3 Cleanup Requirements

This section describes the cleanup requirements that must be met by the cleanup of the Whatcom Waterway site. Consistent with MTCA and SMS requirements, this section addresses three types of requirements:

- **Cleanup Levels (Section 3.1)**: Cleanup levels represent the numeric and/or narrative standards that must be met by a cleanup action in order for it to be considered successful. These standards are based on MTCA and SMS requirements.

- **Remedial Action Objectives (Section 3.2):** Remedial action objectives are narrative statements about the types of actions that must be performed to ensure compliance with the cleanup levels.

- **Potentially Applicable Laws (Section 3.3):** In addition to the requirements of the SMS and the MTCA, many other laws potentially apply to sediment cleanups.

These requirements are described below, and in the tables of this section. Technologies capable of meeting these requirements are then screened in Section 5, and cleanup alternatives are developed and ranked in Sections 6, 7 and 8.

3.1 Site Cleanup Levels

The Whatcom Waterway site is defined by contaminated sediment. Cleanup levels applicable to sediments are defined by SMS regulations as described in Section 3.1.1 below. Some cleanup alternatives may trigger the applicability of cleanup levels for other media, particularly soil and groundwater. These potentially-relevant cleanup levels are described in Section 3.1.2.

3.1.1 Sediment Cleanup Levels

SMS regulations govern the identification and cleanup of contaminated sediment sites and establish two sets of numerical chemical criteria against which surface sediment concentrations are evaluated. The more conservative Sediment Quality Standards (SQS) provide a regulatory goal by identifying surface sediments that have no adverse effects on human health or biological resources. The minimum cleanup level (MCUL) (equivalent to the Cleanup Screening Level or CSL), represents the regulatory level that defines minor adverse effects.

The SQS is Ecology's preferred cleanup standard, though Ecology may approve an alternate cleanup level within the range of the SQS and the MCUL if justified by a weighing of environmental benefits, technical feasibility, and

cost. Chemical concentrations or confirmatory biological testing data may define compliance with the SQS and MCUL criteria.

The primary cleanup levels for the Whatcom Waterway site are defined as the SQS, as measured using bioassay testing procedures. Chemical numeric standards may also be used to evaluate SQS, but bioassays are given preference under SMS regulations because they are considered a more direct and representative measure of potential biological effects. The bioassay test methods that may be used to evaluate compliance with the SQS are defined in current Ecology regulations and guidance and include tests using the amphipod, larval or juvenile polychaete tests.

Based on the series of sediment investigations performed for surface and subsurface sediments in 1996, 1998, and 2002, the key constituents of concern for the sediments in the Whatcom Waterway site areas include mercury and phenolic compounds. The chemical SQS for mercury is 0.41 mg/kg. The chemical MCUL for mercury is 0.59 mg/kg. These levels apply to total mercury, which is the parameter measured directly in the RI chemical testing program. The main phenolic compound detected at elevated concentrations at the site was 4-methylphenol. The SQS and MCUL values for 4-methylphenol are both 0.67 mg/kg. The phenolic compounds phenol and 2,4-dimethylphenol were noted sporadically in surface sediments. The SQS and MCUL values for 2,4-dimethylphenol are both 0.029 mg/kg.

In addition to the evaluation of benthic effects and compliance with the SQS, cleanup levels at the site must protect against other adverse effects to human health and the environment, including food chain effects associated with the potential bioaccumulation of mercury. As described in the R I report, a site-specific BSL of 1.2 mg/kg mercury was developed as part of the RI/FS process. This BSL provides an area-wide average concentration of mercury in sediments that is protective of subsistence-level human consumption of seafood from Bellingham Bay. Bioaccumulation testing performed as part of the RI/FS and related studies has demonstrated that sediment mercury concentrations below this value do not present a risk of food chain effects to ecological receptors. Ecology has conservatively applied the BSL as a cleanup level that must be met for surface sediments within the site, whether or not the area-wide average concentration of mercury exceeds the BSL. This conservative application of the BSL by Ecology provides a substantial additional level of protectiveness to site cleanup decisions.

Consistent with the SMS regulations, sediment cleanup levels apply to the sediment bioactive zone. Previous studies performed as part of the RI/FS documented that this zone consists of the upper 12 centimeters of the sediment column. The cleanup levels do not directly apply to subsurface sediments, but remedial action objectives require that the potential risks of the exposure of deeper sediments be considered and be minimized through the implementation of the cleanup action.

3.1.2 Cleanup Levels for Other Media

Under certain remedial scenarios, the sediments at the site could also be regulated under other programs with regulatory cleanup levels different from SMS criteria, or could potentially impact other media. For example, if the sediments were excavated and were reused as upland soil, then MTCA soil and/or groundwater cleanup levels could be relevant. Additional criteria considered include state and federal water quality criteria, the Puget Sound Dredged Disposal Analysis program (PSDDA), the State of Washington Dangerous Waste Regulations, and the federal Resource Conservation and Recovery Act (RCRA). Table 3-1 summarizes cleanup levels for media other than sediment that may be applicable to various remedial alternatives.

3.2 Remedial Action Objectives

Based on the site conditions and current regulations, remedial goals applicable to the site include the following:

- **Surface Sediments**: Use appropriate technologies including active and/or passive measures to ensure compliance with site cleanup levels as defined in Section 3.1 for the sediment bioactive zone

- **Subsurface Sediments:** Where subsurface sediments have the potential to become exposed, use appropriate technologies including active and/or passive measures to ensure long-term compliance with site cleanup levels in the bioactive zone as defined in Section 3.1

- **Applicable Laws:** Ensure that implementation of the remedial action complies with other applicable laws.

These remedial action objectives are used in subsequent sections of the Feasibility Study to assist in the development, evaluation and ranking of remedial alternatives. The analyses conducted in Sections 7 and 8 of this report ensure that these remedial action objectives are achieved by the preferred remedial alternatives.

3.3 Potentially Applicable Laws

In addition to the requirements of the SMS and the MTCA, many other laws potentially apply to sediment cleanups. These other potential regulatory requirements are listed in Tables 3-1 through 3-3 and are discussed briefly below. Applicable laws will be discussed in further detail for the selected cleanup action at the time the Cleanup Action Plan is completed.

3.3.1 Project Permitting and Implementation

Table 3-2 summarizes regulatory requirements that may impact project permitting and implementation. For actions conducted under a MTCA Order

or a Consent Decree, the project would be exempt from state and local permits and procedural requirements. However, MTCA requires compliance with the substantive provisions of these regulatory programs. MTCA does not contain a procedural exemption from federal permitting.

Construction projects are subject to environmental impact review under SEPA and/or NEPA regulations. The SEPA review for the cleanup of the Whatcom Waterway site is being completed by Ecology through the Draft Supplemental Bellingham Bay Comprehensive Strategy EIS; companion document to the RI/FS. NEPA review will be completed in the future at the time of project permitting by the Corps of Engineers.

The City is currently updating their State-mandated Shoreline Master Plan (SMP) which regulates and manages uses and activities within 200 feet of the shorelines of the City. Shoreline regulations defer to Ecology for site-specific review of cleanup actions conducted under MTCA, provided that those actions are consistent with the substantive requirements of the Shoreline Master Program. The City and Port are working with the Bellingham community to ensure that the land use vision articulated in the Waterfront Vision and Framework Plan is reflected in the SMP update. The SMP update is expected to be completed in early 2007.

As part of the Cleanup Action Plan development, a request will be made to the City of Bellingham and the Department of Fish and Wildlife for a written description of their substantive permit requirements for the preliminary selected remedy. This additional information will be included in the Cleanup Action Plan.

Federal permitting for in-water construction can be implemented under either a Federal 404 Individual permit, or under a Nationwide 38 permit. The federal permitting process includes review of issues relating to wetlands, tribal treaty rights, threatened and endangered species, habitat impacts, and other factors. It is anticipated that the cleanup of the Whatcom Waterway site will be performed using a Federal 404 Individual permit. Where appropriate, that permit will include related actions (e.g., updates to shoreline infrastructure, habitat enhancement projects).

3.3.2 Treatment and Disposal

Table 3-3 summarizes regulatory requirements potentially applicable to sediment treatment or disposal alternatives.

In-water containment, treatment, or disposal options are affected by a series of permits and evaluation criteria including those of the Clean Water Act and the Rivers and Harbors Act, as well as the Washington Hydraulics Code. Dredged material disposal at PSDDA disposal sites or beneficial use of dredged material are regulated by the Dredged Materials Management Program (DMMP) Guidelines.

Alternatives involving sediment disposal on state-owned lands require use authorizations from the Washington Department of Natural Resources (WDNR). These are provided consistent with requirements of state regulations and the state constitution. Where disposal occurs on private lands or as part of a multi-user disposal site, the disposal could be regulated by a series of agreements specific to that disposal facility. Use authorizations or other property-owner agreements can be required for some activities on privately-owned or state-owned aquatic lands.

As shown in Table 3-3, upland off-site disposal options are regulated under the state Solid Waste Regulations (WAC 173-303 and WAC 173-350). For alternatives involving sediment treatment or upland handling, air emissions regulations may apply. These requirements result in limitations on materials accepted by fixed treatment facilities. Requirements such as dust control result from these regulations for upland sediment handling activities.

Water Management

For remediation alternatives involving water generation, the discharge of generated waters may be regulated under state and federal regulations. Discharges from upland areas to surface waters require permits under restrictions of the National Pollutant Discharge Elimination System (NPDES) program. Discharges to the sanitary sewer are subject to pretreatment standards and local discharge standards and permitting.

Puget Sound Dredged Material Management Program

In Puget Sound, the open water disposal of sediments is managed under DMMP. This program is administered jointly by the US Army Corps of Engineers, the US Environmental Protection Agency, the WDNR, and Ecology. The DMMP has developed the PSDDA protocols which include testing requirements to determine whether dredged sediments are appropriate for open-water disposal. The DMMP has also designated disposal sites throughout Puget Sound. While some PSDDA characterization work has been performed at the Whatcom Waterway site, if a remedial alternative is ultimately selected by Ecology that includes PSDDA disposal of sediments, additional characterization work will be required. Use of PSDDA facilities would need to comply with other DMMP requirements including material approval, disposal requirements and payment of disposal site fees.

