2018 WEDA ENVIRONMENTAL EXCELLENCE AWARD NOMINATION FOR CONSIDERATION FOR ENVIRONMENTAL DREDGING

ANCHOR QEA

Port of Bellingham Whatcom Waterway Phase 1 Cleanup Project

Nomination Submitted by WEDA Member Anchor QEA, LLC

SUMMARY

Whatcom Waterway is located in Bellingham, Washington, and has an extensive history of industrial use, both within the waterway and at various active and now inactive sites on the uplands along the shoreline areas, dating back to the mid-1900s. The Port of Bellingham (Port) currently owns the upland properties around Whatcom Waterway and is managing environmental responsibilities at multiple cleanup sites within and surrounding the waterway.

This remediation project is an integral part of the Port's long-term vision to provide direct connection of the waterfront with public access, mixed commercial/residential, and recreational use for the City of Bellingham (City). Because the Whatcom Waterway's historical use has been industrial, the City lacked a direct connection with Bellingham Bay. The Port's long-term vision continues supporting waterfront dependent business, while providing for new commercial use, public use and recreational access, habitat creation, and connection to the Western Washington University campus.

Contamination of sediments within Whatcom Waterway is primarily associated with historical releases from industrial waterfront activities, including mercury discharges from a former chlor-alkali plant, wood waste and degradation products from past log rafting activities, and phenolic compounds from pulp mill wastewater discharges. Mercury was considered a primary contaminant of concern to inform the engineering design for remediation of the waterway.

The remediation was conducted by the Port under a multi-phase Consent Decree that was negotiated with the Washington State Department of Ecology (Ecology). The Consent Decree includes a multi-phase approach for remediation of the entire cleanup site, and the primary objective of the Whatcom Waterway Phase 1 Cleanup Project was to address the risks to human health and the environment within the Phase 1 cleanup areas. General management goals for the Phase 1elements of work included reducing contaminant mass by removal (via dredging) of high-concentration sediment contamination, providing protection from contamination that could not be removed by construction of engineered sediment caps, maintaining the operational use of the waterway for local industry and recreational purposes, and improving shoreline conditions for public access and habitat creation.

Phase 1 project remediation work was completed between July 2015 and June 2016 (Figure 1), and remediation accomplishments included the following:

- Removing approximately 1,100 feet (ft) of treated timber bulkheads
- Removing more than 5,900 square feet (sf) of overwater treated timber structures
- Constructing 765 ft of containment wall to address contaminated soils and groundwater
- Removing approximately 5,000 tons of concrete debris from the shoreline areas
- Removing (via dredging) and landfill disposal of 111,450 cubic yards (cy) of contaminated sediments
- Excavating and landfill disposal of 6,600 cy of contaminated shoreline soils
- Placing approximately 800,000 sf of engineered caps
- Replacing marine infrastructure (dolphins, fender piles, and floats) to restore operational use

The partnership between the Port and Ecology resulted in an innovative approach for cleanup of this site and assisted with funding the overall effort. The engineering dredge design effort was completed to remove the highest concentrations of contaminated sediments while also allowing for construction of engineered sediment caps to protect areas where contaminated sediments could not be dredged (due to structural or other considerations). The project was designed and constructed using proven remedial technologies (i.e., dredging and engineered sediment capping) and experienced remediation contractors in order to meet remediation goals and objectives developed by the Port and required by Ecology.

PROJECT TEAM MEMBERS

Project Owner: Port of Bellingham

Anchor QEA, LLC

Current WEDA Members on Project Team: Tom Wang, P.E.; Matt Woltman, P.E.

