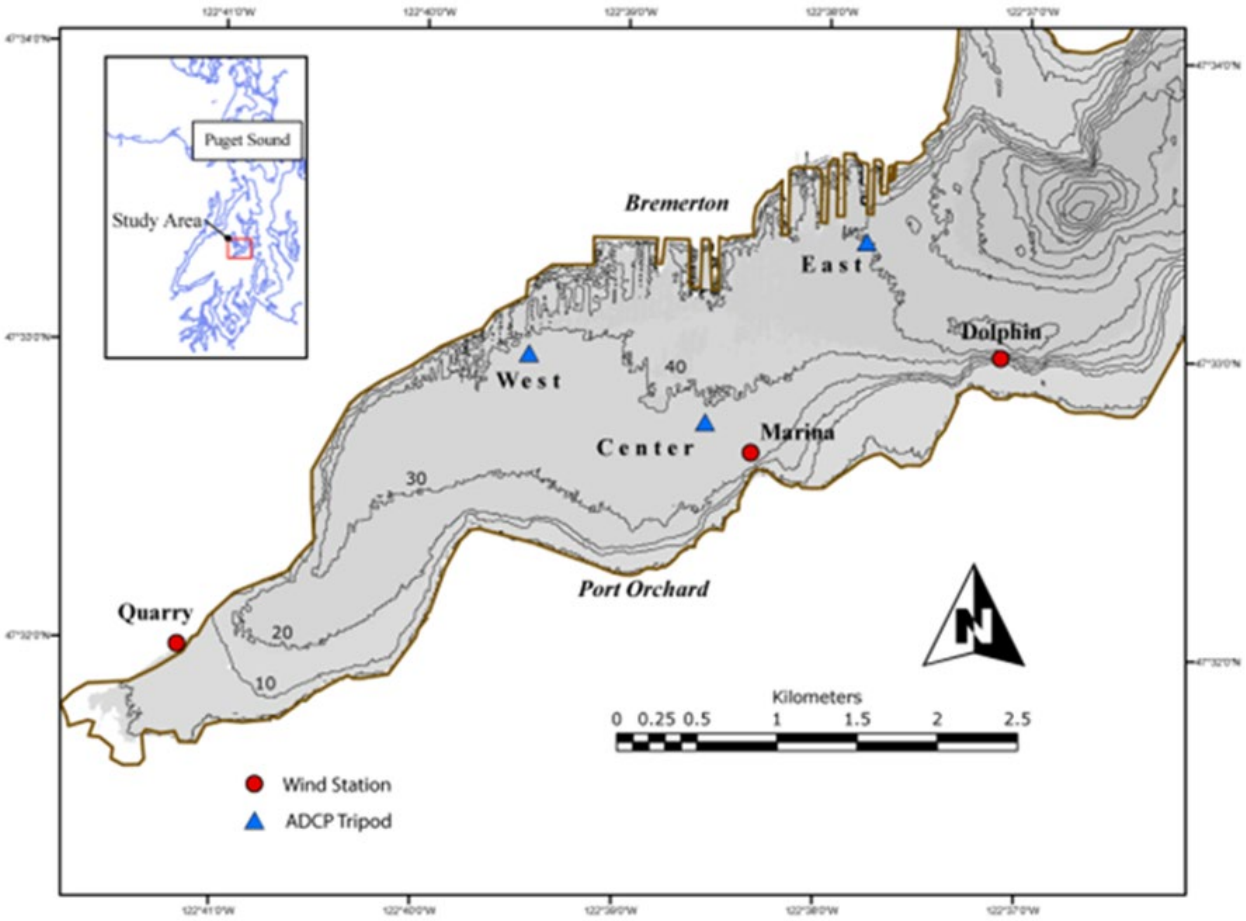

Figure 4-9 USGS 1994 Study ADCP and Wind Station Locations

Wind velocity was measured every 15 minutes at the head of the inlet (Quarry Station), adjacent to the Port Orchard Marina (Marina Station), and near the mouth of the inlet (Dolphin Station). The winds at the three stations had similar structures with fairly narrow ranges in wind direction that were aligned approximately along the axis of Sinclair Inlet (i.e., from the southwest or northeast).

The data collected in 1994 was reviewed in a subsequent USGS report (Noble et al. 2013). The report noted that the salinity data collected during the 1994 USGS survey may not be reliable. However, based on their analysis of other studies, Noble et al. (2013) concluded that:

> *Previous studies have shown that salinity does not vary greatly over the course of the year in the inlet, and ephemeral nature of freshwater input suggests that the riverine influence is small and short lived.*

The limited variation in salinity is supported by an analysis conducted by the Washington State Department of Ecology (Albertson et al. 1995). Salinity and temperature data collected in 1992 at stations distributed throughout Sinclair Inlet were analyzed to assess the lateral and vertical distributions and associated stratification. The measured vertical salinity profiles varied by 1 to 2 parts per thousand, and the stratification was not considered significant (Albertson et al. 1995).

4.7 Data Summary and Model Assumptions

It was determined that the available data are sufficient for configuring the HST model. Based on the data review, the following assumptions were made:

- Freshwater flows are small and do not have a significant impact on flow patterns in the inlet, and therefore do not need to be included in the analysis.
- As a result of the large tidal range and low freshwater discharges, temperature and salinity stratifications in the Sinclair Inlet are negligible and salinity and temperature do not need to be simulated in the analysis.
- Data are not available to determine whether flocculation of the fine-grained sediment is significant in Sinclair Inlet, and it is not considered in the analysis. However, as flocculation typically increases the effective particle settling speed, not including it in the modeling would be expected to have a conservative bias on predicted turbidity estimates.
- Data are not available to support a site-specific correlation between simulated sediment concentrations reported as total suspended solids (TSS) and turbidity, which is the basis of the water quality standard. Therefore, it is assumed that the model results for TSS (reported in units of milligrams per liter [mg/L]) are the same as turbidity (reported as NTU). The assumption of a 1-to-1 ratio is likely conservative. A review of correlations between turbidity and TSS from 8 sediment dredging sites in the United States found the ratio of turbidity to TSS is always less than 1 (Figure 4-10) (Anchor 2003). Among the 8 sites, the ratio of turbidity to TSS ranges from approximately 0.2 to 0.9. A ratio of approximately 0.55 was reported for the Port of Everett, which is likely more representative of NAVBASE Kitsap Bremerton than the other sites included in the review (Anchor 2003).

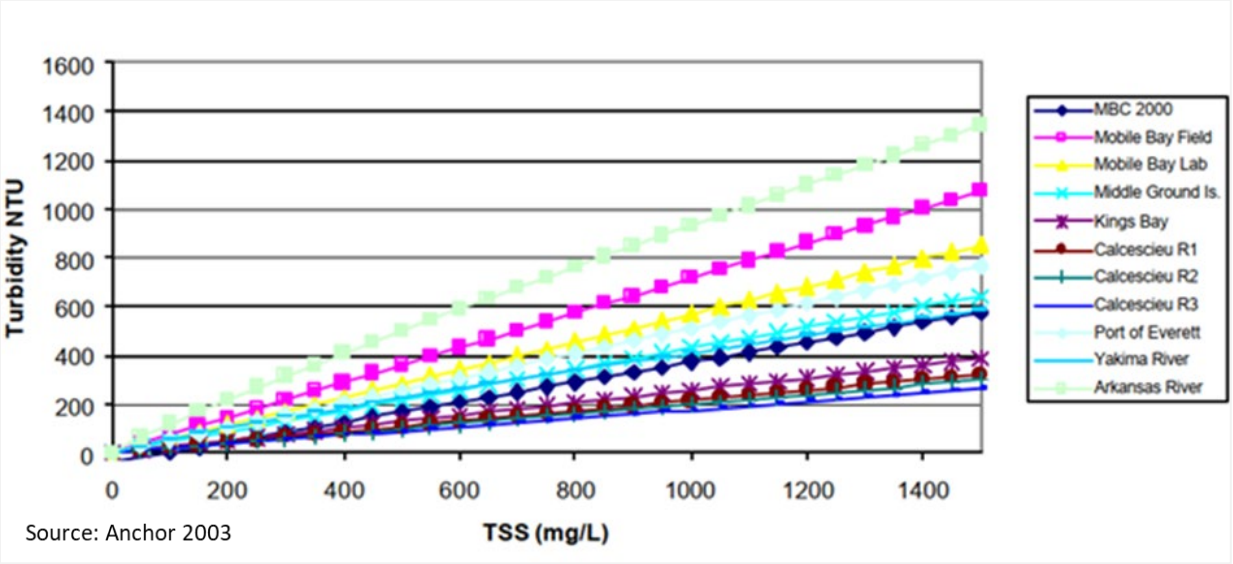

Figure 4-10 Relationship between Turbidity and Total Suspended Solids at Dredging Sites

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5 Model Selection and Existing Conditions Configuration

The selection of the HST model software was made based on a few key modeling requirements, summarized below:

- Sinclair Inlet has a large tidal excursion and is often exposed to strong winds. The current data indicate that the velocities' magnitude and direction vary over the water depth (Gartner et al. 1998). Therefore, a three-dimensional model is required.
- Sediment grain sizes within OU B Marine vary from coarse sand to clay size particles. Therefore, it will be necessary to simulate multiple particle size classes characterized with different settling speeds.
- The currents in Sinclair Inlet are due to both tides and wind forcing. Therefore, accommodating both types of forcing is required in the modeling.
- The model domain will need to be large enough to accommodate tide boundary conditions and the currently unknown extent of turbidity distribution. Therefore, variable grid size capabilities are necessary to provide a high degree of spatial resolution in model results near turbidity sources, within OU B Marine, and at the AOI, and less resolution elsewhere in the model domain.

While several industry-recognized models that can meet these modeling requirements are available (e.g., MIKE3D, DELFT-3D, FVCOM, ROM, and ADH), DELFT-3D was selected due to its documented extensive history of successful applications and focus on sediment transport processes (Gerritsen et al. 2008; De Goede 2020).

The model projection horizontal datum is State Plane Coordinates, Washington North. The vertical datum is MLLW. The model units are meters. The conversion from NAVD88 to MLLW is 0.854 meters (MLLW = NAV88 + 0.854) and was obtained using NOAA's online VDATUM conversion tool (NOAA 2024).

The HST model domain was developed to accommodate the location of suitable tide station data in order to provide tide forcing, as well as to accommodate a yet unknown extent of the turbidity distribution. The model domain includes Sinclair Inlet, Dyes Inlet, and a portion of Port Orchard Bay and Rich Passage (Figure 5-1).

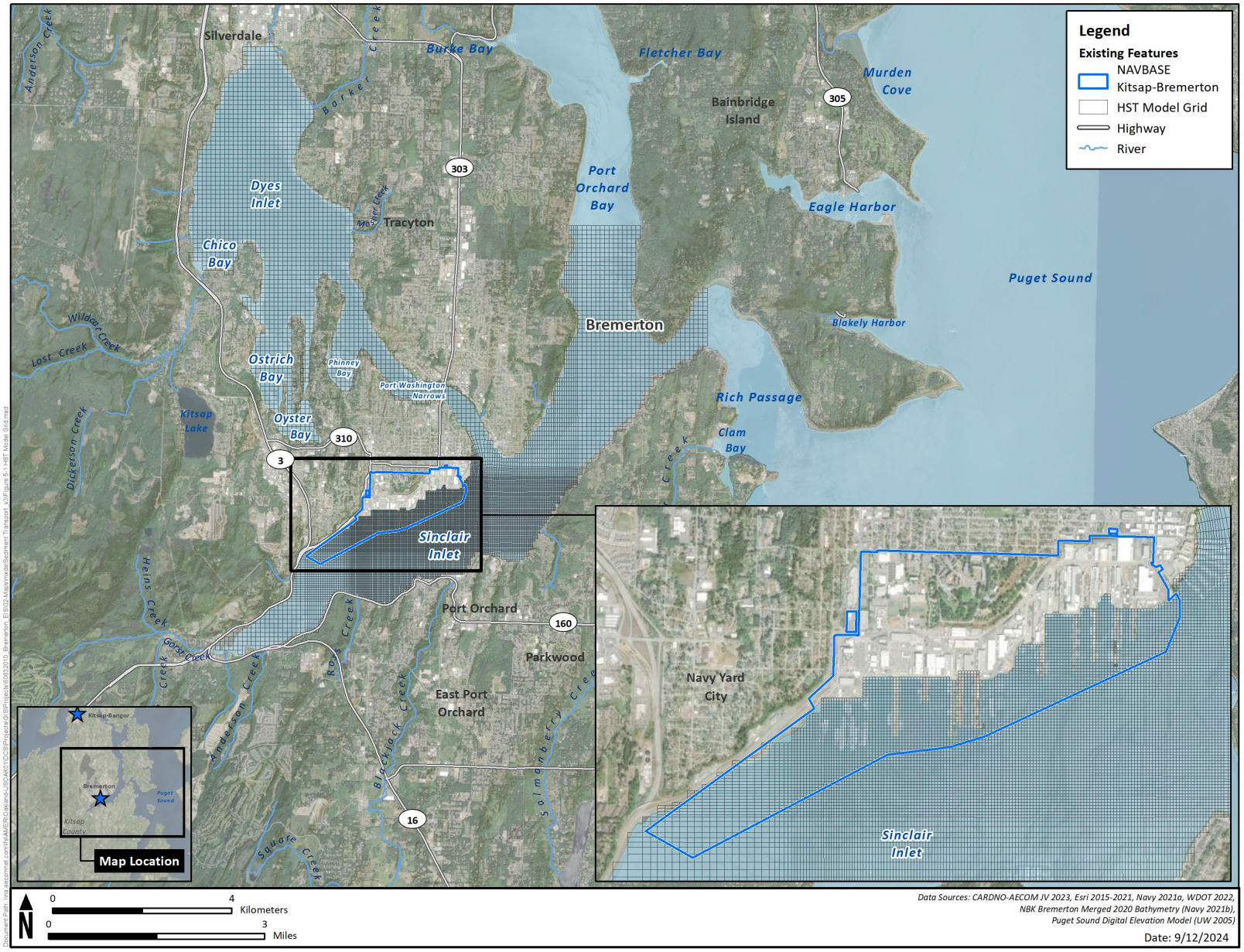

Figure 5-1 HST Model Grid Domain

The applicability of using Bremerton data at the nearby boundaries of Rich Passage and Port Orchard Bay (approximately 5 miles to the east) was tested.[2] Model simulations using the domain described above were implemented with the Bremerton station tide data as the boundary condition and the simulated tides at the Bremerton station location compared to the Bremerton station tides. The results shown in Figure 5-2 validate this approach (the two lines track very closely). A slight gain occurred in the tidal amplitude as it propagated from the boundary to the Bremerton gauge, on the order of 1 percent, and a phase lag of approximately 2 minutes. Based on these results, the model domain with boundaries at Rich Passage and Orchard Port Bay using the Bremerton tide gauge data at those boundaries was implemented.

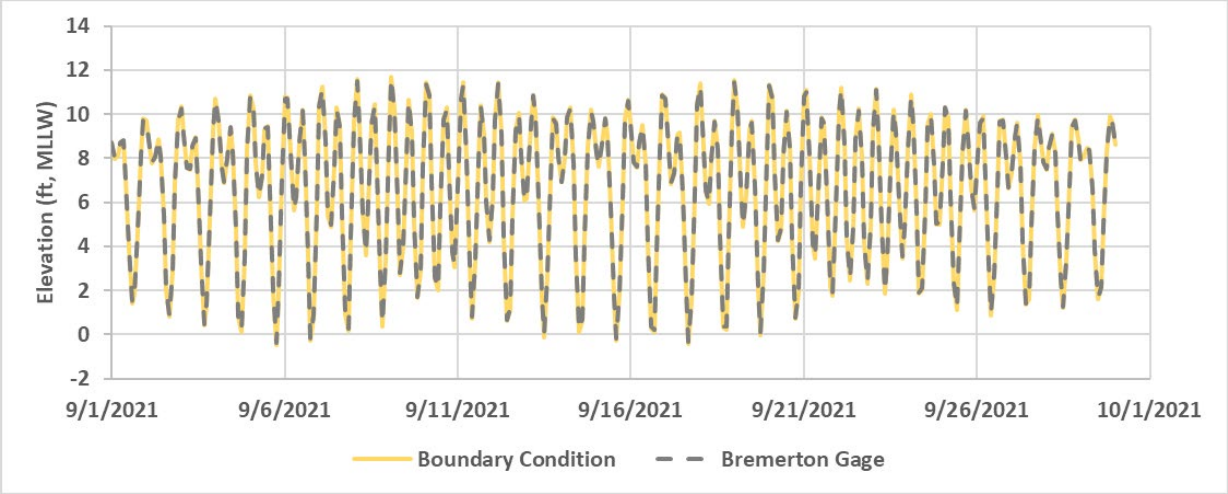

Figure 5-2 Tide Comparison (NOAA Station 9445959)

The model grid size ranged from 20 to 200 meters, with the smaller cells within OU B Marine and at the AOIs to provide adequate spatial resolution of the turbidity distribution at these locations (Figure 5-1). A 200-meter grid cell was used throughout the rest of the model domain. Four equally spaced vertical layers were used in a sigma-grid configuration.

To provide the model bathymetry, the NAVBASE Kitsap Bremerton bathymetry was combined with the PSDEM2005 DEM using ArcGIS Desktop (ArcMap). The vertical PSDEM2005 DEM was converted from NAVD88 to MLLW, and all data were projected to horizontal datum NAD 1983 2011 State Plane Washington North FIPS 4601 meters United States prior to data processing. The bathymetric data was merged into a single data set. In areas of overlapping data, the NAVBASE Kitsap Bremerton data were given preference. The bathymetric data (Figure 4-1 and Figure 4-2) were mapped on the HST model grid.

The model was initially configured with default model parameters for friction and turbulence mixing. The friction parameters were adjusted during the model calibration. Additional parameters are required to simulate the construction activity's impacts on turbidity and sedimentation. These include the sediment grain size, associated settling speed, the sediment release rate (SRR), and duration of the release for each construction-related activity. The development of these parameters is discussed in subsequent report sections.

[2] The next closest tide station is located in Seattle, 13 miles to the east of the study area.

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6 Model Calibration

For this study, the intent of model calibration is to develop a model that simulates the key hydrodynamic characteristics that give rise to turbidity dispersion and sediment deposition. The primary objective is to achieve confidence that these characteristics are captured to a sufficient degree of conservatism such that the calculated outcomes can be relied upon for assessing potential impacts or exceedances of water quality criteria. Available data for calibration were reviewed and subsets of this data were selected that resulted in a calibrated model that meets these objectives. This section documents the process of developing a calibrated model.

The HST model was calibrated to the USGS current velocity data collected in 1994 (Gartner et al. 1998). The calibration of model hydrodynamics is based on comparison to the USGS-measured current velocity data from the winter period (March 1, 1994, through March 30, 1994).

The USGS data also include a 37-day period of current velocity measurements from July 26, 1994, to September 1, 1994. This period was reviewed to assess its suitability for model calibration as it falls within the in-water work window whereas the March period does not. The wind data during the summer (July–August) period indicate a regular pattern of daily wind shifts with moderate wind speeds that did not yield a significant response in the measured velocities (only the expected tidal response was observed). The March 1994 velocity data show a clear flow response to a period of higher sustained winds, which is better for model calibration. As the purpose of the calibration is to demonstrate that the model can accurately simulate the wind-induced flows in Sinclair Inlet, the time period of the calibration data is less critical than the magnitude of the wind forcing and flow response. Therefore, the March 1994 current velocity data set was used because it provided a stronger basis for the model's simulation of wind forced flows than the summer data set.

The HST model was forced with the measured winds from the Port Orchard Marina Station and Bremerton tidal constituents[3] applied at the model boundaries in Rich Passage and Port Orchard Bay. The wind patterns during the calibration period (Figure 6-1) exhibited two patterns: a daily pattern in which the wind speed increases as it rotates from south-southwest to north-northwest, and then decreases as it rotates back to south-southwest. The second pattern is of higher sustained wind speeds ranging from 10 to 20 mph and blowing steadily from the south southwest. This second period occurs between March 15 and March 22, 1994.

[3] Tidal constituents were used for the calibration as measured tide data were not available at the Bremerton station in 1994. A review of tide data from the Bremerton station for the months of March 2022, 2023, and 2024 (NOAA 2024) shows that meteorological influences on tide elevations in Sinclair Inlet are minor. Therefore, the use of tidal constituents rather than measured tide data does not impact the analysis.

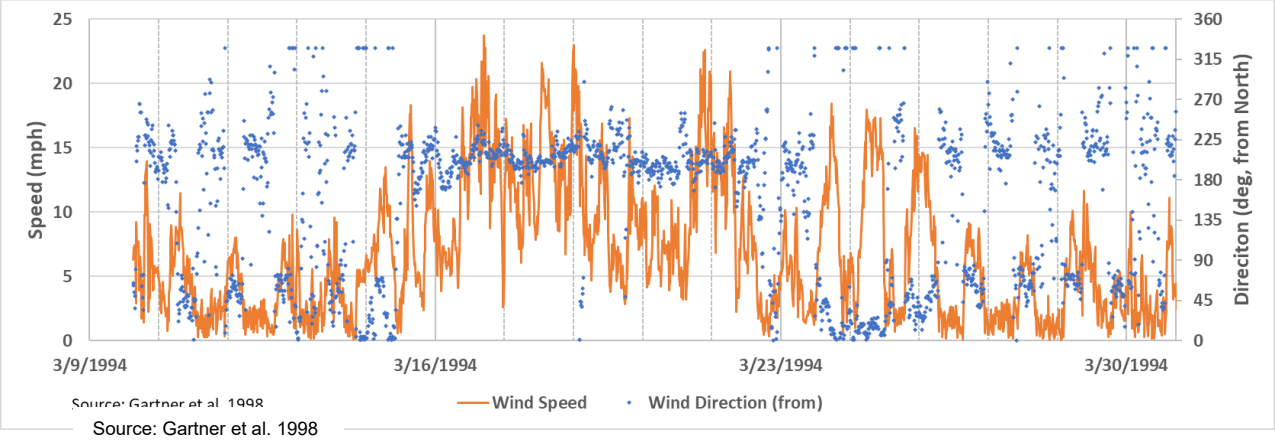
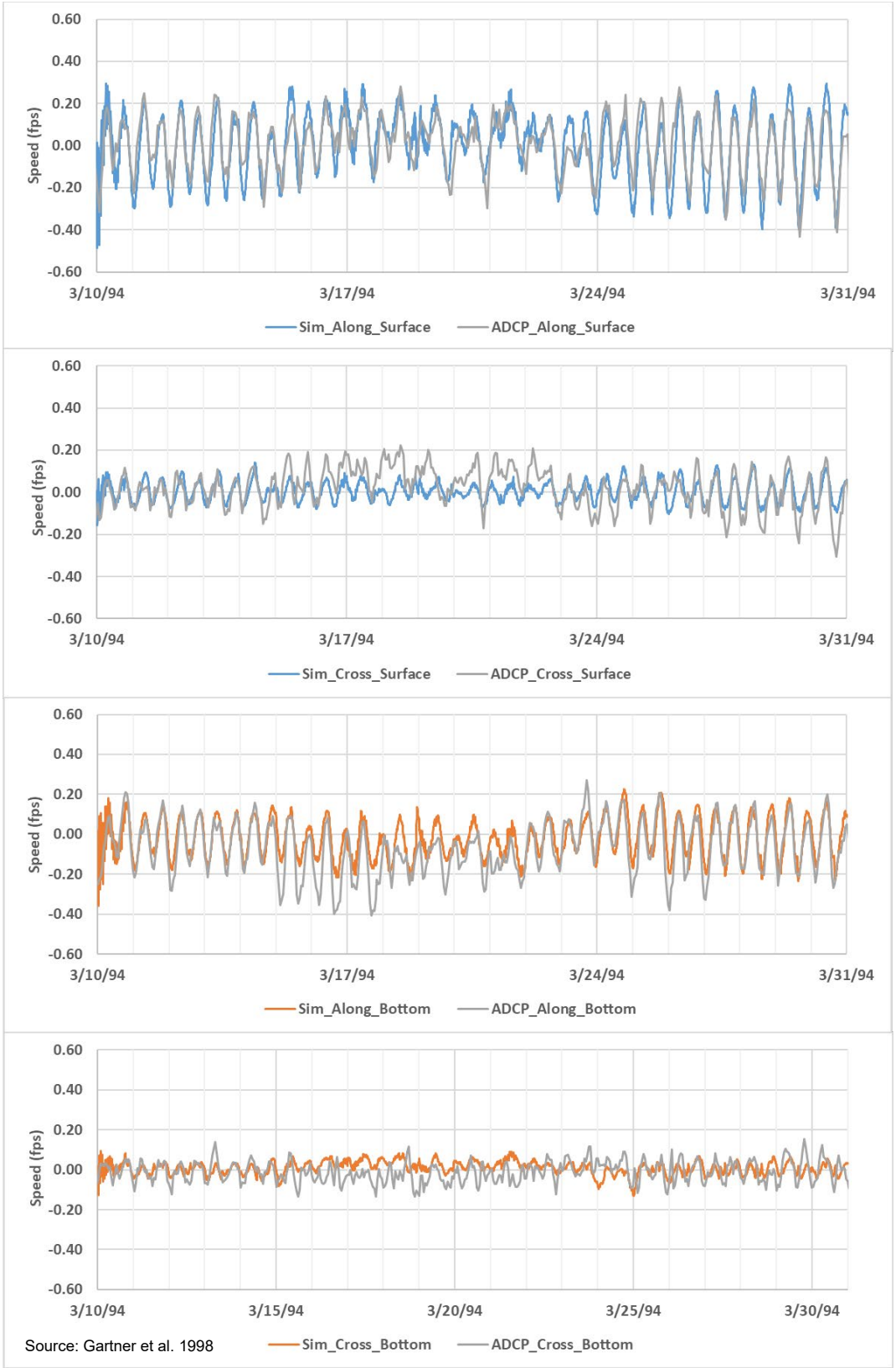


Figure 6-1 Wind Conditions for the March 1994 Calibration Period

The parameters adjusted to calibrate the HST model were the vertical and lateral mixing coefficients and the bottom friction. The calibration assessment was based on a graphical comparison and correlation metric for the bottom and surface velocities at the USGS ADCP central location. A graphical comparison was made between the measured and simulated surface and near-bottom velocities at the ADCP center location (Figure 6-2). The velocity data were resolved into an along-inlet axis, which is aligned on a southwest-northeast axis with flows to the northeast positive, and a cross-inlet axis, aligned in the southwest-northwest direction, with flows to the northwest positive. During the periods of lighter winds, the tides dominated the flows and the simulated velocities correlated with the measured data. The tidal velocities are relatively small, on the order of 0.2 to 0.4 feet per second (fps) (approximately 6 to 12 cm/s).

During the calibration period when the winds rotate to the south-southwest and are sustained, it is expected that the surface waters will veer to the north-northwest due to the wind drag on the water surface. When the northern shore of Sinclair Inlet is encountered, the flows are expected to veer back to the northwest and possibly down-well, yielding a near-bottom flow that is directed more to the south. This pattern is evident in a review of the measured data. The surface layer velocities increase in both the along-inlet (west-southwest–east-northeast) and cross-inlet (south-southeast–north-northwest) directions and the bottom velocities become negative, indicating that the bottom layer is flowing to the south-southwest. The impacts of the winds in the simulated velocities are evident and well reproduced in the surface layer in the along-inlet direction. The pattern is also evident in the bottom layer along-inlet velocities, but with a smaller response. The pattern is not as evident in the simulated cross-inlet surface and bottom layer velocities. However, the cross-inlet velocities are typically very low, on the order of 0.033 fps to 0.066 fps (1 to 2 cm/s).



Source: Gartner et al. 1998

Figure 6-2 Comparison of Measured and Simulated Velocities

Table 6-1 provides a summary of key mathematical parameters typically used to document how well a model fits measured data. Its purpose is to document how the model compares to measured data from the field. Quantitative measures of the model's calibration using the 1994 USGS data shown in Table 6-1 include the mean absolute error, the coefficient of determination, a comparison of the mean and standard deviation of the modeled and measured velocities, and the slope and intercept of a linear curve fit to the measured-model scatter plots (Legates and McCabe 1999).

Table 6-1 Evaluation of the HST Model's Calibrated Velocities

Measure of Calibration		***Surface Along-Inlet***	***Bottom Along-Inlet***	***Surface Cross-Inlet***	***Bottom Cross-Inlet***
Mean Absolute Error (fps)		0.067	0.068	0.061	0.049
Coefficient of Determination		0.83	0.83	0.60	0.18
Slope (-)		0.72	1.14	1.11	0.29
Intercept (fps)		0.01	0.02	-0.04	-0.01
Mean Velocity (fps) [a]	Measured	0.11	0.12	0.08	0.04
	Model	0.13	0.09	0.04	0.03
Standard Deviation (fps) [a]	Measured	0.07	0.09	0.05	0.03
	Model	0.08	0.05	0.03	0.02

Legend: fps = feet per second.

[a] The absolute value of velocity was used to calculate the mean and standard deviation of velocities.

The quantitative measures of the calibration indicate that the model performs well simulating along-inlet velocities. For both the surface and bottom along-inlet velocities, the coefficient of determination is above 0.8 (the closer to 1, the stronger the correlation). The coefficient of determination is a standard statistical measure of variation often referred to as an R^2 value when fitting a line to a data series. The mean absolute error is also relatively low compared to the range of velocities, which is indicated by the standard deviation, meaning that the model is providing reliable results.

The cross-inlet surface velocity coefficient of determination of 0.6 also indicates a strong representation of those velocities. The simulated cross-inlet bottom velocities are not as well-correlated with the measured velocities; however, they have the lowest magnitude and consequently the smallest impact on turbidity dynamics.

The average speeds for each direction were calculated using the absolute value of the velocities because the signals were tidally dominated. In the along-inlet direction, the average measured surface and bottom speeds were on the order of 0.11 to 0.12 fps, and in the cross-inlet direction were 0.04 to 0.08 fps. These trends were reproduced in the simulated velocities.

Overall, the calibrated model reliably reproduces the key characteristics of the tide and wind-driven circulation and is suitable for evaluating the construction activity impacts of the two action alternatives.

7 Environmental Scenarios

The evaluation of the construction-related sediment impacts from the two action alternatives requires conducting simulations over a range of environmental conditions that may occur during the construction. These conditions are characterized by the wind and tide conditions during the July 16 to February 15 in-water construction window. For Tidal Reference Area 5, which includes Sinclair Inlet, Dyes Inlet, Port Orchard, and Port Madison, in-water work is prohibited from February 16 to July 15 to protect fish at sensitive life stages including spawning, incubation, juvenile migration, rearing, and feeding (USACE 2017).

For tides, it is important to cover conditions during both the higher and lower tide ranges. At lower tide ranges, lower velocities and associated dispersion occur. Thus, suspended sediment concentrations may be higher and travel a smaller distance than during periods of higher tide range. A similar situation exists for winds, with less dispersion during lower energy periods and greater dispersion during higher energy periods. In addition to the wind energy, it is also necessary to consider the predominant wind patterns (summer/fall and winter).

The measured tide conditions at Bremerton and wind records from Bremerton National Airport were reviewed to determine suitable periods for simulation. For tides, the daily high and low tide range data from NOAA's Tide and Currents website for 2021–2022 and 2022–2023 were analyzed to determine the maximum, minimum, and average daily tide range for each month during the July 16 to February 15 window when in-water work is allowed (Figure 7-1). The patterns from both years are similar, with the highest ranges occurring in the winter (approximately 17 feet) and the lower ranges occurring in the fall (approximately 12.5 feet). Based on these results, December 2022 and September 2022 were selected to represent the high and low tide range conditions, respectively.

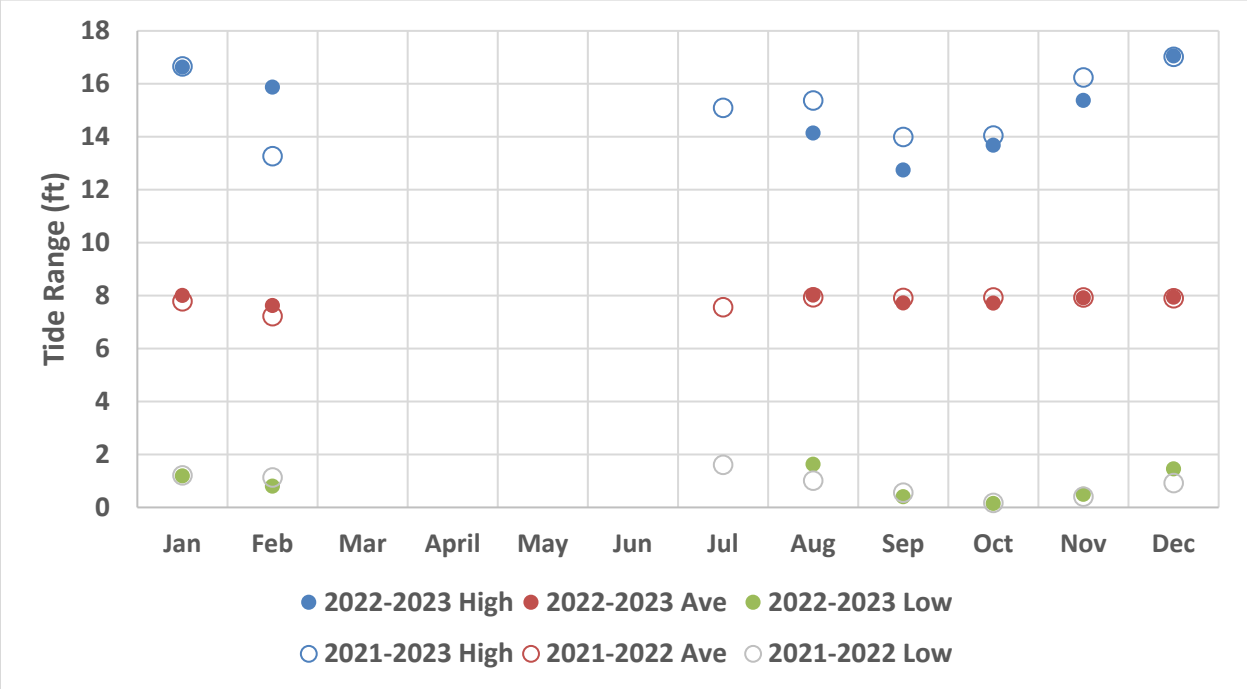


Figure 7-1 Monthly Daily Tide Statistics (NOAA Station 9445958)

The selection of the representative wind records is more complex because both wind energy and the prevailing patterns need to be considered. To simplify the analysis, a no-wind condition was selected to represent the low energy period for both the fall and winter periods. No winds for an extended period of time is highly unlikely, but is included to provide a conservative estimate of the potential impacts (i.e., less dispersion of suspended sediment). To screen for high energy conditions, Bremerton National Airport hourly wind speed and direction data for the 10-year period from 2011 to 2020 were reviewed. Because wind drag on the water surface varies as the square of the wind speed, the wind speed squared (m^2/s) was used as a surrogate for the wind energy. For each month, the wind speed squared was summed for each wind direction bin (30-degree bin increments) to assess monthly patterns in wind energy and direction (Table 7-1). The months that fall entirely or partly within the February 16 to July 15 window when in-water work is not allowed (red shaded cells) were not considered. Of the remaining data, the yellow shaded cells represent the northeast winds and the orange shaded cells represent the southwest winds. Most of the wind energy is associated with those directions. The analysis also indicates that wind energy is due to predominantly southwest winds during the months of November, December, and January, and more balanced between the northeast and southwest directions during August and September, with October being a transitional month.

Table 7-1 Variation of Wind Speed Squared with Month and Direction for Bremerton National Airport

Direction (degrees)/ Month	*15*	*45*	*75*	*105*	*135*	*165*	*195*	*225*	*255*	*285*	*315*	*345*
1 (Jan)	10,665	10,973	760	148	209	9,487	61,967	15,481	691	213	81	856
2 (Feb)	7,012	9,548	902	119	186	6,351	27,765	8,204	481	54	37	314
3 (Mar)	556	4,407	568	23	49	20	1,113	1,457	65	32	3	23
4 (Apr)	360	2,509	686	45	32	137	3,740	4,734	128	8	25	8
5 (May)	350	1,658	538	25	28	187	1,908	2,981	264	35	31	
6 (Jun)	283	2,172	505	73	55	160	1,574	2,363	411	46	30	23
7 (Jul)	4,722	9,072	2,251	324	436	2,218	12,873	7,017	1,074	214	99	425
8 (Aug)	8,099	18,222	3,762	369	471	4,542	17,591	11,009	1,526	335	128	479
9 (Sep)	12,222	19,310	2,932	313	415	7,880	26,204	13,313	1,403	159	127	881
10 (Oct)	9,552	16,087	2,594	270	390	12,315	39,155	13,222	1,324	125	49	1,553
11 (Nov)	10,482	12,448	1,175	158	320	12,607	49,241	13,136	911	91	73	549
12 (Dec)	9,156	10,792	835	173	283	9,837	45,528	10,325	719	163	80	803

Notes: Red shading indicates month falls entirely or partly within time period (February 16–July 15) when in-water work is not allowed. Yellow shading represents northeast winds. Orange shading represents southwest winds. Values are wind speed squared (m^2/s).

The analysis was refined to review each year-month period to determine representative months for the model simulations. First, the months with the highest wind energy were identified (top 25 percent) and then sorted based on the ratio of the northeast to southwest wind energy (Table 7-2). Next, the month with the highest ratio (October 2020) and the lowest ratio (January 2020) were selected. Plots of wind speed and direction for these two months were reviewed (Figure 7-2) to ensure they are representative and do not contain anomalous conditions. As no anomalies were detected, these wind periods were used in the analysis.

Table 7-2 Ranking of Northeast and Southwest Wind Energy by Month and Year

Month-Year	*Total Energy*	*NE Energy*	*SW Energy*	*NE/SW Ratio*
1-2020	1,333	232	5,025	0.05
10-2016	896	280	4,142	0.07
1-2012	1,288	476	5,460	0.09
1-2011	1,090	488	5,059	0.10
10-2014	933	453	3,642	0.12
11-2017	1,038	550	3,783	0.15
1-2018	1,065	688	3,992	0.17
11-2020	1,126	621	3,338	0.19
1-2014	1,322	866	4,281	0.20
12-2018	953	777	3,692	0.21
10-2012	1,142	854	3,829	0.22
11-2014	1,160	993	3,999	0.25
10-2015	1,049	956	3,545	0.27
10-2017	982	1,777	1,977	0.90
9-2014	933	1,439	1,567	0.92
10-2020	893	1,341	1,180	1.14

Note: Units are in m^2/s.
Legend: NE = Northeast; SW = Southwest.

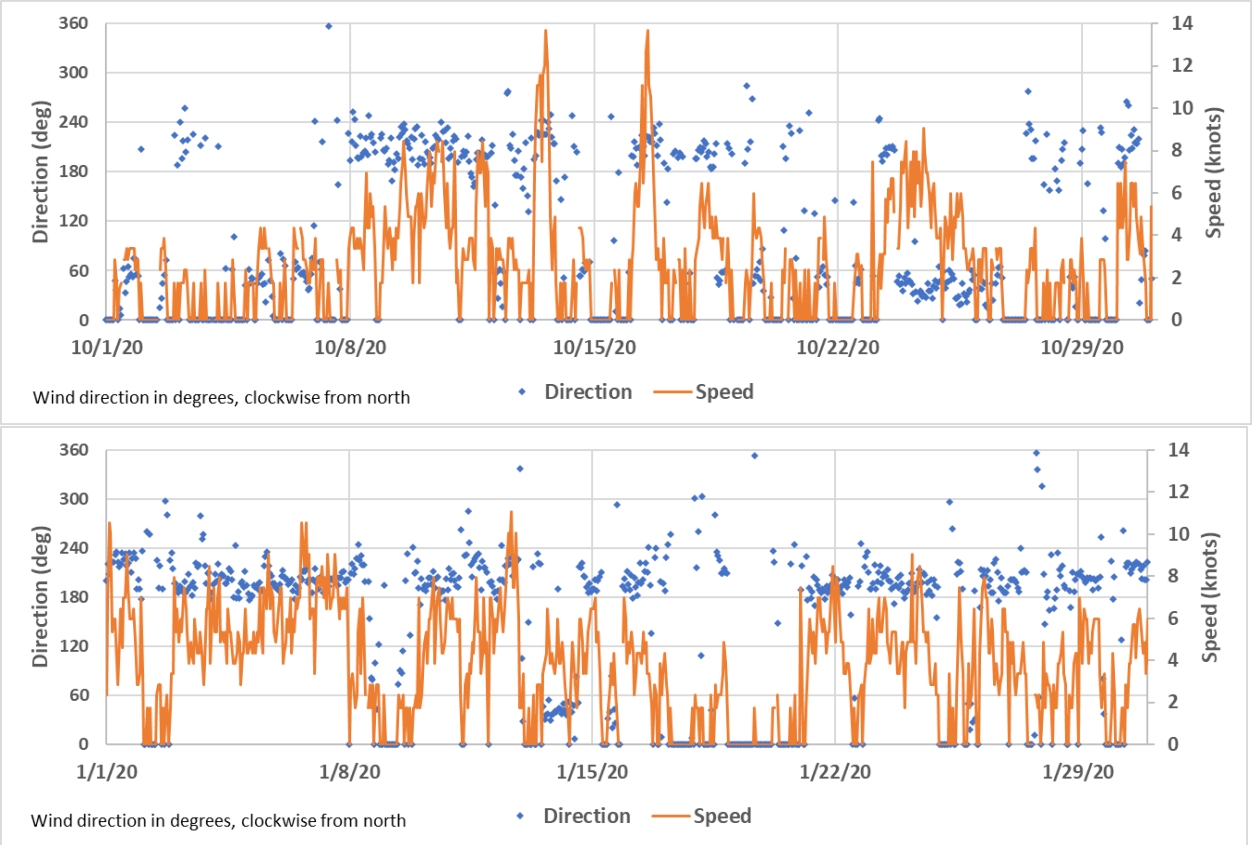


Figure 7-2 High Energy Wind Conditions

The combination of the tides and wind periods yielded six environmental scenarios for the model simulations, summarized in Table 7-3.

Table 7-3 Summary of Environmental Scenarios

Scenario	*Tide Condition*	*Wind Condition*
Env01	September 2022 Low	No winds
Env01A	September 2022 Low	October 2020 (fall)
Env01B	September 2022 Low	January 2020 (winter)
Env02	December 2022 High	No winds
Env02A	December 2022 High	October 2020 (fall)
Env02B	December 2022 High	January 2020 (winter)

8 In-Water Construction Scenarios

Both action alternatives involve components with in-water construction as summarized in Table 8-1.

Table 8-1 Summary of In-Water Construction Components

Alternative 2 – M2D2 at DD3	*Alternative 3 – M2D2 at Mooring A*
Demolition of Piers 4, 5, 6, and 7	Demolition of Mooring A
Construction of new M2D2 at DD3	Construction of new M2D2 at Mooring A
Construction of new Piers 2, 4, and 6	Construction of new Pier 4
Improvements to Moorings E, F, and G	Improvements to Moorings E, F, and G
Seismic upgrades to DD6	Seismic upgrades to DD6
Dredging for demolition of existing structures	Dredging for demolition of existing structures
Dredging for berthing basins	Dredging for berthing basins and a turning basin
Dredging for adequate draft at wharves and piers	Dredging for adequate draft at wharves and piers

Legend: DD3 = dry dock 3; DD6 = dry dock 6; M2D2 = multi-mission dry dock.

The construction sequencing schedules for Alternatives 2 and 3 show in-water work occurring between 2026 and 2039. During the approximately 7-month period when in-water construction is allowed (July 16–February 15), a variety of dredging, demolition, and new construction activities are scheduled to take place, some of which overlap in time and, to some extent, space. Table A-1 and Table A-2 in Appendix A present chronological lists of in-water construction activities associated with Alternatives 2 and 3, respectively. The type of activity, projected start/end dates, anticipated duration, and specifics on the activity are provided to the extent they are known or can be estimated at this time (e.g., dredging volume and rate, pile type, and number removed or installed).

As it is not possible to model all in-water work that would occur under each alternative, sets of temporally overlapping activities were modeled to provide a reasonable but conservative characterization of possible impacts. Selection of the sets of in-water construction activities to model was based on the type and number of overlapping activities. Time periods involving dredging were identified first as prior modeling has shown sediment impacts from dredging to be greater than pile-related activities. Construction time periods not selected for modeling generally had no dredging and/or fewer in-water activities taking place concurrently. Construction activities projected to occur within a cofferdam, such as Phase 2 dredging for Alternative 2, were not modeled as sediment impacts would be confined within the structure.

8.1 Selection of Time Periods and Activities to Model

For Alternative 2, two time periods were selected to model: fall 2026 and fall 2027. For Alternative 3, three time periods were selected: fall 2029, fall 2030, and fall 2035. These time periods were selected because they have the greatest number of concurrent activities including dredging in one or more areas. The set of activities occurring in each time period is shown in Table 8-2 and Table 8-3 for Alternatives 2 and 3, respectively, and summarized below. The spatial layouts for each set of activities are shown in Figure A-1 through Figure A-10 in Appendix A.

Table 8-2 Alternative 2 Construction Activities for Model Simulations – M2D2 at DD3

Component Number	*Component Description*	*Activity Description* [a]	*Start Date*	*End Date*	*Set 1* [b]	*Item Code* [c]	*Set 2* [d]	*Item Code* [c]
Moorings E, F, and G	Mooring F Modification	Install steel batter piles	July [redacted], 2026	February [redacted], 2027	✓	A	N/A	N/A
		Install precast concrete fender piles	July [redacted], 2026	February [redacted], 2027	✓	B	N/A	N/A
2	Install Cofferdam for Saltwater Pumphouse West	Install sheet piles	July [redacted], 2026	February [redacted], 2028	✓	C	✓	F
		Install steel batter piles	July [redacted], 2026	February [redacted], 2028	✓	D	✓	G
2	Temporary Access Pier	Install steel piles (2 rigs)	July [redacted], 2026	February [redacted], 2027	✓	E and F	N/A	N/A
14	Pier 2 Construction	Dredge Pier 2 Basins (2 derricks)	July [redacted], 2026	February [redacted], 2027	✓	G and H	N/A	N/A
2	M2D2 Phase 1 Dredging	Dredge Basin and Piers 6 and 7 Foundations (2 derricks)	August [redacted], 2026	February [redacted], 2029	✓	I and J	✓	A and B
2	Cofferdam at DD3	Install sheet piles	August [redacted], 2026	February [redacted], 2029	✓	K	N/A	N/A
2	Cofferdam at DD3	Install steel pipe piles	August [redacted], 2026	February [redacted], 2029	✓	L	✓	D
14	Pier 2 Construction	Install concrete piles	September [redacted], 2026	February [redacted], 2027	✓	M	N/A	N/A
14	Pier 2 Construction	Install steel piles	September [redacted], 2026	February [redacted], 2027	✓	N	N/A	N/A
2	Pier 6 Demo	Remove concrete foundations	July [redacted], 2027	February [redacted], 2030	N/A	N/A	✓	I
2	Pier 6 Demo	Remove timber piles	July [redacted], 2027	February [redacted], 2030	N/A	N/A	✓	H
2	Pier 7 Demo	Remove timber piles	July [redacted], 2027	February [redacted], 2030	N/A	N/A	✓	C
2	Pier 8 Demo	Remove former Pier 8 foundations	July [redacted], 2027	February [redacted], 2030	N/A	N/A	✓	E

Notes: [a] Chronology of in-water construction activities and start/end dates based on August 8/30/2023 construction sequencing schedule and discussions with Navy and design team. [b] Set 1 includes activities scheduled to occur during the late summer and fall of 2026. [c] Item code assigned to each activity corresponds to spatial layouts for the model shown in Figure A-1 to Figure A-5 of Appendix A. [d] Set 2 includes activities scheduled to occur during the late summer and fall of 2027.

Legend: N/A = not applicable.

Table 8-3 Alternative 3 Construction Activities for Model Simulations – M2D2 at Mooring A

Component Number	*Component Description*	*Activity Description* [a]	*Start Date*	*End Date*	*Set 1* [b]	*Item code* [c]	*Set 2* [d]	*Item code* [c]	*Set 3* [e]	*Item code* [c,e]
3	Temporary Sheet Pile Cutoff Wall	Remove sheet piles (2 rigs)	July [redacted], 2029	September [redacted], 2029	✓	A & B	N/A	N/A	N/A	N/A
3	Dredging for M2D2 Construction	Dredge and prepare seabed for foundations (2 derricks)	August [redacted], 2029	February [redacted], 2030	✓	C & D	N/A	N/A	N/A	N/A
3	Dredging for M2D2 Construction	Dredge/cut caisson foundations into till (2 derricks)	July [redacted], 2030	December [redacted], 2030	N/A	N/A	✓	A & B	N/A	N/A
3	M2D2 Construction	Install sheet piles for walls	July [redacted], 2030	November [redacted], 2031	N/A	N/A	✓	C	N/A	N/A
3	M2D2 Construction	Install steel piles for walls	July [redacted], 2030	November [redacted], 2031	N/A	N/A	✓	D	N/A	N/A
3	M2D2 Construction	Install steel piles for floor	July [redacted], 2030	November [redacted], 2031	N/A	N/A	✓	E	N/A	N/A
3	Dredging for M2D2 Construction	Dredge berthing basins (2 derricks)	July [redacted], 2035	January [redacted], 2036	N/A	N/A	N/A	N/A	✓	A & B
3	Dredging for M2D2 Construction	Dredge turning basins (2 derricks)	July [redacted], 2035	January [redacted], 2036	N/A	N/A	N/A	N/A	✓	C & D
5	DD6 Upgrade	Demo Pier 9 – remove piles	September [redacted], 2035	October [redacted], 2035	N/A	N/A	N/A	N/A	✓	E
5	DD6 Upgrade	Install sheet piles for walls	September [redacted], 2035	November [redacted], 2035	N/A	N/A	N/A	N/A	✓	F
5	DD6 Upgrade	Install steel piles for walls	October [redacted], 2035	November [redacted], 2035	N/A	N/A	N/A	N/A	✓	G
10	Pier 4 Demo	Dredging for Pier 4 demo (2 derricks)	December [redacted], 2035	November [redacted], 2037	N/A	N/A	N/A	N/A	✓	H & I
10	Pier 4 Demo	Remove concrete foundations	December [redacted], 2035	November [redacted], 2037	N/A	N/A	N/A	N/A	✓	J

Notes: [a] Chronology of in-water construction activities and start/end dates based on August 30, 2023, construction sequencing schedule and discussions with Navy and design team. [b] Set 1 includes activities scheduled to occur during late summer and fall 2029. [c] Item code assigned to each activity corresponds to spatial layouts for the model shown in Figure A-6 to Figure A-10 of Appendix A. [d] Set 2 includes activities scheduled to occur during late summer and fall 2030 (item code assigned for modeling shown). [e] Set 3 includes activities scheduled to occur during late summer and fall 2035.

Legend: N/A = not applicable.

8.1.1 Alternative 2 – Sequence 1 (Fall 2026)

Concurrent construction activities modeled for the Alternative 2, Sequence 1 (fall 2026) time period include: Phase 1 basin dredging for M2D2 at DD3 (two derricks), pile driving for cofferdams at DD3 and the Saltwater Pumphouse West (sheet and pipe driving), pile driving for the temporary access pier east of Pier 7, basin dredging and pile driving for new Pier 2 (two derricks), and pile driving for modification of Mooring F (Figure A-1 through Figure A-4 in Appendix A). Figure 8-1 presents the locations of the sediment release activities modeled for Alternative 2, Sequence 1.

8.1.2 Alternative 2 – Sequence 2 (Fall 2027)

Concurrent construction activities modeled for the Alternative 2, Sequence 2 (fall 2027) time period include: Phase 1 basin dredging for M2D2 at DD3 (two derricks), pile driving for cofferdams at DD3 and the Saltwater Pumphouse West (sheet and pipe driving), pile removal at Pier 7 (one derrick), pile removal at Pier 6 (two derricks), foundation removal at former Pier 8 (one derrick) driving for the temporary access pier east of Pier 7, basin dredging and pile driving for new Pier 2, and pile driving for modification of Mooring F (Figure A-5 in Appendix A). Figure 8-2 presents the locations of the sediment release activities modeled for Alternative 2, Sequence 2.

8.1.3 Alternative 3 – Sequence 1 (Fall 2029)

Concurrent construction activities modeled for the Alternative 3, Sequence 1 (fall 2029) time period include: temporary cofferdam pile extraction and dredging for M2D2 foundations (Figure A-6 and Figure A-7 in Appendix A). Figure 8-3 presents the locations of the sediment release activities modeled for Alternative 3, Sequence 1.

8.1.4 Alternative 3 – Sequence 2 (Fall 2030)

Concurrent construction activities modeled for the Alternative 3, Sequence 2 (fall 2030) time period include: pile driving for sheet and pipe piles for walls and floors and cutting and dredging M2D2 foundations into till (Figure A-6 and Figure A-8 in Appendix A). Figure 8-4 presents the locations of the sediment release activities modeled for Alternative 3, Sequence 2.

8.1.5 Alternative 3 – Sequence 3 (Fall 2035)

Concurrent construction activities modeled for the Alternative 3, Sequence 3 (fall 2035) time period include: pile driving for DD6 upgrade, pile extraction to demolish section of Pier 9, dredging for M2D2 berthing and turning basins, and dredging and pile extraction for Pier 4 demolition (Figure A-6, Figure A-9, and Figure A-10 in Appendix A). Figure 8-5 presents the locations of the sediment release activities modeled for Alternative 3, Sequence 3.

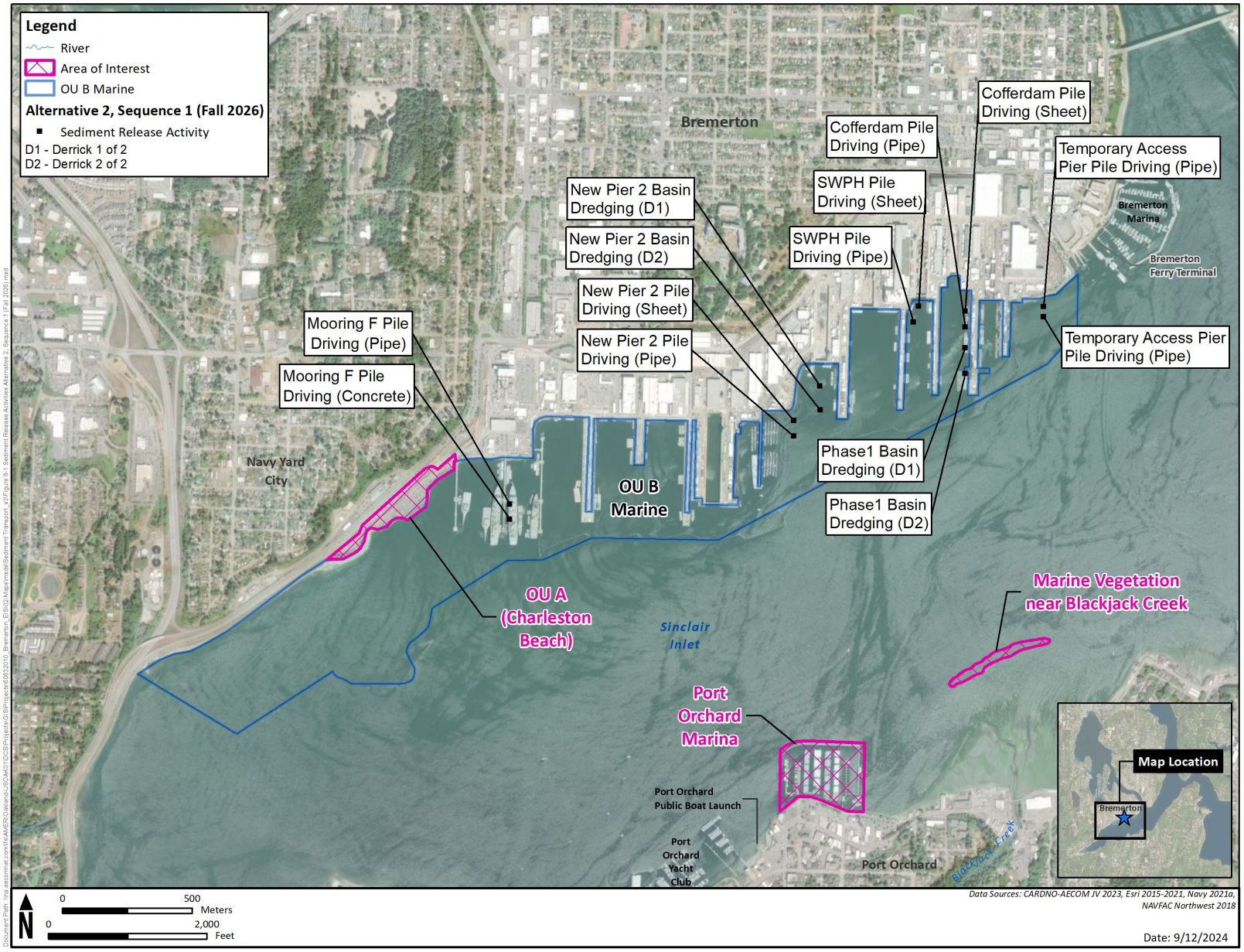


Figure 8-1 Sediment Release Activities Modeled for Alternative 2, Sequence 1 (Fall 2026)

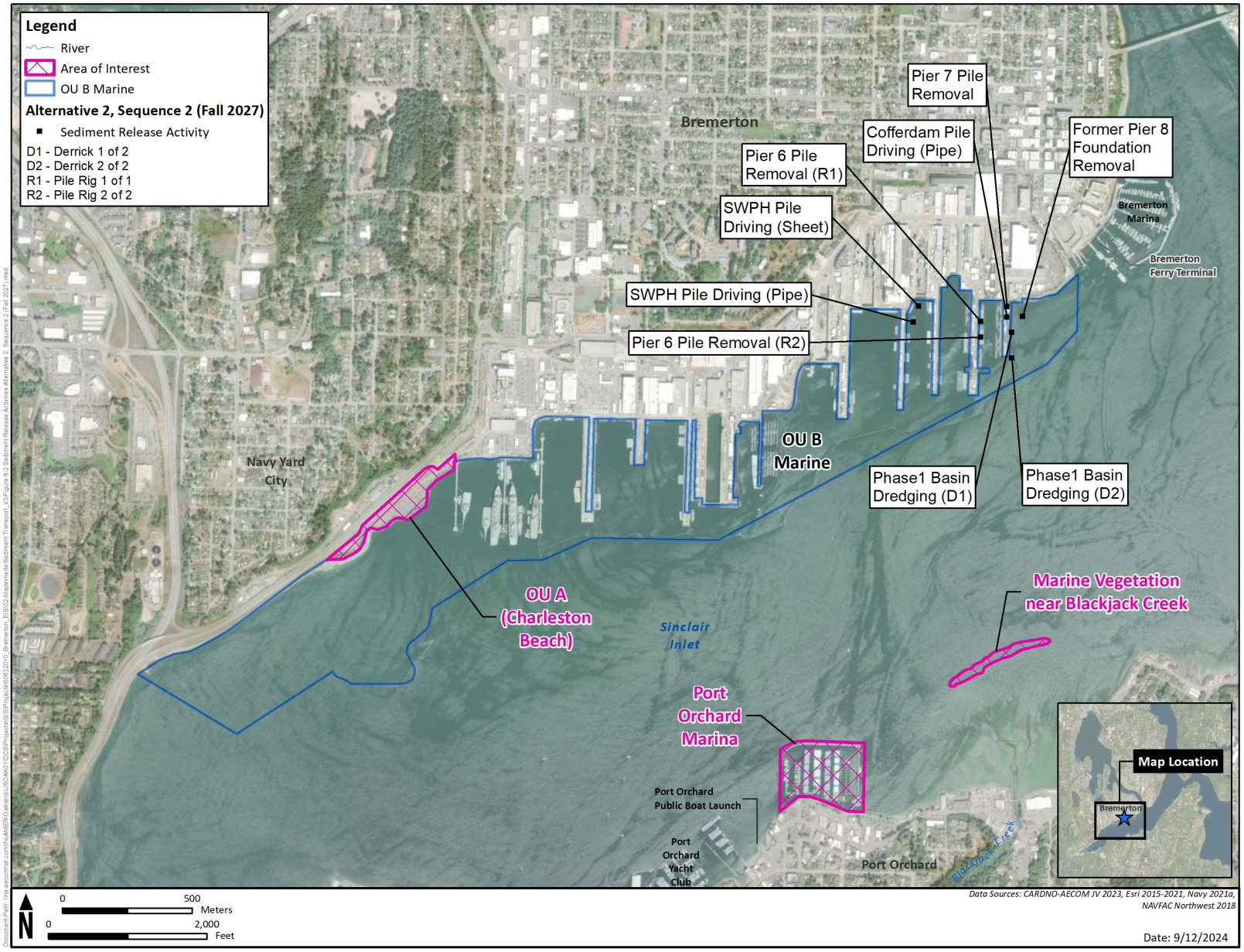


Figure 8-2 Sediment Release Activities Modeled for Alternative 2, Sequence 2 (Fall 2027)

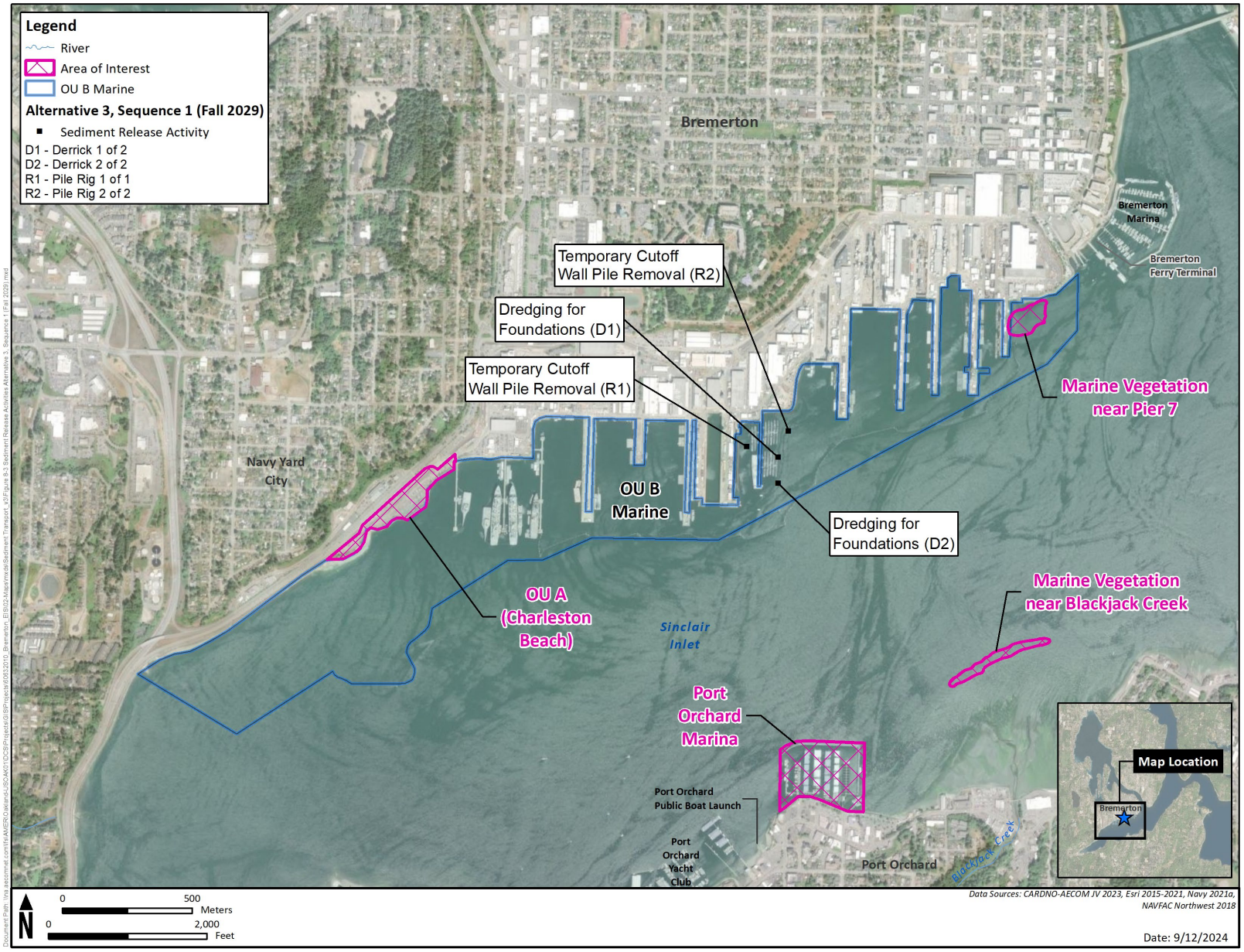


Figure 8-3 Sediment Release Activities Modeled for Alternative 3, Sequence 1 (Fall 2029)

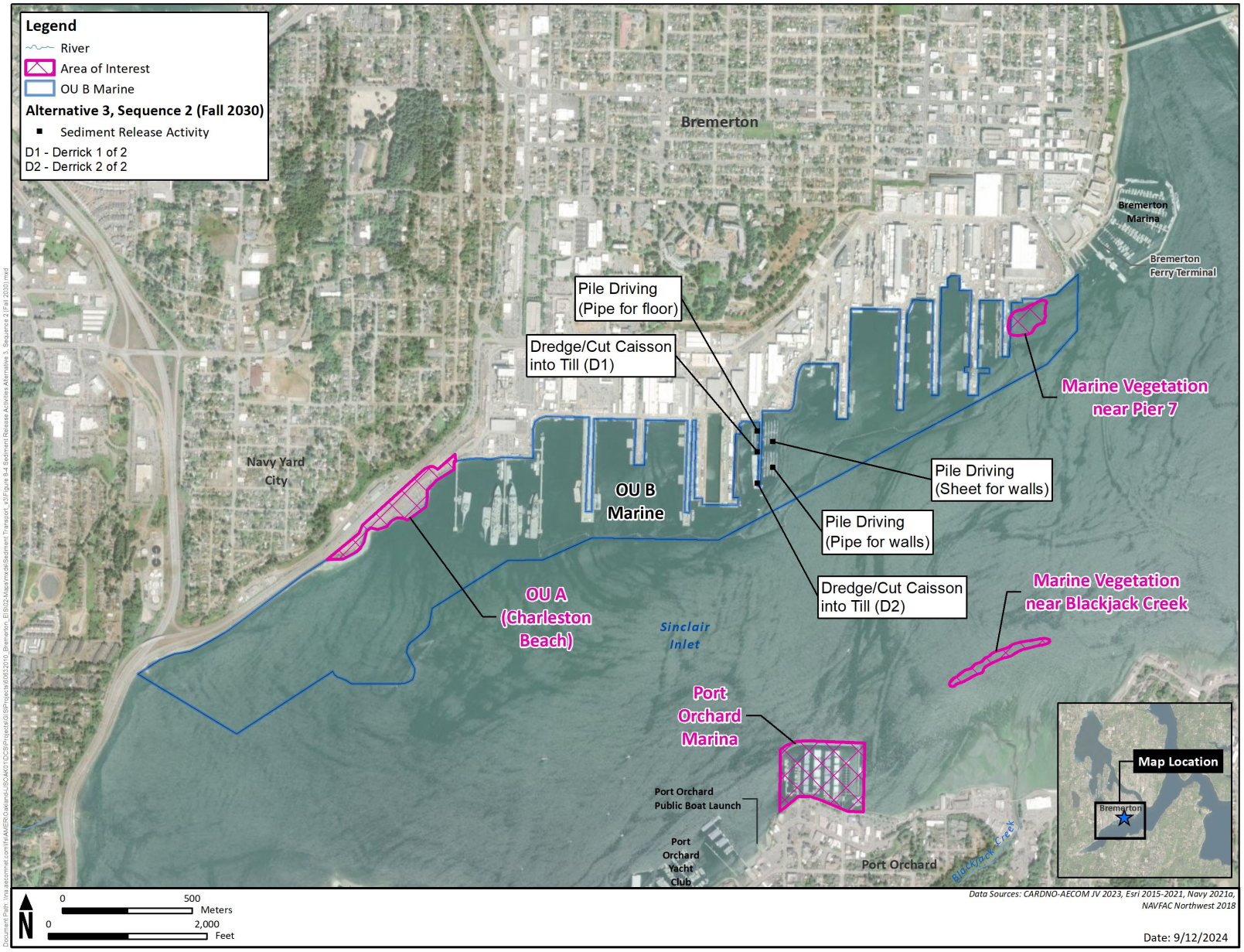


Figure 8-4 Sediment Release Activities Modeled for Alternative 3, Sequence 2 (Fall 2030)

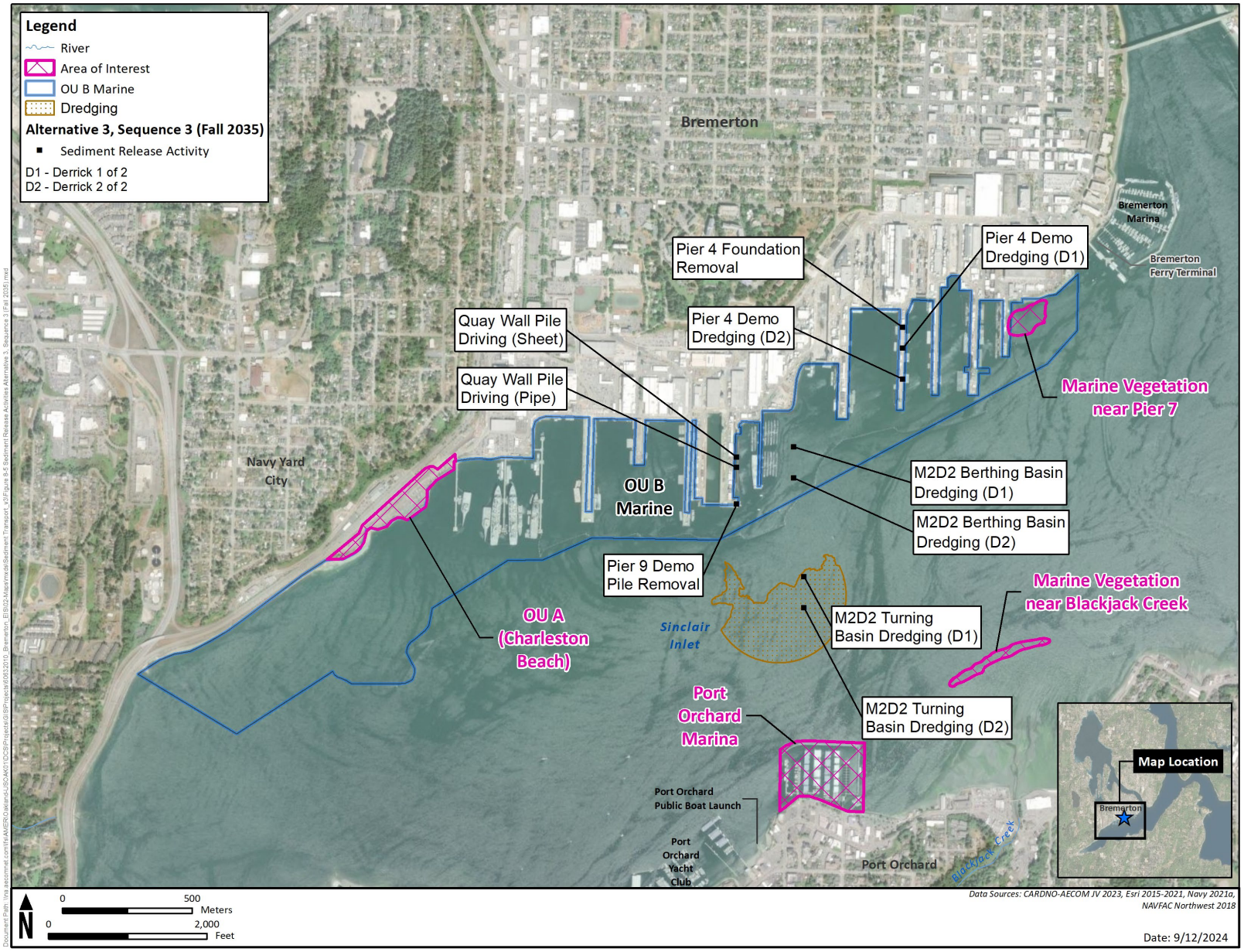


Figure 8-5 Sediment Release Activities Modeled for Alternative 3, Sequence 3 (Fall 2035)

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9 Sediment Characterization

A key parameter for modeling turbidity impacts is the sediment composition. Sediment grain size and porosity are needed to convert sediment volumes associated with in-water construction activities to sediment particle release rates. The two key sediment properties affecting the conversion are the porosity and the percent fines. It is standard practice to only account for the fraction of fines (silts and clays) in the sediments for the purpose of simulating the water column sediment concentrations induced by dredging and pile activities. Implicit in this approach is the assumption that the sand fractions have relatively large settling speeds, will settle back to the seabed quickly, and will not contribute significantly to the suspended sediment concentrations.

The analysis presented in Section 4.7 indicated a strong correlation between percent fines and porosity. The following studies provided the data needed to incorporate both percent fines and porosity into the analysis (including TS and/or WC if porosity was not reported):[4]

- Sediment Characterization at Puget Sound Naval Shipyard (SAIC 2000)
- Bremerton Remedial Investigation, Appendix P (URS Group URS Inc. (URS) 2002)
- Geotechnical Report, Volume 4 (WSP 2021)
- Sediment Grain Size Data Provided in Excel File: M2D2_GSD_WSP_HC (with Modified HC Results) – R01-05042023 from Navy.xlsx (HC 2022)
- Sediment Characterization Report (WSP 2023)

The data set includes 39 samples from locations within and adjacent to areas where in-water construction will be performed (Figure 9-1). The calculation of a factor for converting the bulk sediment volume to a sediment release rate, referred to as the percent fines conversion factor (PFCF), is presented for each sample in Table 9-1. The PFCF is equal to the percent fines multiplied by one minus the porosity (p). If sample porosity was not available, it was calculated from data for TS and WC using the formula:

$$p = 1 - \left[\left(\frac{TS/100}{\rho_s}\right) \div \left(\frac{TS/100}{\rho_s} + \frac{WC/100}{\rho_w}\right)\right]$$

Where ρ_s is the density of the solid particle (sediment) in grams per cubic centimeter (2,650 grams per cubic centimeter) (USACE 2024) and ρ_w is the density of saltwater (1,023 grams per cubic centimeter) (Nayar et al. 2016). Typically, either the TS or WC was reported; however, they are related using the formula WC + TS = 100.

[4] The sediment characterization study conducted by the Navy in 1999 to support the CERCLA feasibility study provided data on grain size, but not porosity, total solids, or water content (Navy 1999).