Solid Waste and Dangerous Waste Criteria

Sediments that are dredged and transferred to upland management may be subject to additional profiling requirements and/or other requirements under federal RCRA regulations and under Washington State Dangerous Waste regulations. However, as described in the RI, state-only toxicity designations and federal TCLP and listing criteria have been evaluated as part of the RI/FS activities and are not anticipated to impact Whatcom Waterway sediment disposition.

The Whatcom County Health Department has primary jurisdictional responsibility for the regulation of solid wastes in the county. They must implement, as minimum standards, the state Solid Waste Handling Standards (WAC 173-350).

The Solid Waste Handling Standards are applicable to and apply specific requirements and permitting for the handling of contaminated soils and "*contaminated dredged material"* (WAC 173-350).

- "*Contaminated dredged material*" means dredged material resulting from the dredging of surface waters of the state where contaminants are present in the dredged material at concentrations not suitable for open water disposal and the deredged material are not dangerous wastes and are not regulated by section 404 of the Federal Clean Water Act (P.L. 95-217).

Sediments managed in other Solid Waste facilities must comply with applicable permit requirements for the receiving facility. Some landfills may require elimination of free liquids from sediments prior to landfill disposal, whereas other facilities are permitted to accept wet sediments for use as daily cover.

Table 3-1 Potentially Applicable Laws —Cleanup Levels

Medium	Standard/Criterion	Citation	Comments and Substantive Requirements
Sediment	Criteria used to identify sediments that have no adverse effects on biological resources and correspond to no significant health risk to humans.	Sediment Management Standards (WAC 173-204)	As described in Section 3.1, cleanup levels apply to the sediment bioactive zone and shall include the SQS as measured using larval, amphipod and juvenile polychaete bioassay tests. The numeric SQS may be used to screen for potential compliance with the SQS if bioassays are not performed. Sediments must also achieve a mercury concentration in surface sediments less than the site-specific mercury BSL (1.2 mg/kg dry weight).
Surface Water	Requirements for establishing numeric or risk-based goals and selecting cleanup actions.	Model Toxics Control Act (WAC 173-340, Sections 720 and 730)	Anticipated to be relevant and appropriate to site remediation alternatives that create new upland (e.g., Alternative 3 creation of ASB fill). • Groundwater created within a fill area must comply with MTCA groundwater cleanup levels at the applicable point of compliance. For a confined nearshore disposal facility, this is assumed to require compliance with MTCA cleanup levels for surface water at the point that groundwater discharges to adjacent surface waters.
	Ambient water quality criteria for the protection of aquatic organisms and human health.	Federal Water Pollution Control Act/ Clean Water Act (CWA) (33 USC 1251–1376; 40 CFR 100–149) 40 CFR 131	MTCA requires the attainment of water quality criteria where relevant to the circumstances of the release. Groundwater within any potential confined nearshore disposal facilities would need to comply with AWQC values at the point of discharge into surface water. • Permitting for sediment cleanup action will define measures to be taken to comply with surface water standards during cleanup implementation.
	State water quality standards; conventional water quality parameters and toxic criteria.	Washington Water Pollution Control Act - State Water Quality Standards for Surface Water (RCW 90.48) WAC 173-201A-130	Narrative and quantitative limitations for surface water protection. • Permitting for sediment cleanup action will define measures to be taken to comply with surface water standards during cleanup implementation.
Soil and Groundwater	State cleanup levels for soils	Model Toxics Control Act (WAC 173-340, Section 740 and 745)	Potentially applicable if sediments are placed in upland areas. Proposed cleanup action does not involve upland reuse of soils.
	State cleanup levels for groundwater	Model Toxics Control Act (WAC 173-340, Section 720)	Potentially applicable if sediments are placed in upland areas. Proposed cleanup action does not involve upland reuse of soils.
	Federal criteria for drinking water	Safe Drinking Water Act (40 CFR 141, 143)	Upland placement of dredged sediments must not impact groundwater that is a current or potential source of drinking water. Proposed cleanup action does not involve upland reuse of soils.

Table 3-2 Potentially Applicable Laws —Project Permitting and Implementation

Location/Activity	Requirement/Prerequisite	Citation	Comments and Substantive Requirements
Evaluation of environmental impacts	Evaluation of project environmental impacts and definition of appropriate measures for impact mitigation	State Environmental Policy Act (SEPA; WAC 197-11), National Environmental Policy Act (42 WSC 4321 et seq.)	Project alternatives contemplated in the RI/FS have been analyzed as part of the companion EIS document, prepared consistent with the Bellingham Bay Demonstration Pilot Environmental Impact Statement Comprehensive Strategy. • Additional environmental review including NEPA compliance will be conducted as part of project permitting and implementation.
Construction Activities within 200 Feet of Shoreline	Construction near shorelines of statewide significance, including marine waters and wetlands.	Shoreline Management Act (WAC 173-14), Bellingham Bay Shoreline Master Program Coastal Zone Management Act (16 USC 1451 et seq.)	Two of the project alternatives involve creation of new sediment disposal sites. If these alternatives are selected for implementation, updates to the Shoreline Master Program will be required. The Bellingham Bay SMP is undergoing amendment by the City of Bellingham during 2006.
Construction in State Waters	Requirements for construction and development projects for the protection of fish and shellfish in state waters.	Construction in State Waters, Hydraulic Code Rules (RCW 75.20; WAC 220-1101),	State HPA permit required unless project implemented under MTCA Consent Decree or Order. Under Consent Decree substantive requirements would still be addressed. • Project implementation and permitting includes coordination with Washington Department of Fish And Wildlife staff. This coordination will address all substantive requirements of the HPA permitting process including information submittals and evaluation of potential mitigation requirements and definition of work procedures and timing. • Dredging, capping and other in-water work activities will be performed at appropriate times of the year to comply with fisheries protection requirements.

Table 3-2 Potentially Applicable Laws —Project Permitting and Implementation

Location/Activity	Requirement/Prerequisite	Citation	Comments and Substantive Requirements
		Rivers and Harbors Appropriation Act (33 USC 401, 40 CFR 230, 33 CFR 320, 322, 323, 325)	Army Corps 404 permit (or Nationwide permit)to be used for project implementation. • Project implementation includes Army Corps of Engineers permitting after final approval by Ecology of a Cleanup Action Plan.
Federal Channel	Project permitting for activities in the federal channel requires approval of the local sponsor and of the Corps of Engineers.	Port-DNR Memorandum of Understanding (December 2005) and Port Resolution 1230	Working with the Department of Natural Resources, the Port has requested that the Washington State Congressional Delegation to update the federal channel designations, including de-authorization of the federal channel in the Inner Waterway area, with future management of that area by the Port as a locally-managed, multi-purpose waterway.
Activities within/Adjacent to Wetlands	Actions must be performed so as to minimize the destruction, loss, or degradation of wetlands as defined by Executive Order 11990 Section 7. Requirement for no net loss of remaining wetlands.	Executive Order 11990, Protection of Wetlands (40 CFR 6, Appendix A) EPA Wetland Actions Plan. (January 1989, OWWP)	Project must result in no net loss or degradation of wetlands. Preferred alternatives identified in the RI/FS comply with the no net loss requirement. • Additional evaluations will be performed during project final design and permitting.
Impacts to Tribal Treaty Rights	United States treaties protect certain rights of recognized tribes of native Americans, including property rights, water rights and fish/shellfish gathering rights.	Treaty of Point Elliott (12 Stat. 927) Treaty of Medicine Creek (10 Stat. 1132)	Impacts to treaty rights are typically addressed during project permitting. Project alternatives evaluated in the RI/FS protect environmental quality at the site and result in no significant changes to site features. • Consultation with area tribal nations will be conducted during project permitting to ensure that there are no adverse impacts to tribal treaty rights.

Table 3-2 Potentially Applicable Laws —Project Permitting and Implementation

Location/Activity	Requirement/Prerequisite	Citation	Comments and Substantive Requirements
Endangered & Threatened Species	Actions must be performed so as to conserve endangered or threatened species, including consultation with the Department of the Interior.	Endangered Species Act of 1973 (16 USC 1531 et seq.) (50 CFR Part 200) (50 CFR Part 402)	Chinook salmon, bull trout and Orca whales have been listed as threatened species. Federal agencies must confer with NOAA Fisheries on any action that may impact listed species. • Project permitting will include compliance with ESA requirements, including consultation with state and federal permitting agencies, completion of a Biological Assessment, and incorporation of appropriate measures as required to avoid adverse impacts to endangered or threatened species.
Habitat Impacts and Mitigation	Policies and procedures have been established by state and federal agencies to evaluate and mitigate habitat impacts	Memorandum of Agreement between EPA and U.S. Army Corps of Engineers (Mitigation under CWA Section 404(b)(1), U.S. Fish & Wildlife Mitigation Policy (46 FR 7644), Fish and Wildlife Coordination Act (16 USC 661 et seq.), Washington Department of Fisheries Habitat Management Policy (POL-410), Compensatory Mitigation Policy for Aquatic Resources (Chapters 75.20 and 90.48 RCW) Bellingham Bay Demonstration Pilot Habitat Mitigation Framework	Mitigation requirements for projects are defined in project permitting and vary with the type of work conducted. The preferred alternatives identified in the RI/FS have been designed to achieve a net gain of sensitive or critical habitats. The need for significant mitigation over-and-above that already included in the RI/FS alternatives is considered unlikely. • Project final design and permitting (e.g., as part of the Biological Assessment performed during project permitting) will include evaluation of project impacts and definition of any mitigation required or appropriate to the work being performed.