Role: Remediation design, permitting, construction oversight, and environmental monitoring

KPFF Consulting Engineers

Role: Structural engineering design and construction oversight

American Construction Company

Role: Prime contractor (marine construction/remediation)

Strider Construction

Role: Upland remediation contractor

Washington State Department of Ecology

Role: Regulatory Agency for Remediation/Cleanup

Nominating Entity: Anchor QEA, LLC

ENVIRONMENTAL BENEFITS

The Whatcom Waterway Phase 1 Cleanup Project included remediation of the Inner Waterway, Log Pond, and Bellingham Shipping Terminal (BST) areas of the site (Figure 2). Whatcom Waterway is located within Bellingham Bay (Bellingham, Washington), and sediments within the waterway have been impacted by past industrial operations including operation of a chlor-alkali plant in the upland area adjacent to the waterway. Mercury was identified as a primary contaminant of concern and was used to identify targeted areas for removal (via dredging) of the contaminated sediments. This project involved targeting priority contamination areas (with the highest concentrations of contamination) for dredging to achieve an immediate reduction in human health and ecological risk. The following environmental benefits were realized:

- Dredging and landfill disposal of greater than 110,000 cy of contaminated sediments from within the Inner Waterway and BST remediation areas
- Restoration of surface substrate in dredged areas via construction of engineered sediment caps and placement of habitat materials to promote habitat colonization
- Prevention of recontamination from remaining upland sources via construction of shoreline containment walls (greater than 750 ft in length)
- Enhancement of environmental habitat conditions through removal of derelict, creosote-treated wood structures and replacement with structures that used more environmentally sustainable materials
- Removal of shoreline bulkhead structures in select site areas and regrading shoreline slopes to reduce overwater structure coverage and to enhance aquatic and intertidal habitat

Environmental challenges were addressed through careful implementation of construction activities by experienced marine remediation contractors. Ecology established stringent water quality requirements that needed to be achieved during completion of dredging activities and construction of engineered sediment caps within the confined area of Whatcom Waterway. Construction activities were carefully planned and sequenced to meet water quality requirements, and silt curtains were used to prevent recontamination when the contractor was required to dredge adjacent to previously remediated areas (Photograph 1).

Upland contamination sources were also encountered when completing shoreline remediation activities, which created challenges in management of construction water. Petroleum-impacted soils were discovered when completing removal of a barge ramp structure, which resulted in generation of impacted construction water that could not be discharged to the waterway. The contractor was able to isolate the impacted construction water through use of a shoreline containment wall and collected and treated the water using a pump-and-treat system to allow for discharge of clean water and to avoid exchange of impacted construction water to the waterway during periods of tidal exchange.

The need to balance Ecology requirements for cleanup with Port tenant needs and ongoing operational use of the waterway presented challenges. Port tenants include a boatyard that required consistent access to the waterway to lift/launch recreational vessels following completion of maintenance activities. The Port worked with their tenant to sequence construction activities such that tenant operations could continue during construction and impacts to tenants could be minimized.

The Port implemented mitigation options as part of the project to offset loss of critical habitat elevations. The engineering design for completing dredging and engineered sediment cap construction included balancing cuts and fills at critical habitat elevations to allow for optimal re-grading of shoreline areas (following removal of existing structures). Overwater structures (derelict piers and piling) were also removed throughout the Inner Waterway and Log Pond remediation areas resulting in a net reduction of overwater structure coverage. The combined effect of balancing cuts and fills at critical habitat elevations and derelict structure removal resulted in an overall self-mitigating project for the Port, and no off-site mitigation was required by the project permits.

The project incorporated principles of "Engineering With Nature" through selection of the natural recovery remediation technology at locations within the Inner Waterway where results of investigation data showed signs of sediment deposition and natural recovery. Whatcom Creek discharges to the head of the Whatcom Waterway and deposits a significant load of clean sediment to the waterway on an annual basis. Sediment data collected within this area of the site showed that surface sediment conditions had recovered over time and did not require active remediation to meet cleanup requirements established by Ecology. The Port will continue to monitor this location of the waterway as part of long-term monitoring activities to verify that cleanup requirements continue to be met over time.

INNOVATION

Inner Waterway Dredge and Engineered Sediment Cap Design

The project included dredging the Inner Waterway remediation area to maximize removal of contaminated sediments and to allow for ongoing operational use of the waterway. Structural and geotechnical engineering limitations prevented full removal of the contaminated sediments in this area, and the project required a strategy to meet cleanup requirements and maintain operational use of the waterway.