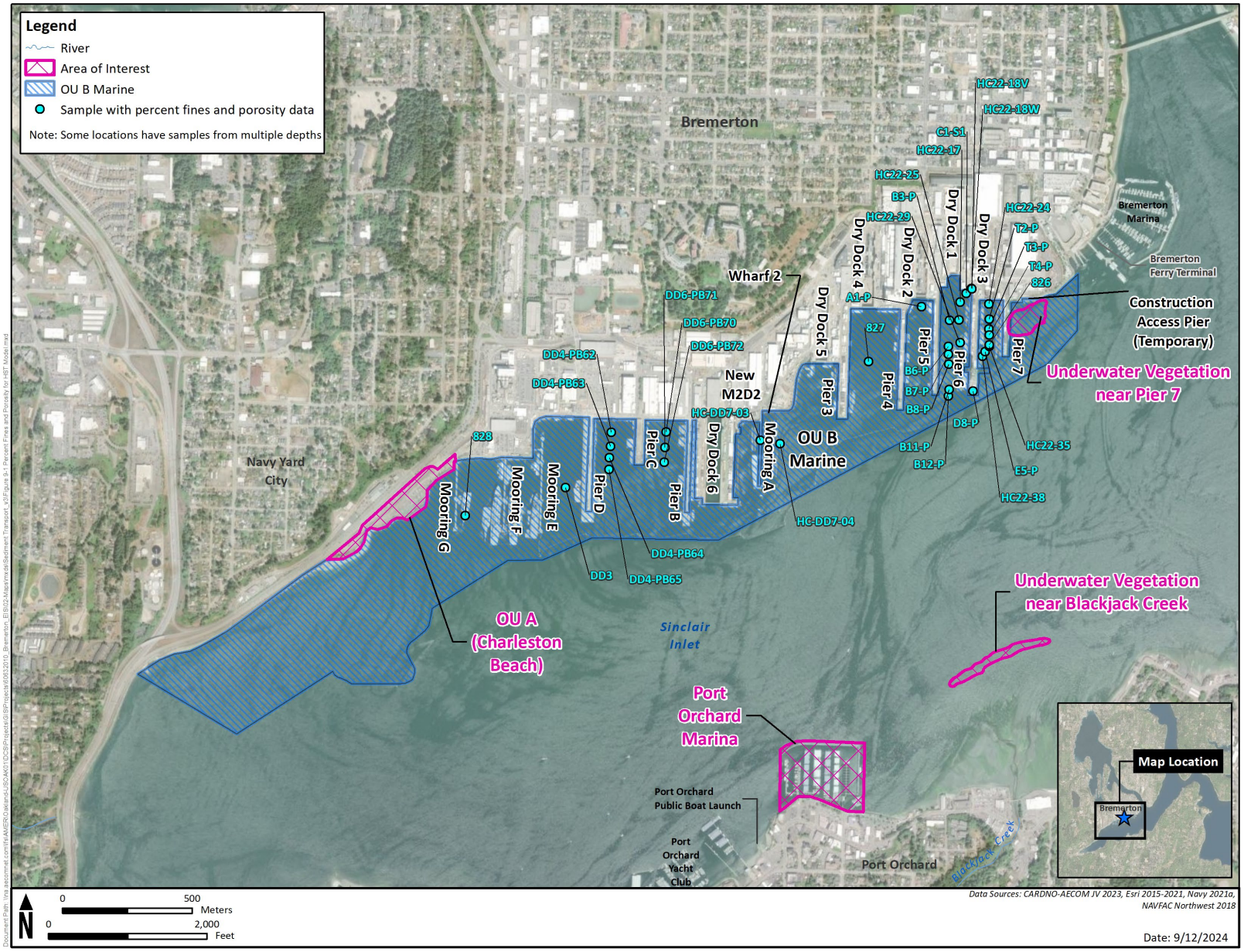

Figure 9-1 Samples with Percent Fines and Porosity Data for HST Model

Table 9-1 Summary of Sediment Data and PFCF Calculation

Source	*Sample ID*	*Latitude*	*Longitude*	*Depth (ft)*	*Fines (%)*	*WC*	*TS*	*Porosity*	*PFCF*
SAIC 2000	DD3	47.5537	-122.6509153	10.2	78.80	n/a	52.5	0.70	0.24
SAIC 2000	DD4-PB65	47.55436319	-122.6487069	13.0	58.80	n/a	68.3	0.55	0.27
SAIC 2000	DD4-PB64	47.55476574	-122.6486917	13.0	62.90	n/a	62.8	0.61	0.25
SAIC 2000	DD4-PB63	47.55516667	-122.6486481	11.2	11.60	n/a	86.8	0.28	0.08
SAIC 2000	DD4-PB62	47.55565347	-122.6486313	10.8	3.70	n/a	88.8	0.25	0.03
SAIC 2000	DD6-PB72	47.55466111	-122.6458843	11.0	8.10	n/a	88.5	0.25	0.06
SAIC 2000	DD6-PB71	47.55516778	-122.6458761	9.0	9.90	n/a	92.3	0.18	0.08
SAIC 2000	DD6-PB70	47.55570764	-122.6458292	7.0	3.40	n/a	88	0.26	0.03
URS 2002	828	47.552653	-122.655993	3	90.00	n/a	n/a	0.74	0.23
URS 2002	827	47.558313	-122.635559	3	79.00	n/a	n/a	0.72	0.22
URS 2002	826	47.558983	-122.629403	3	14.00	n/a	n/a	0.35	0.09
WSP 2021	HC-DD7-03	47.5555	-122.641	1	51.00	55.3	n/a	0.76	0.12
WSP 2021	HC-DD7-04	47.5554	-122.64	1	48.00	75.3	n/a	0.89	0.05
HC 2022	HC22-25	47.55982	-122.630979	16.75	28.30	11.4	n/a	0.25	0.21
HC 2022	HC22-17	47.560441	-122.630961	18.65	37.90	19.2	n/a	0.38	0.23
HC 2022	HC22-29	47.55904	-122.63091	5.75	9.40	12.1	n/a	0.26	0.07
HC 2022	HC22-18W	47.560917	-122.630383	15.75	4.70	7.9	n/a	0.18	0.04
HC 2022	HC22-18V	47.560903	-122.630375	22.35	4.20	13.3	n/a	0.28	0.03
HC 2022	HC22-38	47.558577	-122.629744	15.75	24.60	9.6	n/a	0.22	0.19
HC 2022	HC22-24	47.560395	-122.629483	6.75	28.90	7.7	n/a	0.18	0.24
HC 2022	HC22-24	47.560395	-122.629483	15.5	30.10	17.4	n/a	0.35	0.19
HC 2022	HC22-35	47.558935	-122.629418	15.75	44.10	14.8	n/a	0.31	0.30
WSP 2023	A1-P	47.56024536	-122.6329207	1.9	24.87	n/a	70.3	0.52	0.12
WSP 2023	A1-P	47.56024536	-122.6329207	4.5	3.40	n/a	79.6	0.40	0.02
WSP 2023	B6-P	47.55890211	-122.6314998	2	73.54	n/a	50.3	0.72	0.21
WSP 2023	B7-P	47.55861997	-122.6314877	2	79.60	n/a	50.2	0.72	0.22
WSP 2023	B3-P	47.55980292	-122.6314751	1.15	71.09	n/a	37.5	0.81	0.13
WSP 2023	B8-P	47.5582855	-122.6314644	2	83.05	n/a	47.5	0.74	0.21
WSP 2023	B8-P	47.5582855	-122.6314644	6.85	54.44	n/a	60.9	0.62	0.20
WSP 2023	B12-P	47.55718433	-122.631436	2	66.67	n/a	49	0.73	0.18
WSP 2023	B11-P	47.55740672	-122.6314136	2	84.53	n/a	45.2	0.76	0.20
WSP 2023	C1-S1	47.56074289	-122.6306466	1.35	12.62	n/a	81.9	0.36	0.08
WSP 2023	D8-P	47.55737392	-122.630196	2	33.72	n/a	57.1	0.66	0.11
WSP 2023	D8-P	47.55737392	-122.630196	2	35.22	n/a	60	0.63	0.13
WSP 2023	D8-P	47.55737392	-122.630196	5.75	55.96	n/a	52.3	0.70	0.17
WSP 2023	E5-P	47.55874639	-122.6296088	1.2	10.30	n/a	80.9	0.38	0.06
WSP 2023	T2-P	47.55987697	-122.629449	0.95	86.46	n/a	36	0.82	0.15
WSP 2023	T3-P	47.55952836	-122.6294444	1.7	40.56	n/a	59.1	0.64	0.15
WSP 2023	T4-P	47.55932486	-122.6294229	0.6	27.81	n/a	71.3	0.51	0.14

Legend: n/a = not available; PFCF = percent fines conversion factor; TS = total solids; WC = water content.

Summary statistics and select percentiles for PFCF are presented in Table 9-2.

Table 9-2 Summary Statistics for PFCF

Statistic	PFCF
Average	0.15
Median	0.15
Standard Deviation	0.08
Percentile	**PFCF**
10	0.04
25	0.08
50	0.15
75	0.21
90	0.24

Legend: PFCF = percent fines conversion factor.

The values range about a factor of 5, and it is likely that the release rate of the fines will vary depending on the location of the activity and the depth to which it impacts the sediment. The average PFCF of 0.15 was selected to convert the bulk sediment volume associated with each construction activity to a sediment release rate for the model simulations (Section 10). This value can be expected on average, noting that based on the available data for percent fines and porosity, the actual instantaneous value may increase by a factor of 2 or decrease by a factor of 3. For example, the average PFCF is likely high when working in deeper sediment as percent fines generally decreases with depth (WSP 2024). The impact of varying PFCF on model predictions is evaluated in a sensitivity analysis (Section 11.5).

The settling speed of each fines fraction is site-specific. In the absence of site-specific data, a standard sediment classification and associated settling speeds were used (van Rijn 2023). The guidance suggests four sediment classes with the mean diameter in micrometers and settling speed in millimeters per second, as shown in Table 9-3.

Table 9-3 Summary of Fines Classification

Class Size (µm)	*Settling Speed (mm/s)*
< 8	0.03
8–16	0.12
16–32	0.45
32–63	1.8

Legend: µm = micrometer; mm/s = millimeter per second.

10 Sediment Release Rates

Each of the construction activities (dredging, pile removal, and pile installation) will release sediment into the water column, herein referred to as the SRR. This section describes the development of SRRs associated with each type of construction activity. Appendix C provides additional details on the derivation of SRR and associated time series for input into the model.

10.1 Dredging

Due to the potential for dredging contaminated sediment at the site, mechanical dredging using an environmental clamshell bucket is expected to be used when possible. An environmental clamshell bucket is designed to minimize dredged material being released from the bucket as it is raised through the water column and placed in an open-top barge. To minimize accumulation of suspended sediment in the dredging area, no overflow of dredged material from the open-top barge will be allowed. USACE guidance for assessing turbidity impacts of an environmental clamshell bucket suggests 1 percent of the dredge production rate as the release rate (Gailani et al. 2017; Palermo et al. 2008).

Based on discussions with the Navy and design team, the dredging rate (per dredge) is expected to be approximately 2,000 cubic yards per day, with the dredge operating up to 24 hours per day for 6 days per week. While active dredging for the full 24-hour period is unlikely (e.g., periods of down time), the daily volume of 2,000 cubic yards was divided evenly by 24 to derive an hourly rate of 64 cubic meters per hour. This is assumed to be the dredging rate on average, recognizing that under certain conditions, the rate may be higher or lower. Two dredges are assumed to operate simultaneously in the same area with distance spacing of 328 feet (100 meters) to ensure operational safety and efficiency.

To convert the volumetric dredging rate to a mass-based SRR for application in the HST model, adjustments for the fraction released (1 percent) and sediment composition based on percent fines and porosity (PFCF of 0.15; see Section 9) were applied (Table 10-1). The volume of sediment released was converted to a mass basis using a density of 2,650 kilograms per cubic meter for quartz particles (USACE 2024).

Table 10-1 Calculation of SRR for Dredging

Calculation	*Number*	*Unit*
Dredging Rate	2,000	cy/day
Dredging Rate (0.765 m^3/cy)	1,530	m^3/day
Hourly Dredging Rate (24 hr/day)	64	m^3/hr
Adjustment for Fraction Released (1%)	0.64	m^3/hr
Adjustment for PFCF (0.15)	0.096	m^3/hr
Mass of Sediment Released (2,650 kg/m^3)	253	kg/hr
SRR Per Second (3,600 s/hr)	0.070	kg/s
SRR Per Each of Four Sediment Size Classes	0.018	kg/s

Legend: cy/day = cubic yard per day; kg/m^3 = kilogram per cubic meter; kg/s = kilogram per second; m^3/day = cubic meter per day; m^3/hr = cubic meter per hour; m^3/s = cubic meter per second; PFCF = percent fines conversion factor (% fines × (1-porosity)); SRR = sediment release rate.

After converting the rate in hours to seconds, the release rate of 0.070 kg/s was divided equally among the four sediment size classes (Table 9-3). The resulting SRR of 0.018 kg/s was used in the model for all of the dredging simulations.

10.2 Pile Installation and Removal

In the absence of published SRRs for pile installation and removal activities, engineering judgment guided by conceptual models of the activity was used to estimate the volume and duration of sediment released. The SRR for pile removal and installation activities was developed by assigning a volume of sediment and assuming that volume was released over a short time period (seconds to minutes). Two pile driving or removal rigs are assumed to operate simultaneously in the same area. The conceptual approach for each pile-related activity is summarized below and is considered conservative.

10.2.1 Pile Installation

For installation of piles with square or round cross-sections, it is expected that the base of the pile will disturb sediments as the pile is driven into the seabed. Two conceptual models were developed: one for solid pile and one for hollow piles (i.e., pipes). For the solid piles, the volume of the disturbance will scale with the cross-sectional area of the pile and a depth representing the sediment pushed laterally from the pile base. Eventually, the pile base will be sufficiently far into the seabed that lateral displacement of sediment will be absorbed by the surrounding sediment and not result in resuspension. An example of the estimated SRR is provided for a 24-inch diameter concrete pile (Table 10-2). The depth of the impact is assumed to be 0.5 foot and the diameter of the impact is assumed to be 1.5 times the area of the pile cross-section, yielding a sediment volume of 0.10 m^3. The volume is then adjusted for the sediment composition using the PFCF and converted to mass of sediment released, yielding 40 kg. A 4-minute duration of the impact is assumed, yielding a SRR of 0.17 kg/s, which is distributed equally across the four sediment size classes. After the initial period of impact as the pile is driven deeper, it is assumed that any sediment release is negligible.

Table 10-2 Example of Solid Pile Installation SRR Calculation

Calculation	*Number*	*Unit*
Pile Diameter	24	Inches
Pile Base Area	7.06	ft^2
Depth of Impact	0.5	Feet
Volume of Sediment	3.5	ft^3
Volume of Sediment	0.10	m^3
Mass of Sediment Released (2,650 kg/m^3)	265	Kg
Adjustment for PFCF (0.15)	40	Kg
Duration	4	Minutes
Duration	240	Seconds
SRR	0.17	kg/s
SRR Per Each of Four Sediment Size Classes	0.042	kg/s

Legend: ft^2 = square foot; ft^3 = cubic foot; kg = kilogram; kg/s = kilogram per second; kg/m^3 = kilogram per cubic meter; m^3 = cubic meter; PFCF = percent fines conversion factor (% fines × (1-porosity)); SRR = sediment release rate.

A similar approach was used for the hollow piles. The only difference is that the area of impact is assumed to be a donut-shaped area extending outward 0.5 foot from the outer radius of the pile. The depth of impact and duration are the same as for the solid pile. An example of the estimated SRR is provided for a 72-inch hollow pile in Table 10-3.

Table 10-3 Example of Hollow Pile Installation SRR Calculation

Calculation	*Number*	*Unit*
Pile Diameter	72	Inches
Pile Base Area	10.2	ft^2
Depth of Impact	0.5	Feet
Volume Sediment	5.1	ft^3
Volume Sediment	0.145	m^3
Mass of Sediment Released (2,650 kg/m^3)	383	Kg
Adjustment for PFCF (0.15)	58	Kg
Duration	4	Minutes
Duration	240	Seconds
SRR	0.24	kg/s
SRR Per Each of Four Sediment Size Classes	0.060	kg/s

Legend: ft^2 = square foot; ft^3 = cubic foot; kg = kilogram; kg/s = kilogram per second; kg/m^3 = kilogram per cubic meter; m^3 = cubic meter; PFCF = percent fines conversion factor (% fines × (1-porosity)); SRR = sediment release rate.

The number of pile installations per day depends on the construction schedule (see Appendix A, Table A-1 for Alternative 2 and Table A-2 for Alternative 3). The number of piles installed per day is spread equally over a 10-hour daylight period and is shown in Table 10-6 and Table 10-7 for Alternatives 2 and 3, respectively. For sheet pile installation, the effective volume is the product of the width of the sheet pile (typically 24, 48, or 56 inches) multiplied by impact depth of 0.5 foot and a distance perpendicular to the sheet pile width of 0.5 feet.

10.2.2 Pile Removal

For pile removal, it is assumed that a relatively thin layer of adhered sediment, on the order of a few millimeters (mm), is released as the pile is pulled upward through the water column. The volume of released sediment is calculated as the circumference of the pile multiplied by the length and thickness of the mud layer. A pile length of 20 feet and mud layer thickness of 0.5 inch were assumed for the volume calculations (Table 10-4).

Table 10-4 Example of Pile Removal SRR Calculation

Calculation	*Number*	*Unit*
Pile Diameter	20	Inches
Circumference	5.24	Ft
Thickness of Mud on Pile	0.5	Inches
Thickness of Mud on Pile	0.042	Feet
Length of Pile Extracted	20	Ft
Volume of Sediment	4.36	ft^3
Volume of Sediment	0.124	m^3
Mass of Sediment Released (2,650 kg/m^3)	328	kg
Adjustment for PFCF (0.15)	49	kg
Duration	6	Minutes
Duration	360	Seconds
SRR	0.14	kg/s
SRR Per Each of Four Sediment Size Classes	0.034	kg/s

Table 10-4 Example of Pile Removal SRR Calculation

Calculation	*Number*	*Unit*

Legend: ft^2 = square foot; ft^3 = cubic foot; kg = kilogram; kg/s = kilogram per second; kg/m^3 = kilogram per cubic meter; m^3 = cubic meter; PFCF = percent fines conversion factor (% fines × (1-porosity)); SRR = sediment release rate.

The duration is assumed to be 6 minutes. Following the same procedure as pile installation, the final SRR is 0.14 kg/s, which is distributed across the four sediment size classes.

The details of the foundation removal process are not yet finalized but are expected to include pre-dredging, cutting, and lifting the foundation up through the water column. Some of the foundations are supported with timber piles, and the area below the foundation will be dredged with handheld dredging equipment. It is assumed that the handheld dredging process will not yield significant releases and is not included in the modeling analysis. After the handheld dredging is completed, the foundation will be severed from the timber piles and lifted away. These activities are not expected to yield sediment releases. However, some of the foundations may be sitting directly on the seabed without timber pile support. In this case, the foundation will be lifted directly from the seafloor, either as a single unit or after being cut into pieces. It is expected that water will rush into the gap formed below the foundation as it is lifted off the seabed. The rush of water will last a brief period and will erode sediment until the foundation is a few feet above the seabed. To estimate a SRR associated with this process, it is assumed that the depth of sediment eroded below the foundation is 6 inches and the erosion lasts 6 minutes (Table 10-5).

Table 10-5 Example of Foundation Removal SRR Calculation

Calculation	*Number*	*Unit*
Foundation Bottom Diameter	48	Inches
Foundation Bottom Area	12.6	ft^2
Depth of Impact	0.5	Feet
Volume of Sediment	6.28	ft^3
Volume of Sediment	0.178	m^3
Mass of Sediment Released (2,650 kg/m^3)	472	kg
Adjustment for PFCF (0.15)	71.8	kg
Duration	6	minutes
Duration	360	seconds
SRR	0.20	kg/s
SRR Per Each of Four Sediment Size Classes	0.05	kg/s

Legend: ft^2 = square foot; ft^3 = cubic foot; kg = kilogram; kg/s = kilogram per second; kg/m^3 = kilogram per cubic meter; m^3 = cubic meter; PFCF = percent fines conversion factor (% fines × (1-porosity)); SRR = sediment release rate.

The installation of the of the caisson foundations includes dredging and cutting into till, and then lowering a steel form to the seafloor to provide containment of the concrete pour. The sediment impacts for this process are expected to be dominated by the dredging; therefore, the dredging SRR was applied to simulate this activity.

Table 10-6 and Table 10-7 present a summary of the modeled construction activities and SRR assigned for Alternative 2 and Alternative 3, respectively. The daily hours of dredging and number of piles/foundations installed or removed are also presented in the tables.

Table 10-6 Modeled Construction Activities and Sediment Release Rates for Alternative 2 (M2D2 at DD3)

Alternative 2, Sequence 1 (Fall 2026)					
Construction Activity	***SRR [a] (kg/s)***	***Hours Dredged per Day***	***Piles Installed per Day***	***Piles Removed per Day***	***Foundations Removed per Day***
Phase1 Basin Dredging (D1)	0.070	24	N/A	N/A	N/A
Phase1 Basin Dredging (D2)	0.070	24	N/A	N/A	N/A
Cofferdam Pile Driving (Sheet)	0.055	N/A	3	N/A	N/A
Cofferdam Pile Driving (Pipe)	0.24	N/A	3	N/A	N/A
SWPH Pile Driving (Sheet)	0.055	N/A	3	N/A	N/A
SWPH Pile Driving (Pipe)	0.29	N/A	3	N/A	N/A
Temp. Access Pier Pile Driving (Pipe)	0.23	N/A	3	N/A	N/A
Temp. Access Pier Pile Driving (Pipe)	0.23	N/A	3	N/A	N/A
New Pier 2 Basin Dredging (D1)	0.070	24	N/A	N/A	N/A
New Pier 2 Basin Dredging (D2)	0.070	24	N/A	N/A	N/A
New Pier 2 Pile Driving (Sheet)	0.055	N/A	3	N/A	N/A
New Pier 2 Pile Driving (Concrete)	0.17	N/A	3	N/A	N/A
Mooring F Pile Driving (Pipe)	0.23	N/A	3	N/A	N/A
Mooring F Pile Driving (Concrete)	0.17	N/A	3	N/A	N/A
Alternative 2, Sequence 2 (Fall 2027)					
Construction Activity	***SRR [a] (kg/s)***	***Hours Dredged per Day***	***Piles Installed per Day***	***Piles Removed per Day***	***Foundations Removed per Day***
SWPH Pile Driving (Sheet)	0.055	N/A	3	N/A	N/A
SWPH Pile Driving (Pipe)	0.29	N/A	3	N/A	N/A
Pier 6 Pile Removal (R1)	0.14	N/A	N/A	8	N/A
Pier 6 Pile Removal (R2)	0.14	N/A	N/A	8	N/A
Pier 7 Pile Removal	0.14	N/A	N/A	8	N/A
Cofferdam Pile Driving (Pipe)	0.29	N/A	3	N/A	N/A
Phase1 Basin Dredging (D1)	0.070	24	N/A	N/A	N/A
Phase1 Basin Dredging (D2)	0.070	24	N/A	N/A	N/A
Former Pier 8 Foundation Removal	0.20	N/A	N/A	N/A	6

Legend: D1 = derrick 1 of 2; D2 = derrick 2 of 2; kg/s = kilogram per second; N/A = not applicable; R1 = rig 1 of 2; R2 = rig 2 of 2; SRR = sediment release rate; SWPH = saltwater pumphouse.

[a] SRRs shown in the table are the total for each activity before distributing equally across the four sediment classes. See Appendix C for derivation of SRRs.

Table 10-7 Modeled Construction Activities and Sediment Release Rates for Alternative 3 (M2D2 at Mooring A)

Alternative 3, Sequence 1 (Fall 2029)					
Construction Activity	***SRR [a] (kg/s)***	***Hours Dredged per Day***	***Piles Installed per Day***	***Piles Removed per Day***	***Foundations Removed per Day***
Temp. Cutoff Wall Pile Removal (R1)	0.078	N/A	N/A	8	N/A
Temp. Cutoff Wall Pile Removal (R2)	0.078	N/A	N/A	8	N/A
Dredging for Foundations (D1)	0.070	24	N/A	N/A	N/A
Dredging for Foundations (D2)	0.070	24	N/A	N/A	N/A
Alternative 3, Sequence 2 (Fall 2030)					
Construction Activity	***SRR [a] (kg/s)***	***Hours Dredged per Day***	***Piles Installed per Day***	***Piles Removed per Day***	***Foundations Removed per Day***
Dredge/Cut Caisson into Till (D1)	0.070	24	N/A	N/A	N/A
Dredge/Cut Caisson into Till (D2)	0.070	24	N/A	N/A	N/A
Pile Driving (Sheet for walls)	0.047	N/A	3	N/A	N/A
Pile Driving (Pipe for walls)	0.17	N/A	3	N/A	N/A
Pile Driving (Pipe for floor)	0.31	N/A	3	N/A	N/A
Alternative 3, Sequence 3 (Fall 2035)					
Construction Activity	***SRR [a] (kg/s)***	***Hours Dredged per Day***	***Piles Installed per Day***	***Piles Removed per Day***	***Foundations Removed per Day***
Pier 4 Demo Dredging (D1)	0.070	24	N/A	N/A	N/A
Pier 4 Demo Dredging (D2)	0.070	24	N/A	N/A	N/A
Pier 4 Foundation Removal	0.29	N/A	N/A	N/A	6
M2D2 Turning Basin Dredging (D1)	0.070	24	N/A	N/A	N/A
M2D2 Turning Basin Dredging (D2)	0.070	24	N/A	N/A	N/A
Pier 9 Demo Pile Removal	0.14	N/A	N/A	8	N/A
Quay Wall Pile Driving (Sheet)	0.047	N/A	3	N/A	N/A
Quay Wall Pile Driving (Pipe)	0.17	N/A	3	N/A	N/A
M2D2 Berthing Basin Dredging (D1)	0.070	24	N/A	N/A	N/A
M2D2 Berthing Basin Dredging (D2)	0.070	24	N/A	N/A	N/A

Legend: D1 = derrick 1 of 2; D2 = derrick 2 of 2; kg/s = kilogram per second; N/A = not applicable; R1 = rig 1 of 2; R2 = rig 2 of 2; SRR = sediment release rate; SWPH = saltwater pumphouse.

[a] SRRs shown in the table are the total for each activity before distributing equally across the four sediment classes. See Appendix C for derivation of SRRs.

10.3 Vertical Distribution of Sediment Release Rate

For each activity, the SRR was distributed vertically across the four layers based on the conceptual model. Mechanical dredging typically will release more sediment near the seabed and at the surface than in the middle of the water column. The impact of the environmental clamshell bucket with the seafloor and the sudden change in pressure as the bucket is lifted from the water surface tends to yield larger releases compared to when the bucket is slowly lifted through the water column. Additional surface losses are also associated with swinging the bucket to the barge. The SRR for dredging was

distributed with 40 percent in the bottom layer, 15 percent in each of the two middle layers, and 30 percent in the surface layer (Gailani et al. 2017).

For pile installation, it is assumed that all sediment is released near the seabed and the SRR was applied to the bottom grid layer. For pile removal, it is assumed that the erosion of the thin mud layer on the pile erodes continuously as the pile is lifted through the water column and the SRR is distributed equally among the four vertical layers. For the foundation removal, the SRR is released into the bottom layer.

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11 Results

A model simulation was conducted for each of the alternatives and their associated activity sequences. As described in Section 8, two time periods were modeled for Alternative 2 (fall 2026 and fall 2027) and three time periods for Alternative 3 (fall 2029, fall 2030, and fall 2035). Each alternative-sequence pair was simulated for each of the six environmental scenarios (Table 7-3) listed below, yielding a total of 30 model simulations:

- Env01 Lower Tides, No Wind
- Env01A Lower Tides, Fall Winds
- Env01B Lower Tides, Winter Winds
- Env02 Higher Tides, No Wind
- Env02A Higher Tides, Fall Winds
- Env02B Higher Tides, Winter Winds

For each simulation, the sediment release points were placed on the model grid based on the activity location (Section 8) and the SRR assigned according to the activity type (Section 10). Each simulation represents a 28-day period, and the results were recorded and processed to assess potential impacts.

The direct outputs from the model are a time series of total suspended sediment (TSS) concentrations at 5-minute intervals for grid cells in the vicinity of each construction activity. These outputs were used to estimate water quality impacts associated with each activity at the 150-foot compliance radius. Outputs for the entire grid were also generated at 2-hour intervals to provide snapshots of the TSS dispersion and cumulative sedimentation throughout the full study area. The TSS results were processed into upper (surface), mid-depth, and lower (bottom) layers to coincide with the expected monitoring depths to be used during construction. Mid-depth concentrations were obtained by averaging results for the two middle layers generated by the model.

As noted in Section 4.7, the model results for TSS are used as a surrogate for turbidity. The applicable turbidity criteria at a 150-foot compliance radius are (WAC 173-201A-21):

- 5 NTU over background when the background is 50 NTU or less; or
- A 10 percent increase in turbidity when the background turbidity is more than 50 NTU

For each construction activity, the maximum predicted TSS concentration at the 150-foot compliance boundary was compared to the turbidity criterion of 5 NTU.

11.1 Overview of Model Results

Model results can be illustrated in multiple graphical formats, including time series plots, maps of TSS distribution, and plots of TSS concentration with distance from source. Key findings are discussed below for a set of time series plots and TSS distribution maps.

11.1.1 Time Series Plots of Total Suspended Solids

Time series plots of TSS at four locations (Figure 11-1) are shown in Figure 11-2 (a to d) for Alternative 2, Sequence 1, under the lower tides, no wind scenario (Env01). Three of the four locations are within OU B Marine (DD1, new Pier 2, and Mooring F), and the fourth is Port Orchard Marina to the south.

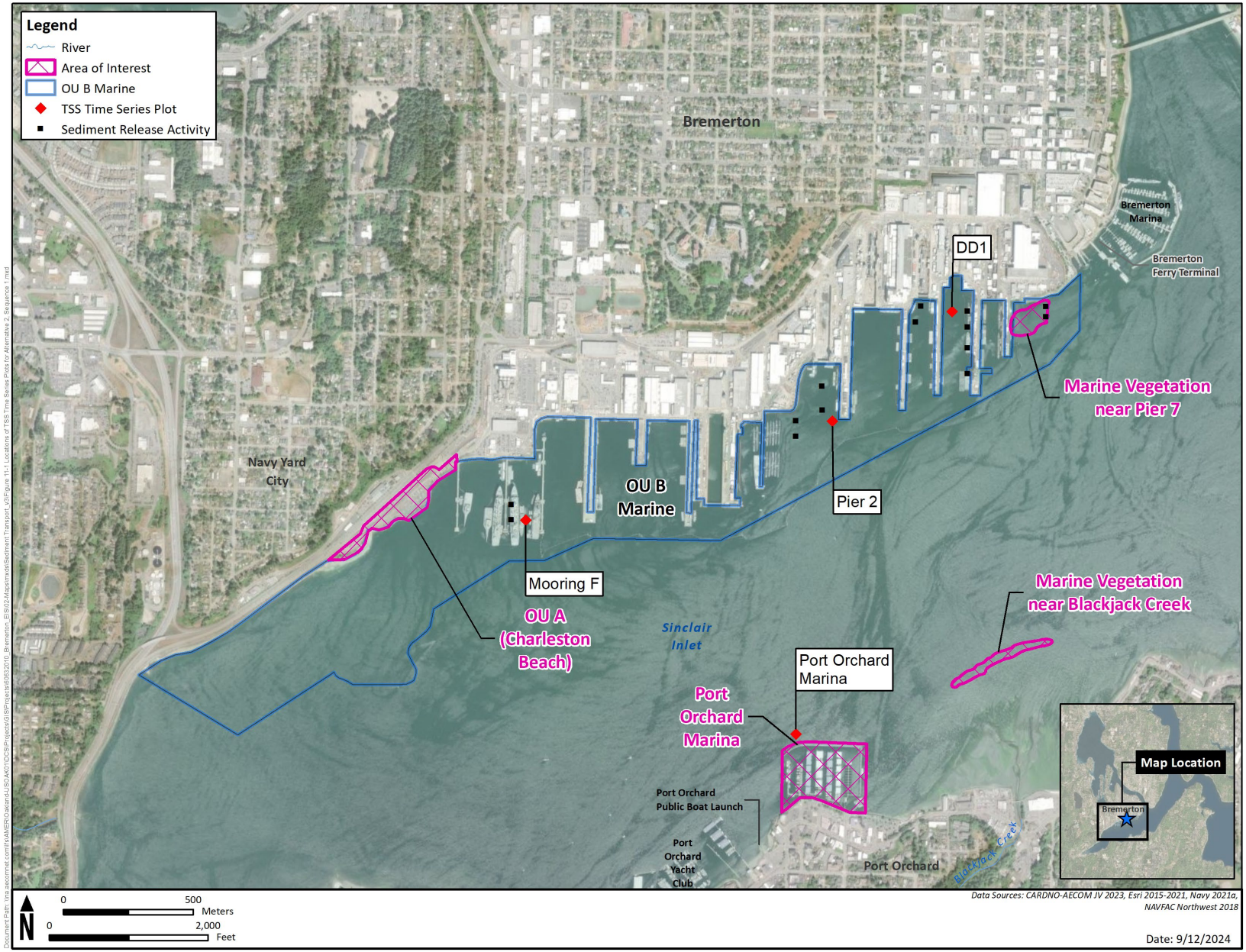

Figure 11-1 Locations of TSS Time Series Plots for Alternative 2, Sequence 1

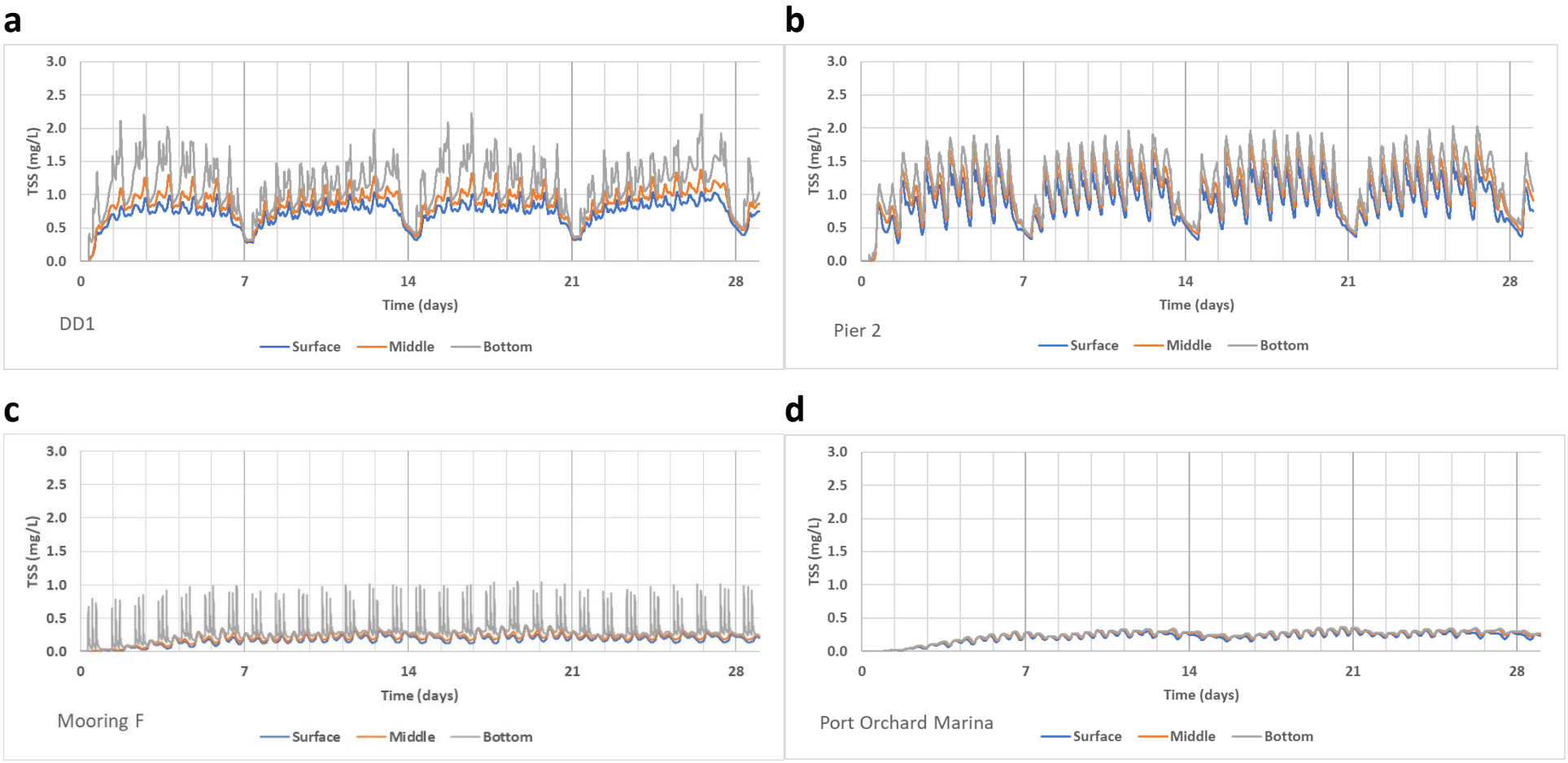

Figure 11-2 TSS Time Series Plots at Select Locations for Alternative 2, Sequence 1 (Environmental Scenario 01 – Lower Tides, No Wind)

Figure 11-2a presents the time series corresponding to a location within DD1 in the vicinity of the M2D2 Phase 1 dredging and pile driving for the cofferdam and Saltwater Pump House (West). As expected, the highest TSS levels occur near the bottom. The influence of the weekly dredging schedule (6 days on and 1 day off) and daily tide cycle on TSS levels are evident. The pile driving activities, which occur three times per day, are also evident in the three sharp peaks in the bottom layer. The middle and surface layers have similar signals but at lower TSS levels and smoothed variations. The results indicate a buildup of TSS on the order of 0.5 to 1.5 mg/L over the duration of the construction activities in this area (TSS levels do not drop back to 0 each day). On a day when dredging does not occur, the buildup of TSS is around 0.5 mg/L (Figure 11-2a). For context, median TSS levels adjacent to NAVBASE Kitsap Bremerton are in the range of 1.5 to 1.7 mg/L based on 10 years of water quality monitoring (Strivens et al. 2020).

Figure 11-2b presents the time series corresponding to a location close to the Pier 2 dredging and pile driving activities. The TSS concentrations at this location are dominated by the Pier 2 dredging activities and the short duration pile driving impacts are not evident. The diurnal tidal signal is clear and predicted TSS in the middle and surface layers mimics the bottom layer but at lower levels. The buildup of TSS is on the order of 0.5 to 1.0 mg/L on the six days when dredging occurs and drops to below 0.5 mg/L on the day when dredging does not take place.

The plot of predicted TSS near Mooring F (Figure 11-2c) is dominated by the short duration pile driving impacts as no dredging activities are near this area. TSS reached approximately 1.0 mg/L in the bottom layer and was highly dispersed in the middle and surface layers. Only the tidal influence on TSS is evident in the upper layers. The buildup is on the order of 0.25 mg/L.

At the Port Orchard Marina (Figure 11-2d), predicted TSS levels are low (less than 0.5 mg/L) and the variation through the water column is small. This is due to the larger fraction of the fines having settled and only the finest grain particles with the slowest settling speed reaching the area. The TSS emanating from waterfront construction activities to the north are dispersed and well mixed both laterally and vertically by the time the TSS reaches the marina. The buildup is on the order of 0.25 mg/L.

11.1.2 Total Suspended Solids Distribution Maps

The distribution of TSS generated by construction activities is illustrated by depicting the peak concentration of TSS predicted at each grid cell at any point in time over the 28-day model simulation. Color contours illustrate the magnitude and spatial extent of modeled TSS concentrations above 2 mg/L (TSS below 2 mg/L is within ambient levels; Strivens et al. 2020). The maximum TSS map illustrates the overall maximum spatial extent of TSS within and outside of OU B Marine from all activities.

Figures showing the distribution of TSS are discussed in Section 11.2 for a subset of the 30 model simulations. The results for Alternative 2 in fall 2026 and Alternative 3 in fall 2035 are presented as they are the busiest construction periods modeled for each alternative. Two environmental scenarios (lower tides, no wind [Env01] and higher tides, winter winds [Env02B]) were selected to illustrate the effect of tides and wind on TSS distribution:

- Alternative 2, Sequence 1, under the lower tides, no wind scenario (Env01)
- Alternative 2, Sequence 1, under the higher tides, winter winds scenario (Env02B)
- Alternative 3, Sequence 3, under the lower tides, no wind scenario (Env01)
- Alternative 3, Sequence 3, under the higher tides, winter winds scenario (Env02B)

11.2 Maximum Total Suspended Solids Distribution

Figure 11-3 through Figure 11-6 present the distribution of maximum TSS for the following simulations:

- Figure 11-3: Alternative 2, Sequence 1, under the lower tides, no wind scenario (Env01)
- Figure 11-4: Alternative 2, Sequence 1, under the higher tides, winter winds scenario (Env02B)
- Figure 11-5: Alternative 3, Sequence 3, under the lower tides, no wind scenario (Env01)
- Figure 11-6: Alternative 3, Sequence 3, under the higher tides, winter winds scenario (Env02B)

Plots of the surface and bottom layers are shown in each figure (the mid-depth layer is not shown but is similar to the surface layer). TSS concentrations are generally higher in the bottom layer.

The figures show that the distribution of TSS is dominated by dredging releases. Under Alternative 2, this includes Phase 1 basin dredging for construction of M2D2 at DD3 and dredging for new Pier 2 (Figure 11-3 and Figure 11-4). Under Alternative 3, this includes dredging for Pier 4 removal and berthing and turning basin dredging for construction of M2D2 at Mooring A (Figure 11-5 and Figure 11-6). TSS concentration contours for pile activities, such as pile driving at Mooring F to the west and pile driving for the temporary access pier east of Pier 7, are barely visible. These results are expected as the pile related activities are intermittent short duration releases over a 10-hour period each day whereas dredging activities are continuous over a long duration (24 hours per day for 6 days per week).

As shown in the figures, TSS concentrations are elevated and, in some cases, greater than 5 mg/L in the immediate vicinity of the construction activity, but drop off quickly with distance from the source. Figure 11-7 presents a plot of maximum TSS in the bottom layer along an east-west transect in the area east of Pier 7 during former Pier 8 foundation removal activities under Alternative 2. The peak TSS of approximately 22 mg/L decreases rapidly with distance. Within 50 feet of the predicted maximum, TSS levels drop below 5 mg/L.

At the 150-foot compliance radius (shown as a red ring around each construction activity on Figure 11-3 through Figure 11-6), there are no exceedances of the turbidity water quality criterion. Comparison of the maximum predicted TSS concentrations to the turbidity water quality criterion is discussed in Section 11.3 for all of the model simulations. The maximum predicted TSS at each AOI, including locations at and outside of the boundary of OU B Marine, is discussed in Section11.4.

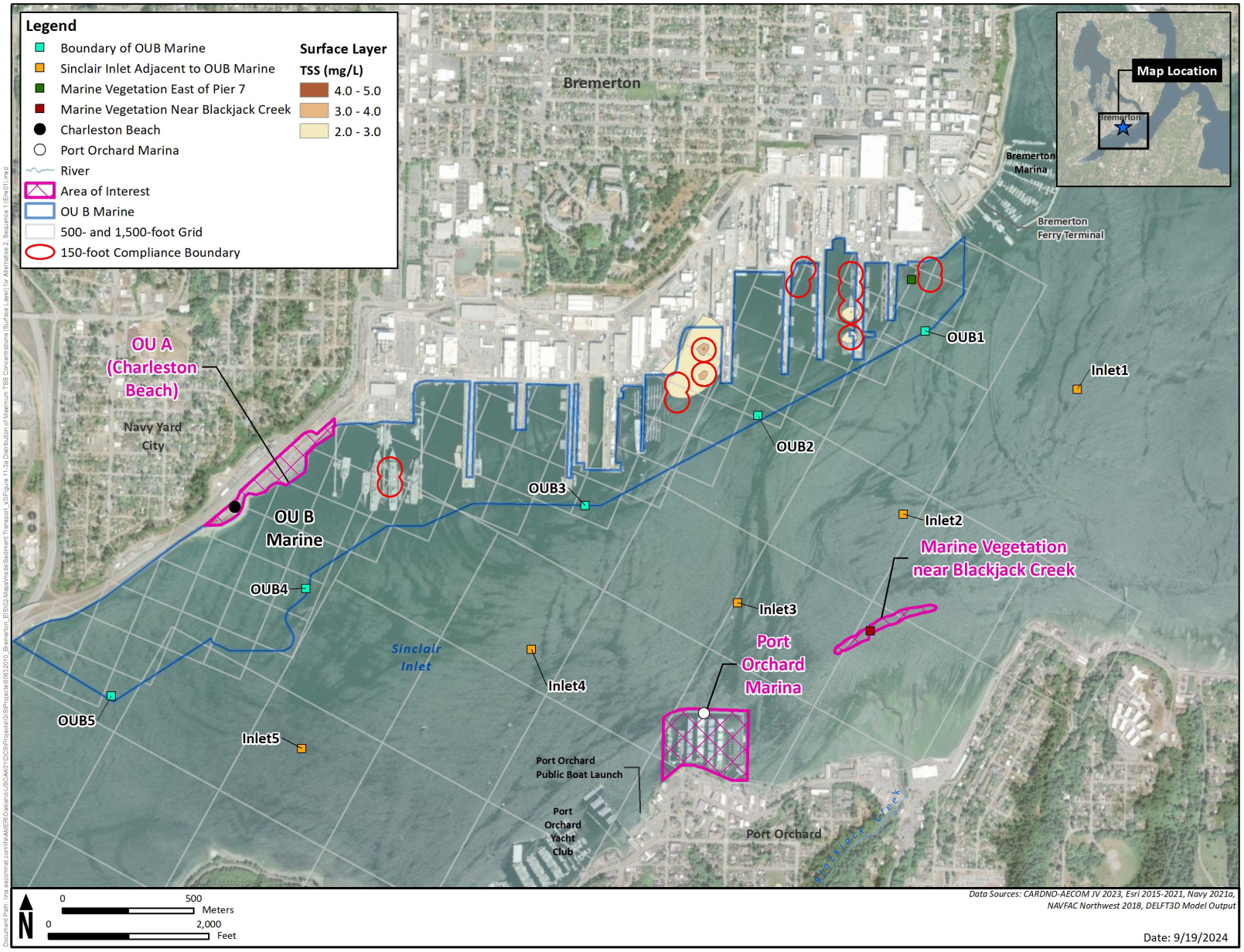

Figure 11-3a Distribution of Maximum TSS Concentrations (Surface Layer) for Alternative 2, Sequence 1 (Env01 – Lower Tides, No Wind)

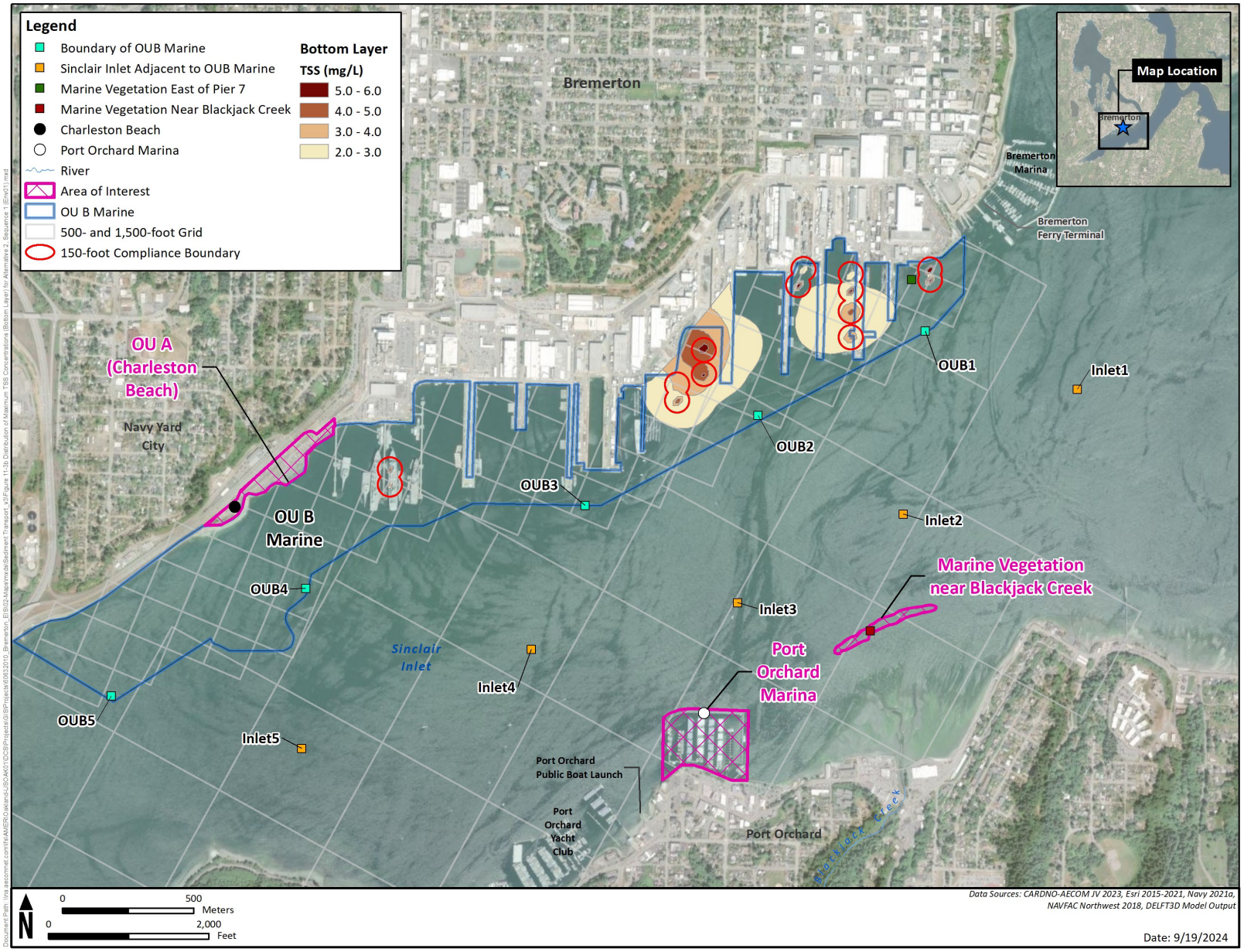

Figure 11-3b Distribution of Maximum TSS Concentrations (Bottom Layer) for Alternative 2, Sequence 1 (Env01 – Lower Tides, No Wind)

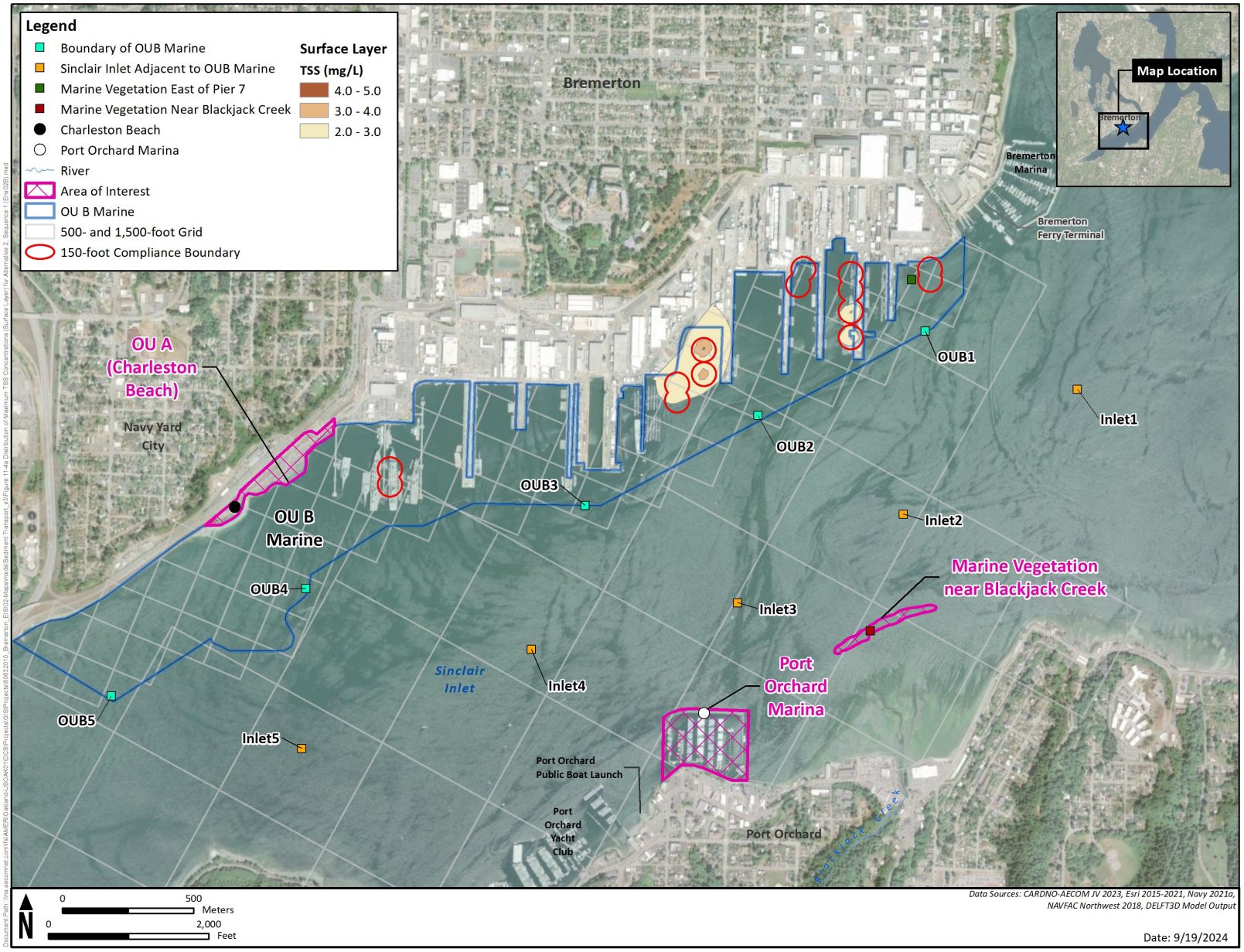

Figure 11-4a Distribution of Maximum TSS Concentrations (Surface Layer) for Alternative 2, Sequence 1 (Env02B – Higher Tides, Winter Winds)

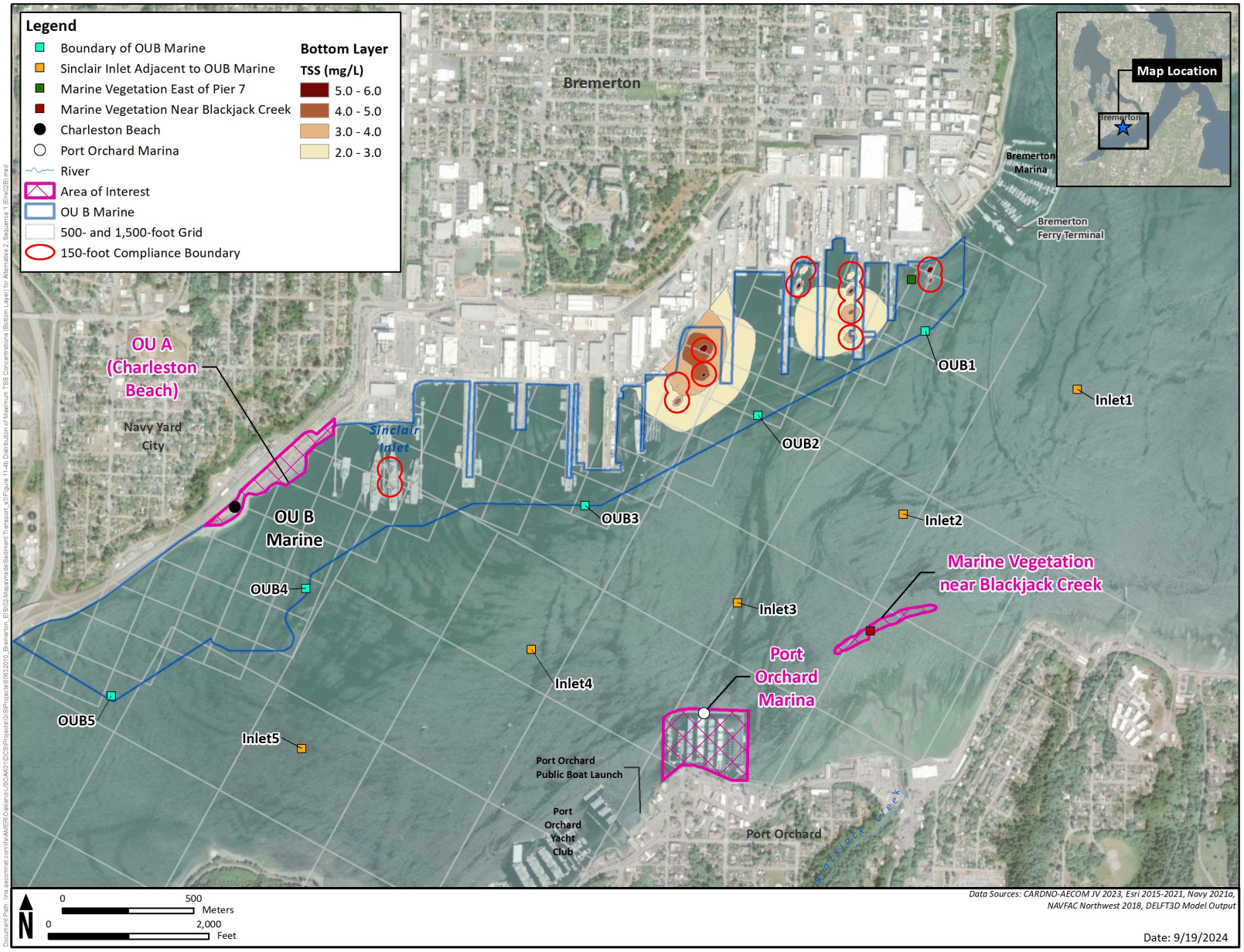

Figure 11-4b Distribution of Maximum TSS Concentrations (Bottom Layer) for Alternative 2, Sequence 1 (Env02B – Higher Tides, Winter Winds)

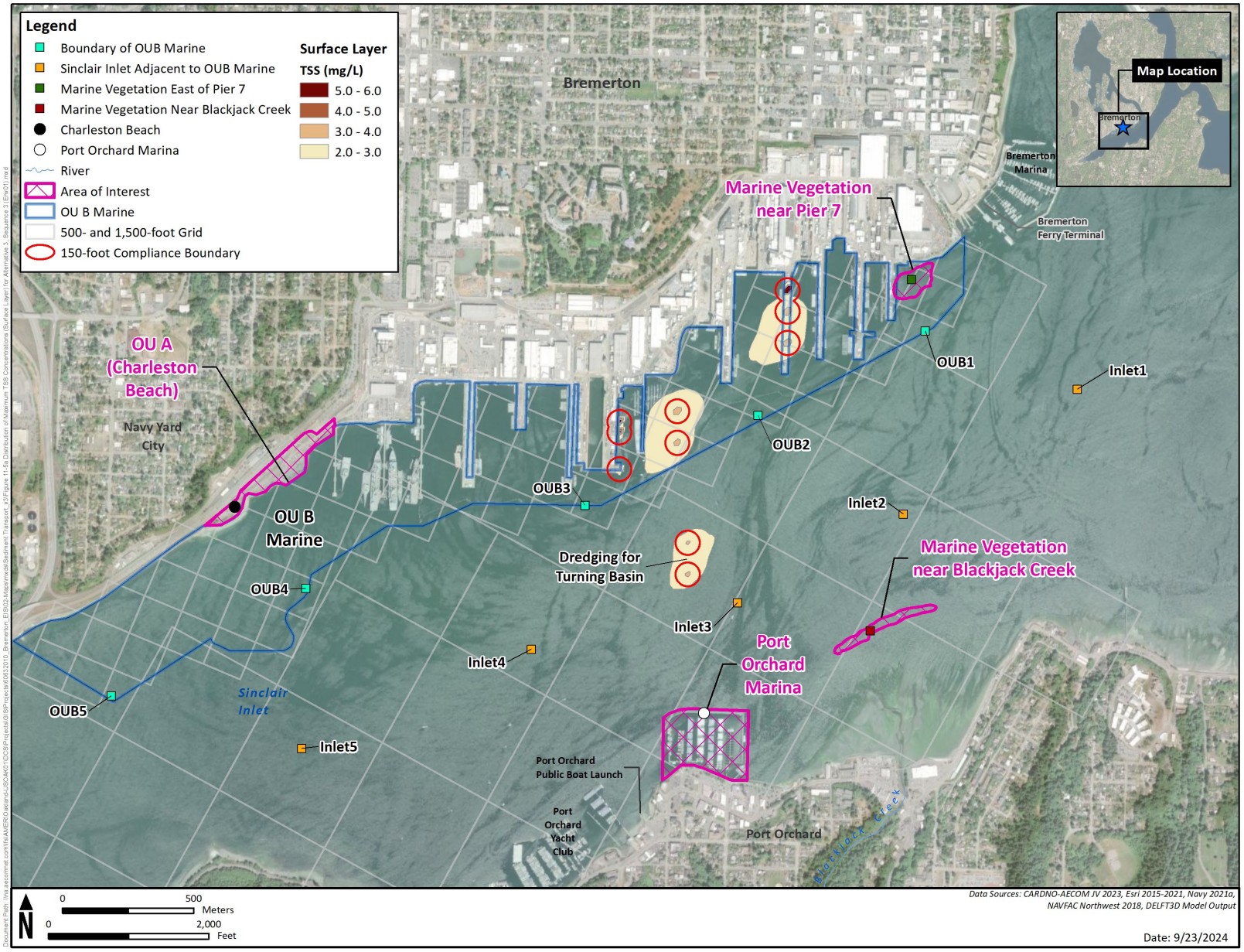

Figure 11-5a Distribution of Maximum TSS Concentrations (Surface Layer) for Alternative 3, Sequence 03 (Env01 – Lower Tides, No Wind)

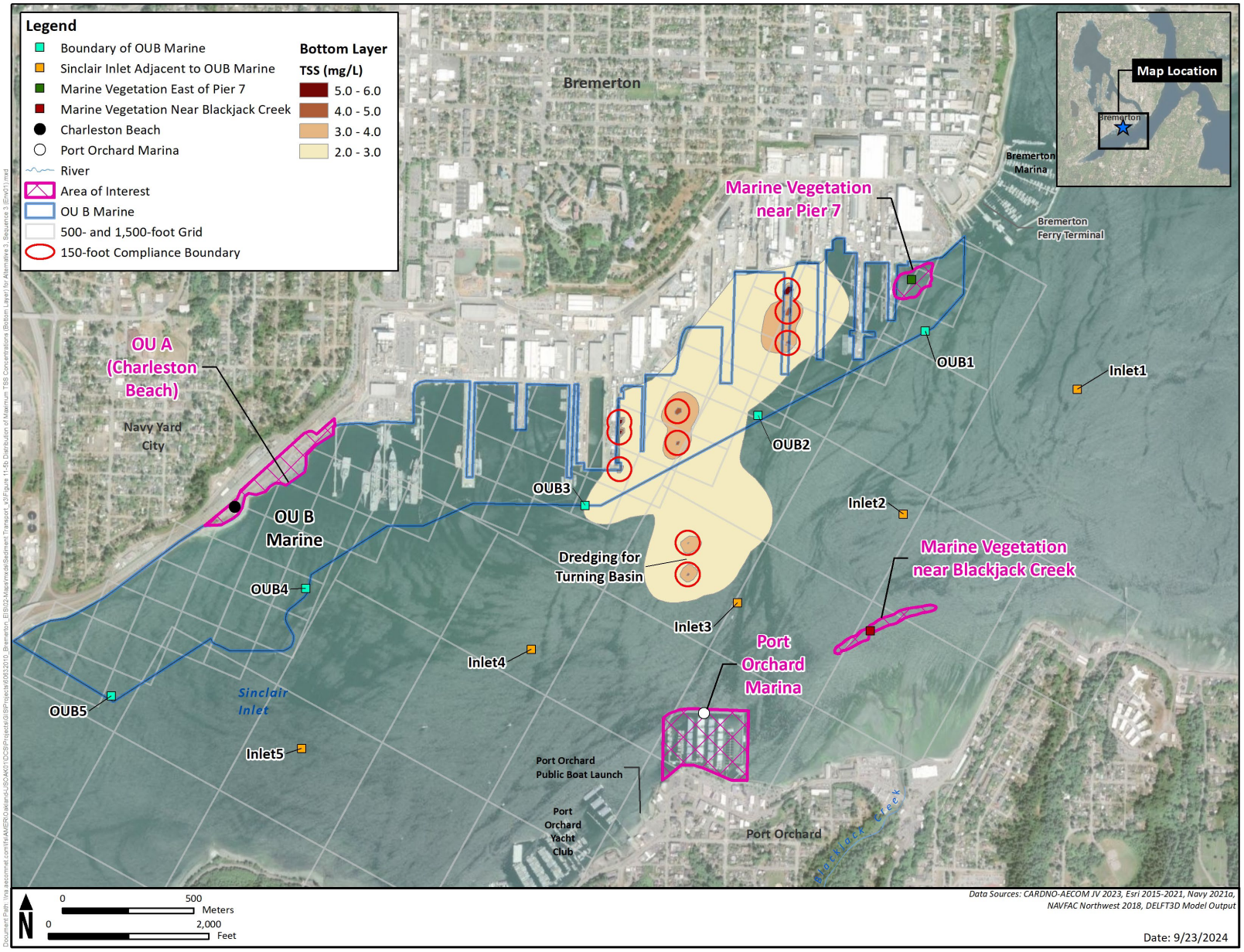

Figure 11-5b Distribution of Maximum TSS Concentrations (Bottom Layer) for Alternative 3, Sequence 03 (Env01 – Lower Tides, No Wind)

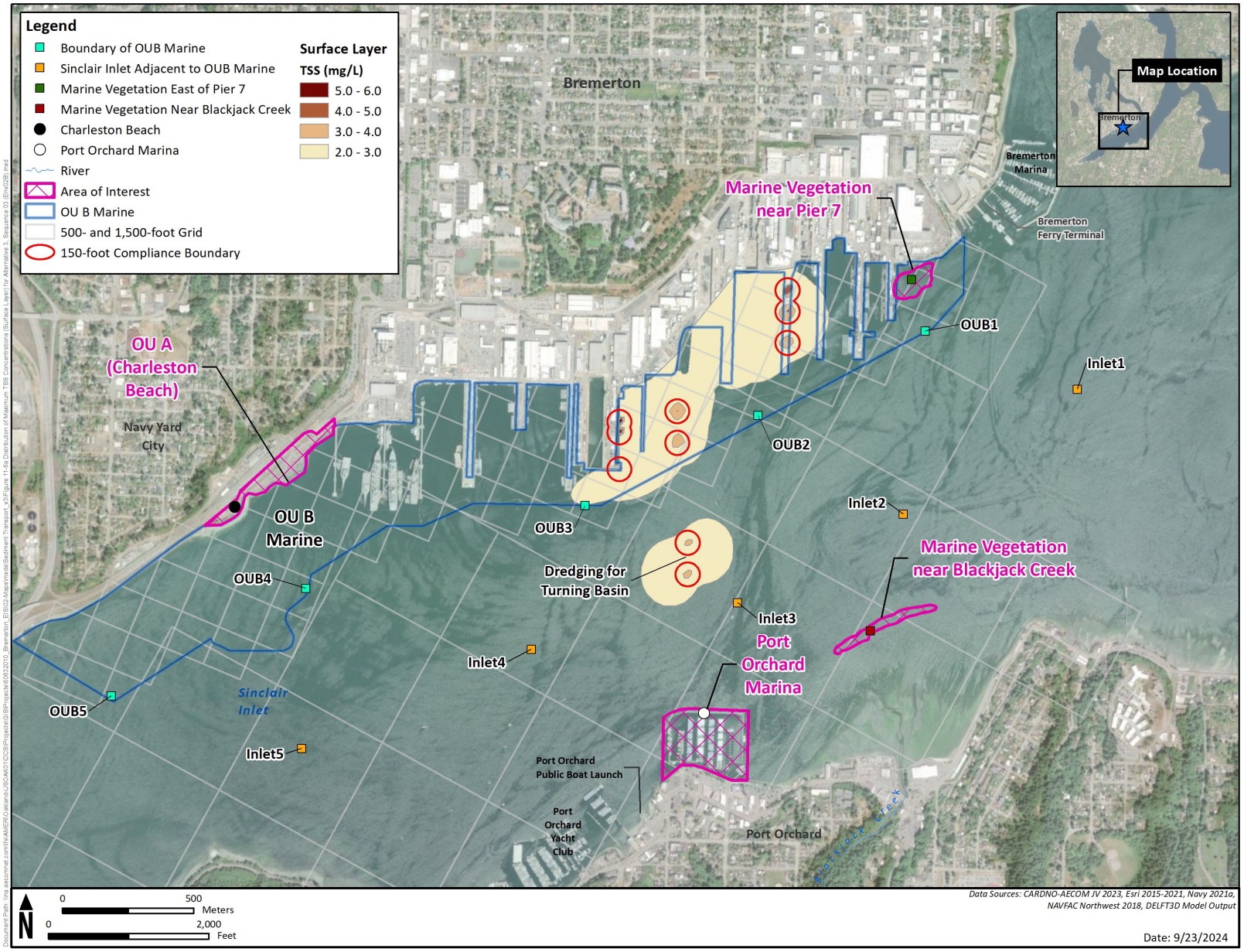

Figure 11-6a Distribution of Maximum TSS Concentrations (Surface Layer) for Alternative 3, Sequence 03 (Env02B – Higher Tides, Winter Winds)

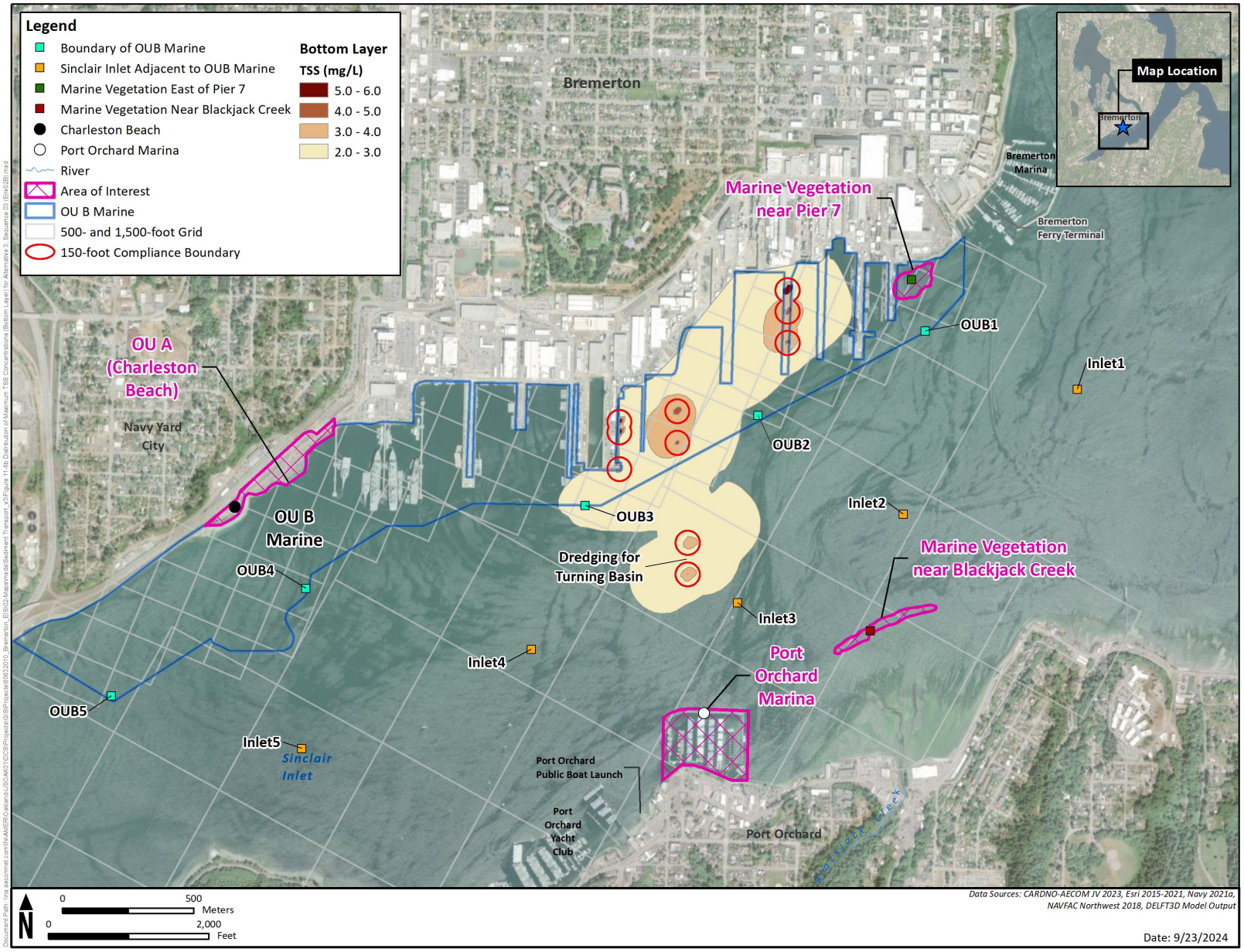

Figure 11-6b Distribution of Maximum TSS Concentrations (Bottom Layer) for Alternative 3, Sequence 03 (Env02B – Higher Tides, Winter Winds)

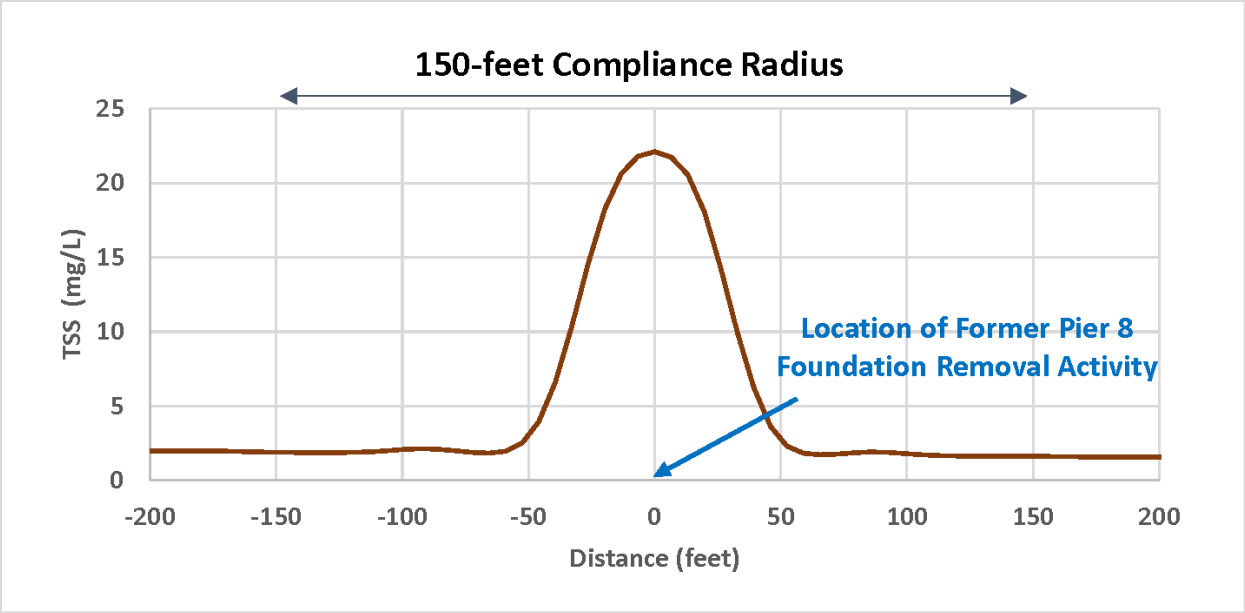

Figure 11-7 Lateral Distribution of Maximum TSS Near Former Pier 8 Foundation Removal for Alternative 2, Sequence 02 (Environmental Scenario 1 – Lower Tides, No Wind)

11.3 Assessment of Compliance with Water Quality Criteria

For each construction activity, compliance with the water quality criterion for turbidity was assessed at the 150-foot compliance radius. The maximum TSS concentration at each 150-foot compliance radius was taken from an interpolation of maximum predicted concentrations reported at each grid cell surrounding the activity. Maps indicating the locations of modeled activities for the five alternative-sequence pairs were presented in Figure 8-1 through Figure 8-5.