Table 3-2 Potentially Applicable Laws —Project Permitting and Implementation

Location/Activity	Requirement/Prerequisite	Citation	Comments and Substantive Requirements
Health and Safety	Development of a health and safety plan with appropriate controls, worker certifications and monitoring	WISHA (WAC 296-62) OSHA (29 CFR 1910.120)	Relevant requirement for environmental remediation operations. • All work activities performed at the site will comply with OSHA/WISHA requirements. • Project final design will include definition of contractor safety requirements, including preparation and compliance with a project Health and Safety Plan, worker training and record-keeping requirements, and other applicable measures.

Table 3-3 Potentially Applicable Laws —Treatment and Disposal

Activity	Requirement	Citation	Comments and Substantive Requirements
In-Water Sediment Disposal or Capping	Army Corps of Engineers Permitting requirements	Sections 401 and 404 of the Clean Water Act (40 CFR 230; & 33 CFR 320, 323, 325 and 328) Section 10 of the Rivers & Harbors Act (33 CFR 320 & 322)	Permitting requirements for discharges into waters of the United States Permitting requirements for dredging or disposal in navigable waters of the United States. • Project implementation includes Army Corps of Engineers permitting to be initiated after development of a final Cleanup Action Plan.
	State HPA permitting	Washington Hydraulics Code (WAC 220-110)	Permitting for work that would use, divert, obstruct or change the natural flow or bed of any salt or fresh waters. • Project implementation and permitting includes coordination with Washington Department of Fish And Wildlife staff. This coordination will address all substantive requirements of the HPA permitting process including evaluation of potential mitigation requirements and definition of work procedures and timing. • Dredging, capping and other in-water work activities will be performed at appropriate times of the year to comply with fisheries protection requirements.
	PSDDA Characterization and Permitting Procedures	Dredged Material Management Program Guidelines (RCW 79.90; WAC 332-30)	Characterization and permitting process for sediments destined for unconfined open-water disposal. • Selected sediments from the site may be characterized and authorized for PSDDA disposal and/or beneficial reuse. • Project implementation will follow PSDDA procedures including obtaining DNR use authorization for sediment disposal at the PSDDA site.
	Multi-User Disposal Site Operating Agreements	Typically the use of multi-user disposal sites is governed by site-specific permits and/or agreements.	The RI/FS does not contemplate use of a multi-user disposal site for sediment disposal.

Table 3-3 Potentially Applicable Laws —Treatment and Disposal

Activity	Requirement	Citation	Comments and Substantive Requirements
	Rules for management of state-owned aquatic lands	State Aquatic Lands Mangement Laws (RCW 79.90 through 79.96; WAC 332-30) State Constitution (Articles XV, XVII, XXVII) Public Trust Doctrine	Sediment disposal, if performed on state-owned aquatic lands, must not be in conflict with state regulations. • Project implementation for PSDDA sediment disposal will follow PSDDA procedures including obtaining DNR use authorization for sediment disposal at the PSDDA site. • If beneficial reuse of sediment is performed on state-owned lands, a sediment use authorization will be obtained. • Sediment capping on state-owned lands, if performed as part of the remedy, will comply with rules for management of state-owned aquatic lands.
Upland Disposal of Dredged Sediments	State criteria for dangerous waste (which are broader than federal hazardous waste criteria)	Washington Dangerous Waste Regulations (WAC 173-303) Designation procedures (Section -070)	State and federal laws prohibit land disposal of certain hazardous or dangerous wastes. • Sediments managed by upland disposal will comply with disposal site criteria. Based on existing characterization data, none of the materials to be managed by upland disposal appear to be Dangerous Wastes. • The need for additional waste profiling will be addressed as part of the engineering design for the project.
	Requirements for solid waste management.	Solid Waste Disposal Act (42 USC Sec. 325103259, 6901-6991), as administered under 40 CFR 257, 258; WAC 173-304, Minimum Functional Standards for Solid Waste Handling. WAC 173-350. Solid Waste Handling Standards.	Applicable to non-hazardous waste generated during remedial activities and disposed of off site unless wastes meet recycling exemptions. • Sediments managed by upland disposal will comply with disposal site criteria. RI/FS alternatives are based on existing permitted facilities that are compliant with these regulations and are permitted to accept impacted dredged materials. • Upland beneficial reuse of sediments which would be regulated under WAC 173-350 is not contemplated under any of the alternatives evaluated in the RI/FS.
Air Emissions	State implementation of ambient air quality standards. NWAPA ambient and emission standards.	Washington State Clean Air Act (70.94 RCW) General Requirements for Air Pollution Sources (WAC 173-400)	Potentially applicable to alternatives involving sediment treatment or upland handling. • On-site treatment of dredged materials using methods that may require an air pollution control permit is not contemplated in the RI/FS alternatives. • Off-site sediment handling and/or treatment/disposal facilities contemplated for use under the RI/FS alternatives comply with applicable air regulations and maintain appropriate permits. • Permitting requirements and compliance of facilities used for dredged material management will be reviewed as part of project final design.

Table 3-3 Potentially Applicable Laws —Treatment and Disposal

Activity	Requirement	Citation	Comments and Substantive Requirements
Wastewater	Permitting & treatment requirements for direct discharges into surface water.	National Pollutant Discharge Elimination System (NPDES) (40 CFR 122, 125) State Discharge Permit Program; NPDES Program (WAC 173-216, -220)	Anticipated to be relevant only if collected waters are discharged to on-site water body. Discharges must comply with substantive requirements of the NPDES permit. Applicable for off-site discharges; a permit would be required. • Construction stormwater requirements will be satisfied for upland handling of sediment, including development of a Storm Water Pollution Prevention Plan and implementation of best management practices. • NPDES program requirements will be reviewed as part of project final design.
	Permitting & pre-treatment requirements for discharges to a POTW	National Pretreatment Standards (40 CFR 403); City of Bellingham Wastewater treatment requirements	Discharges to POTWs are considered off-site activities; pretreatment and permitting requirements would be applicable. • Alternatives include water pretreatment and POTW discharge. Such work would be subject to POTW permitting and pre-treatment standards. Project design and implementation must incorporate waste characterization, pretreatment and permitting. • Permitting requirements will be reviewed as part of project final design.

4 Sediment Site Units

This FS evaluates potential cleanup alternatives for the Whatcom Waterway site. At most cleanup sites, the application of remediation technologies varies across the site, with different technologies being applied to appropriate site areas to accomplish overall site remediation. The division of the site into different areas or "Sediment Site Units" is performed in this section consistent with the requirements of the Sediment Management Standards. In accordance with the SMS, these units are "based on consideration of unique locational, environmental, spatial, or other conditions" (WAC 173-204-200(25)).

This section describes the sediment site units (site units) that are used for the FS, and discusses the characteristics of each of those units. Key characteristics of each site unit that are relevant to the application of remedial technologies and/or the evaluation of remedial alternatives are discussed. These characteristics are described in four groups:

- **Physical Factors** including bathymetry, sediment particle size and texture, wood material distribution, wind and wave energies, and the characteristics of adjacent shorelines

- **Land Use and Navigation** including upland zoning, shoreline infrastructure, navigation uses, natural resources, ongoing waterfront revitalization activities, and potential interrelationships between cleanup considerations and these factors

- **Natural Resources** including the types of existing aquatic habitats within the site unit

- **Contaminant Distribution**, including patterns of surface and subsurface contamination and relative contaminant concentrations.

Figure 4-1 shows the Whatcom Waterway site units used in this FS. These site units are generally consistent with the site units used in previous FS analyses performed in 2000 and 2002. Site units have been numbered 1 through 8 as shown on Figure 4-1. Characteristics of each of the site units are described below.

4.1 Outer Whatcom Waterway (Unit 1)

The Outer Whatcom Waterway includes portions of the Whatcom Waterway located offshore of the Bellingham Shipping Terminal. Unit 1 is divided into three subareas:

- **Units 1A and 1B:** These sub-areas are located offshore of the Bellingham Shipping terminal and connect the outer portions of the Whatcom Waterway to deepwater areas of Bellingham Bay

- **Unit 1C:** This portion of the Waterway is located immediately adjacent to the Bellingham Shipping Terminal. Based on bathymetry, this unit is subdivided into Units 1C1, 1C2 and 1C3.

4.1.1 Physical Factors

The Outer Whatcom Waterway consists of deep-water areas of the Whatcom Waterway navigation channel. Current water depths in this area vary from approximately 30 feet to greater than 36 feet. These depths are largely the result of historical dredging activities in the Waterway.

Sediments in the Outer Waterway are dominated by fine particle size distributions (silts and clays), with a total fines content generally greater than 80 percent. The TOC content of the sediments is generally between 1 and 5 percent, consistent with average TOC distribution for the site.

The bathymetry in most areas of the Outer Waterway is relatively flat, with slopes flatter than 10H:1V. However, slopes become significant along the outer edges of the Waterway, including at the Bellingham Shipping Terminal. The shoreline at the Bellingham Shipping terminal is an engineered slope, including a pile-supported concrete bulkhead and areas of armored slope.

4.1.2 Land Use and Navigation

Navigation uses in Units 1A and 1B of the Outer Waterway are largely transitory, with vessels entering and exiting the Waterway. Vessels are generally not anchored in these areas, and there are no permanent dock structures or mooring dolphins.

In contrast, the areas of Unit 1C include berths for vessels at the Bellingham Shipping Terminal. Propwash effects from vessel traffic are potentially significant at Unit 1C from vessel berthing activities, including both operations of tug boats and potentially the use of bow thrusters on some vessels. Some areas of coarse sediment have been identified along the Unit 1C shoreline near the berth, consistent with fines redistribution common with prop wash effects. Shell accumulations common in berth areas (caused by shells falling from sea life encrusted on dock pilings) may also affect observed particle sizes in this area.