The Port is required (per tenant operational agreements) to maintain the navigable portions of Whatcom Waterway to elevation -18 ft mean lower low water (MLLW). Engineering studies for cleanup of the waterway identified contamination extending well below the limits that would allow for full removal of the contaminated materials, and the cleanup design approach was developed to facilitate removal of the maximum amount of contamination practicable while also meeting waterway operational use requirements. The dredge design within the Inner Waterway remediation area included removing contaminated sediments to elevation -24 ft MLLW within the navigable portions of the waterway to facilitate placing an engineered sediment cap (to provide protection from underlying contaminated sediments that could not be removed) to elevation -20 ft MLLW. The required elevations for dredging and engineered sediment cap construction (Photograph 2) were selected to allow for future maintenance dredging activities to an operational elevation of -18 ft MLLW for the navigable portions of the waterway.

Construction Activity Sequencing

Construction sequencing was a critical element for the project schedule as in-water work was required to be completed within one construction season (August 2015 through March 2016) to meet project timeline and budget constraints. Furthermore, remediation activities (dredging and capping) was sequenced to mitigate slope stability and structural considerations within the confined space of the waterway. The engineering design approach included delineating dredge areas (Figure 3) and sequencing requirements for all dredging activities. These sequencing requirements were developed to minimize the recontamination risk associated with completing dredging activities adjacent to already remediated portions of the waterway and to minimize disruption to Port tenant operations.

Other construction activity sequencing requirements were established in the shoreline areas of the Inner Waterway to facilitate constructing a containment wall. Dredging was required to be completed after installing the shoreline containment wall, followed by placing the engineered sediment caps to stabilize the dredge slopes and containment wall structure.

Ecology Partnership

A significant factor for success in the project was the partnership formed between the Port and Ecology. Early in the project planning phase, the Port developed a relationship with Ecology to take collaborative steps toward a cleanup remedy that met the cleanup objectives and could be constructed within the funding constraints of the project. The Whatcom Waterway Phase 1 Cleanup Project was implemented as part of a larger Bellingham Bay cleanup initiative, and both the Port and Ecology had common goals to see the project succeed. Additionally, the Port received grant funding from Ecology for design and implementation of the cleanup efforts, which was critical to the overall project funding requirements. The grant funding, combined with Port insurance funds and Port-contributed funds, allowed for the project to move forward as part of a program that was mutually agreeable to all parties. The partnership between the Port and Ecology also allowed the Port to understand Ecology requirements early in the design process and build those requirements into the project design and permitting efforts.

Sustainable Approaches

The project involved implementing several sustainability approaches during the cleanup activities. The remediation work generated significant quantities of shoreline debris including large pieces of concrete that were previously used as building foundations for shoreline and upland structures. These large pieces of debris were removed from the shoreline and upland areas and brought to an upland stockpile area (located on Port property) where they were then processed into crushed materials (Photograph 3). The processing of concrete debris allowed the materials to be stored for future beneficial use as structural fill during upland development for the former chlor-alkali mill upland area, instead of being disposed at an off-site landfill facility.

There were several large structures that required demolition as part of the project, and innovative approaches were implemented to encapsulate portions of the structures that would have been difficult to remove or would have resulted in generation of a significant volume of demolition debris. A large clarifier structure was present within the Inner Waterway shoreline area and consisted of a pile-supported concrete foundation. The project required the above-ground portion of the structure be removed to allow for removal of a shoreline bulkhead structure and regrading of the shoreline slope; however, the pile-supported foundation was allowed to remain in place, and non-contaminated fill was placed within the foundation and used to help bring the portion of the upland area to grade following demolition of the clarifier structure. This sustainable approach reduced overall volume of demolition debris that would have been generated for the project and allowed for beneficial re-use of excavated materials on-site (as structural fill) rather than removing the materials for off-site landfill disposal.

ECONOMIC BENEFITS

The project achieved several economic benefits that support the Port's plans for future use of the shoreline areas and upland properties. Remediation of the Inner Waterway adjacent to Port tenant operations allowed for removal of derelict structures (e.g., overwater piers, dolphins, bulkheads) and replacement of these structures with new elements that could better support the ongoing waterway operations. The Port was also able to replace their boatyard tenant float and gangway system as part of the project and enhance the tenant's ability to use the property for their work. Remediation of the BST area achieved deeper water conditions within the berthing areas for vessel moorage at the terminal.