The maximum predicted TSS concentrations at the 150-foot compliance boundary for each alternative and sequence are presented in Table 11-1 through Table 11-5. As shown in these tables, none of the activities results in an exceedance of the water quality criterion for turbidity of 5 NTU over background when the background is 50 NTU or less at the 150-foot compliance radius. The predicted maximum TSS ranges from less than 1 mg/L to 4.5 mg/L. As previously noted, TSS levels were highest near the bottom and lowest near the surface. The scenarios with the highest maximum TSS values were the no wind and winter winds scenarios for the majority of activities. The highest predicted maximum TSS values (4.4 mg/L to 4.5 mg/L) are associated with dredging for the new Pier 2 basins (Alternative 2, Sequence 1) (Table 11-1) and sheet pile driving for M2D2 quay walls at Mooring A (Alternative 3, Sequence 3) (Table 11-5). This is a result of the location of these activities being closer to shore where dispersion is lower.

Table 11-1 Maximum Predicted TSS at 150-Foot Radius from In-Water Sediment Activities, Alternative 2, Sequence 1 – Fall 2026

Environmental Scenario	*Environmental Scenario Code*	*Water Column Depth*	*M2D2 at DD3 Activities (TSS in mg/L)*								*Pier 2 Activities (TSS in mg/L)*				*Mooring F Activities (TSS in mg/L)*	
			M2D2 at DD3 Dredging (D1)	*M2D2 at DD3 Dredging (D2)*	*Cofferdam Pile Driving (Sheet)*	*Cofferdam Pile Driving (Pipe)*	*SWPH Pile Driving (Sheet)*	*SWPH Pile Driving (Pipe)*	*Temp. Access Pier Pile Driving (Pipe) (R1)*	*Temp. Access Pier Pile Driving (Pipe) (R2)*	*New Pier 2 Basin Dredging (D1)*	*New Pier 2 Basin Dredging (D2)*	*New Pier 2 Pile Driving (Sheet)*	*New Pier 2 Pile Driving (Pipe)*	*Mooring F Pile Driving (Pipe)*	*Mooring F Pile Driving (Concrete)*
Lower Tide Range, No Wind	Alt2_Seq01_Env01Surface	Surface	2.0	2.0	1.1	1.6	1.0	1.2	1.3	1.1	2.7	2.7	2.5	2.2	0.3	0.4
Lower Tide Range, No Wind	Alt2_Seq01_Env01Middle	Middle	2.0	2.0	1.4	1.8	1.4	1.4	1.8	1.6	3.0	2.8	2.7	2.3	0.4	0.4
Lower Tide Range, No Wind	Alt2_Seq01_Env01Bottom	Bottom	3.5	3.0	3.0	3.5	3.0	3.3	3.6	3.4	4.5	4.1	3.8	3.5	1.8	1.8
Lower Tide Range, Fall Winds	Alt2_Seq01_Env01Asurface	Surface	2.3	2.2	1.4	1.9	1.4	1.5	1.5	1.4	3.0	2.9	2.7	2.3	0.4	0.4
Lower Tide Range, Fall Winds	Alt2_Seq01_Env01Amiddle	Middle	2.3	2.3	1.6	2.0	1.6	1.7	1.9	1.8	3.2	3.1	2.8	2.4	0.5	0.5
Lower Tide Range, Fall Winds	Alt2_Seq01_Env01Abottom	Bottom	3.4	2.9	3.0	3.4	3.0	3.2	3.7	3.5	4.4	4.1	3.7	3.5	1.8	1.8
Lower Tide Range, Winter Winds	Alt2_Seq01_Env01Bsurface	Surface	2.1	2.1	1.4	1.9	1.4	1.5	1.6	1.5	3.0	2.9	2.6	2.2	0.4	0.4
Lower Tide Range, Winter Winds	Alt2_Seq01_Env01Bmiddle	Middle	2.2	2.1	1.6	2.0	1.5	1.6	1.9	1.8	3.1	3.0	2.8	2.3	0.6	0.6
Lower Tide Range, Winter Winds	Alt2_Seq01_Env01Bbottom	Bottom	3.5	3.0	3.0	3.5	3.0	3.4	4.0	3.8	4.5	4.1	3.8	3.5	1.9	1.9
Higher Tide Range, No Wind	Alt2_Seq01_Env02Surface	Surface	2.0	2.0	1.1	1.6	1.1	1.2	1.3	1.0	2.7	2.7	2.5	2.2	0.5	0.5
Higher Tide Range, No Wind	Alt2_Seq01_Env02Middle	Middle	2.0	2.0	1.3	1.7	1.3	1.4	1.7	1.4	2.9	2.8	2.6	2.3	0.5	0.5
Higher Tide Range, No Wind	Alt2_Seq01_Env02Bottom	Bottom	3.4	3.0	2.9	3.5	2.9	3.3	3.9	3.8	4.5	4.2	3.9	3.5	1.9	1.9
Higher Tide Range, Fall Winds	Alt2_Seq01_Env02Asurface	Surface	2.2	2.2	1.4	1.8	1.4	1.5	1.4	1.3	3.1	3.0	2.8	2.5	0.5	0.5
Higher Tide Range, Fall Winds	Alt2_Seq01_Env02Amiddle	Middle	2.3	2.2	1.7	2.0	1.6	1.8	1.7	1.7	3.3	3.1	2.9	2.5	0.6	0.6
Higher Tide Range, Fall Winds	Alt2_Seq01_Env02Abottom	Bottom	3.3	3.0	2.9	3.3	3.0	3.3	4.0	4.0	4.4	4.1	3.8	3.5	1.8	1.8
Higher Tide Range, Winter Winds	Alt2_Seq01_Env02Bsurface	Surface	2.2	2.2	1.5	1.9	1.4	1.5	1.4	1.3	3.0	2.9	2.6	2.2	0.5	0.5
Higher Tide Range, Winter Winds	Alt2_Seq01_Env02Bmiddle	Middle	2.3	2.2	1.6	2.0	1.6	1.7	1.7	1.6	3.1	3.0	2.7	2.3	0.5	0.5
Higher Tide Range, Winter Winds	Alt2_Seq01_Env02Bbottom	Bottom	3.3	3.0	2.9	3.4	2.9	3.3	3.9	3.8	4.4	4.1	3.8	3.4	1.7	1.7

Notes: Assumes turbidity (expressed as NTU) is equal to predicted concentrations of total suspended solids (TSS) in mg/L. See Section 4.7 for discussion of TSS-turbidity relationship. The water quality criterion used for this modeling analysis is 5 NTU over background when the background is 50 NTU or less and the point of compliance is a radius of 150 feet from the sediment-disturbing activity (WAC 173-201A-21) (Section 3.1).
Legend: DD3 = dry dock 3; D1 = derrick 1 of 2; D2 = derrick 2 of 2; R1 = Pile driving rig 1 of 2; R2 = Pile driving rig 2 of 2; SWPH = Saltwater Pumphouse; TSS = total suspended solids.

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Table 11-2 Maximum Predicted TSS at 150-Foot Radius from In-Water Sediment Activities, Alternative 2, Sequence 2 – Fall 2027

Environmental Scenario	*Environmental Scenario Code*	*Water Column Depth*	*M2D2 at DD3 Activities (TSS in mg/L)*								
			SWPH Pile Driving (Sheet)	*SWPH Pile Driving (Pipe)*	*Pier 6 Pile Removal (R1)*	*Pier 6 Pile Removal (R2)*	*Pier 7 Pile Removal*	*Cofferdam Pile Driving*	*Phase 1 Basin Dredging (D1)*	*Phase 1 Basin Dredging (D2)*	*Former Pier 8 Foundation Removal*
Lower Tide Range, No Wind	Alt2_Seq02_Env01Surface	Surface	0.7	0.8	2.2	2.2	2.3	2.3	2.5	2.2	2.5
Lower Tide Range, No Wind	Alt2_Seq02_Env01Middle	Middle	0.9	0.9	2.4	2.4	2.8	2.4	2.6	2.5	2.8
Lower Tide Range, No Wind	Alt2_Seq02_Env01Bottom	Bottom	2.0	2.2	2.9	2.8	3.6	3.5	3.4	2.2	3.6
Lower Tide Range, Fall Winds	Alt2_Seq02_Env01ASurface	Surface	1.2	1.2	2.0	2.0	2.1	2.1	2.3	2.1	2.4
Lower Tide Range, Fall Winds	Alt2_Seq02_Env01AMiddle	Middle	1.3	1.3	2.1	2.1	2.4	2.2	2.3	2.1	2.6
Lower Tide Range, Fall Winds	Alt2_Seq02_Env01ABottom	Bottom	2.1	2.4	2.5	2.4	3.3	3.0	3.0	2.0	3.3
Lower Tide Range, Winter Winds	Alt2_Seq02_Env01BSurface	Surface	1.2	1.2	1.9	2.0	2.2	2.1	2.2	2.0	2.5
Lower Tide Range, Winter Winds	Alt2_Seq02_Env01BMiddle	Middle	1.3	1.3	2.1	2.0	2.4	2.2	2.3	2.1	2.6
Lower Tide Range, Winter Winds	Alt2_Seq02_Env01BBottom	Bottom	2.1	2.4	2.5	2.3	3.3	3.0	3.0	2.0	3.3
Higher Tide Range, No Wind	Alt2_Seq02_Env02Surface	Surface	1.2	1.2	2.0	2.0	2.2	2.2	2.3	2.1	2.3
Higher Tide Range, No Wind	Alt2_Seq02_Env02Middle	Middle	1.4	1.4	2.1	2.1	2.6	2.3	2.4	2.3	2.6
Higher Tide Range, No Wind	Alt2_Seq02_Env02Bottom	Bottom	2.2	2.4	2.8	2.6	3.2	3.3	3.2	2.1	3.2
Higher Tide Range, Fall Winds	Alt2_Seq02_Env02ASurface	Surface	1.3	1.3	2.1	2.1	2.2	2.2	2.4	2.2	2.4
Higher Tide Range, Fall Winds	Alt2_Seq02_Env02AMiddle	Middle	1.4	1.4	2.2	2.2	2.6	2.4	2.5	2.3	2.6
Higher Tide Range, Fall Winds	Alt2_Seq02_Env02ABottom	Bottom	2.2	2.5	2.6	2.5	3.2	3.1	3.1	2.1	3.3
Higher Tide Range, Winter Winds	Alt2_Seq02_Env02BSurface	Surface	1.2	1.2	2.1	2.1	2.2	2.2	2.3	2.1	2.5
Higher Tide Range, Winter Winds	Alt2_Seq02_Env02BMiddle	Middle	1.3	1.4	2.1	2.1	2.6	2.2	2.4	2.2	2.6
Higher Tide Range, Winter Winds	Alt2_Seq02_Env02BBottom	Bottom	2.2	2.5	2.8	2.6	3.2	3.3	3.2	2.1	3.2

Notes: Assumes turbidity (expressed as NTU) is equal to predicted concentrations of total suspended solids (TSS) in mg/L. See Section 4.7 for discussion of TSS-turbidity relationship. The turbidity water quality criterion used for this modeling analysis is 5 NTU over background when the background is 50 NTU or less and the point of compliance is a radius of 150 feet from the sediment-disturbing activity (WAC 173-201A-21) (Section 3.1).

Legend: DD3 = dry dock 3; D1 = derrick 1 of 2; D2 = derrick 2 of 2; R1 = rig 1 of 2 (north); R2 = rig 2 of 2 (south); SWPH = Saltwater Pumphouse; TSS = total suspended solids.

Table 11-3 Maximum Predicted TSS at 150-Foot Radius from In-Water Sediment Activities, Alternative 3, Sequence 1 – Fall 2029

Environmental Scenario	*Environmental Scenario Code*	*Water Column Depth*	*M2D2 at Mooring A Activities (TSS in mg/L)*			
			Temp. Cutoff Wall Pile Removal (R1)	*Temp. Cutoff Wall Pile Removal (R2)*	*Dredging for Foundations (D1)*	*Dredging for Foundations (D2)*
Lower Tide Range, No Wind	Alt3_Seq01_Env01Surface	Surface	1.8	1.7	2.1	2.0
Lower Tide Range, No Wind	Alt3_Seq01_Env01Middle	Middle	1.9	1.9	2.1	1.9
Lower Tide Range, No Wind	Alt3_Seq01_Env01Bottom	Bottom	2.7	2.8	3.0	3.0
Lower Tide Range, Fall Winds	Alt3_Seq01_Env01ASurface	Surface	1.5	1.6	2.0	1.9
Lower Tide Range, Fall Winds	Alt3_Seq01_Env01AMiddle	Middle	1.7	1.7	2.0	2.0
Lower Tide Range, Fall Winds	Alt3_Seq01_Env01ABottom	Bottom	2.1	2.3	2.6	2.6
Lower Tide Range, Winter Winds	Alt3_Seq01_Env01BSurface	Surface	1.6	1.7	1.9	1.9
Lower Tide Range, Winter Winds	Alt3_Seq01_Env01BMiddle	Middle	1.7	1.7	2.0	1.9
Lower Tide Range, Winter Winds	Alt3_Seq01_Env01BBottom	Bottom	2.1	2.4	2.8	2.8
Higher Tide Range, No Wind	Alt3_Seq01_Env02Surface	Surface	1.4	1.4	1.9	1.9
Higher Tide Range, No Wind	Alt3_Seq01_Env02Middle	Middle	1.6	1.5	1.9	1.8
Higher Tide Range, No Wind	Alt3_Seq01_Env02Bottom	Bottom	2.2	2.3	2.8	2.8
Higher Tide Range, Fall Winds	Alt3_Seq01_Env02ASurface	Surface	1.6	1.6	2.0	2.0
Higher Tide Range, Fall Winds	Alt3_Seq01_Env02AMiddle	Middle	1.7	1.7	2.0	2.0
Higher Tide Range, Fall Winds	Alt3_Seq01_Env02ABottom	Bottom	2.1	2.3	2.7	2.7
Higher Tide Range, Winter Winds	Alt3_Seq01_Env02BSurface	Surface	1.9	1.8	2.1	2.0
Higher Tide Range, Winter Winds	Alt3_Seq01_Env02BMiddle	Middle	2.0	1.9	2.2	2.1
Higher Tide Range, Winter Winds	Alt3_Seq01_Env02BBottom	Bottom	2.7	2.6	3.1	2.9

Notes: Assumes turbidity (expressed as NTU) is equal to predicted concentrations of total suspended solids (TSS) in mg/L. See Section 4.7 for discussion of TSS-turbidity relationship. The turbidity water quality criterion used for this modeling analysis is 5 NTU over background when the background is 50 NTU or less and the point of compliance is a radius of 150 feet from the sediment-disturbing activity (WAC 173-201A-21) (Section 3.1).

Legend: D1 = derrick 1 of 2; D2 = derrick 2 of 2; R1 = rig 1 of 2 (north); R2 = rig 2 of 2 (south); TSS = total suspended solids.

Table 11-4 Maximum Predicted TSS at 150-Foot Radius from In-Water Sediment Activities, Alternative 3, Sequence 2 – Fall 2030

Environmental Scenario	*Environmental Scenario Code*	*Water Column Depth*	*M2D2 at Mooring A Activities (TSS in mg/L)*				
			Dredge/Cut Caisson Foundation into Till (D1)	*Dredge/Cut Caisson Foundation into Till (D2)*	*Drive Dry Dock Piles for Walls (Sheet)*	*Drive Dry Dock Piles for Walls (Pipe)*	*Drive Dry Dock Piles for Floor (Pipe)*
Lower Tide Range, No Wind	Alt3_Seq02_Env01Surface	Surface	2.3	2.3	2.0	2.1	2.2
Lower Tide Range, No Wind	Alt3_Seq02_Env01Middle	Middle	2.4	2.2	2.1	2.2	2.5
Lower Tide Range, No Wind	Alt3_Seq02_Env01Bottom	Bottom	3.4	3.2	3.0	3.0	3.4
Lower Tide Range, Fall Winds	Alt3_Seq02_Env01ASurface	Surface	2.4	2.3	2.1	2.2	2.4
Lower Tide Range, Fall Winds	Alt3_Seq02_Env01AMiddle	Middle	2.6	2.3	2.2	2.3	2.6
Lower Tide Range, Fall Winds	Alt3_Seq02_Env01ABottom	Bottom	3.4	3.2	2.9	2.9	3.3
Lower Tide Range, Winter Winds	Alt3_Seq02_Env01BSurface	Surface	2.4	2.3	2.2	2.2	2.3
Lower Tide Range, Winter Winds	Alt3_Seq02_Env01BMiddle	Middle	2.5	2.4	2.2	2.2	2.5
Lower Tide Range, Winter Winds	Alt3_Seq02_Env01BBottom	Bottom	3.4	3.2	3.0	3.0	3.4
Higher Tide Range, No Wind	Alt3_Seq02_Env02Surface	Surface	2.3	2.2	2.0	2.0	2.2
Higher Tide Range, No Wind	Alt3_Seq02_Env02Middle	Middle	2.3	2.2	2.0	2.1	2.4
Higher Tide Range, No Wind	Alt3_Seq02_Env02Bottom	Bottom	3.5	3.3	2.9	3.1	3.4
Higher Tide Range, Fall Winds	Alt3_Seq02_Env02ASurface	Surface	2.5	2.3	2.1	2.2	2.4
Higher Tide Range, Fall Winds	Alt3_Seq02_Env02AMiddle	Middle	2.6	2.4	2.3	2.3	2.6
Higher Tide Range, Fall Winds	Alt3_Seq02_Env02ABottom	Bottom	3.4	3.2	2.9	2.9	3.4
Higher Tide Range, Winter Winds	Alt3_Seq02_Env02BSurface	Surface	2.4	2.3	2.1	2.1	2.4
Higher Tide Range, Winter Winds	Alt3_Seq02_Env02BMiddle	Middle	2.5	2.4	2.2	2.3	2.5
Higher Tide Range, Winter Winds	Alt3_Seq02_Env02BBottom	Bottom	3.5	3.2	2.8	3.0	3.3

Notes: Assumes turbidity (expressed as NTU) is equal to predicted concentrations of total suspended solids (TSS) in mg/L. See Section 4.7 for discussion of TSS-turbidity relationship. The turbidity water quality criterion used for this modeling analysis is 5 NTU over background when the background is 50 NTU or less and the point of compliance is a radius of 150 feet from the sediment-disturbing activity (WAC 173-201A-21) (Section 3.1).

Legend: D1 = derrick 1 of 2 (north); D2 = derrick 2 of 2 (south); TSS = total suspended solids.

Table 11-5 Maximum Predicted TSS at 150-Foot Radius from In-Water Sediment Activities, Alternative 3, Sequence 3 – Fall 2035

Environmental Scenario	*Environmental Scenario Code*	*Water Column Depth*	*Pier 4 Activities (TSS in mg/L)*			*M2D2 at Mooring A Activities (TSS in mg/L)*						
			Pier 4 Demo Dredging (D1)	*Pier 4 Demo Dredging (D2)*	*Pier 4 Foundation Removal (Concrete)*	*M2D2 Turning Basin Dredging (D1)*	*M2D2 Turning Basin Dredging (D2)*	*Pier 9 Demo Pile Removal*	*Quay Wall Pile Driving (Pipe)*	*Quay Wall Pile Driving (Sheet)*	*M2D2 Berthing Basin Dredging (D1)*	*M2D2 Berthing Basin Dredging (D2)*
Lower Tide Range, No Wind	Alt3_Seq03_Env01Surface	Surface	2.2	2.3	1.9	2.2	2.1	1.6	1.5	1.5	2.1	2.1
Lower Tide Range, No Wind	Alt3_Seq03_Env01Middle	Middle	2.3	2.3	2.1	2.3	2.2	1.9	1.8	1.8	2.0	2.0
Lower Tide Range, No Wind	Alt3_Seq03_Env01Bottom	Bottom	4.2	3.4	4.2	3.3	3.3	2.4	3.5	3.2	3.1	3.1
Lower Tide Range, Fall Winds	Alt3_Seq03_Env01ASurface	Surface	3.6	3.1	3.9	2.8	2.8	2.7	3.1	3.9	2.7	2.6
Lower Tide Range, Fall Winds	Alt3_Seq03_Env01AMiddle	Middle	3.9	3.3	4.0	3.1	3.0	2.9	3.3	4.0	2.9	2.9
Lower Tide Range, Fall Winds	Alt3_Seq03_Env01ABottom	Bottom	4.1	3.4	4.1	3.3	3.2	3.2	3.5	4.2	3.1	3.0
Lower Tide Range, Winter Winds	Alt3_Seq03_Env01BSurface	Surface	3.4	2.9	3.7	2.7	2.6	2.9	3.1	4.0	2.4	2.4
Lower Tide Range, Winter Winds	Alt3_Seq03_Env01BMiddle	Middle	3.9	3.3	4.0	3.1	3.0	3.0	3.4	4.0	2.9	2.9
Lower Tide Range, Winter Winds	Alt3_Seq03_Env01BBottom	Bottom	4.1	3.4	4.2	3.4	3.3	3.2	3.6	4.1	3.1	3.1
Higher Tide Range, No Wind	Alt3_Seq03_Env02Surface	Surface	3.2	2.6	3.6	2.5	2.5	2.9	2.7	3.8	2.4	2.5
Higher Tide Range, No Wind	Alt3_Seq03_Env02Middle	Middle	3.9	3.2	4.2	3.2	3.2	3.1	3.3	4.4	2.8	2.8
Higher Tide Range, No Wind	Alt3_Seq03_Env02Bottom	Bottom	4.1	3.4	4.2	3.4	3.3	3.3	3.7	4.4	3.0	3.0
Higher Tide Range, Fall Winds	Alt3_Seq03_Env02ASurface	Surface	3.7	3.0	3.8	3.0	2.9	3.0	3.1	4.2	2.6	2.6
Higher Tide Range, Fall Winds	Alt3_Seq03_Env02AMiddle	Middle	3.9	3.2	4.2	3.2	3.1	3.1	3.4	4.4	2.8	2.8
Higher Tide Range, Fall Winds	Alt3_Seq03_Env02ABottom	Bottom	4.1	3.4	4.2	3.4	3.4	3.2	3.8	4.3	3.0	3.0
Higher Tide Range, Winter Winds	Alt3_Seq03_Env02BSurface	Surface	3.7	3.0	3.9	2.9	2.9	3.0	3.6	3.9	2.7	2.7
Higher Tide Range, Winter Winds	Alt3_Seq03_Env02BMiddle	Middle	3.9	3.2	4.2	3.2	3.2	3.1	3.4	4.4	2.8	2.9
Higher Tide Range, Winter Winds	Alt3_Seq03_Env02BBottom	Bottom	4.1	3.5	4.2	3.5	3.4	3.1	3.6	4.4	3.0	3.0

Notes: Assumes turbidity (expressed as NTU) is equal to predicted concentrations of total suspended solids (TSS) in mg/L. See Section 4.7 for discussion of TSS-turbidity relationship. The turbidity water quality criterion used for this modeling analysis is 5 NTU over background when the background is 50 NTU or less and the point of compliance is a radius of 150 feet from the sediment-disturbing activity (WAC 173-201A-21) (Section 3.1).

Legend: D1 = derrick 1 of 2 (north); D2 = derrick 2 of 2 (south); TSS = total suspended solids.

11.4 Assessment of Impacts at Areas of Interest

The impacts of construction activities on the AOIs were assessed by two methods. The first is the predicted maximum TSS at each AOI and the second is the predicted cumulative deposition or sedimentation at each location (expressed in units of millimeters [mm]). The points used in the assessment of impacts at each AOI (Figure 11-8) are summarized below:

- **OU B Marine**: 5 points along the boundary of OU B Marine
- **Portions of Sinclair Inlet adjacent to OU B Marine**: 5 points in Sinclair Inlet parallel to the OU B Marine boundary
- **Charleston Beach**: One point at the outer edge of the AOI polygon
- **Marine vegetation east of Pier 7:** One point in the middle of the AOI polygon
- **Port Orchard Marina**: One point at the northern edge of the AOI polygon
- **Marine vegetation along the southern shoreline of Sinclair Inlet near the mouth of Blackjack Creek**: One point at the outer edge of the AOI polygon

The predicted maximum TSS and cumulative deposition are presented in Table 11-6 through Table 11-10 for Charleston Beach, Port Orchard Marina, and the two areas of marine vegetation. As previously noted, the area of marine vegetation east of Pier 7 will be removed as part of Alternative 2 construction activities and is an AOI only under Alternative 3. Table 11-11 through Table 11-15 present maximum TSS and cumulative deposition at the points along the boundary of OU B Marine and in portions of Sinclair Inlet adjacent to OU B Marine.

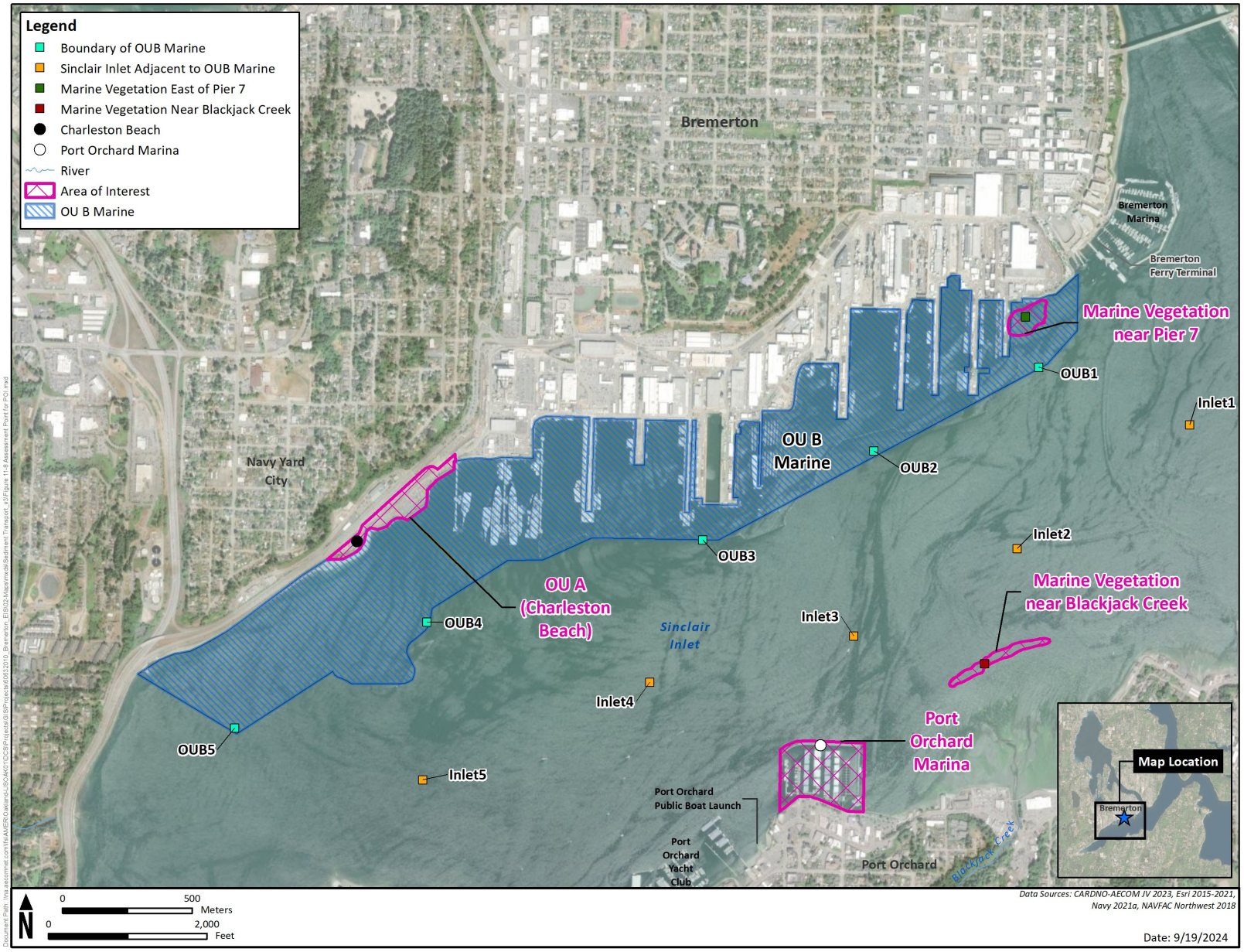

Figure 11-8 Assessment Points for Areas of Interest

11.4.1 Maximum Total Suspended Solids at Areas of Interest

For Alternative 2, the predicted maximum TSS concentrations at Charleston Beach, Port Orchard Marina, and the area of marine vegetation near Blackjack Creek are very low, less than 0.40 mg/L for both time periods modeled (fall 2026 and fall 2027). At the boundary of OU B Marine, maximum TSS is below 1.5 mg/L at the closest assessment point (OU B-1) (Table 11-11a and Table 11-12a). At the assessment points outside of OU B Marine in Sinclair Inlet, maximum TSS levels range from 0.06 mg/L to 0.59 mg/L (Table 11-11a and Table 11-12a). Based on the full set of model simulations for Alternative 2, TSS impacts outside of OU B Marine do not exceed 1-2 mg/L, which is within the range of ambient TSS in nearshore water off NAVBASE Kitsap Bremerton (Strivens et al. 2020).

For Alternative 3, the predicted maximum TSS concentrations at Charleston Beach, Port Orchard Marina, and both areas of marine vegetation are below 0.30 mg/L for the fall 2029 (Sequence 1) and fall 2030 (Sequence 2) time periods (Table 11-8 and Table 11-9). For the fall 2035 time period (Sequence 3), higher TSS concentrations are predicted at these AOIs (up to1 mg/L at Port Orchard Marina; Table 11-10) due to multiple concurrent dredging activities, including dredging for the M2D2 turning basin located outside of OU B Marine. At the OU B Marine boundary assessment points located near the M2D2 berthing and turning basins (OU B-2 and OU B-3), TSS levels range from approximately 1 to 2 mg/L (Table 11-15a). Dredging for the M2D2 berthing and turning basins under Alternative 3 is scheduled to occur in one construction season. When dredging for this component is not occurring, TSS impacts outside of OU B Marine do not exceed 1–2 mg/L (Table 11-13a and Table 11-14a), which is within the range of ambient TSS in the nearshore water off NAVBASE Kitsap Bremerton (Strivens et al. 2020).

11.4.2 Cumulative Sedimentation at Areas of Interest

As shown in Table 11-6 through Table 11-10, the cumulative sedimentation at Port Orchard Marina, Charleston Beach, and the area of marine vegetation along the southern shoreline of Sinclair Inlet near the mouth Blackjack Creek at the end of the 28-day simulation is less than 0.2 mm under all simulations. In the area of marine vegetation east of Pier 7, slightly greater sedimentation (0.3 mm) is predicted due to the proximity of construction activities under Alternative 3. For context, the natural amount of sedimentation that would be expected to occur over the same 28-day period is about 0.21 mm (annual sedimentation rate is about 0.25 +/- 0.12 cm/year in Sinclair Inlet [URS 1999]).

Outside of OU B Marine at the Sinclair Inlet assessment points, cumulative sedimentation is less than 0.1 mm for all scenarios except for Alternative 3, Sequence 3 (Table 11-11b through Table 11-15b). Cumulative sedimentation of as much as 0.5 mm is predicted at assessment point Inlet3 as a result of dredging for the berthing and turning basins (Table 11-15b). As previously noted, dredging for this component is scheduled to be completed in one construction season.

Figure 11-9 presents a time series of predicted cumulative sedimentation in Sinclair Inlet at 1, 2, 3, and 4 weeks for Scenario 1, Alternative 2 (Env01). The sequence illustrates the lateral expansion of the accumulating sedimentation over time. At the end of the 28-day simulation, cumulative sedimentation does not exceed 1 mm at the OU B Marine boundary (Figure 11-9d) and is less than 0.1 mm at the assessment points for portions of Sinclair Inlet adjacent to OU B Marine (Table 11-11b).

For each modeled construction activity, percent complete at the end of the 28-day model simulation period was estimated for both action alternatives (Table 11-16 and Table 11-17). The estimate was based on the total dredge volume or total number of piles to be installed/removed, daily activity rate,

and number of dredging derricks or pile rigs operating. The calculation assumed 6 days per week for dredging and 7 days per week for pile activities. Estimated percent complete at the end of 28 days ranged from less than 10 percent (e.g., dredging for foundations under Alternative 3 in fall 2029) to 100 percent complete (e.g., pile driving for Mooring F replacement under both alternatives). The estimates are based on available design information and best estimates of volumes and rates; however, there is uncertainty in the assumptions.

The simulations did not take into account the impact that best management practices (BMPs) and controls, such as pre-dredge debris sweeps or early warning monitors, would have on reducing the generation and dispersion of turbidity during in-water construction activities. Therefore, the magnitude and extent of both turbidity and sedimentation impacts outside of OU B Marine are expected to be less under actual construction conditions.

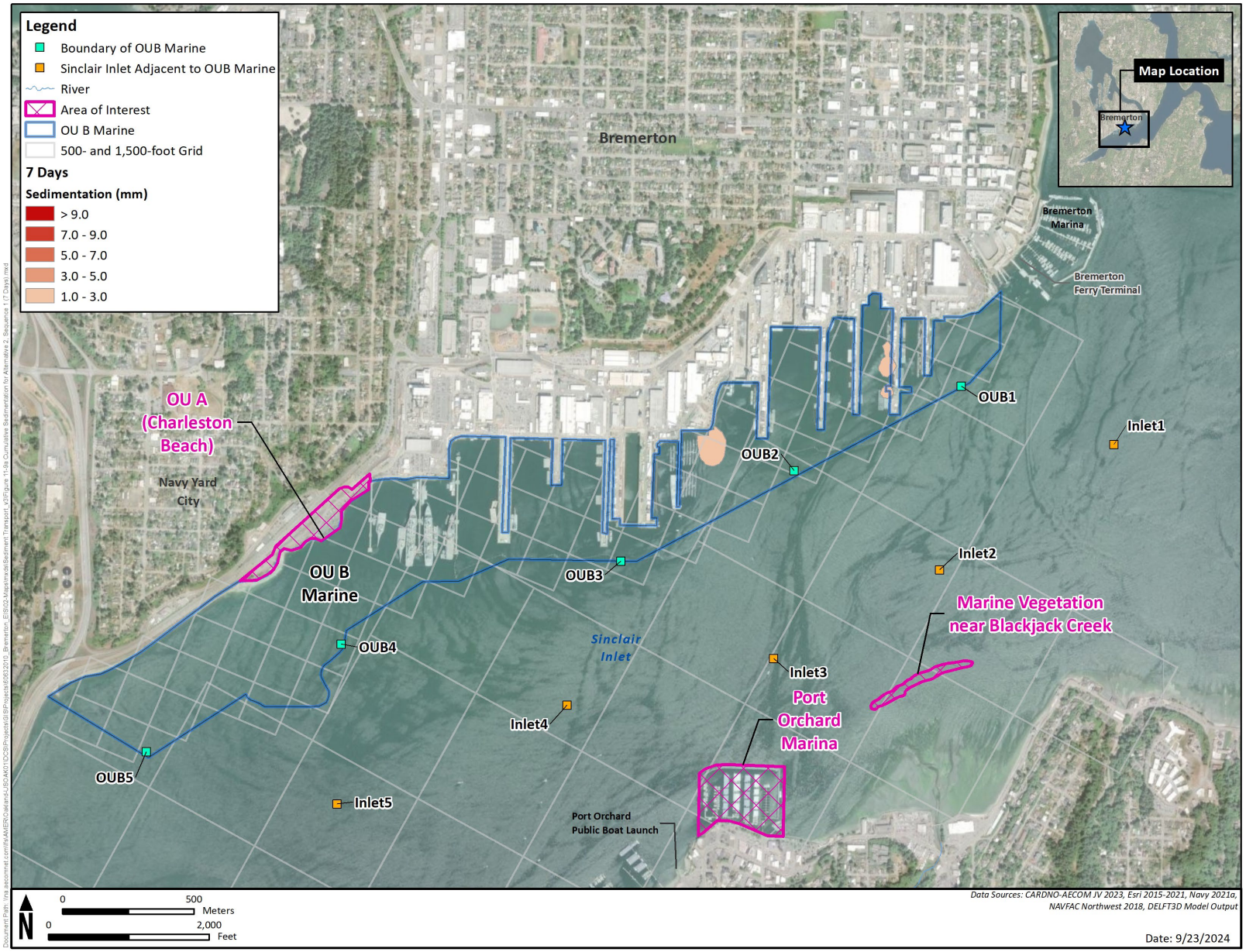

Figure 11-9a Cumulative Sedimentation for Alternative 2, Sequence 1 (7 Days)

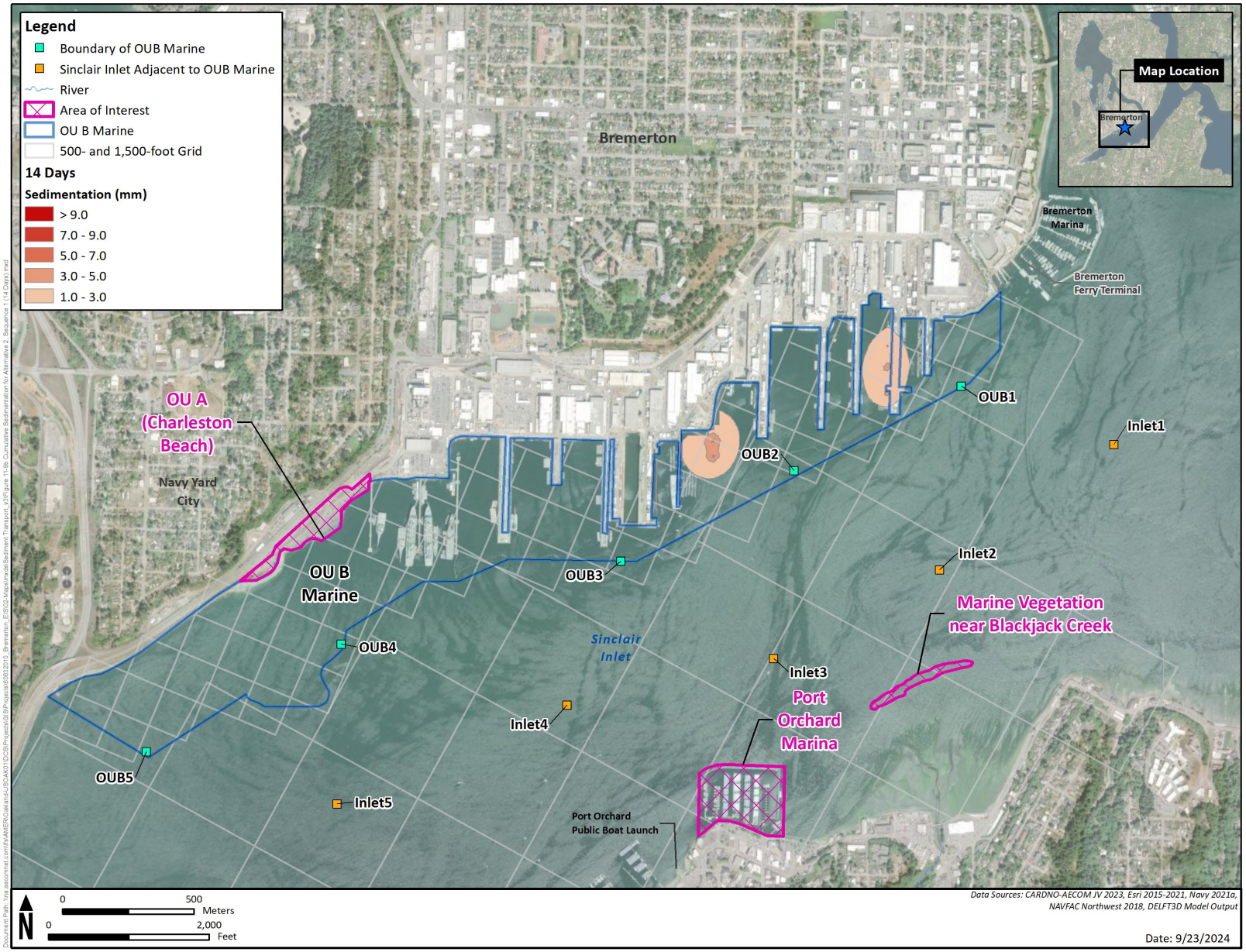

Figure 11-9b Cumulative Sedimentation for Alternative 2, Sequence 1 (14 Days)

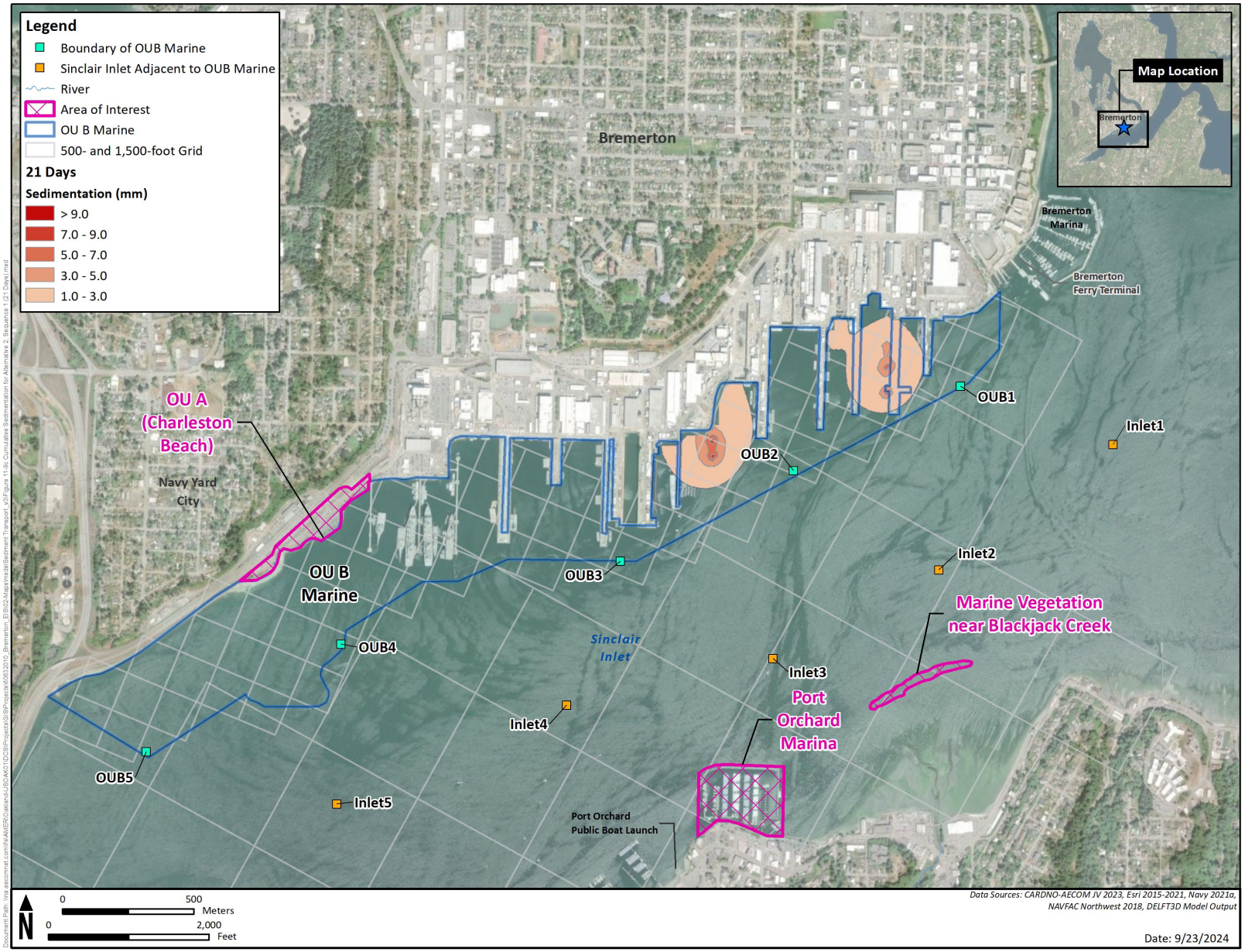

Figure 11-9c Cumulative Sedimentation for Alternative 2, Sequence 1 (21 Days)

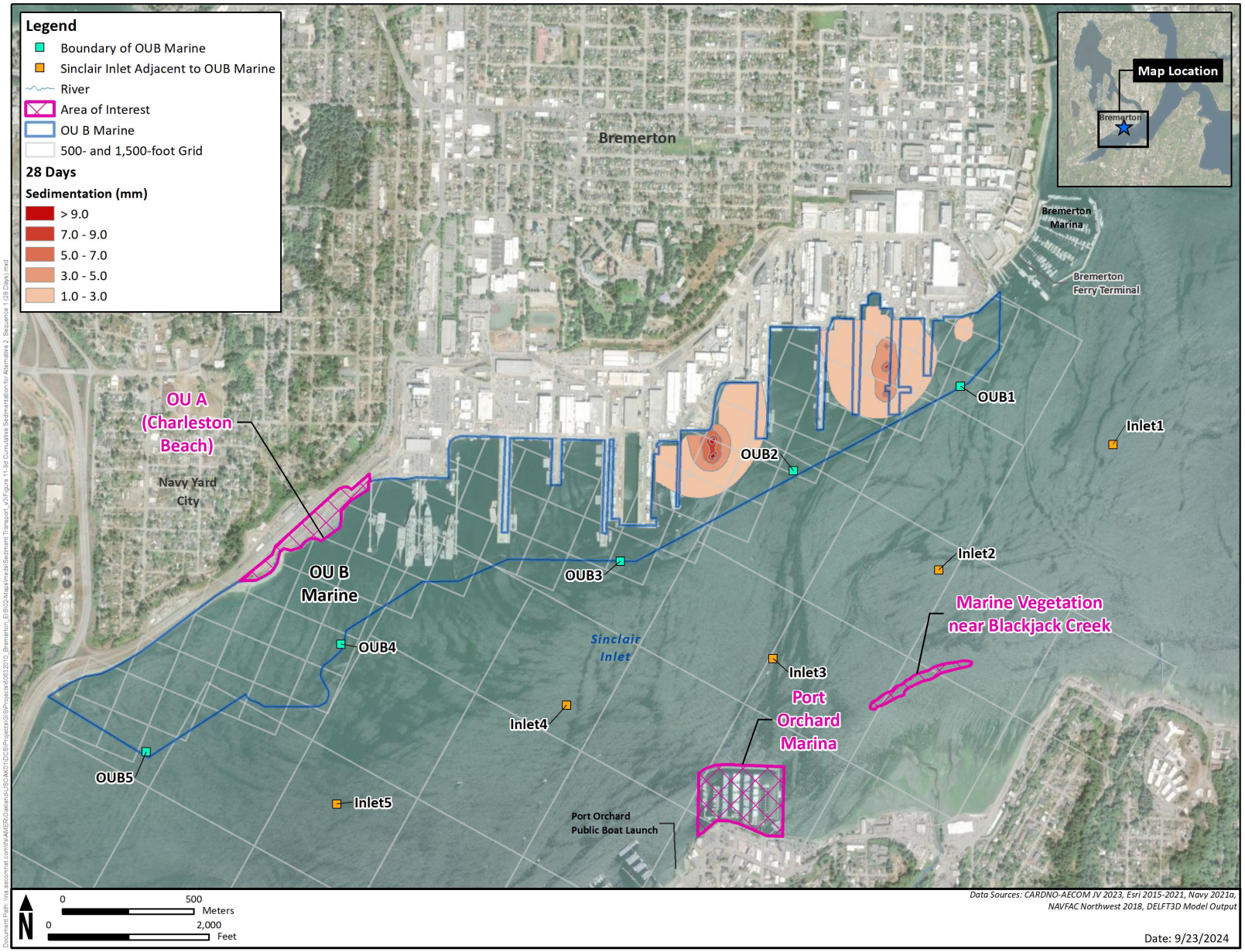

Figure 11-9d Cumulative Sedimentation for Alternative 2, Sequence 1 (28 Days)

Table 11-6 Maximum Predicted TSS and Cumulative Sedimentation at Areas of Interest, Alternative 2, Sequence 1 – Fall 2026

Environmental Scenario	*Environmental Scenario Code*	*Water Column Depth*	*Charleston Beach*		*Port Orchard Marina*		*Marine Vegetation near Blackjack Creek*	
			TSS (mg/L) (a)	*Deposition (mm) (b)*	*TSS (mg/L) (a)*	*Deposition (mm) (b)*	*TSS (mg/L) (a)*	*Deposition (mm) (b)*
Lower Tide Range, No Wind	Alt2_Seq01_Env01Surface	Surface	0.2	—	0.4	—	0.3	—
Lower Tide Range, No Wind	Alt2_Seq01_Env01Middle	Middle	0.2	—	0.4	—	0.3	—
Lower Tide Range, No Wind	Alt2_Seq01_Env01Bottom	Bottom	0.2	0.02	0.4	0.05	0.3	0.04
Lower Tide Range, Fall Winds	Alt2_Seq01_Env01ASurface	Surface	0.2	—	0.4	—	0.3	—
Lower Tide Range, Fall Winds	Alt2_Seq01_Env01AMiddle	Middle	0.2	—	0.4	—	0.3	—
Lower Tide Range, Fall Winds	Alt2_Seq01_Env01ABottom	Bottom	0.2	0.02	0.4	0.05	0.3	0.05
Lower Tide Range, Winter Winds	Alt2_Seq01_Env01BSurface	Surface	0.2	—	0.4	—	0.3	—
Lower Tide Range, Winter Winds	Alt2_Seq01_Env01BMiddle	Middle	0.2	—	0.4	—	0.3	—
Lower Tide Range, Winter Winds	Alt2_Seq01_Env01BBottom	Bottom	0.2	0.02	0.4	0.05	0.3	0.04
Higher Tide Range, No Wind	Alt2_Seq01_Env02Surface	Surface	0.2	—	0.4	—	0.3	—
Higher Tide Range, No Wind	Alt2_Seq01_Env02Middle	Middle	0.2	—	0.4	—	0.3	—
Higher Tide Range, No Wind	Alt2_Seq01_Env02Bottom	Bottom	0.2	0.02	0.4	0.05	0.3	0.04
Higher Tide Range, Fall Winds	Alt2_Seq01_Env02ASurface	Surface	0.2	—	0.4	—	0.3	—
Higher Tide Range, Fall Winds	Alt2_Seq01_Env02AMiddle	Middle	0.2	—	0.4	—	0.3	—
Higher Tide Range, Fall Winds	Alt2_Seq01_Env02ABottom	Bottom	0.2	0.02	0.4	0.05	0.3	0.05
Higher Tide Range, Winter Winds	Alt2_Seq01_Env02BSurface	Surface	0.2	—	0.4	—	0.3	—
Higher Tide Range, Winter Winds	Alt2_Seq01_Env02BMiddle	Middle	0.2	—	0.4	—	0.3	—
Higher Tide Range, Winter Winds	Alt2_Seq01_Env02BBottom	Bottom	0.2	0.02	0.4	0.05	0.3	0.04

Notes: (a) Maximum predicted concentration of total suspended solids (TSS) at area of interest. (b) Accumulated deposition shown is at the end of the 28-day model simulation period.
Legend: — = The calculation of accumulated deposition (cumulative sedimentation) is only applicable to the bottom layer, as sediment particles in the surface and middle layers of the water column eventually settle to the bottom layer; mg/L = milligram per liter; mm = millimeter; TSS = total suspended solids.

Table 11-7 Maximum Predicted TSS and Cumulative Sedimentation at Areas of Interest, Alternative 2, Sequence 2 – Fall 2027

Environmental Scenario	*Environmental Scenario Code*	*Water Column Depth*	*Charleston Beach*		*Port Orchard Marina*		*Marine Vegetation near Blackjack Creek*	
			TSS (mg/L) (a)	*Deposition (mm) (b)*	*TSS (mg/L) (a)*	*Deposition (mm) (b)*	*TSS (mg/L) (a)*	*Deposition (mm) (b)*
Lower Tide Range, No Wind	Alt2_Seq02_Env01Surface	Surface	0.06	—	0.1	—	0.1	—
Lower Tide Range, No Wind	Alt2_Seq02_Env01Middle	Middle	0.06	—	0.2	—	0.1	—
Lower Tide Range, No Wind	Alt2_Seq02_Env01Bottom	Bottom	0.06	0.007	0.2	0.02	0.2	0.02
Lower Tide Range, Fall Winds	Alt2_Seq02_Env01ASurface	Surface	0.06	—	0.1	—	0.2	—
Lower Tide Range, Fall Winds	Alt2_Seq02_Env01AMiddle	Middle	0.06	—	0.1	—	0.2	—
Lower Tide Range, Fall Winds	Alt2_Seq02_Env01ABottom	Bottom	0.07	0.006	0.1	0.02	0.2	0.02
Lower Tide Range, Winter Winds	Alt2_Seq02_Env01BSurface	Surface	0.06	—	0.1	—	0.1	—
Lower Tide Range, Winter Winds	Alt2_Seq02_Env01BMiddle	Middle	0.07	—	0.1	—	0.1	—
Lower Tide Range, Winter Winds	Alt2_Seq02_Env01BBottom	Bottom	0.07	0.006	0.1	0.02	0.1	0.02
Higher Tide Range, No Wind	Alt2_Seq02_Env02Surface	Surface	0.06	—	0.1	—	0.1	—
Higher Tide Range, No Wind	Alt2_Seq02_Env02Middle	Middle	0.06	—	0.1	—	0.1	—
Higher Tide Range, No Wind	Alt2_Seq02_Env02Bottom	Bottom	0.07	0.007	0.1	0.02	0.1	0.02
Higher Tide Range, Fall Winds	Alt2_Seq02_Env02ASurface	Surface	0.06	—	0.2	—	0.2	—
Higher Tide Range, Fall Winds	Alt2_Seq02_Env02AMiddle	Middle	0.06	—	0.2	—	0.2	—
Higher Tide Range, Fall Winds	Alt2_Seq02_Env02ABottom	Bottom	0.06	0.006	0.2	0.02	0.2	0.02
Higher Tide Range, Winter Winds	Alt2_Seq02_Env02BSurface	Surface	0.06	—	0.1	—	0.1	—
Higher Tide Range, Winter Winds	Alt2_Seq02_Env02BMiddle	Middle	0.06	—	0.1	—	0.1	—
Higher Tide Range, Winter Winds	Alt2_Seq02_Env02BBottom	Bottom	0.06	0.006	0.1	0.02	0.1	0.02

Notes: (a) Maximum predicted concentration of total suspended solids (TSS) at area of interest. (b) Accumulated deposition shown is at the end of the 28-day model simulation period.
Legend: — = The calculation of accumulated deposition (cumulative sedimentation) is only applicable to the bottom layer, as sediment particles in the surface and middle layers of the water column eventually settle to the bottom layer; mg/L = milligram per liter; mm = millimeter; TSS = total suspended solids.

Table 11-8 Maximum Predicted TSS and Cumulative Sedimentation at Areas of Interest, Alternative 3, Sequence 1 – Fall 2029

Environmental Scenario	*Environmental Scenario Code*	*Water Column Depth*	*Charleston Beach*		*Port Orchard Marina*		*Marine Vegetation near Blackjack Creek*		*Marine Vegetation near Pier 7*	
			TSS (mg/L) (a)	*Deposition (mm) (b)*	*TSS (mg/L) (a)*	*Deposition (mm) (b)*	*TSS (mg/L) (a)*	*Deposition (mm) (b)*	*TSS (mg/L) (a)*	*Deposition (mm) (b)*
Lower Tide Range, No Wind	Alt3_Seq01_Env01Surface	Surface	0.1	—	0.2	—	0.2	—	0.2	—
Lower Tide Range, No Wind	Alt3_Seq01_Env01Middle	Middle	0.1	—	0.2	—	0.2	—	0.2	—
Lower Tide Range, No Wind	Alt3_Seq01_Env01Bottom	Bottom	0.1	0.02	0.2	0.04	0.2	0.03	0.2	0.02
Lower Tide Range, Fall Winds	Alt3_Seq01_Env01ASurface	Surface	0.1	—	0.2	—	0.2	—	0.2	—
Lower Tide Range, Fall Winds	Alt3_Seq01_Env01AMiddle	Middle	0.1	—	0.2	—	0.2	—	0.2	—
Lower Tide Range, Fall Winds	Alt3_Seq01_Env01ABottom	Bottom	0.1	0.02	0.2	0.04	0.2	0.03	0.2	0.02
Lower Tide Range, Winter Winds	Alt3_Seq01_Env01BSurface	Surface	0.1	—	0.2	—	0.2	—	0.2	—
Lower Tide Range, Winter Winds	Alt3_Seq01_Env01BMiddle	Middle	0.2	—	0.2	—	0.2	—	0.2	—
Lower Tide Range, Winter Winds	Alt3_Seq01_Env01BBottom	Bottom	0.2	0.02	0.2	0.04	0.2	0.02	0.2	0.02
Higher Tide Range, No Wind	Alt3_Seq01_Env02Surface	Surface	0.1	—	0.2	—	0.2	—	0.2	—
Higher Tide Range, No Wind	Alt3_Seq01_Env02Middle	Middle	0.1	—	0.2	—	0.2	—	0.2	—
Higher Tide Range, No Wind	Alt3_Seq01_Env02Bottom	Bottom	0.1	0.02	0.3	0.04	0.2	0.02	0.2	0.02
Higher Tide Range, Fall Winds	Alt3_Seq01_Env02ASurface	Surface	0.1	—	0.3	—	0.2	—	0.3	—
Higher Tide Range, Fall Winds	Alt3_Seq01_Env02AMiddle	Middle	0.1	—	0.3	—	0.2	—	0.3	—
Higher Tide Range, Fall Winds	Alt3_Seq01_Env02ABottom	Bottom	0.1	0.02	0.3	0.04	0.2	0.03	0.3	0.02
Higher Tide Range, Winter Winds	Alt3_Seq01_Env02BSurface	Surface	0.1	—	0.2	—	0.2	—	0.2	—
Higher Tide Range, Winter Winds	Alt3_Seq01_Env02BMiddle	Middle	0.1	—	0.3	—	0.2	—	0.2	—
Higher Tide Range, Winter Winds	Alt3_Seq01_Env02BBottom	Bottom	0.1	0.02	0.3	0.04	0.2	0.02	0.2	0.02

Notes: (a) Maximum predicted concentration of total suspended solids (TSS) at area of interest. (b) Accumulated deposition shown is at the end of the 28-day model simulation period.
Legend: — = The calculation of accumulated deposition (cumulative sedimentation) is only applicable to the bottom layer, as sediment particles in the surface and middle layers of the water column eventually settle to the bottom layer; mg/L = milligram per liter; mm = millimeter; TSS = total suspended solids.

Table 11-9 Maximum Predicted TSS and Cumulative Sedimentation at Areas of Interest, Alternative 3, Sequence 2 – Fall 2030

Environmental Scenario	*Environmental Scenario Code*	*Water Column Depth*	*Charleston Beach*		*Port Orchard Marina*		*Marine Vegetation near Blackjack Creek*		*Marine Vegetation near Pier 7*	
			TSS (mg/L) (a)	*Deposition (mm) (b)*	*TSS (mg/L) (a)*	*Deposition (mm) (b)*	*TSS (mg/L) (a)*	*Deposition (mm) (b)*	*TSS (mg/L) (a)*	*Deposition (mm) (b)*
Lower Tide Range, No Wind	Alt3_Seq01_Env01Surface	Surface	0.1	—	0.2	—	0.2	—	0.1	—
Lower Tide Range, No Wind	Alt3_Seq01_Env01Middle	Middle	0.1	—	0.2	—	0.2	—	0.2	—
Lower Tide Range, No Wind	Alt3_Seq01_Env01Bottom	Bottom	0.1	0.02	0.2	0.040	0.2	0.03	0.2	0.02
Lower Tide Range, Fall Winds	Alt3_Seq01_Env01ASurface	Surface	0.1	—	0.2	—	0.2	—	0.2	—
Lower Tide Range, Fall Winds	Alt3_Seq01_Env01AMiddle	Middle	0.1	—	0.2	—	0.2	—	0.2	—
Lower Tide Range, Fall Winds	Alt3_Seq01_Env01ABottom	Bottom	0.1	0.02	0.2	0.04	0.2	0.03	0.2	0.02
Lower Tide Range, Winter Winds	Alt3_Seq01_Env01BSurface	Surface	0.1	—	0.2	—	0.2	—	0.2	—
Lower Tide Range, Winter Winds	Alt3_Seq01_Env01BMiddle	Middle	0.2	—	0.2	—	0.2	—	0.2	—
Lower Tide Range, Winter Winds	Alt3_Seq01_Env01BBottom	Bottom	0.2	0.02	0.2	0.04	0.2	0.02	0.2	0.02
Higher Tide Range, No Wind	Alt3_Seq01_Env02Surface	Surface	0.1	—	0.2	—	0.2	—	0.2	—
Higher Tide Range, No Wind	Alt3_Seq01_Env02Middle	Middle	0.1	—	0.2	—	0.2	—	0.2	—
Higher Tide Range, No Wind	Alt3_Seq01_Env02Bottom	Bottom	0.2	0.02	0.3	0.04	0.2	0.02	0.2	0.02
Higher Tide Range, Fall Winds	Alt3_Seq01_Env02ASurface	Surface	0.1	—	0.3	—	0.2	—	0.3	—
Higher Tide Range, Fall Winds	Alt3_Seq01_Env02AMiddle	Middle	0.1	—	0.3	—	0.2	—	0.3	—
Higher Tide Range, Fall Winds	Alt3_Seq01_Env02ABottom	Bottom	0.1	0.02	0.3	0.04	0.2	0.03	0.2	0.02
Higher Tide Range, Winter Winds	Alt3_Seq01_Env02BSurface	Surface	0.1	—	0.3	—	0.2	—	0.2	—
Higher Tide Range, Winter Winds	Alt3_Seq01_Env02BMiddle	Middle	0.1	—	0.3	—	0.2	—	0.2	—
Higher Tide Range, Winter Winds	Alt3_Seq01_Env02BBottom	Bottom	0.1	0.02	0.3	0.04	0.2	0.02	0.2	0.02

Notes: (a) Maximum predicted concentration of total suspended solids (TSS) at area of interest. (b) Accumulated deposition shown is at the end of the 28-day model simulation period.
Legend: — = The calculation of accumulated deposition (cumulative sedimentation) is only applicable to the bottom layer, as sediment particles in the surface and middle layers of the water column eventually settle to the bottom layer; mg/L = milligram per liter; mm = millimeter; TSS = total suspended solids.

Table 11-10 Maximum Predicted TSS and Cumulative Sedimentation at Areas of Interest, Alternative 3, Sequence 3 – Fall 2035

Environmental Scenario	*Environmental Scenario Code*	*Water Column Depth*	*Charleston Beach*		*Port Orchard Marina*		*Marine Vegetation near Blackjack Creek*		*Marine Vegetation near Pier 7*	
			TSS (mg/L) (a)	*Deposition (mm) (b)*	*TSS (mg/L) (a)*	*Deposition (mm) (b)*	*TSS (mg/L) (a)*	*Deposition (mm) (b)*	*TSS (mg/L) (a)*	*Deposition (mm) (b)*
Lower Tide Range, No Wind	Alt3_Seq03_Env01Surface	Surface	0.3	—	0.6	—	0.5	—	0.9	—
Lower Tide Range, No Wind	Alt3_Seq03_Env01Middle	Middle	0.3	—	0.7	—	0.5	—	1.1	—
Lower Tide Range, No Wind	Alt3_Seq03_Env01Bottom	Bottom	0.3	0.04	0.7	0.2	0.5	0.1	1.2	0.3
Lower Tide Range, Fall Winds	Alt3_Seq03_Env01ASurface	Surface	0.4	—	0.8	—	0.7	—	1.5	—
Lower Tide Range, Fall Winds	Alt3_Seq03_Env01AMiddle	Middle	0.4	—	0.8	—	0.7	—	1.5	—
Lower Tide Range, Fall Winds	Alt3_Seq03_Env01ABottom	Bottom	0.4	0.05	0.8	0.2	0.7	0.1	1.5	0.3
Lower Tide Range, Winter Winds	Alt3_Seq03_Env01BSurface	Surface	0.4	—	0.8	—	0.6	—	1.5	—
Lower Tide Range, Winter Winds	Alt3_Seq03_Env01BMiddle	Middle	0.4	—	0.8	—	0.6	—	1.5	—
Lower Tide Range, Winter Winds	Alt3_Seq03_Env01BBottom	Bottom	0.5	0.05	0.9	0.2	0.6	0.1	1.5	0.3
Higher Tide Range, No Wind	Alt3_Seq03_Env02Surface	Surface	0.3	—	0.8	—	0.6	—	1.2	—
Higher Tide Range, No Wind	Alt3_Seq03_Env02Middle	Middle	0.4	—	0.9	—	0.7	—	1.5	—
Higher Tide Range, No Wind	Alt3_Seq03_Env02Bottom	Bottom	0.4	0.05	0.9	0.2	0.7	0.1	1.5	0.3
Higher Tide Range, Fall Winds	Alt3_Seq03_Env02ASurface	Surface	0.4	—	0.9	—	0.8	—	1.4	—
Higher Tide Range, Fall Winds	Alt3_Seq03_Env02AMiddle	Middle	0.4	—	0.9	—	0.8	—	1.5	—
Higher Tide Range, Fall Winds	Alt3_Seq03_Env02ABottom	Bottom	0.4	0.05	0.9	0.2	0.8	0.1	1.5	0.3
Higher Tide Range, Winter Winds	Alt3_Seq03_Env02BSurface	Surface	0.4	—	0.9	—	0.7	—	1.4	—
Higher Tide Range, Winter Winds	Alt3_Seq03_Env02BMiddle	Middle	0.4	—	1.0	—	0.7	—	1.6	—
Higher Tide Range, Winter Winds	Alt3_Seq03_Env02BBottom	Bottom	0.4	0.05	1.0	0.2	0.7	0.1	1.5	0.3

Notes: (a) Maximum predicted concentration of total suspended solids (TSS) at area of interest. (b) Accumulated deposition shown is at the end of the 28-day model simulation period.
Legend: — = The calculation of accumulated deposition (cumulative sedimentation) is only applicable to the bottom layer, as sediment particles in the surface and middle layers of the water column eventually settle to the bottom layer; mg/L = milligram per liter; mm = millimeter; TSS = total suspended solids.

Table 11-11a Maximum Predicted TSS at OU B Marine Boundary and Portions of Sinclair Inlet Adjacent to OU B Marine, Alternative 2, Sequence 1 – Fall 2026

Environmental Scenario	*Environmental Scenario Code*	*Water Column Depth*	*Maximum TSS (mg/L) (a)*									
			OUB1	*OUB2*	*OUB3*	*OUB4*	*OUB5*	*Inlet1*	*Inlet2*	*Inlet3*	*Inlet4*	*Inlet5*
Lower Tide Range, No Wind	Alt2_Seq01_Env01	Surface	0.9	0.8	1.1	0.2	0.1	0.4	0.5	0.5	0.6	0.2
		Middle	1.1	1.0	1.2	0.2	0.1	0.5	0.5	0.5	0.6	0.2
		Bottom	1.4	1.4	1.2	0.2	0.1	0.4	0.5	0.5	0.6	0.2
Lower Tide Range, Fall Winds	Alt2_Seq01_Env01A	Surface	1.2	1.0	1.2	0.2	0.1	0.5	0.5	0.5	0.6	0.2
		Middle	1.2	1.1	1.2	0.2	0.1	0.5	0.5	0.5	0.6	0.2
		Bottom	1.3	1.3	1.2	0.2	0.1	0.5	0.5	0.5	0.6	0.2
Lower Tide Range, Winter Winds	Alt2_Seq01_Env01B	Surface	1.1	0.9	1.2	0.3	0.1	0.5	0.5	0.5	0.6	0.2
		Middle	1.1	1.0	1.2	0.3	0.1	0.5	0.5	0.5	0.6	0.2
		Bottom	1.4	1.3	1.2	0.3	0.1	0.5	0.5	0.5	0.6	0.2
Higher Tide Range, No Wind	Alt2_Seq01_Env02	Surface	0.9	0.9	1.1	0.3	0.1	0.5	0.5	0.5	0.6	0.2
		Middle	1.1	1.0	1.2	0.3	0.1	0.5	0.5	0.5	0.6	0.2
		Bottom	1.3	1.4	1.2	0.3	0.1	0.5	0.5	0.5	0.6	0.2
Higher Tide Range, Fall Winds	Alt2_Seq01_Env02A	Surface	1.2	1.1	1.2	0.3	0.1	0.5	0.6	0.5	0.6	0.2
		Middle	1.2	1.1	1.2	0.3	0.1	0.5	0.6	0.5	0.6	0.2
		Bottom	1.3	1.5	1.2	0.3	0.1	0.5	0.6	0.5	0.6	0.2
Higher Tide Range, Winter Winds	Alt2_Seq01_Env02B	Surface	1.1	1.0	1.2	0.3	0.1	0.5	0.5	0.5	0.6	0.2
		Middle	1.2	1.0	1.2	0.3	0.1	0.5	0.5	0.5	0.6	0.2
		Bottom	1.3	1.5	1.2	0.3	0.1	0.5	0.5	0.5	0.6	0.2

Notes: (a) Maximum predicted concentration of total suspended solids (TSS) at area of interest. See Figure 11-8 for the location of assessment points for the boundary of OU B Marine and portions of Sinclair Inlet adjacent to OU B Marine.

Legend: mg/L = milligram per liter; Inlet = Sinclair Inlet; OUB = OUB Marine; TSS = total suspended solids.

Table 11-11b Cumulative Sedimentation at OU B Marine Boundary and Portions of Sinclair Inlet Adjacent to OU B Marine, Alternative 2, Sequence 1 – Fall 2026

Environmental Scenario	*Environmental Scenario Code*	*Water Column Depth*	*Cumulative Sedimentation (mm) (a)*									
			OUB1	*OUB2*	*OUB3*	*OUB4*	*OUB5*	*Inlet1*	*Inlet2*	*Inlet3*	*Inlet4*	*Inlet5*
Lower Tide Range, No Wind	Alt2_Seq01_Env01	Bottom	0.5	0.4	0.2	0.03	0.01	0.05	0.08	0.09	0.1	0.01
Lower Tide Range, Fall Winds	Alt2_Seq01_Env01A	Bottom	0.5	0.4	0.2	0.03	0.01	0.06	0.09	0.09	0.1	0.01
Lower Tide Range, Winter Winds	Alt2_Seq01_Env01B	Bottom	0.5	0.4	0.2	0.03	0.01	0.05	0.08	0.09	0.1	0.02
Higher Tide Range, No Wind	Alt2_Seq01_Env02	Bottom	0.5	0.4	0.2	0.03	0.01	0.05	0.08	0.09	0.09	0.02
Higher Tide Range, Fall Winds	Alt2_Seq01_Env02A	Bottom	0.5	0.4	0.2	0.03	0.01	0.06	0.08	0.09	0.09	0.02
Higher Tide Range, Winter Winds	Alt2_Seq01_Env02B	Bottom	0.5	0.4	0.2	0.03	0.01	0.05	0.07	0.09	0.09	0.02

Notes: (a) Accumulated deposition shown is at the end of the 28-day model simulation period. See Figure 11-8 for the location of assessment points for the boundary of OU B Marine and portions of Sinclair Inlet adjacent to OU B Marine.

Legend: mm = millimeter; Inlet = Sinclair Inlet; OUB = OUB Marine.

Table 11-12a Maximum Predicted TSS at OU B Marine Boundary and Portions of Sinclair Inlet Adjacent to OU B Marine, Alternative 2, Sequence 2 – Fall 2027

Environmental Scenario	*Environmental Scenario Code*	*Water Column Depth*	*Maximum TSS (mg/L) (a)*									
			OUB1	*OUB2*	*OUB3*	*OUB4*	*OUB5*	*Inlet1*	*Inlet2*	*Inlet3*	*Inlet4*	*Inlet5*
Lower Tide Range, No Wind	Alt2_Seq01_Env01	Surface	1.2	0.7	0.4	0.08	0.03	0.4	0.3	0.2	0.2	0.06
		Middle	1.4	0.7	0.4	0.08	0.03	0.4	0.3	0.2	0.2	0.06
		Bottom	1.2	0.7	0.4	0.08	0.03	0.3	0.3	0.2	0.2	0.06
Lower Tide Range, Fall Winds	Alt2_Seq01_Env01A	Surface	1.4	0.6	0.4	0.08	0.03	0.4	0.3	0.2	0.2	0.06
		Middle	1.4	0.6	0.4	0.08	0.03	0.4	0.3	0.2	0.2	0.06
		Bottom	1.2	0.7	0.4	0.08	0.03	0.4	0.3	0.2	0.2	0.06
Lower Tide Range, Winter Winds	Alt2_Seq01_Env01B	Surface	1.3	0.6	0.4	0.09	0.03	0.4	0.2	0.2	0.2	0.06
		Middle	1.4	0.6	0.4	0.1	0.04	0.4	0.2	0.2	0.2	0.06
		Bottom	1.2	0.6	0.3	0.09	0.03	0.3	0.3	0.2	0.2	0.06
Higher Tide Range, No Wind	Alt2_Seq01_Env02	Surface	1.1	0.6	0.4	0.09	0.03	0.3	0.2	0.2	0.2	0.06
		Middle	1.3	0.7	0.4	0.09	0.03	0.3	0.2	0.2	0.2	0.06
		Bottom	1.1	0.7	0.3	0.08	0.03	0.3	0.3	0.2	0.2	0.06
Higher Tide Range, Fall Winds	Alt2_Seq01_Env02A	Surface	1.4	0.8	0.4	0.08	0.03	0.4	0.3	0.3	0.2	0.06
		Middle	1.3	0.8	0.4	0.09	0.03	0.4	0.3	0.3	0.2	0.06
		Bottom	1.1	0.8	0.4	0.09	0.03	0.4	0.3	0.3	0.2	0.06
Higher Tide Range, Winter Winds	Alt2_Seq01_Env02B	Surface	1.3	0.6	0.4	0.08	0.03	0.4	0.2	0.2	0.2	0.06
		Middle	1.3	0.7	0.4	0.08	0.03	0.4	0.2	0.2	0.2	0.06
		Bottom	1.1	0.7	0.3	0.08	0.03	0.4	0.3	0.2	0.2	0.06

Notes: (a) Maximum predicted concentration of total suspended solids (TSS) at area of interest. See Figure 11-8 for the location of assessment points for the boundary of OU B Marine and portions of Sinclair Inlet adjacent to OU B Marine.