A federal navigation channel is located in the Outer Waterway. As described in the RI Report, federal navigation channels represent a conditional agreement between the Corps of Engineers and a local entity (the “local sponsor,” in this case the Port of Bellingham) under which the federal government shares the cost and assists with the implementation of certain defined navigation maintenance activities. The limits of the federal commitment are defined geographically by the dimensions of the “project.” For the Outer Waterway, the project depth is defined as 30 feet below mean

lower low water (MLLW) and the width varies from 263 feet in Unit 1C to 363 feet in Units 1A and 1B.

Figure 4-2 illustrates the essential characteristics of the federal channel and berth areas applicable to Unit 1C of the Outer Waterway. The water depths are maintained at or slightly below the "project depth" of 30 feet in the federal channel areas. The federal channel boundaries are offset from the wharf areas by approximately 50 feet. This "berth" area is defined along the inshore edge by the "pierhead line" and along the offshore edge by the federal channel boundary. Depths in this area are maintained by local interests. Construction is generally prohibited in areas offshore of the pierhead line, and is regulated by the Corps of Engineers and the Coast Guard.

As shown in Figure 4-2, the maintenance of water depths and navigation access in the Unit 1C berth area requires maintenance of substantial shoreline infrastructure. That infrastructure includes bulkheads, engineered armored slopes and over-water wharves that provide for mooring and loading/unloading of vessels moored at the berths. In order to meet the economic needs test of the Corps of Engineers maintenance dredging program, upland land uses are restricted and are designated in Unit 1-C for appropriate water-dependent uses, consistent with the federal channel designation.

The Bellingham Shipping Terminal has been used since the early 1900s for cargo shipping and warehousing activities. The Port recently completed an analysis of federal channel and infrastructure issues in development of Port Commission Resolution 1230 in May of 2006. That Resolution affirmed the intent of the Port to preserve and maintain the current federal channel dimensions in the Outer Waterway area to support deep draft navigation and commercial uses (e.g., use by appropriate institutional users such as the Coast Guard or NOAA). The shoreline infrastructure required for operation of a shipping terminal is present in this area, though significant maintenance and potential upgrades may be required prior to resumption of deep draft uses.

4.1.3 Natural Resources

The areas of the Outer Waterway are composed largely of deepwater aquatic areas. No areas of existing premium nearshore aquatic habitat (shallow-water habitat with appropriate elevation, substrate, wave energy and other characteristics to maximize the benefits of the habitat to juvenile salmonids) are located in the Outer Waterway area. Shallow-water nearshore habitats in the Outer Waterway area are limited to under-dock areas along the Bellingham Shipping Terminal.

4.1.4 Contaminant Distribution

Surface sediments within the Outer Waterway comply with the SMS. All of the surface samples collected recently in this area have passed bioassay testing

(Figure 2-3), and no exceedances of the site-specific BSL for mercury were noted in the most recent sampling round.

Subsurface sediment concentrations in the Outer Waterway are generally quite low (Figures 2-4 and 2-5). As described in Section 7.2 of the RI Report, previous sediment testing suggests that the sediments in Units 1A and 1B may be suitable for open-water disposal or beneficial reuse. In the areas of Unit 1C, sediment contaminant levels are higher, likely precluding these sediments from open water disposal.

4.2 Inner Whatcom Waterway (Units 2 and 3)

The Inner Waterway extends from the Bellingham Shipping Terminal to the head of the Waterway at Roeder Avenue. The Roeder Avenue Bridge crosses the waterway at that location and precludes navigation further upstream. The Inner Waterway has been subdivided into two units designated "Unit 2" and "Unit 3." Each of these site units has been further subdivided:

- **Unit 2A:** Shoaled areas at the head of the 30-foot portion of the 1960s federal navigation channel
- **Unit 2B:** An area between the Whatcom Waterway and the ASB that has been considered for future construction of an access channel as part of ASB marina reuse
- **Unit 2C:** Deep areas of Unit 2, including portions of the federal channel where water depths currently exceed 24 feet below MLLW
- **Unit 3A:** An emergent tideflat area located at the head of the Waterway, adjacent to the Roeder Avenue Bridge
- **Unit 3B:** The shoaled area of the 18ft federal channel in between the emergent tideflat of Unit 3A and Unit 2A.

The characteristics of these Inner Waterway areas are described below.

4.2.1 Physical Factors

The water depths within the Inner Waterway vary greatly. Existing water depths range from greater than 30 feet below MLLW, to intertidal areas that are exposed at low tide. Areas of shallow-water habitat are predominantly located in Unit 3A at the head of the channel and along the berth areas on either side of the federal channel.

The bathymetry of the federal channel is relatively flat. However, sideslopes along either side of the waterway steepen in the berth areas. Historically these side-slopes were hardened with infrastructure for industrial water-dependent

uses. Most shorelines include armored slopes, bulkheads and over-water wharves. However, much of the Inner Waterway shoreline infrastructure is in fair to poor condition. In portions of the Central Waterfront, bulkheads have failed in part or in full, and portions of wharves have collapsed. The state of repair for shoreline infrastructure varies parcel by parcel along the waterway.

Currently, the effective water depths for the Inner Waterway are controlled by the restrictions of the federal navigation channel. Construction is not allowed past the pierhead line, so the water depths at the pierhead line establish the effective water depth for the Inner Waterway. That effective water depth varies from less than zero (in areas where sediments at the pierhead line have shoaled and are exposed at low tide) to a maximum of approximately 22 feet below MLLW. Though the project depth for portions of the federal channel is 30 feet, this depth is not currently maintained in any berth areas, and is not supported by requisite shoreline infrastructure in most areas. Most of the shoreline infrastructure in the Central Waterfront area and near the head of the waterway was established when the waterway project depth was 18 feet. The ability to establish and maintain the full project depth is restricted by the relatively narrow width of the waterway and the existing shoreline conditions.

Sediment texture in the Inner Waterway is generally dominated by fine sediments. The total fines content of Inner Waterway sediments is generally in excess of 80 percent. However, berth areas are armored with rubble, asphalt debris and armor stone in most areas. Sand and gravel are present in some emergent tideflat areas at the head of the waterway, and in beach areas alongside portions of the waterway.

Whatcom Creek enters the Whatcom Waterway upstream of the Roeder Avenue Bridge. Salinities of the inner waterway vary with tide stage and flood level of Whatcom Creek, as freshwater discharges from the creek and mixes with saline waters of Bellingham Bay.

4.2.2 Land Use and Navigation

Like the Outer Waterway, the Inner Waterway has historically been used for industrial water-dependent uses. As described in the RI Report (Section 3.3.3) the federal navigation channel was initially established in the early 1900s, and was updated most recently in 1958 in support of industrial waterfront uses. Portions of the Inner Waterway were deepened in the 1960s to comply with the updated channel dimensions, but other portions were never deepened due to the lack of supporting berth area water depths and requisite shoreline infrastructure. The width of the Waterway is constrained by developed fill areas and upland features adjacent to the Waterway.

As described in the RI Report, the Port recently completed an analysis of federal channel and infrastructure issues in development of Port Commission Resolution 1230 during May of 2006. That Resolution was developed in response to inconsistencies between the community revitalization objectives

as articulated in the Waterfront Futures Group Vision and Framework Plan, and the land use constraints associated with the federal channel within the Inner Waterway area. Specifically, the Resolution stated that the development of new industrial land uses, deep berthing areas, shoreline bulkheads and deep draft navigation infrastructure as required to establish a federal interest in future channel maintenance in this area is inconsistent with the community vision for multiple waterfront uses in the Inner Waterway area, including public shoreline access, habitat enhancement, transient moorage and mixed-use redevelopment. The Resolution articulated that greater benefits could be achieved through operation of a locally-managed, multi-purpose channel in the Inner Waterway, in a manner responsive to the community vision. The Port Resolution followed a previous Port and DNR Memorandum of Understanding completed during 2005, including a proposal to update harbor area and Whatcom Waterway channel dimensions.

Port Resolution 1230 proposed that the portion of the federal navigation channel within the Inner Waterway be de-authorized, and subsequently managed as a locally managed multi-purpose channel from the Bellingham Shipping Terminal inward to the Roeder Avenue Bridge. The Port formally requested the Washington State Congressional Delegation to include language in appropriate legislation to de-authorize the Inner Waterway portion of the Whatcom Waterway federal channel. Congressional approval of de-authorization is expected to occur during late 2006. The de-authorization will not affect the Outer Waterway (i.e., the area at and offshore of the Bellingham Shipping Terminal).

Figure 4-3 illustrates the type of shoreline infrastructure that has been considered for the Inner Waterway as part of Port marine infrastructure planning efforts. The figure was developed by the Port as part of the federal channel and marine infrastructure review activities during 2005 and 2006. The design concept (Figure 4-3) includes shoreline public access and navigation improvements compatible with area mixed use zoning and redevelopment planning. The use of softened shorelines along the sides of the waterway, rather than industrial wharves and bulkheads, has been proposed to help restore natural shoreline functions where compatible with planned navigation uses. Navigation depths within the Inner Waterway are to be maintained appropriate to the channel widths and updated shoreline infrastructure, and would most likely range between 18 to 22 feet below MLLW. During the Bellingham Demonstration Pilot, the area within Unit 3A was identified as a priority location for maintenance and enhancement of premium shallow-water habitat. A former wharf structure was removed by the City as part of cleanup and restoration actions in this area. Preservation of the emergent tideflat in this area was proposed as part of the preferred alternative from the 2000 EIS, and its preservation was referenced as part of the materials supporting Port Resolution 1230.

Throughout much of the Inner Waterway, the historic industrial infrastructure present along the shorelines results in lower-value habitats in nearshore areas, due to the presence of shading, over-water structures, bulkheads and steep armored slopes. The stated objectives of Port Resolution 1230 and its supporting materials were to support the implementation of habitat enhancement and salmon recovery efforts within the Inner Waterway, including the replacement of industrial shoreline infrastructure with shoreline treatments such as those in Figure 4-3 where practicable.