The project included socio-economic benefits by setting the stage for public access and interaction with Whatcom Waterway. Previous use of the properties surrounding the waterway allowed no public interaction and only limited recreational use. The softening of shoreline areas (via removal of shoreline debris and regrading) created public access points throughout the waterway and will support public use of the waterway for recreational purposes such as kayaking, boating, and fishing.

The cleanup of Whatcom Waterway is a critical step in the Port and City's efforts to revitalize the shoreline district. The project served as the gateway for upland redevelopment and construction of public access and interaction areas that will allow people to have more direct access to the shoreline and waterway. Redevelopment of the waterway and adjacent shoreline and upland areas from industrial to mixed use (commercial/residential and industrial) balances the historical use of the waterfront with other commercial uses that will help expand the economic diversity and strength of Bellingham within the waterfront district.

TRANSFERABILITY

The Whatcom Waterway Phase 1 Cleanup Project is a significant accomplishment for the Port, Ecology, and the City of Bellingham. It has provided substantial learning opportunities to the Port and Ecology and serves as an example of how projects can succeed when parties form partnerships and work collaboratively to meet a common goal.

These lessons learned were documented and shared between parties internally and through presentations provided at professional conferences such as WEDA, ASCE, PORTS, and international conferences. Key innovations and lessons learned on this project, including discussions on construction sequencing/phasing and remediation dredging techniques, have been shared at multiple WEDA conferences.

The remediation contractor was also able to gain experience by successfully implementing this project and transfer that experience to future projects. The project advanced remediation dredging techniques, complex engineered sediment cap construction, shoreline armoring design, and "Engineering With Nature", which can be applied to future cleanup projects at other sites throughout the Puget Sound area.

OUTREACH AND EDUCATION

The Port incorporated public communication and outreach efforts throughout the entire project. Key stakeholders included local tribes, Port tenants, the City, agencies/regulators, and members of the public/community. Special advisory groups were also formed to advise the Port on key stakeholder interests, such as: Marina Advisory Committee (MAC) and Bellingham Bay Action Team (BBAT).

The Port and Ecology coordinated with the Lummi Nation early during project planning and permitting efforts, including meeting with both Chiefs and Council to address key concerns regarding protection of habitat and potential impacts to tribal fishing activities during implementation of the project. The Port also coordinated with their tenants and sequenced project activities in a manner that minimized disruption to tenant operations and business during completion of construction activities. The Port and Ecology coordinated and held public

interaction/communication meetings throughout the permitting and engineering design phases of the project to update the public on progress and field comments and to provide justification for the selected remedy and construction approach.

The Port maintained consistent communication with the public throughout the different phases of the project and used opportunities with Ecology to educate the public and other stakeholders regarding the cleanup process requirements and timeline. Following award of the contract to the remediation contractor, a public gathering was arranged to bring the public to the waterfront, see the construction equipment, and celebrate the start of the major cleanup effort. These efforts helped build support and understanding for the project throughout the community and stakeholder groups.

PROJECT FIGURES AND PHOTOGRAPHS

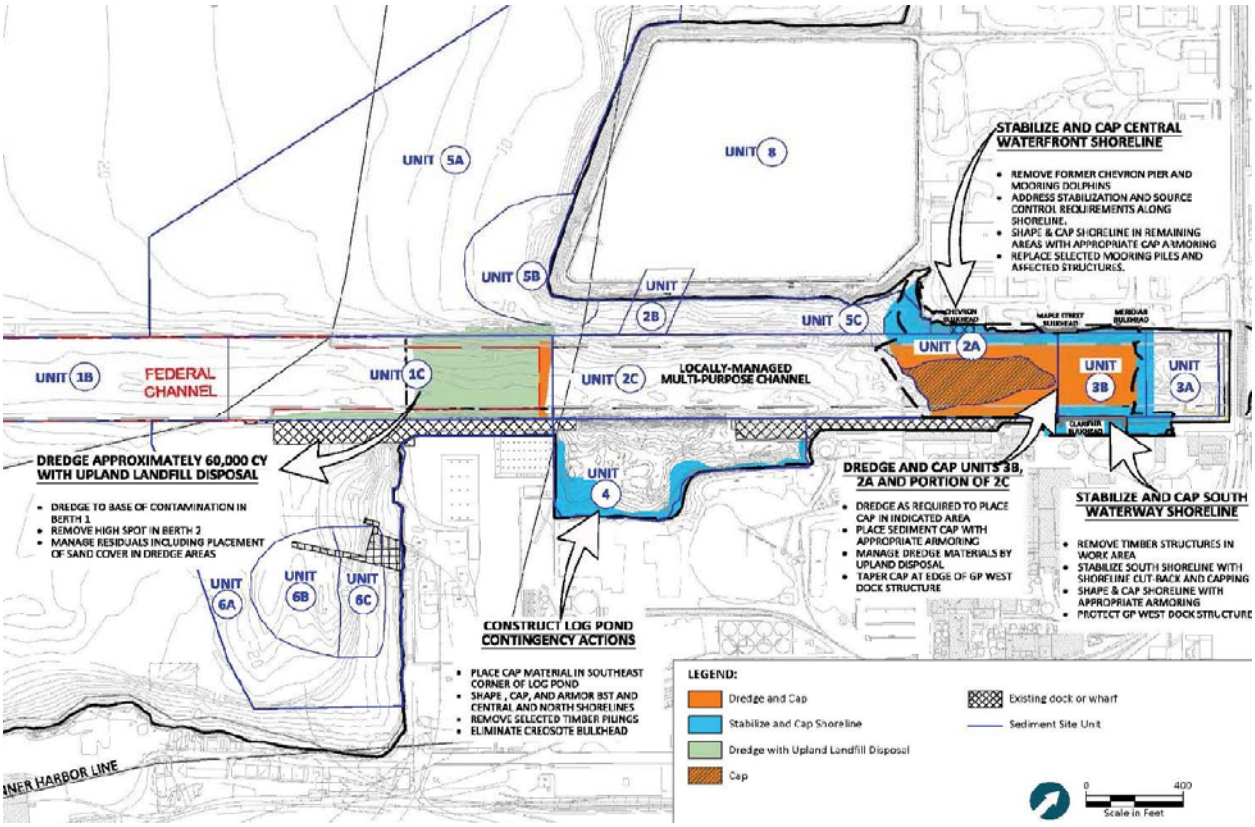


Figure 1. Project Remediation Areas and Boundaries

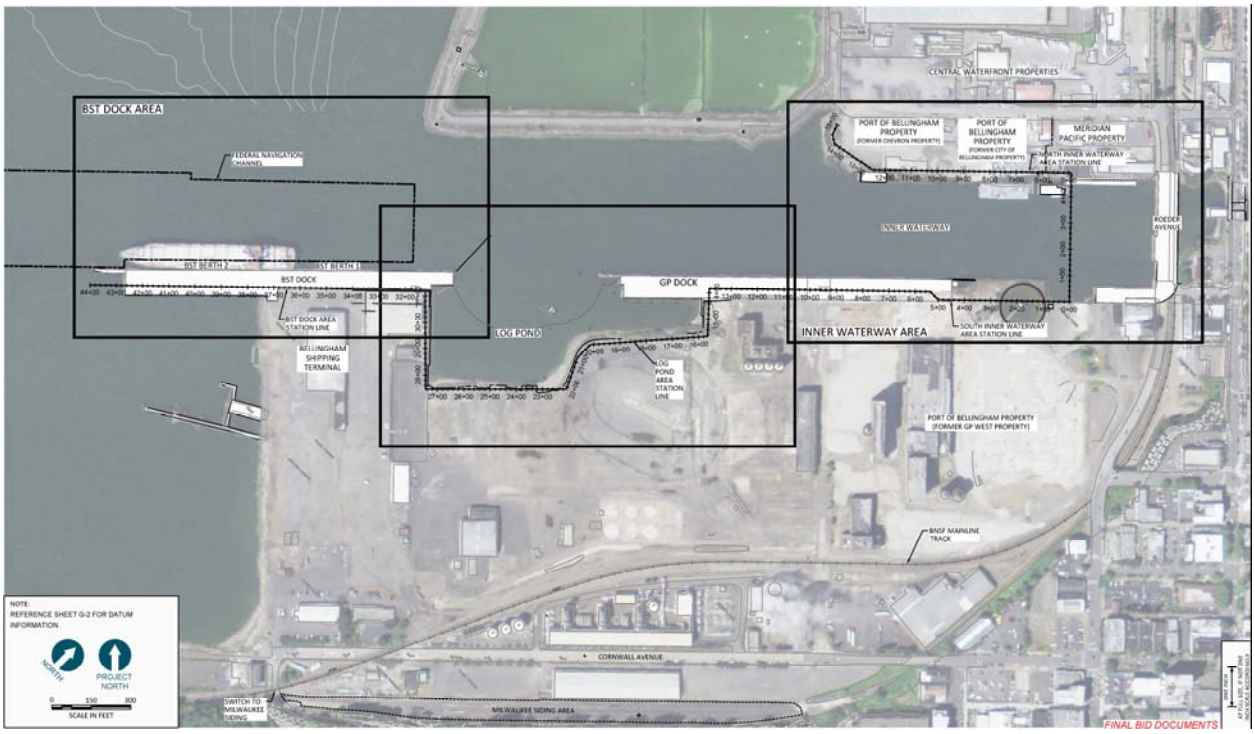


Figure 2. Remediation Areas

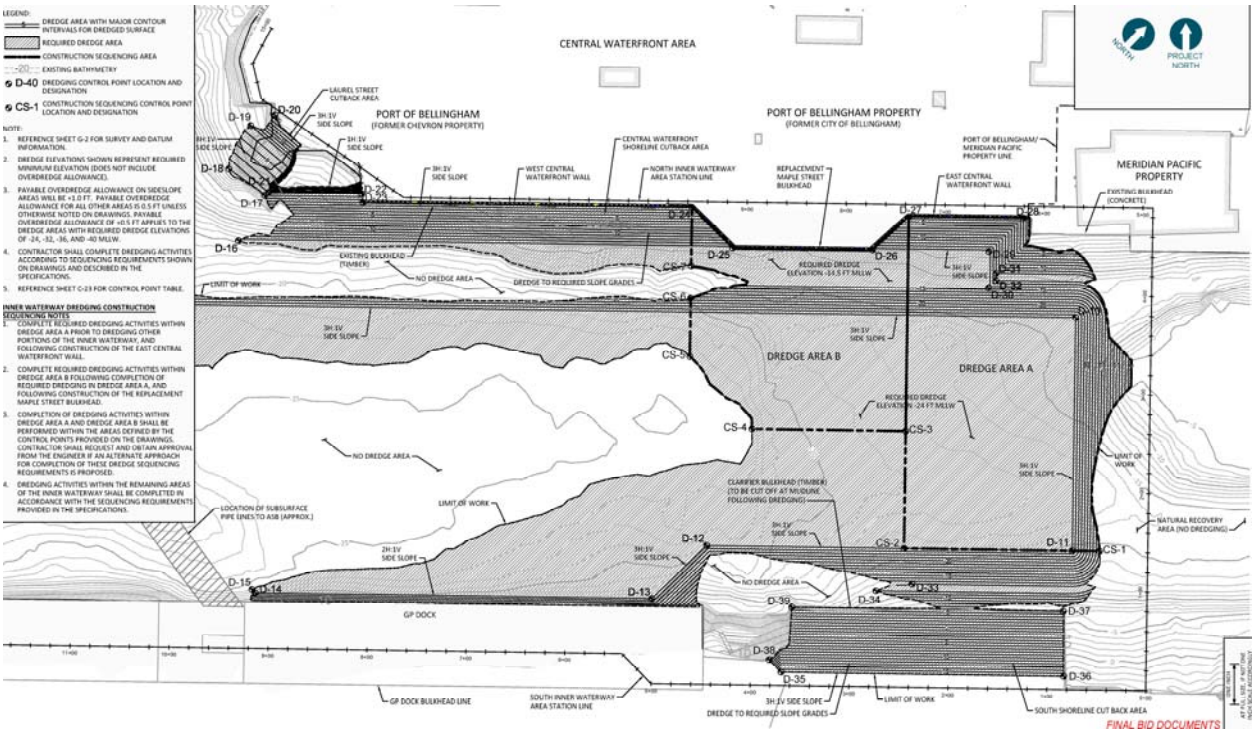
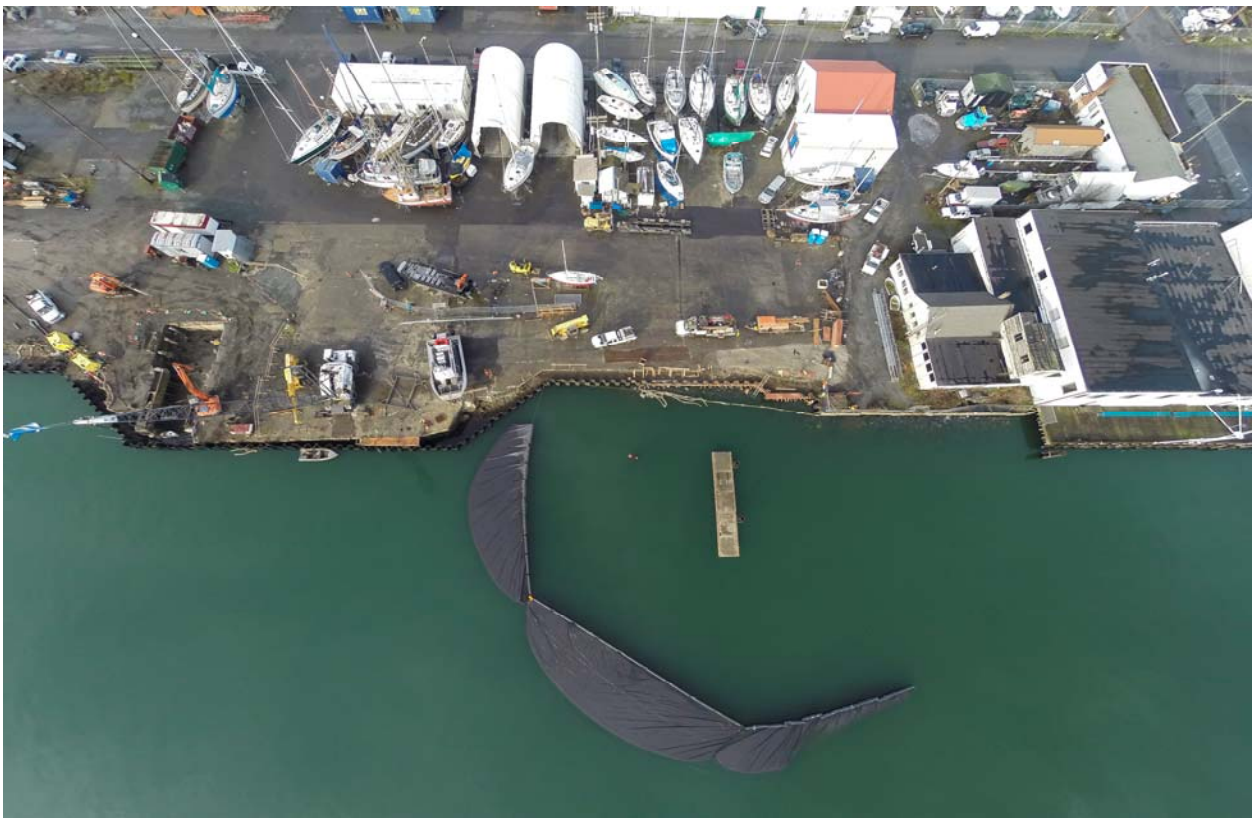


Figure 3. Construction Sequencing – Dredge Areas



Photograph 1. Silt Curtains for Water Quality Control

Photograph 2. Inner Waterway Dredging and Capping

Photograph 3. Concrete Crushing and Upland Stockpile for Material Reuse