Legend: mg/L = milligram per liter; Inlet = Sinclair Inlet; OUB = OUB Marine; TSS = total suspended solids.

Table 11-12b Cumulative Sedimentation at OU B Marine Boundary and Portions of Sinclair Inlet Adjacent to OU B Marine, Alternative 2, Sequence 2 – Fall 2027

Environmental Scenario	*Environmental Scenario Code*	*Water Column Depth*	*Cumulative Sedimentation (mm) (a)*									
			OUB1	*OUB2*	*OUB3*	*OUB4*	*OUB5*	*Inlet1*	*Inlet2*	*Inlet3*	*Inlet4*	*Inlet5*
Lower Tide Range, No Wind	Alt2_Seq01_Env01	Bottom	0.9	0.2	0.05	0.009	0.002	0.06	0.06	0.04	0.03	0.005
Lower Tide Range, Fall Winds	Alt2_Seq01_Env01A	Bottom	0.9	0.2	0.05	0.008	0.002	0.06	0.05	0.03	0.03	0.005
Lower Tide Range, Winter Winds	Alt2_Seq01_Env01B	Bottom	0.9	0.2	0.04	0.008	0.002	0.06	0.04	0.03	0.03	0.005
Higher Tide Range, No Wind	Alt2_Seq01_Env02	Bottom	0.9	0.2	0.05	0.009	0.002	0.05	0.04	0.03	0.03	0.006
Higher Tide Range, Fall Winds	Alt2_Seq01_Env02A	Bottom	0.9	0.2	0.05	0.009	0.002	0.06	0.05	0.04	0.03	0.005
Higher Tide Range, Winter Winds	Alt2_Seq01_Env02B	Bottom	0.9	0.2	0.05	0.009	0.003	0.05	0.04	0.03	0.03	0.006

Notes: (a) Accumulated deposition shown is at the end of the 28-day model simulation period. See Figure 11-8 for the location of assessment points for the boundary of OU B Marine and portions of Sinclair Inlet adjacent to OU B Marine.

Legend: mm = millimeter; Inlet = Sinclair Inlet; OUB = OUB Marine.

Table 11-13a Maximum Predicted TSS at OU B Marine Boundary and Portions of Sinclair Inlet Adjacent to OU B Marine, Alternative 3, Sequence 1 – Fall 2029

Environmental Scenario	*Environmental Scenario Code*	*Water Column Depth*	*Maximum TSS (mg/L) (a)*									
			OUB1	*OUB2*	*OUB3*	*OUB4*	*OUB5*	*Inlet1*	*Inlet2*	*Inlet3*	*Inlet4*	*Inlet5*
Lower Tide Range, No Wind	Alt2_Seq01_Env01	Surface	0.3	0.7	1.0	0.2	0.05	0.2	0.3	0.3	0.4	0.1
		Middle	0.3	0.8	1.1	0.2	0.05	0.2	0.3	0.3	0.4	0.1
		Bottom	0.3	0.8	1.1	0.2	0.05	0.2	0.3	0.3	0.4	0.1
Lower Tide Range, Fall Winds	Alt2_Seq01_Env01A	Surface	0.3	0.7	1.1	0.2	0.05	0.2	0.3	0.3	0.4	0.1
		Middle	0.3	0.8	1.2	0.2	0.05	0.2	0.3	0.3	0.4	0.1
		Bottom	0.3	0.7	1.2	0.2	0.05	0.2	0.3	0.3	0.4	0.1
Lower Tide Range, Winter Winds	Alt2_Seq01_Env01B	Surface	0.3	0.6	1.1	0.2	0.07	0.2	0.3	0.3	0.4	0.1
		Middle	0.3	0.7	1.2	0.2	0.08	0.2	0.3	0.3	0.4	0.1
		Bottom	0.3	0.7	1.2	0.2	0.07	0.2	0.3	0.3	0.4	0.1
Higher Tide Range, No Wind	Alt2_Seq01_Env02	Surface	0.3	0.6	1.0	0.3	0.06	0.3	0.3	0.3	0.4	0.1
		Middle	0.3	0.7	1.1	0.3	0.06	0.3	0.3	0.4	0.4	0.1
		Bottom	0.3	0.7	1.1	0.3	0.05	0.3	0.3	0.4	0.4	0.1
Higher Tide Range, Fall Winds	Alt2_Seq01_Env02A	Surface	0.4	0.7	1.1	0.3	0.06	0.3	0.4	0.3	0.4	0.1
		Middle	0.4	0.7	1.2	0.3	0.06	0.3	0.4	0.4	0.4	0.1
		Bottom	0.4	0.7	1.1	0.3	0.06	0.3	0.4	0.4	0.4	0.1
Higher Tide Range, Winter Winds	Alt2_Seq01_Env02B	Surface	0.4	0.7	1.1	0.2	0.07	0.3	0.3	0.4	0.4	0.1
		Middle	0.4	0.8	1.1	0.2	0.07	0.3	0.3	0.4	0.4	0.1
		Bottom	0.4	0.8	1.1	0.2	0.07	0.3	0.3	0.4	0.4	0.1

Notes: (a) Maximum predicted concentration of total suspended solids (TSS) at area of interest. See Figure 11-8 for the location of assessment points for the boundary of OU B Marine and portions of Sinclair Inlet adjacent to OU B Marine.

Legend: mg/L = milligram per liter; Inlet = Sinclair Inlet; OUB = OUB Marine; TSS = total suspended solids.

Table 11-13b Cumulative Sedimentation at OU B Marine Boundary and Portions of Sinclair Inlet Adjacent to OU B Marine, Alternative 3, Sequence 1 – Fall 2029

Environmental Scenario	*Environmental Scenario Code*	*Water Column Depth*	*Cumulative Sedimentation (mm) (a)*									
			OUB1	*OUB2*	*OUB3*	*OUB4*	*OUB5*	*Inlet1*	*Inlet2*	*Inlet3*	*Inlet4*	*Inlet5*
Lower Tide Range, No Wind	Alt2_Seq01_Env01	Bottom	0.02	0.2	0.4	0.02	0.005	0.01	0.05	0.07	0.09	0.01
Lower Tide Range, Fall Winds	Alt2_Seq01_Env01A	Bottom	0.02	0.2	0.4	0.02	0.005	0.01	0.05	0.07	0.09	0.01
Lower Tide Range, Winter Winds	Alt2_Seq01_Env01B	Bottom	0.02	0.2	0.4	0.02	0.006	0.01	0.04	0.07	0.1	0.01
Higher Tide Range, No Wind	Alt2_Seq01_Env02	Bottom	0.03	0.2	0.4	0.03	0.005	0.02	0.05	0.07	0.08	0.01
Higher Tide Range, Fall Winds	Alt2_Seq01_Env02A	Bottom	0.03	0.2	0.4	0.03	0.005	0.02	0.05	0.07	0.08	0.01
Higher Tide Range, Winter Winds	Alt2_Seq01_Env02B	Bottom	0.03	0.2	0.4	0.03	0.006	0.02	0.05	0.07	0.08	0.01

Notes: (a) Accumulated deposition shown is at the end of the 28-day model simulation period. See Figure 11-8 for the location of assessment points for the boundary of OU B Marine and portions of Sinclair Inlet adjacent to OU B Marine.

Legend: mm = millimeter; Inlet = Sinclair Inlet; OUB = OUB Marine.

Table 11-14a Maximum Predicted TSS at OU B Marine Boundary and Portions of Sinclair Inlet Adjacent to OU B Marine, Alternative 3, Sequence 2 – Fall 2030

Environmental Scenario	*Environmental Scenario Code*	*Water Column Depth*	*Maximum TSS (mg/L) (a)*									
			OUB1	*OUB2*	*OUB3*	*OUB4*	*OUB5*	*Inlet1*	*Inlet2*	*Inlet3*	*Inlet4*	*Inlet5*
Lower Tide Range, No Wind	Alt2_Seq01_Env01	Surface	0.2	0.5	1.1	0.2	0.05	0.2	0.3	0.3	0.4	0.1
		Middle	0.2	0.7	1.3	0.2	0.05	0.2	0.3	0.3	0.4	0.1
		Bottom	0.2	0.6	1.2	0.2	0.05	0.2	0.3	0.3	0.4	0.1
Lower Tide Range, Fall Winds	Alt2_Seq01_Env01A	Surface	0.3	0.6	1.3	0.2	0.05	0.2	0.3	0.3	0.4	0.1
		Middle	0.3	0.7	1.3	0.2	0.05	0.2	0.3	0.3	0.4	0.1
		Bottom	0.3	0.6	1.3	0.2	0.05	0.2	0.3	0.3	0.4	0.1
Lower Tide Range, Winter Winds	Alt2_Seq01_Env01B	Surface	0.3	0.6	1.3	0.2	0.07	0.2	0.3	0.3	0.4	0.1
		Middle	0.3	0.7	1.3	0.2	0.08	0.2	0.3	0.3	0.4	0.1
		Bottom	0.3	0.6	1.3	0.2	0.07	0.2	0.3	0.3	0.4	0.1
Higher Tide Range, No Wind	Alt2_Seq01_Env02	Surface	0.3	0.5	1.1	0.3	0.06	0.3	0.3	0.3	0.4	0.1
		Middle	0.3	0.6	1.3	0.3	0.06	0.3	0.3	0.4	0.4	0.1
		Bottom	0.3	0.6	1.2	0.3	0.06	0.3	0.3	0.4	0.4	0.1
Higher Tide Range, Fall Winds	Alt2_Seq01_Env02A	Surface	0.4	0.6	1.3	0.3	0.06	0.3	0.4	0.4	0.4	0.1
		Middle	0.4	0.7	1.3	0.3	0.06	0.3	0.4	0.4	0.4	0.1
		Bottom	0.4	0.7	1.3	0.3	0.06	0.3	0.3	0.4	0.4	0.1
Higher Tide Range, Winter Winds	Alt2_Seq01_Env02B	Surface	0.3	0.6	1.3	0.3	0.07	0.3	0.3	0.4	0.4	0.1
		Middle	0.3	0.7	1.3	0.3	0.07	0.3	0.3	0.4	0.4	0.1
		Bottom	0.3	0.7	1.3	0.3	0.07	0.3	0.3	0.4	0.4	0.1

Notes: (a) Maximum predicted concentration of total suspended solids (TSS) at area of interest. See Figure 11-8 for the location of assessment points for the boundary of OU B Marine and portions of Sinclair Inlet adjacent to OU B Marine.

Legend: mg/L = milligram per liter; Inlet = Sinclair Inlet; OUB = OUB Marine; TSS = total suspended solids.

Table 11-14b Cumulative Sedimentation at OU B Marine Boundary and Portions of Sinclair Inlet Adjacent to OU B Marine, Alternative 3, Sequence 2 – Fall 2030

Environmental Scenario	*Environmental Scenario Code*	*Water Column Depth*	*Cumulative Sedimentation (mm) (a)*									
			OUB1	*OUB2*	*OUB3*	*OUB4*	*OUB5*	*Inlet1*	*Inlet2*	*Inlet3*	*Inlet4*	*Inlet5*
Lower Tide Range, No Wind	Alt2_Seq01_Env01	Bottom	0.02	0.1	0.5	0.02	0.01	0.01	0.04	0.06	0.09	0.01
Lower Tide Range, Fall Winds	Alt2_Seq01_Env01A	Bottom	0.02	0.1	0.5	0.02	0.01	0.01	0.04	0.07	0.09	0.01
Lower Tide Range, Winter Winds	Alt2_Seq01_Env01B	Bottom	0.02	0.1	0.5	0.02	0.01	0.01	0.04	0.06	0.09	0.01
Higher Tide Range, No Wind	Alt2_Seq01_Env02	Bottom	0.02	0.1	0.4	0.03	0.01	0.02	0.04	0.06	0.08	0.01
Higher Tide Range, Fall Winds	Alt2_Seq01_Env02A	Bottom	0.03	0.1	0.4	0.03	0.01	0.02	0.05	0.07	0.08	0.01
Higher Tide Range, Winter Winds	Alt2_Seq01_Env02B	Bottom	0.03	0.1	0.4	0.03	0.01	0.02	0.04	0.06	0.08	0.01

Notes: (a) Accumulated deposition shown is at the end of the 28-day model simulation period. See Figure 11-8 for the location of assessment points for the boundary of OU B Marine and portions of Sinclair Inlet adjacent to OU B Marine.

Legend: mm = millimeter; Inlet = Sinclair Inlet; OUB = OUB Marine.

Table 11-15a Maximum Predicted TSS at OU B Marine Boundary and Portions of Sinclair Inlet Adjacent to OU B Marine, Alternative 3, Sequence 3 – Fall 2035

Environmental Scenario	*Environmental Scenario Code*	*Water Column Depth*	*Maximum TSS (mg/L) (a)*									
			OUB1	*OUB2*	*OUB3*	*OUB4*	*OUB5*	*Inlet1*	*Inlet2*	*Inlet3*	*Inlet4*	*Inlet5*
Lower Tide Range, No Wind	Alt2_Seq01_Env01	Surface	1.0	1.2	1.4	0.4	0.1	0.7	1.0	0.9	1.1	0.3
		Middle	1.1	1.4	1.6	0.4	0.1	0.7	1.0	1.1	1.1	0.3
		Bottom	1.1	1.7	1.7	0.4	0.1	0.6	1.0	1.4	1.1	0.3
Lower Tide Range, Fall Winds	Alt2_Seq01_Env01A	Surface	1.4	1.7	1.9	0.5	0.2	0.9	1.4	1.3	1.3	0.4
		Middle	1.4	1.9	2.0	0.5	0.2	0.9	1.4	1.4	1.4	0.4
		Bottom	1.4	1.9	2.0	0.5	0.2	0.9	1.3	1.5	1.4	0.4
Lower Tide Range, Winter Winds	Alt2_Seq01_Env01B	Surface	1.3	1.5	2.0	0.6	0.2	0.8	1.2	1.2	1.3	0.4
		Middle	1.4	1.8	2.0	0.7	0.2	0.8	1.3	1.4	1.4	0.4
		Bottom	1.4	1.9	2.0	0.6	0.2	0.8	1.3	1.6	1.4	0.4
Higher Tide Range, No Wind	Alt2_Seq01_Env02	Surface	1.3	1.4	1.8	0.7	0.2	1.0	1.2	1.3	1.4	0.4
		Middle	1.4	1.7	2.1	0.7	0.2	1.0	1.3	1.5	1.5	0.4
		Bottom	1.4	1.8	2.1	0.7	0.2	1.0	1.3	1.6	1.5	0.4
Higher Tide Range, Fall Winds	Alt2_Seq01_Env02A	Surface	1.4	1.7	2.1	0.7	0.2	1.1	1.3	1.4	1.4	0.4
		Middle	1.5	1.8	2.1	0.7	0.2	1.1	1.4	1.4	1.5	0.5
		Bottom	1.4	1.9	2.1	0.7	0.2	1.0	1.3	1.5	1.5	0.5
Higher Tide Range, Winter Winds	Alt2_Seq01_Env02B	Surface	1.4	1.6	2.0	0.7	0.2	1.0	1.2	1.5	1.5	0.4
		Middle	1.5	1.8	2.1	0.7	0.2	1.0	1.3	1.5	1.6	0.4
		Bottom	1.5	1.9	2.1	0.7	0.2	1.0	1.3	1.6	1.6	0.4

Notes: (a) Maximum predicted concentration of total suspended solids (TSS) at area of interest. See Figure 11-8 for the location of assessment points for the boundary of OU B Marine and portions of Sinclair Inlet adjacent to OU B Marine.

Legend: mg/L = milligram per liter; Inlet = Sinclair Inlet; OUB = OUB Marine; TSS = total suspended solids.

Table 11-15b Cumulative Sedimentation at OU B Marine Boundary and Portions of Sinclair Inlet Adjacent to OU B Marine, Alternative 3, Sequence 3 – Fall 2035

Environmental Scenario	*Environmental Scenario Code*	*Water Column Depth*	*Cumulative Sedimentation (mm) (a)*									
			OUB1	*OUB2*	*OUB3*	*OUB4*	*OUB5*	*Inlet1*	*Inlet2*	*Inlet3*	*Inlet4*	*Inlet5*
Lower Tide Range, No Wind	Alt2_Seq01_Env01	Bottom	0.2	0.7	0.6	0.06	0.01	0.07	0.2	0.4	0.4	0.04
Lower Tide Range, Fall Winds	Alt2_Seq01_Env01A	Bottom	0.2	0.7	0.6	0.06	0.01	0.07	0.2	0.4	0.4	0.04
Lower Tide Range, Winter Winds	Alt2_Seq01_Env01B	Bottom	0.2	0.7	0.6	0.07	0.02	0.07	0.2	0.5	0.4	0.04
Higher Tide Range, No Wind	Alt2_Seq01_Env02	Bottom	0.2	0.7	0.6	0.07	0.02	0.09	0.2	0.5	0.3	0.04
Higher Tide Range, Fall Winds	Alt2_Seq01_Env02A	Bottom	0.2	0.7	0.6	0.07	0.02	0.09	0.2	0.5	0.3	0.04
Higher Tide Range, Winter Winds	Alt2_Seq01_Env02B	Bottom	0.2	0.7	0.6	0.08	0.02	0.09	0.2	0.5	0.3	0.05

Notes: (a) Accumulated deposition shown is at the end of the 28-day model simulation period. See Figure 11-8 for the location of assessment points for the boundary of OU B Marine and portions of Sinclair Inlet adjacent to OU B Marine.

Legend: mm = millimeter; Inlet = Sinclair Inlet; OUB = OUB Marine.

Table 11-16 Modeled Construction Activities and Estimated Percent Complete at End of 28-Days for Alternative 2 (M2D2 at DD3)

Alternative 2, Sequence 1 (Fall 2026)					
Construction Activity	***Dredging [a]***		***Pile/Foundation Installation and Removal [a]***		***Estimated Percent Complete End of 28 Days [b]***
	Total Dredge Volume (CY)	***Daily Dredge Volume (CY)***	***Total Piles/ Foundations***	***Daily Rate***	
Phase1 Basin Dredging (D1)	261,000	2,000	N/A	N/A	37%
Phase1 Basin Dredging (D2)		2,000	N/A	N/A	
Cofferdam Pile Driving (Sheet)	N/A	N/A	1,360 LF	14 LF	29%
Cofferdam Pile Driving (Pipe)	N/A	N/A	680	3	12%
SWPH Pile Driving (Sheet)	N/A	N/A	100 LF	14 LF	100%
SWPH Pile Driving (Pipe)	N/A	N/A	160	3	53%
Temp. Access Pier Pile Driving (Pipe)	N/A	N/A	110	3	76%
Temp. Access Pier Pile Driving (Pipe)	N/A	N/A	110	3	76%
New Pier 2 Basin Dredging (D1)	90,900	2,000	N/A	N/A	100%
New Pier 2 Basin Dredging (D2)		2,000	N/A	N/A	
New Pier 2 Pile Driving (Sheet)	N/A	N/A	1,100 LF	14 LF	36%
New Pier 2 Pile Driving (Concrete)	N/A	N/A	904	3	9%
Mooring F Pile Driving (Pipe)	N/A	N/A	96	3	88%
Mooring F Pile Driving (Concrete)	N/A	N/A	48	3	100%
Alternative 2, Sequence 2 (Fall 2027)					
Construction Activity	***Dredging [a]***		***Pile/Foundation Installation and Removal [a]***		***Estimated Percent Complete End of 28 Days [b]***
	Total Dredge Volume (CY)	***Daily Dredge Volume (CY)***	***Total Piles/ Foundations***	***Daily Rate***	
SWPH Pile Driving (Sheet)	N/A	N/A	100 LF	14 LF	100%
SWPH Pile Driving (Pipe)	N/A	N/A	160	3	53%
Pier 6 Pile Removal (R1)	N/A	N/A	3,204	8	14%
Pier 6 Pile Removal (R2)	N/A	N/A		8	
Pier 7 Pile Removal	N/A	N/A	290	8	77%
Cofferdam Pile Driving (Pipe)	N/A	N/A	190	3	44%
Phase1 Basin Dredging (D1)	261,000	2,000	N/A	N/A	37%
Phase1 Basin Dredging (D2)		2,000	N/A	N/A	
Former Pier 8 Foundation Removal	N/A	N/A	188	6	89%

Legend: CY = cubic yards; D1 = derrick 1 of 2; D2 = derrick 2 of 2; kg/s = kilogram per second; LF = linear feet; N/A = not applicable; R1 = rig 1 of 2; R2 = rig 2 of 2; SRR = sediment release rate; SWPH = saltwater pumphouse.

[a] Total dredge volumes, pile/foundation counts, and daily rates provided in Appendix A, Tables A-1 (Alternative 2) and A-2 (Alternative 3) and Appendix C, Attachment A.

[b] Calculation of estimated percent complete based on 6 days per week for dredging and 7 days per week for pile activities.

Table 11-17 Modeled Construction Activities and Estimated Percent Complete at End of 28-Days for Alternative 3 (M2D2 at Mooring A)

Alternative 3, Sequence 1 (Fall 2029)					
Construction Activity	***Dredging*** [a]		***Pile/Foundation Installation and Removal*** [a]		***Estimated Percent Complete End of 28 Days*** [b]
	Total Dredge Volume (CY)	***Daily Dredge Volume (CY)***	***Total Piles/ Foundations***	***Daily Rate***	
Temp. Cutoff Wall Pile Removal (R1)	N/A	N/A	642	8	70%
Temp. Cutoff Wall Pile Removal (R2)	N/A	N/A		8	
Dredging for Foundations (D1)	1,217,200	2,000	N/A	N/A	8%
Dredging for Foundations (D2)		2,000	N/A	N/A	
Alternative 3, Sequence 2 (Fall 2030)					
Construction Activity	***Dredging*** [a]		***Pile/Foundation Installation and Removal*** [a]		***Estimated Percent Complete End of 28 Days*** [b]
	Total Dredge Volume (CY)	***Daily Dredge Volume (CY)***	***Total Piles/ Foundations***	***Daily Rate***	
Dredge/Cut Caisson into Till (D1)	n/a	2,000	N/A	N/A	23% [c]
Dredge/Cut Caisson into Till (D2)		2,000	N/A	N/A	
Pile Driving (Sheet for Walls)	N/A	N/A	400	3	21%
Pile Driving (Pipe for Walls)	N/A	N/A	300	3	28%
Pile Driving (Pipe for Floor)	N/A	N/A	423	3	20%
Alternative 3, Sequence 3 (Fall 2035)					
Construction Activity	***Dredging*** [a]		***Pile/Foundation Installation and Removal*** [a]		***Estimated Percent Complete End of 28 Days*** [b]
	Total Dredge Volume (CY)	***Daily Dredge Volume (CY)***	***Total Piles/ Foundations***	***Daily Rate***	
Pier 4 Demo Dredging (D1)	125,800	2,000	N/A	N/A	76%
Pier 4 Demo Dredging (D2)		2,000	N/A	N/A	
Pier 4 Foundation Removal	N/A	N/A	140	6	100%
M2D2 Turning Basin Dredging (D1)	137,900 [d]	2,000	N/A	N/A	70%
M2D2 Turning Basin Dredging (D2)		2,000	N/A	N/A	
Pier 9 Demo Pile Removal	N/A	N/A	146	8	100%
Quay Wall Pile Driving (Sheet)	N/A	N/A	860	3	10%
Quay Wall Pile Driving (Pipe)	N/A	N/A	250	3	34%
M2D2 Berthing Basin Dredging (D1)	137,900 [d]	2,000	N/A	N/A	70%
M2D2 Berthing Basin Dredging (D2)		2,000	N/A	N/A	

Legend: CY = cubic yards; D1 = derrick 1 of 2; D2 = derrick 2 of 2; kg/s = kilogram per second; LF = linear feet; N/A = not applicable; n/a = not available; R1 = rig 1 of 2; R2 = rig 2 of 2; SRR = sediment release rate; SWPH = saltwater pumphouse.

[a] Total dredge volumes, pile/foundation counts, and daily rates provided in Appendix A, Tables A-1 (Alternative 2) and A-2 (Alternative 3) and Appendix C, Attachment A.

[b] Calculation of estimated percent complete based on 6 days per week for dredging and 7 days per week for pile activities.

[c] Calculation of percent complete based on total number of days for activity (121), as total dredge volume not available.

[d] Total dredge volume for M2D2 dry dock, berthing and turning basins (275,800 CY) split equally between turning and berthing basin dredging activities.

11.5 Sensitivity Analysis

The modeling analysis included a number of assumptions which tended to be conservative. Table 11-18 presents a summary of key model inputs and assumptions and their overall impact on the analysis.

Table 11-18 Summary of Key Model Inputs and Assumptions

Model Input	*Assumption/Approach*	*Comments*
Dredging Rate	2,000 cy/d per derrick (64 m^3/hr) with 2 derricks operating 100 meters apart	Reasonable rate for general production dredging, but high for dredging around pilings/foundations, under piers, and areas with till or debris.
Dredging Duration	Continuous for 24 hours per day, 6 days per week	Does not account for bucket cycle time or downtime.
Fraction Released During Dredging	1%	Likely high-end estimate for environmental clamshell bucket (range from 0.1 to 1% in literature).
Sediment Composition	Percent Fines Conversion Factor of 0.15	Based on a dataset biased to shallower samples which generally have higher percent fines than deeper samples.
Flocculation	None	Deposition rate of particles likely underestimated and simulated TSS likely overestimated.
Conversion of TSS to NTU	1:1 ratio	Likely overestimates NTU based on data for similar site (Port of Everett with a ratio of 0.55 NTU/TSS).

Legend: cy/d = cubic yard per day; m^3/hr = cubic meter per hour; NTU = nephelometric turbidity units; TSS = total suspended solids.

The sensitivity of TSS predictions to a range of values for three modeling parameters was evaluated. For the porosity-percent fines conversion factor (PFCF *f*), the fraction of sediment released during dredging, and the TSS to NTU conversion factor, the assumptions used for the sensitivity analysis are discussed below:

- The fines fraction, represented by PFCF *f*, spanned a 5-fold range due to natural variability in sediment composition; the average was used in the analysis (0.15). For the sensitivity analysis, the 10^{th}, 50^{th}, and 90^{th} percentile values of 0.04, 0.15, and 0.24 were used, respectively. This range incorporates the majority of the PFCF values in the data set from the fall 2023 investigation conducted in the vicinity of M2D2 at DD3 (WSP 2024). The average and median PFCF in the WSP (2024) data set is 0.18 and 0.20, respectively, based on 221 samples from 32 locations at depths ranging from 2 to 45 feet bss.
- The second parameter evaluated is the fraction of sediment released during dredging. Based on research on fraction released during dredging using an environmental clamshell bucket, the value of 1 percent used in this analysis is likely conservative. The range of fractions based on measured data (0.16 percent to 0.88 percent [Hayes and Wu 2001]) or suggested as a representative value (0.5 percent [Hayes, Borrowman, and Schroeder 2007]; 0.5 percent [Schroeder 2009]; or 0.1 percent to 1 percent [Bridges et al. 2008]) vary by a factor of 10. For the sensitivity analysis, values of 0.5 percent, 0.75 percent, and 1 percent were used.
- The conversion from TSS in units of mg/L to turbidity in units of NTU is site-specific and data to determine the conversion are not available. A conservative assumption of 1-to-1 was assumed for the modeling analysis. Literature suggests conversion values ranging from 0.2 to 0.9 NTU per TSS in mg/L. For the sensitivity analysis, values of 0.2, 0.55, and 0.9 were used. As previously

noted, the value of 0.55 based on dredging at the Port of Everett is expected to be similar to conditions at NAVBASE Kitsap Bremerton.

The sensitivity analysis consisted of adjusting the maximum predicted TSS value (4.5 mg/L) to changes in the values for each of the three parameters. The results of the sensitivity analysis are presented in Table 11-19 for each combination of variables.[5]

Table 11-19 Sensitivity of Maximum TSS to Fraction Released, Fines Fraction, and TSS-NTU Conversion Factor

Fraction Sediment Released (%)/ NTU/TSS Conversion Factor	*PFCF = 0.04*			*PFCF = 0.15*			*PFCF = 0.24*		
	0.5	**0.75**	**1**	**0.5**	**0.75**	**1**	**0.5**	**0.75**	**1**
0.2	0.1	0.2	0.2	0.5	0.7	0.9	0.7	1.1	1.4
0.55	0.3	0.5	0.6	1.2	1.8	2.5	2.0	3.0	4.0
0.9	0.5	0.7	1.0	2.0	3.0	4.0	3.2	4.9	6.5

Note: Units for TSS values are mg/L.
Legend: NTU = nephelometric turbidity units; PFCF = percent fines conversion factor; TSS = total suspended solids.

The results of the sensitivity analysis indicate that in areas where the combination of percent fines and porosity results in a PFCF that is higher than what was used in the model (e.g., the 90th percentile of the range), and assuming the TSS-turbidity relationship is 0.9 or greater and the fraction of sediment released during dredging is 1 percent or more, it is possible that turbidity values at the 150-foot compliance boundary could exceed the turbidity water quality criterion of 5 NTU (maximum TSS of 6.5 mg/L). However, the likelihood of all upper-bound assumptions occurring simultaneously is low. When sediment characteristics and dredging conditions are representative of the low end to middle of the range of values, maximum TSS levels are below 1-2 mg/L which is within ambient TSS levels.

As previously noted, the analysis does not take into account the impact that BMPs and controls, such as pre-dredge debris sweeps or early warning monitors, would have on reducing the generation and dispersion of turbidity during in-water construction activities. Therefore, the magnitude and extent of turbidity impacts are expected to be less under actual construction conditions.

[5] The sensitivity analysis did not consider correlation among variables as the extent of any correlation is not known. To the extent the variables are positively correlated, predicted TSS could be greater than shown in Table 11-15-19.

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12 Project Impact on Sinclair Inlet Waves

The impact of shoreline changes as a result of the Proposed Action on waves and longshore drift in Sinclair Inlet was evaluated. Longshore (littoral) drift is the movement of material along the shore by wave action. Changes in wave direction and wave height can affect the movement of suspended sediment. Changes in wave action as a result of the Proposed Action were assessed and the results were used to infer potential changes in the movement of suspended sediment along the shore. The analysis focused on two locations where changes in wave action could be a concern: Charleston Beach and Port Orchard Marina.

The project's impacts on waves at Charleston Beach are expected to be negligible. A prior wave analysis completed for a Charleston Beach shoreline repair study concluded that the longshore drift and associated sediment transport at Charleston Beach is from the west-southwest to the east-northeast due to waves being locally wind-generated and predominant southwesterly winds (CH2M 2019). Consequently, waves arriving at Charleston Beach from the southeast would not be impacted by changes to the BNC shoreline because of the base's location northeast of Charleston Beach. When winds blow from the northeast, Charleston Beach would not be impacted because the beach is sheltered by land to the northeast. Therefore, no impacts to longshore drift along Charleston Beach are expected as a result of the Proposed Action.

The project's impacts on waves at Port Orchard Marina are also expected to be negligible. The piers and wharves at BNC act to reduce the fetch over which waves are generated by blocking the wind from reaching the water surface. When winds blow from the northeast toward Port Orchard Marina, the fetch length under existing conditions is estimated to be 9,632 feet. Fetch length decreases slightly under both action alternatives due to the larger pier structures that would be constructed. Fetch length is estimated to be 9,549 and 9,603 feet under Alternative 2 and Alternative 3, respectively. The height of wind-generated waves is proportional to the square root of the fetch. Consequently, wave height will be reduced in the vicinity of Port Orchard Marina by 0.4 and 0.2 percent for Alternative 2 and Alternative 3, respectively, in comparison to waves generated under the existing shoreline configuration. Therefore, no impacts to longshore drift at Port Orchard Marina are expected as a result of the Proposed Action.

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13 Conclusions

The HST modeling study was conducted to support the EIS for the Proposed Action at NAVBASE Kitsap Bremerton. The study evaluated the impacts of two action alternatives (EIS Alternatives 2 and 3), both of which involve multi-year, in-water construction activities that will disturb sediment and generate turbidity in the water column. The model simulated the hydrodynamics and sediment transport response to construction activities under a range of wind and tide conditions during the in-water work window (July 16 to February 15). Model parameters and SRRs were developed from site-specific data, published guidance, and literature.

The time periods modeled for each alternative represent the potential combined impacts of multiple concurrent in-water construction activities, including dredging, pile driving, and pile extraction. The combination of five time periods (two for Alternative 2 and three for Alternative 3) and six wind and tide combinations resulted in a total of 30 simulations. Each simulation was run for 28 days, with dredging assumed to occur 24 hours per day for 6 days per week and pile activities assumed to occur 10 hours per day for 7 days per week. Environmental conditions were assumed to be constant over the simulation period.

For each modeled in-water construction activity, the predicted maximum TSS was compared to the state of Washington's water quality criterion for turbidity of 5 NTU over background when the background is 50 NTU or less at a radius of 150 feet from the source. None of the modeled activities resulted in the exceedance of the turbidity water quality criterion at the 150-foot compliance boundary. Maximum predicted TSS ranged from less than 1 mg/L to 4.5 mg/L for Alternative 2 and from 1.5 to 4.4 mg/L for Alternative 3. The highest TSS levels occurred near the bottom and were generally lowest near the surface. Of the six environmental scenarios modeled for a range of tidal and wind conditions, the highest TSS values were generally predicted under the no wind scenarios, where tides are the only force affecting turbidity build-up.

In addition to predicting TSS at locations near the in-water construction activities within OU B Marine, turbidity and accumulated sedimentation were predicted at six AOIs:

- Boundary of OU B Marine
- Portions of Sinclair Inlet adjacent to OU B Marine
- Port Orchard Marina
- Charleston Beach
- Marine vegetation along the southern shoreline of Sinclair Inlet near the mouth of Blackjack Creek
- Marine vegetation east of Pier 7 (Alternative 3 only)

The spatial extent of the distribution of TSS is dominated by releases associated with dredging, which was modeled as a continuous 24-hours-per-day activity, although active dredging for the full 24-hour period is unlikely. The maximum predicted TSS levels associated with some of the pile activities are higher than for dredging; however, the peaks are brief (less than 30 minutes) due to the short duration and intermittent nature of pile activities.

TSS from in-water construction activities is rapidly dispersed and well mixed both laterally and vertically by the time it reaches Port Orchard Marina, Charleston Beach, and the area of marine vegetation along the southern shoreline of Sinclair Inlet near the mouth of Blackjack Creek. For these three AOI,

maximum TSS concentrations were below 1.0 mg/L and accumulated sedimentation was on the order of 0.2 mm or less after 28 days of simulated construction activities for both action alternatives. The natural amount of sedimentation that would be expected to occur in Sinclair Inlet over the same 28-day period is about 0.21 mm. Predicted impacts at the area of marine vegetation east of Pier 7 were slightly higher (maximum TSS of 1.6 mg/L and accumulated sedimentation of 0.3 mm) due to the proximity of this AOI to construction activities under Alternative 3 (this area would be dredged/removed under Alternative 2). However, these impacts are not elevated relative to ambient conditions.

The modeling results indicate that construction activities for both action alternatives (Alternatives 2 and 3) are not expected to result in exceedances of the aquatic life turbidity criterion at the 150-foot compliance radius under the assumptions used for the analysis, including continuous dredging for 6 days per week and a range of tidal and wind conditions over the 28-day simulation period. During the busiest in-water construction years when multiple concurrent activities would occur, turbidity impacts were primarily localized within the OU B Marine boundary for Alternative 2. For Alternative 3, turbidity impacts extended into Sinclair Inlet during dredging for the turning basin, which is located outside of OU B Marine. However, dredging for this component is scheduled to be completed in one season. In years without dredging for the turning basin, turbidity impacts for Alternative 3 are predicted to be within the OU B Marine boundary. The modeling analysis also found that impacts on wave action and longshore drift in Sinclair Inlet as a result of changes to the waterfront configuration would be negligible for both action alternatives.

It is possible that certain conditions could result in higher turbidity than predicted, such as dredging in an area with high percent fines or debris that prevents tight closure of the dredge bucket, potentially resulting in a greater release of sediment than modeled. However, these instances are expected to be infrequent and of short duration. In addition, the modeling analysis did not consider the impact that BMPs and controls, such as pre-dredge debris sweeps or early warning monitors, would have on reducing the generation and dispersion of turbidity during in-water construction activities. Thus, the modeling results are considered conservative and impacts under actual operational conditions are expected to be less than predicted.

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Appendix A
In-Water Construction Schedules and Layouts of Modeled Activities

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Figure A-3. Spatial Layout of Activities Modeled for Alternative 2, Sequence 1 (Fall 2026) in Vicinity of New Pier 2

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Figure A-6. General Layout of In-Water Construction Activities Modeled for Alternative 3

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Figure A-9. Spatial Layout of Modeled Activities for Alternative 3, Sequence 3 (Fall 2035) in Vicinity of M2D2 at Mooring A

Figure A-10. Spatial Layout of Modeled Activities for Alternative 3, Sequence 3 (Fall 2035) for Pier 4 Demolition

Table A-1. Alternative 2 - M2S2 at DD3 - Summary of In-Water Construction Activities - 2026-2038

						Pile Activity		Dredging Activity			
Component[a]	Activity [a]	Task Dates		Duration[b,c] (days)	Type of Activity	Total Piles (count) [d]	Pile Rate (piles/day)	Dredge Volume[e] (CY)	Daily Rate[f]	Dredge Rate (m3/hr)	Number of Dredges
		Start	End								
Moorings E, F, & G	MOORING F MODIFICATION	[redacted]	[redacted]	214	Pile driving	--	--	--	--	--	--
Moorings E, F, & G	Install 30-in. steel, batter piles	[redacted]	[redacted]	214	Pile driving	96	3	--	--	--	--
Moorings E F & G	Install pre-cast concrete fender piles (24")	[redacted]	[redacted]	214	Pile driving	48	3				
2-M2D2 at DD2 SWPW	INSTALL TEMPORARY COFFERDAMS AND PERMANENT PILES	[redacted]	[redacted]	209	Pile driving	--	--				
2-M2D2 at DD2 SWPW	Install sheet piles (28 in. Z sheets, 56 in. pair)	[redacted]	[redacted]	209	Pile driving	100LF	3 sheet prs/day				
2-M2D2 at DD2 SWPW	Install 36-in. steel, batter pipe piles for cofferdam template	[redacted]	[redacted]	209	Pile driving	160	3				
2-M2D2 at DD3	TEMPORARY ACCESS PIER (30" DIA Pipe)	[redacted]	[redacted]	209	Pile driving	34	3				
14 - Pier 2 Construction	DREDGE PIER 2 BASINS (to EL-42 ft + 1' OD)	[redacted]	[redacted]	160	Dredging			90900	2000 CY	65	2
2-M2D2 at DD3	PHASE 1 DREDGING (BASIN AND PIER 6 & 7 FOUNDATIONS (to EL-57 ft plus 2 ft OD))	[redacted]	[redacted]	523	Dredging			261000	2000 CY	65	2
2-M2D2 at DD3	INSTALL PERMANENT & TEMPORARY COFFERDAMS AT DD3	[redacted]	[redacted]	523	Pile driving	--	--	--	--	--	--
2-M2D2 at DD3	Install sheet piles (28 in. Z sheets, 56 in. pair)	[redacted]	[redacted]	523	Pile driving	1360 LF	3 sheet prs/day	--	--	--	--
2-M2D2 at DD3	Install 72-in. steel, plumb pipe piles for cofferdam template	[redacted]	[redacted]	523	Pile driving	680	3	--	--	--	--
2-M2D2 at DD3	Install 36-in. steel batter pipe piles for cofferdam template	[redacted]	[redacted]	523	Pile driving	190	3	--	--	--	--
2-M2D2 at DD3	Install 36-in Steel piles for Wharf 7 bulkhead	[redacted]	[redacted]	523	Pile driving	110	3				
2-M2D2 at DD3	Temporary Sheet Piles and Spud Piles (28" z-sheets and 36" DIA Pipe)	[redacted]	[redacted]	523	Pile driving	200 LF	3 sheet prs/day				
14 - Pier 2 Construction	DRIVE PILES FOR PIER 2	[redacted]	[redacted]	160	Pile driving	--	--	--	--	--	--
14 - Pier 2 Construction	Install PC/PS concrete, plumb, octagonal piles (24")	[redacted]	[redacted]	160	Pile driving	904	6	--	--	--	--
14 - Pier 2 Construction	Install PC/PS concrete fender system square piles (18 & 24")	[redacted]	[redacted]7	160	Pile driving	433	15	--	--	--	--
14 - Pier 2 Construction	Install steel, batter piles	[redacted]	[redacted]	160	Pile driving	200	1	--	--	--	--
14 - Pier 2 Construction	Install steel, sheet piles (LF)	[redacted]	[redacted]	160	Pile driving	1100 LF	50 LF	--	--	--	--
2-M2D2 at DD3	DEMOLISH PIER 7 FOUNDATIONS, PIER COLUMNS, AND QUAY WALLS	[redacted]	[redacted]	392	Pile extraction	--	--	--	--	--	--
2-M2D2 at DD3	Extract Concrete Bell Foundations	[redacted]	[redacted]	392	Pile extraction	(276)	1	--	--	--	--
2-M2D2 at DD3	Extract Timber Piles	[redacted]	[redacted]	392	Pile extraction	(290)	8	--	--	--	--
M2D2 Pier 8	DEMOLISH PIER 8 FOUNDATIONS (Concrete Footings Removal)	[redacted]	[redacted]	30	Pile extraction	(188)	6				
12 - Demo Pier 6	DEMOLISH PIER 6 FOUNDATIONS, PIER COLUMNS, AND QUAY WALLS	[redacted]	[redacted]	392	Pile extraction	--	--	--	--	--	--
12 - Demo Pier 6	Extract Concrete Bell Foundations	[redacted]	[redacted]	392	Pile extraction	(234)	1	--	--	--	--
12 - Demo Pier 6	Extract Timber Piles	[redacted]	[redacted]	392	Pile extraction	(3204)	8	--	--	--	--
2-M2D2 PHASE 2	PHASE 2 DREDGING (BASIN (to EL-45 ft plus 2 ft OD))	[redacted]	[redacted]	209	Dry Dredging/Excav.			255000	2000 CY	65	2
2-M2D2 PHASE 3	PHASE 3 DREDGING (CAISSON, PIER 6, NAVIGATIONAL (to EL-57 ft plus 2 ft OD))	[redacted]	[redacted]	392	Dredging			94900	2000 CY	65	2
Moorings E, F, & G	MOORING G MODIFICATION	[redacted]	[redacted]	214	Pile driving	--	--	--	--	--	--
Moorings E, F, & G	Install 30-in. steel, batter piles	[redacted]	[redacted]	214	Pile driving	96	3	--	--	--	--
Moorings E, F, & G	Install pre-cast concrete fender piles (24")	[redacted]	[redacted]	214	Pile driving	48	3				
2-M2D2 at DD3	Install Wharf 7 and Aprons (36" steel pipe)	[redacted]	[redacted]	366	Pile driving	50	3				
2-M2D2 at DD3	Install Fender Piles (24" concrete)	[redacted]	[redacted]	366	Pile driving	460	3				
2-M2D2 at DD3	PHASE 4 DREDGE (BERM, NAVIGATION, TEMP COFFERDAMS Ballast)	[redacted]	[redacted]	366	Dredging			70000	2000 CY	65	2
8B - Pier 6 Replacement	DRIVE PILES	[redacted]	[redacted]	145	Pile driving	--	--	--	--	--	--
8B - Pier 6 Replacement	Install PC/PS concrete, plumb, 24" octagonal piles	[redacted]	[redacted]	145	Pile driving	672	6	--	--	--	--
8B - Pier 6 Replacement	Install PC/PS concrete, fender system, (18"&24")square piles	[redacted]	[redacted]	145	Pile driving	312	15	--	--	--	--
8B - Pier 6 Replacement	Install steel batter 36" piles	[redacted]	[redacted]	145	Pile driving	84	1	--	--	--	--
8B - Pier 6 Replacement	INSTALL TANGENT PILE WALLS (24" drilled shaft, steel & concrete)	[redacted]	[redacted]	32	Pile driving	28	1	--	--	--	--
11 - Pier 5 Demolition	DREDGING FOR PIER 5 DEMO (to EL-57 ft plus 1 ft OD)	[redacted]	[redacted]	113	Dredging			129200	2000 CY	65	2
11 - Pier 5 Demolition	DEMOLISH/EXTRACT CONCRETE FOUNDATIONS	[redacted]	[redacted]	81	Pile extraction	(61)	1			--	--
11 - Pier 5 Demolition	EXTRACT TIMBER PILES	[redacted]	[redacted]	48	Pile extraction	(1248)	8			--	--
2-M2D2 at DD3	REMOVE TEMPORARY COFFERDAM & WHARVES/FENDERING	[redacted]	[redacted]	141	Pile extraction	--	--			--	--
2-M2D2 at DD3	18" PS Concrete Square Fender Piles	[redacted]	[redacted]	141	Pile extraction	(70)	1			--	--
2-M2D2 at DD3	Cofferdam Template (24" Steel Plumb Pipe)	[redacted]	[redacted]	141	Pile extraction	(704)	5			--	--
2-M2D2 at DD3	Cellular Cofferdam (Sheet - Straight Web)	[redacted]	[redacted]	141	Pile extraction	(550 LF)	8			--	--
10&6 - Demo/New Pier 4	DREDGING FOR PIER 4 DEMO	[redacted]	[redacted]	608	Dredging			125800	2000 CY	65	2
5 - DD6 Upgrade	Demo Small Craft Pier	[redacted]	[redacted]	39	Pile extraction	Not specified	8				
5 - DD6 Upgrade	Demo Section of Pier 9	[redacted]	[redacted]	15	Pile extraction	(146)	10				
5 - DD6 Upgrade	Drive Sheet Piles for E, SE, and SW Quay Walls	[redacted]	[redacted]	62	Pile driving	1220 LF	20 LF				
5 - DD6 Upgrade	Drive Steel Batter Piles for E, SE, and SW Quay Walls	[redacted]	[redacted]	42	Pile driving	81	2				
10&6 - Demo/New Pier 4	DEMOLISH/EXTRACT CONCRETE FOUNDATIONS	[redacted]	[redacted]	331	Pile extraction	(140)	1				
10&6 - Demo/New Pier 4	PILE REMOVAL [(STEEL AND CONCRETE (NON-TIMBER)]	[redacted]	[redacted]	331	Pile extraction	--	--				
10&6 - Demo/New Pier 4	C-6 18" Square Piles (Plumb/Batter PC Concrete)	[redacted]	[redacted]	331	Pile extraction	(152)	2				
10&6 - Demo/New Pier 4	C-6 20" Square Piles (Plumb/Batter PC Concrete)	[redacted]	[redacted]	331	Pile extraction	(128)	2				

Table A-1. Alternative 2 - M2S2 at DD3 - Summary of In-Water Construction Activities - 2026-2038

					Pile Activity		Dredging Activity			
Component[a]	Activity [a]	Task Dates	Duration[b,c] (days)	Type of Activity	Total Piles (count) [d]	Pile Rate (piles/day)	Dredge Volume[e] (CY)	Daily Rate[f]	Dredge Rate (m3/hr)	Number of Dredges
10&6 - Demo/New Pier 4	C-6 18" Square Fender System Piles (PC/PS Concrete)	[redacted]	331	Pile extraction	(11)	2				
Moorings E F & G	MOORING E MODIFICATION	[redacted]	214	Pile driving	--	--				
Moorings E, F, & G	Install 30-in. steel, batter piles	[redacted]	214	Pile driving	96	3				
Moorings E F & G	Install pre-cast concrete fender piles (24")	[redacted]	214	Pile driving	48	3				
10&6 - Demo/New Pier 4	EXTRACT TIMBER PILES	[redacted]	143	Pile extraction	--	--				
10&6 - Demo/New Pier 4	Remove timber fender system piles (Component 10)	[redacted]	143	Pile extraction	(395)	8				
10&6 - Demo/New Pier 4	DREDGING FOR PIER 4 BERTHING BASINS (to EL -42 ft plus 1 ft OD)	[redacted]	127	Dredging			31200	2000 CY	65	2
10&6 - Demo/New Pier 4	DRIVE PILES FOR NEW PIER 4	[redacted]	197	Pile driving	--	--				
10&6 - Demo/New Pier 4	C-6 18" & 24" Square Fender System Piles (PC/PS Concrete)	[redacted]	197	Pile driving	398	15				
10&6 - Demo/New Pier 4	C-6 24" Octagonal Plumb PC/PS Concrete Piles	[redacted]	197	Pile driving	824	6				
10&6 - Demo/New Pier 4	C-6 36" Steel Batter Piles	[redacted]	197	Pile driving	96	1				

Notes:

Activities in Column B ordered chronologically by start date. Assume dredging of suitable material (below top 3') commences 1-week following start of dredging of unsuitable material.

Activity shown in red font will take place inside cofferdam and was not considered for the modeling analysis as sediment impacts will be controlled.

(a) Components in Column A and **non-indented** actions in Column B are from excel file titled: "Bremerton In Water Work by Component 10Jun22.xlsx" sent in 6/12/2022 email from Douglas Gilkey; indented actions in Column B are taken from the Engineering Report and "Alternative 2 Component Summary Tables_17May22_v3.xlsx".

(b) Work days conservatively do NOT include days lost to security access or weather. Durations assume 6-day work week per Engineering Report schedules.

(c) Orange highlighted cells in Column E show where the schedule activity start/end dates overlap with the fish window (Feb 16 - Jul 15); days within the fish window are not included in the activity duration.

(d) Pile counts and rates taken from M2D2 DEIS piles table with Navy updates (dated 12/11/23), estimated from similar activity, or calculated from number of piles and duration.

(e) M2D2 Phase 1 dredge volumes provided by Navy Design Team on 9/25/23; Pier 2 dredge volume from 2021 Engineering Rpt.

(f) Dredging rates provided by Navy Design Team on 9/25/23.

Table A-2. Alternative 3 - M2D2 at Mooring A - Summary of In-Water Construction Activities - 2026-2039

					Pile Activity		Dredging Activity[d]			
Component[a]	Activity [a]	Task Dates		Duration[b,c] (days)	Type of Activity	Total Piles (count) [d]	Pile Rate (piles/day)	Dredge Volume[e] (CY)	Daily Rate[f]	Dredge Rate (m3/hr)	Number of Dredges
		Start	End								
Moorings E, F & G	MOORINGS E, F, AND G MODIFICATIONS	[redacted]	[redacted]	366	Pile driving	--	--				
Moorings E, F & G	Install 30-in. steel, batter piles	[redacted]	[redacted]	366	Pile driving	288	3				
Moorings E, F & G	Install pre-cast concrete fender piles (24")	[redacted]	[redacted]	366	Pile driving	144	3				
15 - Demo Mooring A	EXTRACT STRUCTURAL PILES	[redacted]	[redacted]	97	Pile extraction	--	--				
15 - Demo Mooring A	Removal of concrete, plumb, square piles (16-18 in)	[redacted]	[redacted]	97	Pile extraction	(160)	2				
15 - Demo Mooring A	Removal of concrete, batter, square piles (16-18 in)	[redacted]	[redacted]	97	Pile extraction	(101)	1				
15 - Demo Mooring A	Removal of steel, plumb piles	[redacted]	[redacted]	97	Pile extraction	(1882)	19				
15 - Demo Mooring A	Removal of steel, batter piles	[redacted]	[redacted]	97	Pile extraction	(66)	1				
15 - Demo Mooring A	Removal of steel sheet piles	[redacted]	[redacted]	97	Pile extraction	(375) = (500 LF)	5 LF/day				
15 - Demo Mooring A	EXTRACT FENDER PILES	[redacted]	[redacted]	31	Pile extraction	--	--				
15 - Demo Mooring A	Removal of timber, fender-system piles	[redacted]	[redacted]	31	Pile extraction	(6)	8				
15 - Demo Mooring A	Removal of concrete, fender-system, square piles	[redacted]	[redacted]	31	Pile extraction	(26)	1				
3 - M2D2 at Mooring A	Demo Small Craft Pier	[redacted]	[redacted]	31	Pile extraction	Not specified	Not specified				
15 - Demo Mooring A	DEMOLISH MOORING DOLPHINS/EXTRACT SUPPORTING STEEL PILES	[redacted]	[redacted]	24	Pile extraction	(8) per dolphin	2				
3 - M2D2 at Mooring A	INSTALL TEMPORARY SHEET PILE CUT-OFF WALL (18-in Z sheets)	[redacted]	[redacted]	124	Pile driving	642	12				
3 - M2D2 at Mooring A	REMOVE TEMPORARY SHEET PILE CUT-OFF WALL	[redacted]	[redacted]	124	Pile extraction	(642)	8				
3 - M2D2 at Mooring A	DREDGE & PREPARE SEABED FOR FOUNDATIONS (TO EL-64.4 + 2' OD)	[redacted]	[redacted]	170	Dredging	--	--	--	--	--	--
3 - M2D2 at Mooring A	Dredging of Unsuitable Material (top 3' of Sediment)	[redacted]	[redacted]	170	Dredging	--	--	89700	2000 CY	65	2
3 - M2D2 at Mooring A	Dredging of Suitable Material (below the top 3' of sediment)	[redacted]	[redacted]	170	Dredging	--	--	1127500	2000 CY	65	2
3 - M2D2 at Mooring A	SET AND SINK CAISSON FOUNDATIONS TO SEA BED (75 x 80 FT)	[redacted]	[redacted]	52	Set foundations	16	1				
3 - M2D2 at Mooring A	DREDGE AND CUT TO ADVANCE CAISSON FOUNDATIONS INTO TILL	[redacted]	[redacted]	121	Dredging			Not indicated	2000 CY	65	2
3 - M2D2 at Mooring A	DRIVE DRY DOCK PILES	[redacted]	[redacted]	288	Pile driving	--	--				
3 - M2D2 at Mooring A	Install steel pipe piles (Temp. DD Falsework)	[redacted]	[redacted]	288	Pile driving	400	3				
3 - M2D2 at Mooring A	Install sheet pile & DD falsework (steel pipe or H-piles)	[redacted]	[redacted]	288	Pile driving	300	3				
3 - M2D2 at Mooring A	Install 96-in steel plumb pipe piles	[redacted]	[redacted]	288	Pile driving	423	3				
3 - M2D2 at Mooring A	DRIVE PUMPWELLS A & B PILES (steel, plumb, pipe piles)	[redacted]	[redacted]	20	Pile driving	18	3				
3 - M2D2 at Mooring A	DRIVE FREIGHT ELEVATOR PILES	[redacted]	[redacted]	5	Pile driving	1	1				
3 - M2D2 at Mooring A	DRIVE STAIRWELL STRUCTURE PILES	[redacted]	[redacted]	5	Pile driving	6	1				
3 - M2D2 at Mooring A	SET DRY DOCK WALLS & ENTRANCE WALL PRECAST FORM UNITS	[redacted]	[redacted]	63	Pile driving	--	--				
3 - M2D2 at Mooring A	Install Entrance Wall, 72-in steel plumb pipe piles	[redacted]	[redacted]	63	Pile driving	20	3				
3 - M2D2 at Mooring A	INSTALL PERIMETER SHEET PILE WALLS	[redacted]	[redacted]	185	Pile driving	--	--				
3 - M2D2 at Mooring A	Install Steel (Z-Sheet) Sheet Piles	[redacted]	[redacted]	185	Pile driving	642	3				
3 - M2D2 at Mooring A	Install steel plumb/batter pipe piles	[redacted]	[redacted]	185	Pile driving	210	3				
3 - M2D2 at Mooring A	INSTALL EAST AND WEST QUAY WALLS	[redacted]	[redacted]	39	Pile driving	--	--				
3 - M2D2 at Mooring A	Install steel plumb/batter pipe piles	[redacted]	[redacted]	39	Pile driving	39	3				
3 - M2D2 at Mooring A	Install steel, Z-sheet piles	[redacted]	[redacted]	39	Pile driving	83	3				
3 - M2D2 at Mooring A	INSTALL WHARF 2 PILES	[redacted]	[redacted]	120	Pile driving	--	--				
3 - M2D2 at Mooring A	Install Wharf 2 Plumb-Pipe Steel Piles (36-in)	[redacted]	[redacted]	120	Pile driving	373	3				
3 - M2D2 at Mooring A	INSTALL APRON PILES	[redacted]	[redacted]	41	Pile driving	--	--				
3 - M2D2 at Mooring A	Install piles for West/East Apron (36-in steel, plumb pipe piles)	[redacted]	[redacted]	41	Pile driving	107	3				
3 - M2D2 at Mooring A	MISCELLANEOUS DREDGING AROUND DRY DOCK, BERTHING & TURNING	[redacted]		170	Dredging			--			--
3 - M2D2 at Mooring A	Dredging of Unsuitable Material (top 3' of Sediment)	[redacted]	[redacted]	170	Dredging			121600	2000 CY	65	2
3 - M2D2 at Mooring A	Dredging of Suitable Material (below the top 3' of sediment)	[redacted]	[redacted]	170	Dredging			154200	2000 CY	65	2
5 - DD6 Upgrade	Demo Section of Pier 9	[redacted]	[redacted]	15	Pile extraction	146	8				
5 - DD6 Upgrade	INSTALL COMBI-WALL & BRACING PILES	[redacted]	[redacted]	39	Pile driving	--	--				
5 - DD6 Upgrade	Drive Sheet Piles (NZ38)	[redacted]	[redacted]	36	Pile driving	860	40 LF/day				
5 - DD6 Upgrade	Drive Steel Pipe Piles (48-in & 30-in)	[redacted]	[redacted]	32	Pile driving	250	3				

Table A-2. Alternative 3 - M2D2 at Mooring A - Summary of In-Water Construction Activities - 2026-2039

					Pile Activity		Dredging Activity[d]			
Component[a]	Activity [a]	Task Dates	Duration[b,c] (days)	Type of Activity	Total Piles (count) [d]	Pile Rate (piles/day)	Dredge Volume[e] (CY)	Daily Rate[f]	Dredge Rate (m3/hr)	Number of Dredges
10 - Demo Pier 4	DREDGING FOR PIER 4 DEMO (-57'MLLW + 2' OD)	[redacted]	332	Dredging						
10 - Demo Pier 4	Dredging of Unsuitable Material (top 3' of Sediment)	[redacted]	332	Dredging			21400	2000 CY	65	2
10 - Demo Pier 4	Dredging of Suitable Material (below the top 3' of Sediment)	[redacted]	332	Dredging			104400	2000 CY	65	2
10 - Demo Pier 4	DEMOLISH CONCRETE FOUNDATIONS	[redacted]	332	Pile extraction	(140)	1				
5 - DD6 Upgrade	Drive Piles (Utility Pier A)	[redacted]	15	Pile driving	--	--				
5 - DD6 Upgrade	Install Steel Plumb Piles (24 in)	[redacted]	15	Pile driving	63	3				
5 - DD6 Upgrade	Install Concrete Fender Piles (20 in)	[redacted]	15	Pile driving	43	3				
5 - DD6 Upgrade	Drive Piles (Utility Pier B)	[redacted]	15	Pile driving	--	--				
5 - DD6 Upgrade	Install Steel Plumb Piles (24 in)	[redacted]	15	Pile driving	35	3				
5 - DD6 Upgrade	Install Concrete Fender Piles (20 in)	[redacted]	15	Pile driving	12	3				
10 - Demo Pier 4	EXTRACT PILES	[redacted]	145	Pile extraction	--	--				
10 - Demo Pier 4	Remove timber fender system piles	[redacted]	145	Pile extraction	(395)	8				
10 - Demo Pier 4	Remove concrete piles (18-in & 20-in)	[redacted]	145	Pile extraction	(291)	2				
6 - New Pier 4	DREDGING FOR NEW PIER 4	[redacted]	125	Dredging			--			
6 - New Pier 4	Dredging of Unsuitable Material (top 3' of Sediment)	[redacted]	125	Dredging			17500	2000 CY	65	2
6 - New Pier 4	Dredging of Suitable Material (below the top 3' of Sediment)	[redacted]	125	Dredging			13700	2000 CY	65	2
6 - New Pier 4	DRIVE PILES	[redacted]	199	Pile driving	--					
6 - New Pier 4	18 - 24" Square Fender System Piles (PC/PS Concrete)	[redacted]	199	Pile driving	403	15				
6 - New Pier 4	24" Octagonal Plumb PC/PS Concrete Piles	[redacted]	199	Pile driving	904	6				
6 - New Pier 4	36" Steel Batter Piles	[redacted]	199	Pile driving	96	1				

Notes:

Activities in Column B ordered chronologically by start date. Assume dredging of suitable material (below top 3') commences 1-week following start of dredging of unsuitable material.

(a) Components in Column A and non-indented actions in Column B are from excel file titled: "Bremerton In Water Work by Component 10Jun22.xlsx" sent in 6/12/2022 email from Douglas Gilkey; indented actions in Column B are taken from the Engineering Report and "Alternative 2 Component Summary Tables_17May22_v3.xlsx".

(b) Work days conservatively do NOT include days lost to security access or weather. Durations assume 6-day work week per Engineering Report schedules.

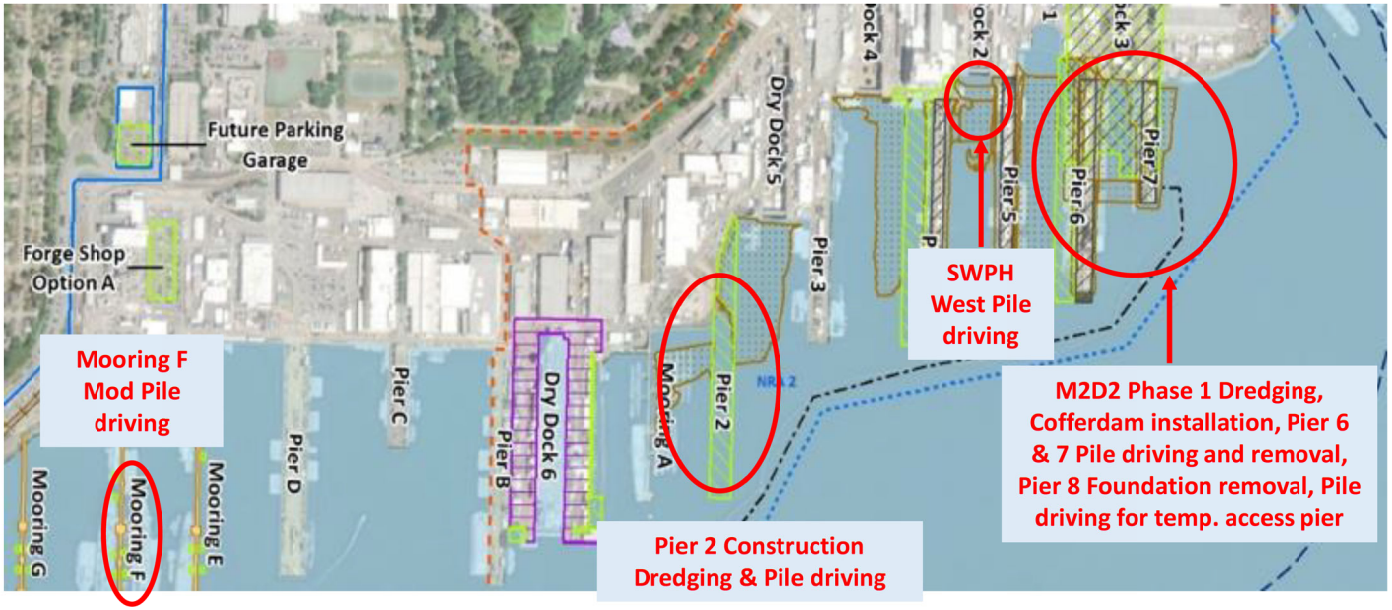
(c) Orange highlighted cells in Column E show where the schedule activity start/end dates overlap with the fish window (Feb 16 - Jul 15); days within the fish window are not included in the activity duration.

(d) Pile counts and rates taken from M2D2 DEIS piles table with Navy updates (dated 12/11/23 and 9/14/23), estimated from similar activity, or calculated from number of piles and duration.

(e) M2D2 Phase 1 dredge volumes provided by Navy Design Team on 9/25/23; Pier 2 dredge volume from 2021 Engineering Rpt.

(f) Dredging rates provided by Navy Design Team on 9/25/23.

Figure A-1. General Layout of In-Water Construction Activities Modeled for Alternative 2



For Alternative 2, modeled two time periods:

1. **Fall 2026** - Phase 1 dredging for M2D2 at DD3, pile driving for cofferdams, pile driving for temporary access pier, dredging and pile driving for new Pier 2, and pile driving for Mooring F mod

2. **Fall 2027** – Phase 1 dredging for M2D2 at DD3, pile driving for cofferdams, pile removal for Piers 6 and 7, and removal of former Pier 8 foundations

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Figure A-2. Spatial Layout of Modeled Activities for Alternative 2, Sequence 1 (Fall 2026) in Vicinity of M2D2 at DD3

Code	Activity Description
G	Phase 1 Basin Dredging (Derrick 1 of 2)
H	Phase 1 Basin Dredging (Derrick 2 of 2)
K	Cofferdam Pile Installation (Sheet)
L	Cofferdam Pile Installation (Pipe)
C	Saltwater Pumphouse West Pile Installation (Sheet)
D	Saltwater Pumphouse West Pile Installation (Pipe)
E & F	Temporary Access Pier Pile Installation (Pipe)

Assumptions:

- *100-meter spacing between dredge derricks (G&H)*
- *Concurrent installation of cofferdam sheet and pipe piles*
- *Dredging = 24 hr/day for 6 day/wk*
- *Pile activities = 10 hr/day for 7 day/wk*

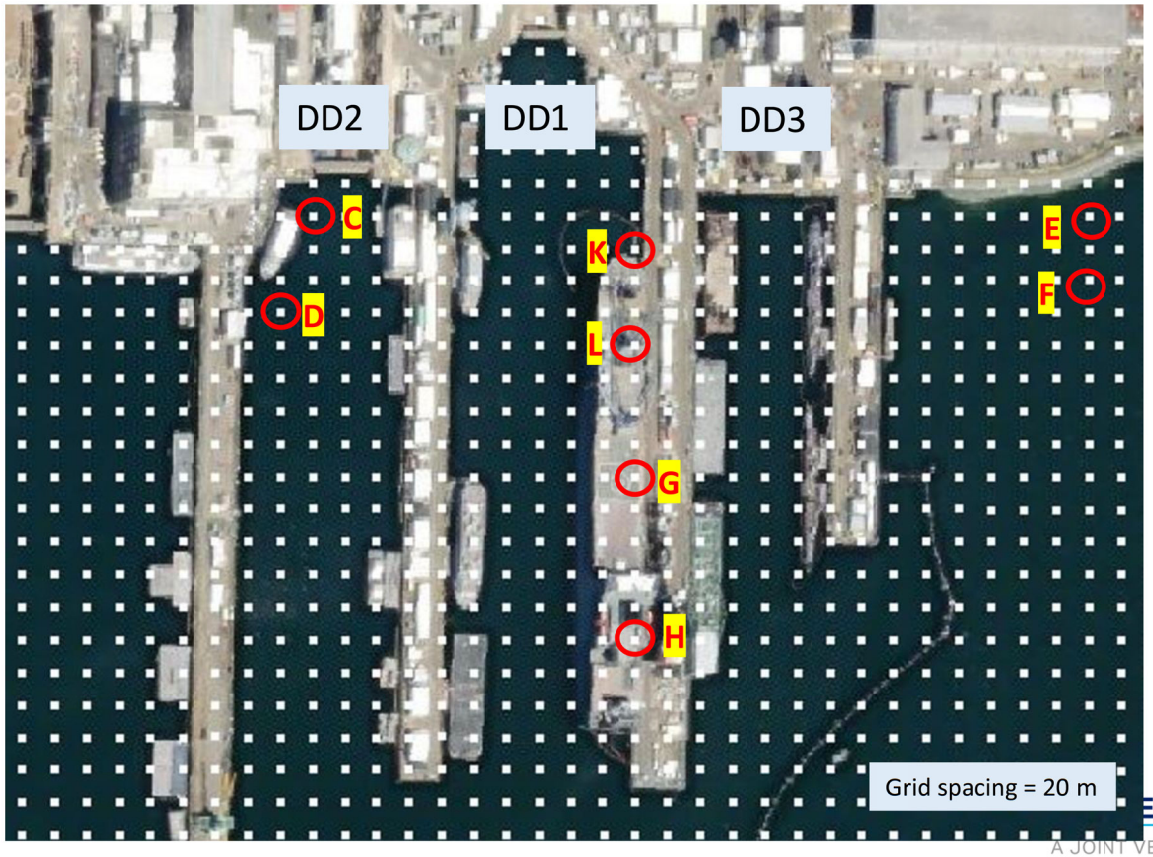

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Figure A-3. Spatial Layout of Activities Modeled for Alternative 2, Sequence 1 (Fall 2026) in Vicinity of New Pier 2

Code	Activity Description
G	Basin Dredging for New Pier 2 (Derrick 1 of 2)
H	Basin Dredging for New Pier 2 (Derrick 2 of 2)
M	New Pier 2 Pile Installation (Sheet)
N	New Pier 2 Pile Installation (Pipe)

Assumptions:

- *100-meter spacing between dredge derricks (G&H)*
- *Installation of sheet and pipe piles for new Pier 2 construction occurs concurrently (M&N)*
- *Dredging = 24 hr/day for 6 day/wk*
- *Pile activities = 10 hr/day for 7 day/wk*

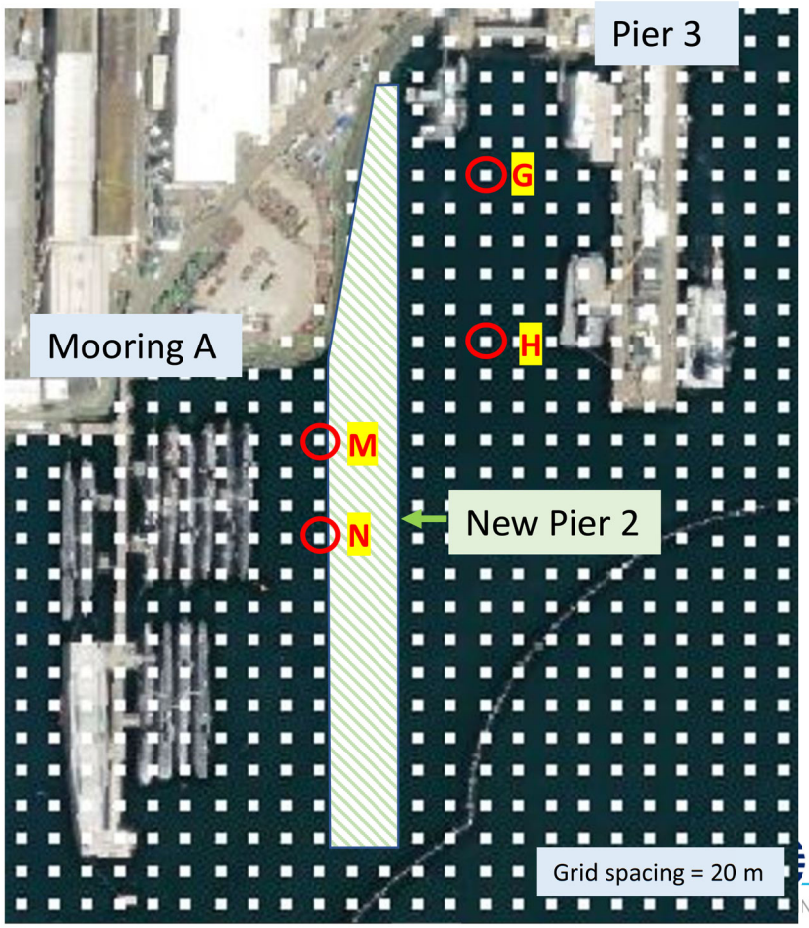

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Figure A-4. Spatial Layout of Activities Modeled for Alternative 2, Sequence 1 (Fall 2026) for Mooring F Modification

Code	Activity Description
A	Mooring F Pile Installation (Pipe)
B	Mooring F Pile Installation (Concrete)

Assumptions:

- *Demo of Mooring F is sequenced with installation of new piles*
- *Concurrent installation of pipe and concrete piles for Mooring F modification (A and B)*
- *Pile activities = 10 hr/day for 7 day/wk*

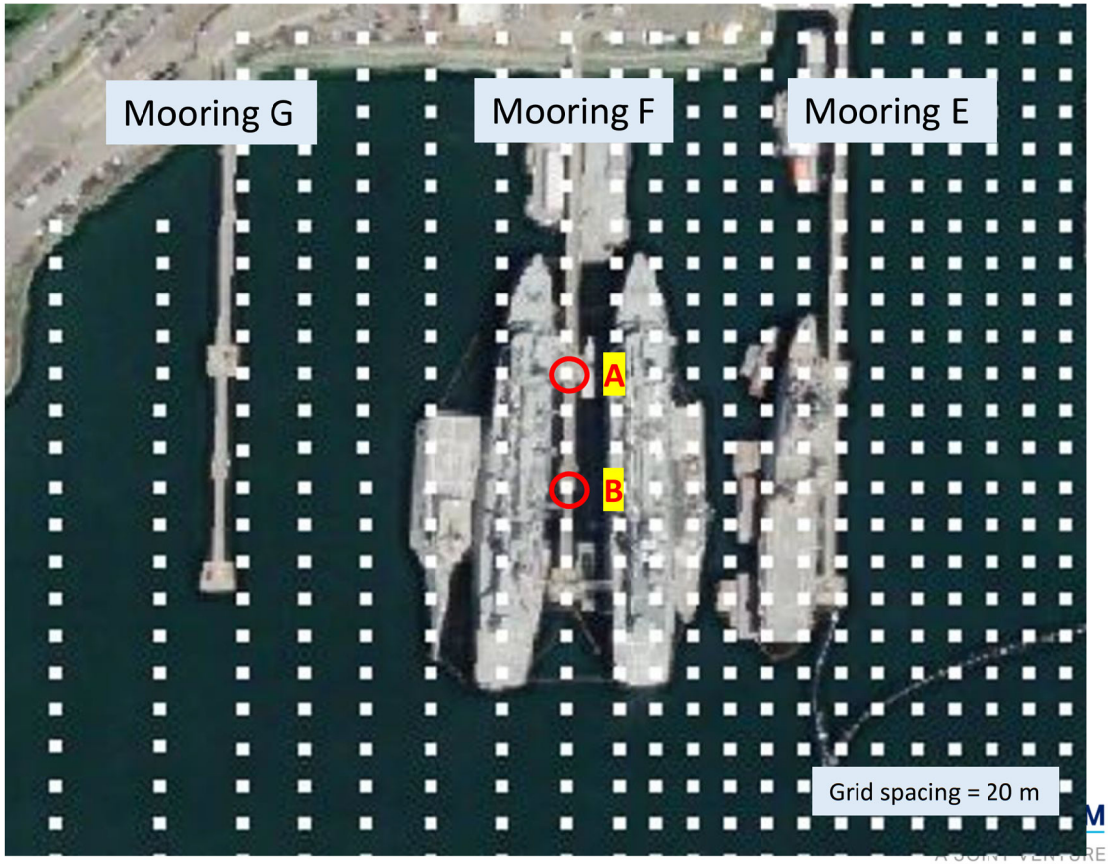


Figure A-5. Spatial Layout of Activities Modeled for Alternative 2, Sequence 2 (Fall 2027) in Vicinity of M2D2 at DD3

Code	Activity Description
A	Phase 1 Basin Dredging (Derrick 1 of 2)
B	Phase 1 Basin Dredging (Derrick 2 of 2)
C	Pier 7 Pile Removal (1 Derrick)
D	Cofferdam Pile Installation (Pipe)
E	Former Pier 8 Foundation Removal
F	Saltwater Pumphouse West Pile Installation (Sheet)
G	Saltwater Pumphouse West Pile Installation (Pipe)
H & I	Pier 6 Pile Removal (2 Derricks)

Assumptions:

- *100-meter spacing between dredge derricks (A and B)*
- *Concurrent installation of cofferdam sheet and pipe piles*
- *Dredging = 24 hr/day for 6 day/wk*
- *Pile activities = 10 hr/day for 7 day/wk*

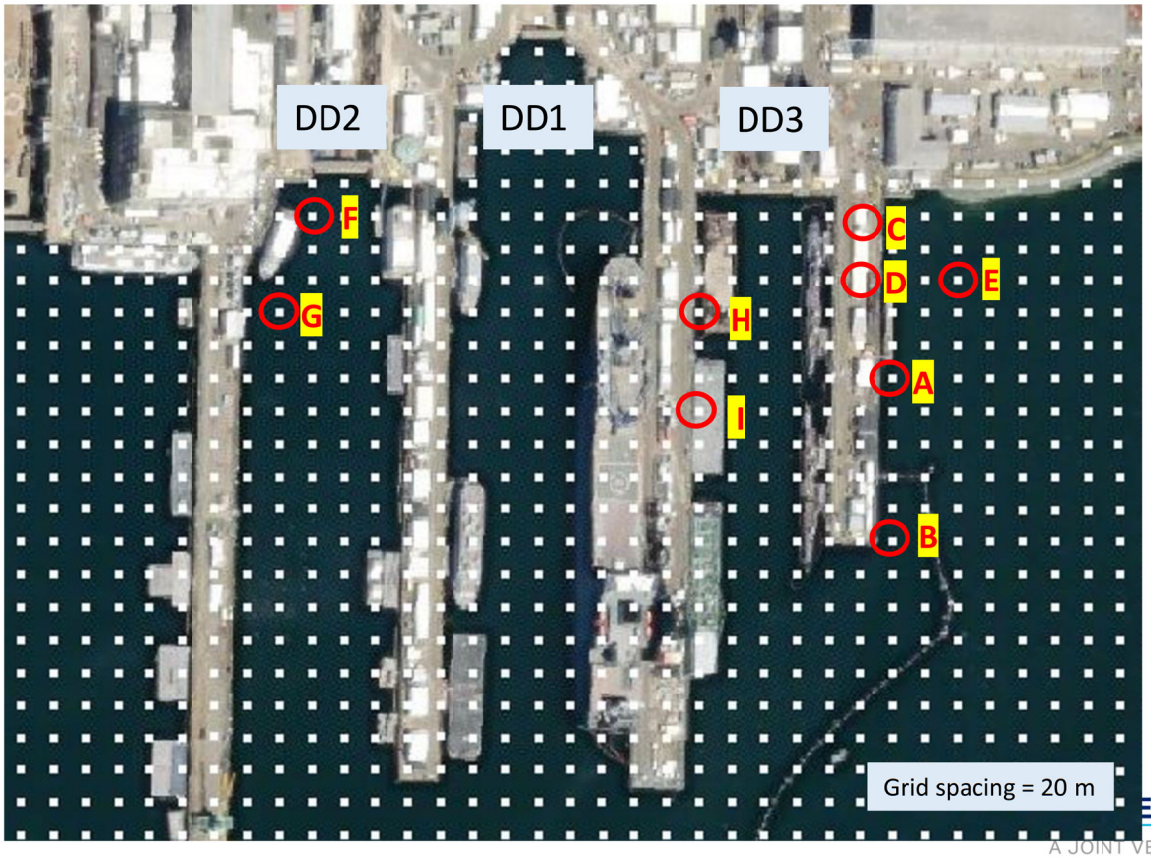
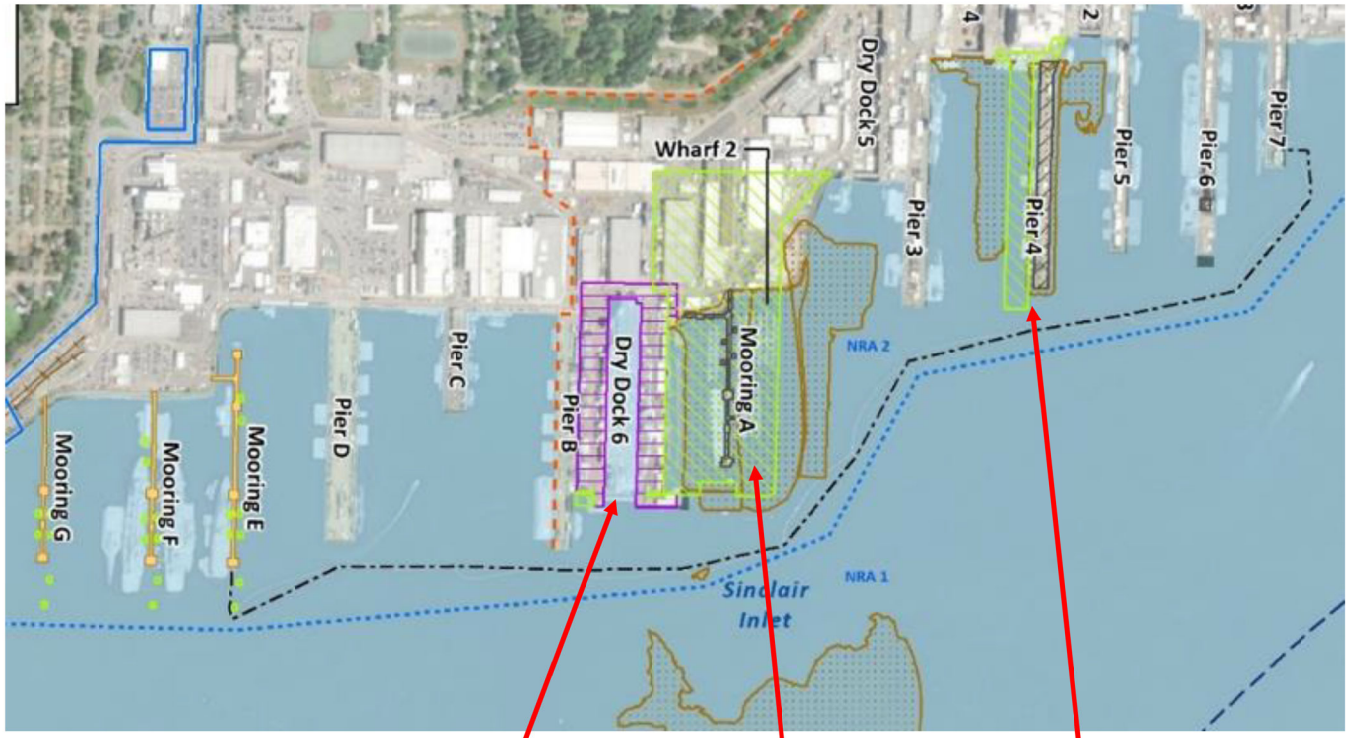


Figure A-6. General Layout of In-Water Construction Activities Modeled for Alternative 3



For Alternative 3, modeled three time periods:

1. **Fall 2029** - Pile extraction and dredging for M2D2 at Mooring A
2. **Fall 2030** – Pile driving and dredging for M2D2 at Mooring A
3. **Fall 2035** – Pile extraction and pile driving for DD6 upgrade, dredging for M2D2 berthing and turning basins, and dredging and pile extraction for Pier 4 demo

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Figure A-7. Spatial Layout of Concurrent Activities for Alternative 3, Sequence 1 (Fall 2029) in Vicinity of M2D2 at Mooring A

Code	Activity Description
A	Remove Temporary Sheet Pile Cutoff Wall (Pile extraction, Rig 1 of 2)
B	Remove Temporary Sheet Pile Cutoff Wall (Pile extraction, Rig 2 of 2)
C	Dredging for Foundations (Derrick 1 of 2)
D	Dredging for Foundations (Derrick 2 of 2)

Assumptions:

- *Location and footprint of M2D2 dry dock are approximate*
- *Mooring A demo complete*
- *100-meter spacing between dredge derricks (C and D)*
- *Dredging = 24 hr/day for 6 day/wk*
- *Pile activities = 10 hr/day for 7 day/wk*

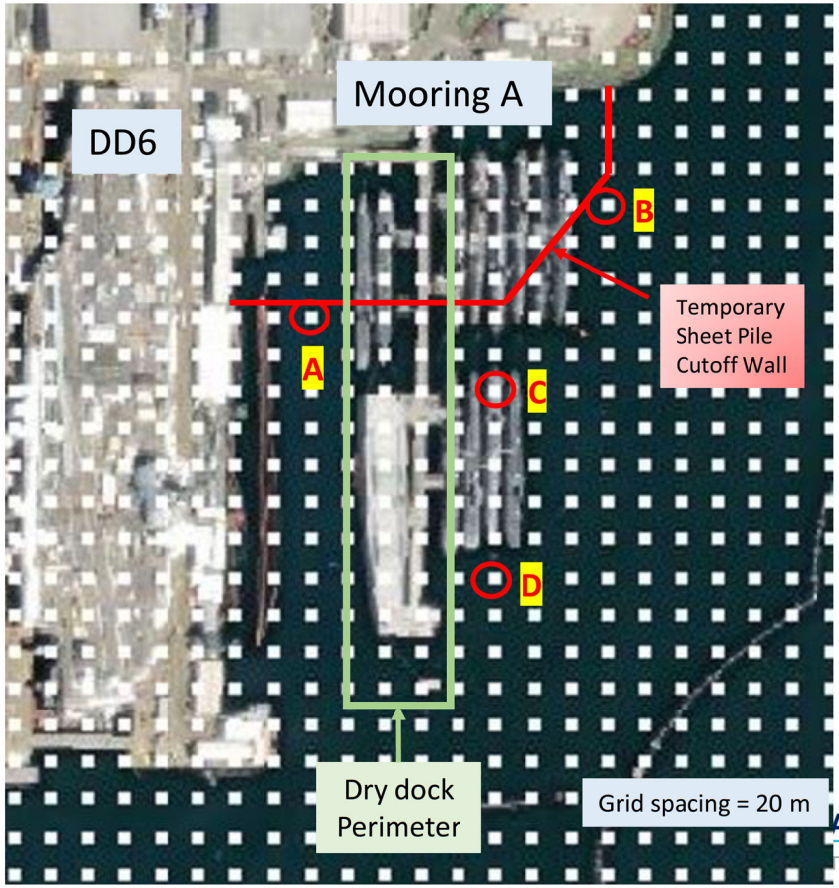

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Figure A-8. Spatial Layout of Concurrent Activities for Alternative 3, Sequence 2 (Fall 2030) in Vicinity of M2D2 at Mooring A

Code	Activity Description
A	Dredge/Cut Caisson Foundation into Till (Derrick 1 of 2)
B	Dredge/Cut Caisson Foundation into Till (Derrick 2 of 2)
C	Pile Driving (Sheet for walls)
D	Pile Driving (24-in Steel Pipe for walls)
E	Pile Driving (96-in Steel Pipe for floor)

Assumptions:

- *Location and footprint of M2D2 dry dock are approximate*
- *100-meter spacing between dredge derricks (A and B)*
- *Dredging = 24 hr/day for 6 day/wk*
- *Pile activities = 10 hr/day for 7 day/wk*

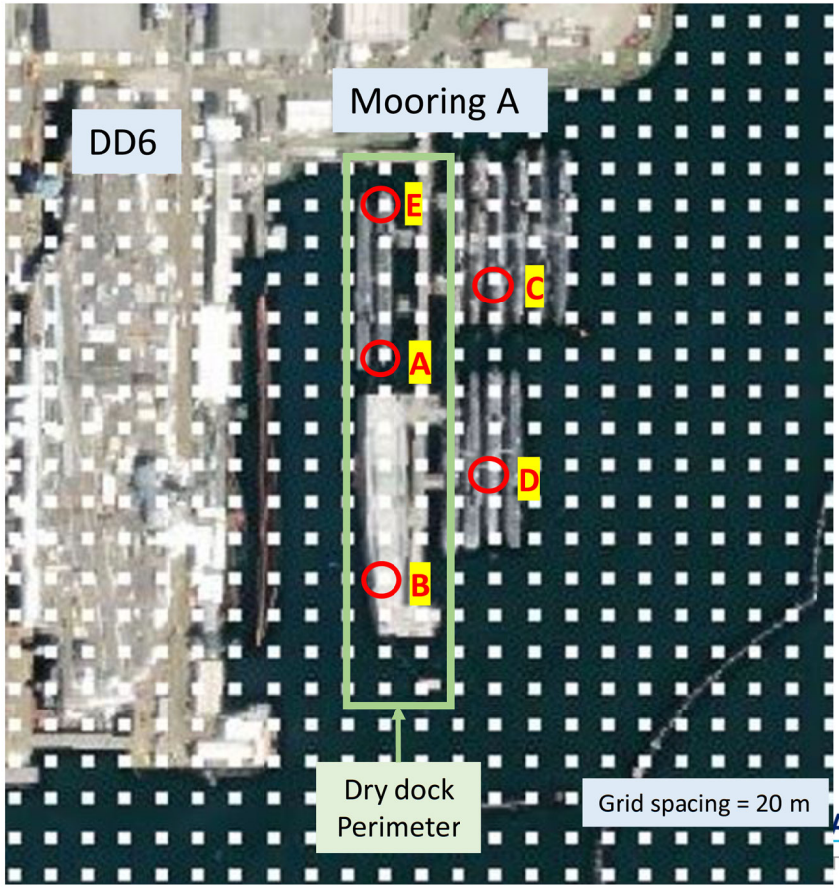

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Figure A-9. Spatial Layout of Modeled Activities for Alternative 3, Sequence 3 (Fall 2035) in Vicinity of M2D2 at Mooring A

Code	Activity Description
A	Dredging for Berthing Basin (Derrick 1 of 2)
B	Dredging for Berthing Basin (Derrick 2 of 2)
C	Dredging for Turning Basin (Derrick 1 of 2)
D	Dredging for Turning Basin (Derrick 2 of 2)
E	Demo Section of Pier 9 (Pile extraction)
F	Pile Driving for DD6 upgrade (Steel pipe for wall)
G	Pile Driving for DD6 upgrade (Sheet Pile for wall)

Assumptions:

- *Location and footprint of M2D2 dry dock are approximate*
- *100-meter spacing between dredge derricks (A and B, and F and G)*
- *Dredging = 24 hr/day for 6 day/wk*
- *Pile activities = 10 hr/day for 7 day/wk*

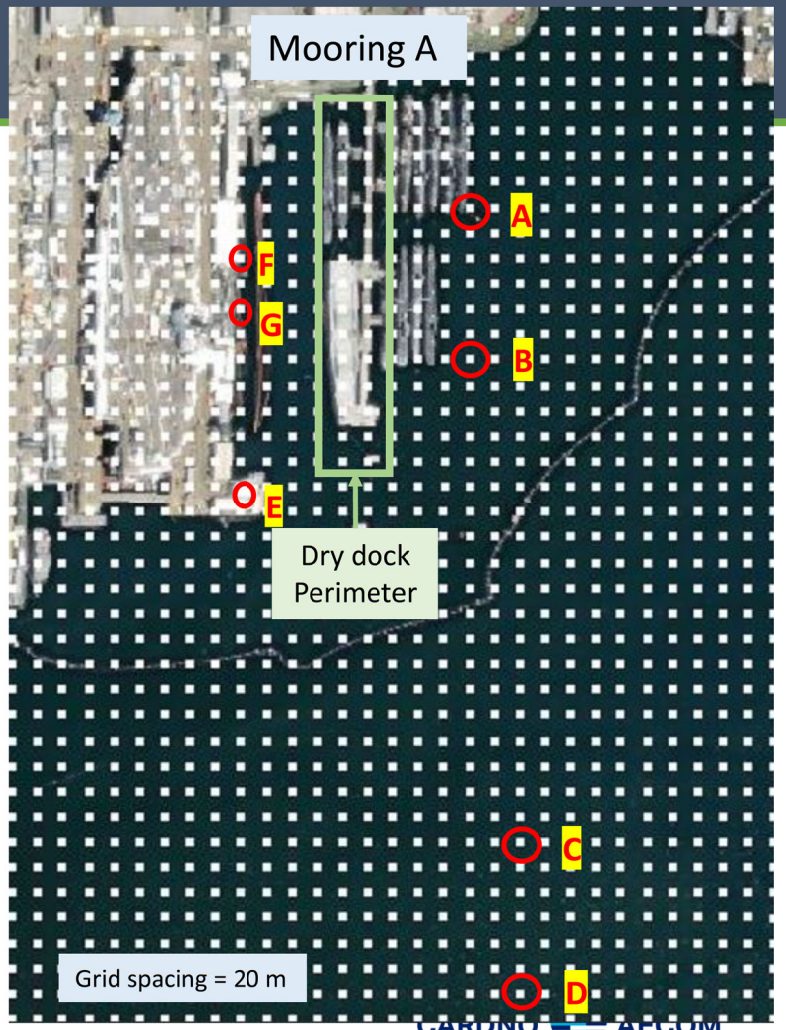
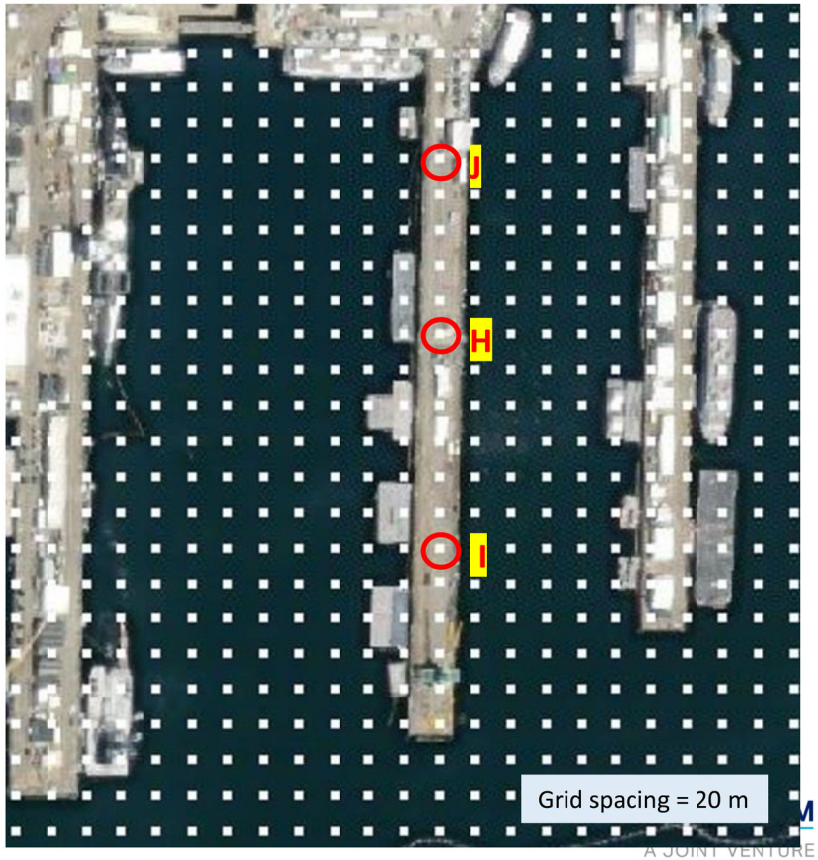


Figure A-10. Spatial Layout of Modeled Activities for Alternative 3, Sequence 3 (Fall 2035) for Pier 4 Demolition

Code	Activity Description
H	Dredging for Pier 4 Demo (Derrick 1 of 2)
I	Dredging for Pier 4 Demo (Derrick 2 of 2)
J	Demolish Concrete Foundations

Assumptions:

- *100-meter spacing between dredge derricks (A and B)*
- *Dredging = 24 hr/day for 6 day/wk*
- *Pile activities = 10 hr/day for 7 day/wk*



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Appendix B
Sediment Characterization

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Appendix B - Summary of Marine Sediment Data Sets with Grain Size Data (Collected 1994-2022)

Source	Sample ID	Collection Date	General Location	Lat	Long	Depth (ft) (a)	Fines % (b)	Sand %	Gravel %	TS	WC	Porosity (c)
WSP 2023	T4-P	9/15/2022	Cofferdam Area	47 559325	-122 6294229	0.6	27.8	56.7	13 8	71.3	*28.7*	0.51
WSP 2023	T2-P	9/15/2022	Cofferdam Area	47 559877	-122.629449	1.0	86.5	12.1	1.5	36.0	*64.0*	0.82
Navy 1999	109	1999	Mooring E	47 553181	-122.651558	1.0	91.0	9	0	N/A	N/A	N/A
Navy 1999	1109	1999	Pier D	47 553427	-122.649728	1.0	34.3	55.6	9.1	N/A	N/A	N/A
Navy 1999	1108	1999	Pier D	47 555244	-122.649699	1.0	59.5	32.8	7.7	N/A	N/A	N/A
Navy 1999	1139	1999	Pier C	47.55387	-122.647204	1.0	91.3	8 2	0.6	N/A	N/A	N/A
Navy 1999	1111	1999	Pier B	47 553833	-122.644493	1.0	47.3	47.2	0	N/A	N/A	N/A
Navy 1999	1110	1999	Pier B	47 555304	-122.644422	1.0	56.6	37.1	5.2	N/A	N/A	N/A
Navy 1999	1138	1999	Mooring A	47 554752	-122.641799	1.0	24.8	75.2	0.1	N/A	N/A	N/A
WSP/HC 2021	HC-DD7-03	Summer 2020	New Pier 2	47.5555	-122.641	1.0	51	49	0	*44.7*	55.3	0.76
Navy 1999	1137	1999	Mooring A	47 556024	-122.640062	1.0	36.1	58.6	5.4	N/A	N/A	N/A
WSP/HC 2021	HC-DD7-04	Summer 2020	New Pier 2	47.5554	-122.64	1.0	48	52	0	*24.7*	75.3	0.89
Navy 1999	1136	1999	Dry Dock 5	47 557528	-122.638287	1.0	82.4	17.7	0	N/A	N/A	N/A
Navy 1999	461	1999	Pier 5	47 558252	-122.632994	1.0	76.0	23.7	0	N/A	N/A	N/A
WSP 2023	B3-P	9/14/2022	Berthing Basins	47 559803	-122 6314751	1.2	71.1	25.1	6.7	37.5	*62.5*	0.81
WSP 2023	E5-P	9/15/2022	Piers 6 & 7	47 558746	-122 6296088	1.2	10.3	81.3	8.6	80.9	*19.1*	0.38
WSP 2023	C1-S1	9/10/2022	Piers 6 & 7	47 560743	-122 6306466	1.4	12.6	62.9	18.4	81.9	*18.1*	0.36
WSP 2023	T3-P	9/15/2022	Cofferdam Area	47 559528	-122 6294444	1.7	40.6	48.9	13.1	59.1	*40.9*	0.64
WSP 2023	A1-P	9/8/2022	Berthing Basins	47 560245	-122 6329207	1.9	24.9	71.8	1.3	70.3	*29.7*	0.52
WSP 2023	B6-P	9/13/2022	Berthing Basins	47 558902	-122 6314998	2.0	73.5	24.3	1.3	50.3	*49.7*	0.72
WSP 2023	B7-P	9/13/2022	Berthing Basins	47 558620	-122 6314877	2.0	79.6	19.4	0.2	50.2	*49.8*	0.72
WSP 2023	B8-P	9/13/2022	Berthing Basins	47 558286	-122 6314644	2.0	83.1	15.8	0.4	47.5	*52.5*	0.74
WSP 2023	B12-P	9/12/2022	Berthing Basins	47 557184	-122.631436	2.0	66.7	23.7	13.7	49	*51*	0.73
WSP 2023	B11-P	9/13/2022	Berthing Basins	47 557407	-122 6314136	2.0	84.5	18.6	0.3	45.2	*54.8*	0.76
WSP 2023	D8-P	9/19/2022	Piers 6 & 7	47 557374	-122.630196	2.0	33.7	31.0	32 5	57.1	*42.9*	0.66
WSP 2023	D8-P	9/19/2022	Piers 6 & 7	47 557374	-122.630196	2.0	35.2	33.4	31 9	60.0	*40.0*	0.63
URS 2002	828	1994	Mooring G	47 552653	-122.655993	3.0	90	10	0	--	--	0.74
URS 2002	827	1994	Dry Dock 4	47 558313	-122.635559	3.0	79	21	0	--	--	0.72
URS 2002	826	1994	Piers 6 & 7	47 558983	-122.629403	3.0	14	76	10	--	--	0.35
Navy 1999	109	1999	Mooring E	47 553181	-122.651558	4.0	91.8	7 5	0	N/A	N/A	N/A
Navy 1999	1139	1999	Pier C	47.55387	-122.647204	4.0	92.2	8 2	0	N/A	N/A	N/A
Navy 1999	1138	1999	Mooring A	47 554752	-122.641799	4.0	37.9	54.3	5.5	N/A	N/A	N/A
Navy 1999	1137	1999	Mooring A	47 556024	-122.640062	4.0	16.3	65.1	17.7	N/A	N/A	N/A
Navy 1999	1136	1999	Dry Dock 5	47 557528	-122.638287	4.0	58.0	35.4	5.7	N/A	N/A	N/A
Navy 1999	461	1999	Pier 5	47 558252	-122.632994	4.0	81.2	18.6	0.2	N/A	N/A	N/A
WSP 2023	A1-P	9/8/2022	Berthing Basins	47 560245	-122 6329207	4.5	3.4	92.4	0.0	79.6	*20.4*	0.40
HC 2022	HC22-29	7/21/2022	Piers 5, 6 & 7	47.55904	-122.63091	5.8	9.4	71.8	18 8	*87.9*	12.1	0.26
WSP 2023	D8-P	9/19/2022	Piers 6 & 7	47 557374	-122.630196	5.8	56.0	27.9	16.1	52.3	*47.7*	0.70
HC 2022	HC22-24	7/26/2022	Piers 5, 6 & 7	47 560395	-122.629483	6.8	28.9	55.0	16.1	*92.3*	7.7	N/A
WSP 2023	B8-P	9/13/2022	Berthing Basins	47 558286	-122 6314644	6.9	54.4	46.3	0.6	60.9	*39.1*	0.62
SAIC 2000	DD6-PB70	1999	Pier B	47.55570764	-122 6458292	7.0	3.4	66.6	30.1	88.0	*12.0*	0.26
SAIC 2000	DD6-PB71	1999	Pier B	47.55516778	-122 6458761	9.0	9.9	32.8	57.4	92.3	*7.7*	0.18
SAIC 2000	DD3	1999	Pier D	47.5537	-122 6509153	10 2	78.8	20.3	1	52.5	*47.5*	0.70
SAIC 2000	DD4-PB62	1999	Pier D	47.55565347	-122 6486313	10 8	3.7	81.9	14 5	88.8	*11.2*	0.25
SAIC 2000	DD6-PB72	1999	Pier B	47.55466111	-122 6458843	11 0	8.1	28.2	63.7	88.5	*11.5*	0.25
SAIC 2000	DD4-PB63	1999	Pier D	47.55516667	-122 6486481	11 2	11.6	29.8	58 8	86.8	*13.2*	0.28
SAIC 2000	DD4-PB65	1999	Pier D	47.55436319	-122 6487069	13 0	78.8	19.9	1.2	68.3	*31.7*	0.55
SAIC 2000	DD4-PB64	1999	Pier D	47.55476574	-122 6486917	13 0	62.9	35.3	2	62.8	*37.2*	0.61
HC 2022	HC22-24	7/26/2022	Piers 5, 6 & 7	47 560395	-122.629483	15 5	30.1	53.4	16 5	*82.6*	17.4	0.35
HC 2022	HC22-18W	8/12/2022	Piers 5, 6 & 7	47 560917	-122.630383	15 8	4.7	66.7	28 6	*92.1*	7 9	0.18
HC 2022	HC22-38	7/30/2022	Piers 5, 6 & 7	47 558577	-122.629744	15 8	24.6	39.1	36 2	*90.4*	9 6	0.22
HC 2022	HC22-35	7/29/2022	Piers 5, 6 & 7	47 558935	-122.629418	15 8	44.1	55.0	0.9	*85.2*	14.8	0.31
HC 2022	HC22-25	7/18/2022	Piers 5, 6 & 7	47.55982	-122.630979	16 8	28.3	62.6	9.0	*88.6*	11.4	0.25
HC 2022	HC22-17	7/20/2022	Piers 5, 6 & 7	47 560441	-122.630961	18.7	37.9	51.4	10 8	*80.8*	19.2	0.38
HC 2022	HC22-18V	7/7/2022	Piers 5, 6 & 7	47 560903	-122.630375	22.4	4.2	61.1	34.7	*86.7*	13.3	0.28

Notes:

N/A - Not available; TS = total solids; WC = water content.

(a) - Depth shown is midpoint for samples collected over a depth interval.

(b) - Sum of silts and clays.

(c) - Porosity (*p*) as reported in source or calculated from water content (WC) or total solids (TS) (values shown in *italics* were calculated by subtracting the reported TS or WC value from 100%) using the formula

$$p = 1 - \left[\left(\frac{TS/100}{\rho_s}\right) \div \left(\frac{TS/100}{\rho_s} + \frac{WC/100}{\rho_w}\right)\right]$$

Where ρs is the density of the solid particle (2,650 grams per cubic centimeter) and ρw is the density of saltwater (1,023 grams per cubic centimeter) (see Section 9 of report).

Sources:

WSP (2023). Final Sediment Characterization Report. March 13, 2023.

HC (2022). Sediment Grain Size Characterization. Excel file: M2D2_GSD_WSP_HC (with Modified HC Results) - R01-05042023_from Navy.xlxs

WSP/HC (2021). Volume 4, Geotechnical Report and Appendices.

URS (2002). Marine Sediment Physical Characterization, Appendix P of RI.

Navy (1999). Draft Technical Memorandum for Results of FS Sediment Sampling, OUB Marine.

SAIC (2000). Sediment Characterization at Puget Sound Naval Shipyard, Phase II BNC.

Appendix B - Summary of Sediment Data Collected Near Piers 6 and 7 (Fall 2023)

Sample ID	Depth (feet)	Percent Fines (a)	Total Solids (%)	Water Content (%)	Porosity (b)
08-09-2023-C01-0-4	2	44.7	67	33	0.56
08-09-2023-C01-4-8	6	23.5	90	10	0.22
08-09-2023-C01-8-12	10	18.3	90	10	0.22
08-09-2023-C01-12-16	14	28.7	83	17	0.35
08-09-2023-C01-16-20	18	26.0	80	20	0.39
08-09-2023-C01-20-24	22	2.0	90	10	0.22
08-09-2023-C01-24-28	26	2.4	89	11	0.24
08-09-2023-C01-28-32	30	3.1	89	11	0.24
08-09-2023-C01-32-36	34	3.9	83	17	0.35
08-09-2023-C01-36-40	38	5.9	87	13	0.28
08-09-2023-C01-36-40_DUP	38	4.8	87	13	0.28
08-09-2023-C01-40-44	42	3.9	88	12	0.26
08-09-2023-C01-44-48	45.5	6.6	89	11	0.24
08-10-2023-C02-0-4	2	31.9	77	23	0.44
08-10-2023-C02-4-8	6	23.4	87	13	0.28
08-10-2023-C02-8-12	10	33.6	86	14	0.30
08-10-2023-C02-12-16	14	4.1	88	12	0.26
08-10-2023-C02-16-20	18	3.8	86	14	0.30
08-10-2023-C02-20-24	22	6.2	84	16	0.33
08-10-2023-C02-24-28	25.6	5.7	85	15	0.31
08-10-2023-C03-0-4	2	20.0	70	30	0.53
08-10-2023-C03-4-8	6	3.8	86	14	0.30
08-10-2023-C03-8-12	10	8.0	84	16	0.33
08-10-2023-C03-12-16	14	22.6	91	9	0.20
08-10-2023-C03-16-20	18	31.1	92	8	0.18
08-10-2023-C03-20-24	22	31.5	90	10	0.22
08-11-2023-C04-0-4	2	2.5	93	7	0.16
08-11-2023-C04-4-8	6	4.2	90	10	0.22
08-11-2023-C04-8-12	10	9.1	85	15	0.31
08-11-2023-C04-12-16	14	17.4	92	8	0.18
08-11-2023-C04-12-16_DUP	14	16.5	91	9	0.20
08-11-2023-C04-16-20	18	6.5	93	7	0.16
08-11-2023-C04-20-24	22	29.5	90	10	0.22
08-11-2023-C04-24-28	25.5	3.2	89	11	0.24
08-15-2023-C05-0-4	2	54.6	52	48	0.71
08-15-2023-C05-4-8	6	18.8	90	10	0.22
08-15-2023-C05-8-12	10	11.5	85	15	0.31
08-15-2023-C05-12-16	14	5.6	81	19	0.38
08-15-2023-C05-16-20	18	7.0	78	22	0.42
08-15-2023-C05-20-24	22	8.4	78	22	0.42
08-15-2023-C05-24-28	25.7	9.1	80	20	0.39
08-14-2023-C06-0-4	2	45.3	57	43	0.66
08-14-2023-C06-4-8	6	20.5	75	25	0.46

Appendix B - Summary of Sediment Data Collected Near Piers 6 and 7 (Fall 2023)

Sample ID	Depth (feet)	Percent Fines (a)	Total Solids (%)	Water Content (%)	Porosity (b)
08-14-2023-C06-8-12	10	6.0	87	13	0.28
08-14-2023-C06-12-16	14	7.9	91	9	0.20
08-14-2023-C06-16-20	18	6.6	92	8	0.18
08-14-2023-C06-20-24	22	33.2	88	12	0.26
08-14-2023-C06-24-28	26	35.7	88	12	0.26
08-14-2023-C06-28-32	28.65	30.8	87	13	0.28
08-14-2023-C07-0-4	2	76.5	49	51	0.73
08-14-2023-C07-4-8	6	57.5	47	53	0.74
08-14-2023-C07-8-12	10	65.7	62	38	0.61
08-14-2023-C07-8-12_DUP	10	61.4	63	37	0.60
08-14-2023-C07-12-16	14	59.2	60	40	0.63
08-14-2023-C07-16-20	18	16.5	81	19	0.38
08-14-2023-C07-20-24	22	7.4	84	16	0.33
08-14-2023-C07-24-28	26	3.0	82	18	0.36
08-14-2023-C07-28-32	30	5.2	88	12	0.26
08-14-2023-C07-32-36	32.7	5.0	89	11	0.24
08-21-2023-C08-0-4	2	32.8	71	29	0.51
08-21-2023-C08-4-8	6	10.1	81	19	0.38
08-21-2023-C08-8-12	10	3.1	90	10	0.22
08-21-2023-C08-12-16	14	6.7	84	16	0.33
08-21-2023-C08-16-20	18	17.9	93	7	0.16
08-21-2023-C08-20-24	22	46.6	92	8	0.18
08-21-2023-C08-24-28	25.55	26.8	91	9	0.20
08-17-2023-C09-0-4	2	32.8	91	9	0.20
08-17-2023-C09-4-8	6	19.0	85	15	0.31
08-17-2023-C09-8-12	10	30.1	88	12	0.26
08-17-2023-C09-12-16	14	34.8	90	10	0.22
08-17-2023-C09-16-20	16.7	42.8	89	11	0.24
08-21-2023-C10-0-4	2	38.9	92	8	0.18
08-21-2023-C10-4-8	6	38.1	93	7	0.16
08-21-2023-C10-4-8_DUP	6	37.5	92	8	0.18
08-21-2023-C10-8-12	10	22.2	92	8	0.18
08-21-2023-C10-12-16	14	21.5	88	12	0.26
08-21-2023-C10-16-20	18	28.2	84	16	0.33
08-21-2023-C10-20-24	21.05	48.0	84	16	0.33
08-21-2023-C11-0-4	2	38.9	92	8	0.18
08-21-2023-C11-4-8	6	39.0	92	8	0.18
08-21-2023-C11-8-12	10	31.5	92	8	0.18
08-21-2023-C11-12-16	14	32.8	93	7	0.16
08-21-2023-C11-16-20	18	37.4	93	7	0.16
08-21-2023-C11-20-24	21.95	38.6	92	8	0.18
08-24-2023-C12-0-4	2	39.5	74	26	0.48
08-24-2023-C12-4-8	6	39.6	92	8	0.18

Appendix B - Summary of Sediment Data Collected Near Piers 6 and 7 (Fall 2023)

Sample ID	Depth (feet)	Percent Fines (a)	Total Solids (%)	Water Content (%)	Porosity (b)
08-24-2023-C12-8-12	10	34.4	94	6	0.14
08-24-2023-C12-12-16	14	38.5	95	5	0.12
08-24-2023-C12-16-20	18	27.7	92	8	0.18
08-24-2023-C12-20-24	22	7.5	89	11	0.24
08-24-2023-C12-24-28	24.15	5.6	93	7	0.16
08-23-2023-C13-0-4	2	55.1	53	47	0.70
08-23-2023-C13-4-8	6	28.5	92	8	0.18
08-23-2023-C13-4-8_DUP	6	30.5	92	8	0.18
08-23-2023-C13-8-12	10	18.4	86	14	0.30
08-23-2023-C13-12-16	14	17.9	81	19	0.38
08-23-2023-C13-16-20	18	9.3	85	15	0.31
08-23-2023-C13-20-24	22	11.2	79	21	0.41
08-23-2023-C13-24-28	26	16.4	82	18	0.36
08-23-2023-C13-28-32	28.1	43.4	87	13	0.28
08-23-2023-C14-0-4	2	93.7	40	60	0.80
08-23-2023-C14-4-8	6	11.5	90	10	0.22
08-23-2023-C14-8-12	10	9.3	94	6	0.14
08-23-2023-C14-12-16	14	10.3	93	7	0.16
08-23-2023-C14-16-20	18	11.7	93	7	0.16
08-23-2023-C14-20-24	21.5	12.8	92	8	0.18
08-18-2023-C15-0-4	2	43.4	73	27	0.49
08-18-2023-C15-4-8	6	32.8	91	9	0.20
08-18-2023-C15-8-12	10	18.9	93	7	0.16
08-18-2023-C15-12-16	14	18.4	89	11	0.24
08-18-2023-C15-16-20	18	18.4	89	11	0.24
08-18-2023-C15-20-24	22	7.5	83	17	0.35
08-18-2023-C15-20-24_DUP	22	7.5	80	20	0.39
08-18-2023-C15-24-28	24.3	7.0	84	16	0.33
08-24-2023-C16-0-4	2	39.5	77	23	0.44
08-24-2023-C16-4-8	6	34.2	92	8	0.18
08-24-2023-C16-8-12	10	32.1	93	7	0.16
08-24-2023-C16-12-16	14	26.6	91	9	0.20
08-24-2023-C16-16-20	18	35.2	89	11	0.24
08-24-2023-C16-20-24	22	43.5	85	15	0.31
08-24-2023-C16-24-28	24.6	32.3	88	12	0.26
08-17-2023-C17-0-4	2	38.4	89	11	0.24
08-17-2023-C17-4-8	6	35.1	89	11	0.24
08-17-2023-C17-8-12	10	29.0	89	11	0.24
08-17-2023-C17-12-16	14	36.4	88	12	0.26
08-17-2023-C17-16-20	17.7	31.5	88	12	0.26
08-18-2023-C18-0-4	2	27.4	90	10	0.22
08-18-2023-C18-4-8	6	28.6	91	9	0.20
08-18-2023-C18-8-12	10	44.0	91	9	0.20

Appendix B - Summary of Sediment Data Collected Near Piers 6 and 7 (Fall 2023)

Sample ID	Depth (feet)	Percent Fines (a)	Total Solids (%)	Water Content (%)	Porosity (b)
08-18-2023-C18-12-16	14	46.8	89	11	0.24
08-18-2023-C18-16-20	17.75	25.7	91	9	0.20
08-16-2023-C19-0-4	2	7.5	80	20	0.39
08-16-2023-C19-4-8	6	6.4	82	18	0.36
08-16-2023-C19-8-12	10	26.7	85	15	0.31
08-16-2023-C19-12-16	14	41.4	89	11	0.24
08-16-2023-C19-16-20	17.85	36.4	89	11	0.24
08-16-2023-C19-16-20_DUP	17.85	41.2	88	12	0.26
08-16-2023-C20-0-4	2	40.1	64	36	0.59
08-16-2023-C20-4-8	6	17.7	72	28	0.50
08-16-2023-C20-8-12	10	8.3	83	17	0.35
08-16-2023-C20-12-16	12.55	13.6	92	8	0.18
08-16-2023-C21-0-4	2	25.3	72	28	0.50
08-16-2023-C21-4-8	6	12.7	81	19	0.38
08-16-2023-C21-8-12	10	17.0	89	11	0.24
08-16-2023-C21-12-16	14	34.0	90	10	0.22
08-16-2023-C21-16-20	18	38.0	90	10	0.22
08-16-2023-C21-20-24	20.85	44.1	89	11	0.24
08-30-2023-C22-0-4	2	49.8	62	38	0.61
08-30-2023-C22-4-8	6	27.3	91	9	0.20
08-30-2023-C22-8-12	10	33.8	93	7	0.16
08-30-2023-C22-12-16	13.15	27.0	93	7	0.16
08-30-2023-C23-0-4	2	19.2	65	35	0.58
08-30-2023-C23-4-8	6	12.1	88	12	0.26
08-30-2023-C23-8-12	10	34.1	92	8	0.18
08-30-2023-C23-12-16	14	49.1	90	10	0.22
08-30-2023-C23-12-16_DUP	14	50.0	90	10	0.22
08-30-2023-C23-16-20	18	22.9	91	9	0.20
08-30-2023-C23-20-24	22	40.2	91	9	0.20
08-30-2023-C23-24-28	26	24.0	91	9	0.20
08-30-2023-C23-28-32	29.1	46.5	85	15	0.31
08-28-2023-C24-0-4	2	11.7	82	18	0.36
08-28-2023-C24-4-8	6	28.1	91	9	0.20
08-28-2023-C24-8-12	10	30.6	91	9	0.20
08-28-2023-C24-12-16	14	21.2	89	11	0.24
08-28-2023-C24-16-20	18	35.7	90	10	0.22
08-28-2023-C24-20-24	22	35.5	88	12	0.26
08-28-2023-C24-24-28	26	57.8	87	13	0.28
08-28-2023-C24-28-32	29.3	45.9	87	13	0.28
08-28-2023-C25-0-4	2	18.9	69	31	0.54
08-28-2023-C25-4-8	6	6.9	85	15	0.31
08-28-2023-C25-8-12	10	7.6	86	14	0.30
08-28-2023-C25-12-16	14	34.2	90	10	0.22

Appendix B - Summary of Sediment Data Collected Near Piers 6 and 7 (Fall 2023)

Sample ID	Depth (feet)	Percent Fines (a)	Total Solids (%)	Water Content (%)	Porosity (b)
08-28-2023-C25-16-20	18	58.3	88	12	0.26
08-28-2023-C25-20-24	22	50.7	87	13	0.28
08-28-2023-C25-24-28	26	23.9	83	17	0.35
08-28-2023-C25-28-32	30	34.2	80	20	0.39
08-28-2023-C25-28-32_DUP	30	30.0	85	15	0.31
08-28-2023-C25-32-36	32.5	34.5	84	16	0.33
08-30-2023-C26-0-4	2	31.4	61	39	0.62
08-30-2023-C26-4-8	6	8.1	84	16	0.33
08-30-2023-C26-8-12	10	24.6	92	8	0.18
08-30-2023-C26-12-16	14	30.3	93	7	0.16
08-30-2023-C26-16-20	18	38.9	93	7	0.16
08-30-2023-C26-20-24	22	25.7	91	9	0.20
08-30-2023-C26-24-28	26	44.3	90	10	0.22
08-30-2023-C26-28-32	30	51.0	90	10	0.22
08-30-2023-C26-32-36	34	44.7	87	13	0.28
08-30-2023-C26-32-36_DUP	34	42.0	88	12	0.26
08-30-2023-C26-36-40	37	58.8	84	16	0.33
08-25-2023-C27-0-4	2	39.6	52	48	0.71
08-25-2023-C27-4-8	6	15.2	82	18	0.36
08-25-2023-C27-8-12	10	28.9	91	9	0.20
08-25-2023-C27-12-16	14	35.1	90	10	0.22
08-25-2023-C27-16-20	18	36.0	88	12	0.26
08-25-2023-C27-20-24	22	31.4	87	13	0.28
08-25-2023-C27-24-28	26	41.9	89	11	0.24
08-25-2023-C27-28-32	30	38.9	85	15	0.31
08-25-2023-C27-28-32_DUP	30	37.3	86	14	0.30
08-25-2023-C27-32-36	32.25	31.2	91	9	0.20
08-29-2023-C28-0-4	2	45.2	48	52	0.74
08-29-2023-C28-4-8	6	33.9	54	46	0.69
08-29-2023-C28-8-12	10	12.8	83	17	0.35
08-29-2023-C28-12-16	14	49.0	87	13	0.28
08-29-2023-C28-16-20	18	27.1	92	8	0.18
08-29-2023-C28-20-24	22	30.7	91	9	0.20
08-29-2023-C28-24-28	26	26.5	91	9	0.20
08-29-2023-C28-28-32	28.55	36.9	91	9	0.20
08-15-2023-C29-0-4	2	67.4	56	44	0.67
08-15-2023-C29-4-8	6	71.5	50	50	0.72
08-15-2023-C29-8-12	10	75.0	57	43	0.66
08-15-2023-C29-12-16	13.35	63.0	64	36	0.59
08-15-2023-C30-0-4	2	75.6	49	51	0.73
08-15-2023-C30-4-8	6	85.7	49	51	0.73
08-15-2023-C30-8-12	9.2	86.8	52	48	0.71
08-17-2023-C31-0-4	2	77.3	51	49	0.71

Appendix B - Summary of Sediment Data Collected Near Piers 6 and 7 (Fall 2023)

Sample ID	Depth (feet)	Percent Fines (a)	Total Solids (%)	Water Content (%)	Porosity (b)
08-17-2023-C31-4-8	6	89.6	49	51	0.73
08-17-2023-C31-8-12	10	86.4	54	46	0.69
08-17-2023-C31-12-16	12.35	93.6	52	48	0.71
08-25-2023-C33-0-4	2	27.8	75	25	0.46
08-25-2023-C33-4-8	6	30.6	91	9	0.20
08-25-2023-C33-8-12	9.1	31.7	89	11	0.24

Notes:

(a) - Sum of silts and clays.

(b) - Porosity as calculated from water content (WC) and total solids (TS) using the formula:

$$p = 1 - \left[\left(\frac{TS/100}{\rho_s}\right) \div \left(\frac{TS/100}{\rho_s} + \frac{WC/100}{\rho_w}\right)\right]$$

Where ρs is the density of the solid particle (2,650 grams per cubic centimeter) and ρw is the density of saltwater (1,023 grams per cubic centimeter) (see Section 9 of report).

Source:

WSP (2024). Final Sediment Delineation Report. March, 2024.

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Appendix C
Derivation of Sediment Release Rates and Discharge Time Series

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APPENDIX C
DERIVATION OF SEDIMENT RELEASE RATES AND DISCHARGE TIME SERIES

The sediment releases require a special format for input into the DELFT3D model as the model does not provide for the direct injection of sediment mass (as kg/s) into the water column. The model requires the sediment to be introduced as a flow or discharge rate (m^3/s) and discharge concentration (kg/m^3). This requires converting the sediment release rate (SRR in units of kg/s) for each activity to a sediment release represented as a discharge rate and discharge concentration. A discharge rate of 0.01 m^3/s was used for the conversion.[1] Using the SRR of 0.070 kg/s for dredging as an example, a discharge concentration of 7.0 kg/m^3 is calculated, which is then distributed equally across the four sediment classes (1.8 kg/m^3 per class) (see derivation in **Attachment A** of the appendix).

This appendix presents conceptual models and derivation of SRR for the following pile activities:

1. Solid Circular Pile Installation
2. Hollow Circular Pile Installation
3. Sheet Pile Installation
4. Foundation Removal
5. Pile Removal

The equations used to calculate sediment volumes and conversions from Imperial to metric units are presented (DELFT3D requires metric inputs). Each pile example uses the dimensions of one of the pile types for the project. For piles with other dimensions, SRRs were calculated using the same approach. The conversion of SRRs to a time series of discharge concentrations for input into the DELFT3D model is also presented for each pile activity.

Attachment A to this appendix presents the calculation of SRR and time series for all pile installation and removal activities modeled for each alternative and sequence. The calculation of the SRR and discharge time series used for all dredging scenarios is also provided in Attachment A.

1. Solid Circular Pile Installation

Figure C.1 presents a diagram of the conceptual model used to estimate the SRR for installing a solid circular pile.

[1] The primary consideration in selecting a discharge rate is that it is sufficiently small such that it does not significantly alter the hydrodynamics and sediment transport. The volume of water injected at 0.01 m^3/s over a 2-hour slack tide period is 2,540 ft^3. This value is very small in comparison to the volume of a 150-ft radius monitoring area, which assuming a 30-foot depth, is approximately 2,120,000 ft^3.

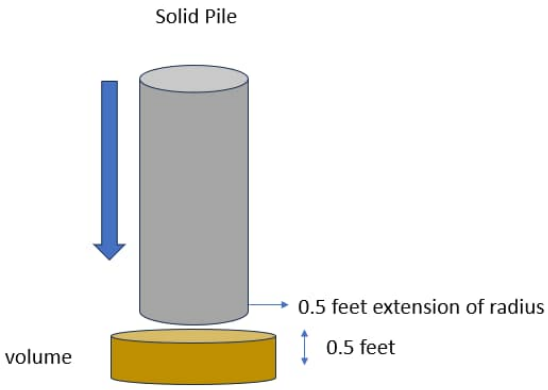

Figure C.1. Conceptual Model for Solid Pile Installation

The volume of sediment disturbance will scale with the cross-sectional area of the pile and the depth representing the sediment pushed laterally from the pile base. Eventually the pile base will be sufficiently far into the seabed that lateral displacement of sediment will be absorbed by the surrounding sediment and not result in resuspension. The calculation of SRR is provided for a 24-inch diameter concrete pile (Table C.1). The depth of the sediment disturbing impact is assumed to be one-half foot and the diameter of the impact is assumed to be 1.5 times the area of the pile cross-section, yielding a sediment volume of 0.10 m^3. The volume is adjusted for the sediment composition, yielding 39.8 kg. A four-minute duration is assumed, yielding a SRR of 0.17 kg/s, which is converted to a discharge concentration of 17 kg/m^3 that is distributed equally across the 4 sediment classes.

Table C.**1. Calculation** of SRR for **Solid Pile Installation**

Pile Diameter	24	Inches
Pile Base Area	7.1	ft^2
Depth of Impact	0.5	Feet
Volume of Sed.	3.53	ft^3
Volume of Sed.	0.10	m^3
Mass of Sed. (2650 kg/m3)	265.4	Kg
Mass of Sed. (%-Fines x (1-porosity)) 0.15	39.8	Kg
Duration	4	Minutes
Duration	240	Seconds
SRR	0.17	Kg/s
Conversion to DELFT3D Input Units		
Discharge Rate	0.01	m^3/s
Discharge Concentration	16.6	kg/m^3
Discharge Concentration (per 1 of 4 classes)	4.15	kg/m^3

Table C.2 presents the time series of model inputs for the first three days of the simulation (the input table continues for the next 25 days of the 28-day simulation). The pile driving activity is assumed to occur 3 times for a duration of 4 minutes over a 10 hour period each day. The four columns of discharge concentrations are the input values for each of the 4 sediment classes.

Table C.2. Discharge Time Series for Input to DELFT3D Model
Solid Pile Installation

Day	Time (minutes)	Discharge Rate (m^3/s)	Discharge Conc. (Kg/m^3)	Discharge Conc. (Kg/m^3)	Discharge Conc. (Kg/m^3)	Discharge Conc. (Kg/m^3)
1	0	0.00	0.00	0.00	0.00	0.00
	480	0.01	4.15	4.15	4.15	4.15
	484	0.00	0.00	0.00	0.00	0.00
	724	0.01	4.15	4.15	4.15	4.15
	728	0.00	0.00	0.00	0.00	0.00
	968	0.01	4.15	4.15	4.15	4.15
	972	0.00	0.00	0.00	0.00	0.00
2	1440	0.00	0.00	0.00	0.00	0.00
	1920	0.01	4.15	4.15	4.15	4.15
	1924	0.00	0.00	0.00	0.00	0.00
	2164	0.01	4.15	4.15	4.15	4.15
	2168	0.00	0.00	0.00	0.00	0.00
	2408	0.01	4.15	4.15	4.15	4.15
	2412	0.00	0.00	0.00	0.00	0.00
3	2880	0.00	0.00	0.00	0.00	0.00
	3360	0.01	4.15	4.15	4.15	4.15
	3364	0.00	0.00	0.00	0.00	0.00
	3604	0.01	4.15	4.15	4.15	4.15
	3608	0.00	0.00	0.00	0.00	0.00
	3848	0.01	4.15	4.15	4.15	4.15
	3852	0.00	0.00	0.00	0.00	0.00

2. Hollow Circular Pile Installation

Figure C.2 presents a diagram of the conceptual model used to estimate the SRR for hollow circular pile installation.

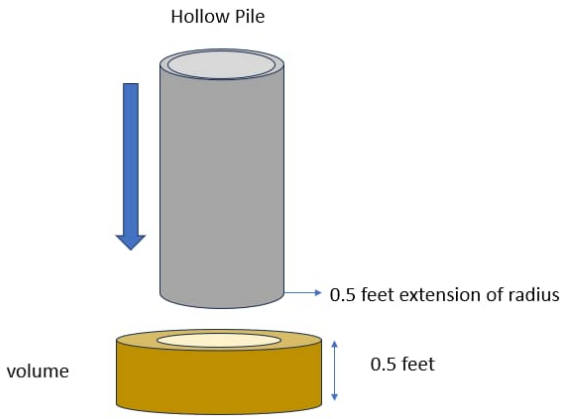

Figure C.2. Conceptual Model for Solid Pile Installation

A similar approach was used for the hollow piles. The only difference is that the area of the impacts is assumed to be a circular area between the radius of the pile and extension of the radius by one-half-foot. The depth of impact and duration are the same as for the solid pile. The calculation of SRR is provided for a 96-inch hollow pile (Table C.3).

Table C.3. **Calculation** of SRR for Hollow **Pile Installation**

Pile Diameter	96	Inches
Pile Base Area	13.4	ft^2
Depth of Impact	0.5	Feet
Volume of Sed.	6.68	ft^3
Volume of Sed.	0.19	m^3
Mass of Sed. (2650 kg/m3)	501.3	Kg
Mass of Sed. (%-Fines x (1-porosity)) 0.15	75	Kg
Duration	4	Minutes
Duration	240	Seconds
SRR	0.31	Kg/s
Conversion to DELFT3D Input Units		
Discharge Rate	0.01	m3/s
Discharge Concentration	31.3	kg/m3
Discharge Concentration (per 1 of 4 classes)	7.83	kg/m3

Table C.4 presents the time series of model inputs for the first three days of the simulation. The pile driving activity is assumed to occur 3 times for a duration of 4 minutes over a 10 hour period each day.

Table C.4. Discharge Time Series for Input to DELFT3D Model
Hollow Pile Installation

Day	Time (minutes)	Discharge Rate (m^3/s)	Discharge Conc. (Kg/m^3)	Discharge Conc. (Kg/m^3)	Discharge Conc. (Kg/m^3)	Discharge Conc. (Kg/m^3)
1	0	0.00	0.00	0.00	0.00	0.00
	480	0.01	7.83	7.83	7.83	7.83
	484	0.00	0.00	0.00	0.00	0.00
	724	0.01	7.83	7.83	7.83	7.83
	728	0.00	0.00	0.00	0.00	0.00
	968	0.01	7.83	7.83	7.83	7.83
	972	0.00	0.00	0.00	0.00	0.00
2	1440	0.00	0.00	0.00	0.00	0.00
	1920	0.01	7.83	7.83	7.83	7.83
	1924	0.00	0.00	0.00	0.00	0.00
	2164	0.01	7.83	7.83	7.83	7.83
	2168	0.00	0.00	0.00	0.00	0.00
	2408	0.01	7.83	7.83	7.83	7.83
	2412	0.00	0.00	0.00	0.00	0.00
3	2880	0.00	0.00	0.00	0.00	0.00
	3360	0.01	7.83	7.83	7.83	7.83
	3364	0.00	0.00	0.00	0.00	0.00
	3604	0.01	7.83	7.83	7.83	7.83
	3608	0.00	0.00	0.00	0.00	0.00
	3848	0.01	7.83	7.83	7.83	7.83
	3852	0.00	0.00	0.00	0.00	0.00

3. Sheet Pile Installation

Figure C.3 presents a diagram of the conceptual model used to estimate the SRR for sheet pile installation.

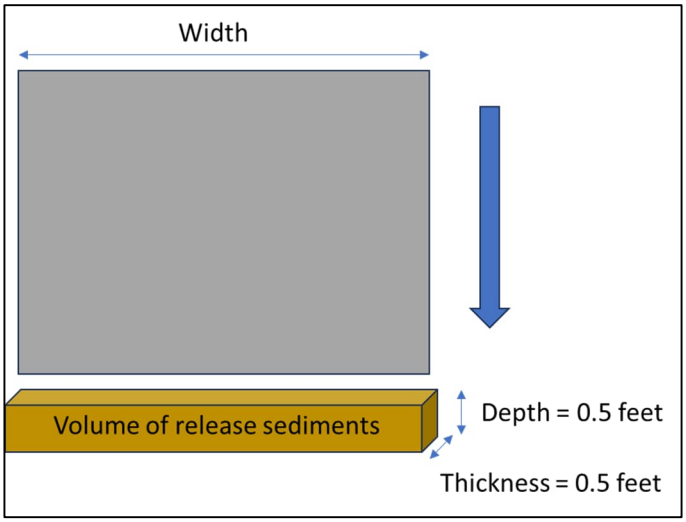

Figure C.3. Conceptual Model for Sheet Pile Installation

The volume of released sediment is the assumed impact depth and thickness multiplied by the width of the sheet. The duration over which the sediment is released is assumed to be 4 minutes. The calculation of SRR is provided for a 56-inch wide sheet pile (Table C.5).

Table C.5. Calculation of SRR for Sheet Pile Installation

Width	56	inches
Width	4.67	Feet
Impact Thickness	0.5	Foot
Impact Depth	0.5	Feet
Volume	1.17	$feet^3$
Volume	0.033	m^3
Mass Sed. (2650 kg/m^3)	87.6	Kg
Mass of Sed. (%-Fines x (1-porosity)) 0.15	13.1	Kg
Duration	4	Minutes
Duration	240	Seconds
SRR	0.055	kg/s
Conversion to DELFT3D Input Units		
Discharge Rate	0.01	m^3/s
Discharge Concentration	5.65	kg/m^3
Discharge Concentration (per 1 of 4 classes)	1.37	kg/m^3

Table C.6 presents the time series of model inputs for the first three days of the simulation. The pile driving activity is assumed to occur 3 times for a duration of 4 minutes over a 10 hour period each day.

Table C.6. Example Activity Discharge Time Series for Input to DELFT3D Model Sheet Pile Installation

Day	Time (minutes)	Discharge Rate (m^3/s)	Discharge Conc. (Kg/m^3)	Discharge Conc. (Kg/m^3)	Discharge Conc. (Kg/m^3)	Discharge Conc. (Kg/m^3)
1	0	0.00	0.00	0.00	0.00	0.00
	480	0.01	1.37	1.37	1.37	1.37
	484	0.00	0.00	0.00	0.00	0.00
	724	0.01	1.37	1.37	1.37	1.37
	728	0.00	0.00	0.00	0.00	0.00
	968	0.01	1.37	1.37	1.37	1.37
	972	0.00	0.00	0.00	0.00	0.00
2	1440	0.00	0.00	0.00	0.00	0.00
	1920	0.01	1.37	1.37	1.37	1.37
	1924	0.00	0.00	0.00	0.00	0.00
	2164	0.01	1.37	1.37	1.37	1.37
	2168	0.00	0.00	0.00	0.00	0.00
	2408	0.01	1.37	1.37	1.37	1.37
	2412	0.00	0.00	0.00	0.00	0.00
3	2880	0.00	0.00	0.00	0.00	0.00
	3360	0.01	1.37	1.37	1.37	1.37
	3364	0.00	0.00	0.00	0.00	0.00
	3604	0.01	1.37	1.37	1.37	1.37
	3608	0.00	0.00	0.00	0.00	0.00
	3848	0.01	1.37	1.37	1.37	1.37
	3852	0.00	0.00	0.00	0.00	0.00

4. Foundation Removal

Figure C.4 presents a diagram of the conceptual model used to estimate the SRR for removal of the concrete foundations.

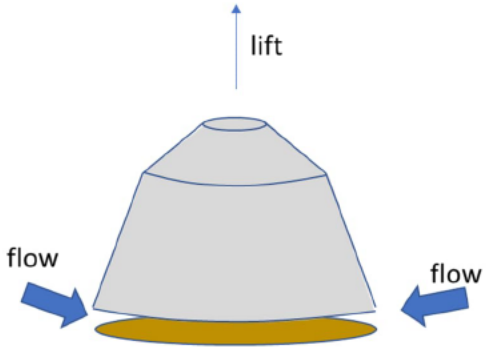

Figure C.4. Conceptual Model of Foundation Removal

The foundation will be lifted directly from the seafloor, either as a single unit or after being cut into pieces. It is expected that water will rush into the gap formed below the foundation as it is lifted off the seabed. The rush of water will last a brief period and will erode sediments until the foundation is a few feet above the seabed. To estimate a SRR associated with this process, it is assumed that the depth of sediment eroded below the foundation is 6 inches, and the erosion lasts 6 minutes **(Table C.7)**.

Table C.7. Calculation of SRR for Foundation Removal

Foundation Bottom Diameter	48	Inches
Foundation Bottom Area	12.6	ft^2
Depth of Impact	6	Inches
Depth of Impact	0.50	Feet
Volume of Sed.	6.28	ft^3
Volume of Sed.	0.178	m^3
Mass of Sed. (2650 kg/m3)	471.8	Kg
Mass of Sed. (%-Fines x (1-porosity)) 0.15	71.8	Kg
Duration	6	Minutes
Duration	360	Seconds
SRR	0.20	Kg/s
Conversion to DELFT3D Input Units		
Discharge Rate	0.01	m^3/s
Discharge Concentration	19.7	kg/m3
Discharge Concentration (per 1 of 4 classes)	4.91	kg/m3

Table C.8 presents the time series of model inputs for the first three days of the simulation. The foundation removal activity is assumed to occur 6 times for a duration of 6 minutes over a 10 hour period each day.

Table C.8. Example Activity Discharge Time Series for Input to DELFT3D Model Foundation Removal

Day	Time (minutes)	Discharge Rate (m^3/s)	Discharge Conc. (Kg/m^3)	Discharge Conc. (Kg/m^3)	Discharge Conc. (Kg/m^3)	Discharge Conc. (Kg/m^3)
1	0	0.00	0.00	0.00	0.00	0.00
	480	0.01	4.91	4.91	4.91	4.91
	486	0.00	0.00	0.00	0.00	0.00
	600	0.01	4.91	4.91	4.91	4.91
	606	0.00	0.00	0.00	0.00	0.00
	720	0.01	4.91	4.91	4.91	4.91
	726	0.00	0.00	0.00	0.00	0.00

	840	0.01	4.91	4.91	4.91	4.91
	846	0.00	0.00	0.00	0.00	0.00
	960	0.01	4.91	4.91	4.91	4.91
	966	0.00	0.00	0.00	0.00	0.00
	1080	0.01	4.91	4.91	4.91	4.91
	1086	0.00	0.00	0.00	0.00	0.00
2	1440	0.00	0.00	0.00	0.00	0.00
	1920	0.01	4.91	4.91	4.91	4.91
	1926	0.00	0.00	0.00	0.00	0.00
	2040	0.01	4.91	4.91	4.91	4.91
	2046	0.00	0.00	0.00	0.00	0.00
	2160	0.01	4.91	4.91	4.91	4.91
	2166	0.00	0.00	0.00	0.00	0.00
	2280	0.01	4.91	4.91	4.91	4.91
	2286	0.00	0.00	0.00	0.00	0.00
	2400	0.01	4.91	4.91	4.91	4.91
	2406	0.00	0.00	0.00	0.00	0.00
	2520	0.01	4.91	4.91	4.91	4.91
	2526	0.00	0.00	0.00	0.00	0.00
3	2880	0.00	0.00	0.00	0.00	0.00
	3360	0.01	4.91	4.91	4.91	4.91
	3366	0.00	0.00	0.00	0.00	0.00
	3480	0.01	4.91	4.91	4.91	4.91
	3486	0.00	0.00	0.00	0.00	0.00
	3600	0.01	4.91	4.91	4.91	4.91
	3606	0.00	0.00	0.00	0.00	0.00
	3720	0.01	4.91	4.91	4.91	4.91
	3726	0.00	0.00	0.00	0.00	0.00
	3840	0.01	4.91	4.91	4.91	4.91
	3846	0.00	0.00	0.00	0.00	0.00
	3960	0.01	4.91	4.91	4.91	4.91
	3966	0.00	0.00	0.00	0.00	0.00

5. Pile Removal

Figure C.5 presents a diagram of the conceptual model used to estimate the SRR for timber pile removal.

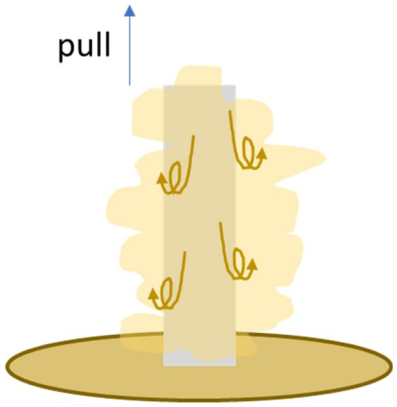

Figure C.5. Conceptual Model of Pile Removal

For pile removal, it is assumed that a relatively thin layer of adhered sediment, on the order of a few millimeters, is released as the pile is pulled upward through the water column. The volume of released sediment is calculated as the circumference of the pile multiplied by the length and thickness of the mud layer. A pile length of 20 feet and mud layer thickness of ½ inch were assumed for the volume calculations. The duration is assumed to be 6 minutes, yielding a SRR of 0.14 kg/s (Table C.9).

Table C.9 Calculation of SRR for Pile Removal

Pile Diameter	20	inches
Circumference	5.24	Ft
Thickness of mud on pile	0.5	Inches
Thickness of mud on pile	0.042	Feet
Length of pile extracted	20	Ft
Volume of Sed.	4.36	ft^3
Volume of Sed.	0.124	m^3
Mass of Sed. (2650 kg/m3)	327.7	Kg
Mass of Sed. (%-Fines x (1-porosity)) 0.15	49.2	Kg
Duration	6	Minutes
Duration	360	Seconds
SRR	0.14	kg/s
Conversion to DELFT3D Input Units		
Discharge Rate	0.01	m^3/s
Discharge Concentration	13.7	kg/m3
Discharge Concentration (per 1 of 4 classes)	3.41	kg/m3

Table C.10 presents the time series of model inputs for the first three days of the simulation. The pile removal activity is assumed to occur 8 times for a duration of 6 minutes over a 10 hour period each day.

Table C.10. Example Activity Discharge Time Series for Input to DELFT3D Model
Pile Removal

Day	Time (minutes)	Discharge Rate (m^3/s)	Discharge Conc. (Kg/m^3)	Discharge Conc. (Kg/m^3)	Discharge Conc. (Kg/m^3)	Discharge Conc. (Kg/m^3)
1	0	0.00	0.00	0.00	0.00	0.00
	480	0.01	3.41	3.41	3.41	3.41
	486	0.00	0.00	0.00	0.00	0.00
	570	0.01	3.41	3.41	3.41	3.41
	576	0.00	0.00	0.00	0.00	0.00
	660	0.01	3.41	3.41	3.41	3.41
	666	0.00	0.00	0.00	0.00	0.00
	750	0.01	3.41	3.41	3.41	3.41
	756	0.00	0.00	0.00	0.00	0.00
	840	0.01	3.41	3.41	3.41	3.41
	846	0.00	0.00	0.00	0.00	0.00
	930	0.01	3.41	3.41	3.41	3.41
	936	0.00	0.00	0.00	0.00	0.00
	1020	0.01	3.41	3.41	3.41	3.41
	1026	0.00	0.00	0.00	0.00	0.00
	1110	0.01	3.41	3.41	3.41	3.41
	1116	0.00	0.00	0.00	0.00	0.00
2	1440	0.00	0.00	0.00	0.00	0.00
	1920	0.01	3.41	3.41	3.41	3.41
	1926	0.00	0.00	0.00	0.00	0.00
	2010	0.01	3.41	3.41	3.41	3.41
	2016	0.00	0.00	0.00	0.00	0.00
	2100	0.01	3.41	3.41	3.41	3.41
	2106	0.00	0.00	0.00	0.00	0.00
	2190	0.01	3.41	3.41	3.41	3.41
	2196	0.00	0.00	0.00	0.00	0.00
	2280	0.01	3.41	3.41	3.41	3.41
	2286	0.00	0.00	0.00	0.00	0.00
	2370	0.01	3.41	3.41	3.41	3.41
	2376	0.00	0.00	0.00	0.00	0.00
	2460	0.01	3.41	3.41	3.41	3.41
	2466	0.00	0.00	0.00	0.00	0.00
	2550	0.01	3.41	3.41	3.41	3.41
	2556	0.00	0.00	0.00	0.00	0.00

3	2880	0.00	0.00	0.00	0.00	0.00
	3360	0.01	3.41	3.41	3.41	3.41
	3366	0.00	0.00	0.00	0.00	0.00
	3450	0.01	3.41	3.41	3.41	3.41
	3456	0.00	0.00	0.00	0.00	0.00
	3540	0.01	3.41	3.41	3.41	3.41
	3546	0.00	0.00	0.00	0.00	0.00
	3630	0.01	3.41	3.41	3.41	3.41
	3636	0.00	0.00	0.00	0.00	0.00
	3720	0.01	3.41	3.41	3.41	3.41
	3726	0.00	0.00	0.00	0.00	0.00
	3810	0.01	3.41	3.41	3.41	3.41
	3816	0.00	0.00	0.00	0.00	0.00
	3900	0.01	3.41	3.41	3.41	3.41
	3906	0.00	0.00	0.00	0.00	0.00
	3990	0.01	3.41	3.41	3.41	3.41
	3996	0.00	0.00	0.00	0.00	0.00

ATTACHMENT A

SEDIMENT RELEASE RATE AND DISCHARGE TIME SERIES

CALCULATION SHEETS FOR DREDGING AND ALL PILE ACTIVITIES

Dredging Rate for All Dredging Scenarios

Dredging Rate	2000	cy/day
Dredging Rate	1530	m3/day
Dredging Rate (24 hr/day)	64	m3/hr
Fraction Released (1%)	0.64	m3/hr
Mass Sed. (%-Fines x (1-porosity)) 0.15	0.096	m3/hr
Sediment Mass (2650 kg/m3)	253	kg/hr
Sediment Release Rate (3600 sec/hr)	0.070	kg/s
Sediment Release Rate (per each of 4 classes)	0.018	kg/s

Conversion to DELFT3D Input Units

Discharge Rate	0.01	m3/s
Discharge Concentration	7.04	kg/m3
Discharge Concentration (per each of 4 classes)	1.76	kg/m3

Vertical Distribution by Model Layer	Rate	%
1 - Surface	0.0030	0.3
2 - Middle (upper)	0.0015	0.15
3 - Middle (lower)	0.0015	0.15
4 - Bottom	0.0040	0.4
	0.01	1.0

per derrick	Time (minutes)	Discharge Rate (m3/s)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)
SURFACE						
Date/Time						
9/1/21 12:00 AM	0	0.0000	0.00	0.00	0.00	0.00
9/1/21 8:00 AM	480	0.0030	1.76	1.76	1.76	1.76
9/7/21 8:00 AM	9120	0.0000	0.00	0.00	0.00	0.00
9/8/21 8:00 AM	10560	0.0030	1.76	1.76	1.76	1.76
9/14/21 8:00 AM	19200	0.0000	0.00	0.00	0.00	0.00
9/15/21 8:00 AM	20640	0.0030	1.76	1.76	1.76	1.76
9/21/21 8:00 AM	29280	0.0000	0.00	0.00	0.00	0.00
9/22/21 8:00 AM	30720	0.0030	1.76	1.76	1.76	1.76
9/28/21 8:00 AM	39360	0.0000	0.00	0.00	0.00	0.00
9/29/21 8:00 AM	40800	0.0030	1.76	1.76	1.76	1.76
10/5/21 8:00 AM	49440	0.0000	0.00	0.00	0.00	0.00
MIDDLE	*Entered for both upper and lower middle layers*					
9/1/21 12:00 AM	0	0.0000	0.00	0.00	0.00	0.00
9/1/21 8:00 AM	480	0.0015	1.76	1.76	1.76	1.76
9/7/21 8:00 AM	9120	0.0000	0.00	0.00	0.00	0.00
9/8/21 8:00 AM	10560	0.0015	1.76	1.76	1.76	1.76
9/14/21 8:00 AM	19200	0.0000	0.00	0.00	0.00	0.00
9/15/21 8:00 AM	20640	0.0015	1.76	1.76	1.76	1.76
9/21/21 8:00 AM	29280	0.0000	0.00	0.00	0.00	0.00
9/22/21 8:00 AM	30720	0.0015	1.76	1.76	1.76	1.76
9/28/21 8:00 AM	39360	0.0000	0.00	0.00	0.00	0.00
9/29/21 8:00 AM	40800	0.0015	1.76	1.76	1.76	1.76
10/5/21 8:00 AM	49440	0.0000	0.00	0.00	0.00	0.00
BOTTOM						
9/1/21 12:00 AM	0	0.0000	0.00	0.00	0.00	0.00
9/1/21 8:00 AM	480	0.0040	1.76	1.76	1.76	1.76
9/7/21 8:00 AM	9120	0.0000	0.00	0.00	0.00	0.00
9/8/21 8:00 AM	10560	0.0040	1.76	1.76	1.76	1.76
9/14/21 8:00 AM	19200	0.0000	0.00	0.00	0.00	0.00
9/15/21 8:00 AM	20640	0.0040	1.76	1.76	1.76	1.76
9/21/21 8:00 AM	29280	0.0000	0.00	0.00	0.00	0.00
9/22/21 8:00 AM	30720	0.0040	1.76	1.76	1.76	1.76
9/28/21 8:00 AM	39360	0.0000	0.00	0.00	0.00	0.00
9/29/21 8:00 AM	40800	0.0040	1.76	1.76	1.76	1.76
10/5/21 8:00 AM	49440	0.0000	0.00	0.00	0.00	0.00

Alternative 2, Sequence 1

Cofferdam Sheet Pile Installation

Width	56	inches
Width	4.7	feet
Thickness (perpendicular)	0.5	foot
Depth of Impact	0.5	Feet
Volume	1.17	feet^3
Volume	0.033	m^3
Mass Sed. (2650 kg/m3)	87.6	kg
Mass Sed. (%-Fines x (1-porosity)) 0.15	13.1	Kg
Duration	4	minutes
Duration	240	seconds
Sediment Release Rate	0.055	Kg/s
Conversion to DELFT3D Input Units		
Discharge Rate	0.01	m3/s
Discharge Concentration	5.5	Kg/m3
Discharge Concentration (per 1 of 4 classes)	**1.37**	Kg/m3

3 sheets per day, 1 rig

Date/Time	Time (minutes)	Discharge Rate (m3/s)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)
	Time Series Shown for First 3 Days of 28 Day Simulation					
9/1/21 12:00 AM	0	0.00	0.00	0.00	0.00	0.00
9/1/21 8:00 AM	480	0.01	1.37	1.37	1.37	1.37
9/1/21 8:04 AM	484	0.00	0.00	0.00	0.00	0.00
9/1/21 12:04 PM	724	0.01	1.37	1.37	1.37	1.37
9/1/21 12:08 PM	728	0.00	0.00	0.00	0.00	0.00
9/1/21 4:08 PM	968	0.01	1.37	1.37	1.37	1.37
9/1/21 4:12 PM	972	0.00	0.00	0.00	0.00	0.00
9/2/21 12:00 AM	1440	0.00	0.00	0.00	0.00	0.00
9/2/21 8:00 AM	1920	0.01	1.37	1.37	1.37	1.37
9/2/21 8:04 AM	1924	0.00	0.00	0.00	0.00	0.00
9/2/21 12:04 PM	2164	0.01	1.37	1.37	1.37	1.37
9/2/21 12:08 PM	2168	0.00	0.00	0.00	0.00	0.00
9/2/21 4:08 PM	2408	0.01	1.37	1.37	1.37	1.37
9/2/21 4:12 PM	2412	0.00	0.00	0.00	0.00	0.00
9/3/21 12:00 AM	2880	0.00	0.00	0.00	0.00	0.00
9/3/21 8:00 AM	3360	0.01	1.37	1.37	1.37	1.37
9/3/21 8:04 AM	3364	0.00	0.00	0.00	0.00	0.00
9/3/21 12:04 PM	3604	0.01	1.37	1.37	1.37	1.37
9/3/21 12:08 PM	3608	0.00	0.00	0.00	0.00	0.00
9/3/21 4:08 PM	3848	0.01	1.37	1.37	1.37	1.37
9/3/21 4:12 PM	3852	0.00	0.00	0.00	0.00	0.00

Alternative 2, Sequence 1
Cofferdam Hollow Pile Installation

Pile Diameter	72	inches
Pile Base Area	10.2	ft^2
Depth of Impact	0.5	feet
Volume Sed.	5.1	ft3
Volume Sed.	0.145	m^3
Mass Sed. (2650 kg/m3)	383.4	Kg
Mass Sed. (%-Fines x (1-porosity)) 0.15	57.5	Kg
Duration	4	minutes
Duration	240	seconds
Sediment Release Rate	0.24	Kg/s

Conversion to DELFT3D Input Units

Discharge Rate	0.010	m3/s
Discharge Concentration	24.0	Kg/m3
Discharge Concentration (per 1 of 4 classes)	**5.99**	Kg/m3

3 piles per day, 1 rig	Time (minutes)	Discharge Rate (m3/s)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)
Date/Time	**Time Series Shown for First 3 Days of 28 Day Simulation**					
9/1/21 12:00 AM	0	0.00	0.00	0.00	0.00	0.00
9/1/21 8:00 AM	480	0.01	5.99	5.99	5.99	5.99
9/1/21 8:04 AM	484	0.00	0.00	0.00	0.00	0.00
9/1/21 12:04 PM	724	0.01	5.99	5.99	5.99	5.99
9/1/21 12:08 PM	728	0.00	0.00	0.00	0.00	0.00
9/1/21 4:08 PM	968	0.01	5.99	5.99	5.99	5.99
9/1/21 4:12 PM	972	0.00	0.00	0.00	0.00	0.00
9/2/21 12:00 AM	1440	0.00	0.00	0.00	0.00	0.00
9/2/21 8:00 AM	1920	0.01	5.99	5.99	5.99	5.99
9/2/21 8:04 AM	1924	0.00	0.00	0.00	0.00	0.00
9/2/21 12:04 PM	2164	0.01	5.99	5.99	5.99	5.99
9/2/21 12:08 PM	2168	0.00	0.00	0.00	0.00	0.00
9/2/21 4:08 PM	2408	0.01	5.99	5.99	5.99	5.99
9/2/21 4:12 PM	2412	0.00	0.00	0.00	0.00	0.00
9/3/21 12:00 AM	2880	0.00	0.00	0.00	0.00	0.00
9/3/21 8:00 AM	3360	0.01	5.99	5.99	5.99	5.99
9/3/21 8:04 AM	3364	0.00	0.00	0.00	0.00	0.00
9/3/21 12:04 PM	3604	0.01	5.99	5.99	5.99	5.99
9/3/21 12:08 PM	3608	0.00	0.00	0.00	0.00	0.00
9/3/21 4:08 PM	3848	0.01	5.99	5.99	5.99	5.99
9/3/21 4:12 PM	3852	0.00	0.00	0.00	0.00	0.00

Alternative 2, Sequence 1

Saltwater Pumphouse West Sheet Pile Installation

Width	56	inches
Width	4.7	feet
Thickness (perpendicular)	0.5	foot
Depth of Impact	0.5	feet
Volume	1.17	feet^3
Volume	0.033	m^3
Mass Sed. (2650 kg/m3)	87.6	kg
Mass Sed. (%-Fines x (1-porosity)) 0.15	13.1	Kg
Duration	4	minutes
Duration	240	seconds
Sediment Release Rate	0.055	Kg/s
Conversion to DELFT3D Input Units		
Discharge Rate	0.01	m3/s
Discharge Concentration	5.5	Kg/m3
Discharge Concentration (per 1 of 4 classes)	**1.37**	Kg/m3

3 sheets per day, 1 rig	Time (minutes)	Discharge Rate (m3/s)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)
Date/Time	**Time Series Shown for First 3 Days of 28 Day Simulation**					
9/1/21 12:00 AM	0	0.00	0.00	0.00	0.00	0.00
9/1/21 8:00 AM	480	0.01	1.37	1.37	1.37	1.37
9/1/21 8:04 AM	484	0.00	0.00	0.00	0.00	0.00
9/1/21 12:04 PM	724	0.01	1.37	1.37	1.37	1.37
9/1/21 12:08 PM	728	0.00	0.00	0.00	0.00	0.00
9/1/21 4:08 PM	968	0.01	1.37	1.37	1.37	1.37
9/1/21 4:12 PM	972	0.00	0.00	0.00	0.00	0.00
9/2/21 12:00 AM	1440	0.00	0.00	0.00	0.00	0.00
9/2/21 8:00 AM	1920	0.01	1.37	1.37	1.37	1.37
9/2/21 8:04 AM	1924	0.00	0.00	0.00	0.00	0.00
9/2/21 12:04 PM	2164	0.01	1.37	1.37	1.37	1.37
9/2/21 12:08 PM	2168	0.00	0.00	0.00	0.00	0.00
9/2/21 4:08 PM	2408	0.01	1.37	1.37	1.37	1.37
9/2/21 4:12 PM	2412	0.00	0.00	0.00	0.00	0.00
9/3/21 12:00 AM	2880	0.00	0.00	0.00	0.00	0.00
9/3/21 8:00 AM	3360	0.01	1.37	1.37	1.37	1.37
9/3/21 8:04 AM	3364	0.00	0.00	0.00	0.00	0.00
9/3/21 12:04 PM	3604	0.01	1.37	1.37	1.37	1.37
9/3/21 12:08 PM	3608	0.00	0.00	0.00	0.00	0.00
9/3/21 4:08 PM	3848	0.01	1.37	1.37	1.37	1.37
9/3/21 4:12 PM	3852	0.00	0.00	0.00	0.00	0.00

Alternative 2, Sequence 1

Saltwater Pumphouse West Solid Pipe Pile Installation

Pile Diameter	36	inches
Pile Base Area	12.6	ft^2
Depth of Impact	0.5	feet
Volume Sed.	6.3	ft^3
Volume Sed.	0.178	m^3
Mass Sed. (2650 kg/m3)	471.8	Kg
Mass Sed. (%-Fines x (1-porosity)) 0.15	70.8	Kg
Duration	4	minutes
Duration	240	seconds
Sediment Release Rate	0.29	Kg/s

Conversion to DELFT3D Input Units

Discharge Rate	0.01	m3/s
Discharge Concentration	29.5	Kg/m3
Discharge Concentration (per 1 of 4 classes	**7.37**	Kg/m3

3 piles per day, 1 rig	Time (minutes)	Discharge Rate (m3/s)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)
Date/Time	**Time Series Shown for First 3 Days of 28 Day Simulation**					
9/1/21 12:00 AM	0	0.00	0.00	0.00	0.00	0.00
9/1/21 8:00 AM	480	0.01	7.37	7.37	7.37	7.37
9/1/21 8:04 AM	484	0.00	0.00	0.00	0.00	0.00
9/1/21 12:04 PM	724	0.01	7.37	7.37	7.37	7.37
9/1/21 12:08 PM	728	0.00	0.00	0.00	0.00	0.00
9/1/21 4:08 PM	968	0.01	7.37	7.37	7.37	7.37
9/1/21 4:12 PM	972	0.00	0.00	0.00	0.00	0.00
9/2/21 12:00 AM	1440	0.00	0.00	0.00	0.00	0.00
9/2/21 8:00 AM	1920	0.01	7.37	7.37	7.37	7.37
9/2/21 8:04 AM	1924	0.00	0.00	0.00	0.00	0.00
9/2/21 12:04 PM	2164	0.01	7.37	7.37	7.37	7.37
9/2/21 12:08 PM	2168	0.00	0.00	0.00	0.00	0.00
9/2/21 4:08 PM	2408	0.01	7.37	7.37	7.37	7.37
9/2/21 4:12 PM	2412	0.00	0.00	0.00	0.00	0.00
9/3/21 12:00 AM	2880	0.00	0.00	0.00	0.00	0.00
9/3/21 8:00 AM	3360	0.01	7.37	7.37	7.37	7.37
9/3/21 8:04 AM	3364	0.00	0.00	0.00	0.00	0.00
9/3/21 12:04 PM	3604	0.01	7.37	7.37	7.37	7.37
9/3/21 12:08 PM	3608	0.00	0.00	0.00	0.00	0.00
9/3/21 4:08 PM	3848	0.01	7.37	7.37	7.37	7.37
9/3/21 4:12 PM	3852	0.00	0.00	0.00	0.00	0.00

Alternative 2, Sequence 1

Temporary Access Pier Solid Pipe Pile Installation

Pile Diameter	30	inches
Pile Base Area	9.6	ft^2
Depth of Impact	0.5	feet
Volume Sed.	4.8	ft^3
Volume Sed.	0.14	m^3
Mass Sed. (2650 kg/m3)	361.3	Kg
Mass Sed. (%-Fines x (1-porosity)) 0.15	54.2	Kg
Duration	4	minutes
Duration	240	seconds
Sediment Release Rate	0.23	Kg/s

Conversion to DELFT3D Input Units

Discharge Rate	0.01	m3/s
Discharge Concentration	23	Kg/m3
Discharge Concentration (per 1 of 4 classes	**5.6**	Kg/m3

3 piles per day, 2 rigs	Time (minutes)	Discharge Rate (m3/s)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)
Date/Time	**Time Series Shown for First 3 Days of 28 Day Simulation**					
9/1/21 12:00 AM	0	0.00	0.00	0.00	0.00	0.00
9/1/21 8:00 AM	480	0.01	5.64	5.64	5.64	5.64
9/1/21 8:04 AM	484	0.00	0.00	0.00	0.00	0.00
9/1/21 12:04 PM	724	0.01	5.64	5.64	5.64	5.64
9/1/21 12:08 PM	728	0.00	0.00	0.00	0.00	0.00
9/1/21 4:08 PM	968	0.01	5.64	5.64	5.64	5.64
9/1/21 4:12 PM	972	0.00	0.00	0.00	0.00	0.00
9/2/21 12:00 AM	1440	0.00	0.00	0.00	0.00	0.00
9/2/21 8:00 AM	1920	0.01	5.64	5.64	5.64	5.64
9/2/21 8:04 AM	1924	0.00	0.00	0.00	0.00	0.00
9/2/21 12:04 PM	2164	0.01	5.64	5.64	5.64	5.64
9/2/21 12:08 PM	2168	0.00	0.00	0.00	0.00	0.00
9/2/21 4:08 PM	2408	0.01	5.64	5.64	5.64	5.64
9/2/21 4:12 PM	2412	0.00	0.00	0.00	0.00	0.00
9/3/21 12:00 AM	2880	0.00	0.00	0.00	0.00	0.00
9/3/21 8:00 AM	3360	0.01	5.64	5.64	5.64	5.64
9/3/21 8:04 AM	3364	0.00	0.00	0.00	0.00	0.00
9/3/21 12:04 PM	3604	0.01	5.64	5.64	5.64	5.64
9/3/21 12:08 PM	3608	0.00	0.00	0.00	0.00	0.00
9/3/21 4:08 PM	3848	0.01	5.64	5.64	5.64	5.64
9/3/21 4:12 PM	3852	0.00	0.00	0.00	0.00	0.00

Alternative 2, Sequence 1

Pier 2 Sheet Pile Installation

Width	56	inches
Width	4.7	feet
Thickness (perpendicular)	0.5	foot
Depth of Impact	0.5	feet
Volume	1.17	feet^3
Volume	0.033	m^3
Mas Sed. (2650 kg/m3)	87.6	Kg
Mass Sed. (%-Fines x (1-porosity)) 0.15	13.1	Kg
Duration	4	minutes
Duration	240	seconds
Sediment Release Rate	0.055	Kg/s
Conversion to DELFT3D Input Units		
Discharge Rate	0.01	m3/s
Discharge Concentration	5.5	Kg/m3
Discharge Concentration (per 1 of 4 classes)	**1.37**	Kg/m3

3 sheets per day, 1 rig	Time (minutes)	Discharge Rate (m3/s)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)
Date/Time	**Time Series Shown for First 3 Days of 28 Day Simulation**					
9/1/21 12:00 AM	0	0.00	0.00	0.00	0.00	0.00
9/1/21 8:00 AM	480	0.01	1.37	1.37	1.37	1.37
9/1/21 8:04 AM	484	0.00	0.00	0.00	0.00	0.00
9/1/21 12:04 PM	724	0.01	1.37	1.37	1.37	1.37
9/1/21 12:08 PM	728	0.00	0.00	0.00	0.00	0.00
9/1/21 4:08 PM	968	0.01	1.37	1.37	1.37	1.37
9/1/21 4:12 PM	972	0.00	0.00	0.00	0.00	0.00
9/2/21 12:00 AM	1440	0.00	0.00	0.00	0.00	0.00
9/2/21 8:00 AM	1920	0.01	1.37	1.37	1.37	1.37
9/2/21 8:04 AM	1924	0.00	0.00	0.00	0.00	0.00
9/2/21 12:04 PM	2164	0.01	1.37	1.37	1.37	1.37
9/2/21 12:08 PM	2168	0.00	0.00	0.00	0.00	0.00
9/2/21 4:08 PM	2408	0.01	1.37	1.37	1.37	1.37
9/2/21 4:12 PM	2412	0.00	0.00	0.00	0.00	0.00
9/3/21 12:00 AM	2880	0.00	0.00	0.00	0.00	0.00
9/3/21 8:00 AM	3360	0.01	1.37	1.37	1.37	1.37
9/3/21 8:04 AM	3364	0.00	0.00	0.00	0.00	0.00
9/3/21 12:04 PM	3604	0.01	1.37	1.37	1.37	1.37
9/3/21 12:08 PM	3608	0.00	0.00	0.00	0.00	0.00
9/3/21 4:08 PM	3848	0.01	1.37	1.37	1.37	1.37
9/3/21 4:12 PM	3852	0.00	0.00	0.00	0.00	0.00

Alternative 2, Sequence 1

Pier 2 Concrete Pile Installation

Pile Diameter	24	inches
Pile Base Area	7.1	ft^2
Depth of Impact	0.5	feet
Volume Sed.	3.53	ft^3
Volume Sed.	0.10	m^3
Mass Sed. (2650 kg/m3)	265.4	Kg
Mass Sed. (%-Fines x (1-porosity)) 0.15	39.8	Kg
Duration	4	minutes
Duration	240	seconds
Sediment Release Rate	0.17	Kg/s

Conversion to DELFT3D Input Units

Discharge Rate	0.01	m3/s
Discharge Concentration	16.6	Kg/m3
Discharge Concentration (per 1 of 4 classes	**4.15**	Kg/m3

3 piles per day, 1 rig	Time (minutes)	Discharge Rate (m3/s)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)
Date/Time	**Time Series Shown for First 3 Days of 28 Day Simulation**					
9/1/21 12:00 AM	0	0.00	0.00	0.00	0.00	0.00
9/1/21 8:00 AM	480	0.01	4.15	4.15	4.15	4.15
9/1/21 8:04 AM	484	0.00	0.00	0.00	0.00	0.00
9/1/21 12:04 PM	724	0.01	4.15	4.15	4.15	4.15
9/1/21 12:08 PM	728	0.00	0.00	0.00	0.00	0.00
9/1/21 4:08 PM	968	0.01	4.15	4.15	4.15	4.15
9/1/21 4:12 PM	972	0.00	0.00	0.00	0.00	0.00
9/2/21 12:00 AM	1440	0.00	0.00	0.00	0.00	0.00
9/2/21 8:00 AM	1920	0.01	4.15	4.15	4.15	4.15
9/2/21 8:04 AM	1924	0.00	0.00	0.00	0.00	0.00
9/2/21 12:04 PM	2164	0.01	4.15	4.15	4.15	4.15
9/2/21 12:08 PM	2168	0.00	0.00	0.00	0.00	0.00
9/2/21 4:08 PM	2408	0.01	4.15	4.15	4.15	4.15
9/2/21 4:12 PM	2412	0.00	0.00	0.00	0.00	0.00
9/3/21 12:00 AM	2880	0.00	0.00	0.00	0.00	0.00
9/3/21 8:00 AM	3360	0.01	4.15	4.15	4.15	4.15
9/3/21 8:04 AM	3364	0.00	0.00	0.00	0.00	0.00
9/3/21 12:04 PM	3604	0.01	4.15	4.15	4.15	4.15
9/3/21 12:08 PM	3608	0.00	0.00	0.00	0.00	0.00
9/3/21 4:08 PM	3848	0.01	4.15	4.15	4.15	4.15
9/3/21 4:12 PM	3852	0.00	0.00	0.00	0.00	0.00

Alternative 2, Sequence 1

Mooring F Solid Pipe Pile Installation

Pile Diameter	30	inches
Pile Base Area	9.6	ft^2
Depth of Impact	0.5	feet
Volume Sed.	4.8	ft^3
Volume Sed.	0.136	m^3
Mass Sed. (2650 kg/m3)	361.3	Kg
Mass Sed. (%-Fines x (1-porosity)) 0.15	54.2	Kg
Duration	4	minutes
Duration	240	seconds
Sediment Release Rate	0.23	Kg/s

Conversion to DELFT3D Input Units

Discharge Rate	0.01	m3/s
Discharge Concentration	22.6	Kg/m3
Discharge Concentration (per 1 of 4 classes	**5.64**	Kg/m3

3 piles per day, 1 rig	Time (minutes)	Discharge Rate (m3/s)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)
Date/Time	**Time Series Shown for First 3 Days of 28 Day Simulation**					
9/1/21 12:00 AM	0	0.00	0.00	0.00	0.00	0.00
9/1/21 8:00 AM	480	0.01	5.64	5.64	5.64	5.64
9/1/21 8:04 AM	484	0.00	0.00	0.00	0.00	0.00
9/1/21 12:04 PM	724	0.01	5.64	5.64	5.64	5.64
9/1/21 12:08 PM	728	0.00	0.00	0.00	0.00	0.00
9/1/21 4:08 PM	968	0.01	5.64	5.64	5.64	5.64
9/1/21 4:12 PM	972	0.00	0.00	0.00	0.00	0.00
9/2/21 12:00 AM	1440	0.00	0.00	0.00	0.00	0.00
9/2/21 8:00 AM	1920	0.01	5.64	5.64	5.64	5.64
9/2/21 8:04 AM	1924	0.00	0.00	0.00	0.00	0.00
9/2/21 12:04 PM	2164	0.01	5.64	5.64	5.64	5.64
9/2/21 12:08 PM	2168	0.00	0.00	0.00	0.00	0.00
9/2/21 4:08 PM	2408	0.01	5.64	5.64	5.64	5.64
9/2/21 4:12 PM	2412	0.00	0.00	0.00	0.00	0.00
9/3/21 12:00 AM	2880	0.00	0.00	0.00	0.00	0.00
9/3/21 8:00 AM	3360	0.01	5.64	5.64	5.64	5.64
9/3/21 8:04 AM	3364	0.00	0.00	0.00	0.00	0.00
9/3/21 12:04 PM	3604	0.01	5.64	5.64	5.64	5.64
9/3/21 12:08 PM	3608	0.00	0.00	0.00	0.00	0.00
9/3/21 4:08 PM	3848	0.01	5.64	5.64	5.64	5.64
9/3/21 4:12 PM	3852	0.00	0.00	0.00	0.00	0.00

Alternative 2, Sequence 1
Mooring F Concrete Pile Installation

Pile Diameter	24	inches
Pile Base Area	7.1	ft^2
Depth of Impact	0.5	feet
Volume Sed.	3.5	ft^3
Volume Sed.	0.10	m^3
Mass Sed. (2650 kg/m3)	265.4	kg
Mass Sed. (%-Fines x (1-porosity)) 0.15	39.8	Kg
Duration	4	minutes
Duration	240	seconds
Sediment Release Rate	0.17	Kg/s

Conversion to DELFT3D Input Units

Discharge Rate	0.01	m3/s
Discharge Concentration	16.6	Kg/m3
Discharge Concentration (per 1 of 4 classes	**4.15**	Kg/m3

3 piles per day, 1 rig	Time (minutes)	Discharge Rate (m3/s)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)
Date/Time	**Time Series Shown for First 3 Days of 28 Day Simulation**					
9/1/21 12:00 AM	0	0.00	0.00	0.00	0.00	0.00
9/1/21 8:00 AM	480	0.01	4.15	4.15	4.15	4.15
9/1/21 8:04 AM	484	0.00	0.00	0.00	0.00	0.00
9/1/21 12:04 PM	724	0.01	4.15	4.15	4.15	4.15
9/1/21 12:08 PM	728	0.00	0.00	0.00	0.00	0.00
9/1/21 4:08 PM	968	0.01	4.15	4.15	4.15	4.15
9/1/21 4:12 PM	972	0.00	0.00	0.00	0.00	0.00
9/2/21 12:00 AM	1440	0.00	0.00	0.00	0.00	0.00
9/2/21 8:00 AM	1920	0.01	4.15	4.15	4.15	4.15
9/2/21 8:04 AM	1924	0.00	0.00	0.00	0.00	0.00
9/2/21 12:04 PM	2164	0.01	4.15	4.15	4.15	4.15
9/2/21 12:08 PM	2168	0.00	0.00	0.00	0.00	0.00
9/2/21 4:08 PM	2408	0.01	4.15	4.15	4.15	4.15
9/2/21 4:12 PM	2412	0.00	0.00	0.00	0.00	0.00
9/3/21 12:00 AM	2880	0.00	0.00	0.00	0.00	0.00
9/3/21 8:00 AM	3360	0.01	4.15	4.15	4.15	4.15
9/3/21 8:04 AM	3364	0.00	0.00	0.00	0.00	0.00
9/3/21 12:04 PM	3604	0.01	4.15	4.15	4.15	4.15
9/3/21 12:08 PM	3608	0.00	0.00	0.00	0.00	0.00
9/3/21 4:08 PM	3848	0.01	4.15	4.15	4.15	4.15
9/3/21 4:12 PM	3852	0.00	0.00	0.00	0.00	0.00

Alternative 2, Sequence 2

Saltwater Pumphouse West Sheet Pile Installation

Width	56	inches
Width	4.7	feet
Thickness (perpendicular)	0.5	foot
Depth of Impact	0.5	feet
Volume	1.17	feet^3
Volume	0.033	m^3
Mass Sed. (2650 kg/m3)	87.6	Kg
Mass Sed. (%-Fines x (1-porosity)) 0.15	13.1	Kg
Duration	4	minutes
Duration	240	seconds
Sediment Release Rate	0.055	Kg/s
Conversion to DELFT3D Input Units		
Discharge Rate	0.01	m3/s
Discharge Concentration	5.5	Kg/m3
Discharge Concentration (per 1 of 4 classes)	**1.37**	Kg/m3

3 piles per day, 1 rig	Time (minutes)	Discharge Rate (m3/s)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)
Date/Time	**Time Series Shown for First 3 Days of 28 Day Simulation**					
9/1/21 12:00 AM	0	0.00	0.00	0.00	0.00	0.00
9/1/21 8:00 AM	480	0.01	1.37	1.37	1.37	1.37
9/1/21 8:04 AM	484	0.00	0.00	0.00	0.00	0.00
9/1/21 12:04 PM	724	0.01	1.37	1.37	1.37	1.37
9/1/21 12:08 PM	728	0.00	0.00	0.00	0.00	0.00
9/1/21 4:08 PM	968	0.01	1.37	1.37	1.37	1.37
9/1/21 4:12 PM	972	0.00	0.00	0.00	0.00	0.00
9/2/21 12:00 AM	1440	0.00	0.00	0.00	0.00	0.00
9/2/21 8:00 AM	1920	0.01	1.37	1.37	1.37	1.37
9/2/21 8:04 AM	1924	0.00	0.00	0.00	0.00	0.00
9/2/21 12:04 PM	2164	0.01	1.37	1.37	1.37	1.37
9/2/21 12:08 PM	2168	0.00	0.00	0.00	0.00	0.00
9/2/21 4:08 PM	2408	0.01	1.37	1.37	1.37	1.37
9/2/21 4:12 PM	2412	0.00	0.00	0.00	0.00	0.00
9/3/21 12:00 AM	2880	0.00	0.00	0.00	0.00	0.00
9/3/21 8:00 AM	3360	0.01	1.37	1.37	1.37	1.37
9/3/21 8:04 AM	3364	0.00	0.00	0.00	0.00	0.00
9/3/21 12:04 PM	3604	0.01	1.37	1.37	1.37	1.37
9/3/21 12:08 PM	3608	0.00	0.00	0.00	0.00	0.00
9/3/21 4:08 PM	3848	0.01	1.37	1.37	1.37	1.37
9/3/21 4:12 PM	3852	0.00	0.00	0.00	0.00	0.00

Alternative 2, Sequence 2

Saltwater Pumphouse West Solid Pipe Pile Installation

Pile Diameter	36	inches
Pile Base Area	12.6	ft^2
Depth of Impact	0.5	foot
Volume Sed.	6.3	ft^3
Volume Sed.	0.18	m^3
Mass Sed. (2650 kg/m3)	471.8	Kg
Mass Sed. (%-Fines x (1-porosity)) 0.15	70.8	Kg
Duration	4	minutes
Duration	240	seconds
Sediment Release Rate	0.29	Kg/s

Conversion to DELFT3D Input Units

Discharge Rate	0.01	m3/s
Discharge Concentration	29.5	Kg/m3
Discharge Concentration (per 1 of 4 classes	**7.37**	Kg/m3

3 piles per day, 1 rig	Time (minutes)	Discharge Rate (m3/s)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)
Date/Time	**Time Series Shown for First 3 Days of 28 Day Simulation**					
9/1/21 12:00 AM	0	0.00	0.00	0.00	0.00	0.00
9/1/21 8:00 AM	480	0.01	7.37	7.37	7.37	7.37
9/1/21 8:04 AM	484	0.00	0.00	0.00	0.00	0.00
9/1/21 12:04 PM	724	0.01	7.37	7.37	7.37	7.37
9/1/21 12:08 PM	728	0.00	0.00	0.00	0.00	0.00
9/1/21 4:08 PM	968	0.01	7.37	7.37	7.37	7.37
9/1/21 4:12 PM	972	0.00	0.00	0.00	0.00	0.00
9/2/21 12:00 AM	1440	0.00	0.00	0.00	0.00	0.00
9/2/21 8:00 AM	1920	0.01	7.37	7.37	7.37	7.37
9/2/21 8:04 AM	1924	0.00	0.00	0.00	0.00	0.00
9/2/21 12:04 PM	2164	0.01	7.37	7.37	7.37	7.37
9/2/21 12:08 PM	2168	0.00	0.00	0.00	0.00	0.00
9/2/21 4:08 PM	2408	0.01	7.37	7.37	7.37	7.37
9/2/21 4:12 PM	2412	0.00	0.00	0.00	0.00	0.00
9/3/21 12:00 AM	2880	0.00	0.00	0.00	0.00	0.00
9/3/21 8:00 AM	3360	0.01	7.37	7.37	7.37	7.37
9/3/21 8:04 AM	3364	0.00	0.00	0.00	0.00	0.00
9/3/21 12:04 PM	3604	0.01	7.37	7.37	7.37	7.37
9/3/21 12:08 PM	3608	0.00	0.00	0.00	0.00	0.00
9/3/21 4:08 PM	3848	0.01	7.37	7.37	7.37	7.37
9/3/21 4:12 PM	3852	0.00	0.00	0.00	0.00	0.00

Alternative 2, Sequence 2

Pier 6 Pile Removal

Pile Diameter	20	inches
Circumference	5.2	ft
Thickness of mud on pile	0.5	inches
Thickness of mud on pile	0.042	ft
Depth of pile extracted	20	ft
Volume Sed.	4.36	ft^3
Volume Sed.	0.124	m^3
Mass Sed. (2650 kg/m3)	327.7	Kg
Mass Sed. (%-Fines x (1-porosity)) 0.15	49.2	Kg
Duration	6	minutes
Duration	360	seconds
Sediment Release Rate	0.14	Kg/s
Conversion to DELFT3D Input Units		
Discharge Rate	0.01	Kg/m3
Discharge Concentration	13.7	Kg/m3
Discharge Concentration per class	**3.41**	Kg/m3

8 piles per day, 2 rigs	Time (minutes)	Discharge Rate (m3/s)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)
Date/Time	**Time Series Shown for First 3 Days of 28 Day Simulation**					
9/1/21 12:00 AM	0	0.00	0.00	0 00	0.00	0.00
9/1/21 8:00 AM	480	0.01	3.41	3.41	3.41	3.41
9/1/21 8:06 AM	486	0.00	0.00	0 00	0.00	0.00
9/1/21 9:30 AM	570	0.01	3.41	3.41	3.41	3.41
9/1/21 9:36 AM	576	0.00	0.00	0 00	0.00	0.00
9/1/21 11:00 AM	660	0.01	3.41	3.41	3.41	3.41
9/1/21 11:06 AM	666	0.00	0.00	0 00	0.00	0.00
9/1/21 12:30 PM	750	0.01	3.41	3.41	3.41	3.41
9/1/21 12:36 PM	756	0.00	0.00	0 00	0.00	0.00
9/1/21 2:00 PM	840	0.01	3.41	3.41	3.41	3.41
9/1/21 2:06 PM	846	0.00	0.00	0 00	0.00	0.00
9/1/21 3:30 PM	930	0.01	3.41	3.41	3.41	3.41
9/1/21 3:36 PM	936	0.00	0.00	0 00	0.00	0.00
9/1/21 5:00 PM	1020	0.01	3.41	3.41	3.41	3.41
9/1/21 5:06 PM	1026	0.00	0.00	0 00	0.00	0.00
9/1/21 6:30 PM	1110	0.01	3.41	3.41	3.41	3.41
9/1/21 6:36 PM	1116	0.00	0.00	0 00	0.00	0.00
9/2/21 12:00 AM	1440	0.00	0.00	0 00	0.00	0.00
9/2/21 8:00 AM	1920	0.01	3.41	3.41	3.41	3.41
9/2/21 8:06 AM	1926	0.00	0.00	0 00	0.00	0.00
9/2/21 9:30 AM	2010	0.01	3.41	3.41	3.41	3.41
9/2/21 9:36 AM	2016	0.00	0.00	0 00	0.00	0.00
9/2/21 11:00 AM	2100	0.01	3.41	3.41	3.41	3.41
9/2/21 11:06 AM	2106	0.00	0.00	0 00	0.00	0.00
9/2/21 12:30 PM	2190	0.01	3.41	3.41	3.41	3.41
9/2/21 12:36 PM	2196	0.00	0.00	0 00	0.00	0.00
9/2/21 2:00 PM	2280	0.01	3.41	3.41	3.41	3.41
9/2/21 2:06 PM	2286	0.00	0.00	0 00	0.00	0.00
9/2/21 3:30 PM	2370	0.01	3.41	3.41	3.41	3.41
9/2/21 3:36 PM	2376	0.00	0.00	0 00	0.00	0.00
9/2/21 5:00 PM	2460	0.01	3.41	3.41	3.41	3.41
9/2/21 5:06 PM	2466	0.00	0.00	0 00	0.00	0.00
9/2/21 6:30 PM	2550	0.01	3.41	3.41	3.41	3.41
9/2/21 6:36 PM	2556	0.00	0.00	0 00	0.00	0.00
9/3/21 12:00 AM	2880	0.00	0.00	0 00	0.00	0.00
9/3/21 8:00 AM	3360	0.01	3.41	3.41	3.41	3.41
9/3/21 8:06 AM	3366	0.00	0.00	0 00	0.00	0.00
9/3/21 9:30 AM	3450	0.01	3.41	3.41	3.41	3.41
9/3/21 9:36 AM	3456	0.00	0.00	0 00	0.00	0.00
9/3/21 11:00 AM	3540	0.01	3.41	3.41	3.41	3.41
9/3/21 11:06 AM	3546	0.00	0.00	0 00	0.00	0.00
9/3/21 12:30 PM	3630	0.01	3.41	3.41	3.41	3.41
9/3/21 12:36 PM	3636	0.00	0.00	0 00	0.00	0.00
9/3/21 2:00 PM	3720	0.01	3.41	3.41	3.41	3.41
9/3/21 2:06 PM	3726	0.00	0.00	0 00	0.00	0.00
9/3/21 3:30 PM	3810	0.01	3.41	3.41	3.41	3.41
9/3/21 3:36 PM	3816	0.00	0.00	0 00	0.00	0.00
9/3/21 5:00 PM	3900	0.01	3.41	3.41	3.41	3.41
9/3/21 5:06 PM	3906	0.00	0.00	0 00	0.00	0.00
9/3/21 6:30 PM	3990	0.01	3.41	3.41	3.41	3.41
9/3/21 6:36 PM	3996	0.00	0.00	0 00	0.00	0.00

Alternative 2, Sequence 2

Pier 7 Pile Removal

Pile Diameter	20	inches
Circumference	5.2	ft
Thickness of mud on pile	0.5	inches
Thickness of mud on pile	0.042	ft
Depth of pile extracted	20	ft
Volume Sed	4.36	ft^3
Volume Sed.	0.124	m^3
Mass Sed. (2650 kg/m3)	327.7	Kg
Mass Sed. (%-Fines x (1-porosity)) 0.15	49.2	Kg
Duration	6	minutes
Duration	360	seconds
Sediment Release Rate	0.14	Kg/s

Conversion to DELFT3D Input Units

Discharge Rate	0.01	Kg/m3
Discharge Concentration	13.7	Kg/m3
Discharge Concentration per class	**3.41**	Kg/m3

8 piles per day, 1 rig

Date/Time	Time (minutes)	Discharge Rate (m3/s)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)
	Time Series Shown for First 3 Days of 28 Day Simulation					
9/1/21 12:00 AM	0	0 00	0.00	0.00	0.00	0.00
9/1/21 8:00 AM	480	0 01	3.41	3.41	3.41	3.41
9/1/21 8:06 AM	486	0 00	0.00	0.00	0.00	0.00
9/1/21 9:30 AM	570	0 01	3.41	3.41	3.41	3.41
9/1/21 9:36 AM	576	0 00	0.00	0.00	0.00	0.00
9/1/21 11:00 AM	660	0 01	3.41	3.41	3.41	3.41
9/1/21 11:06 AM	666	0 00	0.00	0.00	0.00	0.00
9/1/21 12:30 PM	750	0 01	3.41	3.41	3.41	3.41
9/1/21 12:36 PM	756	0 00	0.00	0.00	0.00	0.00
9/1/21 2 00 PM	840	0 01	3.41	3.41	3.41	3.41
9/1/21 2 06 PM	846	0 00	0.00	0.00	0.00	0.00
9/1/21 3:30 PM	930	0 01	3.41	3.41	3.41	3.41
9/1/21 3:36 PM	936	0 00	0.00	0.00	0.00	0.00
9/1/21 5 00 PM	1020	0 01	3.41	3.41	3.41	3.41
9/1/21 5 06 PM	1026	0 00	0.00	0.00	0.00	0.00
9/1/21 6:30 PM	1110	0 01	3.41	3.41	3.41	3.41
9/1/21 6:36 PM	1116	0 00	0.00	0.00	0.00	0.00
9/2/21 12:00 AM	1440	0 00	0.00	0.00	0.00	0.00
9/2/21 8:00 AM	1920	0 01	3.41	3.41	3.41	3.41
9/2/21 8:06 AM	1926	0 00	0.00	0.00	0.00	0.00
9/2/21 9:30 AM	2010	0 01	3.41	3.41	3.41	3.41
9/2/21 9:36 AM	2016	0 00	0.00	0.00	0.00	0.00
9/2/21 11:00 AM	2100	0 01	3.41	3.41	3.41	3.41
9/2/21 11:06 AM	2106	0 00	0.00	0.00	0.00	0.00
9/2/21 12:30 PM	2190	0 01	3.41	3.41	3.41	3.41
9/2/21 12:36 PM	2196	0 00	0.00	0.00	0.00	0.00
9/2/21 2 00 PM	2280	0 01	3.41	3.41	3.41	3.41
9/2/21 2 06 PM	2286	0 00	0.00	0.00	0.00	0.00
9/2/21 3:30 PM	2370	0 01	3.41	3.41	3.41	3.41
9/2/21 3:36 PM	2376	0 00	0.00	0.00	0.00	0.00
9/2/21 5 00 PM	2460	0 01	3.41	3.41	3.41	3.41
9/2/21 5 06 PM	2466	0 00	0.00	0.00	0.00	0.00
9/2/21 6:30 PM	2550	0 01	3.41	3.41	3.41	3.41
9/2/21 6:36 PM	2556	0 00	0.00	0.00	0.00	0.00
9/3/21 12:00 AM	2880	0 00	0.00	0.00	0.00	0.00
9/3/21 8:00 AM	3360	0 01	3.41	3.41	3.41	3.41
9/3/21 8:06 AM	3366	0 00	0.00	0.00	0.00	0.00
9/3/21 9:30 AM	3450	0 01	3.41	3.41	3.41	3.41
9/3/21 9:36 AM	3456	0 00	0.00	0.00	0.00	0.00
9/3/21 11:00 AM	3540	0 01	3.41	3.41	3.41	3.41
9/3/21 11:06 AM	3546	0 00	0.00	0.00	0.00	0.00
9/3/21 12:30 PM	3630	0 01	3.41	3.41	3.41	3.41
9/3/21 12:36 PM	3636	0 00	0.00	0.00	0.00	0.00
9/3/21 2 00 PM	3720	0 01	3.41	3.41	3.41	3.41
9/3/21 2 06 PM	3726	0 00	0.00	0.00	0.00	0.00
9/3/21 3:30 PM	3810	0 01	3.41	3.41	3.41	3.41
9/3/21 3:36 PM	3816	0 00	0.00	0.00	0.00	0.00
9/3/21 5 00 PM	3900	0 01	3.41	3.41	3.41	3.41
9/3/21 5 06 PM	3906	0 00	0.00	0.00	0.00	0.00
9/3/21 6:30 PM	3990	0 01	3.41	3.41	3.41	3.41
9/3/21 6:36 PM	3996	0 00	0.00	0.00	0.00	0.00

Alternative 2, Sequence 2

Cofferdam Solid Pipe Pile Installation

Pile Diameter	36	inches
Pile Base Area	12.6	ft^2
Depth of Impact	0.5	foot
Volume Sed.	6.28	ft^3
Volume Sed.	0.18	m^3
Mas Sed. (2650 kg/m3)	471.8	Kg
Mass Sed. (%-Fines x (1-porosity)) 0.15	70.8	Kg
Duration	4	minutes
Duration	240	seconds
Sediment Release Rate	0.29	Kg/s

Conversion to DELFT3D Input Units

Discharge Rate	0.01	m3/s
Discharge Concentration	29.5	Kg/m3
Discharge Concentration (per 1 of 4 classes)	**7.37**	Kg/m3

3 piles per day, 1 rig	Time (minutes)	Discharge Rate (m3/s)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)
Date/Time	**Time Series Shown for First 3 Days of 28 Day Simulation**					
9/1/21 12:00 AM	0	0.00	0.00	0.00	0.00	0.00
9/1/21 8:00 AM	480	0.01	7.37	7.37	7.37	7.37
9/1/21 8:04 AM	484	0.00	0.00	0.00	0.00	0.00
9/1/21 12:04 PM	724	0.01	7.37	7.37	7.37	7.37
9/1/21 12:08 PM	728	0.00	0.00	0.00	0.00	0.00
9/1/21 4:08 PM	968	0.01	7.37	7.37	7.37	7.37
9/1/21 4:12 PM	972	0.00	0.00	0.00	0.00	0.00
9/2/21 12:00 AM	1440	0.00	0.00	0.00	0.00	0.00
9/2/21 8:00 AM	1920	0.01	7.37	7.37	7.37	7.37
9/2/21 8:04 AM	1924	0.00	0.00	0.00	0.00	0.00
9/2/21 12:04 PM	2164	0.01	7.37	7.37	7.37	7.37
9/2/21 12:08 PM	2168	0.00	0.00	0.00	0.00	0.00
9/2/21 4:08 PM	2408	0.01	7.37	7.37	7.37	7.37
9/2/21 4:12 PM	2412	0.00	0.00	0.00	0.00	0.00
9/3/21 12:00 AM	2880	0.00	0.00	0.00	0.00	0.00
9/3/21 8:00 AM	3360	0.01	7.37	7.37	7.37	7.37
9/3/21 8:04 AM	3364	0.00	0.00	0.00	0.00	0.00
9/3/21 12:04 PM	3604	0.01	7.37	7.37	7.37	7.37
9/3/21 12:08 PM	3608	0.00	0.00	0.00	0.00	0.00
9/3/21 4:08 PM	3848	0.01	7.37	7.37	7.37	7.37
9/3/21 4:12 PM	3852	0.00	0.00	0.00	0.00	0.00

Alternative 2, Sequence 2

Former Pier 8 Foundation Removal

Foundation Bottom Diameter	48	inches
Foundation Bottom Area	12.6	ft^2
Depth of Impact	6	inches
Depth of Impact	0.5	foot
Volume Sed.	6.28	ft^3
Volume Sed.	0.178	m^3
Mass Sed. (2650 kg/m3)	471.8	Kg
Mass Sed. (%-Fines x (1-porosity)) 0.15	70.8	Kg
Duration	6	minutes
Duration	360	seconds
Rate	0.20	Kg/s

Conversion to DELFT3D Input Units

Discharge Rate	0.01	m3/s
Discharge Concentration	19.7	Kg/m3
Discharge Concentration (per sed class)	4.91	Kg/m3

6 per day, 1 rig	Time (minutes)	Discharge Rate (m3/s)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)
Date/Time	**Time Series Shown for First 3 Days of 28 Day Simulation**					
9/1/21 12:00 AM	0	0.00	0.00	0.00	0.00	0.00
9/1/21 8:00 AM	480	0.01	4.91	4.91	4.91	4.91
9/1/21 8:06 AM	486	0.00	0.00	0.00	0.00	0.00
9/1/21 10:00 AM	600	0.01	4.91	4.91	4.91	4.91
9/1/21 10:06 AM	606	0.00	0.00	0.00	0.00	0.00
9/1/21 12:00 PM	720	0.01	4.91	4.91	4.91	4.91
9/1/21 12:06 PM	726	0.00	0.00	0.00	0.00	0.00
9/1/21 2:00 PM	840	0.01	4.91	4.91	4.91	4.91
9/1/21 2:06 PM	846	0.00	0.00	0.00	0.00	0.00
9/1/21 4:00 PM	960	0.01	4.91	4.91	4.91	4.91
9/1/21 4:06 PM	966	0.00	0.00	0.00	0.00	0.00
9/1/21 6:00 PM	1080	0.01	4.91	4.91	4.91	4.91
9/1/21 6:06 PM	1086	0.00	0.00	0.00	0.00	0.00
9/2/21 12:00 AM	1440	0.00	0.00	0.00	0.00	0.00
9/2/21 8:00 AM	1920	0.01	4.91	4.91	4.91	4.91
9/2/21 8:06 AM	1926	0.00	0.00	0.00	0.00	0.00
9/2/21 10:00 AM	2040	0.01	4.91	4.91	4.91	4.91
9/2/21 10:06 AM	2046	0.00	0.00	0.00	0.00	0.00
9/2/21 12:00 PM	2160	0.01	4.91	4.91	4.91	4.91
9/2/21 12:06 PM	2166	0.00	0.00	0.00	0.00	0.00
9/2/21 2:00 PM	2280	0.01	4.91	4.91	4.91	4.91
9/2/21 2:06 PM	2286	0.00	0.00	0.00	0.00	0.00
9/2/21 4:00 PM	2400	0.01	4.91	4.91	4.91	4.91
9/2/21 4:06 PM	2406	0.00	0.00	0.00	0.00	0.00
9/2/21 6:00 PM	2520	0.01	4.91	4.91	4.91	4.91
9/2/21 6:06 PM	2526	0.00	0.00	0.00	0.00	0.00
9/3/21 12:00 AM	2880	0.00	0.00	0.00	0.00	0.00
9/3/21 8:00 AM	3360	0.01	4.91	4.91	4.91	4.91
9/3/21 8:06 AM	3366	0.00	0.00	0.00	0.00	0.00
9/3/21 10:00 AM	3480	0.01	4.91	4.91	4.91	4.91
9/3/21 10:06 AM	3486	0.00	0.00	0.00	0.00	0.00
9/3/21 12:00 PM	3600	0.01	4.91	4.91	4.91	4.91
9/3/21 12:06 PM	3606	0.00	0.00	0.00	0.00	0.00
9/3/21 2:00 PM	3720	0.01	4.91	4.91	4.91	4.91
9/3/21 2:06 PM	3726	0.00	0.00	0.00	0.00	0.00
9/3/21 4:00 PM	3840	0.01	4.91	4.91	4.91	4.91
9/3/21 4:06 PM	3846	0.00	0.00	0.00	0.00	0.00
9/3/21 6:00 PM	3960	0.01	4.91	4.91	4.91	4.91
9/3/21 6:06 PM	3966	0.00	0.00	0.00	0.00	0.00

Alternative 3, Sequence 1

Temporary Cofferdam Sheet Pile Removal

Pile Length	24	inches
Pile Length	2	ft
Thickness of mud on pile	0.25	inches
Thickness of mud on pile	0.021	ft
Depth of pile extracted	20	ft
Volume Sed	1.67	ft^3
Volume Sed.	0.047	m^3
Mass Sed. (2650 kg/m3)	125.2	Kg
Mass Sed. (%-Fines x (1-porosity)) 0.15	18.8	Kg
Duration	4	minutes
Duration	240	seconds
Sediment Release Rate	0.078	Kg/s

Conversion to DELFT3D Input Units

Discharge Rate	0.01	Kg/m3
Discharge Concentration	7.82	Kg/m3
Discharge Concentration per class	**1.96**	Kg/m3

8 sheets per day, 2 rigs

Date/Time	Time (minutes)	Discharge Rate (m3/s)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)
	Time Series Shown for First 3 Days of 28 Day Simulation					
9/1/21 12:00 AM	0	0.00	0.00	0.00	0.00	0.00
9/1/21 8:00 AM	480	0.01	1.96	1.96	1.96	1.96
9/1/21 8:04 AM	484	0.00	0.00	0.00	0.00	0.00
9/1/21 9:30 AM	570	0.01	1.96	1.96	1.96	1.96
9/1/21 9:34 AM	574	0.00	0.00	0.00	0.00	0.00
9/1/21 11:00 AM	660	0.01	1.96	1.96	1.96	1.96
9/1/21 11:04 AM	664	0.00	0.00	0.00	0.00	0.00
9/1/21 12:30 PM	750	0.01	1.96	1.96	1.96	1.96
9/1/21 12:34 PM	754	0.00	0.00	0.00	0.00	0.00
9/1/21 2:00 PM	840	0.01	1.96	1.96	1.96	1.96
9/1/21 2:04 PM	844	0.00	0.00	0.00	0.00	0.00
9/1/21 3:30 PM	930	0.01	1.96	1.96	1.96	1.96
9/1/21 3:34 PM	934	0.00	0.00	0.00	0.00	0.00
9/1/21 5:00 PM	1020	0.01	1.96	1.96	1.96	1.96
9/1/21 5:04 PM	1024	0.00	0.00	0.00	0.00	0.00
9/1/21 6:30 PM	1110	0.01	1.96	1.96	1.96	1.96
9/1/21 6:34 PM	1114	0.00	0.00	0.00	0.00	0.00
9/2/21 12:00 AM	1440	0.00	0.00	0.00	0.00	0.00
9/2/21 8:00 AM	1920	0.01	1.96	1.96	1.96	1.96
9/2/21 8:04 AM	1924	0.00	0.00	0.00	0.00	0.00
9/2/21 9:30 AM	2010	0.01	1.96	1.96	1.96	1.96
9/2/21 9:34 AM	2014	0.00	0.00	0.00	0.00	0.00
9/2/21 11:00 AM	2100	0.01	1.96	1.96	1.96	1.96
9/2/21 11:04 AM	2104	0.00	0.00	0.00	0.00	0.00
9/2/21 12:30 PM	2190	0.01	1.96	1.96	1.96	1.96
9/2/21 12:34 PM	2194	0.00	0.00	0.00	0.00	0.00
9/2/21 2:00 PM	2280	0.01	1.96	1.96	1.96	1.96
9/2/21 2:04 PM	2284	0.00	0.00	0.00	0.00	0.00
9/2/21 3:30 PM	2370	0.01	1.96	1.96	1.96	1.96
9/2/21 3:34 PM	2374	0.00	0.00	0.00	0.00	0.00
9/2/21 5:00 PM	2460	0.01	1.96	1.96	1.96	1.96
9/2/21 5:04 PM	2464	0.00	0.00	0.00	0.00	0.00
9/2/21 6:30 PM	2550	0.01	1.96	1.96	1.96	1.96
9/2/21 6:34 PM	2554	0.00	0.00	0.00	0.00	0.00
9/3/21 12:00 AM	2880	0.00	0.00	0.00	0.00	0.00
9/3/21 8:00 AM	3360	0.01	1.96	1.96	1.96	1.96
9/3/21 8:04 AM	3364	0.00	0.00	0.00	0.00	0.00
9/3/21 9:30 AM	3450	0.01	1.96	1.96	1.96	1.96
9/3/21 9:34 AM	3454	0.00	0.00	0.00	0.00	0.00
9/3/21 11:00 AM	3540	0.01	1.96	1.96	1.96	1.96
9/3/21 11:04 AM	3544	0.00	0.00	0.00	0.00	0.00
9/3/21 12:30 PM	3630	0.01	1.96	1.96	1.96	1.96
9/3/21 12:34 PM	3634	0.00	0.00	0.00	0.00	0.00
9/3/21 2:00 PM	3720	0.01	1.96	1.96	1.96	1.96
9/3/21 2:04 PM	3724	0.00	0.00	0.00	0.00	0.00
9/3/21 3:30 PM	3810	0.01	1.96	1.96	1.96	1.96
9/3/21 3:34 PM	3814	0.00	0.00	0.00	0.00	0.00
9/3/21 5:00 PM	3900	0.01	1.96	1.96	1.96	1.96
9/3/21 5:04 PM	3904	0.00	0.00	0.00	0.00	0.00
9/3/21 6:30 PM	3990	0.01	1.96	1.96	1.96	1.96
9/3/21 6:34 PM	3994	0.00	0.00	0.00	0.00	0.00

Alternative 3, Sequence 2

Sheet Pile Installation (Quay Walls)

Width	48	inches
Width	4	feet
Thickness (perpendicular)	0.5	foot
Depth of Impact	0.5	foot
Volume	1.00	feet^3
Volume	0.028	m^3
Mass Sed. (2650 kg/m3)	75.1	Kg
Mass Sed. (%-Fines x (1-porosity)) 0.15	11.3	Kg
Duration	4	minutes
Duration	240	seconds
Sediment Release Rate	0.047	Kg/s
Conversion to DELFT3D Input Units		
Discharge Rate	0.01	m3/s
Discharge Concentration	4.7	Kg/m3
Discharge Concentration (per 1 of 4 classes)	**1.17**	Kg/m3

3 piles per day, 1 rig	Time (minutes)	Discharge Rate (m3/s)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)
Date/Time	**Time Series Shown for First 3 Days of 28 Day Simulation**					
9/1/21 12:00 AM	0	0.00	0.00	0.00	0.00	0.00
9/1/21 8:00 AM	480	0.01	1.17	1.17	1.17	1.17
9/1/21 8:04 AM	484	0.00	0.00	0.00	0.00	0.00
9/1/21 12:04 PM	724	0.01	1.17	1.17	1.17	1.17
9/1/21 12:08 PM	728	0.00	0.00	0.00	0.00	0.00
9/1/21 4:08 PM	968	0.01	1.17	1.17	1.17	1.17
9/1/21 4:12 PM	972	0.00	0.00	0.00	0.00	0.00
9/2/21 12:00 AM	1440	0.00	0.00	0.00	0.00	0.00
9/2/21 8:00 AM	1920	0.01	1.17	1.17	1.17	1.17
9/2/21 8:04 AM	1924	0.00	0.00	0.00	0.00	0.00
9/2/21 12:04 PM	2164	0.01	1.17	1.17	1.17	1.17
9/2/21 12:08 PM	2168	0.00	0.00	0.00	0.00	0.00
9/2/21 4:08 PM	2408	0.01	1.17	1.17	1.17	1.17
9/2/21 4:12 PM	2412	0.00	0.00	0.00	0.00	0.00
9/3/21 12:00 AM	2880	0.00	0.00	0.00	0.00	0.00
9/3/21 8:00 AM	3360	0.01	1.17	1.17	1.17	1.17
9/3/21 8:04 AM	3364	0.00	0.00	0.00	0.00	0.00
9/3/21 12:04 PM	3604	0.01	1.17	1.17	1.17	1.17
9/3/21 12:08 PM	3608	0.00	0.00	0.00	0.00	0.00
9/3/21 4:08 PM	3848	0.01	1.17	1.17	1.17	1.17
9/3/21 4:12 PM	3852	0.00	0.00	0.00	0.00	0.00

Alternative 3, Sequence 2

Solid Pile Installation (Quay Walls)

Pile Diameter	24	inches
Pile Base Area	7.07	ft^2
Depth of Impact	0.5	foot
Volume Sed.	3.53	ft^3
Volume Sed.	0.10	m^3
Mass Sed. (2650 kg/m3)	265.4	Kg
Mass Sed. (%-Fines x (1-porosity)) 0.15	39.8	Kg
Duration	4	minutes
Duration	240	seconds
Sediment Release Rate	0.17	Kg/s

Conversion to DELFT3D Input Units

Discharge Rate	0.01	m3/s
Discharge Concentration	16.6	Kg/m3
Discharge Concentration (per 1 of 4 classes)	**4.15**	Kg/m3

3 piles per day, 1 rig	Time (minutes)	Discharge Rate (m3/s)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)
Date/Time	**Time Series Shown for First 3 Days of 28 Day Simulation**					
9/1/21 12:00 AM	0	0.00	0.00	0.00	0.00	0.00
9/1/21 8:00 AM	480	0.01	4.15	4.15	4.15	4.15
9/1/21 8:04 AM	484	0.00	0.00	0.00	0.00	0.00
9/1/21 12:04 PM	724	0.01	4.15	4.15	4.15	4.15
9/1/21 12:08 PM	728	0.00	0.00	0.00	0.00	0.00
9/1/21 4:08 PM	968	0.01	4.15	4.15	4.15	4.15
9/1/21 4:12 PM	972	0.00	0.00	0.00	0.00	0.00
9/2/21 12:00 AM	1440	0.00	0.00	0.00	0.00	0.00
9/2/21 8:00 AM	1920	0.01	4.15	4.15	4.15	4.15
9/2/21 8:04 AM	1924	0.00	0.00	0.00	0.00	0.00
9/2/21 12:04 PM	2164	0.01	4.15	4.15	4.15	4.15
9/2/21 12:08 PM	2168	0.00	0.00	0.00	0.00	0.00
9/2/21 4:08 PM	2408	0.01	4.15	4.15	4.15	4.15
9/2/21 4:12 PM	2412	0.00	0.00	0.00	0.00	0.00
9/3/21 12:00 AM	2880	0.00	0.00	0.00	0.00	0.00
9/3/21 8:00 AM	3360	0.01	4.15	4.15	4.15	4.15
9/3/21 8:04 AM	3364	0.00	0.00	0.00	0.00	0.00
9/3/21 12:04 PM	3604	0.01	4.15	4.15	4.15	4.15
9/3/21 12:08 PM	3608	0.00	0.00	0.00	0.00	0.00
9/3/21 4:08 PM	3848	0.01	4.15	4.15	4.15	4.15
9/3/21 4:12 PM	3852	0.00	0.00	0.00	0.00	0.00
9/4/21 12:00 AM	4320	0.00	0.00	0.00	0.00	0.00

Alternative 3, Sequence 2

Hollow Pipe Pile Installation (Floor)

Pile Diameter	96	inches
Pile Base Area	13.4	ft^2
Depth of Impact	0.5	Feet
Volume Sed.	6.7	ft^3
Volume Sed.	0.19	m^3
Mass Sed. (2650 kg/m3)	501.3	Kg
Mass Sed. (%-Fines x (1-porosity)) 0.15	75.2	Kg
Duration	4	minutes
Duration	240	seconds
Sediment Release Rate	0.31	Kg/s

Conversion to DELFT3D Input Units

Discharge Rate	0.01	m3/s
Discharge Concentration	31.3	Kg/m3
Discharge Concentration (per 1 of 4 classes)	**7.83**	Kg/m3

3 piles per day, 1 rig	Time (minutes)	Discharge Rate (m3/s)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)
Date/Time	**Time Series Shown for First 3 Days of 28 Day Simulation**					
9/1/21 12:00 AM	0	0.00	0.00	0.00	0.00	0.00
9/1/21 8:00 AM	480	0.01	7.83	7.83	7.83	7.83
9/1/21 8:04 AM	484	0.00	0.00	0.00	0.00	0.00
9/1/21 12:04 PM	724	0.01	7.83	7.83	7.83	7.83
9/1/21 12:08 PM	728	0.00	0.00	0.00	0.00	0.00
9/1/21 4:08 PM	968	0.01	7.83	7.83	7.83	7.83
9/1/21 4:12 PM	972	0.00	0.00	0.00	0.00	0.00
9/2/21 12:00 AM	1440	0.00	0.00	0.00	0.00	0.00
9/2/21 8:00 AM	1920	0.01	7.83	7.83	7.83	7.83
9/2/21 8:04 AM	1924	0.00	0.00	0.00	0.00	0.00
9/2/21 12:04 PM	2164	0.01	7.83	7.83	7.83	7.83
9/2/21 12:08 PM	2168	0.00	0.00	0.00	0.00	0.00
9/2/21 4:08 PM	2408	0.01	7.83	7.83	7.83	7.83
9/2/21 4:12 PM	2412	0.00	0.00	0.00	0.00	0.00
9/3/21 12:00 AM	2880	0.00	0.00	0.00	0.00	0.00
9/3/21 8:00 AM	3360	0.01	7.83	7.83	7.83	7.83
9/3/21 8:04 AM	3364	0.00	0.00	0.00	0.00	0.00
9/3/21 12:04 PM	3604	0.01	7.83	7.83	7.83	7.83
9/3/21 12:08 PM	3608	0.00	0.00	0.00	0.00	0.00
9/3/21 4:08 PM	3848	0.01	7.83	7.83	7.83	7.83
9/3/21 4:12 PM	3852	0.00	0.00	0.00	0.00	0.00

Alternative 3, Sequence 3

Pier 4 Foundation Removal

Foundation Bottom Diameter	48	inches
Foundation Bottom Area	12.6	ft^2
Depth of Impact	6	inches
Depth of Impact	0.5	foot
Volume Sed.	6.28	ft^3
Volume Sed.	0.178	m^3
Mass Sed. (2650 kg/m3)	471.8	Kg
Mass Sed. (%-Fines x (1-porosity)) 0.15	70.8	Kg
Duration	4	minutes
Duration	240	seconds
Sediment Release Rate	0.29	Kg/s
Conversion to DELFT3D Input Units		
Discharge Rate	0.01	m3/s
Discharge Concentration	29.5	Kg/m3
Discharge Concentration (per 1 of 4 classes)	7.37	Kg/m3

6 piles per day, 1 rig	Time (minutes)	Discharge Rate (m3/s)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)
Date/Time	**Time Series Shown for First 3 Days of 28 Day Simulation**					
9/1/21 12:00 AM	0	0.00	0.00	0.00	0.00	0.00
9/1/21 8:00 AM	480	0.01	7.37	7.37	7.37	7.37
9/1/21 8:04 AM	484	0.00	0.00	0.00	0.00	0.00
9/1/21 10:00 AM	600	0.01	7.37	7.37	7.37	7.37
9/1/21 10:04 AM	604	0.00	0.00	0.00	0.00	0.00
9/1/21 12:00 PM	720	0.01	7.37	7.37	7.37	7.37
9/1/21 12:04 PM	724	0.00	0.00	0.00	0.00	0.00
9/1/21 2:00 PM	840	0.01	7.37	7.37	7.37	7.37
9/1/21 2:04 PM	844	0.00	0.00	0.00	0.00	0.00
9/1/21 4:00 PM	960	0.01	7.37	7.37	7.37	7.37
9/1/21 4:04 PM	964	0.00	0.00	0.00	0.00	0.00
9/1/21 6:00 PM	1080	0.01	7.37	7.37	7.37	7.37
9/1/21 6:04 PM	1084	0.00	0.00	0.00	0.00	0.00
9/2/21 12:00 AM	1440	0.00	0.00	0.00	0.00	0.00
9/2/21 8:00 AM	1920	0.01	7.37	7.37	7.37	7.37
9/2/21 8:04 AM	1924	0.00	0.00	0.00	0.00	0.00
9/2/21 10:00 AM	2040	0.01	7.37	7.37	7.37	7.37
9/2/21 10:04 AM	2044	0.00	0.00	0.00	0.00	0.00
9/2/21 12:00 PM	2160	0.01	7.37	7.37	7.37	7.37
9/2/21 12:04 PM	2164	0.00	0.00	0.00	0.00	0.00
9/2/21 2:00 PM	2280	0.01	7.37	7.37	7.37	7.37
9/2/21 2:04 PM	2284	0.00	0.00	0.00	0.00	0.00
9/2/21 4:00 PM	2400	0.01	7.37	7.37	7.37	7.37
9/2/21 4:04 PM	2404	0.00	0.00	0.00	0.00	0.00
9/2/21 6:00 PM	2520	0.01	7.37	7.37	7.37	7.37
9/2/21 6:04 PM	2524	0.00	0.00	0.00	0.00	0.00
9/3/21 12:00 AM	2880	0.00	0.00	0.00	0.00	0.00
9/3/21 8:00 AM	3360	0.01	7.37	7.37	7.37	7.37
9/3/21 8:04 AM	3364	0.00	0.00	0.00	0.00	0.00
9/3/21 10:00 AM	3480	0.01	7.37	7.37	7.37	7.37
9/3/21 10:04 AM	3484	0.00	0.00	0.00	0.00	0.00
9/3/21 12:00 PM	3600	0.01	7.37	7.37	7.37	7.37
9/3/21 12:04 PM	3604	0.00	0.00	0.00	0.00	0.00
9/3/21 2:00 PM	3720	0.01	7.37	7.37	7.37	7.37
9/3/21 2:04 PM	3724	0.00	0.00	0.00	0.00	0.00
9/3/21 4:00 PM	3840	0.01	7.37	7.37	7.37	7.37
9/3/21 4:04 PM	3844	0.00	0.00	0.00	0.00	0.00
9/3/21 6:00 PM	3960	0.01	7.37	7.37	7.37	7.37
9/3/21 6:04 PM	3964	0.00	0.00	0.00	0.00	0.00

Alternative 3, Sequence 3
Pier 9 Demo Pile Removal

Pile Diameter	20	inches
Circumference	5.24	ft
Thickness of mud on pile	0 5	inches
Thickness of mud on pile	0 042	ft
Depth of pile extracted	20	ft
Volume Sed	4.36	ft3
Volume Sed.	0.124	m3
Mass Sed. (2650 kg/m3)	327.7	Kg
Mass Sed. (%-Fines x (1-porosity)) 0.15	49 2	Kg
Duration	6	minutes
Duration	360	seconds
Sediment Release Rate	0.14	Kg/s
Conversion to DELFT3D Input Units		
Discharge Rate	0.01	Kg/m3
Discharge Concentration	13.7	Kg/m3
Discharge Concentration (per 1 of 4 classes)	**3.41**	Kg/m3

8 piles per day, 1 rig	Time (minutes)	Discharge Rate (m3/s)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)
Date/Time	**Time Series Shown for First 3 Days of 28 Day Simulation**					
9/1/21 12 00 AM	0	0.00	0.00	0.00	0.00	0.00
9/1/21 8 00 AM	480	0.01	3.41	3.41	3.41	3.41
9/1/21 8 04 AM	484	0.00	0.00	0.00	0.00	0.00
9/1/21 9:30 AM	570	0.01	3.41	3.41	3.41	3.41
9/1/21 9:34 AM	574	0.00	0.00	0.00	0.00	0.00
9/1/21 11 00 AM	660	0.01	3.41	3.41	3.41	3.41
9/1/21 11 04 AM	664	0.00	0.00	0.00	0.00	0.00
9/1/21 12:30 PM	750	0.01	3.41	3.41	3.41	3.41
9/1/21 12:34 PM	754	0.00	0.00	0.00	0.00	0.00
9/1/21 2:00 PM	840	0.01	3.41	3.41	3.41	3.41
9/1/21 2:04 PM	844	0.00	0.00	0.00	0.00	0.00
9/1/21 3:30 PM	930	0.01	3.41	3.41	3.41	3.41
9/1/21 3:34 PM	934	0.00	0.00	0.00	0.00	0.00
9/1/21 5:00 PM	1020	0.01	3.41	3.41	3.41	3.41
9/1/21 5:04 PM	1024	0.00	0.00	0.00	0.00	0.00
9/1/21 6:30 PM	1110	0.01	3.41	3.41	3.41	3.41
9/1/21 6:34 PM	1114	0.00	0.00	0.00	0.00	0.00
9/2/21 12 00 AM	1440	0.00	0.00	0.00	0.00	0.00
9/2/21 8 00 AM	1920	0.01	3.41	3.41	3.41	3.41
9/2/21 8 04 AM	1924	0.00	0.00	0.00	0.00	0.00
9/2/21 9:30 AM	2010	0.01	3.41	3.41	3.41	3.41
9/2/21 9:34 AM	2014	0.00	0.00	0.00	0.00	0.00
9/2/21 11 00 AM	2100	0.01	3.41	3.41	3.41	3.41
9/2/21 11 04 AM	2104	0.00	0.00	0.00	0.00	0.00
9/2/21 12:30 PM	2190	0.01	3.41	3.41	3.41	3.41
9/2/21 12:34 PM	2194	0.00	0.00	0.00	0.00	0.00
9/2/21 2:00 PM	2280	0.01	3.41	3.41	3.41	3.41
9/2/21 2:04 PM	2284	0.00	0.00	0.00	0.00	0.00
9/2/21 3:30 PM	2370	0.01	3.41	3.41	3.41	3.41
9/2/21 3:34 PM	2374	0.00	0.00	0.00	0.00	0.00
9/2/21 5:00 PM	2460	0.01	3.41	3.41	3.41	3.41
9/2/21 5:04 PM	2464	0.00	0.00	0.00	0.00	0.00
9/2/21 6:30 PM	2550	0.01	3.41	3.41	3.41	3.41
9/2/21 6:34 PM	2554	0.00	0.00	0.00	0.00	0.00
9/3/21 12 00 AM	2880	0.00	0.00	0.00	0.00	0.00
9/3/21 8 00 AM	3360	0.01	3.41	3.41	3.41	3.41
9/3/21 8 04 AM	3364	0.00	0.00	0.00	0.00	0.00
9/3/21 9:30 AM	3450	0.01	3.41	3.41	3.41	3.41
9/3/21 9:34 AM	3454	0.00	0.00	0.00	0.00	0.00
9/3/21 11 00 AM	3540	0.01	3.41	3.41	3.41	3.41
9/3/21 11 04 AM	3544	0.00	0.00	0.00	0.00	0.00
9/3/21 12:30 PM	3630	0.01	3.41	3.41	3.41	3.41
9/3/21 12:34 PM	3634	0.00	0.00	0.00	0.00	0.00
9/3/21 2:00 PM	3720	0.01	3.41	3.41	3.41	3.41
9/3/21 2:04 PM	3724	0.00	0.00	0.00	0.00	0.00
9/3/21 3:30 PM	3810	0.01	3.41	3.41	3.41	3.41
9/3/21 3:34 PM	3814	0.00	0.00	0.00	0.00	0.00
9/3/21 5:00 PM	3900	0.01	3.41	3.41	3.41	3.41
9/3/21 5:04 PM	3904	0.00	0.00	0.00	0.00	0.00
9/3/21 6:30 PM	3990	0.01	3.41	3.41	3.41	3.41
9/3/21 6:34 PM	3994	0.00	0.00	0.00	0.00	0.00

Alternative 3, Sequence 3

Sheet Pile Installation (Quay Wall)

Width	48	inches
Width	4	feet
Thickness (perpendicular)	0.5	foot
Depth of Impact	0.5	foot
Volume	1.0	ft^3
Volume	0.028	m^3
Mass Sed. (2650 kg/m3)	75.1	Kg
Mass Sed. (%-Fines x (1-porosity)) 0.15	11.3	Kg
Duration	4	minutes
Duration	240	seconds
Sediment Release Rate	0.047	Kg/s
Conversion to DELFT3D Input Units		
Discharge Rate	0.01	m3/s
Discharge Concentration	4.7	Kg/m3
Discharge Concentration (per 1 of 4 classes)	**1.17**	Kg/m3

3 piles per day, 1 rig	Time (minutes)	Discharge Rate (m3/s)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)
Date/Time	**Time Series Shown for First 3 Days of 28 Day Simulation**					
9/1/21 12:00 AM	0	0.00	0.00	0.00	0.00	0.00
9/1/21 8:00 AM	480	0.01	1.17	1.17	1.17	1.17
9/1/21 8:04 AM	484	0.00	0.00	0.00	0.00	0.00
9/1/21 12:04 PM	724	0.01	1.17	1.17	1.17	1.17
9/1/21 12:08 PM	728	0.00	0.00	0.00	0.00	0.00
9/1/21 4:08 PM	968	0.01	1.17	1.17	1.17	1.17
9/1/21 4:12 PM	972	0.00	0.00	0.00	0.00	0.00
9/2/21 12:00 AM	1440	0.00	0.00	0.00	0.00	0.00
9/2/21 8:00 AM	1920	0.01	1.17	1.17	1.17	1.17
9/2/21 8:04 AM	1924	0.00	0.00	0.00	0.00	0.00
9/2/21 12:04 PM	2164	0.01	1.17	1.17	1.17	1.17
9/2/21 12:08 PM	2168	0.00	0.00	0.00	0.00	0.00
9/2/21 4:08 PM	2408	0.01	1.17	1.17	1.17	1.17
9/2/21 4:12 PM	2412	0.00	0.00	0.00	0.00	0.00
9/3/21 12:00 AM	2880	0.00	0.00	0.00	0.00	0.00
9/3/21 8:00 AM	3360	0.01	1.17	1.17	1.17	1.17
9/3/21 8:04 AM	3364	0.00	0.00	0.00	0.00	0.00
9/3/21 12:04 PM	3604	0.01	1.17	1.17	1.17	1.17
9/3/21 12:08 PM	3608	0.00	0.00	0.00	0.00	0.00
9/3/21 4:08 PM	3848	0.01	1.17	1.17	1.17	1.17
9/3/21 4:12 PM	3852	0.00	0.00	0.00	0.00	0.00

Alternative 3, Sequence 3
Hollow Pile Installation (Quay Wall)

Pile Diameter	48	inches
Pile Base Area	7.1	ft^2
Depth of Impact	0.5	foot
Volume Sed.	3.5	ft^3
Volume Sed.	0.10	m^3
Mass Sed. (2650 kg/m3)	265.4	Kg
Mass Sed. (%-Fines x (1-porosity)) 0.15	39.8	Kg
Duration	4	minutes
Duration	240	seconds
Sediment Release Rate	0.17	Kg/s

Conversion to DELFT3D Input Units

Discharge Rate	0.01	m3/s
Discharge Concentration	16.6	Kg/m3
Discharge Concentration (per 1 of 4 classes)	**4.15**	Kg/m3

3 piles per day, 1 rig	Time (minutes)	Discharge Rate (m3/s)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)	Discharge Conc. (Kg/m3)
Date/Time	**Time Series Shown for First 3 Days of 28 Day Simulation**					
9/1/21 12:00 AM	0	0.00	0.00	0.00	0.00	0.00
9/1/21 8:00 AM	480	0.01	4.15	4.15	4.15	4.15
9/1/21 8:04 AM	484	0.00	0.00	0.00	0.00	0.00
9/1/21 12:04 PM	724	0.01	4.15	4.15	4.15	4.15
9/1/21 12:08 PM	728	0.00	0.00	0.00	0.00	0.00
9/1/21 4:08 PM	968	0.01	4.15	4.15	4.15	4.15
9/1/21 4:12 PM	972	0.00	0.00	0.00	0.00	0.00
9/2/21 12:00 AM	1440	0.00	0.00	0.00	0.00	0.00
9/2/21 8:00 AM	1920	0.01	4.15	4.15	4.15	4.15
9/2/21 8:04 AM	1924	0.00	0.00	0.00	0.00	0.00
9/2/21 12:04 PM	2164	0.01	4.15	4.15	4.15	4.15
9/2/21 12:08 PM	2168	0.00	0.00	0.00	0.00	0.00
9/2/21 4:08 PM	2408	0.01	4.15	4.15	4.15	4.15
9/2/21 4:12 PM	2412	0.00	0.00	0.00	0.00	0.00
9/3/21 12:00 AM	2880	0.00	0.00	0.00	0.00	0.00
9/3/21 8:00 AM	3360	0.01	4.15	4.15	4.15	4.15
9/3/21 8:04 AM	3364	0.00	0.00	0.00	0.00	0.00
9/3/21 12:04 PM	3604	0.01	4.15	4.15	4.15	4.15
9/3/21 12:08 PM	3608	0.00	0.00	0.00	0.00	0.00
9/3/21 4:08 PM	3848	0.01	4.15	4.15	4.15	4.15
9/3/21 4:12 PM	3852	0.00	0.00	0.00	0.00	0.00

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APPENDIX I
Protected Species Potentially Occurring within the ROI

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1 Protected Species Potentially Occurring in the ROI

This appendix describes the distribution and life histories of protected (special-status) species in the region of influence (ROI) to support information provided in the Environmental Impact Statement (EIS). The ROI consists of four actions:

1. Demolition, Construction, Operations;
2. Radio Hill Complex Expansion Area/Forge Shop;
3. Dredged Materials Disposal and Contractor Multi-use Site Transit Routes; and
4. Caisson Delivery Route.

Detailed distribution and life histories for protected species are provided for those species that may occur within all portions of the ROI (Table 1-1) with the exception of the Caisson Delivery Route. As discussed in the EIS, two caisson deliveries would occur months to years apart and would occur along a route where multiple Endangered Species Act (ESA)-listed species may be encountered (Table 1-2). The potential impact to species along the path would be from a vessel strike and vessel noise and thus detailed life history for every ESA-listed species encountered is not necessary.

Activities within the Demolition, Construction, Operations, and the Dredged Materials Disposal and Contractor Multi-use Site Transit Routes portions of the ROI would occur over multiple years and may result in various effects to ESA-listed species that are present during project activities (see Section 3.5 of the EIS). Although the Demolition, Construction, Operations activities are expected to result in greater impacts to ESA-listed species than other activities, the Navy is consulting with National Marine Fisheries Services (NMFS) and United States Fish and Wildlife Service (USFWS) for all actions occurring within the entire ROI under implementation of Alternative 2 (Preferred Alternative).

Special-status species, for the purposes of the EIS, are those species listed as threatened or endangered under the ESA and species afforded federal protection under the Marine Mammal Protection Act (MMPA), Bald and Golden Eagle Protection Act, Migratory Bird Treaty Act (MBTA), or the Magnuson-Stevens Fishery Conservation and Management Act (MSA). Regulatory summaries for ESA, MMPA, MBTA, Bald and Golden Eagle Protection Act, and MSA are provided below.

1.1 Endangered Species Act

The purpose of the ESA is to conserve the ecosystems upon which threatened and endangered species depend and to conserve and recover listed species. Section 7 of the ESA requires action proponents to consult with the NMFS or USFWS to ensure that their actions are not likely to jeopardize the continued existence of federally listed threatened and endangered species, or result in the destruction or adverse modification of designated critical habitat. Critical habitat cannot be designated in National Security Exclusion areas owned, controlled, or designated for use by the Department of Defense (DoD) where an Integrated Natural Resources Management Plan has been developed (as required under the Sikes Act [16 United States Code {U.S.C.} 670a et seq., as amended]) that, as determined by the Department of Interior or Department of Commerce Secretary, provides a benefit to the species subject to critical habitat designation. Table 1-1 and Table 1-2 provides a list of all ESA-listed species that may occur within the ROI. See Sections 1.1 through 1.4 for a description of ESA-listed species.

1.2 Marine Mammal Protection Act

All marine mammals are protected under the provisions of the MMPA. The MMPA prohibits any person or vessel from "taking" marine mammals in the United States or the high seas without authorization. The MMPA defines "take" to mean "to harass, hunt, capture, or kill or attempt to harass, hunt, capture, or kill any marine mammal." The MMPA divides federal jurisdiction over marine mammals between NMFS and the USFWS. Ten marine mammal species managed by NMFS have a reasonable potential to occur within the Demolition, Construction, Operations and Dredged Material Disposal and Contractor Multi-use Site Transit Routes portions of the ROI; Table 1-3); two of these species are ESA-listed Distinct Population Segments (DPS) (Table 1-1). NMFS also identifies certain stocks as being strategic and depleted under the MMPA (16 U.S.C. 1362), as follows. Stock status summaries are provided in Table 1-3.

- Strategic Stock is defined by the MMPA as a marine mammal stock—
  - For which the level of direct human-caused mortality exceeds the potential biological removal level;
  - Which, based on the best available scientific information, is declining and is likely to be listed as a threatened species under the ESA within the foreseeable future; or
  - Which is listed as a threatened or endangered species under the ESA or is designated as depleted under the MMPA.
- Depleted Stock is defined by the MMPA as any case in which—
  - The Secretary of Commerce, after consultation with the Marine Mammal Commission and the Committee of Scientific Advisors on Marine Mammals established under MMPA title II, determines that a species or population stock is below its optimum sustainable population;
  - A State, to which authority for the conservation and management of a species or population stock is transferred under section 109, determines that such species or stock is below its optimum sustainable population; or
  - A species or population stock is listed as an endangered species or a threatened species under the ESA.

1.3 Bald and Golden Eagle Protection Act

Bald and golden eagles are protected by the Bald and Golden Eagle Protection Act. This act prohibits anyone, without a permit issued by the Secretary of the Interior, from taking bald eagles, including their parts, nests, or eggs. The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." See section 1.6 for description of bald eagles.

1.4 Migratory Bird Treaty Act

Birds, both migratory and most native-resident bird species, are protected under the MBTA, and their conservation by federal agencies is mandated by Executive Order 13186 (Migratory Bird Conservation). Under the MBTA it is unlawful by any means or in any manner, to pursue, hunt, take, capture, kill, attempt to take, capture, or kill, or possess migratory birds or their nests or eggs at any time, unless permitted by regulation.

Table 1-1 Endangered Species Act-listed and Proposed Species and Designated Critical Habitat that May Occur within the Demolition, Construction, and Operations, Dredged Materials Disposal and Contractor Multi-use Site Transit Routes, or Radio Hill Complex Expansion Area/Forge Shop Region of Influence

Common Name	*Scientific Name*	*DPS/ESU*	*ESA Listing Status*	*Portion of the ROI where Present*	*Designated Critical Habitat Potentially in the ROI*	*Species Initial Ruling and Applicable Updates (Publication Date; Effective Date)*	*Critical Habitat Designation Final Rule (Publication Date; Effective Date)*
Marine Mammals – Cetaceans							
Humpback Whale	*Megaptera novaeangliae kuzira*	Central America DPS	Endangered	Demolition, Construction, Operations Area, Dredged Materials Disposal and Contractor Multi-use Site Transit Routes	No	35 FR 18319 (December 2, 1970), 81 FR 62259 (September 8, 2016; October 11, 2016)	86 FR 21082 (April 21, 2021; May 21, 2021)
		Mexico DPS	Threatened	Demolition, Construction, Operations Area, Dredged Materials Disposal and Contractor Multi-use Site Transit Routes	No	81 FR 62259 (September 8, 2016; October 11, 2016)	86 FR 21082 (April 21, 2021; May 21, 2021)
Killer Whale	*Orcinus ater (Morin et al. 2024)*	Southern Resident DPS	Endangered	Demolition, Construction, Operations Area, Dredged Materials Disposal and Contractor Multi-use Site Transit Routes	Yes, Construction/ Demo Area, Dredged Materials Disposal and Contractor Multi-use Site Transit Routes	70 FR 69903 (November 18, 2005; February 16, 2006)	71 FR 69054 (November 29, 2006; December 29, 2006), 86 FR 41668 (August 2, 2021; September 1, 2021)

Common Name	*Scientific Name*	*DPS/ESU*	*ESA Listing Status*	*Portion of the ROI where Present*	*Designated Critical Habitat Potentially in the ROI*	*Species Initial Ruling and Applicable Updates (Publication Date; Effective Date)*	*Critical Habitat Designation Final Rule (Publication Date; Effective Date)*
Fishes							
Bocaccio Rockfish	*Sebastes paucispinis*	Puget Sound/Georgia Basin DPS	Endangered	Demolition, Construction, Operations Area, Dredged Materials Disposal and Contractor Multi-use Site Transit Routes	Yes, Demolition, Construction, Operations Area, Dredged Materials Disposal and Contractor Multi-use Site Transit Routes	75 FR 22276 (April 28, 2010; July 27, 2010), 82 FR 7711 (January 23, 2017; March 24, 2017)	79 FR 68041 (November 13, 2014; February 11, 2015), Correction 80 FR 7977 (February 13 2015; February 11, 2015)
Bull Trout	*Salvelinus confluentus*	Coterminous U.S. DPS (Coastal Recovery Unit)	Threatened	Demolition, Construction, Operations Area, Dredged Materials Disposal and Contractor Multi-use Site Transit Routes	Yes, Dredged Materials Disposal and Contractor Multi-use Site Transit Routes	64 FR 58910 (November 1, 1999; December 1, 1999)	70 FR 56212 (September 26,2005; October 10, 2005), Revision 75 FR 63897 (October 18, 2010; November 17, 2010)
Chinook Salmon	*Oncorhynchus tshawytscha*	Puget Sound ESU	Threatened	Demolition, Construction, Operations Area, Dredged Materials Disposal and Contractor Multi-use Site Transit Routes	Yes, Demolition, Construction, Operations Area, Dredged Materials Disposal and Contractor Multi-use Site Transit Routes	64 FR 14308 (March 24, 1999, May 24, 1999), 70 FR 37159 (June 28, 2005; August 29, 2005), 79 FR 20802 (April 14, 2014)	70 FR 52629 (September 2, 2005; January 2, 2006)

Common Name	*Scientific Name*	*DPS/ESU*	*ESA Listing Status*	*Portion of the ROI where Present*	*Designated Critical Habitat Potentially in the ROI*	*Species Initial Ruling and Applicable Updates (Publication Date; Effective Date)*	*Critical Habitat Designation Final Rule (Publication Date; Effective Date)*
Steelhead	*Oncorhynchus mykiss*	Puget Sound DPS	Threatened	Demolition, Construction, Operations Area, Dredged Materials Disposal and Contractor Multi-use Site Transit Routes	Yes, Demolition, Construction, Operations Area, Dredged Materials Disposal and Contractor Multi-use Site Transit Routes	72 FR 26722 (May 11, 2007; June 11, 2007), 79 FR 20802 (April 14, 2014)	81 FR 9251* (February 24, 2016; March 25, 2016)
Yelloweye Rockfish	*Sebastes ruberrimus*	Puget Sound/Georgia Basin DPS	Threatened	Demolition, Construction, Operations Area, Dredged Materials Disposal and Contractor Multi-use Site Transit Routes	Yes, Demolition, Construction, Operations Area, Dredged Materials Disposal and Contractor Multi-use Site Transit Routes	75 FR 22276 (April 28, 2010; July 27, 2010), 82 FR 7711 (January 23, 2017; March 24, 2017)	79 FR 68041 (November 13, 2014; February 11, 2015), Correction 80 FR 7977 (February 13, 2015; February 11, 2015)

Common Name	*Scientific Name*	*DPS/ESU*	*ESA Listing Status*	*Portion of the ROI where Present*	*Designated Critical Habitat Potentially in the ROI*	*Species Initial Ruling and Applicable Updates (Publication Date; Effective Date)*	*Critical Habitat Designation Final Rule (Publication Date; Effective Date)*
Marine Invertebrates							
Sunflower Sea Star	*Pycnopodia helianthoides*	Throughout Range	Proposed Threatened	Demolition, Construction, Operations Area, Dredged Materials Disposal and Contractor Multi-use Site Transit Routes	No	88 FR 16212 (Proposed March 16, 2023)	-
Birds							
Marbled Murrelet	*Brachyramphus marmoratus*	Throughout Range	Threatened	Demolition, Construction, Operations Area, Dredged Materials Disposal and Contractor Multi-use Site Transit Routes, Radio Hill Complex Expansion Area/ Forge Shop	No	57 FR 45328 (October 1, 1992; September 28, 1992)	-

Note: *Designated Puget Sound steelhead critical habitat is restricted to freshwater systems and does not overlap with the ROI.
Legend: DPS = Distinct Population Segment; ESA = Endangered Species Act; ESU = Evolutionarily Significant Unit; FR = Federal Register

Table 1-2 Endangered Species Act-listed Species and Designated Critical Habitat that May Occur within the Caisson Delivery Route Region of Influence

Common Name	*Scientific Name*	*DPS/ESU*	*ESA Listing Status*	*Designated Critical Habitat within the ROI*	*Species Initial Ruling and Applicable Updates (Publication Date; Effective Date)*	*Critical Habitat Designation Final Rule (If Applicable)*
Marine Mammals – Cetaceans						
Blue Whale	*Balaenoptera musculus*	Throughout Range	Endangered	No	35 FR 18319 (December 2, 1970; December 2, 1970)	-
Fin Whale	*Balaenoptera physalus*	Throughout Range	Endangered	No	35 FR 18319 (December 2, 1970; December 2, 1970)	-
Humpback Whale	*Megaptera novaeangliae*	Central America DPS	Endangered	Yes	81 FR 62259 (September 8, 2016; October 11, 2016)	86 FR 21082 (April 21, 2021; May 21, 2021)
		Mexico DPS	Threatened	Yes	81 FR 62259 (September 8, 2016; October 11, 2016)	86 FR 21082 (April 21, 2021; May 21, 2021)
Killer Whale	*Orcinus ater (Morin et al. 2024)*	Southern Resident DPS	Endangered	Yes	70 FR 69903 (November 18, 2005; February 16, 2006)	71 FR 69054 (November 29, 2006; December 29, 2006), 86 FR 41668 (August 2, 2021; September 1, 2021)
North Atlantic Right Whale	*Eubalaena glacialis*	Throughout Range	Endangered	No	73 FR 12024 (March 6, 2008; April 7, 2008)	-
North Pacific Right Whale	*Eubalaena japonica*	Throughout Range	Endangered	No	73 FR 12024 (March 6, 2008; April 7, 2008)	-
Rice's Whale	*Balaenoptera ricei*	Throughout Range	Endangered	No	84 FR 15446 (April 15, 2019; May 15, 2019), 86 FR 47022 (August 23, 2021; October 22, 2021)	-
Sei Whale	*Balaenoptera borealis*	Throughout Range	Endangered	No	35 FR 8491 (June 2, 1970; June 2, 1970)	-

Common Name	*Scientific Name*	*DPS/ESU*	*ESA Listing Status*	*Designated Critical Habitat within the ROI*	*Species Initial Ruling and Applicable Updates (Publication Date; Effective Date)*	*Critical Habitat Designation Final Rule (If Applicable)*
Sperm Whale	*Physeter macrocephalus*	Throughout Range	Endangered	No	35 FR 18319 (December 2, 1970; December 2, 1970)	-
Marine Mammals – Mustelids						
Southern Sea Otter	*Enhydra lutris nereis*	Throughout Range	Threatened	No	42 FR 2965 (January 14, 1977)	-
Marine Mammals – Pinnipeds						
Guadalupe Fur Seal	*Arctocephalus townsendi*	Throughout Range	Threatened	No	50 FR 51252 (December 16, 1985; January 15, 1986)	-
Marine Mammals – Sirenians						
West Indian Manatee	*Trichechus manatus latirostris*	Throughout Range	Threatened	No	35 FR 8491 (June 2, 1970)	-
Marine Reptiles – Sea Turtles						
Green Sea Turtle	*Chelonia mydas*	East Pacific DPS	Threatened	No	81 FR 20057 (April 6, 2016; May 6, 2016)	-
		North Atlantic DPS	Threatened	No	81 FR 20057 (April 6, 2016; May 6, 2016)	-
Hawksbill Sea Turtle	*Eretmochelys imbricata*	Throughout Range	Endangered	No	35 FR 8491 (June 2, 1970; June 2, 1970)	-
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	Throughout Range	Endangered	No	35 FR 18319 (December 2, 1970)	-
Leatherback Sea Turtle	*Dermochelys coriacea*	Throughout Range	Endangered	Yes	35 FR 8491 (June 2, 1970)	77 FR 4169 (January 26, 2012; February 27, 2012)
Loggerhead Sea Turtle	*Caretta caretta*	Northwest Atlantic Ocean DPS	Threatened	Yes	76 FR 15932 (March 22, 2011; September 16, 2011)	79 FR 39855 (July 10, 2014; August 11, 2014)
		North Pacific Ocean DPS	Endangered	No	76 FR 15932 (March 22, 2011; September 16, 2011)	-

Common Name	*Scientific Name*	*DPS/ESU*	*ESA Listing Status*	*Designated Critical Habitat within the ROI*	*Species Initial Ruling and Applicable Updates (Publication Date; Effective Date)*	*Critical Habitat Designation Final Rule (If Applicable)*
Olive Ridley Sea Turtle	*Lepidochelys olivacea*	Mexico's Pacific Coast Breeding Colonies	Endangered	No	43 FR 32800 (July 28, 1978)	-
		All Other Areas	Threatened	No	43 FR 32800 (July 28, 1978)	-
Marine Invertebrates						
Sunflower Sea Star	*Pycnopodia helianthoides*	Throughout Range	Proposed Threatened	No	88 FR 16212 (Proposed March 16, 2023)	-
Fishes						
Atlantic Sturgeon	*Acipenser oxyrinchus oxyrinchus*	Carolina DPS	Endangered	No	77 FR 5913 (February 6, 2012; April 6, 2012)	-
		Chesapeake Bay DPS	Endangered	No	77 FR 5879 (February 6, 2012; April 6, 2012)	-
		New York Bight DPS	Endangered	No	77 FR 5879 (February 6, 2012; April 6, 2012)	-
		South Atlantic DPS	Endangered	No	77 FR 5913 (February 6, 2012; April 6, 2012)	-
Bocaccio Rockfish	*Sebastes paucispinis*	Puget Sound/Georgia Basin DPS	Endangered	Yes	75 FR 22276 (April 28, 2010; July 27, 2010), 82 FR 7711 (January 23, 2017; March 24, 2017)	79 FR 68041 (November 13, 2014; February 11, 2015), Correction 80 FR 7977 (February 13, 2015; February 11, 2015)
Bull Trout	*Salvelinus confluentus*	Coterminous U.S. DPS (Coastal Recovery Unit)	Threatened	Yes	64 FR 58910 (November 1, 1999; December 1, 1999)	70 FR 56212 (September 26, 2005; October 10, 2005), Revision 75 FR 63897 (October 18, 2010; November 17, 2010)

Common Name	*Scientific Name*	*DPS/ESU*	*ESA Listing Status*	*Designated Critical Habitat within the ROI*	*Species Initial Ruling and Applicable Updates (Publication Date; Effective Date)*	*Critical Habitat Designation Final Rule (If Applicable)*
Chinook Salmon	*Oncorhynchus tshawytscha*	California Coastal ESU	Threatened	No	64 FR 50394 (September 16,1999; November 15, 1999)	-
		Central Valley Spring-Run ESU	Threatened	No	64 FR 50394 (September 16, 1999; November 15, 1999), 70 FR 37159 (June 28, 2005; August 29, 2005), 79 FR 20802 (April 14, 2014)	-
		Lower Columbia River ESU	Threatened	No	64 FR 14308 (March 24, 1999; May 24, 1999), 70 FR 37159 (June 28, 2005; August 29, 2005), 79 FR 20802 (April 14, 2014)	-
		Puget Sound ESU	Threatened	Yes	64 FR 14308 (March 24, 1999; May 24 1999), 70 FR 37159 (June 28, 2005; August 29, 2005), 79 FR 20802 (April 14, 2014)	70 FR 52629 (September 2, 2005; January 2, 2006)

Common Name	*Scientific Name*	*DPS/ESU*	*ESA Listing Status*	*Designated Critical Habitat within the ROI*	*Species Initial Ruling and Applicable Updates (Publication Date; Effective Date)*	*Critical Habitat Designation Final Rule (If Applicable)*
		Sacramento River Winter-Run ESU	Endangered	No	54 FR 32085 (August 4, 1989; April 2, 1990), 55 FR 46515 (November 5, 1990; November 30, 1990), 59 FR 440 (January 4, 1994; February 3, 1994), 70 FR 37159 (June 28, 2005; August 29, 2005), 79 FR 20802 (April 14, 2014)	-
		Snake River Spring/Summer-Run ESU	Threatened	No	57 FR 14653 (April 22, 1992; May 22, 1992), Correction 57 FR 23458 (June 3, 1992), 70 FR 37159 (June 28, 2005; August 29, 2005), 79 FR 20802 (April 14, 2014)	-
		Snake River Fall-Run ESU	Threatened	No	57 FR 14653 (April 22, 1992; May 22, 1992), Correction 57 FR 23458 (June 3, 1992), 70 FR 37159 (June 28, 2005; August 29, 2005), 79 FR 20802 (April 14, 2014)	-

Common Name	*Scientific Name*	*DPS/ESU*	*ESA Listing Status*	*Designated Critical Habitat within the ROI*	*Species Initial Ruling and Applicable Updates (Publication Date; Effective Date)*	*Critical Habitat Designation Final Rule (If Applicable)*
		Upper Columbia River Spring-Run ESU	Endangered	No	64 FR 14308 (March 24,1999; May 24, 1999), 70 FR 37159 (June 28, 2005; August 29, 2005), 79 FR 20802 (April 14, 2014)	-
		Upper Willamette River ESU	Threatened	No	64 FR 14308 (March 24, 1999; May 24, 1999), 70 FR 37159 (June 28, 2005; August 29, 2005), 79 FR 20802 (April 14, 2014)	-
Chum Salmon	*Oncorhynchus keta*	Columbia River ESU	Threatened	No	64 FR 14508 (March 25, 1999; May 24, 1999), 70 FR 37159 (June 28, 2005; August 29, 2005), 79 FR 20802 (April 14, 2014)	-
		Hood Canal Summer-Run ESU	Threatened	Yes	64 FR 14508 (March 25, 1999; May 24, 1999), 70 FR 37159 (June 28, 2005; August 29, 2005), 79 FR 20802 (April 14, 2014)	-
Coho Salmon	*Oncorhynchus kisutch*	Central California Coast ESU	Endangered	No	61 FR 56138 (October 31, 1996; December 2, 1996), 70 FR 37159 (June 28, 2005; August 29, 2005), 79 FR 20802 (April 14, 2014)	-

Common Name	*Scientific Name*	*DPS/ESU*	*ESA Listing Status*	*Designated Critical Habitat within the ROI*	*Species Initial Ruling and Applicable Updates (Publication Date; Effective Date)*	*Critical Habitat Designation Final Rule (If Applicable)*
		Lower Columbia River ESU	Threatened	No	70 FR 37159 (June 28, 2005; August 29, 2005), 79 FR 20802 (April 14, 2014)	-
		Oregon Coast ESU	Threatened	No	63 FR 42587 (August 10, 1998; October 9, 1998), 73 FR 7815 (February 11, 2008; May 12, 2008), 76 FR 35755 (June 20, 2011), 79 FR 20802 (April 14, 2014)	-
		Southern Oregon and Northern California Coasts ESU	Threatened	No	62 FR 24588 (May 6, 1997; June 5, 1997), 70 FR 37159 (June 28, 2005; August 29, 2005), 79 FR 20802 (April 14, 2014)	-
Eulachon	*Thaleichthys pacificus*	Southern DPS	Threatened	No	75 FR 13012 (March 18, 2010; May 17, 2010)	-
Green Sturgeon	*Acipenser medirostrus*	Southern DPS	Threatened	Yes	71 FR 17757 (April 7, 2006; June 6, 2006), 75 FR 30714 (June 2, 2010; July 2, 2010), 79 FR 20802 (April 14, 2014)	74 FR 52299 (October 9, 2009; November 9, 2009)
Giant Manta Ray	*Manta birostris*	Throughout range	Threatened	No	83 FR 2916 (January 22, 2018; February 21, 2018)	-
Nassau Grouper	*Epinephelus striatus*	Throughout Range	Threatened	No	81 FR 42268 (June 29, 2016)	89 FR 126 (January 2, 2024)

Common Name	*Scientific Name*	*DPS/ESU*	*ESA Listing Status*	*Designated Critical Habitat within the ROI*	*Species Initial Ruling and Applicable Updates (Publication Date; Effective Date)*	*Critical Habitat Designation Final Rule (If Applicable)*
Oceanic Whitetip Shark	*Carcharhinus longimanus*	Throughout range	Threatened	No	83 FR 4153 (January 30, 2018; March 1, 2018)	-
Scalloped Hammerhead Shark	*Sphyrna lewini*	Central & Southwest Atlantic DPS	Threatened	No	79 FR 38213 (July 3, 2014; September 2, 2014)	-
		Eastern Pacific	Endangered	No	79 FR 38213 (July 3, 2014; September 2, 2014)	-
Shortnose Sturgeon	*Acipenser brevirostrum*	Throughout Range	Threatened	No	32 FR 4001 (March 10, 1967; March 11, 1967)	-
Smalltooth Sawfish	*Pristis pectinata*	U.S. DPS	Endangered	No	68 FR 15674 (April 1, 2003)	74 FR 45353 (September 2, 2009)
Sockeye Salmon	*Oncorhynchus nerka*	Ozette Lake ESU	Threatened	No	64 FR 14528 (March 12, 1999; May 24, 1999), 70 FR 37159 (June 28, 2005; August 29, 2005), 79 FR 20802 (April 14, 2014)	-
		Snake River ESU	Endangered	No	56 FR 58619 (November 20, 1991; December 20, 1991), 70 FR 37159 (June 28, 2005; August 29, 2005), 79 FR 20802 (April 14, 2014)	-
Steelhead	*Oncorhynchus mykiss*	California Central Valley DPS	Threatened	No	63 FR 13347 (March 19, 1998; May 18, 1998), 71 FR 833 (January 5, 2006; February 6, 2006), 79 FR 20802 (April 14, 2014)	-

Common Name	*Scientific Name*	*DPS/ESU*	*ESA Listing Status*	*Designated Critical Habitat within the ROI*	*Species Initial Ruling and Applicable Updates (Publication Date; Effective Date)*	*Critical Habitat Designation Final Rule (If Applicable)*
		Central California Coast DPS	Threatened	No	62 FR 43937 (August 18, 1997; October 17, 1997), 71 FR 833 (January 5, 2006; February 6, 2006), 79 FR 20802 (April 14, 2014)	-
		Lower Columbia River DPS	Threatened	No	63 FR 13347 March 19, 1998; May 18, 1998), 71 FR 833 (January 5, 2006; February 5, 2006), 79 FR 20802 (April 14, 2014)	-
		Middle Columbia River DPS	Threatened	No	64 FR 14517 (March 25, 1999; May 24, 1999), 71 FR 833 (January 5, 2006; February 5, 2006), 79 FR 20802 (April 14, 2014)	-
		Northern California DPS	Threatened	No	65 FR 36074 (June 7, 2000; August 7, 2000), 71 FR 833 (January 5, 2006; February 5, 2006), 79 FR 20802 (April 14, 2014)	-
		Puget Sound DPS	Threatened	Yes	72 FR 26722 (May 11, 2007; June 11, 2007), 79 FR 20802 (April 14, 2014)	81 FR 9251 (February 24, 2016; March 25, 2016)

Common Name	*Scientific Name*	*DPS/ESU*	*ESA Listing Status*	*Designated Critical Habitat within the ROI*	*Species Initial Ruling and Applicable Updates (Publication Date; Effective Date)*	*Critical Habitat Designation Final Rule (If Applicable)*
		Snake River Basin DPS	Threatened	No	62 FR 43937 (August 18, 1997; October 17, 1997), 71 FR 833 (January 5, 2006; February 5, 2006), 79 FR 20802 (April 14, 2014)	-
		South-Central California Coast DPS	Threatened	No	62 FR 43937 (August 18, 1997; October 17, 1997), 71 FR 833 (January 5, 2006; February 5, 2006), 79 FR 20802 (April 14, 2014)	-
		Southern California DPS	Endangered	No	62 FR 43937 (August 18, 1997; October 17, 1997), 67 FR 21586 (May 1, 2002; July 1, 2002), 71 FR 833 (January 5, 2006; February 5, 2006), 79 FR 20802 (April 14, 2014)	-

Common Name	*Scientific Name*	*DPS/ESU*	*ESA Listing Status*	*Designated Critical Habitat within the ROI*	*Species Initial Ruling and Applicable Updates (Publication Date; Effective Date)*	*Critical Habitat Designation Final Rule (If Applicable)*
		Upper Columbia River DPS	Threatened	No	62 FR 43937 (August 18, 1997; October 17, 1997), 71 FR 833 (January 5, 2006; February 5, 2006), 74 FR 42605 (August 24, 2009), 79 FR 20802 (April 14, 2014)	-
		Upper Willamette River DPS	Threatened	No	64 FR 14517 (March 25, 1999; May 24, 1999), 71 FR 833 (January 5, 2006; February 5, 2006), 79 FR 20802 (April 14, 2014)	-
Yelloweye Rockfish	*Sebastes ruberrimus*	Puget Sound/Georgia Basin DPS	Threatened	Yes	75 FR 22276 (April 28, 2010; July 27, 2010), 82 FR 7711 (January 23, 2017; March 24, 2017)	79 FR 68041 (November 13, 2014; February 11, 2015), Correction 80 FR 7977 (February 13, 2015; February 11, 2015)
Birds						
Marbled Murrelet	*Brachyramphus marmoratus*	Throughout Range	Threatened	No	57 FR 45328 (October 1, 1992; September 28, 1992)	-

Legend: DPS = Distinct Population Segment; ESA = Endangered Species Act; ESU = Evolutionarily Significant Unit; FR = Federal Register

Table 1-3 Marine Mammals Potentially Present within the Demolition, Construction, Operations and Dredged Material Disposal and Contractor Multi-use Site Transit Routes Region of Influence

Species and Stock	*ESA Status*	*MMPA Additional Status**	*Timing of Occurrence*	*Frequency of Occurrence, in or near Sinclair Inlet*	*Stock Abundance*
California sea lion (*Zalophus californianus)* United States	None	None	Year-round; peak in September– - January	Likely, haulout located onsite (PSB floats)	257,606
Dall's porpoise (*Phocoenoides dalli dalli*) California/Oregon/Washington	None	None	Year-round with peak in winter	Rare	16,498
Gray whale (*Eschrichtius robustus*) Eastern North Pacific	Eastern DPS-Delisted	None	Year-round with March – June peak	Rare	26,960
Pacific harbor porpoise (*Phocoena phocoena vomerina*) Washington Inland Waters	None	None	Year-round	Likely	11,233
Pacific harbor seal (*Phoca vitulina richardii)* Washington Northern Inland Waters	None	None	Year-round	Likely, haulout located 0.7 mile south of NAVBASE Kitsap-Bremerton at Port Orchard	11,036
Pacific harbor seal (*Phoca vitulina richardii)* Southern Puget Sound	None	None	Year-round	Likely to forage along the dredge material disposal route near Tacoma, haulouts located outside of the ROI	1,568
Humpback whale (*Megaptera novaeangliae kuzira*) Central America/Southern Mexico – California-Oregon-Washington	Central America DPS[1] – Endangered	Depleted and Strategic	Year-round, peak in April to November	Rare	1,496
Humpback whale (*Megaptera novaeangliae kuzira*) Mainland Mexico – California-Oregon-Washington	Mexico DPS – Threatened[1]	Depleted and Strategic	Year-round, peak in April to November	Rare	3,477

Species and Stock	*ESA Status*	*MMPA Additional Status**	*Timing of Occurrence*	*Frequency of Occurrence, in or near Sinclair Inlet*	*Stock Abundance*
Humpback whale (*Megaptera novaeangliae kuzira*) Hawai'i	Hawai'i DPS -None	None	Year-round, peak in April to November	Rare	11,278
Killer whale (*Orcinus rectipinnus*) West Coast Transient	None	None	Year-round, with peaks in spring and fall	Rare	349
Killer whale (*Orcinus ater*) Eastern North Pacific Southern Resident	Southern Resident DPS-Endangered[1]	Depleted and Strategic	Year round, peaks in fall and winter months	Rare	75
North Pacific minke whale (*Balaenoptera acutorostrata scammoni*) California–Oregon–Washington	None	None	Year-round but more likely in March – November	Rare	915
Northern elephant seal (*Mirounga angustirostris)* California Breeding	None	None	Year-round, peak in spring and summer	Rare	194,907
Steller sea lion (*Eumetopias jubatus*) Eastern	Eastern DPS-Delisted	None	Year-round with peak in fall and winter	Rare	36,308

Notes: Frequency of Occurrence:
Rare = Few and highly intermittent confirmed sightings, or no confirmed sightings but the distribution of the species is near enough to the area that species could reasonably occur there.
Likely = Confirmed and regular sightings of the species in the area year-round.
*See definition in above in Section 1
[1] Critical Habitat has been designated for this ESA-listed species.

Legend: DPS = Distinct Population Segment; ESA = Endangered Species Act; MMPA = Marine Mammal Protection Act; NAVBASE = Naval Base; PSB = Port Security Pontoon Fence Barrier; ROI = Region of Influence

Sources: Navy, 2018**;** Carretta et al., 2024; Young et al., 2024; Center for Whale Research, 2025

1.5 Magnuson-Stevens Fishery Conservation and Management Act

The MSA provides for the conservation and management of the fisheries in federal waters. Under the Act, Essential Fish Habitat (EFH) consists of the waters and substrate needed by fish to spawn, breed, feed, or grow to maturity. Appendix L provides detail for EFH as protected under the MSA.

1.6 ESA-Listed Marine Mammal Species

1.6.1 Humpback Whale

1.6.1.1 ESA Status

Prior to 2016, humpback whales were listed under the ESA as an endangered species worldwide. Following a 2015 global status review (Bettridge et al., 2015), NMFS established 14 DPSs with different listing statuses (81 Federal Register [FR] 62259, September 8, 2016) pursuant to the ESA. At the time of the DPS designations and listings, the stocks of humpback whales in the Pacific did not align with the newly described DPSs that contained individuals from those stocks. Because MMPA stocks cannot be portioned, i.e., parts managed as ESA-listed while other parts managed as not ESA-listed, NMFS considered the existing humpback whale stocks under the MMPA to be endangered and depleted for MMPA management purposes. The 2023 Stock Assessment Reports (SARs) included revised stock structures for humpback whales in the North Pacific that better align with the ESA-designated DPSs (Young et al., 2023). Four stocks of humpback whales are currently recognized along the United States (U.S.) west coast: the Central America/Southern Mexico – California-Oregon-Washington stock, the Mainland Mexico – California-Oregon-Washington stock, the Mexico – North Pacific stock, and the Hawai'i stock (Carretta et al., 2024; Young et al., 2024).

1.6.1.2 Species Abundance

Photographic spatial capture-recapture methods collected between 2019 and 2021 of the Central America/Southern Mexico – California-Oregon-Washington stock whales wintering in southern Mexico and Central America were estimated abundance of 1,496 (coefficients of variation [CV] = 0.171) individuals (Carretta et al., 2024). The estimate for the Mainland Mexico – California-Oregon-Washington stock is 3,477 (CV = 0.101) individuals. The estimate of the total abundance of whales within the U.S. West Coast Exclusive Economic Zone (EEZ) is 4,973 (CV=0.048) (Carretta et al., 2024). The estimate of the Hawai'i stock is based on wintering area estimates; there is an estimated abundance of 11,278 (CV=0.56) individuals (Carretta et al., 2024).

1.6.1.3 Distribution

Individuals from the Central America/Southern Mexico – California-Oregon-Washington stock are considered part of the Central America DPS, which is listed as endangered under the ESA. Because the Central America DPS is listed under the ESA, the Central America/Southern Mexico – California-Oregon-Washington stock is considered strategic and depleted under the MMPA. This stock winters between Costa Rica and southern coastal Mexico and spends the summer feeding along the U.S. west coast from California to Washington, including the inland waters of the Salish Sea (Carretta et al., 2024). The Mexico DPS is listed as threatened under the ESA, and includes individuals from two stocks: the Mainland Mexico – California-Oregon-Washington stock and the Mexico – North Pacific stock. Because the Mexico DPS is listed under the ESA, the Mainland Mexico – California-Oregon-Washington stock and the Mexico – North Pacific stock are considered strategic and depleted under the MMPA. Humpback whales from

the Mainland Mexico – California-Oregon-Washington stock winter off the mainland of Mexico and spend the summer along the west coast of the U.S. and Canada, from California to the Bering Sea off Alaska, including the inland waters of the Salish Sea (Carretta et al., 2024). Humpback whales from the Mexico – North Pacific stock winter off mainland Mexico, including the Baja California Peninsula and the Revillagigedo Archipelago, located approximately 285 miles (459 kilometers) south/southwest of Cabo San Lucas on the southern tip of the Baja California Peninsula, and summer primarily in Alaskan waters. The Mexico – North Pacific stock specifically excludes any humpback whales that migrate from Mexico to California or Oregon. The 2023 SARs note that the Mexico – North Pacific stock likely includes multiple demographically independent populations (DIPs) based on movement data collected and/or analyzed by Martien et al. (2021), Wade (2021), and Wade et al. (2021), but was designated as a single stock due to insufficient data available to delineate DIPs within the stock (Young et al., 2023).

1.6.1.4 Behavior and Diet

Humpback whales filter-feed on small crustaceans (mostly krill) and small schooling fish (such as Pacific herring [*Clupea pallasii*], Pacific sand lance [*Ammodytes hexapterus*], and Pacific mackerel [*Scomber japonicus*]), consuming up to 2,000 pounds of food per day. Humpback whales use various techniques to help them herd, corral, and disorient their prey, which can involve the use of bubbles, sounds, and even their pectoral fins. One feeding method seen in Alaska waters, called "bubble net feeding," involves using curtains of air bubbles to condense prey. Once the fish are corralled and pushed toward the surface, the whales lunge upward through the bubble net with open mouths engulfing their prey.

1.6.1.5 Species-Specific Threats

Threats to humpback whales include vessel strikes, entanglement, and vessel-based harassment. Inadvertent vessel strikes can injure or kill humpback whales. Humpback whales are vulnerable to vessel strikes throughout their range, but the risk is much higher in coastal areas with heavier ship traffic. Humpback whales can become entangled by many different gear types including moorings, traps, pots, or gillnets. Whale watching vessels, recreational boats, and other vessels may cause stress and behavioral changes in humpback whales. Additionally, food web changes resulting from natural hazards may adversely affect feeding opportunities for this species.

1.6.1.6 Occurrence within the ROI

Humpback whale sightings in Washington inland waters occur regularly in south Puget Sound, the main basin of central Puget Sound, and Colvos Passage, but to date there have been few detections in waterways (recorded in the Orca Network) in the vicinity of Naval Base (NAVBASE) Kitsap-Bremerton and the Demolition, Construction, and Operations ROI (Orca Network, 2025). Orca Network collects sightings from citizen scientists and is used for observation data; however, these data cannot be used to determine abundance or density.

Humpback whales were sighted in the vicinity of Manette Bridge in Bremerton in March and May 2016; and a carcass was found under a dock at NAVBASE Kitsap-Bremerton in June 2016, which was reported to NMFS and the Marine Mammal Stranding Network. In May of 2021, a humpback whale was observed in the Sinclair Inlet (Orca Network, 2025). The number of humpback whales in the Demolition, Construction, and Operations ROI is expected to be very low throughout the year (once or twice per year). This species has a higher likelihood of occurring in the Dredged Materials Disposal and Contractor Multi-use Site Transit Routes portion of the ROI.

Humpback whales that occur in Puget Sound have about a 6 percent endangered Central America DPS, 25 percent threatened Mexico DPS, or 69 percent non-ESA-listed Hawai'i DPS (Wade et al., 2021). There is a very low likelihood that humpback whales in Puget Sound are members of the endangered Central America DPS (NMFS, 2016a). While humpback whales may occur in Puget Sound year round, sightings of the species in the Demolition, Construction, and Operations ROI have only been recorded outside of the in-water work window of July 16–February 15.

Critical Habitat Designated within the ROI

Critical habitat has been designated for the Central America DPS and Mexico DPS of humpback whales, with a final publication date of April 21, 2021, and ruling date of May 21, 2021 (86 FR 21082). Areas designated as critical habitat include specific marine areas located off the coasts of California, Oregon, Washington, and Alaska. However, these areas are outside of the Demolition, Construction, and Operations ROI. A number of take reduction and recovery plans, as well as research and monitoring efforts are currently in place for the humpback whale.

1.6.2 Southern Resident Killer Whale

1.6.2.1 ESA Status

NMFS originally published the listing of Southern Resident killer whale DPS as endangered on November 18, 2005 with an effective date of February 16, 2006 (70 FR 69903). An update of the species status was published and made effective on April 14, 2014 (79 FR 20802). Based on ecological, morphological, and genetic data, a new species name has been recently proposed for this stock, *Orcinus ater* (Morin et al., 2024).

1.6.2.2 Species Abundance

The Southern Resident DPS of killer whales declined steeply from 98 animals in 1996 to 73 in 2019 (Carretta et al., 2024). Since 2019, a few calves have been born and a few deaths recorded; therefore, the current 2025 population is 73 Southern Resident killer whales in the wild (Center for Whale Research, 2025).

1.6.2.3 Distribution

The Southern Resident killer whale is a transboundary DPS that occurs in inland waters of Washington and British Columbia. They regularly transit to coastal sites off Washington State and Vancouver Island (Ford et al., 1994) and are known to travel as far south as central California (Black, 2011; Caretta et al., 2024), and as far north as Alaska but less is known of their offshore movements. Photo-identification of individual whales in the stock through the years has resulted in a substantial understanding of this stock's structure, behaviors, and movements in inland waters.

Historically, Southern Resident killer whales were most frequently observed in the inland waters of Washington State and British Columbia during the late spring, summer, and fall (Hanson and Emmons, 2011). In recent years, however, Southern Resident killer whales have greatly reduced their Salish Sea presence in the spring and summer, with fall and winter now being the seasons they are more likely to occur (Shields, 2023). A recent study (Shields, 2023) study found that Southern Resident killer whales are most commonly seen in Puget Sound in the fall (over 8 times more than any other season). In Washington inland waters, Southern Residents are most often observed in the main passages of Puget

Sound, Haro Strait, along the west side of San Juan Island, and in the Strait of Juan de Fuca (see review in Kriete, 2007; NMFS, 2008; Hanson and Emmons, 2011).

1.6.2.4 Behavior and Diet

Killer whales are highly social, and most live in social groups called pods (groups of related individuals seen together more than half the time). Individual whales tend to stay in their original pods. Pods typically consist of a few to 20 or more animals, and larger groups sometimes form for temporary social interactions, mating, or seasonal concentrations of prey.

Killer whales rely on underwater sound to feed, communicate, and navigate. Pod members communicate with each other through clicks, whistles, and pulsed calls. Each pod in the Eastern North Pacific possesses a unique set of calls that are learned and culturally transmitted among individuals. These calls maintain group cohesion and serve as family badges.

Although the diet of killer whales depends to some extent on what is available where they live, it is primarily determined by the culture (i.e., learned hunting tactics) for each ecotype of killer whale. Southern Resident killer whales exclusively eat fish, mainly salmon, in contrast to another ecotype in the same area (Transients, or Bigg's killer whales) which primarily eats marine mammals and squid (Morin et al., 2024).

Killer whales often use a coordinated hunting strategy and work as a team to catch prey. They are considered an apex predator and sit at the top of the food chain.

1.6.2.5 Species-Specific Threats

The three main threats to the survival of Southern Resident killer whales are: (1) scarcity of prey, (2) high levels of contaminants from pollution, and (3) disturbance from vessels and sound (70 FR 69903). In addition, the small population size and vulnerability to oil spills and disease were identified as significant concerns. The current focus into rebuilding the Southern Resident killer whale population includes recovering their principal food source, which is various Evolutionarily Significant Units (ESUs) of ESA-listed Chinook salmon; decreasing risks from vessels and noise; and reduction of exposure of orcas and their prey to contaminants (Southern Resident Orca Task Force, 2018).

1.6.2.6 Occurrence within the ROI

Southern Resident killer whale presence is unlikely around NAVBASE Kitsap-Bremerton and Sinclair Inlet. The last confirmed sighting of Southern Resident killer whales occurred in January 2015 when Southern Resident killer whales were briefly in Sinclair Inlet just east of NAVBASE Kitsap-Bremerton. The last sighting prior to that was in Dyes Inlet in 1997, just east of the NAVBASE Kitsap-Bremerton waterfront (Orca Network, 2025). However, Southern Resident killer whales seasonally occur just outside of Sinclair Inlet near Manchester and the southern end of Bainbridge Island (Orca Network, 2025). Southern Resident killer whales are unlikely to occur in the Construction, Demolition, Operations ROI and are more likely to occur in the Dredged Materials Disposal and Contractor Multi-use Site Transit Routes portion of the ROI during late fall/winter months (see Table 1-3).

Critical Habitat Designated within the ROI

Critical habitat for the Southern Resident killer whale was initially designated on November 29, 2006, with an effective date of December 29, 2006 (71 FR 69054); and revisions were published on August 2,

2020, with an effective date of September 1, 2021 (86 FR 41668) (Figure 3.5-1 of the EIS). The initial designation included marine habitat in Puget Sound, and was later revised to include marine waters along the coastline of northern California, Oregon and Washington, excluding areas less than 20 feet (6 meters) deep relative to extreme high water. In coastal waters, this critical habitat extends out to a depth of 656 feet (200 meters). The designation excludes NAVBASE Kitsap-Bremerton pursuant to a National Defense exclusion (71 FR 69054). NMFS identified the following physical and biological features (PBFs) (cited in 2006 FR as Primary Constituent Elements [PCEs]) for conservation of this critical habitat: (1) Water quality to support growth and development; (2) Prey species of sufficient quantity, quality, and availability to support individual growth, reproduction, and development, as well as overall population growth; and (3) Passage conditions to allow for migration, resting, and foraging. NMFS revised the Southern Resident killer whale critical habitat designation in August of 2021 (86 FR 41668), which does not change the PBFs for the Southern Resident killer whales or change the National Defense exclusion for NAVBASE Kitsap-Bremerton, but added six newly identified specific coastal areas for critical habitat designation (Orca Network, 2025).

1.7 ESA-Listed Marbled Murrelet

1.7.1 ESA Status

The marbled murrelet is the only ESA-listed bird species likely to overlap with stressors associated by the Proposed Action within the ROI. The Washington, Oregon, and California DPS of the marbled murrelet was federally listed as threatened in 1992 by the USFWS (57 FR 45328).

1.7.2 Species Abundance

At-sea surveys have been conducted since 2000 under the Effectiveness Monitoring Program of the Northwest Forest Plan within Conservations Zones 1 through 6 (Washington to California) (USFWS, 2019). Conservation Zones 1 and 2 are in Washington and overlap with the ROI. The murrelet population estimate for Conservation Zones 1 through 6 was estimated at 23,260 birds in 2016 with trends showing decline in Conservation Zones 1 and 2 (USFWS, 2019).

1.7.3 Distribution

Marbled murrelets are pursuit-diving seabirds that spend most of their lives in the marine environment and nest in mature and old-growth forests (USFWS, 1997). Murrelets can occur year-round in Puget Sound, although their flock size, density, and distribution vary by season (Nysewander et al., 2005; Falxa et al., 2016). Murrelets use the marine environment for courtship, loafing, and foraging (USFWS, 1997). Habitat selection in the marine environment depends on both terrestrial and marine resources. During the breeding season, nearshore marine locations in proximity to nesting habitat with cool water temperatures are most likely to be occupied (Lorenz et al., 2016). In Washington State, murrelets have long commuting distances from the nest to foraging habitat, ranging from 10.4 to 90.2 miles (16 kilometers to 145 kilometers) (USFWS, 2019).

1.7.4 Behavior and Diet

In Puget Sound, the nesting season is asynchronous between April 1 and September 23. During the breeding season, murrelets tend to forage in well-defined areas along the shoreline in relatively shallow marine waters. Throughout their range, marbled murrelets are opportunistic feeders and utilize prey of diverse sizes and species. Prey species in Washington coastal and inland waters have not been well

documented, but include Pacific sand lance, Pacific anchovy (*Engraulis mordax*), immature Pacific herring, shiner perch (*Cymatogaster aggregata*), and small crustaceans (especially euphausiids) (review by Burkett, 1995). Invertebrates are a primary prey source in the nonbreeding season, whereas fish are a source year-round. Murrelets typically forage in pairs during the summer, with singles and flocks of three or more birds occurring less often (Strachan et al., 1995; Merizon et al., 1997). During the pre-basic (post-breeding season) molt, murrelets are essentially flightless and must select foraging sites that provide adequate prey resources within swimming distance (Carter, 1984; Carter and Stein, 1995). During the nonbreeding season, murrelets typically disperse and are found farther from shore (Strachan et al., 1995).

1.7.5 Species-Specific Threats

Primary causes for the decline of this species that led to listing marbled murrelet under the ESA include direct mortality from oil spills, bycatch in gillnet fisheries, and loss of nesting habitat (61 FR 26256). A 5-year status review conducted by USFWS (2019) evaluated changes in threats with a focus on natural hazards. Natural hazards are projected to result in changes that further reduce prey quality and quantity with added concerns that murrelet may not be able to adapt to changes in their marine environment. Population estimates conducted since the 2004 and 2009 5-year status reviews show continued population decline in Washington State (USFWS, 2024). Based on the latest 5-year status review, current threats to the marbled murrelet include the following:

1. Historic and ongoing loss of terrestrial (forest) habitat (via timber harvest, wildfire, and effects of natural hazards).
2. Predation on murrelet eggs and chicks in their nests.
3. Changes in marine forage conditions (ocean acidification, hypoxic/anoxic events, accumulation of toxic contaminants in prey and overfishing), affecting the abundance, distribution, and quality of murrelet prey.
4. Mortality from harmful algal blooms and biotoxins.
5. Gillnet and purse seine fishing (including derelict fishing gear) and oil spills (USFWS, 2019).

1.7.6 Occurrence within the ROI

At-sea marbled murrelet surveys have been conducted since 2000 in Washington State during the nesting season of May through July (McIver et al., 2021). The monitoring zone that includes the ROI encompasses a much larger area that includes the Strait of Juan de Fuca, Puget Sound, Hood Canal, and the San Juan Islands (McIver et al., 2021). At-sea density surveys have also been conducted since 2012 adjacent to Navy facilities, including NAVBASE Kitsap-Bangor and NAVBASE Kitsap-Bremerton (Pearson and Lance, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020; Pearson et al., 2023, 2024). These surveys report very few to zero marbled murrelets within the Puget Sound transect strata surveyed that includes the ROI. Surveys conducted from fall 2023 through spring 2024 reported 0–0.006 marbled murrelets per kilometer transect length sampled (Pearson et al., 2024). Forage fish habitat occurs within the Demolition and Construction portion of the ROI which could attract foraging murrelets. Marbled murrelets may occur within the Demolition, Construction, Operations, and Dredged Material Disposal and Contractor Multi-use Transit routes.

Marbled murrelets have been documented in the nearshore and deeper waters adjacent to NAVBASE Kitsap-Bangor since 2001 (Kitsap Audubon Society, 2008; Agness and Tannenbaum, 2009; Navy, 2009; Tannenbaum et al., 2009, 2011; Hart Crowser, 2013a, 2014a; Pearson and Lance, 2013, 2014, 2015,

2016, 2017, 2018, 2019, 2020; Pearson et al., 2023, 2024). In February 2023, a marbled murrelet habitat assessment at NAVBASE Kitsap-Bangor was conducted. Potential nesting habitat is composed of coniferous trees within 55 miles (88.5 km) of marine waters that support at least one 4-inch diameter platform located at least 33 feet (10 meters) off the ground, with horizontal and vertical cover. There were 1,105 potential nesting platforms identified within the NAVBASE Kitsap-Bangor survey areas; 513 were described as average habitat quality and 592 as marginal (Navy, 2023a). Marbled murrelet abundance in the Radio Hill Complex Expansion Area and Forge Shop portion of the ROI is expected to be greatest in fall and winter months (Falxa et al., 2015; Pearson and Lance, 2016). However, this assessment triggered marbled murrelet nesting occupancy surveys and the first of which that were conducted in 2024 resulted in no definitive marbled murrelet detections (Raedeke, 2025). A second year of surveys will be conducted in Spring/Summer 2025 as required by Pacific Seabird Group protocol to assign occupancy status.

1.7.7 Designated Critical Habitat within the ROI

Critical habitat was designated for the marbled murrelet in 1996, revised in 2011, and affirmed in 2016 (81 FR 51348), and includes only upland forest areas. There is no designated critical habitat for marbled murrelet within the ROI.

1.8 ESA-Listed Fish

1.8.1 ESA-Listed Salmonids

Juveniles and adults of all anadromous salmonid ESUs and DPSs in the ROI traverse through Puget Sound estuaries (or embayments such as Sinclair Inlet) en route to and from the Pacific Ocean. The time spent in a given river or estuary is determined by species, a combination of environmental conditions (i.e., river discharge, water temperature, food availability), intrinsic biological differences (population), and physiological and energetic status (overall health). There is extensive variation in migration behavior among individuals, sexes, and populations.

Adult salmonids may move into estuaries throughout the year and may remain for several weeks prior to migrating upstream into rivers for spawning. Different species, size classes, and life history types continually move downstream and enter tidal waters on their migration to the ocean. Some juvenile salmonid species, such as steelhead, may move quickly through an estuary, whereas chum and ocean-type Chinook salmon (which emigrate to the ocean as sub-yearling smolts) are smaller in size and generally select shallower, slower water habitats along river margins, thus inhabiting an estuary for longer periods of time.

ESA-listed salmonids likely to occur within the Demolition, Construction, and Operations portion of the ROI include Chinook salmon (Puget Sound ESU), steelhead (Puget Sound DPS), and bull trout (Coterminous U.S. DPS [Coastal Recovery Unit]). The life histories for each of these salmonids are described in more detail below.

1.8.1.1 Puget Sound Chinook Salmon ESU

Status and Management

NMFS listed the Puget Sound Chinook salmon ESU as threatened under the ESA on March 24, 1999 (64 FR 14308). The 2016 5-year status reviews for all Pacific salmon and steelhead were published with no changes in listing status warranted for any of the listed salmon and steelhead (NMFS, 2016b). This ESU

was updated on April 14, 2014 (79 FR 20802) and includes all wild (naturally spawned) populations of Chinook salmon from rivers and streams flowing into Puget Sound, including the Strait of Juan de Fuca from the Elwha River, eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound, and the Strait of Georgia in Washington, and 25 artificial propagation programs (81 FR 72759).

Population and Abundance

Puget Sound Chinook salmon have a low abundance relative to historical levels (NMFS, 2007; Puget Sound Partnership, 2024). Specific population numbers based on freshwater returns can be found on the Washington Department of Fish and Wildlife (WDFW) online Salmon Conservation and Reporting Engine application (WDFW, 2023). Hatchery fall-run Chinook are produced at the Suquamish Tribe's Gorst Creek Rearing Facility on Gorst Creek (Suquamish Tribe, 2021). The rearing facility fish are not considered part of the Puget Sound Chinook salmon ESU and are not ESA-listed (85 FR 81822). The rearing facility releases about 2.1 million sub-yearling smolts into Gorst Creek during the months of May and June (Suquamish Tribe, 2021). Small numbers of Gorst Creek Rearing Facility-produced salmon are suspected to spawn naturally in Gorst Creek and nearby streams, including natural production that occurs in Blackjack Creek (Fresh et al., 2006). It is also important to note that Chinook using Dyes Inlet, located north of the ROI, may migrate through the ROI.

Beach seine surveys (n=300) were conducted in 2001 and 2002 to characterize juvenile salmonid use in Sinclair Inlet within the ROI (Fresh et al., 2006). Approximately 10 percent of the juvenile Chinook salmon collected each year were unmarked subyearlings and possibly the progeny of natural spawning fish. This percentage was noted to possibly be an overestimate, depending on the rate of fin-clipping that occurred at the hatchery sites. Approximately 62 percent of juvenile hatchery Chinook salmon with coded wire tags (CWT) sampled in the Sinclair Inlet originated from 13 Puget Sound natal stream basins as far away from Sinclair Inlet as the Nisqually, Dungeness, and Stillaguamish rivers (Fresh et al., 2006). About 10.7 percent of the CWT hatchery fish were from programs included within the ESA-listed Puget Sound Chinook salmon ESU (Fresh et al., 2006).

Life History

The general life history of anadromous Chinook salmon includes both freshwater and ocean phases of development. Incubation, hatching, and emergence occur in fresh water, followed by seaward migration to the ocean, which is preceded by the onset of smoltification. After several years at sea, maturation is initiated, and adults return to freshwater habitats to spawn in their natal streams. Stream-type Chinook salmon spend extended periods in fresh water before smoltification, in contrast to the ocean-type Chinook, which migrate to the ocean as sub-yearling smolts (NMFS, 2023).

Coastal streams are dominated by the ocean-type Chinook salmon, whereas the stream-type Chinook are mainly found in the headwater streams of larger river systems (Groot and Margolis, 1991). The Puget Sound Chinook salmon ESU is composed predominantly of ocean-type fall-run fish. Like other species of Pacific salmon, Chinook salmon die after spawning and are therefore not able to spawn more than once.

Habitat and Geographic Range

Because of their large body size, adult Chinook salmon tend to use deeper water and larger size substrate (gravel and cobble) to spawn as compared to other salmonid species (WDFW, 2023). After

emergence from redds, Chinook typically spend up to 4 months rearing in natal or nearby non-natal estuaries or coastal creek mouths before migrating into Puget Sound. Individuals may reside in the Salish Sea for extensive periods of time before migrating to the Pacific Ocean or they may remain in the Salish Sea (NMFS, 2023). Catch data from commercial fishing records indicate that maturing Chinook salmon are found in the highest concentrations along the continental shelf within 32 nautical miles (60 kilometers [km]) off the Washington, Oregon, and California coastlines at depths ranging from 98 feet to 230 feet (30 to 70 meters) (PFMC, 2014). After 3 to 6 years in marine waters, Chinook return to natal streams to spawn (Groot and Margolis, 1991).

Chinook from the following river systems may migrate through the ROI: Cedar, Puyallup, White, Nisqually, Sammish, Green (Duwamish), Skykomish, Snoqualmie, North Fork and South Fork Stillaguamish, Upper and Lower Skagit, Lower and Upper Sauk, Cascade, and Suiattle (WDFW, 2023).

Predator/Prey Interactions

Predators of Chinook salmon vary across life stage and habitat. Juveniles and smolts are common seasonal prey of birds, such as gulls, pelicans, ospreys, and bald eagles; piscivorous fish, including other salmonids; and aquatic mammals such as river otters. Smolts and adults are commonly preyed on by marine mammals, such as sea lions, harbor seals, and Southern Resident killer whales, especially within coastal areas (Groot and Margolis, 1991). Juveniles in nearshore marine habitat feed mostly on amphipods and crustaceans, while adults feed on fish (Groot and Margolis, 1991).

Migration

Maturing ocean phase Chinook begin their return migration from coastal shelf habitats towards their natal streams as early as April for spring-run fish and typically September and October for fall-run fish.

Sinclair Inlet Chinook salmon are fall-run fish that spawn in tributaries both inside and outside the Demolition and Construction portion of the ROI from September through October (WDFW and Western Washington Treaty Indian Tribes, 1994). Fresh et al. (2006) found the timing of hatchery and wild juvenile Chinook salmon to be almost identical, as most were captured in nearshore areas from April through June with a peak of abundance in May, followed by a decline to low levels from July through September (Fresh et al., 2006). Juvenile Chinook salmon out-migrants were found to have a residence time in Sinclair Inlet of 5.4 to 9.3 days (Fresh et al., 2006).

Species-Specific Threats

There are many threats to the survival of Chinook salmon found within the ROI, which vary with life stage and location. Principal threats include, but are not limited to, reductions in suitable forage species and refuge habitat; alteration of stream flow patterns and habitat degradation; barriers to fish passage; predation; channel alterations; poor water quality; stormwater discharge, non-native fish, and non-native plants; and natural hazards (NMFS, 2007). These threats pose a serious challenge to the persistence of Chinook salmon within the ROI.

Occurrence within the ROI

Returning adults and juvenile outmigrant Puget Sound Chinook may be found in the Demolition, Construction, Operations portion of the ROI from March to early July whereas adult and subadults may be present within deeper offshore waters adjacent to the NAVBASE Kitsap-Bremerton waterfront

throughout the year, and occasionally enter nearshore waters (Fresh et al., 2006). Hook-and-line fishing conducted near the Controlled Industrial Area has documented the presence of adult Puget Sound Chinook (Frierson et al., 2016). A drydock entrainment study at NAVBASE Kitsap-Bremerton recorded a total of 187 Chinook salmon. Of these, 137 fish were clipped (hatchery origin) and 50 were non-clipped and presumed to be wild fish (Pacunski et al., 2022). Puget Sound Chinook are likely to occur along the Dredged Material Disposal, Contractor Multi-use Site Transit, and Caisson Delivery routes.

Designated Critical Habitat within the ROI

Critical habitat has been designated for Puget Sound Chinook salmon on September 2, 2005 (70 FR 5629) which includes Sinclair Inlet from the extreme high tide to a depth of 30 meters (98 feet) below mean lower low water (Table 3-1 and Figure 3-1). NMFS communicated with the DoD during the rule process and determined critical habitat would be designated within Sinclair Inlet Naval Restricted Area (NRA) #1, confined to a narrow nearshore zone from the line of extreme high tide down to the line of mean lower low water (70 FR 52629) (Figure 3-1). However, except for this narrow band of nearshore along NRA#1, NMFS determined that under ESA Section 4(b)(2), NRAs in Sinclair Inlet were excluded from critical habitat designation by NMFS based on national security impacts (70 FR 52629) (Figure 3-1). Additionally, the DoD easements or rights-of-way within the NRA #2, adjacent to the Bremerton waterfront (Figure 3-1), were exempt from critical habitat designation. Designated critical habitat overlaps with the Dredged Material Disposal, Contractor Multi-use Site Transit, and Caisson Delivery routes.

Of the six Puget Sound Chinook salmon critical habitat PBFs (70 FR 52629). These include:

- Estuarine **areas** free of obstruction and excessive predation with:
  - **Water quality and quantity, and salinity conditions** supporting juvenile and adult physiological transitions between fresh and saltwater.
  - **Natural cover** such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels.
  - **Juvenile and adult forage**, including aquatic invertebrates and fishes, supporting growth and maturation.
- Nearshore **marine areas** free of obstruction and excessive predation with:
  - **Water quality and quantity conditions and forage**, including aquatic invertebrates and fishes, supporting growth and maturation.
  - **Natural cover** such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels.

1.8.1.2 Puget Sound Steelhead DPS

Status and Management

NMFS listed the Puget Sound Steelhead DPS as threatened under the ESA on May 11, 2007 (72 FR 26722). The 2016 5-year status reviews for all Pacific salmon and steelhead were published with no changes in listing status warranted for any of the listed salmon and steelhead (NMFS, 2016b). This DPS was updated on April 14, 2014, and includes all naturally spawned anadromous winter-run and summer-run steelhead populations in streams in the river basins of the Strait of Juan de Fuca and Puget Sound, Washington, bounded to the west by the Elwha River (inclusive) and to the north by the Nooksack River and Dakota Creek, and five artificial propagation programs (79 FR 20802).

Population and Abundance

Within the Puget Sound DPS, there are 32 DIPs that are grouped into three MPGs: Northern Cascades MPG, Central and South Puget Sound MPG, and Hood Canal and Strait of Juan de Fuca MPG (NMFS, 2019). The Central and South Puget Sound MPG overlaps with the ROI. Puget Sound steelhead have a low abundance relative to historical levels (NMFS, 2007, 2016b, 2019), and there is widespread occurrence of hatchery fish in naturally spawning populations (Good et al., 2005; NMFS, 2019). Native winter-run populations occur in Gorst, Blackjack, Anderson, and Ross creeks (WDFW, 2023; WDFW and Western Washington Treaty Indian Tribes, 1994). Hard et al. (2015) showed that four creeks in Dyes/Sinclair have observed spawning steelhead (Blackjack, Gorst, Chico, and Barker). Due to the small size of the streams entering Sinclair Inlet, the population of steelhead is historically small (WDFW and Western Washington Treaty Indian Tribes, 1994). Fresh et al. (2006) detected only four juvenile steelhead during 300 beach seines conducted in Sinclair Inlet between 2001 and 2002. This is likely due to the limited time that steelhead smolts spend in nearshore habitat before moving away from the shoreline along the surface and then proceeding with rapid migration from nearshore habitat to offshore habitat (Moore et al., 2015).

Life History

Steelhead may exhibit either an anadromous life cycle or they may spend their entire life in fresh water (McEwan and Jackson, 1996). The name “steelhead” is used primarily for the anadromous form of this species. Steelhead exhibit one of the most complex suites of life history traits of any species of Pacific salmonid. Unlike other salmonids, steelhead can spawn more than once (i.e., are iteroparous), whereas all other salmonids discussed here spawn once and then die (i.e., are semelparous). Anadromous steelhead may spend several years in fresh water before smoltification and up to 3 years in salt water before returning to spawn.

There is considerable variation in this life history pattern within the population. Steelhead can be divided into two basic reproductive types, based on the state of sexual maturity at the time of river entry and duration of spawning migration. The first is the stream-maturing type (summer-run steelhead), which enters fresh water in a sexually immature condition between May and October and requires several months to mature and spawn. The second is the ocean-maturing type (winter-run steelhead), which enters fresh water between November and April and, sexually mature, spawns shortly thereafter. Puget Sound streams are dominated by winter-run steelhead, but several rivers have native and hatchery summer-run fish. Steelhead that migrate through Sinclair Inlet are expected to be winter-run fish.

Habitat and Geographic Range

The present distribution of steelhead extends from the Kamchatka Peninsula in Asia, east to Alaska, and south to Southern California, although the species’ historical range extended at least to Mexico (Good et al., 2005). Within the marine waters of Puget Sound, steelhead smolts spend very little time in nearshore habitats (up to approximately 2 days) before moving away from the shoreline along the surface and then proceeding with rapid migration to offshore habitats (Moore et al., 2015). Steelhead are thought to rely heavily on offshore marine waters for feeding, with high seas tagging programs indicating steelhead make more extensive migrations offshore in their first year than other Pacific salmonids (Quinn and Myers, 2005).

Steelhead from the populations located south of the Demolition, Construction, Operations ROI may migrate through the ROI as they move north in Puget Sound and to the Strait of Juan de Fuca before migrating to and from the Pacific Ocean. These populations include: East Kitsap, South Sound Tributaries, Nisqually, Puyallup/Carbon, White River, and Green (Duwamish) (WDFW, 2023).

Predator/Prey Interactions

Predators of steelhead include fish-eating birds, such as terns and cormorants; piscivorous fish, including other salmonids; and pinnipeds, such as sea lions and harbor seals, especially within coastal areas (NMFS, 2019). Juvenile out-migrants in Puget Sound feed mostly on zooplankton (small animals that drift in the water), while adults in offshore marine habitat feed on squid, crustaceans, and small fishes, including juvenile salmon (Fresh et al., 1981).

Migration

Adult spawners enter Sinclair Inlet in early December and enter spawning streams by early January, spawning from February through late March (WDFW and Western Washington Treaty Indian Tribes, 1994). Puget Sound steelhead smolts enter marine habitat between early May and mid-June and have a short average residence time during their out-migration in Puget Sound of 5.1 days (Goetz, 2016). Thus, residence time of out-migrating juveniles originating in Sinclair Inlet is very brief. Contrasting with chum and juvenile Chinook salmon, juvenile steelhead in marine waters are not known to be nearshore dependent, and have been found to move quickly from freshwater into offshore marine water (Welch et al., 2004).

Species-Specific Threats

There are many threats to the survival of the steelhead in the ROI which generally include the same threats as described for Chinook (i.e., reductions in suitable forage species and refuge habitat; alteration of stream flow patterns and habitat degradation; barriers to fish passage; channel alterations; poor water quality; stormwater discharge, non-native fish, invertebrates, and plants; and natural hazards) (NMFS, 2019). NMFS recovery strategy for the Central and South Puget Sound MPG is to protect and increase access to high quality habitats, particularly in upper watersheds, restore lower and middle watershed reaches with potential high-quality habitat, and improve juvenile survival in Puget Sound waters (NMFS, 2019). The Suquamish Tribe (2020) has developed a recovery plan for the East Kitsap DIP which is the East Kitsap Peninsula Tributaries Winter-Run. The plan has set goals for improvements in a variety of habitats (upland forest cover, freshwater wetlands, riparian areas, stream channel accessibility, water availability, and marine foodweb) (Suquamish Tribe, 2020).

Occurrence within the ROI

At least four systems in Dyes and Sinclair inlets support steelhead (Hard et al., 2015). During a nearshore study in Sinclair Inlet conducted in 2001 and 2002, only four juvenile steelhead were collected (Fresh et al. 2006). Trawl surveys conducted during the month of June in 2014 recorded two steelhead. Juveniles, if present, are expected in early May through mid-June (Hard et al., 2007) but nearshore occurrence would be brief (Moore et al., 2015). Adults may be present in the further offshore waters in early December through early January (WDFW and Western Washington Treaty Indian Tribes, 1994). Steelhead were not captured in Remote Operated Vehicle, light trap, or hook and line surveys in 2012–2016 (Frierson et al., 2016; Lowry et al., 2013). They also were not observed during a recent drydock

entrainment study (Pacunski et al., 2022). Puget Sound steelhead are likely to occur along the Dredged Material Disposal, Contractor Multi-use Site Transit, and Caisson Delivery routes.

Designated Critical Habitat within the ROI

Critical habitat has been designated for the Puget Sound steelhead, including approximately 2,031 stream miles (3,269 kilometers) within the geographical area presently occupied by this DPS (no marine habitat) (81 FR 9251). Designated critical habitat for the Puget Sound steelhead does not overlap spatially with the entire ROI. It is designated in freshwater only, including tributary creeks to Sinclair Inlet, Gorst, Blackjack, Anderson, and Ross Creeks. The closest designated area is approximately 0.9 mile (1.4 kilometer).

1.8.1.3 Bull Trout Coterminous U.S. DPS (Coastal Recovery Unit)

Status and Management

USFWS listed the Coterminous U.S. DPS of bull trout as threatened under the ESA on November 1, 1999 (64 FR 58910). Bull trout populations in the ROI are part of the Coastal Recovery Unit and contain the only anadromous form of bull trout in the United States (USFWS, 2015).

Population and Abundance

The Puget Sound region contains eight core areas (Chilliwack River, Nooksack River, Upper Skagit River, Lower Skagit River, Stillaguamish River, Snohomish and Skykomish Rivers, Chester Morse Lake, and Puyallup River) (USFSW, 2015). The nearest documented populations of anadromous bull trout to NAVBASE Kitsap-Bremerton is the White River bull trout population (Puyallup River). The Skagit population is 51 miles (85 kilometers) to Sinclair Inlet and is one of the largest healthy core populations of bull trout in Puget Sound (USFWS, 2015).

Life History

Bull trout are a native fish in western North America, inhabiting pristine cold-water streams. Unlike other salmonids, bull trout require colder water temperatures. They exhibit resident and migratory life history strategies throughout much of their current range. There are four distinct types of bull trout: anadromous, adfluvial (migrating between lakes, rivers, or streams), fluvial (migrating between streams or rivers), and resident (nonmigratory). Anadromous bull trout migrate from freshwater habitats to marine habitats and are the only type of bull trout found in Puget Sound (Goetz, 2016).

A literature review indicates that individual bull trout have been documented to switch between fluvial and anadromous life histories in alternate years (Goetz, 2016). Resident bull trout complete their entire life cycle in the tributary (or nearby) streams in which they spawn and mature. Migratory bull trout spawn in tributary streams where juveniles stay from 1 to 4 years before migrating to either a lake (adfluvial), river (fluvial), or in certain coastal areas to saltwater (anadromous), where maturity is reached in one of the three habitats (75 FR 63897). In the ocean, bull trout will typically remain within 3 nautical miles (5 kilometers) of the shore (Hayes et al., 2011).

Bull trout in marine waters are shoreline-oriented (Goetz, 2016) and enter marine water for the primary purpose of foraging on smaller fish in the intertidal and subtidal zones of the photic zone, primarily in water less than 33 feet (10 meters) in depth. Although bull trout in marine water will occasionally use areas deeper than 33 feet (10 meters), they do not maintain position and soon return to shallower

water. Acoustic tagged bull trout in Puget Sound are usually detected less than 0.2 mile (0.4 kilometer) from the shoreline in water less than 13 feet (4 meters) deep (Goetz, 2016; Hayes et al., 2011). Puget Sound anadromous bull trout enter marine waters in early spring with residence time in salt water averaging 2 months, with a maximum of 4 months (Goetz, 2016).

Habitat and Geographic Range

The Coastal Recovery Unity encompasses Washington and western Oregon. Within western Washington, the major geographic regions containing this unit include the Olympic Peninsula, Puget Sound, and Lower Columbia River basins. The Olympic Peninsula and Puget Sound geographic regions also include their associated marine waters (Puget Sound, Hood Canal, Strait of Juan de Fuca, and Pacific coast) (USFWS, 2015). Bull trout from the Puyallup and Skagit River systems may migrate through the ROI as well as from the Stillaguamish, White River, and Green/Duwamish River (WDFW, 2023).

The closest documented occurrences of bull trout to the ROI was a tagged individual just below the Ballard Locks that was tracked entering the Stillaguamish River 10 days later (Goetz et al., 2004).

Predator/Prey Interactions

Bull trout are opportunistic feeders, with food habits primarily a function of size and life history strategy. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macro-zooplankton, and small fish (Goetz, 1994; Donald and Alger, 1993). Adult fluvial migratory bull trout feed primarily on a wide variety of resident and anadromous fish species (Fraley and Shepard, 1989; Brown, 1992; Donald and Alger, 1993; Guy et al., 2011). Bull trout primarily enter marine waters to prey on surf smelt (*Hypomesus pretiosus*), Pacific sand lance (*Ammodytes hexapterus*), juvenile Pacific herring (*Clupea pallasii*), shiner perch (*Cymatogaster aggregata*), three-spine stickleback (*Gasterosteus aculeatus*), and juvenile salmonids (*Oncorhynchus* spp.) (Goetz et al., 2004; Goetz, 2016). Lake trout (*Salvelinus namaycush*), brown trout (*Salmo trutta*), brook trout (*Salvelinus fontinus*), and northern pike minnow (*Ptychocheilus oregonensis*) prey on juvenile bull trout in areas where they co-occur (USFWS, 2015).

Migration

Bull trout have been documented to make marine migrations in Puget Sound up to 150 km from the mouth of their natal streams (Goetz, 2016). Crossing water depths of over 33 feet (10 meters) is unusual behavior and bull trout migrate in marine habitat along the nearshore (Goetz, 2016). As stated above, anadromous bull trout utilizing marine habitat closest to the ROI spawn in the White River (Puyallup River system) and the most abundant and stable core populations near the ROI are from the Skagit River systems. Seasonal surveys of anadromous juvenile bull trout migration in the Skagit River between 1990 and 2009 recorded an average of 186 fish collected from downstream traps (Zimmerman and Kinsel, 2010). The Skagit River, below the Gorge Dam (excluding the Baker River), has multiple major and minor tributaries that are extensively used by bull trout for spawning and rearing and cumulative redd counts from the South Fork Sauk went from a recorded low of 4 in 1990 to a high of 370 in 2004 (WDFW, 2023). The last count in 2008 was of 208 redds (WDFW, 2023). The Puyallup Tribe conducted extensive bull trout migratory telemetry studies and redd surveys along the upper White River and West Fork White River, recording a total of 38 spawners and 70 redds in 2013 (Marks et al., 2014). Result of the study showed that the cold high elevation mountain streams with the Mt Rainier National Park (at the White River headwaters) provide the majority of critical bull trout spawning habitat in the basin (Marks et al., 2014).

Swimming through nearshore marine habitat, a bull trout would have to migrate approximately 21 miles (34 kilometers) from the mouth of the Puyallup River or 53 miles (85 kilometers) from the mouth of the Skagit River to reach NAVBASE Kitsap-Bremerton. As such, bull trout could occur within the ROI, but occurrence is expected to be brief and rare.

Species-Specific Threats

Threats to bull trout include habitat loss and fragmentation due to historically human-caused land and water management activities; overutilization for commercial, scientific, or educational purposes; disease or predation by native or non-native/invasive species; inadequacy of existing regulatory mechanisms; fish passage issues; competition and hybridization; and natural hazard impacts such as warming climates, changing precipitation, and hydrologic regimes (USFWS, 2015).

Threats to the anadromous life history of bull trout in the closest natal rivers to NAVBASE Kitsap-Bremerton nearshore habitat are seasonally high temperatures within the Skagit River tributaries that were caused by removal of riparian trees and reduction in stream flow (USFWS, 2015). Threats to the Puyallup River habitat are from poor structural complexity to instream habitat from flooding and erosion associated with residential development (USFWS, 2015). Threats to nearshore and estuarine foraging habitat include loss of eelgrass in shallow intertidal habitat, bank armoring, and filling of intertidal habitat, and reduced abundance of forage fish species (USFWS, 2010).

Occurrence within the ROI

Bull trout were not captured in ROV, light trap, or hook-and-line surveys in 2012-2016 (Frierson et al., 2016; Lowry et al., 2013). Likewise, beach seining and trawl surveys conducted by WDFW in Sinclair Inlet from 2001-2002 did not result in captures of any bull trout (Fresh et al., 2006). Bull trout were not observed during a recent drydock entrainment study (Pacunski et al., 2022). Bull trout have the potential to occur within the Demolition, Construction, Operations portion of the ROI, but occurrence is expected to be rare. Although unlikely, it is possible that bull trout may occur along the Dredged Material Disposal, Contractor Multi-use Site Transit, and Caisson Delivery routes.

Designated Critical Habitat within the ROI

Critical habitat for bull trout was originally designated on September 26, 2005 (70 FR 56212) and later revised on October 18, 2010 (75 FR 63897). Critical habitat is designated along the Puget Sound (southern tip of Elliott Bay) shoreline (Dredged Materials Disposal and Contractor Multi-use Site Transit Routes portion of the ROI) and is also designated along the west coast shoreline (Caisson Delivery Route portion of the ROI). Critical habitat is not designated within the Demolition, Construction, Operations portion of the ROI (75 FR 63897).

1.8.2 ESA-Listed Rockfish

Two ESA-listed rockfish that are likely to occur within the ROI are the Puget Sound/Georgia Basin DPSs of bocaccio (*Sebastes paucispinis*) and yelloweye rockfish (*Sebastes ruberrimus*). The life histories are described in detail below.

1.8.2.1 Puget Sound/Georgia Basin DPS of Bocaccio

Status and Management

NMFS listed the Puget Sound/Georgia Basin bocaccio rockfish DPS as endangered under the ESA on April 28, 2010 (75 FR 22276). The listing includes bocaccio rockfish throughout greater Puget Sound in marine waters east of the Victoria Sill (which spans the Strait of Juan de Fuca from Victoria, B.C. to Port Angeles, Washington), and recognizes that the DPS continues across the international border into the inland waters of British Columbia, Canada. Following the initial listing, NMFS updated and amended the listing description of the bocaccio rockfish DPS on January 23, 2017 to include fish *residing within* the Puget Sound/Georgia Basin rather than fish *originating from* the Puget Sound/Georgia Basin (82 FR 7711).

Population and Abundance

No specific population estimate exists for the Puget Sound/Georgia Basin DPS of bocaccio rockfish (Drake et al., 2010). Historical data indicate that populations of bocaccio have always been low within the Puget Sound. It has been estimated that there were about 100 individual bocaccio in Puget Sound proper in the 1980s (Palsson et al., 2009).

Life History

Bocaccio and other rockfishes are unique among bony fishes in that the fertilization and embryo development is internal, and they give birth to live larval young. Larval young are found in surface waters and may be distributed over a wide area. Larvae and small juvenile rockfish offshore may remain in open waters for several months, being passively dispersed by ocean currents. The retentive circulation patterns of currents within the Puget Sound make it likely that a significant fraction of larvae released by bocaccio there (especially in more inland portions of the Sound) are retained within the Sound (75 FR 22276). Approximately 50 percent of adult bocaccio mature in 4–6 years and may live as long as 50 years (National Oceanic and Atmospheric Administration Fisheries [NMFS], 2021a). Within coastal Pacific ocean waters, bocaccio school with widow (*Sebastes entomelas*), yellowtail (*Sebastes flavidus*), and speckled rockfishes (*Sebastes ovalis*) (Love and York, 2006) and occur in large aggregations under drifting kelp beds and over firm sand-mud bottoms.

Habitat and Geographic Range

The circulation patterns of currents within the Puget Sound limit the dispersal range of bocaccio. Although larval bocaccio do remain in the pelagic environment longer than some other rockfish species (approximately 155 days), it is likely that a significant fraction of larvae released by bocaccio are retained within the Sound, especially throughout the more inland portions of the Puget Sound (74 FR 18516). Although juvenile bocaccio have never been documented within the Puget Sound, habitats that feature rock and macroalgae (kelp species) are most readily used by juvenile bocaccio along the coast (Garrison and Miller, 1982; Love et al., 1991). As adults, densities of bocaccio are highest near rocky habitats (hard substrata), but they have also been documented along areas of high relief and non-rocky substrates such as sand, mud, and other unconsolidated substrates (Miller and Borton, 1980). Rocky habitats are limited in the Puget Sound, with only 3.8 square miles (10 square kilometer [km^2]) of such habitat in Puget Sound proper, and 80 square miles (207 km^2) in North Puget Sound (Palsson et al., 2009). Adult bocaccio are most frequently found between 160 and 820 feet (50 and 250 meters) depth but may be found as

deep as 1,560 feet (475 meters) (Orr et al., 2000; Love et al., 2002). Bocaccio display greater pelagic behavior (willingness to occupy areas higher in the water column) and have more movement potential than other rockfish species (NMFS, 2011). Historically in the Puget Sound, the highest concentrations of bocaccio are found south of Tacoma Narrows (Miller and Borton, 1980).

Predator/Prey Interactions

Predators of juvenile bocaccio include piscivorous fish, such as salmon and rockfish; fish-eating birds, such as terns and cormorants; and harbor seals (Love et al., 2002). The main predators of adult bocaccio are pinnipeds, such as sea lions and harbor seals (Species at Risk Act, 2002**).**

Larval rockfish feed on larval krill, diatoms, dinoflagellates, tintinnids, and cladocerans. Pelagic juveniles are opportunistic feeders, consuming fish larvae, copepods, krill, and euphausiids of all life stages. Adults are primarily piscivores, eating other rockfishes, hake, sablefish, anchovies (*Engraulidae*), lanternfishes, and squid (NMFS, 2010).

Migration

Although bocaccio are generally sedentary, juvenile bocaccio move to deeper water as they age. Tagging studies in Southern California have recaptured juveniles between 0.6 and 92 miles (1 and 148 kilometer) from their tagging location after 2 years (Hartmann, 1987). In that same study, adults were recaptured at their tagging location as much as 827 days later. Acoustic tagging work has shown more complex behavior with most bocaccio staying around 200 to 400 hectares most of the time, but some fish have been known to utilize areas greater than 2,965 acres (1,200 hectares). Some individuals remain at fairly constant depths, while others change depth by as much as 328 feet (100 meters), generally moving to more shallow depths during the day (Drake et al., 2010; Starr et al., 2002). Drake et al. (2010) have summarized information on migration and movements for the bocaccio rockfish.

Species-Specific Threats

Non-pelagic rockfish, including the bocaccio, are extremely vulnerable to overfishing and bycatch during fisheries for other rockfish species. Another contributing factor to the vulnerability of bocaccio, as well as with other rockfishes, is the lack of a vent on their swim bladder. Without venting, bocaccio brought up from depth can suffer injury as air in the swim bladder expands, which often leads to bulging eyes or the stomach protruding from the mouth, in addition to other unseen internal injuries. With an inflated swim bladder, the bocaccio cannot submerge easily and, if released, are subject to predation while floating on the surface. Because of the low survival rates of released bocaccio, catch and release fishing is strongly discouraged (WDFW, 2011). The NMFS (2017) rockfish recovery plan identified the following additional threats as factors contributing to the decline of Puget Sound/Georgia Basin bocaccio: Degradation and/or loss of nearshore and benthic/deepwater habitat, invasive/nonindigenous species, contaminants, nutrient addition and low dissolved oxygen, predation by marine mammals and piscivorous fish, infectious diseases, inbreeding of small isolated populations, hybridization, competition with other rockfish species and hatchery releases of Pacific salmon, derelict fishing gear, natural hazards, ocean acidification, and anthropogenic noise and vessel traffic. These threats pose a serious challenge to the persistence of the Puget Sound/Georgia Basin DPS of bocaccio.

Occurrence within the ROI

The WDFW ROV surveys were conducted exclusively within the rocky habitats of the San Juan Basin in 2008 (Pacunski et al., 2013). Bocaccio were not detected in north Puget Sound or Puget Sound proper (refers to the waters east of and including Admiralty Inlet) by these ROV surveys or bottom trawl surveys (Drake et al., 2010). ROV, hook-and-line, and fish trap surveys adjacent to NAVBASE Kitsap-Bremerton by Lowry et al. (2013) and Frierson et al. (2016) failed to detect bocaccio. However, bocaccio were sampled by genetic and ROV surveys in 2015 within Puget Sound proper (NMFS, 2017). Andrews et al. (2018) reported the recent capture of three bocaccio within the Whidbey Basin. NMFS and WDFW surveys for bocaccio are ongoing, with the most recent captured in June 2022 (Kelly, pers. comm., 2022). The closest bocaccio captured to the NAVBASE Kitsap-Bremerton waterfront was approximately 15 miles (24 kilometers). Although adult and subadult bocaccio are currently present in Puget Sound at an almost undetectable level, their preference for rocky benthic areas between 164 and 1,640 feet (50 and 500 meters) in depth (Palsson et al., 2009) makes their presence in the ROI unlikely. Young-of-the year juvenile bocaccio occur on shallow rocky reefs and nearshore areas (Love et al., 1991) and their association with macroalgae provides habitat for which this life stage may occur within the Demolition and Construction portion of the ROI (Love et al., 1991). Bocaccio are expected to occur along the Dredged Material Disposal, Contractor Multi-use Site Transit, and Caisson Delivery routes.

Designated Critical Habitat within the ROI

NMFS originally designated critical habitat for this DPS on November 13, 2014 (79 FR 68041) and a correction was issued on February 13, 2015 (80 FR 7977) that includes 590.4 square miles (1,529 km^2) of nearshore habitat and 414.1 square miles (1,072.5 km^2) of deepwater habitat. Benthic habitats or sites deeper than 98 feet (30 meters) that possess or are adjacent to areas of complex bathymetry consisting of rock and/or highly rugose habitat are essential to conservation because these features support growth, survival, reproduction, and feeding opportunities by providing the structure for rockfishes to avoid predation, seek food, and persist for decades. Critical habitat was not designated for bocaccio rockfish within the Naval Restricted Areas located in Sinclair Inlet due to national security exclusion (79 FR 68041). The critical habitat exclusion area in Sinclair Inlet includes all the waters of Sinclair Inlet west of a line drawn from the Bremerton ferry landing on the north shore of Sinclair Inlet down to the south shore of Sinclair Inlet (see Figure 3.5-5 of the EIS). Designated critical habitat overlaps with Dredged Material Disposal, Contractor Multi-use Site Transit, and Caisson Delivery routes.

The PBFs considered essential to the conservation of adult bocaccio include:

- **Quantity, quality, and availability of prey species** to support individual growth, survival, reproduction, and feeding opportunities.
- **Water quality and sufficient levels of dissolved oxygen** to support growth, survival, reproduction, and feeding opportunities.
- **The type and amount of structure and rugosity (surface roughness)** necessary to provide adequate shelter.

The PBFs considered essential to the conservation of juvenile bocaccio include:

- **Quantity, quality, and availability of prey species** to support individual growth, survival, reproduction, and feeding opportunities.

- **Water quality** and sufficient levels of dissolved oxygen to support growth, survival, reproduction, and feeding opportunities.
- **Settlement habitats** located in the nearshore with substrates such as sand, rock, and/or cobble compositions that also support Kelp (families Chordaceae, Alariaceae, Lessoniacea, Costariaceae, and Laminaricea) because these features enable forage opportunities and refuge from predators, and enable behavioral and physiological changes needed for juveniles to occupy deeper adult habitats.

1.8.2.2 Puget Sound/Georgia Basin DPS of Yelloweye Rockfish

Status and Management

NMFS listed Puget Sound/Georgia Basin DPS of yelloweye rockfish as threatened under the ESA on April 28, 2010 (75 FR 22276). The listing includes yelloweye rockfish throughout the greater Puget Sound in marine waters east of the Victoria Sill (which spans the Strait of Juan de Fuca from Victoria, B.C. to Port Angeles, Washington), and recognizes that the DPS continues across the international border into the inland waters of British Columbia, Canada. Recent research has found evidence for two populations of yelloweye rockfish within the DPS – one in Hood Canal and one within the rest of the Puget Sound/Georgia Basin (NMFS, 2017). Following the initial listing, NMFS updated and amended the listing description of the yelloweye rockfish DPS on January 23, 2017 (82 FR 7711) to include fish *residing within* the Puget Sound/Georgia Basin rather than fish *originating from* the Puget Sound/Georgia Basin, and correcting a descriptive boundary to include Johnstone Strait in Canada based on a new evaluation of genetic similarity and systematic variation (Andrews et al., 2018).

Managers have constrained catches by eliminating all retention of yelloweye rockfish in both commercial and recreational fisheries, instituting broad spatial closures, and creating new gear restrictions intended to reduce trawling in rocky shelf habitats and the coincident catch of rockfish in shelf flatfish trawls (Taylor and Wetzel, 2011).

Population and Abundance

From the mid-1970s to mid-1990s, recreational catch and effort data suggests possible declines in yelloweye rockfish abundance (Palsson et al., 2009). The number of angler trips increased substantially, while there was a decline in the average number of rockfish caught per trip. These data suggest declines in the population over time when correlated together. Surveys conducted by WDFW within the past few years have not detected yelloweye rockfish in Central Puget Sound; however, few of these fish are caught by anglers, which suggests low population abundance (NMFS, 2021b).

Life History

Yelloweye rockfish are among the largest rockfish species (Love et al., 2002). Yelloweye rockfish and other rockfishes are unique among bony fishes in that the fertilization and embryo development of their young is internal, and they give birth to live larval young. Fecundity in female yelloweye rockfish ranges from 1.2 to 2.7 million young. Yelloweye rockfish larval release occurs between February and September. The larval young are found in surface waters and may be distributed over a wide area extending several hundred miles (several hundred kilometers) offshore. Their survival is affected by ocean conditions such as temperature, currents, and the availability of food. Larvae and small juvenile rockfish may remain in open waters for several months, being passively dispersed by ocean currents. Yelloweye rockfish juveniles, unlike bocaccio rockfish, do not typically occupy shallow, intertidal areas, but settle in deeper,

300–590 feet (91 to 180 meters) waters (NMFS, 2021b). Approximately 50 percent of adult yelloweye rockfish are mature by 16 inches (41 centimeters) total length, which is about 6 years of age. Yelloweye rockfish are among the longest-lived rockfishes and can live up to 118 years (NMFS, 2021b).

Habitat and Geographic Range

Yelloweye rockfish range from northern Baja California to the Aleutian Islands, Alaska, but are most common from central California northward to the Gulf of Alaska. Juveniles and subadults tend to be more common than adult fish in shallower water and are associated with rocky reefs, canopy kelp, and artificial structures. As yelloweye rockfish mature, they move to deeper water and increase in size, but usually exhibit strong site fidelity to rocky bottoms and outcrops. Yelloweye rockfish occur in waters 80–1,560 feet (24–475 meters) but are most commonly found between 300 and 590 feet (91 and 180 meters) (NMFS, 2021b).

Predator/Prey Interactions

Common predators of adult yelloweye rockfish include killer whales, seals, sharks, and dolphins. Juvenile yelloweye rockfish may be taken by birds, porpoises, and fishes such as other rockfish and lingcod. Larval rockfish feed on diatoms, dinoflagellates, tintinnids, and cladocerans, while juveniles consume copepods and euphausiids of all life stages. Adults eat demersal invertebrates and small fishes, including other species of juvenile rockfish associated with kelp beds, rocky reefs, pinnacles, and sharp drop-offs (NMFS, 2021b; Drake et al., 2010).

Migration

No real migration is known for adult yelloweye rockfish. Adult yelloweye rockfish, like many species of non-pelagic rockfish, have small home ranges, and some of them may live their entire adult life on a single rock pile (WDFW, 2011).

Species-Specific Threats

Non-pelagic rockfish, including the yelloweye rockfish, are extremely vulnerable to overfishing and bycatch during fisheries for other rockfish species. Another contributing factor to the vulnerability of yelloweye rockfish, as well as with other rockfishes, is the lack of a vent on their swim bladder. Without venting, yelloweye rockfish brought up from depth can suffer injury as air in the swim bladder expands, which often leads to bulging eyes or the stomach protruding from the mouth, in addition to other unseen internal injuries. With an inflated swim bladder, the yelloweye rockfish cannot submerge easily and, if released, are subject to predation while floating on the surface. Because of the low survival rates of released yelloweye rockfish, catch and release fishing is strongly discouraged (WDFW, 2011). Additional threats to yelloweye rockfish identified by NMFS (2017) are discussed above for bocaccio. Because the species is slow growing, late to mature, and long-lived, recovery from threats will take many years, even if the threats are no longer affecting the species. These threats pose a serious challenge to the persistence of the Puget Sound/Georgia Basin DPS of yelloweye rockfish.

Occurrence within the ROI

WDFW ROV surveys were conducted exclusively within the rocky habitats of the San Juan Basin in 2008, recording 39 juvenile yelloweye rockfish in western San Juan Islands (Pacunski et al., 2013). Trawl data in Puget Sound proper detected the presence of yelloweye rockfish in 2004 but were not observed in

earlier trawl surveys (1987, 1989, 1991, and 2001) (Drake et al., 2010). REEF scuba survey data has consistently recorded observations of yelloweye rockfish since 2001 within northern and southern Puget Sound (Drake et al., 2010). ROV, hook-and-line, and fish trap surveys adjacent to NAVBASE Kitsap-Bremerton by Lowry et al. (2013) and Frierson et al. (2016) failed to detect yelloweye rockfish. Andrews et al. (2018) reported the recent capture of four yelloweye within Central Puget Sound during angling fish surveys focused on known historical hot spots for yelloweye identified by recreational fishers and fisheries managers. Although yelloweye rockfish are currently present in Puget Sound at low numbers, their preference for rocky benthic areas between 50 and 500 meters in depth (Palsson et al., 2009) makes their presence within Sinclair Inlet unlikely. Yelloweye rockfish are expected to occur along the Dredged Material Disposal, Contractor Multi-use Site Transit, and Caisson Delivery routes.

Designated Critical Habitat within the ROI

NMFS originally designated critical habitat for this DPS on November 13, 2014 (79 FR 68041) and a correction was issued on February 13, 2015 (80 FR 7977) that includes 414.1 square miles (1,072.5 km^2) of deepwater habitat. Benthic habitats or sites deeper than 98 feet (30 meters) that possess or are adjacent to areas of complex bathymetry consisting of rock and/or highly rugose habitat are essential to conservation because these features support growth, survival, reproduction, and feeding opportunities by providing the structure for rockfishes to avoid predation, seek food, and persist for decades. Critical habitat was not designated for bocaccio rockfish within the NRAs located in Sinclair Inlet due to national security exclusion (79 FR 68041). The critical habitat exclusion area in Sinclair Inlet includes all the waters of Sinclair Inlet west of a line drawn from the Bremerton ferry landing on the north shore of Sinclair Inlet down to the south shore of Sinclair Inlet (see Figure 3.5-5 of the EIS). Designated critical habitat overlaps with Dredged Material Disposal, Contractor Multi-use Site Transit, and Caisson Delivery routes.

The following physical or biological features are considered essential to the conservation of adult and juvenile yelloweye rockfish:

- **Quantity, quality, and availability of prey species** to support individual growth, survival, reproduction, and feeding opportunities.
- **Water quality and sufficient levels of dissolved oxygen** to support growth, survival, reproduction, and feeding opportunities.
- **Structure and rugosity** that supports feeding opportunities and predator avoidance.

1.9 ESA-Proposed Sunflower Sea Star

1.9.1 Status and Management

NMFS issued a proposed rule to list the sunflower sea star as a threatened species under the ESA in March 2023 (88 FR 16212).

1.9.2 Species Abundance

Prior to the onset of sea star wasting syndrome (SSWS), which resulted in massive die-off of the species between 2013 and 2017, the species was fairly common throughout its range, with local abundance likely tied to prey availability and other factors. Following the SSWS pandemic, the species suffered an estimated 94.3 percent decline across its range, with declines of 99.6 to 100 percent in the southern portion of the range (Hamilton et al., 2021), which includes the Demolition, Construction, and Operations ROI. Additionally, the species has not recovered since 2017, with few juveniles surviving to

adulthood and little evidence of recent recruitment or rebound (Gravem et al., 2021; Lowry et al., 2022 [both as cited in 88 FR 16212]).

1.9.3 Distribution

Sunflower sea stars are native to marine waters along the Pacific Coast from Mexico to Alaska and are most common from the Alaska Peninsula to Monterey, California.

The species is a habitat generalist (Gravem et al., 2021 as cited in 88 FR 16212) and occupies a large geographic and depth range. Sunflower sea stars occur along the outer coasts and inside waters, most commonly in temperate waters, and are found in kelp forests, rocky intertidal areas (Hodin et al., 2021), and eelgrass meadows (Dean and Jewett, 2001; Gravem et al., 2021). They occupy a wide range of benthic substrates, and are found in the low intertidal and subtidal zones to a depth of 1,427 feet (435 meters), but are most common at depths less than 25 meters and rare in waters deeper than 394 feet (120 meters) (Fisher, 1928; Lambert, 2000; Hemery et al., 2016; Gravem et al., 2021 [all as cited in 88 FR 16212]).

1.9.4 Behavior and Diet

Reproductive cycles vary and are likely influenced by environmental factors such as food availability, seawater temperature, photoperiod, salinity, and the lunar cycle (Chia and Walker, 1991; Pearse et al., 1986 [both as cited in 88 FR 16212]). Detailed information about reproduction in the species is lacking. Based on one old study from the Bremerton area (Kjerskog-Agersborg, 1918 as cited in 88 FR 16212) it appears that individuals migrate to shallower waters during the spawning season, where they form temporary large aggregations.

Larval and pre-metamorphic individuals are planktonic feeders. Adults generally consume benthic and mobile epibenthic invertebrates, including sea urchins, snails, crabs, sea cucumbers, and other sea stars. (Mauzy et al., 1968; Shivji et al., 1983 [both as cited in 88 FR 16212]). They also feed on sessile invertebrates such as barnacles and bivalves, and in subtidal sites in Puget Sound, up to 72 percent of their diet comes from clams, which they dig out from the substrate with their arms (Mauzy et al., 1968 as cited in 88 FR 16212).

1.9.5 Species-Specific Threats

The sunflower sea star remains highly susceptible to SSWS, a disease caused by one or more viruses that may be exacerbated by ocean warming, ocean acidification, toxic contaminants, and other processes that generate physiological stress in individuals. Because the disease is not thoroughly understood, additional research is needed to determine effective regulatory mechanisms for protecting the species.

1.9.6 Occurrence within the ROI

The Demolition, Construction, and Operations ROI is within the range of the sunflower sea star, although there have been no surveys for this species to document whether it is present. Casendino et al. (2023) demonstrated that in surveys conducted from 1997–2019, which included nearby Port Madison, sunflower sea star were most abundant at shallower depths (<82 feet [<25 m]). Further, sunflower sea star were relatively absent from the catch after 2010. Given the extreme population decline in this area, sunflower sea stars are unlikely to be present in the Bremerton waterfront area. However, in the absence of surveys, its occurrence cannot be ruled out. It is possible that sunflower sea star may occur along portions of the Dredged Material Disposal, Contractor Multi-use Site Transit, and Caisson Delivery routes.

1.9.7 Designated Critical Habitat within the ROI

No critical habitat has been proposed for this species because NMFS has concluded that it is not currently determinable (88 FR 16212).

1.10 Marine Mammal Species that are not ESA-listed

Ten non-listed marine mammals may be present in the ROI that are protected under the MMPA (see Table 1-3). This section describes status, abundance, distribution, and occurrence for species within the Demolition, Construction, Operations and Dredged Materials Disposal and Contractor Multi-use Site Transit route portions of the ROI as these activities have the greatest potential to affect marine mammals.

Several dolphin species, including Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), common bottlenose dolphin (*Tursiops truncatus*), short-beaked common dolphin (*Delphinus delphis*), and Risso's dolphin (*Grampus griseus*), have been detected in Puget Sound on occasion but are not expected to occur in the Demolition, Construction, Operations ROI.

Northern sea otter (*Enhydra lutris kenyoni*) have also been detected in Puget Sound on occasion, but known populations are limited to rocky habitat along the Olympic Peninsula and the western portion of the Strait of Juan de Fuca and are not expected to occur in the vicinity of the Demolition, Construction, Operations ROI.

1.10.1 Humpback Whale

See Section 1.1.1 for information regarding the distribution, behavior, diet, and ROI presence of humpback whales. Four stocks of humpback whales are currently recognized along the U.S. West Coast: the Central America/Southern Mexico – California-Oregon-Washington stock, the Mainland Mexico – California-Oregon-Washington stock, the Mexico – North Pacific stock, and the Hawai'i stock (Carretta et al., 2024; Young et al., 2024). Individuals from the Central America/Southern Mexico – California-Oregon-Washington stock, Mainland Mexico – California-Oregon-Washington stock, and Hawai'i stock could occur in the vicinity of Puget Sound Navy installations. NMFS conducted a global status review and reclassified the humpback whale into 14 DPSs (81 FR 62260) in 2016. Of these 14 DPSs, the ESA-listed Mexico DPS (listed as threatened) and Central America DPS (listed as endangered) and the non-listed Hawai'i DPS have the potential to occur in the vicinity of the project. Both of the ESA-listed DPSs are considered depleted under the MMPA (81 FR 62260). Under the revised stock structure described in the 2022 SARs, the Hawai'i DPS, which is not listed under the ESA, is aligned with the newly described Hawai'i stock (Young et al., 2023). The Hawai'i stock consists of one DIP (the Hawai'i – Southeast Alaska/Northern British Columbia DIP) and one unit (the Hawai'i – North Pacific unit), which may or may not comprise multiple DIPs. Lacking available data to assess them separately, NMFS manages the DIP and unit as a single stock. Individuals from the Hawai'i - Southeast Alaska/Northern British Columbia DIP generally winter off Hawai'i and summer in Southeast Alaska and Northern British Columbia, including a small number of humpbacks that summer in Southern British Columbia and Washington State. Individuals from the Hawai'i – North Pacific unit also winter in Hawai'i, but summer in Russia and Western/Central Alaska from the Bering Sea and Aleutian Islands to the Gulf of Alaska, excluding Southeast Alaska. The Hawai'i stock is not considered strategic or depleted (Young et al., 2023).

1.10.2 Minke Whale

1.10.2.1 Status and Management

Minke whales are protected under the MMPA, but they are not considered depleted or strategic, nor are they listed under the ESA. The greatest uncertainty in their status is whether entanglement in commercial gillnets and ship strikes could have reduced their relatively small local population.

The taxonomy, or classification, of the minke whale is complex. The northern (or common) minke whale is separated into two distinct subspecies: the North Pacific (*B. a. scammoni*) and North Atlantic (*B. a. acutorostrata*). The North Pacific subspecies is broken into three management stocks: the Alaskan stock; the California-Oregon-Washington stock; and the Hawai'i stock. The California-Oregon-Washington stock of minke whale is considered a resident stock (Carretta et al., 2018) and includes minke whales within the inland Washington waters of the Puget Sound and the San Juan Islands (Dorsey et al., 1990).

1.10.2.2 Species Abundance

No estimates have been made for the number of minke whales in the entire North Pacific. The abundance estimate for the California-Oregon-Washington stock of minke whales is 915 individuals (see Table 1-3) (Carretta et al., 2024). A small number of minke whales appear to have established home ranges in the inland waters of Washington primarily in the Strait of Juan de Fuca and the San Juan Islands area, and are relatively rare south of Admiralty Inlet (Navy, 2019).

1.10.2.3 Distribution

Dorsey et al. (1990) noted minke whales feeding in locations of strong tidal currents. Hoelzel et al. (1989) reported that 80 percent of the feeding observations in the San Juan Islands were over submarine slopes of moderate incline at a depth of about 66 feet (20 meters) to 328 feet (100 meters). Three feeding grounds have been identified in the Strait of Juan de Fuca and the San Juan Islands area (Osborne et al., 1988; Hoelzel et al., 1989; Dorsey et al., 1990; Stern 2005). There is year-to-year variation in the use of these feeding areas, and other feeding areas probably exist (Osborne et al., 1988; Dorsey et al., 1990). Washington inland water sighting data from January 2005 through August 2012 indicate that minke whales typically occur as lone individuals or in small groups of two or three (Orca Network, 2025).

1.10.2.4 Behavior and Diet

Although minke whales are usually sighted individually or in small groups of two to three, loose groupings of up to 400 animals have been seen in feeding areas closer to the poles. Minke whales feed by side-lunging into schools of prey and gulping large amounts of water. Minke whales opportunistically feed on crustaceans, plankton, and small schooling fish Species-Specific Threats

Threats to minke whales include vessel strikes, entanglement, and ocean noise.

1.10.2.5 Occurrence within the ROI

Sightings of minke whales in Puget Sound, south of Admiralty Inlet are infrequent. Approximately 55 minke whale opportunistic sightings were recorded by Orca Network between January 2005 and August 2012 in inland Washington waters. Most of those sightings (n=41) were in Admiralty Inlet and the 14 records that were in Puget Sound (but outside Admiralty Inlet) occurred from March through October (Orca Network, 2025). No sightings were reported in the vicinity of NAVBASE Kitsap-Bremerton (Rich

Passage through Agate Passage including Sinclair Inlet and Dyes Inlet). Based on this information, the number of minke whales potentially present in the ROI is expected to be very low in any given month, with the lowest likelihood during the winter months.

1.10.3 Gray Whale

1.10.3.1 Status and Management

Two North Pacific populations of gray whales are formally recognized: the Western Pacific DPS (also known as the Western North Pacific or the Korean-Okhotsk population) that is critically endangered and shows no apparent signs of recovery, and the Eastern Pacific DPS (also known as the Eastern North Pacific or the California-Chukchi population) that appears to have recovered from exploitation and was removed from listing under the ESA in 1994 (59 FR 31094). All populations of the gray whale are protected under the MMPA; the Western Pacific subpopulation is listed as endangered under the ESA and is depleted under the MMPA, but there is no designated critical habitat for this species.

A few hundred gray whales (considered to be a subset of the Eastern Pacific gray whale population) are recognized as the Pacific Coast Feeding Group (PCFG). Instead of using the typical migratory route of the Eastern Pacific population, these whales feed do not travel to Arctic waters but remain along the Pacific coast between southeastern Alaska and Southern California throughout the summer and fall (Calambokidis et al., 2017b). The PCFG population estimate is low, at only about 243 individuals (Carretta et al., 2024). While the PCFG is recognized as a distinct feeding aggregation (Carretta et al., 2020), this small group of whales has generated uncertainty regarding the stock structure of the Eastern North Pacific population (Carretta et al., 2020). Photo-identification, telemetry, and genetic studies suggest that the PCFG may be demographically distinct (Calambokidis et al., 2010; Mate et al., 2010; Frasier et al., 2011; Lagerquist et al., 2019). However, the NMFS Task Force on gray whale stock structure (Weller et al., 2013) was not able to provide definitive advice as to whether the PCFG is a separate population stock under MMPA guidelines, and the group has no formal status under the MMPA, International Union for Conservation of Nature, or ESA. Currently, the PCFG is not treated as a distinct stock in the NMFS stock assessment reports, but this may change in the future based on new information (Carretta et al., 2022; Weller et al., 2013).

1.10.3.2 Species Abundance

The most recent estimate of abundance for the Eastern North Pacific population is from the 2015/2016 southbound survey and is 26,960 (CV=0.05) whales (Carretta et al., 2024). The minimum population estimate is 25,849. The 2015 PCFG population estimate is low, at only about 243 individuals (Carretta et al., 2024).

1.10.3.3 Distribution

While the majority of the gray whale population migrates past the Strait of Juan de Fuca en route to or from their high latitude feeding or low latitude breeding grounds, a few of them enter Washington inland waters to feed (Stout et al., 2001).

Gray whales are observed in Washington inland waters, including Puget Sound, in all months of the year (Calambokidis et al., 2010; Orca Network, 2025), with peak numbers from March through June (Calambokidis et al., 2010).

Fewer than 20 gray whales are typically documented in the inland waters of Washington and British Columbia each year, beginning in January (WDFW, 2012). Most whales sighted are part of a small, regularly occurring group of 15–20 gray whales that use mudflats in the Whidbey Island and the Camano Island area as a springtime feeding area (Orca Network, 2025; Pavlinovic and Calambokidis, 2024). Observed feeding areas are located in Saratoga Passage between Whidbey and Camano Islands, including Crescent Harbor, and in Port Susan Bay between Camano Island and the mainland north of Everett (Orca Network, 2025).

1.10.3.4 Behavior and Diet

Gray whales are frequently observed traveling alone or in small, mostly unstable groups, although large aggregations may be seen in feeding and breeding grounds. Like other baleen whales, long-term bonds between individuals are thought to be rare.

They are primarily bottom feeders that consume a wide range of benthic (sea floor) and epibenthic (above the sea floor) invertebrates, such as amphipods. Gray whales suck sediment and food from the sea floor by rolling on their sides and swimming slowly along, filtering their food through 130 to 180 coarse baleen plates on each side of their upper jaw. In doing so, they often leave long trails of mud behind them and "feeding pits" on the seafloor. Gray whales also feed on dense aggregations of ghost shrimp (*Neotrypaea californiensis*) (Weitkamp et al., 1992; Richardson, 1997).

1.10.3.5 Species-Specific Threats

Threats to gray whales include vessel strikes, entanglement, disturbance from whale watching activities, and ocean noise. From December 17, 2018 through November 9, 2023, NMFS tracked an unusual mortality event (UME) of gray whales along the Pacific coast. A total of 690 strandings of gray whale in the U.S., Canada, and Mexico were associated with this UME (NOAA, 2025). Preliminary examinations of stranded whales has found signs of emaciation in a subset of the whales. Vessel strikes and killer whale predation have also been documented in stranded gray whales analyzed as part of the UME (NOAA, 2024). The Investigative Team concluded that the preliminary cause of the UME was localized ecosystem changes in the whale's Subarctic and Arctic feeding areas that led to changes in food, malnutrition, decreased birth rates, and increased mortality all documented during the UME.

1.10.3.6 Occurrence within the ROI

Gray whales that are not identified with the regularly occurring group in the Whidbey Island and Camano Island area are occasionally sighted in Puget Sound. These whales are not associated with feeding areas and are often emaciated (WDFW, 2012). There are typically from 2 to 10 stranded gray whales per year in Washington (Cascadia Research, 2012), but the UME from December 2018–November 2023 recorded 84 strandings in Washington during that time period (NOAA, 2025). Most recently, a gray whale spent several weeks in Dyes Inlet near NAVBASE Kitsap-Bremerton in April and May 2023 and subsequently stranded near Olympia, Washington in June 2023.

Any gray whale use of the ROI would be limited to rare occurrences and presence would be most likely between March and November.

1.10.4 Killer Whale, West Coast Transient Stock

1.10.4.1 Status and Management

Among the genetically distinct assemblages of killer whales in the northeastern Pacific, the West Coast Transient stock, which ranges from California to southeastern Alaska, is one of two stocks that may occur in the vicinity of the Dredged Materials Disposal and Contractor Multi-use Site Transit Routes, Demolition, Construction, and Operations ROIs. Killer whales belonging to the West Coast Transient stock are protected under the MMPA, but not listed under the ESA. Based on ecological, morphological, and genetic data, a new species name has been recently proposed for this stock, *Orcinus rectipinnus* (Morin et al., 2024).

1.10.4.2 Species Abundance

Historically, the number of West Coast Transient killer whales in Washington inland waters at any one time was considered likely to be fewer than 20 individuals (Wiles, 2004). More recently, the Pacific Whale Watch Association (PWWA) recorded observations of West Coast Transient killer whales in the Salish Sea on 278 days in 2022, with a total of 1,221 unique sightings (defined as an observation of a specific group of killer whales on a single day and does not include repeat reports of the same whales on the same day; PWWA, 2023). On April 1, 2022, 72 individual West Coast Transient killer whales from 10 different groups were documented in the Salish Sea (PWWA, 2022). Many of the West Coast Transients in Washington inland waters have been catalogued by photo-identification (Towers et al., 2019).

A minimum abundance estimate for the West Coast Transient stock is 349 animals based on photographic data (Young et al., 2024). This estimate is considered conservative and does not include whales from southeastern Alaska and California that are provisionally classified as part of the stock (Allen and Angliss, 2013).

1.10.4.3 Distribution

The geographical range of the West Coast Transient stock of killer whales includes waters extending from California through southeastern Alaska; higher abundances are found within the coastal waters of southern Alaska and British Columbia (Krahn et al., 2002). Transient killer whales in the Pacific Northwest spend most of their time along the outer coast of British Columbia and Washington, but visit inland waters in search of harbor seals, porpoises, sea lions, and other prey. Transients may occur in inland waters in any given month (Shields, 2018), but studies have shown seasonal increases in occurrences: Baird and Dill (1995) found some transient groups frequenting the vicinity of harbor seal haulouts around southern Vancouver Island during August and September, which is the peak period for pupping through post-weaning of harbor seal pups. During the period 2004–2010, transient killer whales occurred in Washington inland waters most frequently in August-September with a strong second peak in April-May (Houghton et al., 2015). However, not all transient groups were seasonal in these studies and their movements appeared to be unpredictable.

1.10.4.4 Behavior and Diet

West Coast Transient killer whales most often travel in small pods of up to four individuals (Baird and Dill, 1996). Houghton et al. (2015) reported that the group size most often observed in the Salish Sea was four whales for 2004–2010. This is larger than the size most often observed from 1987–1993, indicating that group size appears to be increasing during 2004–2010. According to unpublished data (Houghton,

pers. comm., 2012), the most commonly observed group size in Puget Sound (Puget Sound is defined in Section 2 as waters east of Admiralty Inlet [including Hood Canal] through South Puget Sound and north to Skagit Bay) from 2004 to 2010 was 6 whales (mode = 6, mean = 6.88) (Houghton, pers. comm., 2012). During the April 1, 2022 single-day record of 72 West Coast Transient killer whales observed throughout the Salish Sea, the largest group documented was 19 (PWWA, 2022).

According to the Center for Whale Research (2025), transient killer whales tend to travel in small groups of one to five individuals, and stay close to shorelines, often near seal rookeries when pups are being weaned. Diet is comprised of a variety of marine mammal species and squid. Harbor seals represent about half or more of the prey captured or attacked in British Columbia, Washington, and Southeast Alaska. A 2014 study reported substantial numbers of squid remains in the stomachs of two West Coast Transient killer whales suggests that squid may be a larger component of the diet than previously recognized (Hanson and Walker, 2014). Seabirds are rarely consumed (Ford et al., 1998).

1.10.4.5 Species-Specific Threats

Killer whale populations in the northeastern Pacific are variously affected by three primary threats: changes to prey availability that may occur due to fishing or natural hazards , elevated levels of environmental contaminants, and vessel effects and anthropogenic marine sound.

1.10.4.6 Occurrence within the ROI

Transient killer whales in the Pacific Northwest spend most of their time along the outer coast of British Columbia and Washington but occasionally visit the inland waters of Puget Sound while hunting for prey. West Coast Transient killer whales have been seen infrequently near NAVBASE Kitsap-Bremerton (e.g., sightings in May 2010, April and June 2013, June 2015, August 2022, June 2023 April 2024, May 2024, February 2025 and April 2025 in Dyes Inlet, and June 2015, June 2019, April 2020, May 2022, August 2022, April 2023,May 2023, October 2023, April 2024, May 2024, November 2024, February 2025, March 2025, and April 2025 in Sinclair Inlet) (Orca Network, 2025). While this stock may be present year-round in Puget Sound, it is most often observed in the ROI in spring and summer (see Table 1-3).

1.10.5 Harbor Porpoise

1.10.5.1 Status and Management

Harbor porpoises are protected under the MMPA, but not listed under the ESA. NMFS conservatively recognizes two stocks in Washington waters: the Oregon/Washington Coast stock and the Washington inland waters stock (Carretta et al., 2024). Individuals from the Washington inland waters stock are expected to occur in Puget Sound.

1.10.5.2 Species Abundance

The Washington inland waters stock mean abundance estimate based on 2013 to 2015 aerial surveys conducted in the Strait of Juan de Fuca, San Juan Islands, Gulf Islands, and Strait of Georgia is 11,233 harbor porpoises (Carretta et al., 2024). The minimum population estimate is 8,308.

1.10.5.3 Distribution

Harbor porpoises were historically one of the most commonly observed marine mammals in Puget Sound (Scheffer and Slipp, 1948); however, there was a significant decline in sightings beginning in the 1940s (Everitt et al., 1979; Calambokidis et al., 1992), likely due to adverse interactions with fishing and water pollution (Evenson et al., 2016). Only a few sightings were reported between the 1970s and 1980s

(Calambokidis et al., 1992; Osmek et al., 1996; Suryan and Harvey, 1998), and no harbor porpoise sightings were recorded during multiple ship and aerial surveys conducted in Puget Sound (including Hood Canal) in 1991 and 1994 (Calambokidis et al., 1992; Osmek et al., 1996). Incidental sightings of marine mammals during aerial bird surveys conducted as part of the Puget Sound Ambient Monitoring Program (PSAMP) detected few harbor porpoises in Puget Sound between 1992 and 1999 (Nysewander et al., 2005). Since 1999, the Puget Sound Ambient Monitoring Program data and stranding data have documented increasing numbers of harbor porpoise in Puget Sound, indicating that the species was returning to the area (Washington Department of Fish and Wildlife, 2008). Navy-funded systematic aerial surveys conducted in the Washington's inland waters have confirmed that harbor porpoises are present in Puget Sound year-round and have reoccupied their historic range within Puget Sound (Navy, 2019).

1.10.5.4 Behavior and Diet

Harbor porpoises mainly prey on schooling fish, like herring and mackerel. Occasionally, they will consume squid and octopus. They are most often observed singly, in pairs, or in groups of up to 10, although there are reports of aggregations of up to 200 harbor porpoises (Carretta et al., 2022). Most seasonal movements appear to be inshore-offshore and may be influenced by prey availability.

1.10.5.5 Species-Specific Threats

Threats to harbor porpoise include entanglement in fishing gear and ocean noise.

1.10.5.6 Occurrence within the ROI

In Washington inland waters, harbor porpoise is known to occur in the Strait of Juan de Fuca and the San Juan Island area year-round (Calambokidis and Baird, 1994; Osmek et al., 1996; Carretta et al., 2012; Hall, 2004, 2011). Since 1999, PSAMP data, stranding data, and aerial surveys conducted from 2013 to 2015 documented increasing numbers of harbor porpoise in Puget Sound, indicating that the species is increasing in the area (WDFW, 2008; Jeffries, 2013; Jefferson et al., 2016). Little information is available on harbor porpoise sightings at NAVBASE Kitsap-Bremerton, but based on the regional density estimate of 0.54 individuals per square kilometers (Navy, 2020), this species is expected to regularly occur in the vicinity of NAVBASE Kitsap-Bremerton in low numbers.

1.10.6 Dall's Porpoise

1.10.6.1 Status and Management

Dall's porpoises are protected under the MMPA and are not listed under the ESA. Dall's porpoise is managed by NMFS within U.S. Pacific Economic Exclusion Zone waters as two stocks: (1) an Alaska stock; and (2) a California-Oregon-Washington stock (Allen and Angliss, 2012; Carretta et al., 2012). The California-Oregon-Washington stock occurs in Washington inland waters (Carretta et al., 2018).

1.10.6.2 Species Abundance

The most recent estimated abundance for the California-Oregon-Washington stock is 16,498 individuals (see Table 1-3) (Carretta et al., 2024). Additional numbers of Dall's porpoise occur in the inland waters of Washington State, but the most recent estimate of 900 animals obtained in 1996 (Calambokidis et al., 1997) is not included in the overall estimate of abundance for this stock due to the need for more current information. Research published prior to the decline of harbor porpoise in the 1960s suggest that Dall's porpoise was rarely, if ever, seen in Washington's inner marine waters (Evenson et al., 2016). As harbor porpoise declined, Dall's porpoise was likely filling a vacated ecological niche (Evenson et al.,

2016). If this is the case, the occurrence of Dall's porpoise would be expected to decrease as harbor porpoise populations have reestablished themselves in Puget Sound.

1.10.6.3 Distribution

Dall's porpoises may occur in Washington inland waters year-round but appear to be very rare (Evenson et al., 2016). Extensive aerial surveys conducted in Puget Sound and Hood Canal in all seasons from 2013–2015 logged only one individual sighting (Jefferson et al., 2016). Only four Dall's porpoises were detected in aerial surveys of the northern inland waters of Washington (Strait of Juan de Fuca, San Juan Islands, Strait of Georgia) during spring 2015 (Smultea et al., 2015). Additional sightings have been reported in the Strait of Juan de Fuca and Haro Strait between San Juan Island and Vancouver Island (Nysewander et al., 2005; Orca Network, 2025).

1.10.6.4 Behavior and Diet

Dall's porpoises can dive up to 1,640 feet (500 meters) to feed on small schooling fish (e.g., anchovies, herring, and hake), mid- and deepwater fish (e.g., lanternfish and smelts), cephalopods (e.g., squid and octopus), and occasionally crustaceans (e.g., crabs and shrimp). Feeding usually occurs at night when their prey migrates up toward the surface. They have 38 to 56 very small, spade-shaped teeth (about the size of a piece of grain or rice) on each jaw that are useful for grasping.

1.10.6.5 Species-Specific Threats

Threats to Dall's porpoise include entanglement in fishing gear, contaminants, and ocean noise.

1.10.6.6 Occurrence within the ROI

Dall's porpoises were previously detected in Puget Sound during aerial surveys in winter (1993–2008) and summer (1992–1999) as part of the PSAMP (Nysewander et al., 2005; WDFW, 2008), with additional observations reported to Orca Network (2025). During the surveys, Dall's porpoise was sighted in Puget Sound as far south as Carr Inlet in southern Puget Sound and as far north as Saratoga Passage. Dall's porpoise has not been documented in the Rich Passage to Agate Passage area in the vicinity of NAVBASE Kitsap-Bremerton in either summer or winter surveys (Nysewander et al., 2005; WDFW, 2008). Recent extensive aerial surveys of Puget Sound and Hood Canal during 2013–2015 detected only one individual (Jefferson et al., 2016) but did not specify its location. Dall's porpoises could be present in waters in the vicinity of the ROI, but are unlikely to occur with regularity, and if present are likely to occur in small group sizes.

1.10.7 Steller Sea Lion

1.10.7.1 Status and Management

In the North Pacific, NMFS has designated two Steller sea lion stocks: (1) the Western U.S. stock consisting of populations at and west of Cape Suckling, Alaska (144 degrees west longitude); and (2) the Eastern U.S. stock, consisting of populations east of Cape Suckling, Alaska. The western U.S. stock is listed as depleted under the MMPA and endangered under the ESA. Although there is evidence of mixing between the two stocks (Jemison et al., 2013), animals from the western U.S. stock are not present in Puget Sound. Steller sea lion individuals that occur in Puget Sound are from the Eastern DPS (Allen and Angliss, 2013). The Eastern DPS (stock) was removed from listing under the ESA in 2013 because it was stable or increasing throughout the northern portion of its range (Southeast Alaska and British Columbia,

Canada) and stable or increasing slowly in the central portion of its range (Oregon through northern California) (NMFS, 2013).

1.10.7.2 Species Abundance

The minimum estimated eastern U.S. stock of Steller sea lions is 36,308 based on pup counts (Young et al., 2024). In Washington waters, Steller sea lion abundances vary seasonally with a minimum estimate of 1,000 to 2,000 individuals present or passing through the Strait of Juan de Fuca in fall and winter months (Jeffries et al., 2000). Steller sea lion numbers in Washington State decline during the summer months, which correspond to the breeding season at Oregon and British Columbia rookeries (approximately late May to early June) and peak during the fall and winter months (Jeffries et al., 2000). A few Steller sea lions can be observed year-round in Puget Sound although most of the breeding age animals return to rookeries in the spring and summer.

1.10.7.3 Distribution

In Washington, Steller sea lions use haul-out sites primarily along the outer coast from the Columbia River to Cape Flattery, as well as along the Vancouver Island side of the Strait of Juan de Fuca (Jeffries et al., 2000). A major winter haul-out is located in the Strait of Juan de Fuca at Race Rocks, British Columbia, Canada (Canadian side of the Strait of Juan de Fuca) (Edgell and Demarchi, 2012). Numbers vary seasonally in Washington with peak numbers present during the fall and winter months and a decline in the summer months that corresponds habitat and distributional shifts related to the breeding season at and occupancy of coastal rookeries (approximately late May to early June) (Jeffries et al., 2000).

1.10.7.4 Behavior and Diet

Steller sea lions are predatory and consume a wide range of prey, foraging and feeding primarily at night on over a hundred species of fish (including Atka mackerel (*Pleurogrammus monopterygius*), walleye pollock (*Theragra chalcogramma*), salmon, Pacific cod (*Gadus macrocephalus*), Pacific sand lance (*Ammodytes hexapterus*), arrowtooth flounder (*Atheresthes stomias*), Irish lords (*Hemilepidotus hemilepidotus*), rock sole (*Lepidopsetta bilineata*), capelin (*Mallotus villosus*), eulachon, Pacific sandfish (*Trichodon trichodon*), Pacific herring (*Clupea pallasii*), rockfish (*Sebastes spp*.), smooth lumpsucker (*Aptocyclus ventricosus*), and Pacific hake (*Merluccius productus*) and cephalopods (including squid and octopus). Their diet varies in different parts of their range and at different times of the year, depending on the abundance and distribution of prey species.

1.10.7.5 Species-Specific Threats

Steller sea lions are exposed to a variety of human-caused and natural threats including effects of fisheries on prey, natural hazards, predation, toxic substances, contaminants, incidental take due to interactions with active fishing gear, illegal shooting, disease and parasites, entanglement, and illegal feeding.

1.10.7.6 Occurrence within the ROI

Shore-based surveys at NAVBASE Kitsap-Bremerton have only detected Steller sea lion once since the surveys were initiated in 2010, with one individual observed hauled-out on the Port Security Barrier (PSB) in September of 2022 (Navy, 2022). However, there have been other detections of the species at NAVBASE Kitsap-Bremerton. During marine mammal monitoring P-834 Seawolf Class Service Pier Extension, there were 87 observations of Steller sea lion transiting through the monitoring area during

95 days of monitoring, occurring in July to January (Navy, 2021). Naval Base Kitsap, Bangor, Washington Marine mammal monitoring during the 2023 test pile program at Bremerton detected one Steller sea lion during 15 days of monitoring (Navy, 2024). Steller sea lions were detected during aerial surveys conducted by WDFW in spring 2013 on navigational buoys (Jeffries, 2013). Steller sea lions haul-out on floating platforms in Clam Bay approximately 0.5 mile (0.8 kilometer) offshore from the Manchester Fuel Depot's finger pier, approximately 8 miles (13 kilometers) from NAVBASE Kitsap-Bremerton. Since this species irregularly may occur regionally in southern Puget Sound, occasional presence in the ROI may occur, with the potential for a few seasonal residents to be present daily.

1.10.8 California Sea Lion

1.10.8.1 Status and Management

California sea lions are protected under the MMPA and are not listed under the ESA. NMFS has defined one stock for California sea lions (U.S. Stock), with five genetically distinct geographic populations: (1) Pacific Temperate, (2) Pacific Subtropical, (3) Southern Gulf of California, (4) Central Gulf of California, and (5) Northern Gulf of California. The Pacific Temperate population includes rookeries within U.S. waters and the Coronados Islands just south of the U.S./Mexico border. Animals from the Pacific Temperate population range north into Canadian waters, and movement of animals between U.S. waters and Baja California waters have been documented (Carretta et al., 2019).

1.10.8.2 Species Abundance

The population size of the U.S. stock was estimated at 257,606 in 2018 (Carretta et al., 2024). Some 3,000 to 5,000 animals are estimated to move into northwest waters (both Washington and British Columbia) during the fall (September) and remain until the late spring (May) when most return to breeding rookeries in California and Mexico (Jeffries et al., 2000). While there is data lacking on the overall numbers of California sea lions that seasonally visit Puget Sound, an estimated 788 individuals were utilizing haulouts at Navy facilities alone in 2016 (Delong et al., 2017).

1.10.8.3 Distribution

During the nonbreeding season (fall/winter), adult and subadult males migrate northward along the coast to central and northern California, Oregon, Washington, and Vancouver Island, and return south in the spring. They are occasionally sighted hundreds of miles offshore. Primarily male California sea lions migrate into northwest waters with most adult females with pups remaining in waters near their breeding rookeries off the coasts of California and Mexico. California sea lions also enter bays, harbors, and river mouths and often haul-out on man-made structures such as piers, jetties, offshore buoys, and oil platforms.

Jeffries et al. (2000) identified dedicated, regular haulouts used by adult and subadult California sea lions in Washington inland waters. Main haulouts are present at NAVBASE Kitsap-Bremerton, as well as in Rich Passage near Manchester, Seattle (Shilshole Bay), south Puget Sound (Commencement Bay, Budd Inlet), and numerous navigation buoys south of Whidbey Island to Olympia in south Puget Sound (Jeffries et al., 2000).

1.10.8.4 Behavior and Diet

California sea lions feed mainly offshore in coastal areas but may also feed in Puget Sound. They eat a variety of prey—such as squid, anchovies, mackerel, rockfish, salmonids, and sardines—found in

upwelling areas. They also may take fish from commercial fishing gear, sport fishing lines, and fish passage facilities at dams and rivers.

1.10.8.5 Species-Specific Threats

California sea lions are exposed to a variety of human-caused and natural threats including entanglement in fishing gear, biotoxins resulting from harmful algal blooms, and human-caused injuries.

1.10.8.6 Occurrence within the ROI

California sea lions (subadult and adult male sea lions) are typically present most of the year except for June through mid-August in Washington inland waters, with peak abundance numbers between October and March (DeLong et al., 2017). California sea lions would be expected to occasionally forage within the ROI, following local prey availability. During the summer months associated with the species breeding periods, the species is generally absent as they would be at or transiting to and from rookeries in California waters. This period of decreased presence partially coincides with the projects in water work window of July 16 to February 15.

California sea lions have been documented in shore- and boat-based surveys at NAVBASE Kitsap-Bremerton since 2010 (Navy, 2022). Summary reports for these surveys through 2022 indicate that as many as 412 individuals may be hauled-out at one time (October 2019) on the PSB floats that encircle the facility (Navy, 2022). Overall, the number of sea lions observed has been relatively stable since 2016, although there has been variability in survey efforts from year-to-year (41 surveys in 2022 compared to approximately 12 surveys per year preceding 2019.). The average monthly mean of California sea lions hauled-out on the PSB during the in-water work window of July 16 to February 15 is 116 animals for the most recent 10 years of survey data (July 2012 to October 2022).

1.10.9 Northern Elephant Seal

1.10.9.1 Status and Management

Northern elephant seals are protected under the MMPA and are not listed under the ESA. NMFS has defined one stock for the northern elephant seal, the California Breeding stock, which is geographically distinct from a population in Baja California. Individuals that may occur in Puget Sound likely belong to the California Breeding stock although elephant seals from the Baja California population show a similar migration pattern and some seals may travel as far as north as Puget Sound (Robinson et al., 2012).

1.10.9.2 Species Abundance

A complete population count of elephant seals is not possible because all age classes are not ashore at the same time. Instead, pups are counted during the breeding season (because this is the only age class that is ashore in its entirety), and the number of births is estimated from the pup count. The size of the population is then estimated from the number of births and the proportion of pups in the population. The California stock is estimated to have a population of 187,386 (Carretta et al., 2024). Based on trends in pup counts, northern elephant seal colonies were continuing to grow in California through 2005 but are currently stable or slowly decreasing in Mexico (Stewart et al., 1994 as cited in Carretta et al., 2013).

1.10.9.3 Distribution

The northern elephant seal occurs almost exclusively in the eastern and central North Pacific. Rookeries are located from central Baja California, Mexico, to northern California (Stewart and Huber, 1993). Adult elephant seals engage in two long migrations per year, one following the breeding season and another

following the annual molt (Stewart and DeLong, 1995; Robinson et al., 2012). They return to land between the two foraging periods to molt, and females return earlier than males (March through April versus July through August). After the molt, adults then return to their northern feeding areas until the next winter breeding season. Breeding occurs from December to March (Stewart and Huber, 1993). Juvenile elephant seals typically leave the rookeries in April or May and head north as far as coastal British Columbia (Le Boeuf et al., 1996). Most elephant seals return to their natal rookeries when they start breeding (Huber et al., 1991). Their foraging range extends thousands of miles offshore into the central North Pacific (Robinson et al., 2012). Adults tend to stay offshore, but juveniles and subadults are often seen along the coasts of Oregon, Washington, and British Columbia (Condit and Le Boeuf, 1984; Stewart and Huber, 1993; Le Boeuf et al., 1996).

In Washington inland waters, there are regular haulout sites at Smith and Minor Islands, Dungeness Spit, and Protection Island in the Strait of Juan de Fuca, which are thought to be used year-round (Jeffries et al., 2000; Jeffries, 2012 personal communication). Pupping has occurred at these sites as well as at Race Rocks on the British Columbia side of the Strait of Juan de Fuca (Jeffries, pers. comm., 2012). Typically, a small number of individuals, about 2 to 10, are present at these sites. Additionally, a few individuals have been regularly using and even pupping on Whidbey Island and Anacortes (Cauvel, 2020).

1.10.9.4 Behavior and Diet

Northern elephant seals have a diet of mostly squid and fishes, but also rays and sharks. Northern elephant seals spend much of the year—generally about 9 months—in the ocean. They are usually underwater, diving to depths of about 1,000 to 2,500 feet (300 to 762 meters) for 20-to-30-minute intervals with only short breaks at the surface (Le Boeuf et al., 2000; Robinson et al., 2012). They are rarely seen out at sea for this reason. While on land, they tend to prefer sandy beaches.

1.10.9.5 Species-Specific Threats

Threats to elephant seals include entanglement in fishing gear and vessel strikes.

1.10.9.6 Occurrence within the ROI

Aside from the well-publicized individuals that haul-out on Whidbey Island and Anacortes, this species only occasionally is seen hauling-out in Puget Sound when molting, where individual seals haul-out for 32 days (average) to molt, usually during the spring and summer and typically on sandy beaches (Worthy et al., 1992). Shore-based surveys at NAVBASE Kitsap-Bremerton have rarely detected any elephant seals since the surveys began in 2010 (Navy, 2022); however, one individual was seen in August of 2020 near Kitsap Memorial Park (Navy, 2021) and one individual was seen at South Beach on Bainbridge Island in May of 2023, just outside of the Demolition, Construction, and Operations ROI (Navy, 2023b).

1.10.10 Harbor Seal

1.10.10.1 Status and Management

Harbor seals are not listed as depleted under the MMPA, nor are they listed under the ESA. Harbor seals are the most common, widely distributed marine mammal found in Washington marine waters and are frequently observed in the nearshore marine environment. They occur year-round and breed in Washington. Numerous harbor seal haulouts occur in Washington inland waters, and NMFS has tracked three separate stocks based on haulout location:

1. Southern Puget Sound (south of the Tacoma Narrows Bridge);

2. Washington Northern Inland Waters (including Puget Sound north of the Tacoma Narrows Bridge, the San Juan Islands, and the Strait of Juan de Fuca); and
3. Hood Canal.

1.10.10.2 Species Abundance

Aerial surveys of harbor seals in Washington inland waters were conducted during the pupping season in 1999, during which time the total numbers of hauled-out seals (including pups) were counted. In 1999, the mean count of harbor seals was 7,213 in Washington Northern Inland Waters, 711 in Hood Canal, and 1,025 in Southern Puget Sound (Jeffries et al., 2003). Using a correction factor to account for animals in the water, which are missed during aerial surveys, Jeffries et al. (2003) reported population estimates of 11,036 for the Washington Northern Inland Waters stock and 1,568 for the southern Puget Sound stock of harbor seals. However, because the most recent abundance estimate is more than 8 years old, there is no current estimate of abundance and the stock assessment report for harbor seals in Washington inland waters has not been updated since.

1.10.10.3 Distribution

Harbor seals are a coastal species, rarely found more than 12 miles from shore, and frequently occupy bays, estuaries, and inlets (Baird, 2001). Individual seals have been observed several miles upstream in coastal rivers (Baird, 2001). Ideal harbor seal habitat includes haulout sites, shelter during the breeding periods, and sufficient food (Bjørge, 2002). Haul-out areas can include intertidal and subtidal rock outcrops, sandbars, sandy beaches, peat banks in salt marshes, and man-made structures such as log booms, docks, and recreational floats (Wilson, 1978; Prescott, 1982; Schneider and Payne, 1983; Gilbert and Guldager, 1998; Jeffries et al., 2000; Lambourn et al., 2010; London et al., 2012). Harbor seals do not make extensive pelagic migrations (Peterson et al., 2012), though some long-distance movement of tagged animals in Alaska (108 miles [174 kilometers]) and along the U.S. west coast (up to 342 miles [550 kilometers]) have been recorded (Brown and Mate, 1983; Womble and Gende, 2013). Harbor seals have also displayed strong fidelity to haulout sites.

Harbor seals occur year-round and breed in Washington, using numerous harbor seal haulouts that are distributed throughout in Washington inland waters. Haulouts include intertidal and subtidal rock outcrops, beaches, reefs, sandbars, log booms, and floats. Numbers of individuals at haulouts range from a few to between 100 and 500 individuals (Jeffries et al., 2000).

1.10.10.4 Behavior and Diet

The harbor seal's diet consists mainly of fish, shellfish, and crustaceans. Harbor seals complete both shallow and deep dives while hunting depending on the availability of prey.

1.10.10.5 Species-Specific Threats

Harbor seals are exposed to a variety of human-caused and natural threats including entanglement in fishing gear, illegal feeding and harassment, habitat degradation, chemical contaminants, oil spills and energy exploration, vessel collisions, disturbance, and disease.

1.10.10.6 Occurrence within the ROI

Harbor seals using haulouts in the Demolition, Construction, and Operations ROI are designated as being part of the Washington Northern Inland Waters Stock. No haulouts have been identified at NAVBASE Kitsap-Bremerton, and the nearest documented haulouts are across Sinclair Inlet, approximately 0.7 mile

(1.1 kilometer) away. Shore-based surveys at NAVBASE Kitsap-Bremerton have occasionally observed harbor seals hauling-out on the PSB or submarines at NAVBASE Kitsap-Bremerton since the surveys began in 2010 (Navy, 2022). During these surveys, small numbers of harbor seals have also often been observed swimming near the Bremerton waterfront during various months. Approximately 0.24 harbor seals were observed per monitoring day, when monitors were present for a few hours (Navy, 2022). Dead harbor seals are also occasionally located during these surveys or reported by shipyard personnel, with causes of death, if evident, including net entanglement, prematurely born pups, gunshot wounds, and predation wounds. In 2022, nine harbor seal carcasses were recorded at NAVBASE Kitsap-Bremerton (Navy, 2023b). Many of the carcasses were too decomposed to determine cause of death. During marine mammal monitoring conducted for the nearby Manette Bridge (located approximately 1 mile (1.6 kilometer) northeast of NAVBASE Kitsap-Bremerton), an average of 11 harbor seals were spotted per day (Washington State Department of Transportation, 2011, 2012). Coincidentally, the largest number of harbor seals observed in one day at NAVBASE Kitsap-Bremerton during pinniped monitoring was 11 individuals (Navy, 2022). This species is considered to be resident and will be present during the in-water work window of July 16 to February 15.

Harbor seals belonging to the Southern Puget Sound Stock may encounter project vessels along the Contractor Multi-use Site Transit route portion of the ROI in the vicinity of Tacoma. Individuals present in this area may be foraging or transiting to haul-out or foraging locations.

1.11 Bird Species that are not ESA-Listed

The following section discusses those bird species that are most likely to be encountered on the installation and receive federal protection under either the MBTA and/or the BGEPA.

1.11.1 Marine Birds

1.11.1.1 Shorebirds

Shorebirds likely to occur within the ROI are mainly present during winter and/or migration, depending on species life history. Exceptions include the killdeer (*Charadrius vociferus*), which is present year-round, and the spotted sandpiper (*Actitis macularius*), a summer resident and potential breeder in the ROI. Shorebirds primarily rely on resources in the ROI for foraging during the nonbreeding season when overwintering or as a stopover during spring and fall migrations (Buchanan, 2004). Both the killdeer and spotted sandpiper may nest close to water (Opperman, 2003). Many shorebirds such as plovers, sandpipers, sanderlings, and dowitchers forage on larvae and aquatic insects (Buchanan, 2004). Other food sources include amphipods, copepods, crustaceans, and molluscs. Some roosting habitats used by shorebirds include salt flats or grassy areas adjacent to intertidal foraging areas, higher elevation sand beaches, log rafts, piles, and other floating structures, particularly when natural roost sites are limited (Buchanan, 2004). Some of these habitats are present within the ROI and could be used by shorebirds.

1.11.1.2 Waterfowl

Most marine waterfowl species occur during the winter in the ROI and migrate north during their breeding season. However, common (*Mergus merganser*) and red-breasted mergansers (*Mergus serrator*), Canada geese (*Branta canadensis*), and some dabbling duck (*Anas* spp.) species can be observed year-round. Marine waterfowl primarily forage in the nearshore environment, including near man-made structures, but are also found in deeper marine waters. The primary forage resources of marine waterfowl include mollusks, crustaceans, and plant material. Other secondary food sources in the nearshore environment are aquatic larvae and invertebrates. In the Puget Sound, eelgrass beds are

important foraging zones for dabbling ducks (Lovvorn and Baldwin, 1996). Mergansers, such as the common merganser, nest close to water in rock crevices, tree cavities, or under tree roots (Opperman, 2003) and may nest along shoreline habitat during summer. Marine waterfowl also rest on shore and in the intertidal zone.

1.11.1.3 Seabirds

Two primary guilds of seabirds occur within the ROI: surface feeders and pursuit divers. Depending on individual species life history, surface-feeding seabirds occur in the ROI during different seasons. Gulls and terns forage on small schooling fish (e.g., Pacific herring, Pacific sand lance, and juvenile salmonids) visible from the water surface in the nearshore and deeper marine waters. Additional forage resources taken opportunistically by gulls include objects gleaned on the water's surface, garbage on shore or inland, scavenged carrion, and small birds and eggs. Gulls can also forage in the intertidal zone. For example, some species feed on molluscs by dropping them from the air to break them on a hard surface on the ground.

Pursuit-diving seabirds can occur year-round in the ROI; however, numbers of some species are greater during winter months (e.g., pelagic cormorants [*Phalacrocorax pelagicus*], common murres [*Uria aalge*], and pigeon guillemots [*Cepphus columba*]). Cormorants, such as the double-crested cormorant (*Phalacrocorax auratus*), primarily nest in colonies along the outer coast of Washington, while nonbreeding cormorants are found year-round in the Puget Sound. Cormorants roost on buoys and other structures in Navy locations' waterfront areas. Pursuit-diving seabirds, such as the tufted puffin (*Fratercula cirrhata*) are found in nearshore and deeper marine waters where they capture prey underwater. They are also found near man-made structures where algal and invertebrate communities have become established on underwater piles. Similar to surface feeders, the primary forage resources of the pursuit divers' includes small schooling fish such as Pacific sand lance and Pacific herring. Pigeon guillemots forage more opportunistically on demersal fish and invertebrates (Vermeer et al., 1987).

1.11.2 Birds of Prey

1.11.2.1 Bald Eagle

The bald eagle was delisted from the federally threatened species list in 2007 (72 FR 37346) but remains protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act (16 U.S.C. 668), which prohibits the taking, possession of, or commerce in bald and golden eagles.

Bald eagles in the Pacific Northwest include resident birds and winter migrants that breed farther north. Migration patterns are often timed to track the availability of spawning salmonids (Buehler, 2000). Bald eagles are present year-round in Puget Sound. Many resident eagles in the Pacific Northwest migrate in late summer, when juveniles and adults move north up the coast to meet salmon runs in Alaska. At the end of these salmon runs in late fall, Alaskan and Pacific Northwest eagles move south, again following salmon runs (Watson and Pierce, 1998; Stinson et al., 2001). Adults reach wintering grounds in Pacific Northwest states in November or December, followed by juveniles in January. Washington's wintering eagles begin to arrive in October from northern breeding territories in Alaska and Canada. The winter distribution of bald eagles in Washington is similar to the breeding distribution, but more concentrated at salmon spawning streams and waterfowl wintering areas. Winter ranges are considerably larger and more variable than breeding ranges (Buehler, 2000). Eagles that breed in more northern latitudes return to their breeding grounds during spring migration from January to March, depending on food resources and weather conditions. Aerial surveys conducted from 2018 to 2019 recorded total number of

territories in Washington State at 1,626. This is a combined total for the following stratum areas: Washington Southern Cascades (162), Olympic Puget Sound and NE Cascades (1,209), and Columbia River (255) (USFWS, 2020).

Nesting habitat for bald eagles has been primarily defined by areas of large, mature trees close to large bodies of water and typically away from human development. Recently, however, eagles are nesting within suburban landscapes indicating they have become more accustomed to human activity (Kalasz and Buchanan, 2016). Courtship and nest building activities generally begin in January and February with egg-laying beginning in early March to early April. Eaglets hatch in mid-April or early May and fledge in mid-July, often remaining within the vicinity of the nest for an additional month (Rodrick and Milner, 1991). An active bald eagle nest is located north of Pier B in a residential area, approximately 2,500 feet (762 meters) from the Bremerton shoreline (Navy, 2018).

1.11.2.2 Osprey

Ospreys are an unlisted raptor species protected by the MBTA. They occur within habitats that are located near water (fresh and saltwater) but will migrate from wintering sites towards the southern coasts and occur in areas far from water such as deserts. Osprey eat primarily fish that range from 4 to 12 (10 centimeters to 30 centimeters) inches long. Predators of ospreys include bald eagles, golden eagles, and great horned owls (American Oceans, 2022).

During a study on breeding behavior of ospreys at three nest sites on the San Juan Islands, adults were observed arriving at the nests in late April or early May. Hatching occurred throughout the month of June with young fledging from mid-July to mid-August with an average of two young per nest. Most osprey families were recorded leaving the nest area by mid-September (Stinson et al., 1988).

Ospreys currently nest or attempt to nest on inactive vessels at NAVBASE Kitsap-Bremerton (Navy, 2018). Plans exist to construct multiple nest platforms to encourage osprey to move nests off of inactive Navy vessels, but are currently on hold.

1.11.3 Terrestrial Birds

Dozens of terrestrial bird species exist that may be present in the ROI and are protected under the MBTA. Although the industrialized nature of NAVBASE Kitsap Bremerton limits the diversity and number of birds that may be found on the installation, many native species may still be found in the region throughout the year, including songbirds, corvids, woodpeckers and doves. Table 1-4 lists those species most likely to occur on the installation.

Table 1-4 MBTA-Protected Terrestrial Bird Species Likely to occur at NAVBASE Kitsap-Bremerton

Species	Scientific Name	Family
O. Columbiformes		
Band-Tailed Pigeon	*Patagioenas fasciata*	Columbidae
Mourning Dove	*Zenaida macroura*	Columbidae
O. Passeriformes		
American Goldfinch	*Spinus tristis*	Fringillidae
American Robin	*Turdus migratorius*	Turdidae
Barn Swallow	*Hirundo rustica*	Hirundinidae
Bewick's Wren	*Thryomanes bewickii*	Troglodytidae
Black-Capped Chickadee	*Poecile atricapillus*	Paridae
Common Crow	*Corvus brachyrhynchos*	Corvidae
Dark-Eyed Junco	*Junco hyemalis*	Passerellidae
Evening Grosbeak	*Coccothraustes vespertinus*	Fringillidae
Fox Sparrow	*Passerella iliaca*	Passerellidae
Golden-Crowned Kinglet	*Regulus satrapa*	Regulidae
House Finch	*Haemorhous mexicanus*	Fringillidae
Hutton's Vireo	*Vireo huttoni*	Vireonidae
Killdeer	*Charadrius vociferus*	Charadriidae
Pine Siskin	*Spinus pinus*	Fringillidae
Purple Finch	*Haemorhous purpureus*	Fringillidae
Purple Martin	*Progne subis*	Hirundinidae
Red-Breasted Nuthatch	*Sitta canadensis*	Sittidae
Red Crossbill	*Loxia curvirostra*	Fringillidae
Red-Winged Blackbird	*Agelaius phoeniceus*	Icteridae
Ruby-Crowned Kinglet	*Regulus calendula*	Regulidae
Song Sparrow	*Melospiza melodia*	Passerellidae
Spotted Towhee	*Pipilo maculatus*	Passerellidae
Steller's Jay	*Cyanocitta stelleri*	Corvidae
Varied Thrush	*Ixoreus naevius*	Turdidae
White-Crowned Sparrow	*Zonotrichia leucophrys*	Passerellidae
Winter Wren	*Troglodytes hiemalis*	Troglodytidae
O. Piciformes		
Northern Flicker	*Colaptes auratus*	Picidae

Species	Scientific Name	Family
Red-Breasted Sapsucker	*Sphyrapicus ruber*	Picidae

Source: Navy 2018

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