The navigation needs associated with Unit 2B are controlled by the future reuse of the ASB. As described below, the ASB area has been identified in Port and City planning efforts for development of a new waterfront marina. Planning efforts have focused on the ability to develop an environmentally sustainable marina, including integrated public access and habitat enhancement elements in the design concept. All of the recent design concepts for the marina (Figure 4-4) have identified Unit 2B as the optimum location for construction of a marina access channel. This location is preferred because it minimizes the disruption of shallow-water habitat areas (current features and potential future habitat enhancements) offshore of the ASB, and it would make use of existing navigation infrastructure within the Whatcom Waterway.

4.2.3 Natural Resources

The Inner Waterway includes a mixture of deepwater areas, and areas of emergent shallow-water habitat. Shallow-water habitat areas at the head of the Waterway and along portions of its sides are valuable forage and refuge areas as part of migration corridors for juvenile salmonids.

The preservation and enhancement of these areas was identified as a priority action under the Demonstration Pilot. However, the ability to accomplish this action is subject to balancing of habitat needs with infrastructure and navigation requirements.

4.2.4 Contaminant Distribution

With the exception of localized areas adjacent to the Colony Wharf site, surface sediments within the Inner Waterway comply with SMS bioassay criteria. Mercury concentrations are in most cases below the site-specific BSL (see Figure 2-3). While subsurface contaminant concentrations are relatively low (Figure 2-4 and 2-5), previous testing has indicated that sediments removed from the Inner Waterway are unlikely to be suitable for open water disposal or beneficial reuse (RI Report, Section 7.2).

4.3 Log Pond (Unit 4)

The Log Pond area was remediated as part of an Interim Remedial Action, completed by GP in 2000 and early 2001. The Log Pond action included placement of a sediment cap to remediate site sediments, and additional actions to enhance nearshore aquatic habitat in that area. Multiple rounds of

monitoring have been performed, documenting the success of that action, including Year 1, Year 2 and ongoing Year 5 monitoring. However, some enhancements to shoreline edges of the Interim Action cap are required to minimize potential cap erosion, and enhance the long-term stability of the cap. These additional actions are described in Appendix D of this Feasibility Study.

4.3.1 Physical Factors

The Log Pond was created as various fills were placed around the area. It was used for log handling and was the location of the original wastewater outfall from the GP chlor-alkali plant to Bellingham Bay, prior to construction of the ASB. An interim cleanup action consisting of the construction of a combination sediment cap and habitat enhancement was completed in the GP Log Pond in 2001.

Prior to the Interim Action, the Log Pond had a bottom elevation that was typically approximately -10 feet MLLW, with slopes up to the shorelines, and down to approximately -26 feet MLLW at the intersection with the Whatcom Waterway. During the Interim Action, approximately 42,000 cubic yards of sediment were placed, with thicknesses ranging up to 6 feet, with a typical design thickness of greater than 3 feet, and an average thickness as placed of 3 to 4 feet. This brought the bottom elevation up so that it was generally on the order of -3 to -4 feet MLLW, and sloped up to the shorelines, and down to the Whatcom Waterway.

Currently, there are very few structures within the Log Pond. A pile-supported conveyor system exists along the Bellingham Shipping Terminal shoreline, a dolphin (i.e., cluster of pilings) is located within the log pond, and there are numerous pilings along the shoreline. A wharf extends to the southwest, in front of the Log Pond along a portion of the Waterway.

The shoreline prior to the interim action was generally composed of riprap and concrete rubble slopes and wooden and steel sheet-piling bulkheads down to a depth of approximately -5 feet MLLW. These shorelines were left in place through construction.

The sediments in the GP Log Pond prior to the interim action ranged from sandy to very sandy organic silt and clay with a slightly clayey sand with some gravel near the shoreline. The solids content of the sediments ranged from approximately 25 to 40 percent, with an average around 30 to 35 percent. In the northeast end of the pond, a large (>50 percent) content of shell fragments was noted.

The material placed as part of the Interim Action consisted of beneficially reused dredge materials from two sources. The first was navigational dredging spoils from the Swinomish Channel near La Conner, Washington. This material was a sand, with less than 4 percent fines, and 1 to 8 percent

gravel. The other material used was dredge material from the Squalicum Creek Waterway in Bellingham. This material was generally classified as a silty clay. A grab sample taken during the 2001 construction indicated that the material was an organic clay, and contained 5 percent sand, 78 percent silt, and 17 percent clay.

TOC concentrations in the GP Log Pond prior to the interim action ranged from 2.7 to 15 percent, with an average of approximately 6 to 10 percent. TOC measurements were not made of the Swinomish Channel materials. The Squalicum Creek materials were approximately 1.5 to 1.7 percent TOC. The current surface in the GP Log Pond is largely these Squalicum Creek materials.

As described in Appendix D, the Log Pond is partially sheltered from prevailing winds. However some westerly winds can enter the Log Pond and subject portions of the shoreline to erosive forces. Remaining areas of the shoreline are protected from these wind and wave forces, though northerly winds and vessel wakes can produce some smaller waves. Cap monitoring has shown good long-term stability for the majority of the cap area. Some erosion effects have been noted in limited shoreline areas of the cap. Enhancements to the shoreline conditions to provide for long-term stability of these areas under site wind and wave conditions are presented in Appendix D and will be implemented as part of the final remedial action for the site.

4.3.2 Land Use and Navigation

As its name implies, Unit 4 was historically used as a log pond for lumber and pulp mill operations. These uses have been discontinued since the Interim Remedial Action.

The Log Pond has been designated for cleanup and habitat restoration uses. Some public access enhancements to upland shoreline areas are likely as part of future New Whatcom redevelopment activities. These uses would likely include development of a shoreline promenade along portions of the Log Pond. No in-water navigation uses are contemplated for the Log Pond, with the exception of potential use by small hand-carry boats (i.e., kayaks).

4.3.3 Natural Resources

Monitoring of the Log Pond Interim Action cap has confirmed the use of the restored area by juvenile salmonids, juvenile Dungeness crabs and other aquatic organisms and marine mammals.

Some eel grass colonization has occurred since implementation of the Interim Action. However, the colonization has been limited to date to a relatively small number of established blades. A pilot program has been funded under the Bellingham Bay Demonstration Pilot to enhance natural colonization rates through seeding of the area with eel grass. This pilot test is ongoing.

4.3.4 Contaminant Distribution

As described in Appendix I of the RI Report, the Log Pond Interim Action has attained compliance with surface sediment cleanup levels throughout most of the area. No migration of contaminants upward through the cap or through cap porewater has been observed.

A localized area of recontamination was noted in the southwest corner of the Log Pond, adjacent to an area of shoreline not included in the Interim Action cap boundaries. As described in Appendix D, shoreline enhancements to this area will be performed as part of the final remedial action, including extension of the cap area to include this adjacent area, and placement of appropriately-graded materials to ensure long-term stability of the cap edges.

4.4 Areas Offshore of ASB (Unit 5)

The area offshore of the ASB is a relatively shallow-water area, the majority of which has not been dredged for navigation uses. This area of the site is designated as Unit 5. Unit 5 is subdivided in to three subareas:

- **Unit 5A:** Deeper water areas offshore of the ASB
- **Unit 5B:** High-energy nearshore areas on the "shoulder" of the ASB. Some sediments within this area have mercury concentrations that remain above site cleanup levels
- **Unit 5C:** Shallow-water areas along the southeastern shoulder of the ASB, adjacent to the Inner Waterway.

4.4.1 Physical Factors

Water depths within Unit 5 vary by area. In Unit 5B the depths are shallow, ranging from approximately 6 feet to approximately 12 feet below MLLW. Similarly, Unit 5C water depths are shallow, ranging from approximately 2 feet below MLLW along the edge of the ASB, to depths of approximately 18 feet below MLLW along the Whatcom Waterway.

Water depths in Unit 5A vary from relatively deepwater (up to 26 feet below MLLW) offshore areas, to shallow water areas adjacent to the ASB (as shallow as 4 feet below MLLW. Depths shoal gradually, consistent with natural bathymetric conditions within the Bay. The depth contours along the Whatcom Waterway edges of these areas have been affected by historic dredging patterns within the Waterway.

The sediments within Unit 5 range from fine-grained sediments in deepwater areas, to sandy sediments with some gravel in shallow-water, high-energy areas of Unit 5B. The particle size distribution is controlled by area wave energies as described in Appendix C.

Current wave energies in Unit 5C are lower due to the partial sheltering of this area by the ASB structure and the Bellingham Shipping Terminal.

4.4.2 Land Use and Navigation

The shoulder areas of the ASB were historically used for log rafting, prior to construction of the ASB. Future navigation use of these areas is considered limited by water depths and the lack of available upland adjacent to these areas.

The Port plans to develop an environmentally sustainable marina within the ASB. The marina has been included in the Port's Comprehensive Scheme of Harbor Improvements as described below (Section 4.7). However, navigation features within Unit 5 are not contemplated due to anticipated conflicts between such uses and habitat preservation and enhancement objectives. The priority uses within Unit 5 are those associated with habitat enhancement opportunities.

The modification of this area to construct nearshore habitat benches along this portion of the shoreline was considered as part of the 2000 Comprehensive Strategy EIS, and has been incorporated into design concepts for the ASB marina (Figures 4-4 and 4-5). However, no modifications to this area have been completed to date.

4.4.3 Natural Resources

The Habitat Restoration Documentation Report (BBWG, 1999) identified Unit 5 shoreline areas as salmonid migration corridors, though depths and wave energies are not currently optimal for the development of premium nearshore habitat quality.

4.4.4 Contaminant Distribution

Throughout most of Unit 5 the surface sediments comply with the SMS. Subsurface sediment concentrations are relatively low as shown in Figures 2-4 and 2-5. However, wave energies within Unit 5B are higher than in other areas and recent sampling in 2002 indicates that, while sediments in this area do not exceed bioassay criteria established under SMS, the site-specific mercury BSL is exceeded in Unit 5B (Figure 2-3).

4.5 Areas Near Bellingham Shipping Terminal (Unit 6)

Unit 6 consists of the aquatic lands to the south and southeast of the Whatcom Waterway and Bellingham Shipping Terminal. This area has been subdivided into three subareas:

- **Unit 6A:** Deepwater areas of Unit 6 that comply with sediment cleanup levels

- **Units 6B and 6C:** Deepwater and intermediate-depth areas near the former barge dock where exceedances of bioassay criteria were noted during recent sampling in 2002.

4.5.1 Physical Factors

Most of Unit 6 consists of deepwater areas, with elevations greater than 18 feet below MLLW. However, shallow-water areas are located immediately adjacent to the Bellingham Shipping Terminal. The shorelines in this area consist of engineered slopes, armored to resist wind and wave erosion.

Sediments in deepwater areas of Unit 6 consist of fine-grained sediments typical of the Whatcom Waterway site. The total fines content typically exceeds 80 percent. TOC levels range from 1 to 5 percent, consistent with average Whatcom Waterway site conditions.

4.5.2 Land Use and Navigation

Navigation uses in Unit 6 have historically included log rafting, barge traffic and tug boat mooring. Some prop wash effects may be significant in this area, depending assuming future barge and tug uses.

Two docks are located within Unit 6, including the barge dock and the former GP Chemical dock. The northern side of Unit 6 is bounded by the back side of the Bellingham Shipping Terminal wharf structure.

Some dredging activities have historically been performed in Unit 6, including dredging for establishment of cargo terminal berth areas, as well as dredging to obtain fill material for use in development of the Bellingham Shipping Terminal. Regular maintenance dredging such as that considered for the Whatcom Waterway areas is not expected. As described above for the Outer Waterway, the Bellingham Shipping Terminal will likely remain under industrial water-dependent use for the foreseeable future, including potential reuse by institutional users and/or cargo operations.

4.5.3 Natural Resources

Like Unit 5, the area within Unit 6 was identified in the Habitat Restoration Documentation Report (BBWG, 1999) as a salmonid migration corridor, though depths, wave energies and substrates were not optimal. Habitat values in this area are also constrained by navigation infrastructure needs of the Bellingham Shipping Terminal, including the presence of over-water wharves and armored shorelines.

4.5.4 Contaminant Distribution

The principal contaminants historically identified in the Unit 6 area are phenolic compounds. The primary sources of these compounds appear to be from historical log rafting activities. Natural recovery processes for these

materials include both deposition and burial, as well as biodegradation (phenolic compounds are biodegradable under both aerobic and anaerobic conditions).

During sediment testing in 2002, a single failure was noted in an amphipod bioassay test performed at station AN-SS-30 (see Figure 2-5). Mercury levels were below the numeric SQS in this sample. No bioassay exceedances or elevated mercury levels were noted in other areas of Unit 6 during 2002 sampling activities.

4.6 Starr Rock (Unit 7)

Starr Rock consists of a sediment disposal area used for management of sediments dredged from the Whatcom Waterway and adjacent berth areas during the late 1960s. The area was designated for sediment disposal under project Corps of Engineers permits. The area is located in submerged offshore areas near the natural Starr Rock navigation obstruction. This area is designated as Unit 7.

4.6.1 Physical Factors

Water depths in Area 7 range from a low of approximately 20 feet below MLLW to a maximum of approximately 40 feet. Due to its deepwater location, Unit 7 is not subject to significant wave energies. Sediments in this area are predominantly fine-grained materials, with total fines contents of greater than 80 percent. Like most areas of the Whatcom Waterway, the TOC content of sediments in this area is generally between 1 and 5 percent. Localized deposits of woody materials were noted, with some TOC contents exceeding 5 percent.

4.6.2 Land Use and Navigation

Historic navigation uses in Unit 7 were limited to log rafting. These uses were discontinued in the 1970s with the development of Boulevard Park nearby. Future navigation uses in Unit 7 are not anticipated other than transit uses by recreational vessels. Deepwater navigation is restricted in this area due to the proximity of the natural shallow-water obstruction at Starr Rock, and by the lack of adjacent upland navigation support facilities.

4.6.3 Natural Resources

Unit 7 consists of a deepwater habitat area and has not been identified as premium habitat for salmonids or other aquatic species.

4.6.4 Contaminant Distribution

The surface sediments within Unit 7 comply with the SMS. Surface sediments in this area do not contain any exceedances of the site-specific mercury BSL, and no exceedances of SMS criteria were noted in sediment bioassays during the 2002 sampling event (Figure 2-3).

4.7 ASB (Unit 8)

Unit 8 consists of the interior of the ASB. This facility was constructed by GP in 1978 for treatment of wastewater from pulp and tissue mill operations.

4.7.1 Physical Factors

The ASB is approximately 1,000 feet wide north-south, and varies from approximately 1,000 to 1,400 feet wide east-west. The ASB berms enclose Unit 8 and separate it from Bellingham Bay. The ASB berms enclose an area of approximately 28 acres.

Figures 2-2 and 4-5 show schematic cross-sections of the ASB berm. Additional cross-sections of the ASB area are included in the RI Report (RI Figures 3-6 and 3-8). The berm was constructed of quarried sand and stone materials placed at the time of construction. The interior of the ASB was dredged to depths approximately 15 feet below MLLW. A bentonite material was used to reduce the permeability of the berm and make it suitable for wastewater containment uses. An asphalt surface was placed around the berm interior edges to prevent wind and wave erosion of the berm structure. The outer edges of the berm are armored with stone to protect against wave erosion. Wastewater elevations within the ASB are maintained by active pumping at approximately 19 to 20 feet above MLLW. This elevation is significantly higher than the water elevations in Bellingham Bay, and provides hydraulic head necessary to discharge treated wastewater by gravity flow through the GP-owned, NPDES-permitted outfall.

Since construction of the ASB facility, biotreatment sludges have accumulated in the ASB. These sludges are soft, wet and are extremely high in TOC content. The solids content of these materials is less than 30 percent and averages about 14 percent. The TOC content is very high, averaging between 30 and 50 percent. The sludges consist of pulp solids and microbial biomass produced during biotreatment of facility wastewaters.

In contrast to the ASB sludges, the berm materials consist primarily of clean coarse sand obtained from quarry sites during ASB construction. These materials were tested for physical properties and chemical properties as part of the Remedial Investigation activities. Sediments underlying the ASB also consist of sandy materials.

The exterior of the ASB was constructed with a final cover of large armoring rock, generally of 300 to 4,400 pounds. These exterior slopes were constructed between 2.5 and 3:1 (H:V). The interior slopes are finished at slopes of approximately 2.5:1 (H:V).

4.7.2 Land Use and Navigation

The ASB facility was constructed by GP for treatment of wastewater and stormwater. It also provides cooling water management for the Encogen

energy production facility. These uses are expected to continue through June of 2008, consistent with Port-GP agreements. After that time these uses are likely to be discontinued.

The ASB has been identified by the Port as the preferred site in Bellingham Bay for construction of a new marina facility (Makers, 2004). The preference for the site was based on several factors, including the ability to develop a marina with net gains in both habitat and public access opportunities. The development of a marina in the ASB was included in the 2004 Waterfront Futures Group Vision and Framework Plan, and in the Port's 2004 update to its Comprehensive Scheme of Harbor Improvements. The development of a marina in the ASB was a key element of the Port's purchase of the GP properties in 2005, and is also a key element of Port-City plans for redevelopment of the New Whatcom redevelopment area, as stated in the Port-City Interlocal Agreement of May 2006. Preliminary design concepts for a marina have been developed between 2004 and 2006, incorporating public access and habitat enhancements. Some of these concepts are illustrated in Figures 4-4 and 4-5.

The earliest marina design concepts shown in Figure 4-4 were developed as part of the Waterfront Futures Group. The community preference was that public access features to be located on portions of the breakwater surrounding the new marina. A modified design concept was developed by the Port integrating the Waterfront Futures Group concepts with modifications to the original concept made after consultations with resource agencies and project stakeholders. Modifications included relocation of the marina entrance, and the incorporation of habitat enhancement and fish passage features in subaqueous portions of the breakwater. Additional analyses were conducted as part of a waterfront design charette during March of 2006. That charette included resource agencies and community representatives, and resulted in further development of the design concept for integrated marina, public access and habitat enhancement uses. Some of the design concepts developed at the design charette are included in Figure 4-4.

Figure 4-5 illustrates some of the changes that have been contemplated for the ASB berm structure as part of marina reuse. These changes assume that Waterway cleanup activities remove the ASB sludges from the site. The clean berm materials can then be partially removed from the area for reuse in cleanup and habitat enhancement activities. The berms would be modified to reduce overall height and width consistent with marina breakwater requirements. Public access amenities may be included in the berm, potentially including a shoreline promenade, landscape features and other enhancements. Habitat enhancements may be included in the berm including nearshore habitat benches on either the inner or outer areas of the berm. Marina facilities would be located in deepwater areas inside the ASB area. The final design will depend on optimization of navigation, public access and

habitat uses and will be developed in future design and permitting for area reuse.

The City also evaluated the ASB for potential future stormwater or wastewater treatment uses, but it determined that it is not well suited for these uses due to its location, elevation, and the operational characteristics of the current GP-owned outfall structure.

4.7.3 Natural Resources

Currently the ASB is used as a wastewater treatment lagoon, and the area has no significant existing natural resources or habitats. The area is segregated from the marine environment by the ASB berms. The water within the ASB consists of industrial wastewater, and the ASB interior shorelines are lined with asphalt.

4.7.4 Contaminant Distribution

As described in the RI Report, the ASB sludges contain the highest contaminant levels of all of the materials requiring remediation. Contaminant levels include elevated mercury levels from chlor-alkali plant wastewaters, but also contain very high levels of phenolic compounds and other inorganic and organic contaminants including cadmium, zinc, phthalates and polynuclear aromatic hydrocarbon (PAH) compounds. Average subsurface sediment quality data for the ASB sludges (0.4-4 ft depth interval) are summarized in Figures 2-4 and 2-5.

As described in section 4.7.1, the ASB sludges are soft, wet and have very high TOC contents.. In portions of the ASB, a layer of contaminated sediments is located at the transition between the ASB sludges and underlying clean sediments.

Materials in the ASB berms were directly tested as part of Remedial Investigation Activities. The berm sands were free from anthropogenic contaminants and were suitable for material reuse, provided that ASB sludges are first removed so that the materials can be safely accessed. Some contaminated sediments are present in a thin layer of sediments at the pre-construction mud-line, beneath the ASB berm materials as shown in Figure 2-2.

4.8 I&J Waterway Sediment Site

The I&J Waterway sediments were sampled as part of the RI activities. Mercury associated with the Whatcom Waterway site is present at low levels in subsurface sediments in this area (Figure 2-4). However, testing as part of the RI showed that mercury concentrations did not exceed SMS biological criteria in surface sediments, and characterization of subsurface sediments has shown that the mercury levels do not exceed allowable levels for open-water disposal or beneficial reuse. In contrast, contamination of surface sediment

with phthalates, nickel, wood waste and other contaminants from localized historical releases has been shown to be present in excess of SMS standards in the I&J Waterway area.

During 2003 and 2004, Ecology determined that the sediments at the head of the I&J Waterway represent a distinct contamination area that was best managed as a separate sediment cleanup site. As described in the RI Report (RI Section 6.1.3) a separate RI/FS is being conducted for this area under an Agreed Order between the Port and Ecology. Based on its management as a separate site, the I&J Waterway is not carried forward as a site unit for the Whatcom Waterway FS.

Outside of the I&J waterway sediment site, the sediments within the I&J waterway are not subject to further remedial action, because surface sediments do not exceed SMS cleanup levels, and further remedial action is not required to address impacted subsurface sediments. Testing performed during the Remedial Investigation showed that subsurface sediments within the outer portion of the federal navigation are suitable for open-water disposal. Ongoing channel maintenance activities conducted by the Corps of Engineers includes material characterization provisions that address future management of the sediments in this area.

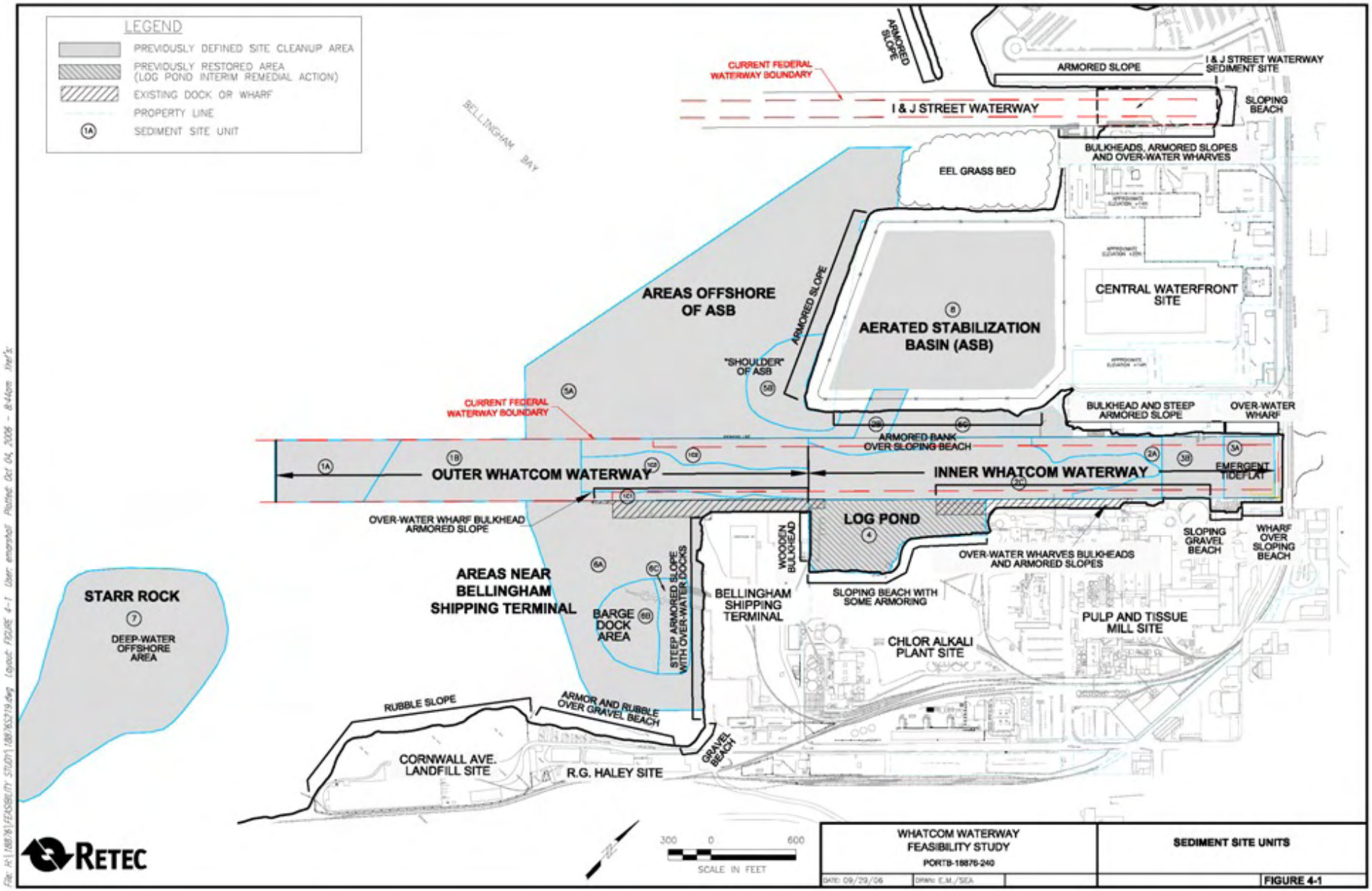

LEGEND
PREVIOUSLY DEFINED SITE CLEANUP AREA
PREVIOUSLY RESTORED AREA (LOG POND INTERIM REMEDIAL ACTION)
EXISTING DOCK OR WHARF
PROPERTY LINE
1A SEDIMENT SITE UNIT
BELLINGHAM BAY
CURRENT FEDERAL WATERWAY BOUNDARY
ARMORED SLOPE
I & J STREET WATERWAY
I & J STREET WATERWAY SEDIMENT SITE
SLOPING BEACH
BULKHEADS, ARMORED SLOPES AND OVER-WATER WHARVES
EEL GRASS BED
CENTRAL WATERFRONT SITE
AREAS OFFSHORE OF ASB
AERATED STABILIZATION BASIN (ASB)
"SHOULDER" OF ASB
BULKHEAD AND STEEP ARMORED SLOPE
OVER-WATER WHARF
ARMORED BANK OVER SLOPING BEACH
OUTER WHATCOM WATERWAY
INNER WHATCOM WATERWAY
EMERGENT TIDEFLAT
OVER-WATER WHARF BULKHEAD ARMORED SLOPE
LOG POND
WOODEN BULKHEAD
SLOPING GRAVEL BEACH
WHARF OVER SLOPING BEACH
OVER-WATER WHARVES BULKHEADS AND ARMORED SLOPES
AREAS NEAR BELLINGHAM SHIPPING TERMINAL
STEEP ARMORED SLOPE WITH OVER-WATER DOCKS
BARGE DOCK AREA
BELLINGHAM SHIPPING TERMINAL
SLOPING BEACH WITH SOME ARMORING
PULP AND TISSUE MILL SITE
CHLOR ALKALI PLANT SITE
STARR ROCK
DEEP-WATER OFFSHORE AREA
RUBBLE SLOPE
ARMOR AND RUBBLE OVER GRAVEL BEACH
GRAVEL BEACH
CORNWALL AVE. LANDFILL SITE
R.G. HALEY SITE
RETEC
300 0 600
SCALE IN FEET
WHATCOM WATERWAY FEASIBILITY STUDY
PORTB-18876-240
SEDIMENT SITE UNITS
FIGURE 4-1

Figure 4-2
Shoreline Infrastructure and Dredging Patterns in the Outer Waterway

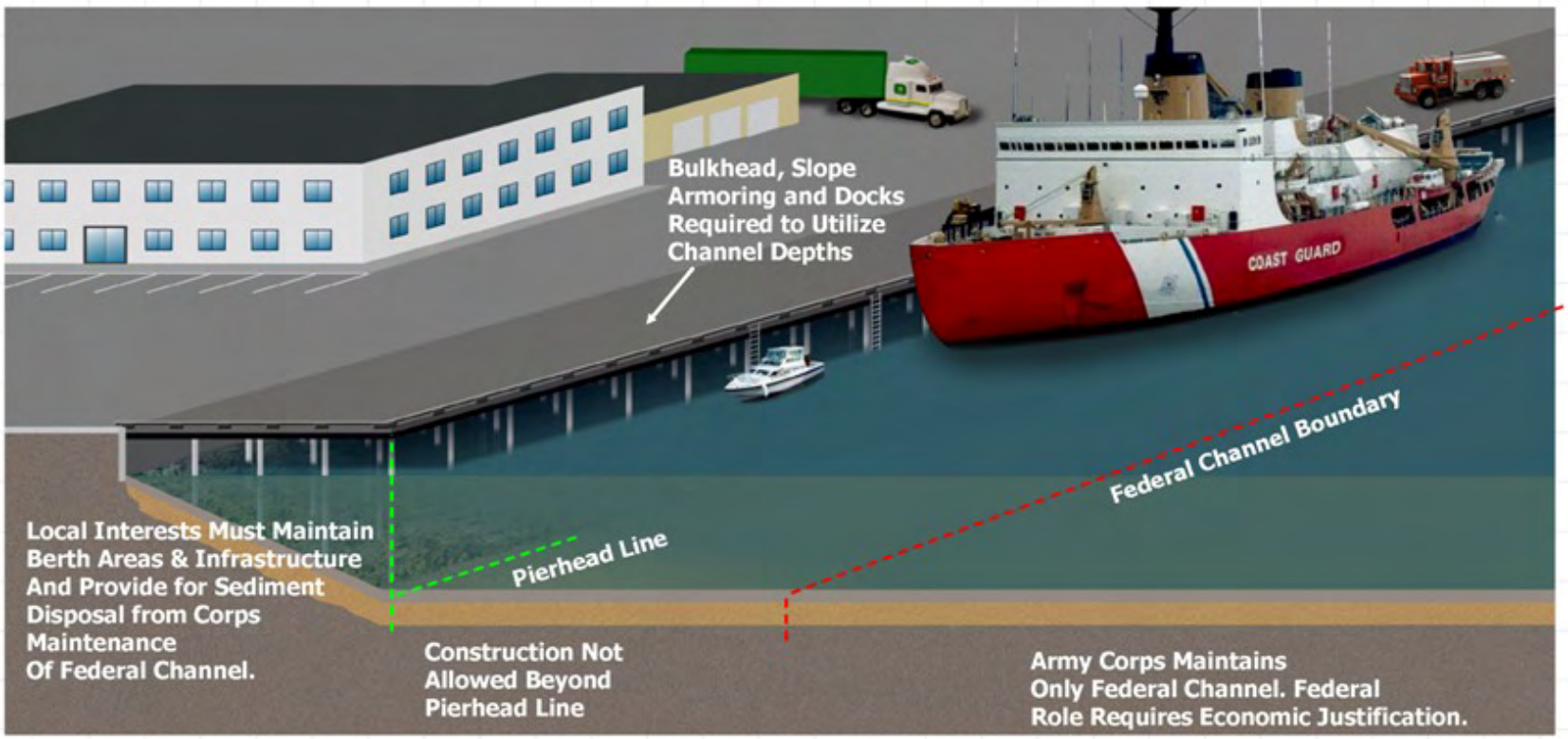


Figure 4-3
Shoreline Infrastructure Design Concept for Multi-Purpose Inner Waterway

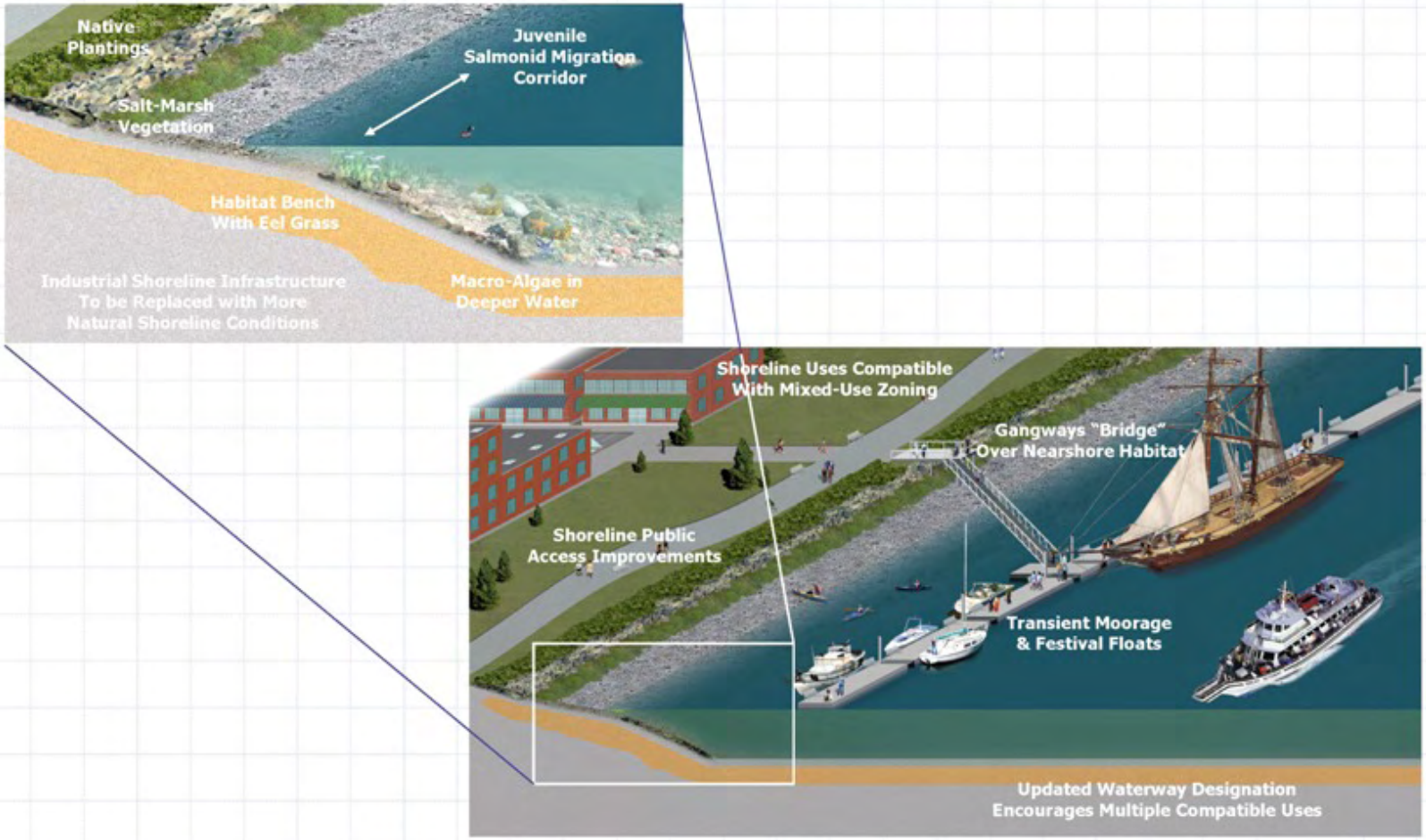


Figure 4-4
ASB Marina Design Concepts

Early Design Concepts

Waterfront Futures Group Concept Drawing

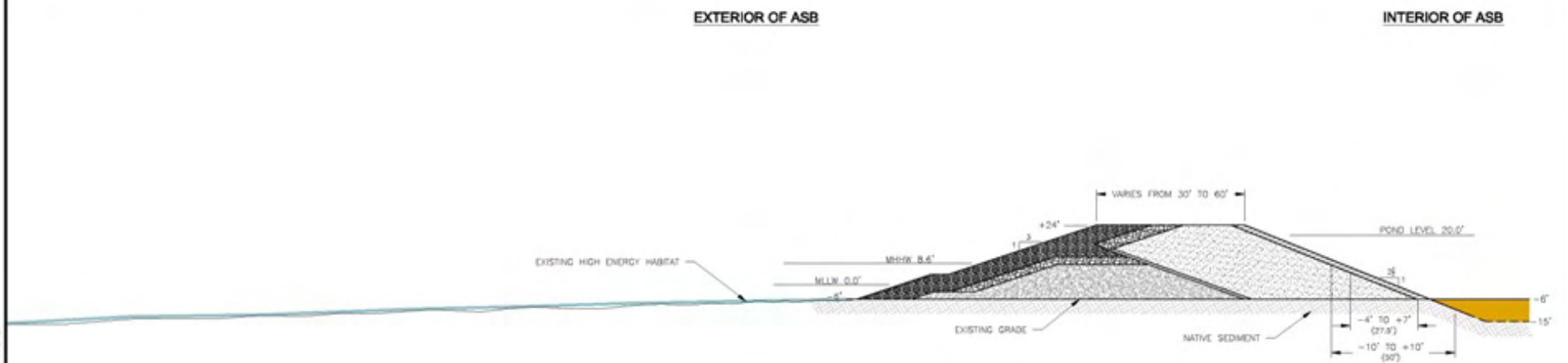
Initial Concept at Time of Port Update to Comprehensive Scheme of Harbor Improvements

Updated Concepts from 2006 Waterfront Design Charette

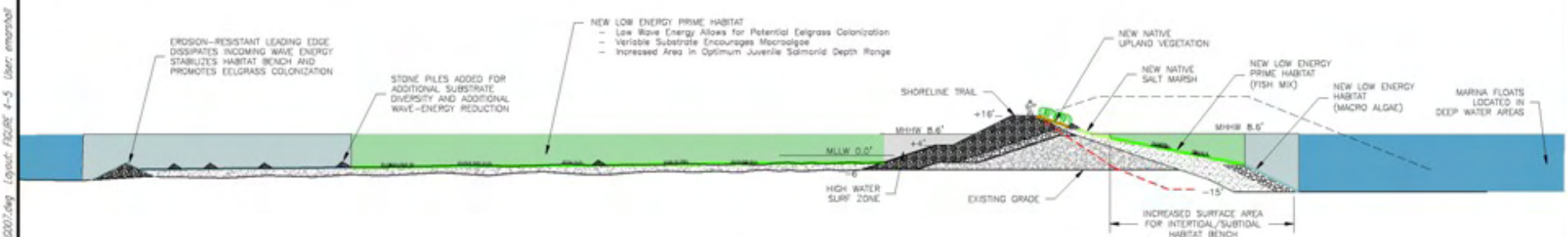
Overview Showing Public Access And Habitat Enhancements Along Breakwater

Design Concepts for Waterfront Trail System

Illustration of Linkages Between Marina and Other Waterfront Revitalization Efforts Along the Inner and Outer Whatcom Waterway



EXISTING CONDITIONS



PRELIMINARY DESIGN CONCEPT

20 0 40
SCALE IN FEET

RETEC

WHATCOM WATERWAY FEASIBILITY STUDY	PRELIMINARY DESIGN CONCEPT ASB BERM RECONFIGURATION
DATE: 08/21/06 DRWN: A.S./SEA	FIGURE 4-5

File: H:\168761\FEASIBILITY STUDY\168460007.dwg Layout: FIGURE 4-5 User: emarshall Plotted: Sep 27, 2006 - 10:40am Xref's: