STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Northwest Regional Office • 3190 160th Avenue SE • Bellevue, Washington 98008-5452 • (425) 649-7000

October 10, 2006

Dear Interested Party:

In October of 2000, after public review and comment, the Department of Ecology (Ecology) issued the Final Environmental Impact Statement for the Bellingham Bay Comprehensive Strategy (FEIS). The FEIS analyzed and compared the major environmental differences between implementing the Comprehensive Strategy and not implementing the Comprehensive Strategy, as well as analyzed and compared a range of remedial action alternatives that address contaminated sediment sites in Bellingham Bay, including the Whatcom Waterway site.

Since completion of this document subsequent events and new information have resulted in the need to update previous analyses, as well as to analyze new remedial alternatives. Eight remedial alternatives for the cleanup of the Whatcom Waterway site plus a No Action Alternative are analyzed and compared in the attached Draft Supplemental Environmental Impact Statement: Bellingham Bay Comprehensive Strategy, Whatcom Waterway Cleanup Site, prepared in compliance with the State Environmental Policy Act (RCW 43.21C). This Supplemental EIS is a companion document to the Supplemental Remedial Investigation/Feasibility Study (RI/FS) for the Whatcom Waterway site which is concurrently available for public review.

Key potential environmental impacts pertain to Geology, Water and Environmental Health; Fish and Wildlife; and Land Use, Shoreline Use and Recreation/Public Use. Many of the proposed remedial alternatives destabilize areas of the shoreline, eliminate existing habitat, and conflict with planned land uses resulting in net adverse impacts to the environment. Other alternatives stabilize areas of the shoreline, create new habitat, and are consistent with planned land uses resulting in a net beneficial impact.

Written comments on the Supplemental EIS will be accepted throughout the public comment period, which runs from October 10, 2006 to December 9, 2006. In addition, Ecology will provide information about the Supplemental EIS and the companion Supplemental RI/FS at two public meetings:

- October 26th, 6:30 p.m. – 8:30 p.m., Bellingham Cruise Terminal, 355 Harris Avenue, Bellingham, WA
- November 30th, 6:30 p.m. – 8:30 p.m., Bellingham Municipal Court, 2014 C Street, Bellingham, WA

The Supplemental EIS, the companion RI/FS and public comment on both documents will inform Ecology's preliminary selection of a cleanup alternative for the Whatcom Waterway site. This alternative will be further detailed and available for public review in a draft Cleanup Action Plan (CAP). Following public review of the CAP, a final CAP will be issued with the final Supplemental EIS. The cleanup will then move forward into design permitting, construction and long-term monitoring.

For further information on the Supplemental EIS, please contact Lucy McInerney of Ecology at 425-649-7272, at the address above, or e-mail lpeb461@ecy.wa.gov.

Sincerely,

Steven M. Alexander
Toxics Cleanup Program Regional Manager

SMA:LM:nr

FACT SHEET

Project Title:

Bellingham Bay Comprehensive Strategy – Whatcom Waterway Cleanup Site.

Proposed Action:

The Proposed Action consists of the cleanup of the Whatcom Waterway Site, in accordance with requirements of the Model Toxics Control Act (MTCA) and Sediment Management Standards (SMS) regulations. Cleanup of the Whatcom Waterway site is one element of the Bellingham Bay Comprehensive Strategy, a bay-wide guidance document developed through the Bellingham Bay Demonstration Pilot (Pilot), a 14 member federal, state, local and tribal partnership. The Bellingham Bay Comprehensive Strategy was presented by the Department of Ecology (Ecology) in a Final Environmental Impact Statement in October of 2000.

Ecology has issued for public review and comment a Draft Supplemental Remedial Investigation/Feasibility Study (RI/FS), evaluating eight potential cleanup alternatives for the Whatcom Waterway site. The RI/FS identifies preferred cleanup alternatives based on MTCA evaluation criteria. The preferred alternatives are identified in the RI/FS as Alternatives "5" and "6". Both alternatives conduct remediation of the Whatcom Waterway site using a combination of dredging with upland disposal, capping, institutional controls, and monitored natural recovery technologies. The RI/FS includes detailed evaluation of six other remedial alternatives that would accomplish the cleanup of the site in different ways.

This Draft Supplemental Environmental Impact Statement: Bellingham Bay Comprehensive Strategy, Whatcom Waterway Cleanup Site (SEIS) evaluates potential environmental impacts associated with each of the eight remedial alternatives evaluated in the RI/FS document, and compares these to the impacts of a No Action alternative. The evaluation is conducted consistent with State Environmental Policy Act (SEPA) requirements. In addition to these regulatory requirements the SEIS also evaluates consistency of the alternatives with the goals of the Bellingham Bay Demonstration Pilot.

The SEIS, the companion RI/FS and public comment on both documents will inform Ecology's preliminary selection of a cleanup alternative for the Whatcom Waterway site. This alternative will be further detailed and available for public review in a draft Cleanup Action Plan (CAP). Following public review of the CAP, a final CAP will be issued with the final Supplemental EIS. The cleanup will then move forward into design permitting, construction and long-term monitoring.

Project Location:

The project is located within the inner, urbanized portion of Bellingham Bay. The Whatcom Waterway site includes aquatic lands located within and around the Whatcom Creek Waterway navigation channel, located near downtown Bellingham.

Proponent:

Port of Bellingham
P.O. Box 1677
Bellingham, Washington 98227-1677

Lead Agency:

Washington State Department of Ecology
P.O. Box 47775
Olympia, Washington 98504-7775

Responsible Official:

Steven M. Alexander
Toxics Cleanup Program Regional Manager

Washington State Department of Ecology
Northwest Regional Office
3190 160th Avenue SE
Bellevue, Washington 98008-5452

Contact Person:

Lucille T. McInerney, P.E.
Washington State Department of Ecology
Northwest Regional Office
3190 160th Avenue SE
Bellevue, Washington 98008-5452
(425) 649-7272
E-mail: lpeb461@ecy.wa.gov

Required Approvals:

Depending on the final cleanup alternative ultimately selected by Ecology, the following permits and other approvals may be required:

- Hydraulic Project Approval (HPA – Washington Department of Fish and Wildlife)
- Department of the Army Section 10 / Section 404 Permit (Corps of Engineers)
- Section 401 Approval (Ecology)
- Aquatic Use Authorization (Department of Natural Resources)
- Coastal Zone Management Certification (Ecology)
- Shoreline Substantial Development (City of Bellingham)
- ESA Compliance (National Marina Fisheries Service and United States Fish and Wildlife Service)

The cleanup action will be exempt from the procedural requirements of state and local permits if conducted pursuant to a MTCA administrative order or

consent decree issued by Ecology, however the substantive requirements of the applicable laws must be addressed.

Authors and Principal Contributors:

Washington State Department of Ecology
3190 160th Avenue SE
Bellevue, WA 98008-5452
Project Lead: Lucille T. McInerney, P.E.

The RETEC Group, Inc.
1011 SW Klickitat Way, Suite 207
Seattle, WA 98134-1162
Project Lead: John Guenther, LHG
Additional contributors include: Mark Larsen, Allison Crowley, Mike Byers, Jamie Stevens, Dan Berlin

Grette & Associates
151 S Worthen St, #101
Wenatchee, Washington 98801
Project Lead: Glenn Grette

Date of Issue:

October 10, 2006

Comments Due by:

December 9, 2006.
Submit to Lucille T. McInerney at above address or lpeb461@ecy.wa.gov

Public Meetings:

Public Meeting	Public Meeting
October 26th, 2006	November 30th, 2006
6:30 p.m. – 8:30 p.m.	6:30 a.m. – 8:30 p.m.
Bellingham Cruise Terminal	Bellingham Municipal Court
355 Harris Avenue	2014 "C" Street
Bellingham, Washington	Bellingham, Washington

Cleanup Start Date:

The anticipated start date for site cleanup is fall of 2008. This date is subject to final Ecology determinations, and project engineering design and permitting.

Location of Draft SEIS and other documents available for review.

Department of Ecology
Bellingham Field Office
1204 Railroad Avenue, Suite 200
(360) 738-6250

Bellingham Public Library
210 Central Avenue, Bellingham
(360) 676-6860

Department of Ecology
Northwest Regional Office
3190 160th Avenue SE
Bellevue, Washington 98008-5452
(425) 649-7190 (Call for an appointment)

Ecology's Web Site:
http://www.ecy.wa.gov/programs/tcp/sites/bel_bay_sites.html

Costs to the Public:

An electronic copy of the draft EIS is available free of charge at Ecology's web site.

Printed copies can be obtained from Ecology subject to applicable reproduction charges.

Draft Supplemental Environmental Impact Statement: Bellingham Bay Comprehensive Strategy

Whatcom Waterway Cleanup Site

Prepared by:

The RETEC Group, Inc.
1011 SW Klickitat Way, Suite 207
Seattle, WA 98134-1162

RETEC Project Number: PORTB-18876

Prepared for:

Washington Department of Ecology
3190 160th Ave SE
Bellevue, Washington 98003

Public Review Draft

October 10, 2006

Draft Supplemental Environmental Impact Statement: Bellingham Bay Comprehensive Strategy

Whatcom Waterway Cleanup Site

Prepared by:

The RETEC Group, Inc.
1011 SW Klickitat Way, Suite 207
Seattle, WA 98134-1162

RETEC Project Number: PORTB-18876

Prepared for:

Washington Department of Ecology
3190 160th Ave SE
Bellevue, Washington 98003

Prepared by:

J.C. Stevens (for)

Allison Crowley, P.E.

(for)

John Guenther, Hydrogeologist

Reviewed by:

Mark Larsen , Senior Project Manager

October 10, 2006

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1 Summary

This Supplemental Environmental Impact Statement (EIS) presents an environmental impact analysis in accordance with the requirements of the State Environmental Policy Act (SEPA), as defined in WAC 197-11. This impact analysis has been conducted in support of the cleanup of the Whatcom Waterway site in Bellingham.

Following public review, this EIS together with the companion Draft Supplemental Remedial Investigation and Feasibility Study (RI/FS), will be used by the Department of Ecology (Ecology) to preliminarily select a cleanup alternative for the Whatcom Waterway site. The preliminarily selected cleanup alternative will be articulated for public review in a future Draft Cleanup Action Plan.

This document was prepared consistent with the requirements of the State Environmental Policy Act (SEPA) regulations, as defined in WAC 197-11. In addition, this document provides an evaluation of proposed actions against a set of non-regulatory goals, developed by Ecology in conjunction with other regulatory and resource agencies, local governments, tribes and project stakeholders as part of the Bellingham Bay Demonstration Pilot. Background regarding the Whatcom Waterway site and the Bellingham Bay Demonstration Pilot are provided in Sections 1.1 and 1.2 below. Subsequent sections of this summary describe the project regulatory context, and describe the evaluated project alternatives and the conclusions of the Supplemental EIS.

After considering public comment on this Supplemental EIS and the project RI/FS, the Department of Ecology (Ecology) will select a cleanup alternative for the site. That alternative will be implemented after development of a site Consent Decree and after subsequent remedy design and permitting.

1.1 Whatcom Waterway Project Background

The Whatcom Waterway site is located within Bellingham Bay (Figure 1-1). The site includes aquatic lands that have been impacted by contaminants historically released from industrial waterfront activities, including mercury discharges from the former Georgia Pacific (GP) chlor-alkali plant, as well as other industrial releases. A history of the site and surrounding area was provided in Section 2 of the Remedial Investigation report (Volume 1 of the RI/FS) and is summarized in Section 2.1 of this Supplemental EIS.

The RI/FS process for the Whatcom Waterway site was initiated by Georgia Pacific under Ecology oversight. The RI/FS process was specified under MTCA Agreed Order DE 95TC-N399 and was initiated in 1996. The study included detailed sampling and analysis in 1996 and 1998, and subsequent sampling activities in 2002, 2003 and 2004. The site investigation data from

these activities are described in the Remedial Investigation report (Volume 1 of the RI/FS).

In parallel with the RI/FS activities, a Bellingham Bay Comprehensive Strategy EIS was developed by an interagency consortium known as the Bellingham Bay Demonstration Pilot (Pilot). The Pilot brought together a cooperative partnership of agencies, tribes, local government, and businesses known collectively as the Pilot Work Group, to develop an approach for source control, sediment cleanup and associated habitat restoration in Bellingham Bay. As part of the approach, the Pilot Work Group developed a Comprehensive Strategy that considered contaminated sediments, sources of pollution, habitat restoration and in-water and shoreline land use from a Bay-wide perspective. The strategy integrated this information to identify priority issues requiring action in the near-term and to provide long-term guidance to decision-makers. The Comprehensive Strategy was finalized as a Final Environmental Impact Statement in October 2000 prepared under the State Environmental Policy Act (SEPA), as described in Section 1.2 below.

A previous version of the RI/FS was produced in 2000, along-side the production of the October 2000 Pilot EIS. That RI/FS addressed portions of the Whatcom Waterway site, but did not address the Aerated Stabilization (ASB) portion of the site (see Figure 1-1). However, since 2000, the Bellingham Waterfront has undergone a series of dramatic land use changes. Those changes have included but are not limited to the following:

- Closure of the Georgia Pacific pulp mill and chemical plant
- Sale of the GP mill site to the Port
- Additional land use ownership changes in the Central Waterfront Area
- An area-wide shift from industrial to mixed-use development and zoning in waterfront areas.

In addition, the closure of the Georgia Pacific mill operations necessitated the evaluation of ASB remediation options which had not been previously addressed by the RI/FS or EIS process. Georgia Pacific prepared in 2002 a draft supplemental Feasibility Study and EIS Supplement. However, these documents were not accepted by Ecology or finalized. Ecology required the implementation of additional investigation activities, and required the production of the current RI/FS and EIS documents to address site decision-making requirements.

The current RI/FS document integrates previous efforts and provides a comprehensive evaluation of site conditions and cleanup options. The document addresses current and anticipated land uses, and is performed consistent with the Agreed Order and its Amendments. This Supplemental

EIS evaluates environmental impacts associated with the RI/FS remedial alternatives, as well as a No Action Alternative.

1.2 Overview of the Bellingham Bay Demonstration Pilot and the Bellingham Bay Comprehensive Strategy

The cleanup of contaminated sediments has proven to be a difficult task, complicated by high costs, limited options for sediment management, concerns about environmental liability, source control issues, habitat alterations, and regulatory and land use considerations. To address the need for sediment cleanup and overcome some of the existing roadblocks to optimizing cleanup actions, the Bellingham Bay Demonstration Pilot (Pilot) was established.

The Pilot brings together a cooperative partnership of agencies and tribes, local government and businesses known collectively as the Pilot Team, to develop an approach for source control, sediment cleanup and associated habitat restoration in Bellingham Bay. The history of the Pilot has been closely aligned with the MTCA process for the Whatcom Waterway site, though the Pilot scope is more comprehensive than that single site.

As described in Section 2.2.2, the Pilot Team first crafted a Mission Statement for the project. That mission statement is:

> "To use a new cooperative approach to expedite source control, sediment cleanup and associated habitat restoration in Bellingham Bay."

The Pilot Team then defined four fundamental project elements – sediment cleanup and source control, sediment disposal siting, habitat, and land use. The Pilot Team then developed seven baywide Pilot goals that reflect the collective interests of the Pilot Team and the desired outcome of the project.

Seven Baywide Pilot Goals

Goal 1 – Human Health and Safety: *Implement actions that will enhance the protection of human health.*

Goal 2 – Ecological Health: *Implement actions that will protect and improve the ecological health of the bay.*

Goal 3 – Protect and Restore Ecosystems: *Implement actions that will protect, restore, or enhance habitat components making up the bay's ecosystem.*

> **Goal 4 – Social and Cultural Uses:** *Implement actions that are consistent with or enhance cultural and social uses in the bay and surrounding vicinity.*
>
> **Goal 5 – Resource Management**: *Maximize material re-use in implementing sediment cleanup actions, minimize the use of non-renewable resources, and take advantage of existing infrastructure where possible instead of creating new infrastructure.*
>
> **Goal 6 – Faster, Better, Cheaper:** *Implement actions that are more expedient and more cost-effective, through approaches that achieve multiple objectives.*
>
> **Goal 7 – Economic Vitality:** *Implement actions that enhance water-dependent uses of commercial shoreline property.*

The Pilot Team compiled, collected and analyzed information for each project element separately. The information and priorities for each of the four project elements were then combined to create the Comprehensive Strategy.

The Comprehensive Strategy was presented in a Final EIS in October of 2000. Section 2.2.3 of this document provides an overview of the elements of the Comprehensive Strategy. That Comprehensive Strategy included both programmatic elements, as well as project alternatives addressing SEPA review for specific projects:

- **General Baywide Recommendations:** These programmatic elements of the strategy were not tied to specific project alternatives or actions. Together with the Mission Statement and the Goals, these recommendations remain unaffected by land use changes and other actions on Bellingham Bay.

- **Subarea Strategies:** These programmatic strategies provided greater detail on priorities and recommended actions for land use, habitat, sediment cleanup and source control within each of nine geographic sections of the Bay. Some of these strategies have been affected by the sweeping land use changes that have taken place in the Bay, and Ecology has indicated that these Subarea Strategies will be updated after completion of the community land use planning process.

- **Draft Habitat Mitigation Framework:** This programmatic element was developed by the Pilot Team to address the analysis of habitat impacts and benefits. The Pilot Team also identified priority restoration opportunities within the Bay, many of which have already been implemented.

- **Integrated Near-Term Remedial Action Alternatives:** These project alternatives addressed multiple sediment cleanup sites, including the Whatcom Waterway. The current Supplemental EIS updates these project alternatives, to address new site data, area land use changes and actions taken at other cleanup sites. These changes do not affect the programmatic elements of the Pilot which are addressed by the 2000 FEIS.

Following review and evaluation of comments on the Draft EIS (published in August 1999), the Comprehensive Strategy was identified as the Preferred Alternative in the 2000 FEIS.

1.3 Role of the Current EIS

This Supplemental EIS evaluates environmental impacts associated with a specific project, the cleanup of the Whatcom Waterway site.

1.3.1 Proposed Action and EIS Regulatory Role

The purpose of this EIS is to evaluate environmental impacts, benefits and potential mitigation actions associated with the cleanup of the Whatcom Waterway site. The methodology of the environmental review is conducted consistent with SEPA regulatory requirements.

In addition, this EIS analysis document reviews the consistency of the proposed action with the goals of the Pilot, as documented in the 2000 Comprehensive Strategy.

1.3.2 Relationship to Previous EIS Documents

As described above, the 2000 FEIS included both programmatic and project elements. The programmatic elements of the FEIS remain unchanged, and are carried forward in this document.

The subarea strategies documented in the 2000 FEIS are to be updated by the Department of Ecology and the Pilot Team after completion of the community land use planning process. This EIS discusses factors which have affected the subarea strategies, but does not propose final amendments to those subarea strategies.

The specific project alternatives evaluated in the 2000 FEIS must be updated in order to address new site data, area land use and navigation changes, and actions taken at other cleanup sites. This EIS provides a current comprehensive analysis of project alternatives for cleanup of the Whatcom Waterway site, and represents a Supplemental EIS with respect to the Whatcom Waterway project elements of the 2000 FEIS.

1.3.3 SEPA Lead Agency

The Department of Ecology is the SEPA lead agency for this Supplemental EIS. This is consistent with the 2000 FEIS, for which Ecology was the SEPA lead agency.

1.3.4 Relationship to Land Use Planning Process

Community land use planning efforts are ongoing with respect to the future waterfront land uses, infrastructure and associated land use regulations. Significant planning activities have already been completed. Upcoming activities associated with this process include development of a final area Master Plan for the "New Whatcom" area of Bellingham's Waterfront. That area extends along the waterfront between the Cornwall Avenue Landfill and the I&J Waterway (see Figure 1-1). The Master Planning process will include SEPA environmental review of the Master Plan elements. The current Supplemental EIS does not address the activities of the Master Plan, but remains focused on those activities directly associated with the cleanup of the Whatcom Waterway site.

1.3.5 Future Environmental Reviews and Permitting

This is not the only environmental review that will be conducted for the Whatcom Waterway site cleanup. Cleanup of the Whatcom Waterway site will involve future environmental review and permitting activities.

Federal permitting for in-water construction can be implemented either under 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). This permitting will be conducted concurrently with other approvals associated with in-water construction activities. National Environmental Policy Act (NEPA) review will be completed at the time of project permitting, with the completion of an environmental review by the Corps of Engineers.

Shoreline Master Plan requirements impact projects occurring within 200 feet of the shoreline. The Bellingham Shoreline Master Program (SMP) is being updated as part of the current land use planning activities. However, shoreline regulations defer to Ecology for site-specific review of cleanup actions conducted under MTCA. A separate Shoreline Permit review for the cleanup project is not anticipated as part of the site cleanup design and permitting.

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. Additional information will be included in the Cleanup Action Plan.

1.4 Significant Areas of Controversy and Uncertainty

The primary areas of controversy and uncertainty are as follows:

- The relationship between site cleanup activities required under Model Toxics Control Act (MTCA) and Sediment Management Standards (SMS) regulations, and planned land and navigation uses in waterfront areas.
- What mitigation measures may be required to address adverse environmental impacts associated with the RI/FS cleanup alternatives.
- Willingness of the parties implementing cleanup to incorporate habitat restoration projects consistent with the Bellingham Bay Comprehensive Strategy.

1.5 SEPA Evaluation of Project Alternatives

The primary function of the current EIS is to document the environmental impacts of each of the project alternatives, consistent with the requirements of SEPA regulations. Review of potential SEPA impacts of site cleanup is also required under SMS regulations. Where the project alternatives as described in the FS Report have significant adverse impacts that can be mitigated, appropriate mitigation measures are defined in the EIS. Where project alternatives result in net adverse impacts that are integral to the alternatives and cannot be mitigated, these are identified and discussed.

Based on the SEPA analysis as summarized in Section 4, most of the project alternatives will require mitigation measures over-and-above the elements of the MTCA remedy design concepts. Mitigation measures defined in the SEPA analysis should be considered as part of cleanup planning and implementation. Incremental costs of mitigation will affect the overall cost of each alternative. Alternatives 5 and 6 had net beneficial impacts or mitigated impacts under the SEPA criteria, indicating that required mitigation measures will be minimal for implementation of these alternatives.

1.5.1 Elements of the Environment

The SEPA regulations (WAC 197-11-444) define different elements of the environment that should be considered in the development of an EIS. Following EIS scoping, the Comprehensive Strategy 1999 draft and 2000 final EIS documents organized these SEPA environmental elements into five categories. These five categories were used in analysis of remedial

alternatives as part of the Supplemental EIS. The five elements of the environment included the following:

- **Geology, Water, Environmental Health:** These factors include both the natural and built environment. The geology element includes soil and sediment stability issues. The water element focuses on water quality. The environmental health element incorporates both the pollution control benefits of conducting the cleanup, as well as potential impacts/benefits associated with implementation of the cleanup itself.

- **Fish and Wildlife:** This category includes the fish and wildlife in the project area, the different existing habitats, and the potential changes (positive and negative) to those habitats that may occur as part of the cleanup.

- **Land Use, Navigation and Public Shoreline Access:** This category includes the uses of the project area, including the aquatic areas and nearby shorelines and waterfront properties. The elements within this category focus on existing community priorities that have been defined in previous and ongoing land use planning efforts, and how these priorities are either furthered or adversely impacted by the cleanup alternatives.

- **Air and Noise:** These elements address potential impacts to existing air quality and noise levels, particularly during the construction of the cleanup.

- **Cultural Resources:** Cultural resources include existing archaeological, cultural and historical resources that may be impacted by the proposed project.

1.5.2 SEPA Evaluation of Alternatives

Table 1-1 summarizes the findings of the SEPA evaluation for each of the eight RI/FS alternatives and for the SEPA No Action Alternative. For each element of the environment, the conclusions are summarized based on the level of net impacts to the environment, and whether any adverse impacts are mitigated within the scope of the alternative as defined in the FS Report. Where additional measures may be required above-and-beyond the remedial alternative, such mitigation measures are discussed.

Figures 1-2 and 1-3 illustrate significant differences between several of the project alternatives. Those figures show elements of the remedial alternatives, overlain on the New Whatcom Draft Framework Plan (Appendix E) developed as part of the area land use planning process. Significant SEPA findings for the project alternatives are as follows:

- **No Action Alternative:** The No Action Alternative does not conduct sediment cleanup consistent with MTCA requirements. Adverse impacts are incurred for environmental health as a result. Mitigation of these impacts requires implementation of cleanup actions as in the other project alternatives. The No Action Alternative does not stabilize project shorelines. Because residual impacted sediments are left adjacent to unstabilized project shorelines under this alternative, net adverse impacts were noted under the first SEPA category (geology, water, environmental health). Net adverse impacts were noted under the fish and wildlife category, because while the No Action Alternative retains existing nearshore aquatic habitat within the Inner Whatcom Waterway, these habitat benefits are offset by the lack of environmental protectiveness of the alternative. Additional cleanup measures would be required to mitigated these adverse impacts. Under the third SEPA category (land use, navigation & shoreline public access) the No Action Alternative was found to have net adverse impacts. The No Action Alternative does not address land use or navigation needs within the Whatcom Waterway channel, leaving residual contaminated sediments at locations and elevations that conflict with planned waterway uses. Further, the No Action Alternative does not support planned aquatic reuse of the ASB, and conflicts with land use plans for this area. Mitigation of land use impacts would require additional environmental cleanup measures, as included in other project alternatives. Because the No Action Alternative will not involve construction activities, there are no anticipated impacts to air or noise levels (SEPA category 4). The No Action Alternative does not involve dredging within the Whatcom Waterway, minimizing the risk of disturbance of historical or cultural artifacts, resulting in no anticipated impacts under SEPA category 5 (historic and cultural preservation).

- **Alternative 1:** Alternative 1 accomplishes sediment cleanup consistent with MTCA requirements. However, the cleanup actions do not stabilize project shorelines. Because residual impacted sediments are left adjacent to unstabilized project shorelines under this alternative, net adverse impacts were noted under the first SEPA category (geology, water, environmental health). Net beneficial impacts were noted under the fish and wildlife category, because Alternative 1 retains existing nearshore aquatic habitat within the Inner Whatcom Waterway, and creates a new area of improved shallow-water habitat offshore of the ASB. Under the third SEPA category (land use, navigation & shoreline public access) Alternative 1 was found to have net adverse impacts. Alternative 1 does not address land use or navigation needs within the Whatcom Waterway channel, leaving residual contaminated sediments at locations and elevations that conflict with planned

waterway uses. Further, Alternative 1 does not achieve restoration of aquatic uses within the ASB, and conflicts with land use plans for this area. Like all of the remediation alternatives, cleanup implementation will result in some impacts under SEPA category 4 (air and noise impacts), though these can be mitigated through compliance with applicable regulatory requirements and best practices. Alternative 1 does not involve dredge within the Whatcom Waterway, minimizing the risk of disturbance of historical or cultural artifacts.

- **Alternative 2:** Alternative 2 is expected to comply with MTCA cleanup requirements, protecting water quality and environmental health. However, the alternative requires deep dredging within the Inner Waterway area, which will destabilize project shorelines. This shoreline destabilization represents a net adverse impact under SEPA category 1 (geology, water, environmental health) that will require mitigation. Mitigation will include the construction of bulkheads and hardened shoreline infrastructure to prevent shoreline collapse and permit use and maintenance of target dredge depths. Probable costs for the construction of this deep draft infrastructure are estimated at $30 million, not including long-term maintenance. Alternative 2 was found to have net beneficial impacts under SEPA category 2 (fish & wildlife), through anticipated net gains in the quantity of shallow-water, nearshore habitat. Sediments removed from the Whatcom Waterway by dredging the would be managed using a new containment facility constructed near the Cornwall Avenue Landfill. The design and operation of the facility would be generally consistent with that defined in the 2000 Pilot FEIS. The containment facility is assumed under this alternative to be constructed so that the top layer of the facility remained submerged, with an elevation suitable for development of premium shallow-water habitat. As described in Section 3.3, premium nearshore habitat has the combination of elevation, location, substrate and other factors that optimize the refuge and forage benefits of the habitat to juvenile salmonids. This habitat created under Alternative 2 would offset losses of existing nearshore aquatic habitat in the Inner Waterway associated with deep dredging of the 1960s federal channel. Under SEPA category 3 (land use, navigation & shoreline public access) Alternative 2 is expected to result in significant net adverse impacts. The deep dredging and associated shoreline infrastructure requirements of this alternative are inconsistent with planned mixed-use redevelopment of the Inner Waterway. The bulkheads and other infrastructure is in direct conflict with planned habitat enhancements in this area, and the construction of deep draft infrastructure will be in conflict with area redevelopment planning (Figure 1-3). The use restrictions associated with the obsolete

federal channel also conflict with local plans for public shoreline access and environmental enhancements in the Inner Waterway areas. The capping in-place of the ASB sludges is in direct conflict with planned aquatic reuse of this area. The land use and navigation impacts of Alternative 2 cannot be mitigated, but are intrinsic to this alternative. Like all of the remediation alternatives, cleanup implementation will result in some adverse impacts under SEPA category 4 (air and noise impacts), though these can be mitigated through compliance with applicable regulatory requirements and best practices. Alternative 2 will involve dredging at the head of Whatcom Waterway, raising a potential for disturbance of historical or cultural resources (SEPA category 5). These impacts would need to be mitigated through appropriate planning, archaeological monitoring and/or other measures.

- **Alternative 3:** Alternative 3 is expected to comply with MTCA cleanup requirements, protecting water quality and environmental health. However, the alternative requires deep dredging within the Inner Waterway area, which will destabilize project shorelines. This shoreline destabilization represents a net adverse impact under SEPA category 1 (geology, water, environmental health) that will require mitigation. Mitigation will include the construction of bulkheads and hardened shoreline infrastructure to prevent shoreline collapse and permit use and maintenance of target dredge depths (Figure 1-3). Probable costs for the construction of this deep draft infrastructure are estimated at $30 million, not including long-term maintenance. Alternative 3 is likely to produce net adverse impacts under SEPA category 2 (fish & wildlife), through anticipated net loss in the quantity of shallow-water, nearshore habitat. Sediments removed from the Whatcom Waterway by dredging the would be managed by construction a nearshore fill within the ASB, without creation of new nearshore habitat as in Alternative 2. Some nearshore habitat is constructed offshore of the ASB, but this habitat enhancement may not be sufficient to offset losses of existing nearshore aquatic habitat in the Inner Waterway associated with deep dredging of the 1960s federal channel. Additional habitat mitigation is likely to be required. Under SEPA category 3 (land use, navigation & shoreline public access) Alternative 3 is expected to result in significant net adverse impacts. The deep dredging and associated shoreline infrastructure requirements of this alternative are inconsistent with planned mixed-use redevelopment of the Inner Waterway. The bulkheads and other infrastructure is in direct conflict with planned habitat enhancements in this area, and the construction of deep draft infrastructure will be in conflict with area redevelopment planning. The use restrictions associated with the obsolete federal channel also conflict with local plans for public shoreline access and

environmental enhancements in the Inner Waterway areas. The construction of the nearshore fill within the ASB is in direct conflict with planned aquatic reuse of this area. The land use and navigation impacts of Alternative 3 cannot be mitigated, but are intrinsic to this alternative. Like all of the remediation alternatives, cleanup implementation will result in some adverse impacts under SEPA category 4 (air and noise impacts), though these can be mitigated through compliance with applicable regulatory requirements and best practices. Alternative 3 will involve dredging at the head of Whatcom Waterway, raising a potential for disturbance of historical or cultural resources (SEPA category 5). These impacts would need to be mitigated through appropriate planning, archaeological monitoring and/or other measures.

- **Alternative 4:** Alternative 4 is expected to comply with MTCA cleanup requirements, protecting water quality and environmental health. Unlike previous alternatives 1, 2 and 3, Alternative 4 conducts remediation of the Inner Waterway area consistent with the multi-purpose waterway concept (Figure 1-2). Capping and stabilization of Inner Waterway shorelines will be accomplished as part of the implementation of this alternative, in a manner consistent with planned land and navigation uses in this area. Alternative 4 therefore achieves net beneficial impacts under SEPA category 1 (geology, water, environmental health). There are some habitat impacts under Alternative 4, but these are offset by habitat gains through preservation and construction of nearshore habitat (Figure 1-2). Alternative 4 produces a net beneficial impact under SEPA category 2 (fish & wildlife). Under SEPA category 3 (land use, navigation & shoreline public access), this alternative results in net adverse impacts that cannot be mitigated. The alternative avoids the deep dredging and associated shoreline infrastructure requirements of Alternatives 2 and 3, and hence avoids navigation and land use conflicts in the Inner Whatcom Waterway. However, the capping of the ASB sludges results in direct conflicts with planned aquatic reuse of this area. The land use and navigation impacts of Alternative 4 cannot be mitigated, and are intrinsic to this alternative. Like all of the remediation alternatives, cleanup implementation will result in some adverse impacts under SEPA category 4 (air and noise impacts), though these can be mitigated through compliance with applicable regulatory requirements and best practices. Alternative 4 will involve dredging in the Whatcom Waterway, but dredging at the head of Whatcom Waterway is minimized, increasing protection for potential historical or cultural resources. Potential impacts under SEPA category 5 can be mitigated through appropriate project design and archeological review.

- **Alternative 5:** Alternative 5 is expected to comply with MTCA cleanup requirements, protecting water quality and environmental health. Like Alternative 4, this alternative conducts remediation of the Inner Waterway area consistent with the multi-purpose waterway concept. Dredging, capping and stabilization of Inner Waterway shorelines will be accomplished as part of the implementation of this alternative, in a manner consistent with planned land and navigation uses in this area. Alternative 5 therefore achieves net beneficial impacts under SEPA category 1 (geology, water, environmental health). There are some habitat impacts under Alternative 5, but these are offset by a substantial net gain in the quantity of nearshore habitat. In addition to the habitat improvements included in Alternative 4, Alternative 5 accomplishes remediation of the ASB, and the ASB is reconnected to the surface waters of Bellingham Bay (Figure 1-2). This increases open-water habitat by approximately 28 acres, and introduces nearly 4,500 linear feet of salmonid migration corridor in an area formerly cut off from Bellingham Bay. Alternative 5 produces a substantial net beneficial impact under SEPA category 2 (fish & wildlife). Under SEPA category 3 (land use, navigation & shoreline public access), this alternative results in significant net beneficial impacts. The alternative accomplishes implementation of the multi-purpose channel concept, including deep dredging at the Bellingham Shipping Terminal, and dredging, capping and shoreline stabilization in the Inner Waterway. Shorelines in this area are reconstructed in a manner consistent with planned mixed use redevelopment of the Inner Waterway (Figure 1-2). Remediation of the ASB facilitates planned aquatic reuse of this area for construction of a marina with integrated public access and habitat enhancements. Like all of the remediation alternatives, cleanup implementation will result in some adverse impacts under SEPA category 4 (air and noise impacts), though these can be mitigated through compliance with applicable regulatory requirements and best practices. Alternative 5 will involve dredging in the Whatcom Waterway, but dredging at the head of Whatcom Waterway is minimized, increasing protection for potential historical or cultural resources. Potential impacts under SEPA category 5 can be mitigated through appropriate project design and archeological review.

- **Alternative 6:** Most elements of Alternative 6 are identical to those of Alternative 5. Alternative 6 results in net beneficial impacts under the first three of the SEPA categories, and results in mitigated impacts under the fourth and fifth category. The main difference between Alternative 6 and Alternative 5 is the increased use of dredging near the Bellingham Shipping Terminal. This increased dredging is compatible with planned navigation and land

uses, and does not result in requirements for new shoreline infrastructure. The deeper dredging does not trigger new habitat impacts, because the dredging is confined to deep-water areas. As a result, the additional dredging does not result in new adverse impacts under SEPA categories. In fact, the additional dredging provides additional benefits under the third SEPA category (land use, navigation & shoreline public access) by supporting potential future deepening of the Outer Whatcom Waterway, should that be required in the future.

- **Alternative 7:** Alternative 7 is expected to comply with MTCA cleanup requirements, protecting water quality and environmental health. However, the alternative requires deep dredging within the Inner Waterway area, which will destabilize project shorelines. This shoreline destabilization represents a net adverse impact under SEPA category 1 (geology, water, environmental health) that will require mitigation. Mitigation will include the construction of bulkheads and hardened shoreline infrastructure to prevent shoreline collapse and permit use and maintenance of target dredge depths. Probable costs for the construction of this deep draft infrastructure are estimated at $30 million, not including long-term maintenance. Alternative 7 is likely to produce mitigated adverse impacts under SEPA category 2 (fish & wildlife), through anticipated impacts to existing shallow-water, nearshore habitat. As with Alternatives 5 and 6, nearshore habitat improvements are accomplished as part of the remediation of the ASB, and construction of a sediment cap and habitat bench offshore of the ASB. This additional habitat is expected to offset the destruction of nearshore habitat at the head and along the sides of the Whatcom Waterway. Additional habitat mitigation is not likely to be required under Alternative 7. Under SEPA category 3 (land use, navigation & shoreline public access) Alternative 7 is expected to result in significant net adverse impacts. The deep dredging and associated shoreline infrastructure requirements of this alternative are inconsistent with planned mixed-use redevelopment of the Inner Waterway. The bulkheads and other infrastructure is in direct conflict with planned habitat enhancements in this area, and the construction of deep draft infrastructure will be in conflict with area redevelopment planning. The use restrictions associated with the obsolete federal channel also conflict with local plans for public shoreline access and environmental enhancements in the Inner Waterway areas. These land use and navigation impacts cannot be mitigated, but are intrinsic to this alternative. Like all of the remediation alternatives, cleanup implementation will result in some adverse impacts under SEPA category 4 (air and noise impacts), though these can be mitigated through compliance with applicable regulatory requirements and best practices. Alternative

7 will involve dredging at the head of Whatcom Waterway, raising a potential for disturbance of historical or cultural resources (SEPA category 5). These impacts would need to be mitigated through appropriate planning, archaeological monitoring and/or other measures.

- **Alternative 8:** Alternative 8 is expected to comply with MTCA cleanup requirements, protecting water quality and environmental health. However, the alternative requires deep dredging within the Inner Waterway area, which will destabilize project shorelines. This shoreline destabilization represents a net adverse impact under SEPA category 1 (geology, water, environmental health) that will require mitigation. Mitigation will include the construction of bulkheads and hardened shoreline infrastructure to prevent shoreline collapse and permit use and maintenance of target dredge depths. Probable costs for the construction of this deep draft infrastructure are estimated at $30 million, not including long-term maintenance. Alternative 8 is likely to produce net adverse impacts under SEPA category 2 (fish & wildlife), through anticipated impacts to existing shallow-water, nearshore habitat. As with Alternatives 5 and 6, nearshore habitat improvements are accomplished as part of the remediation of the ASB. However, Alternative 8 converts nearshore habitat to deep-water habitat in areas offshore and adjacent to the ASB. These conversions represent net adverse impacts to juvenile salmonid habitat. In addition to the destruction of nearshore habitat at the head and along the sides of the Whatcom Waterway, Alternative 8 is likely to result in a net adverse impacts to fish and wildlife. Additional habitat mitigation is likely to be required under Alternative 8. Under SEPA category 3 (land use, navigation & shoreline public access) Alternative 8 is expected to result in significant net adverse impacts. The deep dredging and associated shoreline infrastructure requirements of this alternative are inconsistent with planned mixed-use redevelopment of the Inner Waterway. The bulkheads and other infrastructure is in direct conflict with planned habitat enhancements in this area, and the construction of deep draft infrastructure will be in conflict with area redevelopment planning. The use restrictions associated with the obsolete federal channel also conflict with local plans for public shoreline access and environmental enhancements in the Inner Waterway areas. These land use and navigation impacts cannot be mitigated, but are intrinsic to this alternative. Of the evaluated remediation alternatives, implementation of Alternative 8 will result in the greatest adverse impacts under SEPA category 4 (air and noise impacts), though these can be mitigated through compliance with applicable regulatory requirements and best practices. Alternative 8 will involve dredging at the head of Whatcom Waterway, raising

a potential for disturbance of historical or cultural resources (SEPA category 5). These impacts would need to be mitigated through appropriate planning, archaeological monitoring and/or other measures.

1.6 Pilot Evaluation of Alternatives

The Pilot analysis of alternatives summarized in Section 5 of this EIS is different from MTCA or SEPA in that it is not required under existing regulatory authorities. Consistency with the Pilot Comprehensive Strategy and the seven Pilot Goals is voluntary. However, the use of the Pilot goals provides an additional basis by which the qualitative benefits or short-comings of a remedial alternative can be measured.

As shown in Table 1-1, each of the alternatives was qualitatively ranked in Section 5 under each of the seven Pilot Goals based on the ability of the alternative to further that goal. Qualitative rankings were applied as either "Low," "Medium," or "High." A "high" ranking indicates that the alternative provides better progress toward that Pilot goal than other alternatives ranked as "Low," or "Medium." Composite rankings were then applied based on the average results of the seven individual rankings for each alternative.

Based on the Pilot evaluation as documented in Table 1-1, the two alternatives that provide the greatest overall benefits are Alternatives 5 and 6. These two alternatives are roughly equivalent to each other, and both are consistent with the land use planning objectives identified in the New Whatcom Draft Framework Plan, as illustrated in Figure 1-2. Significant findings from the Pilot evaluation for these and the other alternatives are as follows:

- **No Action Alternative**: The Pilot evaluation resulted in very low rankings for the No Action Alternative. That alternative received low rankings under all seven of the individual Pilot Goals. The Pilot analysis suggests that even in the absence of MTCA and SMS requirements (which prevent use of the No Action Alternative at the site), further consideration of the No Action Alternative is not warranted.

- **Alternative 1:** A low Pilot ranking was also identified for Alternative 1. This alternative represents the lowest cost alternative evaluated in the Feasibility Study. Alternative 1 received medium rankings for Goals 1, 2 and 3 (Human Health & Safety, Ecological Health and Habitat Protection & Restoration). However, these modest benefits were offset by low rankings for other Pilot Goals 4 through 7 (Social & Cultural Uses; Resource Management; Faster, Better, Cheaper; and Economic Vitality, Shoreline Land Use).

- **Alternatives 2, 3 & 4:** Alternatives 2, 3 and 4 all ranked medium under the Pilot. These alternatives all ranked medium for Goals 1 and 2 (Human Health & Safety and for Ecological Health). The alternatives all

received medium rankings for Goals 5 and 6 (Resource Management and Faster, Better, Cheaper), reflecting the cost-effectiveness of these alternatives relative to some other project alternatives. Alternatives 2 and 3 ranked low for Goals 4 and 7 (Social & Cultural Uses and Economic Vitality & Shoreline Land Use), because these alternatives conflict with planned land uses both within the Inner Waterway and also within the ASB. The greatest differences in rankings between Alternatives 2, 3 and 4 were noted with respect to Goal 3 (Habitat Protection & Restoration). Habitat Protection and Restoration Rankings varied from high (Alternative 2) to low (Alternative 3), reflecting the significant differences in net environmental impacts/benefits of these alternatives to fish and wildlife habitat.

- **Alternatives 5 & 6:** Alternatives 5 and 6 received the highest rankings against Pilot goals. These alternatives received high rankings under each of the seven Pilot Goals. High rankings under Goals 1 and 2(Human Health & Safety and Ecological Health) were achieved because cleanup is conducted to the maximum extent practicable as defined under MTCA (see discussion Section 5.3). High rankings under Goal 3 (Habitat Protection and Restoration) were achieved, because these Alternatives provide the greatest restoration benefits of any of the project alternatives. The remedies are specifically tailored to planned waterfront land uses, resulting in high rankings for Goals 4 and 7 (Social & Cultural Uses and Economic Vitality & Shoreline Land Uses). High rankings under goals 5 and 6 (Resource Use and Faster, Better Cheaper) apply to Alternatives 5 and 6. While the probable costs of the remedial alternatives are higher than Alternatives 1-4, these costs are proportionate to environmental, habitat and land use benefits achieved under Alternatives 5 and 6. Furthermore, some of the incremental mitigation costs and resource requirements incurred for Alternatives 2 and 3 are avoided. Finally, Alternatives 5 and 6 provide an opportunity to capture additional funding sources (i.e., moorage revenues) to help offset the costs of remediation.

- **Alternatives 7 & 8:** Alternatives 7 and 8 were the two highest cost alternatives evaluated in the Feasibility Study. Alternative 7 was ranked medium against the Pilot Goals, and Alternative 8 was ranked low. Both of these alternatives ranked high for Goals 1 and 2 (Human Health and Safety and Ecological Health), because they conduct cleanup to at least the level considered permanent to the maximum extent practicable under MTCA, as with Alternatives 5 and 6. However, Alternative 7 received only medium rankings for Goal 3 (Habitat Protection and Restoration). Alternative 7 is considered to roughly balance habitat impacts and benefits. Alternative 8 receives a low ranking under Goal 3, because Alternative 8 appears to produce a net loss of premium nearshore habitat. The two alternatives ranked low for Goals 4 and 7 (Social & Cultural Uses and Economic Vitality, Shoreline Land Use)

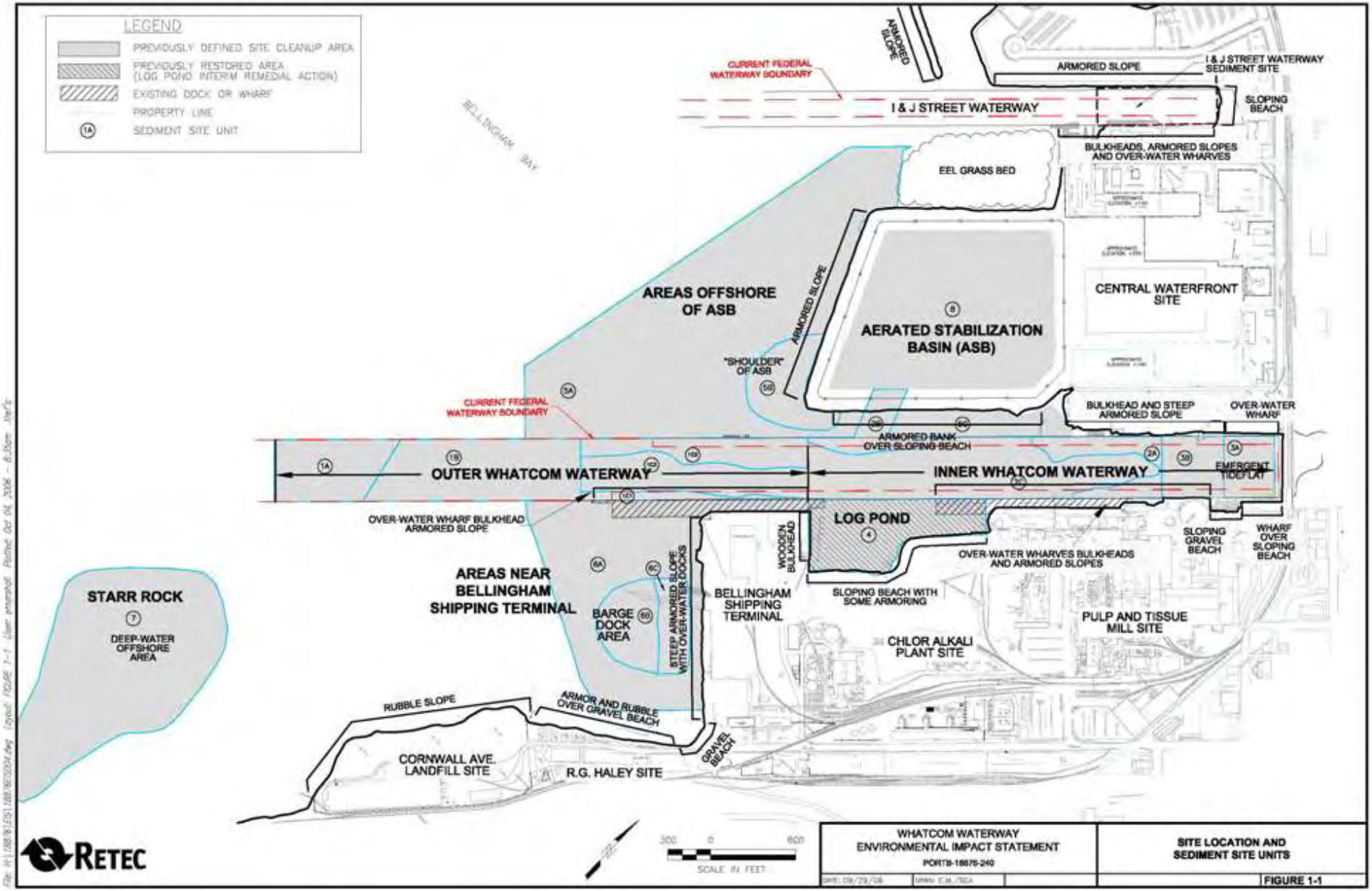
due to the conflicts between the cleanup alternatives and the planned navigation and land uses. Alternatives 7 and 8 received low rankings for Goals 5 and 6 (Resource Management and Faster, Better, Cheaper) because of the disproportionately high costs of the alternatives relative to the environmental, land use and habitat benefits of the alternatives.

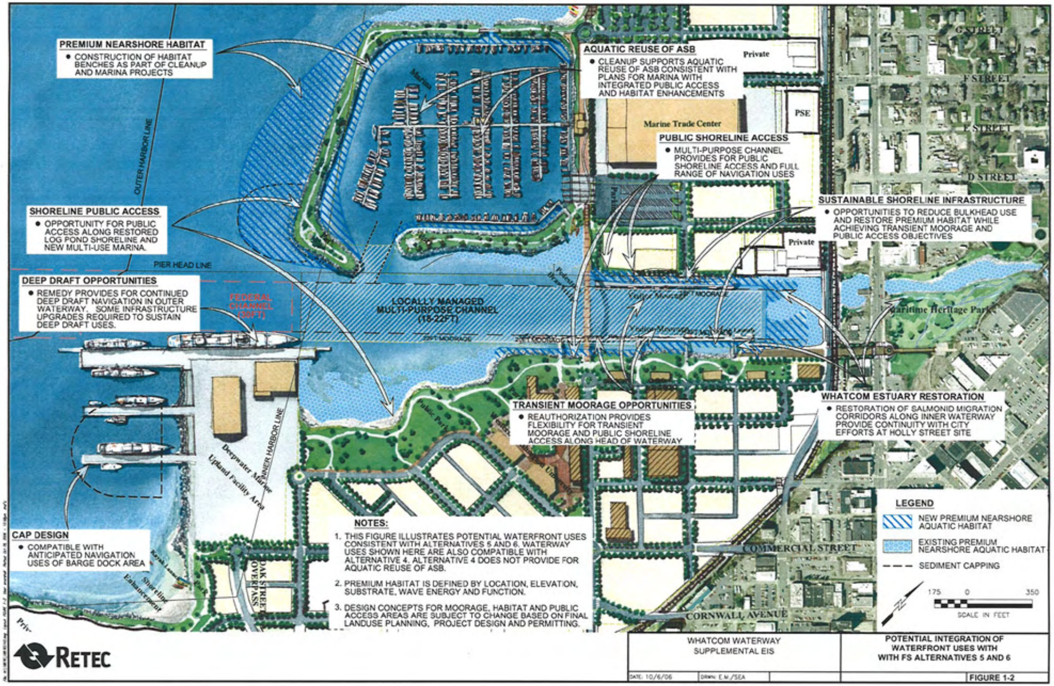
Table 1-1. Summary of EIS Alternatives Analysis

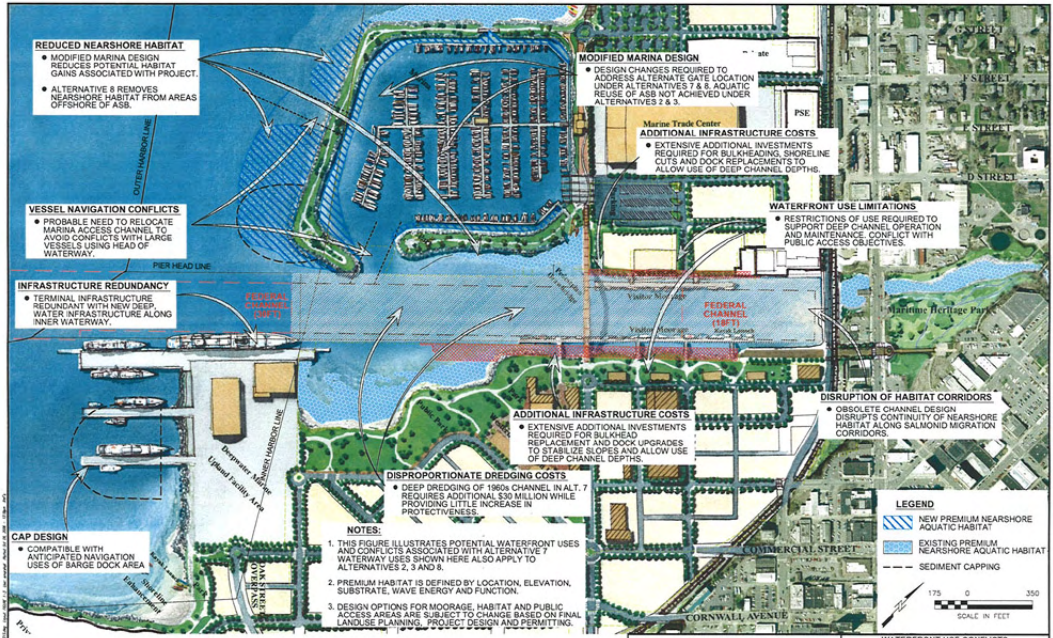
Alternative Number Probable Cost ($Million)	**No Action** $0	**Alt. 1** $8	**Alt. 2** $34	**Alt. 3** $34	**Alt. 4** $21	**Alt. 5** $42	**Alt. 6** $44	**Alt. 7** $74	**Alt. 8** $146
Alternative Description (Section 4)	Fig 4-1	Fig 4-2	Fig 4-3	Fig 4-4	Fig 4-5	Fig 4-6	Fig 4-7	Fig 4-8	Fig 4-9
Waterway Remedy									
Waterway Uses	Limited-Use	Limited-Use	Industrial	Industrial	Multi-Purpose	Multi-Purpose	Multi-Purpose	Industrial	Industrial
Sediment Disposal	None	None	Cornwall CAD	ASB Fill	Upland	Upland	Upland	Upland	Upland
ASB Area Remedy									
Future Uses	Non-Aquatic Use	Non-Aquatic Use	Non-Aquatic Use	Non-Aquatic Use	Non-Aquatic Use	Aquatic Reuse	Aquatic Reuse	Aquatic Reuse	Aquatic Reuse
Sediment Disposal	None	None	None	ASB Fill	None	Upland	Upland	Upland	Upland
SEPA Analysis of Impacts, Benefits & Mitigation (Section 4)									
Elements of the Environment (see Table 4-2 for detailed analysis) *(WAC 197-11-444)* [1]									
1 Geology, Water, Environmental Health	Net Adverse Impacts	Net Adverse Impacts	Net Adverse Impacts	Net Adverse Impacts	Net Beneficial Impacts	Net Beneficial Impacts	Net Beneficial Impacts	Net Adverse Impacts	Net Adverse Impacts
2 Fish & Wildlife	Net Adverse Impacts	Net Beneficial Impacts	Net Beneficial Impacts	Net Adverse Impacts	Net Beneficial Impacts	Net Beneficial Impacts	Net Beneficial Impacts	Mitigated Impacts	Net Adverse Impacts
3 Land Use, Navigation & Shoreline Public Access	Net Adverse Impacts	Net Adverse Impacts	Net Adverse Impacts	Net Adverse Impacts	Net Adverse Impacts	Net Beneficial Impacts	Net Beneficial Impacts	Net Adverse Impacts	Net Adverse Impacts
4 Air & Noise	-- No Change	Mitigated Impacts	Mitigated Impacts	Mitigated Impacts	Mitigated Impacts	Mitigated Impacts	Mitigated Impacts	Mitigated Impacts	Mitigated Impacts
5 Historic & Cultural Preservation	-- No Change	-- No Change	Mitigated Impacts	Mitigated Impacts	Mitigated Impacts	Mitigated Impacts	Mitigated Impacts	Mitigated Impacts	Mitigated Impacts
Pilot Comparative Analysis of Alternatives (Section 5)									
Overall Ranking of Alternative Against Pilot Goals *(See Section 5.2, Table 5-1)*	Low	Low	Medium	Medium	Medium	High	High	Medium	Low
1 *Human Health & Safety*	Low	Medium	Medium	Medium	Medium	High	High	High	High
2 *Ecological Health*	Low	Medium	Medium	Medium	Medium	High	High	High	High
3 *Habitat Protection & Restoration*	Low	Medium	High	Low	Medium	High	High	Medium	Low
4 *Social & Cultural Uses*	Low	Low	Low	Low	Medium	High	High	Low	Low
5 *Resource Management*	Low	Low	Medium	Medium	Medium		High	Low	Low
6 *Faster, Better, Cheaper*	Low	Low	Medium	Medium	Medium	High	High	Low	Very Low
7 *Economic Vitality, Shoreline Land Use*	Low	Low	Low	Low	Medium	High	High	Low	Low
Alternatives Ranking Under MTCA & SMS *(See Project MTCA RI/FS Report)*	-- Not Evaluated (Not MTCA Compliant)	Low	Medium	Medium	Medium	High (RI/FS Preferred Alt.)	High (RI/FS Preferred Alt.)	Low [2]	Low [2]

Notes:

1. Consistent with WAC 197-11-444(3), the SEPA environmental elements have been combined to improve readability and to focus on significant issues. Categorization of the environmental elements was performed consistent with the Comprehensive Strategy 2000 FEIS.
2. Alternatives 7 and 8 were determined to be impracticable based on the MTCA disproportionate cost analysis, resulting in a low overall MTCA alternative ranking.


LEGEND
PREVIOUSLY DEFINED SITE CLEANUP AREA
PREVIOUSLY RESTORED AREA (LOG POND INTERIM REMEDIAL ACTION)
EXISTING DOCK OR WHARF
PROPERTY LINE
1A SEDIMENT SITE UNIT
ARMORED SLOPE
CURRENT FEDERAL WATERWAY BOUNDARY
I & J STREET WATERWAY
I & J STREET WATERWAY SEDIMENT SITE
SLOPING BEACH
BELLINGHAM BAY
BULKHEADS, ARMORED SLOPES AND OVER-WATER WHARVES
EEL GRASS BED
AREAS OFFSHORE OF ASB
ARMORED SLOPE
AERATED STABILIZATION BASIN (ASB)
CENTRAL WATERFRONT SITE
"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
BELLINGHAM SHIPPING TERMINAL
SLOPING BEACH WITH SOME ARMORING
BARGE DOCK AREA
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
300 0 600
SCALE IN FEET
RETEC
WHATCOM WATERWAY ENVIRONMENTAL IMPACT STATEMENT
PORTB-18878-240
SITE LOCATION AND SEDIMENT SITE UNITS
DATE: 09/29/08
FIGURE 1-1


PREMIUM NEARSHORE HABITAT
• CONSTRUCTION OF HABITAT BENCHES AS PART OF CLEANUP AND MARINA PROJECTS
SHORELINE PUBLIC ACCESS
• OPPORTUNITY FOR PUBLIC ACCESS ALONG RESTORED LOG POND SHORELINE AND NEW MULTI-USE MARINA.
DEEP DRAFT OPPORTUNITIES
• REMEDY PROVIDES FOR CONTINUED DEEP DRAFT NAVIGATION IN OUTER WATERWAY. SOME INFRASTRUCTURE UPGRADES REQUIRED TO SUSTAIN DEEP DRAFT USES.
CAP DESIGN
• COMPATIBLE WITH ANTICIPATED NAVIGATION USES OF BARGE DOCK AREA
AQUATIC REUSE OF ASB
• CLEANUP SUPPORTS AQUATIC REUSE OF ASB CONSISTENT WITH PLANS FOR MARINA WITH INTEGRATED PUBLIC ACCESS AND HABITAT ENHANCEMENTS
PUBLIC SHORELINE ACCESS
• MULTI-PURPOSE CHANNEL PROVIDES FOR PUBLIC SHORELINE ACCESS AND FULL RANGE OF NAVIGATION USES
SUSTAINABLE SHORELINE INFRASTRUCTURE
• OPPORTUNITIES TO REDUCE BULKHEAD USE AND RESTORE PREMIUM HABITAT WHILE ACHIEVING TRANSIENT MOORAGE AND PUBLIC ACCESS OBJECTIVES
TRANSIENT MOORAGE OPPORTUNITIES
• REAUTHORIZATION PROVIDES FLEXIBILITY FOR TRANSIENT MOORAGE AND PUBLIC SHORELINE ACCESS ALONG HEAD OF WATERWAY
WHATCOM ESTUARY RESTORATION
• RESTORATION OF SALMONID MIGRATION CORRIDORS ALONG INNER WATERWAY PROVIDE CONTINUITY WITH CITY EFFORTS AT HOLLY STREET SITE
OUTER HARBOR LINE
PIER HEAD LINE
FEDERAL CHANNEL (30FT)
LOCALLY MANAGED MULTI-PURPOSE CHANNEL (18-22FT)
INNER HARBOR LINE
Deepwater Marine Upland Facility Area
Marine Trade Center
Private
PSE
Maritime Heritage Park
G STREET
F STREET
E STREET
D STREET
COMMERCIAL STREET
CORNWALL AVENUE
OAK STREET OVERPASS
Shoreline Enhancement
Public Park
NOTES:
1. THIS FIGURE ILLUSTRATES POTENTIAL WATERFRONT USES CONSISTENT WITH ALTERNATIVES 5 AND 6. WATERWAY USES SHOWN HERE ARE ALSO COMPATIBLE WITH ALTERNATIVE 4. ALTERNATIVE 4 DOES NOT PROVIDE FOR AQUATIC REUSE OF ASB.
2. PREMIUM HABITAT IS DEFINED BY LOCATION, ELEVATION, SUBSTRATE, WAVE ENERGY AND FUNCTION.
3. DESIGN CONCEPTS FOR MOORAGE, HABITAT AND PUBLIC ACCESS AREAS ARE SUBJECT TO CHANGE BASED ON FINAL LANDUSE PLANNING, PROJECT DESIGN AND PERMITTING.
LEGEND
NEW PREMIUM NEARSHORE AQUATIC HABITAT
EXISTING PREMIUM NEARSHORE AQUATIC HABITAT
SEDIMENT CAPPING
175 0 350
SCALE IN FEET
RETEC
WHATCOM WATERWAY SUPPLEMENTAL EIS
POTENTIAL INTEGRATION OF WATERFRONT USES WITH WITH FS ALTERNATIVES 5 AND 6
DATE: 10/6/06
DRWN: E.M./SEA
FIGURE 1-2


REDUCED NEARSHORE HABITAT
MODIFIED MARINA DESIGN REDUCES POTENTIAL HABITAT GAINS ASSOCIATED WITH PROJECT.
ALTERNATIVE 8 REMOVES NEARSHORE HABITAT FROM AREAS OFFSHORE OF ASB.
VESSEL NAVIGATION CONFLICTS
PROBABLE NEED TO RELOCATE MARINA ACCESS CHANNEL TO AVOID CONFLICTS WITH LARGE VESSELS USING HEAD OF WATERWAY.
INFRASTRUCTURE REDUNDANCY
TERMINAL INFRASTRUCTURE REDUNDANT WITH NEW DEEP WATER INFRASTRUCTURE ALONG INNER WATERWAY.
CAP DESIGN
COMPATIBLE WITH ANTICIPATED NAVIGATION USES OF BARGE DOCK AREA
MODIFIED MARINA DESIGN
DESIGN CHANGES REQUIRED TO ADDRESS ALTERNATE GATE LOCATION UNDER ALTERNATIVES 7 & 8. AQUATIC REUSE OF ASB NOT ACHIEVED UNDER ALTERNATIVES 2 & 3.
ADDITIONAL INFRASTRUCTURE COSTS
EXTENSIVE ADDITIONAL INVESTMENTS REQUIRED FOR BULKHEADING, SHORELINE CUTS AND DOCK REPLACEMENTS TO ALLOW USE OF DEEP CHANNEL DEPTHS.
WATERFRONT USE LIMITATIONS
RESTRICTIONS OF USE REQUIRED TO SUPPORT DEEP CHANNEL OPERATION AND MAINTENANCE. CONFLICT WITH PUBLIC ACCESS OBJECTIVES.
DISRUPTION OF HABITAT CORRIDORS
OBSOLETE CHANNEL DESIGN DISRUPTS CONTINUITY OF NEARSHORE HABITAT ALONG SALMONID MIGRATION CORRIDORS.
ADDITIONAL INFRASTRUCTURE COSTS
EXTENSIVE ADDITIONAL INVESTMENTS REQUIRED FOR BULKHEAD REPLACEMENT AND DOCK UPGRADES TO STABILIZE SLOPES AND ALLOW USE OF DEEP CHANNEL DEPTHS.
DISPROPORTIONATE DREDGING COSTS
DEEP DREDGING OF 1960s CHANNEL IN ALT. 7 REQUIRES ADDITIONAL $30 MILLION WHILE PROVIDING LITTLE INCREASE IN PROTECTIVENESS.
NOTES:
1. THIS FIGURE ILLUSTRATES POTENTIAL WATERFRONT USES AND CONFLICTS ASSOCIATED WITH ALTERNATIVE 7 WATERWAY USES SHOWN HERE ALSO APPLY TO ALTERNATIVES 2, 3 AND 8.
2. PREMIUM HABITAT IS DEFINED BY LOCATION, ELEVATION, SUBSTRATE, WAVE ENERGY AND FUNCTION.
3. DESIGN OPTIONS FOR MOORAGE, HABITAT AND PUBLIC ACCESS AREAS ARE SUBJECT TO CHANGE BASED ON FINAL LANDUSE PLANNING, PROJECT DESIGN AND PERMITTING.
LEGEND
NEW PREMIUM NEARSHORE AQUATIC HABITAT
EXISTING PREMIUM NEARSHORE AQUATIC HABITAT
SEDIMENT CAPPING
175 0 350
SCALE IN FEET
OUTER HARBOR LINE
PIER HEAD LINE
INNER HARBOR LINE
FEDERAL CHANNEL (50FT)
FEDERAL CHANNEL (18FT)
Marine Trade Center
Visitor Moorage
Maritime Heritage Park
D STREET
E STREET
F STREET
COMMERCIAL STREET
CORNWALL AVENUE
Deepwater Alongshore
Upland Facility Area
Bellingham Shipping Terminal
Fairhaven Shipyard
OAK STREET
MAPLE STREET
RETEC
WHATCOM WATERWAY
ENVIRONMENTAL IMPACT STATEMENT
DATE: 10/5/06
Drawn: E.M./SEA
WATERFRONT USE CONFLICTS ASSOCIATED WITH OTHER PROJECT ALTERNATIVES
FIGURE 1-3

2 Project Background

This section provides background information regarding the Whatcom Waterway site, the Bellingham Bay Demonstration Pilot, and the context of this Supplemental EIS. This information is provided to assist readers in understanding the purpose and context of this document. Also included in this section is an introduction to sediment cleanup laws and techniques (Section 2.4) that are relevant to the project.

2.1 Whatcom Waterway Site History

The Whatcom Waterway Site ("Site") consists of lands located within and adjacent to the Whatcom Waterway in Bellingham, Washington (Figure 1-1). Mercury and other contaminants have been detected within the Site at concentrations that exceed cleanup standards defined under MTCA and SMS regulations.

2.1.1 Site-Area History

The vicinity of the Whatcom Waterway site area has been used for industrial activities by multiple parties since the late 1800s. Industrial operations conducted within the area include, but are not limited to, the following:

- Coal shipping
- Log rafting
- Pulp and paper mill operation
- Chemical manufacturing
- Cargo terminal operations
- Grain shipment
- Fish processing and cannery operations
- Bulk petroleum terminal operations (two facilities)
- Boatyard operation
- Handling of sand, gravel, and other mineral ores
- Municipal landfill operations
- Multiple lumber mills and a wood products manufacturing operations
- Operation of a co-generation power plant.

Pulp and paper mills have been operated on the Pulp and Tissue Mill Site (Figure 1-1). In the early 1900s the mills were operated by Puget Sound Pulp and Timber. The mills were later sold to Georgia Pacific (GP) in the 1960s.

In 1965 GP constructed a chlor-alkali plant adjacent to the Log Pond. The plant operated between 1965 and 1999 using a mercury cell process to produce chlorine, sodium hydroxide, and hydrogen. Between 1965 and 1971, mercury-containing wastewaters from the chlor-alkali plant were discharged

directly into the Log Pond. Between 1971 and 1979 pretreatment measures were installed to reduce mercury discharges. Chlor-alkali plant wastewater discharges to the Log Pond area were discontinued in 1979, following construction of the Aerated Stabilization Basin (ASB).

The ASB facility was constructed by GP during 1978 and 1979 for management of wastewaters in compliance with the Clean Water Act. The ASB design was approved by Ecology in 1978, and a Corps permit and City Shoreline Substantial Development Permit were obtained. Permitting included completion of an EIS for the project (Brown and Caldwell, 1978). The outfall from the ASB continues to be owned by GP and wastewater and sediment quality in that area are monitored under the National Pollutant Discharge Elimination System (NPDES) permit program (Permit No. WA-000109-1).

The Whatcom Waterway was listed by Ecology as a contaminated site in the early 1990s. The site RI/FS process was initiated after completion of a site hazard assessment by Ecology, and after development of an Agreed Order between Ecology and GP.

2.1.2 The 2000 RI/FS and EIS

In 1996, the RI/FS process for the Whatcom Waterway site was initiated under a MTCA Agreed Order (DE 95TC-N399) between GP and Ecology. Detailed sampling and analysis was performed in 1996 and 1998, and an RI/FS report was completed in July 2000 following public notice and opportunity to comment. Sediment data summaries from the 2000 RI/FS are attached as Appendix B of the FS.

In parallel with the RI/FS activities, a Bellingham Bay Comprehensive Strategy EIS was prepared. The EIS was both a project-specific EIS, evaluating a range of cleanup alternatives for the Whatcom Waterway site, and a programmatic EIS, evaluating the Bellingham Bay Comprehensive Strategy. The Comprehensive Strategy was developed by an interagency consortium known as the Pilot. The Pilot brought together a cooperative partnership of agencies, tribes, local government, and businesses known collectively as the Pilot Work Group, to develop a cooperative approach to expedite source control, sediment cleanup and associated habitat restoration in Bellingham Bay. As part of the approach, the Pilot Work Group developed a Comprehensive Strategy that considered contaminated sediments, sources of pollution, habitat restoration and in-water and shoreline land use from a Bay-wide perspective. The strategy integrated this information to identify priority issues requiring action in the near-term and to provide long-term guidance to decision-makers.

The Comprehensive Strategy was finalized as a Final Environmental Impact Statement in October 2000 prepared under SEPA. While it was published as a companion document to the 2000 RI/FS for the Whatcom Waterway site, and while it addressed project impacts associated with the MTCA cleanup of the

Whatcom Waterway site, the 2000 FEIS contained other contemplated actions above-and-beyond the regulatory requirements of the MTCA site cleanup process. For example, the potential habitat restoration actions identified in the Comprehensive Strategy represent additional actions that are not required under state or federal regulations, but which would benefit the ecosystem of Bellingham Bay if implemented. The Pilot Work Group agreed to work cooperatively to identify opportunities to further the goals of the Pilot. The Comprehensive Strategy identified a broad series of potential actions that were considered by the Work Group to be beneficial in furthering the goals of the Pilot throughout Bellingham Bay. These potential actions were organized by subareas within Bellingham Bay, and were published as Appendix A of the 2000 Comprehensive Strategy EIS (a copy of this appendix is also attached to this EIS as Appendix A).

Absent significant changes or new information, the 2000 RI/FS and EIS documents would have formed the basis for Ecology's selection of a cleanup approach for the Whatcom Waterway site. That selection would have been formalized in a CAP. However, subsequent events and new information have made it necessary to complete the supplemental RI/FS and EIS studies.

In 2001 GP closed its pulp mill which dramatically reduced the wastewater treatment needs associated with process operations. The ASB was constructed in 1978 within the Whatcom Waterway site area, on lands impacted by mercury discharges from the chlor-alkali plant. In addition, the ASB facility has received effluent from the chlor-alkali plant and the pulp and tissue mills. The ASB contamination from these sources was not addressed in the 2000 Whatcom Waterway RI/FS investigations of remedial alternatives, because at that time it was an operational wastewater treatment facility. However, with the reduced treatment needs resulting from the 2001 closure of the GP pulp mill, the contamination issues could be addressed as part of the cleanup of the Whatcom Waterway site.

To address this new portion of the Whatcom Waterway site, a new remedial alternative was evaluated in 2002 through a Supplemental FS (Anchor, 2002a) and companion Draft Supplemental EIS (Anchor, 2002b). The new remedial alternative proposed using a portion of the ASB as a near shore fill disposal facility for disposal of contaminated materials removed from areas of the Whatcom Waterway site outside the ASB and from other contaminated sediment sites in Bellingham Bay. The proposal included maintenance of a down-sized wastewater treatment facility constructed within the footprint of the existing ASB.

2.1.3 Log Pond Interim Action

In late 2000 and early 2001, Georgia Pacific implemented a combined sediment cleanup and habitat restoration action at the Log Pond, part of the Whatcom Waterway site. The work was performed under the terms of a MTCA Interim Action Agreed Order with Ecology and as authorized under

Clean Water Act Permit No. 2000-2-00424 administered by the U.S. Army Corps of Engineers (Corps). The Log Pond project beneficially reused 43,000 cubic yards of clean dredging materials from the Swinomish navigation channel and from the Squalicum Waterway. The materials were used to cap contaminated sediments in the Log Pond, and to improve habitat substrate and elevations for use by aquatic organisms. The habitat restoration component of the project was voluntarily implemented by GP in accordance with the Bellingham Bay Comprehensive Strategy.

Monitoring of the Log Pond Interim Action has been performed in Year 1, Year 2 and Year 5. Results of monitoring have confirmed that the cap is successfully meeting most performance objectives, with the exception of some erosion at the shoreline edges of the cap. Enhancements to the shoreline edges of the Log Pond cap to correct these erosional areas cap have been incorporated into the Feasibility Study. Monitoring results have documented the development of habitat functions within the Log Pond (Anchor, 2001b and 2002c). Recommendations for enhancement of long-term shoreline stability have been developed as part of the 2006 Supplemental Feasibility Study.

2.1.4 Supplemental Investigations

During 1999 and 2000, GP closed its chlor-alkali plant, its pulp mill and its chemical plant. The closure of the Georgia Pacific pulp mill dramatically reduced the water treatment needs associated with company operations. Since its construction in 1978, the ASB facility has received effluents from the chlor-alkali plant, pulp and tissue mills and contaminants in ASB sludges include mercury contamination. However, because the ASB had been in operation as a water treatment facility, the ASB facility had not been previously included in the Whatcom Waterway RI/FS investigations or remedial alternatives.

In spring and summer of 2002, following completion of the 2002 Supplemental FS and EIS, additional site data were collected to inform future remedial design activities. The results of these investigations were summarized in a Pre-Remedial Design Evaluation (PRDE) report (attached as Appendix A of the FS). The PRDE data collection included the following major work elements:

- Surface sediment sampling to document natural recovery rates and refine the boundaries of the area of sediment exceeding site cleanup levels
- Subsurface testing of samples located in the Outer Whatcom Waterway area
- Contaminant mobility testing for use in evaluation and design of confined disposal alternatives

- Geotechnical testing, column settling tests and consolidation tests of site sediments for use in dredging, capping and confined disposal alternatives evaluations.

In 2003 Ecology requested additional data collection to better characterize contamination within the ASB. This work was conducted under Addendum 4 of the RI/FS Work Plan and included testing of chemical and physical properties of the ASB sludges and underlying native sands. This sampling was performed in the summer of 2003. Data collected during that investigation are attached as Appendix C of the FS Report.

During 2004 additional site characterization data were collected at the ASB facility. This work was conducted under Addendum No. 5 of the RI/FS Work Plan. The investigation included testing of the chemical and physical properties of the ASB berm sands, bathymetric surveys of the ASB, and dewatering tests of the ASB sludges. Sampling was performed between July and September of 2004.

2.1.5 Purchase of GP Mill Site by Port of Bellingham

After soliciting interest from various potential purchasers, GP ultimately sold its Bellingham mill site to the Port of Bellingham. The property transfer included an extended due diligence period lasting through late 2004. During the due diligence period the Port conducted extensive community outreach, and met with regulatory and resource agencies, and many project stakeholders. The property transfer was finalized in January of 2005. As part of the transfer agreements, the Port agreed to assume leadership of the cleanup of multiple sites, including the Whatcom Waterway site.

Following completion of the property transaction, the Port and Ecology signed an Amendment to the RI/FS Agreed Order and to the Log Pond Agreed Order. The current RI/FS document integrates previous site investigations and studies and provides a comprehensive evaluation of site conditions and cleanup options. The document addresses current and anticipated land uses, and is performed consistent with the Agreed Order and its Amendments. This Supplemental EIS has been prepared consistent with the Programmatic elements of the Pilot Comprehensive Strategy to evaluate environmental impacts associated with the RI/FS remedial alternatives, and to assist in the identification of preferred alternatives for the site.

2.2 History of the Bellingham Bay Pilot and Comprehensive Strategy

This section provides additional background information on the history of the Bellingham Bay Demonstration Pilot and the Comprehensive Strategy.

2.2.1 Initial Development of the Pilot Concept

In May of 1994 a group of five federal and state agencies in Washington state formed the Cooperative Sediment Management Program (CSMP) to address the need for sediment cleanup and overcome some of the existing roadblocks to expedited action. The agencies included:

- Washington Department of Ecology
- Washington State Department of Natural Resources
- U.S. Environmental Protection Agency, Region 10
- U.S. Army Corps of Engineers
- Puget Sound Water Quality Action Team.

The Washington State Department of Transportation later joined the CSMP signatory agencies. Working collectively, these agencies proposed to help fund a demonstration pilot (the Pilot) to develop sediment cleanup priorities in an urban embayment of Puget Sound by creating a partnership with local governments and businesses. The key goals identified for the Pilot at that time were to control the sources of contamination and expedite cleanup of high priority sediment sites, test various incentives for cleanup, and create new and flexible methods for achieving cleanup. The CSMP agencies also acknowledged that actions for source control, cleanup, habitat, dredging and other activities such as navigation/commerce are interrelated. The agencies agreed that a broader approach is the proper scale for identifying and managing these activities and for translating laws and programs into effective action. Ecology set aside a grant available to local governments under the Model Toxics Control Act (MTCA) to help fund the Pilot. In June 1996, following discussion with interested parties from four urban bays of Puget Sound, Bellingham Bay was selected as the location for the CSMP Demonstration Pilot.

At the same time the CSMP agencies decided to undertake the Demonstration Pilot, they also agreed to evaluate the feasibility of a Multi-User Disposal Site (MUDS) facility as another method to expedite sediment cleanup. A MUDS facility would accept contaminated sediment from multiple users. The Puget Sound Confined Disposal Site Study Draft Programmatic EIS was issued Jointly by the Corps of Engineers, Ecology and DNR in February of 1999.

The Pilot addresses the area of Bellingham Bay within a line drawn from Point Frances to Governors Point, including Portage Bay and Chuckanut Bay. The geographic scope of the Pilot is focused on the urban portion of Bellingham Bay for data summary and development of strategies for source control and sediment cleanup, and the broader bay for evaluation of natural resource issues and opportunities for habitat protection and restoration.

2.2.2 The Pilot Team and its Scope of Work

In September 1996, the Bellingham Bay Pilot Team was established. The Pilot Team included the following:

- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- U.S. Environmental Protection Agency
- National Marine Fisheries Service
- Washington Department of Ecology
- Washington State Department of Natural Resources
- Washington State Department of Transportation
- Washington Department of Fish and Wildlife
- Puget Sound Water Quality Action Team
- City of Bellingham
- Whatcom County Health Department
- Lummi Nation
- Nooksack Tribe
- Georgia Pacific West, Inc.

The Port of Bellingham agreed to be co-project manager with Ecology. Using consensus-based decision-making, the Pilot Team established the Mission Statement and the seven "baywide" goals that it wanted to ultimately achieve. That mission statement is:

> *"To use a new cooperative approach to expedite source control, sediment cleanup and associated habitat restoration in Bellingham Bay."*

As part of project goal setting, the Pilot Team defined four fundamental project elements: sediment cleanup and source control, sediment disposal siting, habitat, and land use. The Pilot Team then developed seven baywide Pilot goals that reflect the collective interests of the Pilot Team and the desired outcome of the project. The Pilot goals were formally adopted by the multi-agency work group in 1997, and these goals provide an additional evaluation tool to assess proposed cleanup actions in Bellingham Bay.

Seven Baywide Pilot Goals

Goal 1 – Human Health and Safety: *Implement actions that will enhance the protection of human health.*

Goal 2 – Ecological Health: *Implement actions that will protect and improve the ecological health of the bay.*

Goal 3 – Protect and Restore Ecosystems: *Implement actions that will protect, restore, or enhance habitat components making up the bay's ecosystem.*

Goal 4 – Social and Cultural Uses: *Implement actions that are consistent with or enhance cultural and social uses in the bay and surrounding vicinity.*

Goal 5 – Resource Management: *Maximize material re-use in implementing sediment cleanup actions, minimize the use of non-renewable resources, and take advantage of existing infrastructure where possible instead of creating new infrastructure.*

Goal 6 – Faster, Better, Cheaper: *Implement actions that are more expedient and more cost-effective, through approaches that achieve multiple objectives.*

Goal 7 – Economic Vitality: *Implement actions that enhance water-dependent uses of commercial shoreline property.*

The Pilot Team compiled, collected and analyzed information for each project element separately. The information and priorities for each of the four project elements were then combined to create the Comprehensive Strategy.

2.2.3 Bellingham Bay Comprehensive Strategy

The Bellingham Bay Comprehensive Strategy was presented in a Final EIS in October of 2000. Following review and evaluation of comments on the Draft EIS (published in August 1999), the Comprehensive Strategy was identified as the Preferred Alternative in the October 2000 FEIS.

The Comprehensive Strategy included both programmatic elements, as well as project alternatives addressing SEPA review for specific projects. The programmatic elements of the Comprehensive Strategy included Bay-Wide Recommendations, Sub-Area Strategies and a Habitat Mitigation Framework. Project elements of the Comprehensive Strategy included SEPA review of specific near-term remedial action alternatives. An overview of these programmatic and project elements of the Comprehensive Strategy is provided below.

General Baywide Recommendations

The Comprehensive Strategy included a number of Baywide recommendations for achieving the seven goals of the Pilot. These general recommendations were listed according to the four project elements. These Baywide Recommendations were programmatic in nature and were not tied to specific project alternatives or actions.

Together with the Mission Statement and the Pilot Goals, the General Baywide Recommendations remain unaffected by land use changes and other actions on Bellingham Bay, and they provide a guide to implementation of sediment cleanup, source control, habitat restoration and land use actions within Bellingham Bay.

Subarea Strategies and Habitat Mitigation Framework

The Comprehensive Strategy also included specific strategy recommendations for each of nine geographic subareas within Bellingham Bay. These Subarea Strategies (Appendix A) provided greater detail on priorities and recommended actions for land use, habitat, sediment cleanup and source control within each geographic subarea.

Some elements of the Subarea Strategies have been affected by the sweeping land use changes that have taken place since development of the Comprehensive Strategy (Section 2.2.4). Ecology has indicated that these Subarea Strategies are to be updated in the near future following completion of community land use planning efforts.

The Pilot Team also developed lists of priority restoration opportunities that were available within Bellingham Bay. This list of restoration opportunities is included in the Subarea Strategies contained in Appendix A of the 2000 FEIS and in Appendix A of this SEIS. A number of these restoration opportunities have been accomplished since development of the initial list. However, project opportunities remain and can be used to guide project planning and prioritization for habitat restoration activities.

In addition to the Subarea Strategies, a Habitat Mitigation Framework (Appendix D of this SEIS) was developed by the Pilot Team to address the analysis of habitat impacts and benefits, and to clarify the types of mitigation and incremental habitat enhancement actions that may be implemented within Bellingham Bay.

Integrated Near-Term Remedial Action Alternatives

As part of the 2000 FEIS, SEPA evaluation was conducted for specific project alternatives that addressed multiple sediment cleanup sites, including the Whatcom Waterway, as well as the Cornwall Avenue Landfill and other sites. For the Whatcom Waterway, it has been necessary to update the project alternatives to address new site data, area land use changes, and actions taken at other cleanup sites. Therefore, this Supplemental EIS has been developed to address these changes. These changes do not affect the programmatic elements of the Pilot which are addressed by the 2000 FEIS.

2.2.4 Recent Changes Affecting the Project

Extensive changes have occurred between 2000 and the present that have necessitated updates to both the Whatcom Waterway RI/FS and the EIS evaluation of project alternatives. These changes include the following:

- 1999 closure of the GP chlor-alkali plant.
- 2001 closure of the GP pulp mill and chemical plant.
- 2004 development of the Waterfront Vision and Framework Plan by the Waterfront Futures Group, a community land use visioning effort initiated by the City and the Port and involving Bellingham citizens. The group developed a suite of Guiding Principles and Recommendations that addressed land use priorities for six areas of Bellingham Bay.
- Completion of marina demand studies and marina alternatives siting analyses by the Port, including identification of the ASB as a preferred location for development of a future small boat marina.
- January 2005 Port acquisition of 137 acres of GP waterfront property, including portions of the Whatcom Waterway site, in accordance with the Waterfront Vision and Framework Plan.
- Additional evaluations of navigation and waterfront infrastructure needs by the Port, DNR and the Army Corps of Engineers relating to the Whatcom Waterway. These evaluations included development of a November 2005 Port-DNR Memorandum of Understanding relating to changing waterfront land use needs (Appendix C), development of a May 2006 Port Resolution #1230 and corresponding federal legislation to make adjustments to the dimensions of the federal channel within the Whatcom Waterway (Appendix E). These changes are intended to support the development of waterfront land use, public access, navigation and habitat restoration improvements consistent with the Waterfront Vision and Framework Plan, while maintaining the viability of the Bellingham Shipping Terminal.
- Initiation of a joint Port-City Master Planning process for the waterfront area in the vicinity of the Whatcom Waterway site. This process is being implemented consistent with Port-City interlocal agreements dated January 2005 and July 2006. The interlocal agreements and the planning actions implemented by those agreements propose to redevelop the area to support mixed residential, commercial, light industrial, institutional and recreational uses and to support the development of transportation, utilities, public access, parks and open space and marine infrastructure including a marina, boat launch, transient moorage and associated parking. Consistent with

the interlocal agreements, the properties within the New Whatcom planning area have been rezoned to mixed-use zoning, contingent on finalization of an approved Master Plan.

- Pending update to the City Shoreline Master Program (SMP). The SMP is a state-mandated shoreline land use planning effort. The SMP update is expected to embrace and elaborate on the work of the Waterfront Futures Group

These factors resulted in changes to the facts relevant to each of the four elements of the Pilot, including sediment cleanup, disposal siting, land use and habitat restoration. An updated RI/FS document and an update to the EIS were required in order to address these changes and ensure an appropriate evaluation of cleanup alternatives.

2.3 Role of the Current EIS

This Supplemental EIS evaluates environmental impacts associated with a specific project, the cleanup of the Whatcom Waterway site.

2.3.1 Proposed Action and EIS Regulatory Role

The purpose of this EIS is to evaluate environmental impacts, benefits and potential mitigation actions associated with the cleanup of the Whatcom Waterway site, together with habitat and land use issues directly associated with that project. The methodology of the environmental review is conducted consistent with SEPA regulatory requirements.

In addition, this EIS analysis document reviews the consistency of the proposed action with the goals of the Pilot, as documented in the 2000 Comprehensive Strategy. While consistency with the goals of the Pilot is not a regulatory requirement, the goals do provide an important bay-wide context for regulatory decisions.

2.3.2 Relationship to Previous EIS Documents

As described above, the 2000 FEIS included both programmatic and project elements. The programmatic elements of the FEIS remain unchanged, and are carried forward in this document.

The Subarea Strategies documented in the 2000 FEIS are to be updated by the Department of Ecology and the Pilot Team after completion of the community land use planning process. This EIS discusses factors which have affected the Subarea Strategies, but does not propose final amendments to those Subarea Strategies.

The specific project alternatives evaluated in the 2000 FEIS must be updated in order to address new site data, area land use and navigation changes, and actions taken at other cleanup sites. This EIS provides a current

comprehensive analysis of project alternatives for cleanup of the Whatcom Waterway site, and represents a Supplemental EIS with respect to the Whatcom Waterway project elements of the 2000 FEIS.

2.3.3 SEPA Lead Agency

The Department of Ecology is the SEPA lead agency for this Supplemental EIS. This is consistent with the 2000 FEIS, for which Ecology was the SEPA lead agency.

2.3.4 Relationship to Land Use Planning Processes

Community land use planning efforts are ongoing with respect to the future waterfront land uses, infrastructure and associated land use regulations. Activities conducted to date have included the following:

- Early land use priority setting conducted by the Waterfront Futures Group, and subsequent formal adoption of the Waterfront Futures Group Vision and Framework Plan (Appendix B) by the City of Bellingham
- Land use studies conducted for the Central Waterfront area
- Master Planning efforts for the Bellingham Shipping terminal and vicinity
- Review of navigation needs and infrastructure requirements for the Whatcom Waterway, including development of the November 2005 Port-DNR Memorandum of Understanding (Appendix C) and Port Resolution 1230 (Appendix F) addressing the updating of the federal navigation channel
- Alternatives evaluations for siting of new marina facilities to meet regional moorage demand
- Outreach activities conducted by the Port of Bellingham as part of the GP due diligence process during 2004, including soliciting of extensive stakeholder and public input on potential waterfront cleanup actions, land use alternatives and navigation priorities for the Whatcom Waterway
- Community land use planning efforts planning and redevelopment of the New Whatcom area leading to rezoning of the area for mixed-use development. Excerpts from the Master Planning process are attached as Appendix E.
- Outreach activities associated with the Port's amendment to its Comprehensive Scheme of Harbor Improvements in 2004 identifying the need for future aquatic use of the ASB area, and

completion of a community design charette in 2006 (Figure 3-7) by the Port to solicit community input on the integration of habitat and public access elements with the marina uses

- Extensive additional contributions by community groups, research institutions, and project stakeholders.

Upcoming activities associated with this process include development of a final area Master Plan for the "New Whatcom" area of Bellingham's Waterfront. That area extends along the waterfront between the Cornwall Avenue Landfill and the I&J Waterway (see Figure 1-1). The zoning within the New Whatcom area has been updated to a "mixed use" designation by the City, contingent on final development of the area Master Plan. The Master Planning process will include SEPA environmental review of the Master Plan elements. The current Supplemental EIS does not address the activities of the Master Plan, but remains focused on those activities directly associated with the cleanup of the Whatcom Waterway site.

2.3.5 Future Environmental Reviews and Permitting

This Supplemental EIS is not the only vehicle for environmental review of the Whatcom Waterway cleanup action. Cleanup of the Whatcom Waterway site will involve future environmental review and permitting activities.

Federal permitting for in-water construction can be implemented either under 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). This permitting will be conducted concurrently with other approvals associated with in-water construction activities. National Environmental Policy Act (NEPA) review will be completed at the time of project permitting, with the completion of an environmental review 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. Additional information will be included in the Cleanup Action Plan.

2.4 Introduction to Sediment Cleanup Laws and Techniques

This section provides an overview of the cleanup laws and techniques that are applicable to the cleanup of the Whatcom Waterway site. These laws and techniques are described in more detail in the RI/FS document. The overview provided in this section includes the following three elements:

- **Sediment Cleanup Laws:** Cleanup of the Whatcom Waterway site is governed primarily by two cleanup laws. These include the Model Toxics Control Act (MTCA) and the Sediment Management Standards (SMS). These laws are discussed in Section 2.4.1 below.

- **Cleanup Levels**: Cleanup levels define the goals for site cleanup and are established under state and federal regulations including MTCA and SMS. The cleanup levels applicable to the cleanup of the Whatcom Waterway site are described below in Section 2.4.2.

- **Sediment Cleanup Techniques:** Sediment cleanup actions involve application of specific cleanup techniques or technologies. The cleanup techniques being considered for the Whatcom Waterway site are described in Section 2.4.3 below.

2.4.1 Sediment Cleanup Laws

The main state law that defines how cleanup decisions are to be made is the Model Toxics Control Act (MTCA). When contaminated sediments are involved, the cleanup levels and other procedures are also regulated by the Sediment Management Standards (SMS). MTCA regulations specify criteria for the evaluation and conduct of a cleanup action. SMS regulations dictate the standards for cleanup. Under both laws, a cleanup must protect human health and the environment, meet environmental standards in other laws that apply, and provide for monitoring to confirm compliance with site cleanup levels.

The cleanup solutions that have proven successful at sediment cleanup are those that block pathways that can expose people or environmental receptors to contaminants, and that provide a healthy environment over the long-term. MTCA regulations place a premium on the use of solutions that are "permanent to the maximum extent practicable," and MTCA regulations

define the ways in which different cleanup alternatives are to be compared and ranked.

The implementation of a cleanup action under MTCA and SMS must comply with other state, federal and local laws, regulations and ordnances. The ability for a proposed cleanup action to comply with these requirements is considered as part of the remedy selection process under MTCA.

The key MTCA document for evaluating site cleanup actions is the remedial investigation and feasibility study (RI/FS). In the RI/FS, different potential alternatives for conducting a site cleanup action are defined. The alternatives are then evaluated against MTCA criteria, and one or more preferred alternatives are identified. After reviewing the RI/FS study, and after consideration of public comment, Ecology then selects a cleanup method and documents that selection in a document known as the Cleanup Action Plan. The agency-selected cleanup action is then implemented after completion of project design and permitting.

2.4.2 Site Cleanup Levels

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

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 RI Report, a site-specific BSL of 1.2 mg/kg mercury was developed as part of the 2000 RI/FS. 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 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.

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).

2.4.3 Sediment Cleanup Techniques

Different techniques can be used for the cleanup of contaminated sediments. Some of the most common cleanup techniques are summarized in Figure 2-1. The techniques include both active (i.e., dredging to remove impacted sediments) and passive (i.e., allowing nature to naturally isolate impacted sediments) measures.

The goals of each technique are 1) to isolate and confine contaminated sediments so that plants and animals are no longer exposed to the contamination, and 2) to ensure that the sediments within the bioactive zone comply with site cleanup levels. Often, more than one technique is used for cleanup, with different techniques being applied in different site areas. The RI/FS includes detailed discussion of the different sediment cleanup techniques. The main cleanup techniques applicable to the Whatcom Waterway site include the following:

- **Monitored Natural Recovery:** Natural recovery is similar to capping in that it results in containment of the impacted sediments beneath a layer of clean material. The difference between natural recovery and capping is that in natural recovery, the containment is achieved by allowing natural sediment deposition to bury the impacted sediments. The process occurs naturally in areas like Bellingham Bay where rivers are discharging clean sediments at rates that will cap contaminated sediments naturally in the absence of human interference.

- **Institutional Controls:** Institutional controls are mechanisms for ensuring the long-term performance of cleanup actions. They are applicable to most remedies where contaminants are not completely removed from the site, and are applicable to all eight of the remedial alternatives evaluated in the Whatcom Waterway RI/FS. Institutional controls involve administrative and legal tools to document the presence of contaminated materials, regulate the anthropogenic disturbance/management of these materials, and provide for long-term care of remedial actions including long-term monitoring.

- **Containment by Capping:** Capping is an effective technology for use with contaminated sediments that are not located in areas where removal is required for environmental, navigation or land use reasons. Capping involves covering the contaminated sediments with a layer of clean material that will be physically stable under site conditions. Capping avoids resuspension of contaminated sediments that can occur with sediment removal.

Appropriately sited and designed caps can also enhance aquatic habitat conditions.

- **Sediment Removal by Dredging:** Sediments can be removed from the aquatic environment through dredging. Typically dredging is used when impacted sediments are located in areas that conflict with navigation and land use priorities, or where the sediments are not stable if left in place. There are multiple different dredging methods, applicable to different site conditions. Section 4 of the RI/FS document includes a discussion of the different dredging methods and their typical applications. A single project may use multiple types of dredging, with different methods applied in different areas.

- **Confined Disposal Options:** One option for managing contaminated sediments that are removed by dredging is to contain them within specially constructed facilities on the waterfront. The two most common types of waterfront containment facilities are Confined Aquatic Disposal facilities and Confined Nearshore Disposal facilities:

  - Confined Aquatic Disposal (CAD): The CAD technique places the dredged contaminated sediment in a submerged location, and caps (covers) it with clean material. CADs are designed and placed in the locations where they will always be underwater. The thickness of the cap and the grain size of the cleanup sediment are designed to prevent contaminants from migrating back into the aquatic environment. With appropriate design and planning, the surface of the CAD can represent a significant habitat enhancement.

  - Confined Nearshore Disposal: This technique, also known as "nearshore fill" is a type of landfill constructed in aquatic locations along the shoreline. A berm is constructed of clean material to enclose the proposed fill area. Then the dredged sediments are placed within the fill area. The fill is continued so that the upper fill layer is "dry ground" above the tide level. The fill is capped with clean material . Nearshore fills create new land that can be used, but they eliminate aquatic habitat in the areas filled and converted to dry land uses.

- **Upland Disposal:** Sediments removed from the waterfront can be managed by disposal in existing permitted disposal sites. This method has been used extensively within Puget Sound where capping, natural recovery and/or aquatic disposal options were not suitable for management of all impacted sediments. Under this technique the sediments are barged to an offload facility and are then transported to an upland landfill in trucks or in railcars. The

upland landfills are contained and monitored consistent with state, local and federal regulations. The technique is typically more expensive than other options.

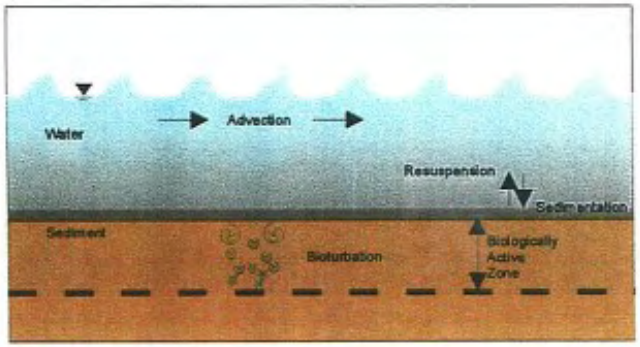
- **Beneficial Reuse:** In some cases, sediments may require removal (e.g., to address land use or navigation needs, or to access other materials) but remain suitable for reuse in aquatic or upland areas. This reuse is known as beneficial reuse. It is similar to recycling in that it conserves other natural resources (e.g., reuse of sandy sediments for capping reduces the need to quarry new sand materials).

- **In-Place Treatment of Dredged Sediments:** Techniques to treat sediments in place, without first requiring their removal have been explored by Ecology, EPA, and others. One such technology was tested at the Whatcom Waterway site as part of the RI/FS process, but it was not found to be effective. Different types of in-place treatment technologies are discussed in the RI/FS document. But workable techniques have not been identified that would be successful at the Whatcom Waterway site.

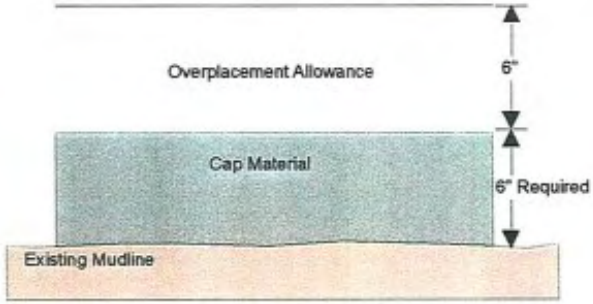
- **Treatment of Dredged Sediments Prior to Disposal**: In some cases it may be appropriate to treat removed sediments prior to disposal of the sediments. For example, sediments that are loose and that have high moisture contents can be treated to remove excess water. This reduces the transportation impacts and the required landfill space used in the ultimate disposal. The appropriateness of treatment technologies varies with the type of material and the type of disposal.

The project cleanup alternatives evaluated in the RI/FS use the above-listed cleanup techniques, in different combinations, to accomplish remediation of the site. The RI/FS alternatives are described in Section 4 of this Supplemental EIS, and in Volume 2 of the RI/FS.

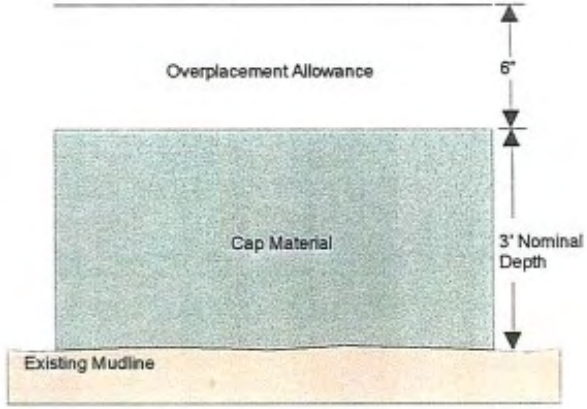
Figure 2-1. Common Sediment Remediation Techniques



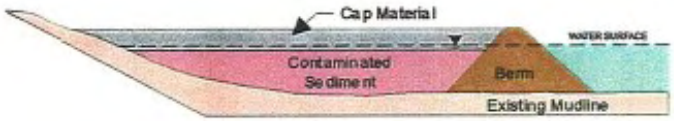
Schematic of Natural Recovery



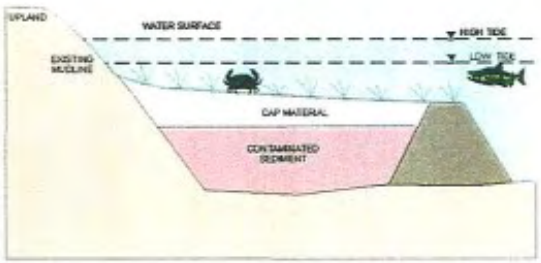
Thin-Layer Cap Section (Typ.)



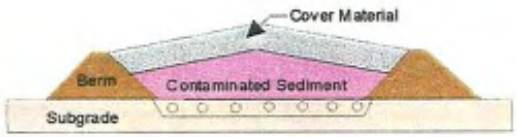
Thick Cap Section (Typ.)



Nearshore Confined Disposal



Confined Aquatic Disposal



Upland Confined Disposal

3 Description of Affected Environment

Section 4 of this EIS describes the Project Alternatives and discusses potential environmental impacts, benefits and mitigation options associated with the different Alternatives. This section provides a description of the environment in which the cleanup will be performed, and highlights features of the environment that are impacted (positively or negatively) by the Alternatives discussed in Section 4.

3.1 Overview of Environmental Features

3.1.1 Elements of the Environment

SEPA regulations (WAC 197-11-444) define different elements of the environment that should be considered in the development of an EIS. Following EIS scoping, the Comprehensive Strategy 1999 draft and 2000 final EIS documents organized these SEPA environmental elements into five categories. These five categories are used in this Supplemental EIS, and include the following:

- **Geology, Water, Environmental Health:** These factors include both the natural and built environment. The geology element includes soil and sediment stability issues. The water element focuses on water quality. The environmental health element incorporates both the pollution control benefits of conducting the cleanup, as well as potential impacts/benefits associated with implementation of the cleanup itself. The Geology, Water and Environmental Health characteristics of the environment are described in detail in Section 3.2.

- **Fish and Wildlife:** This category includes the fish and wildlife in the project area, the different existing habitats, and the potential changes (positive and negative) to those habitats that may occur as part of the cleanup. The fish and wildlife characteristics of the environment are described in Section 3.3.

- **Land Use, Navigation and Public Shoreline Access:** This category includes the uses of the project area, including the aquatic areas and nearby shorelines and waterfront properties. The elements within this category focus on community land use planning efforts, and how these plans are either furthered or adversely impacted by the cleanup alternatives. The land use, navigation and public shoreline access elements of the environment are described in Section 3.4.

- **Air and Noise:** These elements address potential impacts to existing air quality and noise levels, particularly during the construction of the cleanup. The air and noise characteristics of the environment are described in Section 3.5 below.

- **Cultural Resources:** Cultural resources include existing archaeological, cultural and historical resources that may be impacted by the proposed project. These cultural resource characteristics of the environment are described in Section 3.6 below.

3.1.2 Whatcom Waterway Site Units

The Whatcom Waterway site includes different geographic areas of the waterfront. The RI/FS document divides the remediation areas of the site into eight "site units" for evaluation of cleanup alternatives. The RI/FS site units are shown in Figure 1-1. These site units are used in the EIS to assist in the discussion of the affected environment and the different impacts/benefits of the project alternatives. The site units and their subdivisions are described below.

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.

Inner Whatcom Waterway (Units 2 and 3)

The Inner Whatcom 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 Whatcom 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.

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 the FS Report.

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 Whatcom Waterway.

Area Adjacent to BST (Unit 6)

Unit 6 consists of the aquatic lands to the south and southeast of the Whatcom Waterway and Bellingham Shipping Terminal (BST). 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.

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.

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. The ASB sludges are the most contaminated materials on the waterfront requiring remediation.

The I&J Waterway

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. However, testing as part of the RI showed that mercury concentrations did not exceed SMS biological criteria in surface sediments. Characterization of subsurface sediments in the outer portions of the I&J Waterway has shown that the mercury levels do not exceed allowable levels for open-water disposal or beneficial reuse in these areas. No further actions are required under MTCA to address environmental protection in these areas. This area was designated as a no action area during the 2000 RI/FS.

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 inner portion of the I&J Waterway area. During 2003 and 2004, Ecology determined that the I&J Waterway sediments 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 the lack of remediation triggers for the outer portion of the I&J Waterway area, and based on the management as a separate site of the inner portion of the I&J Waterway, the I&J Waterway area is not carried forward as a site unit in the Whatcom Waterway FS.

3.2 Geology, Water, and Environmental Health

An overview of the geology, water, and environmental health characteristics of the Whatcom Waterway site environment are described below in Section 3.2.1. These characteristics are described in more detail for each of the Site Units in Section 3.2.2.

3.2.1 Overview of Key Issues

Background discussion of the geology, water quality and environmental health of Bellingham Bay is provided in this section. This discussion was adapted from the 2000 FEIS, and has been updated by new information.

Geology, Shoreline Stability, Seismic Conditions

- **Regional Geologic History:** The Bellingham Bay surrounding geology was shaped by various glacial deposits, derived from the advance and retreat of the Cordilleran Ice Sheet between 18,000 and 14,000 years ago. The Chuckanut Formation, constituting the eastern shore of Bellingham Bay from Governor's Point north to Whatcom Creek, consists of sandstone and carbonaceous shale. Stratified outwash sand and gravels are abundant from the mouth of Whatcom Creek west to the edge of the Nooksack River delta, where terrace deposits associated with the Nooksack floodplain have been developed. From the western edge of the Nooksack River floodplain south to Portage Island contains Bellingham Drift sediment, a blue-gray unsorted and unstratified sandy silt and pebbly clay derived from rock debris that melted from floating ice.

- **Area Sedimentation:** The current shoreline of Bellingham Bay is a result of combined effects of natural geologic and oceanographic processes, as well as anthropogenic influences. Sediment material is continually deposited in to the bay as a result of tributary inputs (Nooksack) and shoreline erosion.

- **Anthropogenic Shoreline Modifications:** Before development, large tidal flats were at the mouths of Squalicum, Whatcom and Padden Creeks. In 1892, three waterways were approved for construction in the northeast portion of Bellingham Bay. Whatcom Creek Waterway dredging by the Corps of Engineers began in 1904 and continued, with associated land modifications, up to 1910. Dredge material was used as fill on the mud flats at the mouth of the creek in order to create building sites for wharves, factories, and streets. Filling activities using material from Whatcom Waterway and other waterways (Squalicum Creek and I&J Waterway) occurred along the east and southeast shore of Bellingham Bay between 1940s and 1960s. The shoreline has also been modified by rip-rap and bulkheading.

- **Seismic Conditions:** Western Washington experiences seismic activity related to plate tectonics and has a history of relatively large earthquakes. More then 1,000 earthquakes occur in the state of Washington each year, with 5 to 20 being severe enough to be felt. No major fault lines exist in the study area. However, small earthquakes have been centered in and around Bellingham Bay in the last century.

- **Flooding, Storm Surge and Tsunami Projections:** Flooding, storm surge, and tsunamis (in decreasing order of probability of occurrence) may increase the water levels in Bellingham Bay on rare occasions. Information on flooding in the Whatcom Waterway, is obtained from the Federal Emergency Management Agency (FEMA) flood insurance rate maps (FIRMs) for Bellingham (FEMA 2004). FIRM Panel 1213D shows a base flood elevation at the mouth of Whatcom Creek of 8 feet (NGVD 29). This elevation represents a conservatively high 100-year flood elevation of between 12 and 13 feet above mean lower low water (MLLW). Storm surge is obtained by subtracting the highest observed tide on 5 January 1975 from the predicted tide for that day. The predicted high tide as obtained from NOS (Nobeltec, 2004) for 5 January 1975 was 9.6 feet. The actual measured high tide was 10.4 feet (MLLW). The difference is a storm surge of 0.8 feet. The properties of the storm, especially the wind speed and direction, are unknown. The storm surge may or may not be independent of any flooding in the area, but is assumed to occur over a sufficiently long period of time to occur over the period of higher high water. Tsunami inundation for Bellingham Bay is given by Walsh et al (2004). In the Whatcom Waterway site area, the tsunami depth of inundation to be between 0 and 0.5 m (0 – 1.6 ft). If a tsunami were to occur, this inundation depth would be added to the water elevation in the bay at that time. This means that the water elevation in the site area may increase by up to 1.6 feet above the tidal elevation at the time. This assumes that the tsunami occurs independently from either flooding storm surge.

- **Shoreline Infrastructure:** The characteristics of shoreline infrastructure in the Whatcom Waterway site area vary significantly from site unit to site unit. However, the infrastructure generally has been developed for industrial water-dependent shoreline uses. The infrastructure generally consists of bulkheaded or armored shorelines, with over-water wharves and structures present in Waterway areas. As described in Section 3.2.2 below, the infrastructure in many area of the Whatcom Waterway is obsolete and does not match the channel depth authorization. Much of the infrastructure is in need of repair or replacement.

Surface Water Quality

Bellingham Bay measures approximately twelve miles long by three miles wide and opens to the Puget Sound to the south and southwest. The bay is a component of a system of interconnected bays that meet the Rosario Straits and eventually the Pacific Ocean. Most oceanic waters enter Bellingham Bay at depth from the north end of Rosario Strait. Some water also enters through Bellingham Channel. Surface water is exchanged between Bellingham Bay and Samish Bay to the south. A shallow sill limits water exchange to the west through Hale Passage. The average residence time for water in Bellingham Bay is four to five days, but can range from one to eleven days.

Studies performed by Ecology and others in the 1970s found that the water quality in inner Bellingham Bay was historically degraded as the result of direct discharge of municipal wastes, pulp and paper mill process water, and other point and nonpoint source discharges to the bay. Efforts to address contamination problems in Bellingham Bay have been underway since, resulting in substantial reductions in the amount of contaminants discharged to Bellingham Bay and corresponding improvements in water quality over time. NPDES permit requirements have led to the implementation of technology-based controls on wastewater and industrial dischargers to the bay, including the Post Point WWTP, GP's ASB facilities, and stormwater discharges to the bay (Ecology, 1999).

Two water quality limitations in Bellingham Bay were identified in the 1998 Section 303(d) list, which is a required mechanism for states to report impaired water bodies to USEPA. Waters placed on the 303(d) list are required to have a TMDL developed to set allowable limits of pollutants into the water body. A TMDL for sediment contamination by toxic pollutants has been developed for the bay (Ecology, 2001). The 2001 TMDL submittal addressed impairments to Bellingham Bay due to potential toxic effects from contaminated sediments based on the 1998 Section 303(d) list of impaired waterbodies. The TMDL and subsequent TMDL Detailed Implementation Plan (Ecology, 2003b) identified the cleanup of existing contaminated sites under MTCA as the vehicle to attain water quality standards. Outside of the immediate discharge area for several urban streams, potentially toxic substances have not been detected in Bellingham Bay at concentrations exceeding state or federal water quality criteria.

Characteristics of Bellingham Bay surface water and pollution inputs are described below:

- **Bottom Currents:** Bottom currents have a net southward flow throughout the bay at depth. They are relatively consistent throughout the year and typically range from 0.2 to 0.3 meters per second. In the inner bay area, deep currents vary with tidal fluctuations. The currents generally flow toward the Whatcom

Waterway during the incoming tide. During ebb tides, deep currents generally flow in a clockwise direction in the inner bay.

- **Bellingham Bay Freshwater Inputs:** The inner bay is influenced by tidal-induced marine waters and fresh water inputs from four watersheds of the Nooksack River Water Resource Inventory Area (WRIA1) entering the bay. From north to south the inputs are: the Nooksack River, the Lower Squalicum Creek, Whatcom Creek and Padden Creek. A fifth watershed, Chuckanut Creek, discharges into Chuckanut Bay, south of the inner bay. It drains an area of 13 square miles which is minimally impacted by human activities. Some residential and commercial areas are present.

  - **The Nooksack Watershed:** The Nooksack River watershed drains approximately 800 square miles westward into Bellingham Bay. The Fraser and Sumas systems flow northward into Canada. Lake Whatcom is the largest lake covering 5,000 acres in area. It is drained by Whatcom Creek, which discharges into Bellingham Bay through the Whatcom Waterway. The western boundary of these watershed areas borders over 130 miles of marine shoreline. (WSU, 2005)

  - **Whatcom Creek Watershed:** The Whatcom Creek Watershed drained by Whatcom Creek, which flows through the City of Bellingham, originating at Lake Whatcom and draining into Bellingham Bay. This urban stream has been listed under Section 303(d) of the federal Clean Water Act as not meeting water quality standards for fecal coliform and temperature. A TMDL is being developed for Whatcom Creek for fecal coliform. The creek is also impacted by channelization, vegetation removal and urban stormwater runoff. In June 1999, a petroleum pipeline that crosses under Whatcom Creek ruptured, causing a gasoline spill into the creek. The gasoline was ignited, causing a large fire and explosion. The pipeline has been repaired (Ecology, 1999, 2004c). Whatcom Creek is the only natural surface water outlet of Lake Whatcom, a glacially formed lake located in Whatcom County and the largest lake in the Nooksack River WRIA. Lake Whatcom supplies drinking water for more than 85,000 residents in Bellingham and Whatcom County, as well as process water for several industries. The City of Bellingham diverts flow from river mile 7 of the Middle Fork of the Nooksack River into Lake Whatcom. Water is diverted through a tunnel under Bowman Mountain to Mirror Lake. Water from Mirror Lake flows to Lake Whatcom via Anderson Creek. The City of Bellingham operates a control dam at the outfall of Lake Whatcom as it enters Whatcom Creek. A TMDL is underway

for Whatcom Lake for dissolved oxygen and fecal coliform impacts (Ecology, 2004c). Like many municipalities, the City of Bellingham employs Whatcom Creek and its tributaries as part of the stormwater conveyance system. In areas with a high percentage of impervious surfaces, stormwater runoff is a major source of bacteria pollution in streams. Currently 23.6% of the total Whatcom Creek watershed area is covered with impervious surface (Ecology, 2004c).

- **Squalicum Creek Watershed:** The Squalicum Creek watershed drains 26 square miles of land. Squalicum Creek originates at Squalicum Lake and also flows through Bellingham. The combined creeks and tributaries of the watershed combine to form 84 kilometers of stream habitat that drain water from land of varying uses. As an urban stream, the creek is influenced by channelization, vegetation removal, and urban storm water runoff (Ecology, 1999, 2004b).

- **Stormwater and Industrial Discharges:** In addition to these natural discharges, the City maintains a stormwater collection and conveyance system that includes eighteen storm drains that discharge to Bellingham Bay. Stormwater discharges are a potential source of water and sediment contamination to the bay, and the city is regulated under Phase II of the federal NPDES Storm Water Program. The City of Bellingham stormwater program, along with other permitted discharges, described in the Inner Bellingham Bay Sediment TMDL, are described below. A total of 40 waterfront or surface water discharge source locations to the bay were identified. The potential sources included 10 waterfront NPDES discharges, 12 suspected or confirmed contaminated sites, and the 18 city storm water outfalls. However, no ongoing sources have been identified that have the potential to affect water or sediment quality beyond the immediate discharge zone.

  - **City of Bellingham Stormwater System:** The City of Bellingham originally developed a local stormwater program and submitted it to the Department of Ecology in 1999. It included an extensive source cleanup program, which incorporated vactor truck waste activities. After review of the program, Ecology recommended that the city concentrate on improvements in following two areas: 1) coordinate the stormwater program with the planned sediment cleanup in Bellingham Bay; and 2) improve the stormwater plan requirements for redevelopment. Bellingham is also a "Phase II" city in the federal stormwater NPDES permitting program,

which requires stormwater programs meeting the federal requirements to be in place (Ecology, 2001).

- **Port of Bellingham Stormwater Program:** The Port leads environmental protection efforts at its properties around Bellingham Bay. As part of this role, the Port recently created a Stormwater Master Plan for Squalicum Harbor. The Plan conforms to the City of Bellingham's stormwater requirements as well as the Department of Ecology's Puget Sound Stormwater Technical Manual for all development and redevelopment activities in the Harbor. The Stormwater Master Plan includes a series of pollution prevention operational and structural BMPs and treatment alternatives to reduce or eliminate adverse impacts from Port activities on stormwater and receiving waters. The planned efforts for Squalicum Harbor and Marina are intended to provide a model for Port source control activities throughout Bellingham Bay. The Port also carries three baseline general stormwater NPDES permits for facilities that drain to or otherwise potentially impact Bellingham Bay. One general permit is for the Bellingham Airport. The Port also has coverage for the maintenance shop near the shipping terminal on Whatcom Waterway and for the Alaska ferry terminal in Fairhaven. Data for these facilities covered under the general permit does not show they are a source of sediment contamination (Ecology, 2001).

- The C Street CSO is regulated under the Bellingham Post Point NPDES Permit (No. WA-002374-4). Post Point is the location of the city's Waste Water Treatment Plant (WWTP). Department of Ecology records show that there have been three CSO overflow events since 1995. However, the City has made substantial system improvements in recent years to minimize overflow events. In addition the C Street stormwater discharge was identified as an outfall of concern in the development of the City of Bellingham Comprehensive Stormwater Program and under the NPDES general stormwater program.

- **Bornstein Seafoods:** Bornstein Seafoods carries a State Waste Discharge Permit (ST7304) for the discharge of screened seafood processing wastewater to the Bellingham Post Point WWTP. They have a Baseline General Permit for Industrial Stormwater (SO3-000679). The Department of Ecology administers both permits. Bornstein Seafoods is not identified as an ongoing source of contaminated sediments (Ecology, 2001).

Soil and Groundwater Quality

Several upland and shoreline properties in the vicinity of the Whatcom Waterway site are cleanup sites managed by the Department of Ecology under MTCA regulations. These include the following:

- **Holly Street Landfill**: The Holly Street Landfill site is a 13-acre historic solid waste landfill located in the Old Town district of Bellingham. In the late 1800s, the site was part of the original Whatcom Creek estuary and mudflat. Around 1905, private property owners began filling portions of the site with dredge spoils and other materials to increase useable upland areas. From 1937 to 1953, municipal waste was used by owners to fill private tidelands within the former Whatcom Creek estuary. Wastes, including debris and scrap materials, were disposed of according to landfill disposal practices of the time (Ecology, 2004a). Solid waste covers approximately 9.1 acres on the northwest side of Whatcom Creek and 3.8 acres on the southeast side (Maritime Heritage Park). The City of Bellingham currently owns 8.3 acres of the 13-acre landfill site, including all landfill properties located along the Whatcom Creek shoreline (Ecology, 2004a). Refuse along the northern shoreline of Whatcom Creek was excavated in conjunction with construction of an engineered cap, and material will be placed along the southern shoreline to stabilize the bank. The northern shoreline excavation and cap system controls releases of copper and zinc to Whatcom Creek that occur when estuary water mixes with the solid waste in the bank. The cleanup also included long term protection through legal restrictions on property use and monitoring of the cleanup action. Excavation for the project removed approximately 12,400 tons of solid waste, primarily from the northern bank prior to constructing the cap with clean materials (Ecology, 2004a).

- **Cornwall Avenue Landfill:** The Cornwall Avenue Landfill site, located at the south end of Cornwall Avenue, measures approximately eight acres and is adjacent to Bellingham Bay. Most of the site was originally tide flats and sub-tidal areas of Bellingham Bay. From 1888 to 1946, the site was used for sawmill operations, including log storage and wood disposal. From 1946 to 1965, the Port of Bellingham held the lease on the state-owned land. The property was subleased to the City of Bellingham from 1953 to 1962. The City used the site for municipal waste disposal. The City continued waste disposal at the site under a sublease from American Fabricators from 1962 until 1965. Landfill operations ended at the site in 1965, and a soil layer was placed on top of the municipal waste (Ecology, 2004a). Previous environmental investigations of the site indicate the presence of hazardous substances in groundwater, surface water, soil and sediments above state cleanup standards. These substances include

arsenic, copper, lead, mercury, silver, zinc, cyanide, polychlorinated biphenyls (PCB), bis(2-ethylhexyl) phthalate, PAH compounds and fecal coliform. The Port is leading the completion of an RI/FS for cleanup of this site in coordination with the City and DNR. The completion of this study is expected during 2006 and will include remediation measures for impacted uplands and nearshore sediments. Ecology is ensuring that cleanup activities are appropriately coordinated with the adjacent RG Haley site.

- **RG Haley Site:** Soil and groundwater at this upland contaminated site contain concentrations of pentachlorophenol, petroleum and associated constituents that exceed water quality and sediment protection criteria, respectively. In 2001, an oil seep was observed discharging into Bellingham Bay from the shoreline along the northern boundary of the site. An investigation revealed that portions of the site were contaminated with chemicals consistent with the site's former use as a wood treatment facility. The contaminants were found at levels exceeding state regulatory cleanup levels in surface water, shallow groundwater, sediment and soil (Ecology, 2004a). The visible release of contamination from the site into Bellingham Bay was controlled through the installation of a barrier wall and a product recovery system. The temporary contaminant recovery system continues to operate. An RI/FS is being conducted under an Agreed Order with Ecology and a draft report is scheduled to be released for public review during 2006. The cleanup at this site will include remediation of impacted uplands and nearshore sediments. Ecology is ensuring that cleanup activities are appropriately coordinated with the adjacent Cornwall Avenue Landfill site.

- **Central Waterfront Site:** The Central Waterfront site includes four former cleanup sites that have been combined into a single site to comprehensively manage commingled groundwater contamination. The site includes properties formerly known as the Roeder Avenue Landfill, the Chevron Bulk Fuels Facility, The Boat Yard at Colony Wharf, and the Olivine Uplands site (Ecology, 2004a). The Roeder Avenue Landfill was a bermed municipal landfill operated between 1965 and 1974. The Chevron Bulk Fuels Facility is located along C-Street and is an area where soils and groundwater are impacted by petroleum hydrocarbons associated with historic fuel handling practices. This has been purchased by the Port of Bellingham. The Boatyard at Colony Wharf is an operational boatyard. Soils and groundwater at the site are impacted by low levels of metals contamination, principally copper. Petroleum has also been detected in soil and groundwater. The site has been purchased by the City of Bellingham, and cleanup activities are being managed by the Port under an Interlocal Agreement with the City. The Olivine site was formerly used by previous Port tenants for operation of a lumber mill,

and later for operation of a rock crushing plant. Contaminants identified at the site include petroleum hydrocarbons, PAHs, and low levels of heavy metals, principally nickel. The Port and City are conducting the cleanup of the Central Waterfront site and expect to complete an uplands RI/FS for public review in early 2007 under an Agreed Order with Ecology.

- **Chlor-Alkali Plant**: The chlor-alkali plant site was recently acquired by the Port from GP. Soils and groundwater at that site contain elevated levels of mercury from historic operations of the chlor-alkali plant by GP. Two rounds of RI/FS investigations have been performed at the site, and additional studies were performed as part of the Whatcom Waterway Log Pond Interim Action. Results indicate that soil and groundwater conditions at the site do not represent a current source control concern for Whatcom Waterway site sediments or surface water quality. The Port, GP, and Ecology plan to amend an existing Agreed Order to complete an RI/FS of this site.

- **Former GP Pulp and Tissue Mill Site:** The Pulp and Tissue Mill site was also recently acquired by the Port from GP. This property has been used since the early 1900s for pulp and tissue mill operation. Some impacts to soil and groundwater were identified at the site during environmental investigations performed at the site during 2004, and the site was listed by Ecology as a contaminated site. The key issues at the site include petroleum contamination near old bunker fuel storage areas, and low-level metals impacts in groundwater near the former acid plant area of the pulp mill. Based on patterns of sediment contamination in the Whatcom Waterway, neither of these areas appears to represent an ongoing source of contamination to Whatcom Waterway sediments. However, additional actions will be required to address these contamination problems and finalize plans for site cleanup and redevelopment of the Pulp and Tissue Mill site. Under the terms of the GP property acquisition, the Port will conduct the investigation and cleanup of this site, with oversight by the Department of Ecology.

Sediment Quality and Source Control

Sediment quality issues have been directly evaluated by the Whatcom Waterway RI/FS process. Readers should refer to that document for a thorough discussion of site conditions. This section provides a brief summary of that information.

- **Sedimentation Patterns**: The Nooksack River, Whatcom Creek, Squalicum Creek, Chuckanut Creek, and Padden Creek Watersheds contribute sediment to Bellingham Bay. The largest volume of water and sediment entering Bellingham Bay is the Nooksack River. As previous discussed, dredging and shoreline

modifications have affected the natural sedimentation process in Bellingham Bay. This is particularly true in the inner bay, where industrial and commercial/shipping activities have been focused. The "net sedimentation rate" is a measure of the long-term burial rate of sediments beneath more recently deposited sediment materials. (Within contaminated areas of Bellingham Bay, this measurement provides an indication of how rapidly "clean" sediments are being deposited over contaminated material.) The net sedimentation rate in inner Bellingham Bay has been estimated at roughly 1.6 cm/year. Estimates of net sedimentation rates within Whatcom Waterway has been determined using sediment core studies and by calculating net changes in mud line elevation of the waterways between 1975 and 1996. These rates vary considerably within the channel area, ranging from 0 to 9.4 cm/year.

- **Sediment Bioactive Zone:** Sediment is the material suspended in or settled on the bottom of a water body. It is typically a mixture of sand, silt and clay. When describing the characteristics of sediment, reference to different sediment layers is made. "Surface" sediments reside directly below the mud line and represent the "biologically active zone." The extent of the surface sediment layer can vary from site to site, and may extend to a depth of between 10 and 16 centimeters below mud line within the bay. Previous evaluations for the Whatcom Waterway site indicated that the bioactive zone thickness within the site averages 12 centimeters. "Subsurface" sediments are located below surface sediments.

- **Sediment Contamination:** As stated earlier, efforts to address contamination problems in Bellingham Bay have been underway since the early 1970s. Over these past 25 years, the amount of contaminants discharged to the bay has been substantially reduced, which has led to improvements in water and sediment quality. However, recent studies have found that certain contaminants continue to persist in sediments, and could pose a potential risk to aquatic organisms that live in these areas. Contaminated sediments occur primarily in localized areas within the northeast corner of the bay. The existing sediment conditions in Bellingham Bay are currently being evaluated through a number of site-specific RI/FS efforts and general status investigations. Of more than 50 chemicals analyzed, three have been regularly detected in Bellingham Bay sediments at concentrations that exceed the current SQS chemical criteria. These chemicals of potential concern are mercury, 4-methylphenol and phenol concentrations. Solid waste accumulations have also been mapped adjacent to the former Cornwall Avenue Landfill. Compliance with sediment

cleanup standards considers potential future changes to the surface sediment layer that would result from dredging. In Bellingham Bay, subsurface contamination has been detected in the federal navigation channels. These sediments could potentially be exposed by dredging and become "surface" sediments. A brief description of contaminants of concern is provided here, followed by a description of their occurrence within the study area.

- **Mercury:** A naturally-occurring metal, mercury is ubiquitous within the environment. Elevated concentrations of mercury in the aquatic environment have been associated with chlor-alkali facilities, shipyards, mining operations, dental processes, fungicide applications, and other sources. Releases of mercury to Bellingham Bay peaked during the 1965 to 1971 period, largely related to releases from the GP chlor-alkali facility. However, this source of mercury to Bellingham Bay has since been eliminated. Mercury exists in many forms within the aquatic environment; the three most predominant forms are elemental mercury, inorganic mercury and methylmercury. The high vapor pressure of elemental mercury makes it possible for this chemical to volatilize from water into air. Inorganic mercury, which comprises the greatest fraction in sediments is strongly absorbed to and transported with sediment particles. Methylmercury is the most toxic and readily bioaccummulated form of mercury. Methylaton of inorganic mercury by microbes occurs at or near the sediment:water interface where oxygen has been depleted. Although methylmercury typically comprises less than 10 percent of the total mercury burden in Puget Sound sediments, more than 90 percent of the total mercury present in fish and shellfish tissue is methylmercury. The relationship between total mercury concentrations in surface sediments and tissue in Bellingham Bay was characterized in the Whatcom Waterway RI/FS, and was used to develop site-specific sediment cleanup levels (Ecology, 1999).

- **Phenolic Compounds:** Both phenol and 4-methylphenol are also ubiquitous within the environment, and are often detected in stormwater runoff. Phenol and 4-methylphenol are known degradation products of natural wood products, and accumulations of these compounds in regional sediments is frequently associated with wood material deposits (Ecology, 1999).

- **Sediment TMDL Study**: A TMDL for mercury contamination in sediments was established for the Inner Bellingham Bay in 2001. The TMDL sets an allowable daily load of pollutants to the water

body from point and nonpoint sources. Sediment sampling in Bellingham Bay has found mercury and other contaminants at levels that exceed the state Sediment Management Standards chemical criteria. The presence of contaminated sediments in Inner Bellingham Bay has been documented to be due to historical practices. No ongoing sources have been identified as causing violations of marine Sediment Quality Standards (SQS), however, some sources may affect small areas of the bay immediately adjacent to outfall pipes (Ecology, 2001).The key areas of Inner Bellingham Bay on the 303(d) list are identified as Whatcom Waterway, I&J Waterway, GP Outfall, and Harris Avenue Shipyard. Of the more than fifty chemicals analyzed, only those described above were regularly detected at concentrations that exceed current state SQS chemical criteria in the Whatcom Waterway site area. Surface concentrations of mercury, 4-methylphenol, and wood material in the Whatcom Waterway area were significantly lower than concentrations detected several feet below the mudline. These patterns correspond to decreasing surface sediment concentrations over the past 25 years, due to source controls implemented at the GP facility and in other areas of Bellingham Bay beginning in the early 1970's. This process of natural recovery is also a result of the gradual incorporation of clean sediment deposits loading primarily from the Nooksack River Watershed (Ecology, 2001).

- **Sediment Areas Managed Separately**: In addition to the remediation areas being addressed under the Whatcom Waterway site, Ecology is conducting the cleanup of other areas under separate site designations or under the NPDES water quality program. These separate sediment management areas include the following:

  - **I&J Waterway:** Surface sediment sampling in I&J Waterway have been shown to be impacted with contaminants different from those present in the Whatcom Waterway site area. These include phthalates and nickel, and also PAH compounds. The Port is currently conducting a sediments RI/FS for this area under an Agreed Order with Ecology. The completion of that study is expected during 2006.

  - **GP Outfall**: The GP Outfall area was identified as a 303(d)-listed contaminated sediment site in Bellingham Bay due to levels of mercury above the cleanup screening level. A detailed contaminant transport analysis was carried out to evaluate the sediment recontamination potential for mercury for the current discharge levels of the GP Outfall. The modeling process predicted the current GP Outfall discharge will not cause

mercury sediment contamination to SQS levels in Bellingham Bay. Furthermore, the dynamic model showed that existing sediments within the immediate outfall area were predicted to recover to below the mercury SQS chemical criteria prior to 1999. Sampling data from 1999 confirmed model predictions and demonstrated that the sediments within the vicinity of the GP outfall comply with SQS cleanup criteria for mercury. In addition, the GP chlor-alkali plant (the mercury discharge source) has been closed and pulping operations have terminated, which will improve the discharge quality from the outfall (Ecology, 2001). Biological confirmatory tests were run on the samples from the three highest-concentration stations in the station cluster. All biological tests passed SQS biological screening criteria. Therefore, the confirmatory biological testing procedures under SMS do not qualify this station cluster as a contaminated sediment site and demonstrates compliance with the SQS criteria through the principal of biological override (Ecology, 2001).

- **Cornwall Avenue Landfill**: The Cornwall Avenue Landfill is managed as a separate cleanup site. The Port is leading the completion of an RI/FS for cleanup of this site, in coordination with the City and DNR. The completion of this study is expected during 2006. Cleanup of this site will be completed after finalization of the RI/FS and development of a Consent Decree.

- **RG Haley**: An RI/FS is in progress at this site. Sediments in the nearshore areas of this site have been impacted by pentachlorophenol, petroleum and selected PAH compounds. The RI/FS is being conducted under an Agreed Order with Ecology and a draft report is expected during 2006. The cleanup at this site will include remediation of impacted nearshore sediments. Ecology is ensuring that cleanup activities are appropriately coordinated with the adjacent Cornwall Avenue Landfill site.

3.2.2 Issues by Site Area

Relevant geology, water quality and environmental health issues are discussed below. The discussion is organized by geographic area using the site units shown in Figure 1-1.

Outer Whatcom Waterway (Unit 1)

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

The bathymetry in most areas of the Outer Whatcom 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 Bellingham Shipping terminal is an engineered slope, including a pile-supported concrete bulkhead and areas of armored slope.

Surface sediments within the Outer Whatcom Waterway (Figure 3-1) have recovered through sedimentation and natural recovery. All of the surface samples collected recently in this area have passed bioassay testing, and no exceedances of the site-specific bioaccumulation screening level (BSL) for mercury were noted.

Subsurface sediment concentrations in the Outer Whatcom Waterway are generally quite low (Figure 3-2 and Figure 3-3). 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 sediments from open water disposal. However, contaminant concentrations are well below those in the most contaminated remaining portion of the site, the ASB sludges.

Inner Whatcom Waterway (Units 2 and 3)

The water depths within the Inner Whatcom 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, consistent with typical deep draft infrastructure requirements as shown in Figure 3-5. However, much of the Inner Whatcom Waterway shoreline infrastructure is in fair to poor condition. In portions of the Central Waterfornt, 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 Whatcom 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 Whatcom 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 Whatcom Waterway is generally dominated by fine sediments. The total fines content of Inner Whatcom 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 along-side portions of the waterway.

Whatcom Creek enters the Whatcom Waterway upstream of the Roeder Avenue Bridge. Salinities of the Inner Whatcom 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.

Surface sediment (Figure 3-1) quality within most areas of the Inner Whatcom Waterway has naturally recovered. With the exception of localized areas adjacent to the Colony Wharf site and one area near the Log Pond, surface sediments within the Inner Whatcom Waterway comply with SMS bioassay criteria, and mercury concentrations are well below the site-specific BSL. Subsurface contaminant concentrations are relatively low in comparison to the ASB sludges (Figure 3-2 and Figure 3-3). However, previous testing has indicated that sediments removed from the Inner Whatcom Waterway are unlikely to be suitable for open water disposal or beneficial reuse

Log Pond (Unit 4)

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 Georgia Pacific chlor-alkali plant to Bellingham Bay, prior to construction of the ASB. A cleanup action consisting of construction of a combination sediment cap and habitat enhancement was completed in the GP Log Pond in 2001.

The Log Pond prior to the Interim Action 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 43,000 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 construction was generally composed of rip-rap 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 construction 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%, with an average around 30 to 35%. In the northeast end of the pond, a large (>50%) 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% fines, and 1 to 8% 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% sand, 78% silt, and 17% clay.

TOC concentrations in the GP Log Pond prior to construction 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 of Volume 2 of the RI/FS, 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 the RI/FS and will be implemented as part of the final remedial action for the site.

As described in the Environmental Design Report for the Interim Action, the subsurface mercury concentrations in the Log Pond are elevated due to historic mercury discharges from the former chlor-alkali plant. Ecology determined that removal of the sediments was not technically practicable. The Log Pond Interim Action has been successful at containing these sediments, and no migration of contaminants upward through the cap or through cap porewater has been observed.

As described in Appendix D of Volume 2 of the RI/FS, most surface sediments within the Log Pond comply with sediment cleanup levels. A localized area of recontamination was noted during Year-5 monitoring in the southwest corner of the Log Pond, adjacent to an area of shoreline not included in the Interim Action cap boundaries. 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.

Areas Offshore of ASB (Unit 5)

Water depths within Unit 5 vary by area. In Unit 5-B the depths are shallow, ranging from approximately 6 feet to approximately 12 feet below MLLW. Similarly, Unit 5-C 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 5-A 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 5-B. The particle size distribution is controlled by area wave energies.

Wave energies in Unit 5-C are lower than in Unit 5-B due to the partial sheltering of this area by the ASB structure and the Bellingham Shipping Terminal. Further reductions in wave energies in this area are anticipated as part of future marina construction improvements.

Throughout most of Unit 5 the surface sediments (Figure 3-1) have naturally recovered and are compliant with site cleanup levels. Subsurface sediment concentrations are relatively low as shown in Figure 3-2 and Figure 3-3. However, wave energies within Unit 5-B are higher than in other areas and have slowed natural recovery rates and the deposition of fine sediments in this area. Recent sampling in 2002 demonstrated that sediments in this area do not exceed bioassay criteria established under SMS. But mercury levels remain elevated within Unit 5-B due to the lower levels of natural recovery in this area.

Area Adjacent to BST (Unit 6)

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.

The principle contaminants historically identified in the Unit 6 area are phenolic compounds. The primary sources of these compounds appears 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 3-1). 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.

Starr Rock (Unit 7)

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.

The surface sediments (Figure 3-1) within Unit 7 have naturally recovered. 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.

ASB (Unit 8)

The ASB is approximately 1000 feet wide north-south, and varies from approximately 1000 to 1400 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.

Figure 3-4 shows in schematic cross-section the construction of the ASB berm. The berms were 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 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 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 4400 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).

As described in the RI/FS, the ASB sludges contain the highest contaminant levels of all of the materials requiring remediation (Figure 3-2 and Figure 3-3). 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.

The ASB sludges are soft, wet and have very high TOC contents. If managed as part of a nearshore fill, these sludges would be subject to primary and secondary consolidation, and would likely produce methane during anaerobic decomposition.

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.

3.3 Fish and Wildlife

An overview of the fish and wildlife characteristics of the Whatcom Waterway site are described in Section 3.3.1 below. The particular considerations for each of the Site Units are described in Section 3.3.2.

3.3.1 Overview of Key Issues

This section describes fish and wildlife habitats in the Whatcom Waterway, which is located on the northeastern side of inner Bellingham Bay. Detailed information on Bay-wide habitat conditions and habitat maps can be found in the Data Compilation Report (Pacific International Engineering and Anchor Environmental, 1999).

Most of the habitats in Bellingham Bay are used by a variety of marine and terrestrial species for feeding, reproduction, rearing, and/or refuge. The Whatcom Waterway specifically hosts various benthic macroinvertebrates (bivalves, crabs, polychaetes), as well as providing habitat or passage for various fish species (both bottomfish and pelagic species such as salmon).

Types and Functions of Habitats

Three different elevations of habitat are considered within this EIS: intertidal, shallow subtidal, and subtidal. Although separated by only a few feet, these three strata have distinct soil textures and support varying plant and animal communities. Each stratum has two types of substrata: sand/mud/cobble and gravel/rocky shore. The habitat typically found in these strata is summarized here to preface more detailed descriptions of fish and wildlife habitat in the Bay.

- **Intertidal: 4 feet below to 11 feet above MLLW**

  - **Sand/mud/cobble.** This area supports rooted plants to varying degrees, with increased numbers and variety occurring at higher elevations. Native eelgrass is most commonly found at 0 to 4 feet below MLLW, while rushes, sedges, and pickleweed can be found at 11 to 8 above MLLW. These plants provide food and refuge to various organisms, including juvenile salmon, shrimp, crab, and flat fish. Mudflats found in this

substratum support epibenthic prey that are consumed by juvenile salmon migrating through the area. Pacific herring may also use the eelgrass and macroalgae found in the intertidal zone as spawning habitat. The finer substrate at higher elevations (8 to 11 feet above MLLW) provides spawning habitat for sand lance and surf smelt. Premium intertidal habitat of this kind, with the appropriate substrate, energy levels and other conditions providing maximum benefit to juvenile salmonids, is limited in the Whatcom Waterway area to areas at the head of the Whatcom and I&J Waterways, areas along portions of the sides of the Whatcom Waterway, in beach areas at the foot of Hilton Avenue and at the foot of Pine Street and in portions of the Log Pond following completion of the Interim Remedial Action.

- **Gravel/rocky shore.** Native eelgrass is occasionally found in pools and channels on the rocky shores at about 0 feet MLLW. Brown, green, and red algae are also found throughout this area. The higher elevations of this substratum are affected by higher tides; plant material can consist of lichens, some flowering plants, and leadwort. Animals commonly encountered include crabs, shrimp, sponges, sea anemones, worms, sea stars, oysters, and various fish (e.g., perch, prickleback, flat fish, and some juvenile salmon). Fish use this area for feeding, refuge, and reproduction, and this intertidal can represent premium nearshore habitat for juvenile salmonids. Armored and rocky areas of the Whatcom Waterway with this type of habitat are located along the sides of the Whatcom and I&J waterways, along the shoreline of the ASB, and in portions of the Log Pond.

- **Shallow Subtidal: 4 to 10 feet below MLLW**

  - **Sand/mud/cobble.** The plant and animal communities and functions in this substratum are similar to those described in lower elevations of the intertidal habitat; a notable exception is native eelgrass, which is typically more common within the -4 to 10 feet below MLLW zone. Mudflats within this substratum support epibenthic prey that is consumed by juvenile salmon migrating through the area. The substrate within this elevation can also provide suitable habitat for Dungeness crab mating and egg brooding. Shallow subtidal areas are located at the heads and along portions of the sides of the Whatcom and I&J waterways, in areas at the foot of Hilton Avenue and Pine Street, in the ASB shoulder area and in the Log Pond.

- **Gravel/rocky shore.** Native eelgrass is occasionally found in this area, as are a variety of brown, red and green algae. Animals common to this substratum include crabs, shrimp, sponges, sea anemones, worms, sea stars, oysters, and a variety of fish such as perch, prickleback, flat fish, and some juvenile salmon. The fish use this area for feeding, refuge and reproduction. Rocky shallow subtidal habitats are located along portions of the Whatcom and I&J Waterways and along the shorelines of the ASB and in portions of the Log Pond.

- **Subtidal: Greater than 10 feet below MLLW**

  - **Sand/mud/cobble.** Native eelgrass is still relatively common between 10 and 20 feet below MLLW; however, beyond 20 feet below, light is limited and eelgrass and macroalgae are less prevalent. Some varieties of hardshell clams are also less abundant with increased depth, while the geoduck clam tends to be more abundant in deeper water. The substrate within this elevation can provide suitable habitat for Dungeness crab mating and egg brooding. The substrate and water column are also used for feeding by a variety of fish, including sub-adult and adult juvenile salmon. Most portions of the Site consist of subtidal habitat with sand or mud bottom.

  - **Gravel/rocky shore.** Larger-sized fish and shellfish often occur in deeper waters. Greater than 20 feet below MLLW, light reaching the sea floor limits the abundance and growth of macroalgae. In addition, the occurrence of some species such as oyster is rare. Rocky subtidal shorelines within the site predominantly occur along the developed shorelines of the Whatcom and I&J Waterways. Some rocky outcroppings occur at subtidal elevations at Starr Rock.

Fisheries and Invertebrate Resources

Documented fisheries resources for Bellingham Bay include the following:

- **Surf Smelt and Sand Lance:** Surf smelt and Pacific sand lance are common fish that spawn in the high intertidal portions of coarse sand and gravel beaches (WDF, 1992). Surveys by Washington Department of Fish and Wildlife (WDFW) have documented spawning beaches in Bellingham Bay. However, no surf smelt or sand lance spawning has been documented in inner Bellingham Bay, presumably because suitable substrates are not available.

- **Pacific Herring:** Pacific herring spawn in inland marine waters of Puget Sound between January and June in specific locations. There is typically a 2-month peak within the overall spawning

season. Herring, which deposit their eggs on marine vegetation such as eelgrass and algae in the shallow subtidal and intertidal zones between 1 foot above and 5 feet below MLLW, are known to congregate in the deeper water of Bellingham Bay. However, only relatively low-density spawning deposition occurs in the Bay, and none of that has been documented in the vicinity of the Whatcom Waterway.

- **Salmonids:** Bellingham Bay is used extensively by anadromous salmon species (Shea et al., 1981). Each of the streams flowing into Bellingham Bay is used by one or more of the economically important species listed in Table 3-1. The Nooksack River has the largest salmon runs in Bellingham Bay, followed by Squalicum and Whatcom creeks. Concentrations of chum, coho, and chinook salmon along the shoreline and in offshore waters in Bellingham Bay peak annually about mid-May. Juvenile coho and chinook salmon appear to have different migration habits. Coho remain in the Bay for approximately 30 to 35 days, while chinooks remain about 20 days. More recent studies on the distribution of chinook salmon (Ballinger and Vanderhorst, 1995) indicate relatively high numbers of juvenile chinook salmon and average numbers of coho salmon use the area in the vicinity of the Whatcom Waterway.

- **Groundfish:** Several species of groundfish occur in both shallow and deep waters in Bellingham Bay for part or all of their life. Detailed information on groundfish species and their timing and use of Bellingham Bay is not available. Key characteristics of groundfish occurring in northern Puget Sound are generally applicable to Bellingham Bay.

Bellingham Bay supports a variety of marine invertebrates, ranging from infauna (worms, clams, and small ghost shrimp that penetrate benthic sediments) to epibenthic plankters (organisms such as very small crustaceans that move off the substrate surface) to larger invertebrates such as oysters, crabs, and shrimp.

- **Clams, Geoduck and Oysters:** The predominant bivalves in Bellingham Bay are intertidal and subtidal hardshell clams. Intertidal shell clam types include butter, littleneck, horse, and soft-shell clams and cockles. Subtidal clam resources consist of butter, littleneck, and horse clams. Native oyster and Pacific geoduck are also known to occur in Bellingham Bay (Palm, 1995; WDF, 1981; WDFW, 1992; Webber, 1974). Shellfish densities are relatively low along the eastern shore of Bellingham Bay in the vicinity of the Whatcom Waterway, although bivalves are the dominant benthic organism within the Waterway (Anchor Environmental, 1999). Scattered oysters also occur along the

shoreline of the Whatcom Creek estuary (Palm, 1995). Geoduck, which is only present in a handful of locations in the Bay, does not occur within the Whatcom Waterway.

- **Shrimp:** Seven species of pandalid shrimp, including, pink, coonstripe, dock, and spot shrimp, occur in nearshore and deeper waters of Bellingham Bay. For example, coonstripe shrimp have been observed in intertidal areas immediately offshore of the Cornwall Avenue Landfill (which is just south of the Whatcom Waterway), and this species is common around piers and floats. Shrimp densities in the areas surrounding the Whatcom Waterway are moderate when the Bay is viewed as a whole.

- **Crab:** Crab trawls conducted for the Puget Sound Dredge Disposal Analysis (PSDDA) investigations indicate that the predominate crab resources in Bellingham Bay are the non-edible purple or graceful crab, the edible red rock crab, and the edible Dungeness crab. The highest densities of rock crab occur in relatively shallow water (30 to 45 feet below MLLW) in areas extending from the Lummi Peninsula to inner Bellingham Bay. Rock and Dungeness crab are likely to occur in shallower waters of Bellingham Bay not sampled as part of the PSDDA investigations. Dungeness crab is generally abundant in most areas of Bellingham Bay, and has been documented in the Whatcom Waterway. The northern and eastern shorelines of Bellingham Bay serve as nursery/rearing areas for juvenile Dungeness crab. A shell substrate is a preferred habitat for the first 8 to 10 weeks after larvae settle. However, other substrates, such as small cobbles and gravel, algae, and eelgrass, are also recognized as important rearing habitat for juvenile crab. Because the Whatcom Waterway has relatively limited quantities of these habitats, its usefulness as a nursery/rearing area is likely limited.

Table 3-1 Salmon and Trout Fisheries in Bellingham Bay

Species	Fishery
Coho	mid-September to mid-November
Chum	early November to mid-December
Chinook	late July to mid-September
Pink	July in odd years
Sockeye	no fishery
Steelhead	mid-December to January
Cutthroat	no commercial fishery
Bull trout	no fishery

Sea Birds and Marine Mammals

The greater Bellingham Bay area and its shallow estuarine habitats support a number of birds at all seasons. Although Bellingham Bay is not used extensively by large populations of waterfowl, wintering populations tend to be 10 to 15 times larger than summer populations for migratory species (Manual et al., 1979). The Bay is located on the flight path between the Fraser River estuary and Skagit Bay, and is used as a stopover for seabirds and waterfowl migrating between these two areas. Waterfowl sited in Bellingham Bay include brant, snow geese, mallard, widgeon, green-winged teal, and pintail. Bellingham Bay is also used as an over-wintering area for diving birds such as scoter and golden eye. A variety of both natural and man-made habitats provide protection from winter storms habitat to migrant and wintering birds.

Glaucous-winged gulls use inner Bellingham Bay for resting and foraging. Pigeon guillemonts use the shoreline area in and around the Whatcom Waterway for nesting and foraging. The Habitat Restoration Documentation Report (Pacific International Engineering, 1999) describes the individual bird species and their use of Bellingham Bay by season.

Limited information is available on the presence and residence time of marine mammals in Bellingham Bay (PTI, 1989). Bay-wide, several species have been reported: the harbor seal, sea lions, Orca whale, gray whale, and harbor porpoise. As described below, the local population of Orca whale is being listed as endangered under the Endangered Species Act (ESA). The other marine mammals are not threatened or endangered species under ESA, but they are protected from hunting under the Marine Mammal Protection Act. Seals and sea lions have been noted using the Log Pond and portions of the I&J Waterway for resting areas. Migrating gray whales have been noted to enter Bellingham Bay and to feed in subtidal areas of Puget Sound. Orca whales are occasionally observed in and near Bellingham Bay, though they are more typically observed in Rosario Strait and near the San Juan Islands.

Threatened, Endangered, Sensitive and Candidate Species

Under the ESA, a species likely to become extinct is categorized as "endangered." A species likely to become endangered within the foreseeable future is categorized as "threatened." This section provides information on the occurrence of threatened and endangered bird, fish and marine mammal species in Bellingham Bay.

- **Bald Eagle:** The majority of bald eagle nest sites occur in the eastern portion of Bellingham Bay, primarily in the Nooksack River delta along the shoreline and in inland areas of the Lummi Peninsula. There are also some nests along the shoreline of Portage Island and Chuckanut Bay. Nest trees in the Pacific Northwest are typically tall conifers located in forested or semi-

forested areas within about 1 mile of large bodies of water with adequate food supplies. Marine and freshwater fish are eagles' preferred prey; birds contribute a smaller proportion of the eagle diet. Prey may also include small mammals. Nesting eagles generally forage within 10 square miles of their nest site. Thus, while the Whatcom Waterway vicinity does not appear to provide eagle habitat, it may serve as a food source. The bald eagle was proposed for delisting as of July 6, 1999 due to apparent recovery of the species in the U.S. (Federal Register 50 CFR Part 17). The bird is still be protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The United States Fish and Wildlife Service (USFWS) also works with state wildlife agencies to monitor the status of the species as required by the ESA.

- **Peregrine Falcon:** Peregrine falcons are also found in Bellingham Bay. They feed almost exclusively on birds captured in flight, particularly waterfowl, shorebirds, and game birds. Peregrine falcons typically nest on cliff ledges greater than 150 feet in height that are close to the water. The Whatcom Waterway has no documented Peregrine falcon nests.

- **Marbled Murrelet:** Open water concentrations of marbled murrelets have been recorded in the central portion of Bellingham Bay. Murrelets forage in the marine environment typically up to 2 miles near a coastline. The species forages year round in waters generally less than 90 feet deep, sometimes congregating in well-defined areas where food is abundant. These birds generally do not utilize shallower waters less than 30 feet deep. Marbled murrelets reportedly feed on a wide variety of prey, including sand lance, Pacific herring, and other marine taxa such as crustaceans. Murrelets require old growth or mature forest composed of conifers, including Douglas fir, western red cedar, Sitka spruce, and western hemlock. There are no known nest sites along the shoreline of Bellingham Bay, and no clear association between these birds and the Whatcom Waterway.

- **Salmon:** On March 16, 1999, the National Marine Fisheries Service (NMFS) added nine West Coast salmon to the Endangered Species List. Of the nine listed species, one occurs within the project area: the Puget Sound chinook salmon, which was listed as a threatened species. Two races of chinook salmon (spring and fall) are found in Bellingham Bay. The timing of adult migration to freshwater differs between these two races, but the timing of the return of adult fish, spawning, and emigration of juveniles overlap. Fall chinook is the most common run of chinook salmon observed in Puget Sound. Juvenile fall chinook generally emigrate to the estuary between February and August as sub-yearlings (within the

first year after being spawned) or as yearlings. Individual fish may only use Bellingham Bay for a period of days to a few weeks before heading into the greater Puget Sound estuary. They may use the estuaries and intertidal areas between April and November for further rearing and growth. As juvenile fish move into neritic habitats, they preferentially consume emergent insects and epibenthic crustaceans in salt marsh habitat or decapod larvae, larvae, and other prey (Simenstad et al., 1991). Whatcom Creek and the Whatcom Waterway are utilized by salmon, although the Whatcom Waterway serves more as a migration corridor between Whatcom Creek and the Whatcom Creek Estuary than nursery/rearing habitat given the lack of suitable substrate and refuge.

- **Bull Trout:** Bull trout, listed as a threatened species under the ESA by the USFWS, are a member of the North American salmon family. Bull trout occur in the Nooksack River, and presumably spend some time in Bellingham Bay. Many are resident to a single stream; others migrate on a fluvial (i.e., spawn in headwaters streams and live downstream in larger rivers) or adfluvial basis (spawn in streams but live in lakes). Bull trout tend to prefer cold, clear waters (no more than 64 degrees Fahrenheit). Whatcom Creek does host bull trout, indicating that the trout use the Whatcom Waterway as a migratory path if not a refuge and rearing area.

- **Orca Whales:** On November 15, 2005, the National Oceanic and Atmospheric Administration (NOAA) Fisheries announced its decision to list the North Pacific Southern Resident Orca whale (Orcinus orca) population as endangered under the Endangered Species Act (ESA). The listing was effective on February 6, 2006 (50CFR 223/224). The listing is specific to the three resident whale pods (J, K, and L pod) with spring through fall ranges in Puget Sound and the Straits of Georgia and Juan de Fuca. This population was previously (December 16, 2004) proposed for listing as threatened. NOAA Fisheries has announced that they are preparing language for proposed Orca whale critical habitat for this population. A number of factors have been identified by NOAA Fisheries as having resulted in the listing of these Orca whales as endangered. Sound and disturbance from vessel traffic, toxic chemicals which accumulate in top predators, and uncertain prey availability (primarily salmon) all have been identified as concerns for the continued survival of this population. The small number of whales in this group, and relatively slow rate of population recovery since a 20 percent population decline during the 1990s also puts this historically small group at risk of extinction during a catastrophic event such as an oil spill or disease outbreak..

Priority Restoration Opportunities

In the Final Habitat Restoration Documentation Report for the Bellingham Bay Demonstration Pilot Project, the Habitat Subcommittee identified the following target species for Bellingham Bay.

- All salmonid species including Cutthroat trout and Steelhead
- Dolly Varden (bull trout)
- Bull trout (thought to occur in the Nooksack River)
- Sand lance and surf smelt
- Pacific herring
- Ling cod
- Flatfish (e.g., English sole)
- Pandalid shrimp
- Dungeness crab
- Hardshell clams

Based on the recent listing of the Orca whales, it appears appropriate to target restoration activities on those actions that would also support protection of those marine mammals.

In addition to the listing of target species, the Habitat Subcommittee identified the following focused habitat restoration/protection objectives:

- Provide clean sediments to support functions and species
- Restore the 200+ acres of historical native eelgrass bed that was formerly located in inner Bellingham Bay to the extent possible
- Restore/enhance degraded estuaries of Whatcom, Squalicum, Padden, and Little Squalicum Creeks to support salmonids, salmonid prey, and functions such as refuge, feeding, and rearing
- Restore/enhance/protect viable habitat that provides connective corridors between estuary and open water habitats and between other habitats in the open water environment
- Restore/enhance/protect natural habitat forming processes that create and maintain habitat
- Net gain in aquatic area and function
- Preserve existing viable habitat that tends to either concentrate sensitive life history stages and/or supports large numbers of species of concern
- Maximize habitat restoration/protection opportunities (including marine buffer) with remediation and/or shoreline projects

- Restore lost habitat attributes by removing shoreline fills, shoreline landfills, remnant structures, and removing/replacing treated timber structures.

Specific habitat opportunities prioritized under the Pilot were generally those that achieve restoration and enhancement of habitat for juvenile salmonids. In general, the actions that achieve restoration of salmonid habitat are beneficial to marine mammals including Orca whales. Habitat for juvenile salmon would improve due to the project; therefore, the availability of this important class of prey may increase. The following discussion addresses priority issues related to enhancement of salmonid habitats in Bellingham Bay.

While many species of salmonids may be present in nearshore estuarine and marine waters of Bellingham Bay, those species that enter saltwater early during their first year (some chinook, chum, and pink salmon) are typically considered to be more nearshore reliant. These fish are predominantly surface oriented, inhabiting the top meter or two or the water column moving in and out with the tides over shallow subtidal and intertidal areas.

These juvenile salmon are nearshore dependent for two main reasons, forage opportunities and refuge from larger, deeper water predators. They feed on organisms at the water-substrate interface (epibenthos), in the water column (plankton), and at the surface (neuston). Chum and chinook early in their saltwater residence feed primarily on epibenthos, although some neustonic and planktonic feeding occurs, especially as fish become larger. Pinks feed primarily on plankton from their initial entry into salt water. A number of physical and biological factors in the nearshore environment interact to create conditions that can enhance or detract from forage and refuge opportunities. Four physical factors in particular, tidal elevation, substrate type, and slope, and salinity influence habitat suitability for these fish, all of which can be modified by exposure to current or waves. Habitat that optimizes each of these factors represents premium habitat for juvenile salmonids..

- **Tidal Elevation:** Tidal elevation of a particular area dictates the duration of tidal exposure (dry periods between tides). This affects the conditions that can develop at different elevations. Shallow subtidal areas experience relatively high light levels, but essentially no tidal exposure. Larger macroalgae, eelgrass, and other organisms that might be susceptible to desiccation can survive at these elevations. The vegetation in this area supports prey organisms and can provide refuge for juvenile salmon. These fish spend a relatively small proportion of their time in waters over this elevation (primarily during very low tides) because they are primarily surface oriented. Low to middle intertidal areas (-4 to +4 ft MLLW) experience relatively short periods of tidal exposure, averaged over an entire season, and also receive a great deal of light. This area can be very productive for desiccation resistant

macroalgae and invertebrate populations, including those epibenthos on which chum and chinook feed. Because they move in and out with the tides, juvenile salmon also spend a large proportion of their time in water over substrate at low to middle tidal elevations. While juvenile salmon spend relatively little time at higher tidal elevations (e.g., above MHHW, 8.46 MLLW in Bellingham Bay), the fringing salt tolerant plants that thrive in these areas can produce invertebrates, including chironomid fly larvae which also are important prey organisms. Tidal elevation characteristics relative to light and duration of exposure are not substantially altered with differences in wave or current regimes in shallow subtidal areas. The upper range of low to middle intertidal macroalgae may be expanded as desiccation during tidal exposure is reduced due to wave action, and the upper intertidal and supratidal areas, or "splash zone" can be expanded to even higher elevations, increasing upper range of salt tolerant plants.

- **Substrate Type:** Substrate type is a factor in providing suitable foraging opportunities for juvenile salmon. The epibenthic invertebrate assemblage can vary both in terms of composition and density based on substrate type. Generally, finer substrates (e.g., silts, sand, and mud) are correlated with higher densities of those epibenthos on which juvenile salmon most often feed. This includes both those organisms associated with the substrate itself, and those organisms associated with aquatic vegetation (e.g., eelgrass). An exception to this generality is where exposure to wave or current energy is relatively high, in which case more coarse substrates (e.g., gravel or cobble) are correlated with higher densities of epibenthos. This is particularly the case with those organisms associated with macroalgae (e.g., certain types of amphipods), is more likely to be present or accumulate in areas with coarser substrate. Coarser substrates also allow for more dissipation of water energy on the substrate surface.

- **Slope:** Slope is a factor that affects both foraging and refuge function of nearshore environments. Shallower slopes, particularly in the lower to middle tidal elevations, improves conditions for epibenthos, and therefore juvenile salmon foraging opportunity, by reducing desiccation rates during tidal exposure. They increase retention of organic detritus for processing into the food web at the epibenthic level. Shallower slopes also provide greater functional habitat area for juvenile salmon at given tidal elevations. Because juvenile salmon stay in the top meter or two of the water column, tidal profiles that allow them to stay in shallow water during most or all stages of the tidal cycle provide refuge from deeper water predators, including larger salmonids that feed from below. By contrast, steeply sloped nearshore areas provide less total area of

less productive habitat at any given elevation, and little if any refuge from predators deeper in the water column. There are exceptions to this general case depending on wave exposure. In highly exposed areas, and shallowly sloped nearshore area will experience significantly more wave run up and a higher energy surf-zone that may outweigh the benefits of greater and higher functioning habitat area, and also shallow water refuge. Steeper slope profiles at specific elevations and/or coarser substrate can mitigate wave run up and surf break in higher energy areas.

- **Salinity:** Salinity influences habitat suitability for juvenile salmon by determining the physiological regime and the biological assemblage. The biological assemblage, including aquatic vegetation and invertebrates, of a given area is strongly tied to salinity. In areas of freshwater input, like the Whatcom Waterway, a salinity gradient exists along which this assemblage shifts from freshwater to marine organisms, with specialists in estuarine conditions in the middle. Surface oriented juvenile salmon in the nearshore, particularly chum and chinook, forage extensively in estuarine habitats. This is the case both for fish in their natal estuaries, and also fish that have already entered salt water and subsequently encounter lower salinity conditions. Low salinity areas are limited habitats in inner Bellingham Bay and provide important habitats for juvenile salmonids undergoing the physiological transition to saltwater.

In summary, the characteristics of premium habitat for juvenile salmonids and other selected species requires the optimization of multiple factors. The functions and values of the created habitat vary depending on this collection of factors.

Habitat Issues and Navigation Infrastructure

Portions of the Whatcom Waterway site area have been developed for navigation uses with infrastructure improvements. This infrastructure affects the types of habitat conditions that are present in these areas. Other than depth modifications (i.e., dredging) the main types of navigation infrastructure that exist in the Whatcom Waterway site area include bulkheads, armored slopes and over-water structures. These are illustrated in Figure 3-5. Habitat considerations associated with these features are described below:

- **Bulkheads:** The term bulkhead refers to constructed sheer vertical walls that stabilize the shoreline. Typically they are concrete or metal sheet pile, although many older bulkheads are constructed from treated timber. In the Whatcom Waterway, bulkheads are a common feature in the intertidal zone. Most extend from above mean higher high water to the structure design depth (varies from mean lower low water to depths greater than 10 feet below MLLW depending on the required

water depth at the face of the bulkhead). Bulkheads are often installed in conjunction with armored slopes below the toe of the bulkhead. A bulkhead yields a habitat with no depth variability and no horizontal surfaces to support primary production, secondary production, or processing of detritus. While sessile organisms, including barnacles and some macroalgae, can attach to the vertical bulkheads, it is not suitable for producing epibenthic prey organisms for juvenile salmon. The vertical slope also means that juvenile salmon using the top one to two meters of the water column are in much deeper water during most or all tidal cycles, depending on the bottom elevation of the bulkhead, compared to a naturally sloping nearshore area. This may increase their susceptibility to predators. Juvenile salmon use waters adjacent to bulkheads, and can forage on prey items derived from planktonic or neustonic sources. However, due to the lack of epibenthic organisms, overall prey resources are typically considered to be reduced relative to sloped habitat.

- **Armored Slopes:** Slopes armored with large stones or "riprap" are typically steep and compress the horizontal habitat profile yielding less habitat within the desired zones for juvenile salmonids than do more gently sloped habitats. Unlike bulkheads, the resulting habitat does have surfaces to support primary productions, secondary production, and processing of detritus. Substrate size of riprap slopes differs from the fine silts or sands that would have been typical of the depositional delta area in the historic Whatcom Creek, or even more coarse gravel or cobble substrates farther from the mouth of the creek. At elevations that are exposed to regular, significant wave energy, riprap has essentially no ability to retain water or organic material on its own, except in depressions in individual pieces. Exposed rock surfaces at these elevations eventually develop sessile biological matrices, including macroalgae and invertebrates, which reduce desiccation at small scales and allows for an assemblage including mobile invertebrates. At lower elevations that do not have significant wave exposure, riprap can provide a suitable substrate for many different species of macroalgae and also provides habitat areas in its interstices for invertebrates. A common means of improving the productivity of riprap slopes is to fill the interstices of the rock with a finer material (e.g., gravel) that can increase both water and organic material retention, and increase the ability of the bulkhead slope to support an assemblage include juvenile salmon prey organisms. This method may not be appropriate in higher energy areas where substrate may not be retained at mid and higher elevations. The biological assemblages on riprap substrate are more comparable to that of a rocky nearshore area than beaches. While there are epibenthic prey available for juvenile salmon in these areas, habitat function is reduced compared to areas with smaller substrate. Juvenile salmon use waters adjacent to

riprap and can forage on prey items derived from planktonic or neustonic sources as well as the limited epibenthic prey.

- **Overwater Structures:** Intertidal and shallow subtidal shading has decreased light levels underneath and around overwater structures. Shading is of primary concern because it reduces light available for photosynthesis by aquatic vegetation. Reduced primary productivity has implications both in terms of habitat structure and complexity (reduction or loss of aquatic vegetation), and in terms supporting productivity elsewhere in the food web, including juvenile salmon prey organisms. Shading impacts extend beyond the structural footprint of the structure as the sun's movement across the sky over a day or season results in a larger shaded area as it is oriented in different aspects. Small structures, such as narrow piers, shade relatively less area than large or wide structures such as pier aprons. Depending on the orientation of the narrow structure, direct sunlight can reach most the shade footprint over the course of a day or season. The distance from the lighted edge to the center of the structure footprint is also relatively smaller than at a wider structure, resulting in higher levels of ambient light. In contrast with wide structures, large proportions of the shade footprint may never receive direct sunlight. Wider structures also decrease the ratio of lighted edge to shaded area, and increase the distance from the lighted edge to the center of the structure footprint. This results in less ambient light under wider structures and therefore more intense impacts associated with shading. This has implications for productivity and can reduce the habitat function of an area for juvenile salmon foraging. Nearshore habitat function may be reduced underneath and immediately adjacent to overwater structures. For juvenile salmon, this impact is relatively greater at the typically highly productive low to middle intertidal zone, although impacts on macroalgae in the shallow subtidal and salt tolerant plants in the supratidal splash zone also can affect productivity in these zones. As with bulkheads, foraging function around overwater structures may be reduced due to decreased productivity but alternative food sources (plankton, neuston) are available. Those juvenile salmon that move into deeper water to avoid overwater structures may be more susceptible to deeper water predators, but this behavior is not always the response to encountering a structure.

In summary, premium habitats minimize the presence of bulkheads, steep armored slopes and over-water structures. However, waterfront navigation needs force compromises to be made between navigation and habitat features in most waterfront industrial areas. The cleanup and redevelopment of the Whatcom Waterway and New Whatcom areas provides a unique opportunity to reevaluate required infrastructure needs and achieve gains in premium nearshore habitat while simultaneously meeting the needs of waterfront navigation and land use.

3.3.2 Environmental Characteristics by Site Area

Environmental characteristics of the Whatcom Waterway site area described below by site unit with a focus on fish and wildlife habitats.

Outer Whatcom Waterway (Unit 1)

The areas of the Outer Whatcom Waterway are composed largely of deepwater aquatic areas. Shallow-water nearshore habitats in the Outer Whatcom Waterway area are limited to under-dock areas along the Bellingham Shipping Terminal. Potential habitat enhancement opportunities in these areas are limited by the infrastructure needs associated with operation of a deep draft moorage area in support the operations of the federal navigation channel (Figure 3-5).

Inner Whatcom Waterway (Units 2 and 3)

The Inner Whatcom Waterway includes a mixture of deepwater areas, and areas of emergent shallow-water habitat. The shallow-water habitat areas at the head of the Waterway and along its sides are extremely valuable 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.

During the Bellingham Demonstration Pilot, the area within Site Unit 3-A 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. Adjusting navigation dredging dimensions to preserve the emergent tideflat area was proposed as part of the preferred alternative from the 2000 FEIS.

The reevaluation of Whatcom Waterway navigation needs and associated shoreline infrastructure requirements completed as part of the Whatcom Waterway and New Whatcom projects provides an opportunity to preserve and enhance nearshore habitat located long the sides of the Whatcom Waterway. Preliminary design concepts for how waterfront infrastructure might be integrated with the needs of a mixed-use waterfront in the Inner Whatcom Waterway are shown in Figure 1-2, Figures 3-6 and 3-7 and in Appendix E. These concepts locate navigation infrastructure offshore of premium nearshore habitat benches. The bulkheads, over-water wharves and steep armored shorelines typical of industrial waterfront areas are minimized under these concepts. The ability to implement this type of shoreline treatment will be dependent on cleanup and land use decision-making.

Log Pond (Unit 4)

The Bellingham Bay Work Group identified habitat enhancement opportunities within the Log Pond as a priority restoration opportunity (BBWG, 1999). Monitoring 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 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.

There are some remaining opportunities for habitat enhancements within the Log Pond. These include potential removal of the conveyor system and remaining pilings and/or dolphins. Some areas of the Log Pond remain deeper than -4 feet MLLW, and increases to these mudline elevations could further enhance habitat quality in these areas

Areas Offshore of ASB (Unit 5)

The Habitat Restoration Documentation Report (BBWG, 1999) documented high priority restoration opportunities are within Unit 5. The Unit 5 areas were considered valuable as salmonid migration corridors, and as potential premium nearshore aquatic habitat. Shallow water habitat could be established by raising the elevation next to the ASB, and by creating structures that would reduce wave energies and allow for eel grass colonization. To the north of the ASB, along Hilton Avenue, an eel grass bed has become established. This area has elevations generally shallower than 5 feet below MLLW, and the area is partially protected from wave energies by the ASB and by a shallow-water leading edge.

Figure 3-4 shows a conceptual design for a premium nearshore habitat bench that could be within Unit 5B to improve the habitat quality of this area. These enhancements include raising of sediment elevations to depths between 3 and 6 feet below MLLW, and providing a stone leading edge to trip incoming waves and reduce resultant wave energies in shallow-water areas. These features would largely replicate conditions already present in the eel grass flat located in the Hilton Avenue area. The figure shows the different wave energy and depth regimes both along the outside (Unit 5) and inside (Unit 8) of the ASB per preliminary design concepts developed by the Port after consultation with resource agencies and project stakeholders. Any final design for this area would be subject to additional refinement during design and permitting for site cleanup, marina development and habitat enhancement activities.

Area Adjacent to BST (Unit 6)

Like Unit 5, the area within Unit 6 has some potential value for enhancement of nearshore habitat. However, the navigation uses within this area restrict the potential for development of significant habitat benches as described above for Unit 5.

Starr Rock (Unit 7)

Unit 7 consists of a deepwater habitat area. The depths in this area do not allow for enhancement of shallow-water habitat uses

ASB (Unit 8)

During the Bellingham Bay Demonstration Pilot, the potential to conduct habitat enhancement activities inside the ASB area was identified. While these uses conflict with current wastewater and cooling water treatment uses, they can be potentially integrated into future marina reuse of the facility. The preliminary design concepts developed by the Port for a future ASB marina incorporated such habitat enhancement features.

If opened to the aquatic environment, the ASB would restore 28 acres of open-water habitat. This would also develop just under 4,500 linear feet of new salmonid migration corridors. The acreage of premium nearshore aquatic habitat developed as part of marina reuse would vary depending on final design and berm configurations, with potential habitat bench areas located on the inside and/or the outside of the berm. Figures 1-2 and 3-4 show one preliminary design concept illustrating the different habitat opportunities that exist with berm reconfiguration.

3.4 Land Use, Navigation, and Public Shoreline Access

An overview of the land use, navigation and public shoreline access considerations of the Whatcom Waterway site area is provided in Section 3.4.1 below. The particular considerations associated with each of the Site Units are described in Section 3.4.2.

3.4.1 Overview of Key Issues

Land use issues are discussed below and include both 1) regulations and plans that govern waterfront land uses, and 2) priority uses that have been identified by the local community for focusing waterfront redevelopment efforts.

Land Use Regulations and Planning

Multiple jurisdictions govern land uses on the shoreline of Bellingham Bay near the Whatcom Waterway Site – the City of Bellingham, Whatcom County, Port of Bellingham, and the Department of Natural Resources. Through comprehensive plans and shoreline master programs, these organizations determine what activities and facilities are approved within the shoreline of their jurisdiction.

- **Bellingham Shoreline Master Program**: The City of Bellingham's Shoreline Master Program (SMP) regulates and manages uses and activities within 200 feet of the shorelines within

the City. In doing so, the SMP attempts to create an appropriate balance between economic development, water quality, conservation, and public uses. The SMP manages this range of environments through the use of shoreline designations. These designations include broad goals for the area within each respective designation and actions the City will undertake to help achieve those goals. The existing SMP was adopted in 1989, and the City is presently updating it. The updated SMP will have new environmental designations, goal statements and action strategies for accomplishing those goals and a set of environmental expectations. The purpose of the updated SMP is twofold: (1) to promote the public's health, safety and welfare along the shorelines, and (2) to encourage redevelopment, increase public access, improve water quality and enhance habitat within the shoreline jurisdiction. 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.

- **Bellingham Comprehensive Plan**: Bellingham Bay Comprehensive Strategy was developed by a cooperative partnership of agencies, tribes, local government, and businesses known collectively as the Pilot Work Group. The Comprehensive Strategy was intended to provide long-term guidance to decision-makers relating to implementation of sediment cleanup, source control, and habitat restoration actions in Bellingham Bay. The Comprehensive Strategy was finalized as a Final Environmental Impact Statement in October 2000, and it preceded some of the significant land-use changes that have occurred since that time. Yet much of the work of the Pilot, especially that regarding potential habitat restoration actions, remains relevant. While the Port and City are not bound by regulation to implement these potential restoration actions, many of the habitat restoration actions that were identified in Appendix A of the 2000 FEIS as furthering Pilot goals have been either implemented, or have been carried forward as part of community land use planning efforts since 2000. These habitat goals are reflected in the Waterfront Futures Group Vision and Framework Plan, and in marine infrastructure planning for the Whatcom Waterway area. The Port, City and other Pilot Work Group members have sought ways to implement the Pilot goals in the context of changing community land use needs

- **Whatcom County Shoreline Master Program:** As with Bellingham's Shoreline Master Program (SMP), the overall goal of the Whatcom County Shoreline Master Program is to achieve rational, balanced, and responsible use of the County's

irreplaceable shorelines. To achieve that goal, the program strives to promote the public health, safety, and general welfare by providing long range, comprehensive policies and effective, reasonable regulations for development and use of Whatcom County shorelines. There are seven elements in the County's shoreline program – Economic Development, Public Access, Recreation, Circulation, Shoreline Use, Conservation, and Historic-Cultural. The purpose of the designations is to provide a systematic, rational, and equitable basis upon which to guide and regulate development within specific shoreline reaches.

- **Port Planning Activities:** The Port of Bellingham is responsible to the citizens of Whatcom County for providing shipping and marine cargo facilities, general boating, and maritime industry facilities, as well as assisting in maintaining and developing a healthy regional economy. The Port's main planning tools are area Master Plans, and the Port's Comprehensive Scheme of Harbor Improvements. Over the past 10 years, the Port has led and participated in extensive land use planning activities related to Bellingham's waterfront areas. Examples of these activities include the following:

  - Land use studies conducted during 1999 and 2000 for the Central Waterfront area.

  - Master Planning efforts for the Bellingham Shipping terminal and vicinity, also completed in 1999 and 2000.

  - Alternatives evaluations for siting of new marina facilities to meet regional moorage demand.

  - Outreach activities conducted by the Port of Bellingham as part of the GP due diligence process during 2004, including soliciting of extensive stakeholder and public input on potential waterfront cleanup actions, land use alternatives and navigation priorities for the Whatcom Waterway.

  - Amendment to the Port Comprehensive Scheme of Harbor Improvements identifying the need for future aquatic use of the ASB area for marina development.

  - Ongoing Port and City leadership land use planning efforts for the redevelopment of the New Whatcom area, including pending development of a final area Master Plan for the "New Whatcom" area of Bellingham's Waterfront. The Master Planning process will include SEPA environmental review of the Master Plan elements.

- **Port Management Agreement (Port and DNR)**: The Port of Bellingham and DNR entered into a cooperative agreement in September 1997 to allow the Port to manage certain state-owned aquatic lands through a Port Management Agreement (PMA) (RCW 79.90.475). The Port is responsible for managing the aquatic lands covered under the PMA consistent with federal and state regulations and laws, and DNR's aquatic land management goals of fostering water-dependent uses, ensuring environmental protection, encouraging public use and access, promoting production on a continuing basis of renewable resources, and generating income from the use of aquatic lands consistent with the goals. Parcel 3 of the current PMA includes portions of the Bellingham Shipping Terminal, and adjacent aquatic lands near the barge dock area.

- **State-Owned Aquatic Lands (DNR):** State-owned aquatic lands in Bellingham Bay include bedlands, tidelands, filled tidelands, designated Harbor Areas and state waterways. State regulations guide the use and management of these lands. Bedlands are those lands lying waterward of the extreme low tide mark, or the outer harbor line. Harbor areas are the areas located between the inner and outer harbor lines. The Bellingham Harbor Areas were originally established by the state of Washington as two separate harbor areas – New Whatcom and Fairhaven – on September 1, 1891. Currently, state-owned aquatic lands include the three Bellingham waterways (Whatcom Waterway, I&J Street Waterway and Squalicum Waterway). The Port of Bellingham and DNR have signed a Memorandum of Understanding (Appendix C) committing to update harbor area and waterway designations as part of the ongoing land use planning process.

Waterfront Land Use Priorities

Waterfront land use priorities in the Whatcom Waterway site area have historically been characterized by a focus on water-dependent industrial uses like those formerly located at the Georgia Pacific mill site and the Bellingham Shipping Terminal. However, the Bellingham waterfront has undergone a series of unprecedented land use changes. The community's land use priorities for waterfront areas, particularly those in the Inner Whatcom Waterway, are best reflected in the Vision and Framework Plan of the Waterfront Futures Group (Appendix B). Key elements of that plan for the areas of the Whatcom Water site (described in the Vision and Framework Plan as the City Center area) include the following:

- Develop a mixed-use waterfront neighborhood including new job opportunities and urban housing.

- Complete the cleanup and opening of the ASB to accommodate either a new marina or new marine habitat combined with stormwater treatment or some combination of those uses.
- Maintain deepwater moorage in the Whatcom Waterway, consistent with other uses and preservation of critical habitat areas.
- Reinforce the Inherent Qualities of Each Place on the Waterfront including integration of water-dependent uses with new commercial, institutional, educational, and residential uses and public spaces.
- Restore the Health of Land and Water including enhancement of natural systems, tailoring of cleanup strategies and remediation to planned uses, and restoration and enhancement of beaches wherever possible.
- Improve Waterfront Access including connections between uplands and waterfront areas and links to regional trail systems, while respecting natural habitat.
- Encourage and promote fisheries and ocean-related research industrial and facilities.
- Promote a health and Dynamic Waterfront Economy including mixed-use redevelopment of the former Georgia Pacific Mill site and the uplands area adjacent to the Cornwall Avenue Landfill site.
- Provide transient moorage in the Inner Whatcom Waterway, while avoiding impacts to critical habitat in this area
- Provide hand-carry boat landing opportunities within the project area, including at the Cornwall Avenue Landfill and near the ASB.
- Enhance the system of connected public open spaces between the Whatcom Waterway and the south end of the Cornwall Avenue Landfill, including open spaces along the waterfront and completion of the over-water walkway between the Cornwall Avenue Landfill and Boulevard Park.

These land use priorities require a more complex, balanced approach than the historical “industrial only” approach to the Bellingham Waterfront.

Navigation Priorities

The Port of Bellingham is and has historically been the local sponsor responsible for working with the U.S. Army Corps of Engineers on the development and maintenance of federal navigation channels. Currently, the Whatcom, I&J, and Squalicum waterways are federally-authorized channels for navigation and commerce. The Whatcom Waterway was initially authorized for dredging by the River and Harbors Act of June 15, 1910.

Public Law 86-645, Section 7 (May 5, 1965) first authorized the I&J Waterway. The dimensions of both channels have been modified through time.

The Port of Bellingham operates a marine shipping facility at the Bellingham Shipping Terminal (BST). The main products historically handled at the terminal included wood pulp and aluminum ingots, automobiles, powdered milk, logs and other cargo. A Burlington Northern-Santa Fe main line runs adjacent to the BST. A rail spur runs from the terminal to the main line; a rail barge transfer span is on site. The Burlington Northern-Santa Fe main line connects with Canada's Canadian National, Canadian Pacific, and BC Rail lines.

Deep-draft vessels approaching Bellingham Bay from the north use the channel between Lummi and Sinclair Islands. Vessels approaching from the south generally use the Bellingham Channel that leads eastward from Rosario Straight. Shallow-draft vessels proceeding to Bellingham from the south frequently use Swinomish Channel and Padilla Bay, and from the north, Hale Passage. Two federally designated anchorage areas have been established in the Bay, outside of the Whatcom Waterway site area. The bottom of these areas consists of a thin accumulation of mud over hardpan forming rather poor holding ground in heavy weather. General Anchorage has a circular radius of 2,000 yards, and Explosives Anchorage has a circular radius of 1,000 yards (Navigation Data Center 1998).

The Port of Bellingham conducted an assessment of the three waterways in 1998 (BST Associates 1998). This assessment examined the changes to the shipping fleet over the past twenty to thirty years. The study documented changes in cargo shipping practices, including a trend of increasing draft for cargo vessels. The drafts common for vessels calling on Ports in the Pacific Northwest was between 37 and more than 45 feet. The depths and widths of the Whatcom Waterway are not sufficient, particularly the narrow constraints of the Inner Whatcom Waterway, to accommodate cargo shipping given the demands of the shipping industry. Specific navigation priorities for the Outer Whatcom Waterway and Inner Whatcom Waterway areas are described in Section 3.4.2 below.

The development of a combined marina, aquatic habitat and public shoreline access uses in the ASB area is an element of the Port's planning for the Whatcom Waterway area. These uses are consistent with the Vision and Framework Plan of the Waterfront Futures Group (Appendix B) and are carried forward as part of the New Whatcom Master Plan process (Appendix E). The concept for the ASB area is described below in section 3.4.2.

Recreation and Public Shoreline Access

Enhancing waterfront recreation and shoreline access opportunities has been a key element of the Waterfront Futures Group work and of supplemental land

use planning activities. Significant information on these opportunities is described below:

- **Bellingham Parks**: A variety of parks are found in the area, including 23 neighborhood parks, 8 community parks, 18 special use areas and 24 natural open space areas owned by the State, County, Port, Bellingham School District and City (Bellingham 1995). Some of the larger parks along the shoreline include Little Squalicum Park, Maritime Heritage Center Park, Boulevard Park, and the Port of Bellingham Marine Park. A few non-motorized trails exist along the shoreline, however, the City Parks and Recreation Department's Open Space, Parks, and Recreation Plan indicates the number of trail miles available to the local population is a slightly below the recommended standard. Accordingly, the Parks and Recreation Department is interested in adding to their existing trail system. Potential trail corridors have been identified by the City along the entire shoreline of the inner bay. New parks, open space and trail areas are being incorporated into the planning for the New Whatcom area.

- **Public Shoreline Access:** Enhancing public shoreline access in waterfront areas is a key priority of the New Whatcom planning effort. This is particularly true for the Inner Whatcom Waterway where public shoreline access has been historically restricted by navigation and industrial use activities. Enhancement of public shoreline access was also a key priority in the preliminary design concepts developed by the Port for a new marina for the ASB area.

- **Shellfish Harvesting:** Within Bellingham Bay there are two tribal groups with fishing rights: the Lummi Nation and Nooksack Tribe. They use and enjoy a variety of fisheries resources from Bellingham Bay and surrounding streams and rivers for subsistence, ceremonial, and commercial purposes. These resources include a wide variety of salmon, other fish, crab, and clams, which have varying harvest times. Major tribal shellfish areas are found in and around Portage Bay and Portage Island, and along the Lummi Peninsula. Primary species harvested by the Lummi Nation include Pacific oysters, native littleneck clams, and Manila clams. Clam harvests, primarily from the Lummi Nation, have increased considerably over the past 25 years. Crab landings have remained stable over the past 25 years, at an annual baywide harvest of approximately 233,000 pounds per year (tribal and commercial landings). The only commercial shellfish harvesting area in Bellingham Bay is the Portage Island area.

- **Salmon Fisheries:** Tribal and non-tribal commercial salmon fishing occurs throughout Bellingham Bay. Sport fishing is

generally restricted to an area south of Post Point to Chuckanut Bay and off Governors Point. The most lucrative fisheries in Bellingham Bay are the chinook, coho, and chum salmon. Although there are no targeted fisheries for pink and sockeye salmon, these species are incidentally caught in the Bay. Sockeye salmon are also caught incidentally in the Nooksack River fisheries. Over the past 15 years, salmon have represented the largest portion of total catch from Bellingham Bay. Many of the habitat restoration priorities for Bellingham Bay have focused on the preservation and enhancement of critical habitats for salmon, consistent with the social and cultural importance of the salmon fisheries and the troubled condition of many of the salmon stocks.

- **Groundfish Fisheries:** Several groundfish species occur in Bellingham Bay. These species are used by the Tribes and are harvested by other users of the Bay, and are considered to be economically and ecologically important. These species include but are not limited to Pacific cod, Rockfish, Lingcod, Rock Sole, English sole, and Starry flounder. Except for inner Bellingham Bay, the entire bottom of the Bay is considered part of the recreational fishery for marine fisheries resources (CH2M Hill 1984). Commercial fishing for these species occurs primarily in the deeper water of the central part of the Bay. Prior to about 1984, there was a relatively large herring fishery. However, declines in the length and age of fish were observed by WDFW in 1980. These data, along with uncertainties regarding the origin of local stock, prompted closure of the fishery in 1984.

3.4.2 Land Use, Navigation, and Shoreline Issues by Site Area

Land use, navigation and shoreline public access issues are summarized below by geographic area, using the Site Unit designations shown in Figure 1-1.

Outer Whatcom Waterway (Unit 1)

Navigation uses in the Outer Whatcom Waterway offshore of the Bellingham Shipping Terminal are largely transitory, with vessels coming into and traveling out of the Waterway. Vessels are generally not anchored in these areas, and there are no permanent dock structures or mooring dolphins.

A federal navigation channel is located in the Outer Whatcom Waterway. 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 Whatcom Waterway, the project

depth is defined as 30 feet below mean lower low water (MLLW) and the width varies from 263 feet near the Shipping Terminal to 363 feet in offshore areas.

Under the federal channel maintenance program, the local sponsor can request the Corps to maintain the project depths by periodic maintenance dredging. Subject to federal funds availability, the Corps conducts such dredging under its Operations and Maintenance program. The federal participation is subject to a navigation needs analysis that must show that the dredging is in the national economic interest. This needs analysis considers industrial and commercial navigation uses (e.g., cargo operations, commercial fishing, institutional users) but does not consider recreational, public access, or habitat uses.

If maintenance dredging is performed by the Corps in a federal channel, the local sponsor must provide for sediment disposal, and must share certain other costs. The sponsor is responsible for coordinating the costs of development and maintenance of "berth" areas and shoreline infrastructure with local property owners and other interests. The berth areas are the areas located along-side the federal channel that are used for mooring of vessels. In order for the water depth of a federal channel to be usable, the depths in berth areas must be consistent with those in the channel. Otherwise a vessel traveling in the channel would not be able to moor along-side a wharf.

Figure 3-5 illustrates the essential characteristics of the federal channel and berth areas applicable to Unit 1C of the Outer Whatcom Waterway. The current water depths in the Outer Whatcom Waterway are 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. The pierhead line runs along the face of the docks at the Bellingham Shipping Terminal.

As shown in Figure 3-5, the maintenance of water depths in the berth areas of the Shipping Terminal 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 have been restricted and are designated in the Shipping Terminal area 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. Multiple future uses have been considered as part of the evaluation of land use changes in the New Whatcom planning area (Appendix E). The Shipping Terminal areas are currently anticipated to continue in water dependent uses. Potential future uses include operation of appropriate institutional users (e.g., Coast Guard or NOAA), limited cargo shipping, or other deep draft navigation uses.

The Port recently completed a review of navigation and infrastructure requirements associated with the Whatcom Waterway. As discussed in Port Resolution 1230 (Appendix F) it is anticipated that the federal channel will be maintained in the Outer Whatcom Waterway areas consistent with its current dimensions. 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.

Shallow-water nearshore habitats in the Outer Whatcom Waterway area are limited to under-dock areas along the Bellingham Shipping Terminal. Potential habitat restoration enhancement opportunities in these areas are limited by the infrastructure needs associated with operation of a deep draft moorage area in support the operations of the federal navigation channel. The Bellingham Bay Comprehensive Strategy reflects this and has no specific restoration recommendations for this area.

Inner Whatcom Waterway (Units 2 and 3)

Like the Outer Whatcom Waterway, the Inner Whatcom Waterway has historically been used for industrial water-dependent uses. These have included operation of lumber mills, the GP pulp and paper mill, gravel shipping, fish processing and bulk petroleum terminal operations. The federal navigation channel was initially established in the early 1900s with project depths of 18 feet below MLLW (Inner Whatcom Waterway) and 26 feet (Outer Whatcom Waterway). This deeper portion of the channel was expanded between 1958 and 1961. Most of the Central Waterfront area was developed when the project depth was 18 feet below MLLW.

The federal project boundaries prohibit Corps dredging within 50 feet of the pierhead lines and structures. This limits the effective water depth in this area due to the lack of supporting berth area depths and requisite shoreline infrastructure. The width of the Waterway is constrained by developed fill areas and upland features adjacent to the Waterway.

Effective water depths in the Inner Whatcom Waterway are currently limited by the restrictions of the federal navigation channel to the depths at the pierhead line. These depths range from less than zero in some shoaled areas to as much as 22 feet in outer portions of the GP dock. In areas offshore of the Log Pond, the water depths are usable only for transit (i.e., vessels entering or

leaving the Inner Whatcom Waterway), because no shoreline land areas or over-water infrastructure exists in these areas.

The land use restrictions associated with the historic federal channel boundaries are in conflict with both current and planned uses of the Inner Whatcom Waterway as a result the Port has initiated consultations with the Department of Natural Resources, the Corps, and other parties to update channel designations. The historically industrial, water-dependent uses of shoreline properties are undergoing a transition to mixed-use redevelopment. The area zoning has been updated to mixed-use, and the area is undergoing a Master Plan development effort (Appendix E). The Master Planning effort is grounded in the principles of the Waterfront Futures Group (Appendix B), a community-based planning process that identified land use priorities for the waterfront areas.

During 2005 the Port and DNR signed a Memorandum of Understanding (Appendix C) which included a proposal to update harbor area and Whatcom Waterway channel dimensions. The objective is to provide for a range of uses within the Inner Whatcom Waterway consistent with local land and navigation uses. The Inner Whatcom Waterway would be managed by local interests as a Multi-Purpose Waterway, providing a wider range of uses than those supported by the current federal channel designations.

In addition, in May 2006 the Port Commission, after public comment, issued Resolution 1230 (Appendix F) which requests that the U.S. Congress de-authorize the Inner Whatcom Waterway from head of the federal channel at the Roeder Avenue Bridge to Bellingham Shipping Terminal, in order to allow implementation of a Multi-Purpose Waterway, and to focus federal funding participation on the deep draft terminal areas of the Outer Whatcom Waterway. Language proposing the modifications to the federal channel has been drafted and included in congressional legislation that is expected to be finalized during 2006.

As shown in Figure 3-6 and Figure 3-7, the Locally-Managed Multi-Purpose Channel concept provides for shoreline public access. Navigation depths would be appropriate to the channel widths and shoreline infrastructure, and would range between 18 to 22 feet below MLLW. Portions of the waterway at the head of the channel (Unit 3-A) would likely be preserved as premium shallow-water habitat. Sideslopes in berth areas along the sides of the waterway would be enhanced to support navigation uses in the waterway, and also to develop additional shallow-water habitat areas, particularly in intertidal and shallow subtidal elevations. Navigation infrastructure would likely include floats and access gangways, rather than industrial wharves and bulkheads which decrease achievable habitat benefits.

Unit 2-B has been identified during Port marina planning as the preferred location for an access channel between the ASB and the Whatcom Waterway.

The use of Unit 2-B minimizes the potential disruption of nearshore habitat. Alternate access channel locations have been evaluated, but these locations result in greater disruption of existing nearshore habitat, and greater limitations on potential future habitat enhancements. The use of the Unit 2-B location for the access channel is partly contingent on navigation planning for the Inner Whatcom Waterway. If deep draft navigation uses are conducted within the Inner Waterway, this may result in navigation conflicts that would force use of an alternate channel location as shown in some of the older marina design concepts (refer to Figure 3-7 and Figure 1-3).

The RI/FS study and this Supplemental EIS analyze a range of uses and associated dredging patterns for the Inner Whatcom Waterway areas, including both heavy industrial uses dominated by the federal channel, and the current mixed-use requirements as articulated in the principles of the Waterfront Futures Group and local planning activities. Obtaining consistency between Waterway cleanup activities in the Inner Whatcom Waterway and area land use and navigation priorities is specifically evaluated as part of remedial alternatives analysis in the RI/FS and in this Supplemental EIS.

Log Pond (Unit 4)

As its name implies, the Log Pond was historically used as a log pond for lumber and pulp mill operations. These uses have been discontinued since the completion of the Log Pond Interim Remedial Action in 2000/2001.

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 redevelopment of the former GP Mill site. 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.

Areas Offshore of ASB (Unit 5)

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. 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 priority uses within Unit 5 are those associated with habitat enhancement opportunities. The potential location for development of a new premium nearshore habitat bench is shown in Figure 1-2.

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.

Area Adjacent to BST (Unit 6)

Navigation uses in the Barge Dock area have historically included log rafting, barge traffic, and tug boat mooring. Some propeller wash effects may be significant in this area, depending assuming future barge and tug uses.

Two docks are located within this area including the barge dock and the former GP Chemical dock. The northern side of the Barge Dock area is bounded by the back side of the Bellingham Shipping Terminal wharf structure.

Some dredging activities have historically been performed in the Barge Dock area, including dredging for establishment of cargo terminal berth areas, as well as dredging to obtain fill material for use in development of a portion 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 Whatcom Waterway, the Bellingham Shipping Terminal is anticipated remain under industrial water-dependent use, including potential reuse by institutional users and cargo operations.

Starr Rock (Unit 7)

Historic navigation uses in the Starr Rock area were limited to Log rafting. These uses were discontinued in the 1970s with the development of Boulevard Park nearby. Future navigation uses in the Starr Rock area 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.

ASB (Unit 8)

The ASB facility was constructed by Georgia Pacific 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 Bellingham Bay Comprehensive Strategy included a recommendation for removal of the ASB in order to establish intertidal and shallow sub-tidal habitat. However, no funding mechanisms have been identified to implement this type of project, and alternative uses of the ASB have formed the basis of recent land use planning efforts.

During 2004, the ASB was 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. Preliminary design concepts for a marina incorporating public access and habitat enhancements were developed by the Port after consultation with resource agencies and project stakeholders. One of these design concepts is presented in the current Feasibility Study and in the Draft Supplemental EIS. The design concept incorporates development of intertidal and shallow sub-tidal habitat, consistent with the general intent of the Bellingham Bay Comprehensive Strategy recommendation. If completed according to that design concept, the ASB marina would reconnect the 28-acre ASB area to Bellingham Bay, and restore nearly 4,500 linear feet of salmonid migration corridors. The acreage of premium nearshore aquatic habitat developed as part of marina reuse would vary depending on final design and berm configurations, with potential habitat bench areas located on the inside and the outside of the berm.

Figures 3-4 and 3-7 and the illustrations contained in Appendix E illustrate 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. Figures 1-2 and 3-7 and the illustrations in Appendix E show the marina design concepts in plan view. 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 Port updated its Comprehensive Scheme of Harbor Improvements in 2004 to reflect the future planned use of the ASB for marina development. The Port further developed a funding plan to conduct the cleanup of the ASB and the development of the marina project. The majority of the ASB was acquired by the Port as part of the 2005 GP property transaction. The City has supported the marina development concept as documented in the July 2006 Interlocal Agreement between the Port and the City (Appendix E). Development of a marina in the ASB, and the final design of any such marina, is subject to additional design and permitting evaluations.

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.

3.5 Air and Noise

An overview of air quality and noise issues and how they are regulated within the Whatcom Waterway site and vicinity is provided in Section 3.5.1 below. Specific considerations applicable to the different site areas are described in Section 3.5.2.

3.5.1 Overview of Key Issues

Air Quality

Air quality in the Bellingham Bay study area is regulated by EPA, Ecology and the Northwest Air Pollution Authority (NWAPA). Each agency has its own role in regulating air pollution. NWAPA has local authority for regulation and permitting of stationary sources and construction emissions. Ecology regulates mobile sources. The EPA sets national standards and has oversight authority over NWAPA and Ecology.

Under the 1970 Clean Air Act, EPA established air quality standards for six pollutants. These standards, known as National Ambient Air Quality Standards (NAAQS) specify maximum allowable concentrations over varying time periods. For regional air quality to remain in attainment with these standards, they cannot be exceeded more than a given number of times per year over a given time period. The major airborne pollutants of concern controlled by the NAAQS include the following:

- Particulate Matter (PM_{10})
- Particulate Matter ($PM_{2.5}$)
- Lead (Pb)
- Sulfur dioxide (SO_2)
- Carbon monoxide (CO)
- Ozone (O_3)
- Nitrogen Dioxide (NO_2).

Under the Clean Air Act, EPA develops two standards for each pollutant of concern – a primary standard for protection of public health, and a secondary standard for protection of public welfare. Public welfare includes effects on soils, water, crops, vegetation, buildings, property, animals, wildlife, weather, visibility, transportation and other economic values, as well as personal comfort and well-being.

Existing Air Conditions

Primary source of pollutants in the Bellingham Bay area are automobile traffic, marine activities and industrial activities. Fueling and operation of

gasoline-powered automobiles and boats generate CO. However, periodic monitoring of CO levels indicates that levels are low and this pollutant is not present a concern in the study area (Keel 1999).

The GP pulp and paper mill was the primary industrial source of air pollutants in the study area. Emissions from the mill have decreased substantially since closure of the pulp and chemical operations. Other nearby industrial sources of air pollutants include the Intalco Aluminum plant, the Conoco Phillips oil refinery and the BP oil refinery. Sulfur dioxide emissions are monitored at all of these industrial facilities. Within NWAPA's jurisdiction, most of the industrial emissions of SO_2 come from petroleum refining and aluminum production operations. Ambient SO_2 levels in the Bellingham Bay area have been within the allowable standards set forth by EPA.

Ground-level ozone is a key ingredient of urban smog, formed by the reaction of gases (nitrous oxides and hydrocarbons) in the presence of heat and sunlight. These gases are emitted from combustion sources such as motor vehicles and power plants. Ozone concentrations are measured on a regional basis and are monitored by NWAPA. In general, the prevailing winds common to Bellingham Bay help to keep ozone concentrations within EPA standards.

The three pollutants most likely to be of concern in Bellingham Bay are sulfur dioxide (SO_2), particulate matter and ozone (Keel, 1999). NWAPA operates several air quality monitoring stations within its jurisdiction. Additional stations at industrial facilities monitor concentrations of SO_2, PM_{10} and ozone. Monitoring results show that air quality in Bellingham Bay is good and is currently in attainment with all air quality pollutant criteria.

Noise

The unit used to measure noise is the decibel (dB). A weighted decibel scale (dBA) was developed to approximate the sensitivity of the human ear to sounds of different frequencies. The dBA scale is used in most noise ordinances and standards. Decibles are measured logarithmically. An increase of 10 decibels means that the sound is 10 times as loud. Thus, 80 dB is 10 times louder than 70 dB, and 90dB is 100 times louder than 70 dB. For reference, light traffic generates a decibel rating of 50dB, while truck traffic rates around 90dB.

Washington State noise standards (WAC 173-60-040) identify the maximum permissible noise levels for three classes of land use:

- **Class A:** Residential, multi-family, recreational and entertainment (parks, camping facilities, resorts), and community service facilities (hospitals, correctional facilities).

- **Class B**: Commercial and retail uses, banks, office buildings, recreational and entertainment (theaters, stadiums, fairgrounds), community service facilities (schools, churches, government and cultural facilities).

- **Class C:** Industrial, agricultural, storage and distribution facilities.

The zoning or land use of both the source of noise and the receiving property are considered in the state noise standards. Sounds originating from temporary construction sites as a result of construction activity are exempt from the state rules, except for the provisions of Class A properties between 10 p.m. and 7 a.m.

The City of Bellingham municipal code includes a section on Public Disturbance Noise (10.24.120). This section provides general description of sounds that are considered a public disturbance, without establishing minimum standards or specifying decibel levels. For example, construction and industrial noise in residential areas, between the hours of 10 p.m. and 7 a.m. is considered unlawful. This is consistent with the Washington State noise limitations. In the absence of a specific local noise ordinance in Bellingham, the Washington State limitations apply within City limits.

Existing Noise Conditions

Land uses around Bellingham Bay are a mixture of open space, residential communities, and marine/industrial operations. Noise in the study area is caused by airplanes, vehicular traffic, ferries, trains and commercial/industrial activities. Sensitive noise receptors (Class A land uses) include residential communities along the north side of the Bay and in the South Hill and Fairhaven neighborhoods on the south side of the bay. Several parks along the bay are also considered sensitive receptors, including Maritime Heritage Center Park and Boulevard Park. The planned development of additional parks and open space areas will increase the number of sensitive noise receptors along the Bay.

3.5.2 Air and Noise Issues by Site Area

Air quality and noise impacts will be associated with cleanup construction activities. However, these impacts will be mitigated through the use of appropriate equipment and work hours, to be specified during project design and permitting. Project air quality and noise issues vary less by project area than do other environmental factors evaluated in this EIS. However, potential variation of noise considerations by project area includes the following:

- **Outer Whatcom Waterway (Unit 1):** No sensitive noise receptors are currently located adjacent to Unit 1.

- **Inner Whatcom Waterway (Units 2 and 3):** Sensitive noise receptors located near the Inner Whatcom Waterway currently include Maritime Heritage Park. As the redevelopment of the New Whatcom area proceeds, additional Class A or Class B areas may be established. This could impact project noise control requirements.

- **Log Pond (Unit 4):** No sensitive noise receptors are currently located adjacent to Unit 4. As the redevelopment of the New Whatcom area proceeds, additional Class A or Class B areas may be established, including mixed use redevelopment of portions of the former GP mill site. This could impact project noise control requirements.

- **Areas Offshore of ASB (Unit 5):** No sensitive noise receptors are currently located adjacent to Unit 5. As the redevelopment of the New Whatcom area is proceeds, additional Class A or Class B areas may be established, including potentially new park areas along the perimeter of the ASB. This could impact project noise control requirements.

- **Areas Adjacent to BST (Unit 6):** No sensitive noise receptors are currently located adjacent to Unit 6. As the redevelopment of the New Whatcom area is proceeds, additional Class A or Class B areas may be established, including potentially new mixed-use development and/or park areas along the perimeter of the RG Haley and Cornwall Avenue Landfill sites. This could impact project noise control requirements.

- **Starr Rock (Unit 7):** Boulevard Park is considered a sensitive noise receptor and is located near Unit 7.

- **ASB (Unit 8):** No sensitive noise receptors are currently located adjacent to Unit 8.

3.6 Cultural Resources

Cultural and historical resource review will be addressed during subsequent design and permitting reviews for the project. However, an overview of previous studies and their findings is provided in Section 3.6.1 below. The findings relevant to each of the Site Units are described in Section 3.6.2.

3.6.1 Overview of Key Issues

The project area is part of an active marine shoreline that has undergone many changes since the glaciers retreated from the area approximately 8,000 years ago. Sea level fluctuations associated with glacial retreat and sea level rise submerged parts of the Bellingham Bay shoreline that may have been exposed and habitable at approximately 5,000 years ago. The level did not stabilize to

the current level until approximately 2,250 years ago (Williams and Roberts 1989). Sand spits and small embayments or coves such as those found on Portage Island and in the Fairhaven area may contain submerged archaeological sites that were inundated over time by the rising sea level. The identification of shell midden sites along the shore of Bellingham Bay from Portage Island to Chuckanut Bay reveal the likelihood for hunter-fisher-gatherer deposits.

Previous Cultural Resource Studies

During the 2000 FEIS development, a review of existing literature was conducted to provide an overview of cultural resources in the project area. This review was conducted to determine the probability for hunter-fisher-gatherer and historic archaeological resources, and historic structures within or adjacent to the project area that are listed in the National Register of Historic Places (NRHP), or are eligible for listing in the NRHP. The review included consultation with state and county agencies responsible for maintaining inventories of archaeological sites, including shipwrecks and historic structures, to locate recorded sites and structures within or adjacent to the project area, and to determine their evaluation status. Background ethnographic and historic information was acquired through review of ethnographies, local histories, previous cultural resource studies, historic maps, and geologic and soil surveys.

Cultural resource investigations in and near the project area vicinity have included overviews, field surveys, and testing projects (Bellingham Bay Demonstration Pilot Project, Whatcom County Cultural Resources Overview Report, LAAS, 1999). An additional review of archaeological and cultural resources was completed during remediation of the Holly Street Landfill site in 2004, including on-site archaeological monitoring during all excavation work at that site.

Twenty-four hunter-fisher-gatherer archaeological sites along the shore of Bellingham Bay have been identified during previous cultural resource studies and archaeological investigations in the project area vicinity.

Tribal Consultation

The Whatcom Waterway site is within the territory of the Nooksack and Lummi tribes. Territorial divisions were described by Suttles (1951), who placed Lummi territory within the San Juan Islands and along the mainland shoreline from Point Whitehorn to Chuckanut Bay. Nooksack territory extended inland along the Nooksack River basin as far south as Lake Whatcom (Suttles 1951). European explorers arriving in the area in the late eighteenth century, however, encountered both tribes in the project area (Salo 1993).

The Lummi Nation and Nooksack Tribe were contacted as part of the development of the 2000 FEIS and asked for information pertinent to the

project area. Harlan James, a member of the Lummi Nation, stated that Bellingham Bay was good fish habitat and that "fish are culture and culture is fish." He emphasized that the entire west side of Bellingham Bay and the mouth of the river are culturally important to the tribe. Other parts of Bellingham Bay were taken from the Lummi Nation through their exclusion from the reservation. Mr. James specifically noted that a Lummi canoe landing area in the Old Town district near the mouth of Whatcom Creek has been filled but that it is culturally important to the Lummi people. He also stated that they fished the entire Bay and that Lummi elders remember octopi, sole, and other fish in Bellingham Bay that are no longer available. These marine resources were different than those outside Bellingham Bay. Mr. James concluded that the entire Bay was of cultural significance to the Lummi Nation.

Hunter-Fisher-Gatherer Archaeological Sites

Bellingham Bay provided a wide variety of marine and terrestrial resources that were collected by hunter-fisher-gatherers of the area and processed at seasonal and long-term camps along the shore of the Bay. Hunter-fisher-gatherer deposits within these areas would be associated with fishing, seasonal and long-term camp occupations, shellfish and salmon processing, and terrestrial resource collecting and processing. Out of the 24 hunter-fisher-gatherer archaeological sites recorded in the project area, 17 are shell middens, six are lithic scatters, and one is a possible petroglyph. All the sites are on sand spits, along beach terraces and embayments, or on bluffs or ridges overlooking Bellingham Bay. Shell midden and lithic sites recorded in the project area vary in size and integrity. Cultural deposits identified at shell midden sites consist of whole and fragmented shell, fire modified rock, bone and stone tools, and faunal remains. Cobble choppers, cores, fire modified rock, scrapers and utilized flakes were identified at the lithic sites.

Historic development in the project area has most likely adversely affected hunter-fisher-gatherer shell midden deposits and lithic sites. A possibility does exist, however, that submerged sites or intact subsurface deposits could be present under fill deposits at the mouth of Whatcom Creek. Other areas of the Bay also have a lower probability of occurrence, limited to potential submerged prehistoric sites at the paleoshorelines of the major drainages covered by sea level rise in the last 8,000 years. Intact deposits are not expected in areas subject to previous dredging and fill activity.

Of the 24 hunter-fisher-gatherer archaeological sites identified within the project area, only one has been evaluated for significance (45WH111). The site is on the southern tip of the Lummi Peninsula at Portage Point and was tested by Grabert and Griffin (1983) as part of mitigation measures related to the construction of 31 miles of sewer pipeline through the Lummi Reservation. The site contained archaeological deposits that could provide information important to regional prehistory. Grabert (1983) recommended

that the site be nominated for inclusion in the National Register of Historic Places. This area would not be affected by any of the project alternatives.

Historic Archaeological Sites

Historic archaeological resources may be present in the project area primarily within the area surrounding former Citizen's Dock. Archaeological deposits associated with early industry in the Bellingham area such as the Roeder-Peabody Mill site, located at the mouth of Whatcom Creek may be present under fill deposits. Other mid-19th century and later structures of interest within the project area include the Sehome Dock (the Bellingham Bay Coal Company's Wharf); Colony Wharf (Fairhaven Land Company's Wharf); Geltrec Improvement Company's Wharf and Saw Mill. Because Bellingham went through a period of "wharfing out" just before the Constitutional convention in the late 1880's, there may be other structures built along the shoreline in addition to those listed above.

A low probability for significant historic archaeological resources exists within the project area since much of the project area is fill deposits from the 1900s. These fill deposits were placed over tidal flats that did not contain structures during historic times. Isolated artifacts would probably not retain integrity of location and cannot answer research questions pertaining to the history of the area.

One historic site, Fort Bellingham (45WH185H), was recorded in the vicinity of the project area. The site is on a high bluff on the north shore of Bellingham Bay. The fort was constructed in 1856 in response to the Indian Wars of 1855-1856. Fort Bellingham was a palisaded fort containing a store, mess hall, headquarters, barracks, and two blockhouses. A large wharf was also constructed at the foot of the bluff directly below the fort and extended into the Bay (Schneider 1969). The fort was in operation until 1861 and then was abandoned. The land was returned to the original property owners in 1868 (Schneider 1969). Nothing remains of the site today and only a few artifacts related to the occupation are present in the collections at Whatcom Museum of History and Art (Schneider 1969). The site was nominated for inclusion in the NRHP in 1969. Fort Bellingham was not accepted for listing in the NRHP, but was placed in the Washington State Register (now the Washington Heritage Register) in 1971. This area will not be affected by any of the proposed project alternatives.

Historic Structures

A review of the National Register of Historic Places Register, the Washington Heritage Register, and the Whatcom County Historic Property Register indicated that no historic structures that would be affected by the proposed project are recorded within the project area. However, the citizens Dock area is potentially relevant to the project alternatives.

- **Citizen's Dock.** Citizen's Dock was inventoried and nominated to the NRHP by Michael Sullivan in 1980 (Sullivan 1980a, b). The dock was constructed as a passenger terminal and freight warehouse in 1913 on pilings above the tidewaters at the mouth of Whatcom Creek (Sullivan 1980b). The dock was modeled after the Coleman Dock in Seattle and provided Bellingham with a link to Puget Sound's Mosquito Fleet (Sullivan 1980b). A large wooden building was constructed on top of the dock to serve as the passenger waiting area, warehouse, baggage space, ticket sales area, and offices (Sullivan 1980b). The dock was used for public transportation and as a freight warehouse until 1938. After 1938, passenger steamship service was terminated and the dock was used solely for freight service until 1971 (Sullivan 1980b). Currently the dock is used by tugs and barges. Citizen's Dock was sold to the City of Bellingham in 1980 and may be incorporated into a planned Maritime Heritage Waterfront Park (Sullivan 1980b). Citizen's Dock was placed in the NRHP in 1981. However, due to its unsafe condition, the City of Bellingham removed the dock, cutting the pilings just above the existing mud-line.

3.6.2 Archaeological or Historical Resource Issues by Site Area

Most of the work activities potentially associated with cleanup of the Whatcom Waterway site would occur in previously-dredged and/or recently deposited sediments where the potential for encountering significant, in-tact archaeological or historical resources is considered to be low. Considerations by site area are described below.

Outer Whatcom Waterway (Unit 1)

The Outer Whatcom Waterway area consists of historically dredged sediments that are not expected to contain archaeological resources.

Inner Whatcom Waterway (Units 2 and 3)

The majority of the Inner Whatcom Waterway area consists of historically dredged sediments that are not expected to contain archaeological resources. However, in the very head of the Whatcom Waterway (Unit 3-A) near the Roeder Avenue Bridge there is some potential for archaeological and/or historical resources to be contained within project sediments. Additional evaluation by an archaeological consultant could be warranted in these areas. Citizens Dock was a historic structure located in this area, but it was removed by the City for safety concerns.

Log Pond (Unit 4)

The Log Pond area consists of previously dredged, filled and capped areas. The probability for encountering significant archaeological or historical resources is considered remote.

Areas Offshore of ASB (Unit 5)

The ASB shoulder is located offshore of any historic structures or shorelines. The probability for encountering significant archaeological or historical resources in this area is considered remote.

Area Adjacent to BST (Unit 6)

Portions of the Barge Dock area have historically been dredged, and the BST area was filled and armored for navigation improvements. The probability for encountering significant archaeological or historical resources in this area is considered remote.

Starr Rock (Unit 7)

The Starr Rock Area consists of relatively deep-water offshore areas. The area was used during the 1960s as a dredge material disposal site. The probability for encountering significant archaeological or historical resources is considered remote in this area.

ASB (Unit 8)

The ASB Interior was previously dredged by Georgia Pacific at the time the ASB was created. The probability for encountering significant archaeological or historical resources is considered remote.

LEGEND

- PREVIOUSLY RESTORED AREA (LOG POND INTERIM REMEDIAL ACTION)
- PASSING BIOASSAY FROM 2002 DATA SET
- FAILING BIOASSAY FROM 2002 DATA SET (SQS)
- FAILING BIOASSAY FROM 2002 DATA SET (MCUL)
- PASSING BIOASSAY FROM 1996/1998 DATA SET
- 0.41 — 2002 MERCURY CONCENTRATIONS
- 0.41 — 1996/1998 MERCURY CONCENTRATIONS (MOST RECENT OF 1996/1998 SAMPLING EVENTS)

BIOASSAY DATA INTERPRETATION

- AREA PASSING SMS CRITERIA
- AREA EXCEEDING SQS BIOASSAY CRITERIA
- AREA EXCEEDING MCUL BIOASSAY CRITERIA
- AREA EXCEEDING MERCURY BSL

NOTES:

1. MERCURY SEDIMENT CONCENTRATIONS ARE REPORTED AS mg/kg DRY WEIGHT.
2. REFER TO APPENDIX A FOR 2002 SAMPLING EVENT AND APPENDIX B FOR 1996 AND 1998 SAMPLING EVENTS.
3. CONCENTRATIONS OF BOTH MERCURY AND PHENOLIC COMPOUNDS WERE BELOW SQS CONCENTRATIONS AT STARR ROCK SAMPLE LOCATION AN-SS-03 WHEN ANALYZED IN 2002 (SAME LOCATION AS HC-SS-03 ON FIGURE 5-3)
4. SAMPLE CWB-2 AT COLONY WHARF (SEE APPENDIX F) PASSED THE AMPHIPOD, LARVAL AND POLYCHAETE BIOASSAYS. HOWEVER, SOME MICROTOX TOXICITY WAS DETECTED AT ECOLOGY'S SQS LEVEL.
5. THE BSL EXCEEDANCE AT STATION HC-SC-79 WAS NOT RESAMPLED DURING THE 2002 SAMPLING EVENT.
6. PSDDA SUITABILITY SCREENING (APPENDIX H) SHOWED THAT I&J WATERWAY SEDIMENTS IN THE VICINITY OF HC-SC-83 ARE LIKELY SUITABLE FOR PSDDA DISPOSAL.
7. ASB SLUDGES WERE SAMPLED USING CORE SAMPLES WITH SAMPLING INTERVALS DIFFERENT THAN SURFACE SEDIMENT SAMPLING (0-12cm). REFER TO FIGURES 2-4 AND 2-5 FOR ASB SLUDGE DATA SUMMARIES.

AREA OF SURFACE PHTHALATE IMPACTS ADDRESSED AS PART OF I&J WATERWAY SEDIMENT SITE

BIOASSAY FAILURES ASSOCIATED WITH COLONY WHARF SITE

LOG POND

SEE FIGURE 5-5 FOR CURRENT LOG POND DATA

CORNWALL AVE. LANDFILL SITE

R.G. HALEY SITE

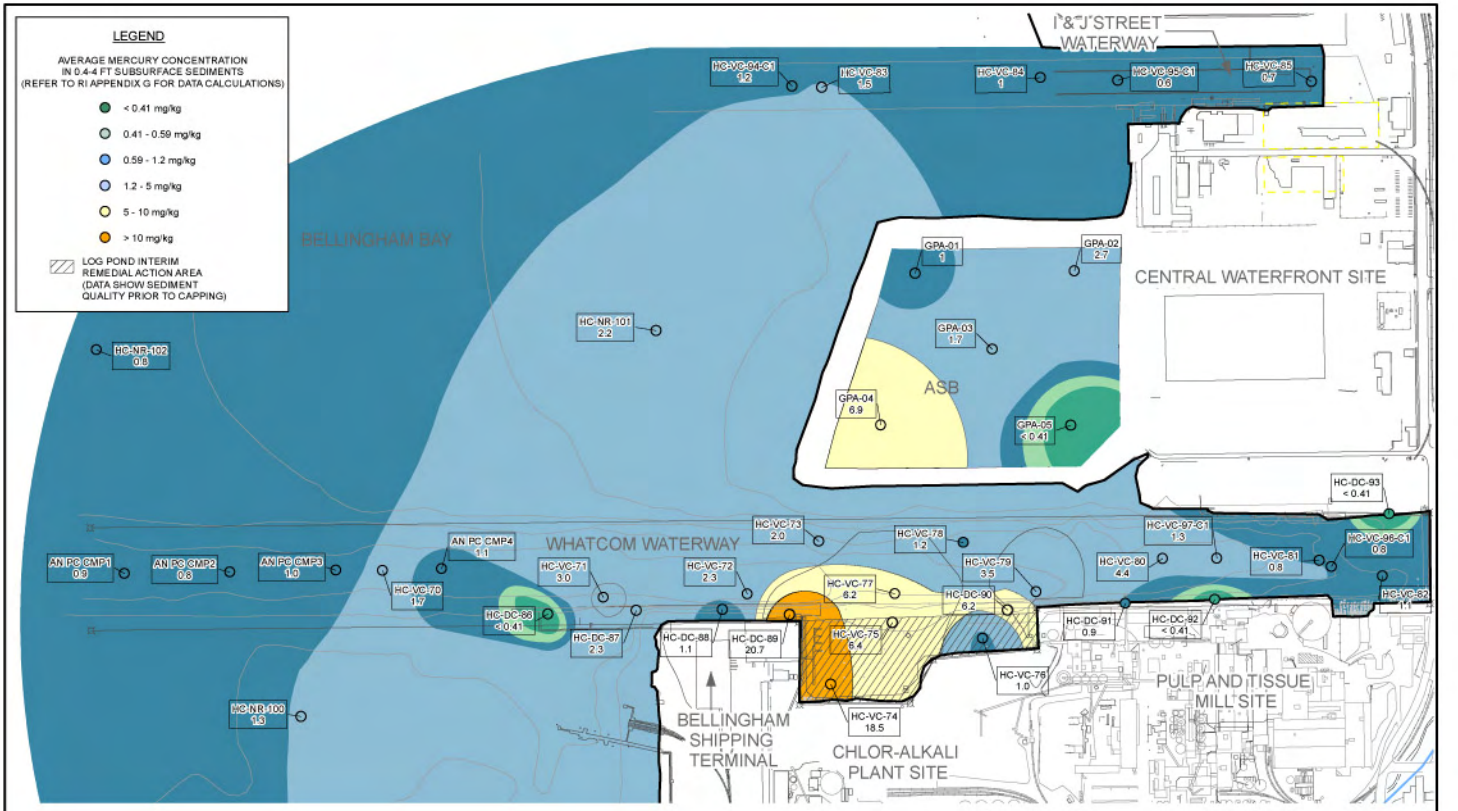
ASB [7]

350 0 700

SCALE IN FEET

RETEC

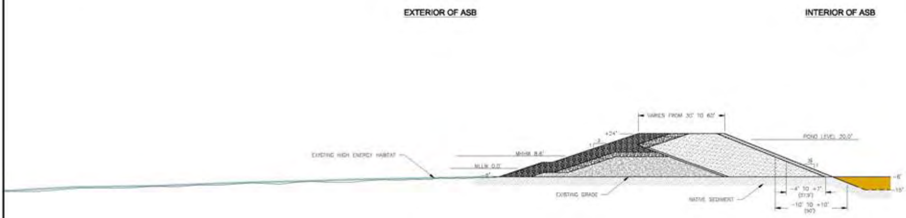
WHATCOM WATERWAY ENVIRONMENTAL IMPACT STATEMENT PORTB-18876			MOST RECENT SURFACE SEDIMENT BIOASSAY DATA AND BSL EXCEEDANCE AREAS
DATE: 10/09/06	DRWN: E.M./SEA		FIGURE 3-1



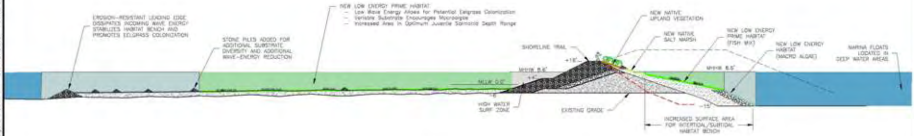
RETEC

WHATCOM WATERWAY EIS PORTB-18876-240		**SHALLOW SUBSURFACE SEDIMENT DATA (0.4 - 4') (MERCURY)**
DATE: 9/19/06	DWN. BY: KBL/ftc	FILE: T:/POB_WHATCOM/PROJECTS/erhg_HC.MXD
		FIGURE: 3-2


LEGEND
AVERAGE SUBSURFACE SEDIMENT QUALITY WITHIN THE 0.4-4 FT INTERVAL AS QUANTIFIED USING THE CUMULATIVE ENRICHMENT RATIO METHOD (C.E.R.) (REFER TO RI APPENDIX G FOR C.E.R. RATIO CALCULATIONS)
< 1 C.E.R.
1 - 2 C.E.R.
2 - 5 C.E.R.
5 - 20 C.E.R.
20 - 80 C.E.R.
> 80 C.E.R.
LOG POND INTERIM REMEDIAL ACTION AREA (DATA SHOW CONDITIONS PRIOR TO CAPPING)
I & J STREET WATERWAY
CENTRAL WATERFRONT SITE
BELLINGHAM BAY
WHATCOM WATERWAY
ASB
PULP AND TISSUE MILL SITE
BELLINGHAM SHIPPING TERMINAL
CHLOR-ALKALI PLANT SITE
HC-VC-64/C1 5.07
HC-VC-83 5.9
HC-VC-84 2.4
HC-VC-82/C2 3.7
HC-VC-85 1.7
GPA-01 10.1
GPA-02 175.8
GPA-03 59.4
GPA-04 57.1
GPA-05 33.2
HC-NR-101 5.3
HC-NR-102 3
HC-DC-60 0.9
HC-VC-73 5.9
HC-VC-78 3.5
HC-VC-79 12.0
HC-VC-80 71.5
HC-VC-97/C1 7.8
HC-VC-81 3.2
HC-VC-96/C1 10.4
HC-VC-82 10.9
AMPS/SMP1 2.5
AMPS/SMP2 3.2
AMPS/SMP3 2.7
AMPS/SMP4 3.1
HC-VC-71 1.5
HC-VC-72 5.6
HC-VC-77 19.1
HC-VC-75 16.6
HC-DC-90 4.5
HC-VC-76 3.4
HC-DC-91 6.9
HC-DC-92 3.3
HC-DC-88 4.9
HC-DC-89 77.4
HC-DC-87 23.2
HC-DC-86 1.9
HC-VC-74 64.7
HC-NR-100 3.2
0 200 400 Feet
RETEC
WHATCOM WATERWAY EIS
PORTB-18876-240
SHALLOW SUBSURFACE SEDIMENT DATA (0.4-4) (CUMULATIVE ENRICHMENT RATIO)
DATE: 9/19/06
DWN. BY: KBL/ftc
FILE: T:/POB_WHATCOM/PROJECTS/ICER_HC.MXD
FIGURE: 3-3



EXISTING CONDITIONS



20 0 40
SCALE IN FEET

PRELIMINARY DESIGN CONCEPT

RETEC

WHATCOM WATERWAY ENVIRONMENTAL IMPACT STATEMENT PORTB-18876-240	PRELIMINARY DESIGN CONCEPT ASB BERM RECONFIGURATION
DATE: 09/29/06 DRWN: A.S./SEA	FIGURE 3-4

RETEC

Figure 3-5
Shoreline Infrastructure and Dredging Patterns in the Outer Waterway

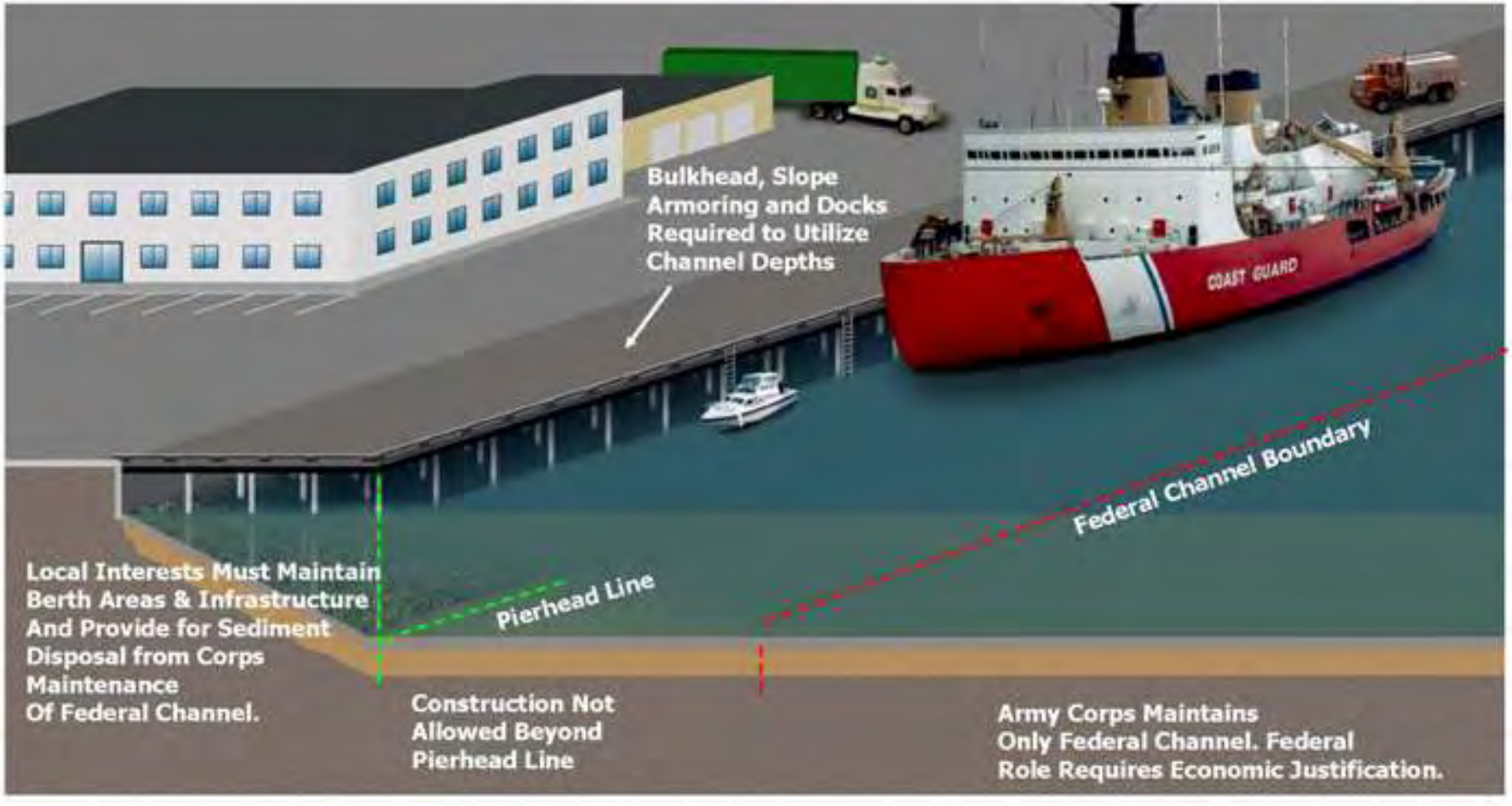


Figure 3-6
Shoreline Infrastructure Design Concept for Multi-Purpose Inner Waterway

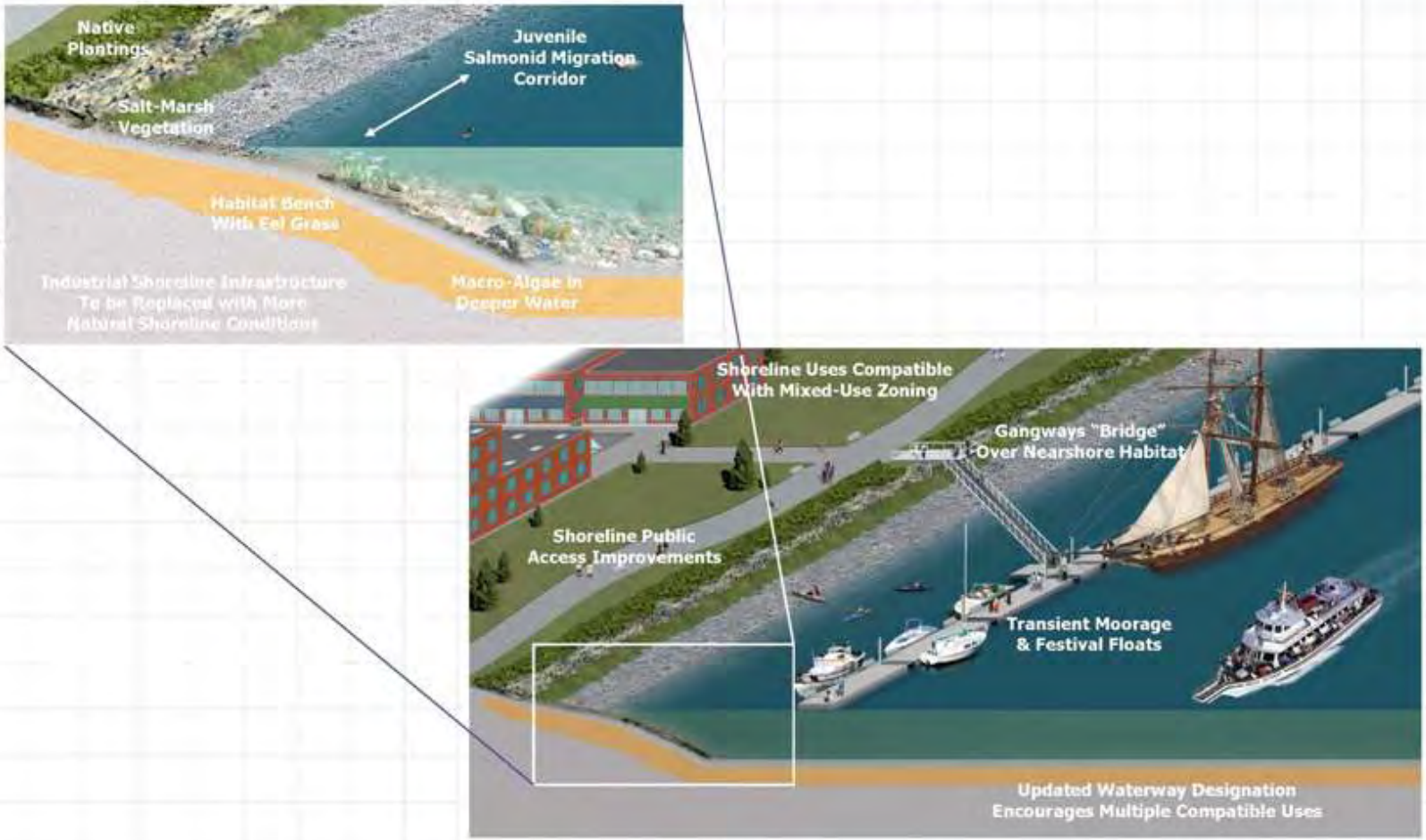


Figure 3-7
ASB Marina Design Concepts

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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

4 SEPA Analysis Project Alternatives

This section includes a description of each of nine EIS alternatives and their associated environmental impacts, benefits and/or mitigation. The alternatives include a SEPA No Action alternative, as well as eight alternatives evaluated in the FS Report. The numbering of the Alternatives has been maintained consistent between the RI/FS and this Supplemental EIS to facilitate comparison between the two documents.

Table 4-1 provides a concise description of each of the Alternatives including alternative costs, remedial technologies used, and land use implications for the Whatcom Waterway and ASB.

Table 4-1 Concise Summary of Evaluated Alternatives

Alternative Description									
		Cleanup Technologies Applied						Land Use	
Cleanup Alt.	**Probable Cost [1] ($ Million)**	**Institutional Controls**	**Monitored Natural Recovery**	**Containment**	**Removal & Disposal**	**Treatment**	**Reuse & Recycling**	**Whatcom Waterway**	**ASB**
No Action (Fig 4-1)	**$ 0**	**Yes**	**Yes**	**Yes**	--	--	--	Limited-Use Channel	Non-Aquatic (Not Capped)
Alt. 1 (Fig 4-2)	**$ 8**	**Yes**	**Yes**	**Yes**	--	--	--	Limited-Use Channel	Non-Aquatic (Capped)
Alt. 2 (Fig 4-3)	**$ 34**	**Yes**	**Yes**	**Yes**	--	--	--	Dredged for 1960s Industrial Channel	Non-Aquatic (Capped)
Alt. 3 (Fig 4-4)	**$ 34**	**Yes**	**Yes**	**Yes**	--	--	--	Dredged for 1960s Industrial Channel	Non-Aquatic (Filled)
Alt. 4 (Fig 4-5)	**$ 22**	**Yes**	**Yes**	**Yes**	**Yes**	--	--	Dredged for Multi-Purpose Channel	Non-Aquatic (Capped)
Alt. 5 (Fig 4-6)	**$ 42**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	Dredged for Multi-Purpose Channel	Aquatic (Opened to Bay)
Alt. 6 (Fig 4-7)	**$ 44**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	Dredged for Multi-Purpose Channel	Aquatic (Opened to Bay)
Alt. 7 (Fig 4-8)	**$ 74**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	Dredged for 1960s Industrial Channel	Aquatic (Opened to Bay)
Alt. 8 (Fig 4-9)	**$ 146**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	Dredged for 1960s Industrial Channel	Aquatic (Opened to Bay)

Note 1. Costs shown in Table 4-1 exclude costs associated with mitigation of SEPA adverse environmental impacts.

Table 4-2 provides a more comprehensive side-by-side description of each of the alternatives, with detailed descriptions of actions to be conducted in each area of the site. Table 4-2 also summarizes the impacts, benefits and mitigation associated with each alternative. Figures 4-1 through 4-9 illustrate the design concept of each of the alternatives.

The following sections describe each of the nine EIS alternatives and their environmental impacts, benefits and mitigation. Refer to Section 3 for additional background information on the elements of the environment discussed in this Section.

4.1 Project No Action Alternative

Figure 4-1 illustrates the design concept for the No Action project alternative. This alternative does not comply with MTCA cleanup requirements.

4.1.1 Alternative Description

As its name suggests, the No Action alternatives does not include active remediation, monitoring or other actions in any site areas. Some sediment recovery through natural processes of sedimentation will occur in portions of the site, but these actions will not be monitored, and no contingencies will be in place should recovery fail to achieve site cleanup levels.

Actions by Site Area

Actions performed under the No Action Alternative are described below by site area.

- **Outer Whatcom Waterway (Unit 1):** Under the No Action Alternative, no dredging or capping will be performed in the outer portion of Whatcom Waterway. Surface sediments in this area currently comply with SMS criteria. Subsurface impacted sediments would remain in place beneath the clean surface sediments. Some reduction in waterway depth would result under this alternative. No monitoring, institutional controls or other measures are included to ensure that subsurface contaminated sediments are not disturbed.

- **Inner Whatcom Waterway (Units 2 & 3):** As with the Outer Whatcom Waterway, no dredging, capping, monitoring or institutional controls would be performed in the Inner Whatcom Waterway. The majority of this area has naturally recovered, with some surface contamination remaining in nearshore berth areas along the Colony Wharf portion of the Central Waterfront site, and in an area near the Log Pond. Future use of the Inner Whatcom Waterway would be encumbered by areas of shoaling at the head of the waterway and in berth areas. No shoreline stabilization is conducted under this alternative.

- **Log Pond (Unit 4):** The Log Pond area was previously remediated as part of an Interim Action implemented in 2000. Subsequent monitoring has demonstrated the protectiveness of the subaqueous cap, and the effectiveness of habitat enhancement actions completed as part of that project. However, some erosion in

shoreline areas has been noted during 5-year monitoring. No further actions would be taken in this area under the No Action Alternative.

- **Areas of ASB (Unit 5):** Exceedances of site-specific cleanup levels within Unit 5-B have been noted. However, no capping, dredging, institutional controls or monitoring will be performed in this area.

- **Areas Near Bellingham Shipping Terminal (Unit 6):** Exceedances of site-specific cleanup levels within Units 6-B and 6-C have been noted. However, no capping, dredging, institutional controls or monitoring will be performed in these areas.

- **Starr Rock (Unit 7):** Sediments in the Starr Rock area currently comply with site-specific cleanup levels. No capping, dredging, institutional controls or monitoring will be performed in this area.

- **ASB (Unit 8):** The ASB will not be remediated under this Alternative. The presence of the impacted sludges will prevent future aquatic reuse of the ASB.

Sediment Disposal

No sediment dredging is included in the No Action Alternative. No sediment disposal sites are required under this alternative.

Costs & Schedule

The No Action Alternative has no project costs or actions associated with its implementation. However, costs may be substantial to conduct mitigation of impacts associated with the No Action Alternative.

4.1.2 Impacts, Benefits and Mitigation

Table 4-2 summarizes the environmental impacts, benefits and mitigation associated with the No Action alternative.

Geology, Water and Environmental Health

The No Action alternative produces net adverse impacts with respect to geology, water and environmental health. Significant impacts and potential mitigation requirements include the following:

- **Adverse Impact – Cleanup Not Performed:** The No Action alternative does not comply with MTCA or SMS regulations. Environmental health is not protected under this alternative. Potential impacts to human health and/or environmental receptors are not controlled. Mitigation of these impacts will require additional remedial measures as provided in the other project alternatives.

- **No Change – No Construction Disturbances to Water Quality:** The No Action alternative does not involve construction activities. Therefore there will be no construction impacts to existing water quality. This avoids adverse impacts associated with construction activities.

- **Adverse Impacts – Sediment Resuspension:** The No Action alternative does not conduct remediation or apply institutional controls in navigation areas. The potential for resuspension of impacted subsurface sediments is not controlled. Mitigation of this potential impact would require the implementation of additional remediation.

- **Adverse Impact – Interference with Shoreline Stabilization:** The shorelines in the Inner Whatcom Waterway include areas where shoreline infrastructure has degraded to the point that the shorelines are unstable. Because no actions are conducted to stabilize and remediate these shoreline areas, shoreline erosion will likely occur, resulting in impacts to upland property. The presence of the contamination will hinder future shoreline stabilization projects. Impacts associated with shoreline erosion and/or recontamination may also occur in the Log Pond, since the No Action alternative does not include the shoreline enhancements provided under the other project alternatives.

Fish and Wildlife

The No Action alternative results in net adverse impacts to fish and wildlife category. Significant impacts and potential mitigation requirements include the following:

- **Adverse Impact – Lack of Environmental Protectiveness:** The No Action alternative does not protect fish or wildlife from potential contamination impacts. These potential impacts offset other potential benefits associated with the No Action alternative. The mitigation of this issue will require implementation of additional cleanup measures as provided under the other project alternatives.

- **No Change – No Construction Disturbances:** Because the No Action alternative does not involve construction activities, this alternative does not trigger short-term disruptions associated with dredging and capping activities.

- **Beneficial Impact – Preservation of Nearshore Habitats:** The No Action alternative does not change bottom contours in the Waterway or harbor areas. Where emergent nearshore aquatic habitats have developed, these areas would remain undisturbed

under this Alternative. However, the No Action Alternative does not ensure that this preservation will be maintained over the long-term.

Land Use, Navigation and Public Shoreline Access

The No Action alternative conflicts with community land use, navigation and public shoreline access plans. The alternative results in significant net adverse impacts under these environmental categories. Mitigation of these impacts requires additional actions, as are conducted under other project alternatives:

- **Adverse Impacts – Outer Whatcom Waterway Navigation:** The No Action Alternative does not remove impacted sediments in the Outer Whatcom Waterway. The presence of residual impacted sediments will impact the effective water depth of the terminal area. Current water depths range from about 30 feet to over 35 feet below MLLW, but dredging will be required in the future to maintain navigation depth. Such dredging would resuspend impacted sediments unless the dredging were precluded below the current mudline. This would effectively limit the usable and maintainable water depth in this area to a minimum of approximately 25 to 26 feet below MLLW. The restoration of deep draft use capabilities at the Bellingham Shipping Terminal consistent with the current infrastructure and channel dimensions would require implementation of sediment removal as provided under other project alternatives (Alternatives 2 through 8).

- **Adverse Impacts – Inner Whatcom Waterway Navigation**: The Inner Whatcom Waterway has highly variable mud-line elevations. Shoaling is present particularly at the head of the waterway (near the Roeder Avenue bridge) and along the berth areas of the Central Waterfront shoreline. Effective water depths (the usable water depth along the current pierhead line) in this area vary from about -7 feet MLLW to areas that are exposed at low tide. Under the No Action Alternative, navigation in many of these areas would be impaired or effectively precluded, because insufficient depth would remain to allow for vessel traffic or for future waterway maintenance and navigation. Because waterway sediments would not be managed actively through capping and/or removal as under other project alternatives, project construction planning and permitting for any future shoreline activities along the Waterway would have greater recontamination risks, and this would tend to limit redevelopment flexibility of these nearshore areas. Mitigation of these impacts would require implementation of additional active remediation as provided under other project alternatives.

- **Beneficial Impacts – Habitat Preservation and Enhancement:** The No Action Alternative would result in preservation of

emergent nearshore habitat at the head and along the sides of the Inner Whatcom Waterway. As noted above, the No Action Alternative does not provide long-term protectiveness for these habitat areas. Preserving and enhancing nearshore habitat along salmon migration corridors is consistent with the Bellingham Bay Comprehensive Strategy and will benefit juvenile salmonids and other fish and wildlife species.

- **Adverse Impact – Conflict with Planned ASB Reuse:** The ASB has been identified in previous land use studies as the preferred location for development of a future environmentally sustainable marina with integrated public access and habitat enhancements. The No Action Alternative does not remediate the ASB and directly conflicts with this planned reuse. Mitigation of this impact would require remediation of the ASB as provided under other project alternatives (Alternatives 5, 6, 7 or 8).

Air and Noise

The No Action alternative does not involve new construction activities. No changes to existing air quality or noise levels are anticipated under this alternative.

Cultural Resources

The No Action alternative does not involve construction-associated impacts to historical or cultural resources.

4.2 Project Alternative 1

Alternative 1 uses containment, monitored natural recovery and institutional controls to comply with SMS cleanup levels and MTCA cleanup requirements. Alternative 1 makes the least use of active remedial technologies of all of the alternatives evaluated in the FS Report.

4.2.1 Alternative Description

Alternative 1 is illustrated in Figure 4-1. The application of active cleanup measures and institutional controls is detailed in Table 4-2 for each Site Unit:

Actions by Site Area

Actions performed under Alternative 1 are described below by site area.

- **Outer Whatcom Waterway (Unit 1):** Under Alternative 1, no dredging or capping will be performed in the outer portion of Whatcom Waterway. Surface sediments in this area currently comply with SMS criteria. Subsurface impacted sediments would remain in place beneath the clean surface sediments. Some reduction in waterway depth would result under this alternative.

Future channel maintenance would likely be restricted beneath elevations of approximately 26 feet below MLLW in order to avoid resuspension of impacted subsurface sediments. This depth restriction would need to be addressed in Waterway planning and site institutional controls.

- **Inner Whatcom Waterway (Units 2 & 3):** As with the Outer Whatcom Waterway, no dredging or capping would be performed in the Inner Whatcom Waterway under Alternative 1. The majority of this area has naturally recovered, with some surface contamination remaining in nearshore berth areas along the Colony Wharf portion of the Central Waterfront site. Additional recovery time will be required to achieve full restoration of this area. Reductions in waterway depths will accompany the use of natural recovery in the Inner Whatcom Waterway areas. Additional recovery modeling would be required as part of Cleanup Action Plan development and/or remedial design to verify the applicability of natural recovery for this area. Institutional controls and monitoring are included for the Inner Whatcom Waterway area.

- **Log Pond (Unit 4):** The Log Pond area was previously remediated as part of an Interim Action implemented in 2000. Subsequent monitoring has demonstrated the protectiveness of the subaqueous cap, and the effectiveness of habitat enhancement actions completed as part of that project. Actions in this area will include enhancements to the shoreline edges of the cap, to ensure long-term stability of the cap. These enhancements are described in Appendix D of the FS Report.

- **Areas Offshore of ASB (Unit 5):** Exceedances of site-specific cleanup levels within Unit 5-B will be remediated using sub-aqueous capping. Appendix C of the FS Report describes the design concept for this area, including methods to maintain cap stability in a manner compatible with anticipated permitting requirements. The remaining areas of Unit 5 comply with site-specific cleanup levels. No sediment capping or dredging is proposed for these areas at this time. Additional evaluations of sediment stability will be conducted as part of engineering design. These areas will be monitored to document the continued effectiveness of natural recovery at complying with cleanup levels. Additional measures will be taken in this area only if engineering design evaluations indicate that such measures are required.

- **Areas Near BST (Unit 6):** The area south of the barge docks at the Bellingham Shipping (Units 6-B and 6-C) exceeds SMS cleanup levels. This area will be remediated using a deep-water sub-aqueous cap. Final water depths in this area will be greater than -

18 feet MLLW in most areas, consistent with shoreline infrastructure and navigation uses historically conducted there. The cap will be constructed of coarse granular materials and will be designed to resist potential prop-wash erosion effects. The remaining portions of Unit 6 comply with site-specific cleanup goals. No sediment capping or dredging is proposed for these areas. These areas will be monitored to document the continued effectiveness of natural recovery at complying with cleanup levels.

- **Starr Rock (Unit 7):** Sediments in the Starr Rock area currently comply with site-specific cleanup levels. No sediment capping or dredging is proposed for these areas. These areas will be monitored to document the continued effectiveness of natural recovery at complying with cleanup levels.

- **ASB (Unit 8):** The sludges within the ASB will be remediated using a thick sub-aqueous cap. Prior to cap placement, the treatment equipment (aerators, weirs, etc.) would be removed from the ASB. The conceptual design for the cap includes a nominal 3-foot layer of sandy capping material, with coarse materials placed in nearshore areas where wind-driven wave action may be significant.

Sediment Disposal

No sediment dredging is included in Alternative 1. All impacted sediments are managed in-place using containment technologies (capping) and monitored natural recovery. No sediment disposal sites are required under this alternative.

Costs & Schedule

Alternative 1 is the lowest cost of the eight alternatives evaluated in the FS Report. The total probable cost of Alternative 1 is $8 million. Most of this cost is associated with the capping of the ASB sludges and the two impacted harbor areas. Additional costs are included to provide for long-term monitoring of capping and natural recovery areas. Mitigation costs are not included in the $8 million probable cost estimate.

The construction activities in Alternative 1 can likely be completed within a single construction phase. The capping activities in the two impacted harbor areas would be completed during appropriate times of the year when the potential for impacts to juvenile salmonids is minimized. These construction "fish windows" (the time periods during which in-water construction can be performed while minimizing potential impacts to juvenile salmonids) are typically specified as part of project permitting requirements. Because the ASB area is not connected to Bellingham Bay, the capping activities within the ASB will not necessarily be time-limited by the "fish windows".

Monitoring of capped and natural recovery areas will occur under Alternative 1. Previous recovery analyses performed as part of the Remedial Investigation suggest that 5 and 10 years may be required for the sediment areas near the Colony Wharf portion of the Central Waterfront site. Site-specific recovery modeling would be required as part of Cleanup Action Plan development or remedial design to verify the effectiveness of this alternative.

4.2.2 Impacts, Benefits and Mitigation

Table 4-2 summarizes the environmental impacts, benefits and mitigation associated with Alternative 1.

Geology, Water and Environmental Health

Alternative 1 produces net adverse impacts under the category including geology, water and environmental health. Significant impacts and potential mitigation requirements include the following:

- **Beneficial Impact – Sediment Cleanup:** Alternative 1 produces a beneficial impact through remediation and compliance with site cleanup levels consistent with MTCA and SMS requirements. Active cleanup is performed in the ASB Shoulder (Unit 5-B) area, the Barge Dock (Unit 6-B/C) and within the ASB. Monitored natural recovery and institutional controls are used to remediate other areas.

- **Mitigated Impact – Construction Water Quality:** Alternative 1 includes capping activities in Units 5B, 6B and 6C. This capping will result in short-term disturbances to water quality during placement of capping material. These impacts can be mitigated through the use of best practices for design and construction of the caps. For capping of the ASB, the cap material would be placed without opening the facility to surface water. For the other two capping areas, water quality control will be achieved through use of appropriate equipment and cap materials, and the controlled placement of cap material. The use of highly dispersive placement methods (e.g., hydraulic placement) for capping of the Unit 5 and Unit 6 areas should be avoided. The project will include additional state and federal agency review as part of project design and permitting.

- **Beneficial Impact – Control of Sediment Resuspension:** Alternative 1 remediates the Whatcom Waterway navigation areas using monitored natural recovery and institutional controls. While these actions may impact land uses (see below), these actions would reduce the potential for sediment resuspension relative to the No Action Alternative.

- **Adverse Impact – Interference with Shoreline Stabilization:** Portions of the shoreline infrastructure in the Inner Whatcom Waterway have degraded, resulting in shoreline instability. Because no actions are conducted to stabilize and remediate these shoreline areas, shoreline erosion may occur, resulting in impacts to upland property. The presence of contaminated sediment in berth areas will tend to interfere with public or private shoreline stabilization efforts. Mitigation of these impacts would require either development of stable shoreline slopes as under project Alternatives 4, 5 and 6, or the installation of new hardened shoreline infrastructure as in project Alternatives 2, 3, 7 or 8.

- **Beneficial Impact – Log Pond Shoreline Stabilization:** Limited erosion has been noted in some shoreline edges of the Log Pond cap. Under Alternative 1, these erosional areas would be corrected, resulting in improved long-term performance of the Log Pond cap, and prevention of erosion and/or recontamination.

Fish and Wildlife

Alternative 1 results in net beneficial impacts to fish and wildlife. Significant impacts, benefits and mitigation associated with Alternative 1 include the following:

- **Beneficial Impact – Environmental Cleanup:** Completion of site cleanup and compliance with site cleanup levels will protect aquatic receptors from the effects of contaminated sediments.

- **Mitigated Impact – Construction Disturbances:** Construction of Alternative 1 will involve some in-water construction activities associated with capping in Unit 5B and in Units 6B and 6C. Potential disturbances to fish and wildlife could be mitigated in these areas through the use of best practices for project design, permitting and construction. Examples of best practices include 1) the timing of work activities within appropriate “fish windows” to avoid migration periods for juvenile salmonids or other sensitive species, 2) the use of construction equipment, cap materials and placement methods that minimize water quality impacts, noise and physical disturbances to aquatic habitats, and 3) completion of additional environmental reviews as part of project design and permitting. These measures are considered likely to mitigate the impacts associated with construction disturbances under Alternative 1.

- **Beneficial Impacts – Preservation of Inner Whatcom Waterway Habitat:** Alternative 1 does not change bottom contours in the Inner Whatcom Waterway. However, where emergent nearshore aquatic habitats have developed, these areas

would remain undisturbed, and disturbance of these areas would be restricted as part of the site institutional controls. The protection of these emergent habitat areas represents a beneficial impact for fish and wildlife.

- **Mitigated Impacts – Log Pond Shoreline Enhancements:** Construction of Alternative 1 will involve some in-water construction activities within the Log Pond to enhance the stability of the Log Pond shoreline. These actions will involve a change in substrate conditions in limited areas, with placement of pebbles and beach gravels in some areas, and placement of stone groins for material retention in other areas. The actions are expected to result in minimal changes to the area of intertidal habitat. Potential adverse impacts associated with substrate changes in some areas are offset by other nearshore habitat gains under the alternative.

- **Beneficial Impacts – Enhancement of Unit 5-B Habitat:** Alternative 1 develops additional nearshore aquatic habitat within Unit 5B, through the construction of an engineered cap. If constructed consistent with the design concept included in Appendix C of the FS Report, the cap will enhance the quality of between 4 and 6 acres of nearshore habitat, with improvements in elevation and reductions in wave energy. The enhancement of nearshore habitat quality in this area as accomplished under that design is consistent with restoration objectives of the Bellingham Bay Comprehensive Strategy and will benefit juvenile salmonids and other fish and wildlife species.

Land Use, Navigation and Public Shoreline Access

Alternative 1 provides a slight enhancement of land use, navigation and public shoreline access uses relative to the No Action alternative. However, net adverse impacts continue to exist under this alternative that can only be mitigated through the implementation of additional actions.

- **Adverse Impact – Outer Whatcom Waterway Navigation:** Alternative 1 does not remove impacted sediments in the Outer Whatcom Waterway. The presence of residual impacted sediments represents a conflict with current and planned navigation uses in this area. Current depths range from about 30 feet to over 35 feet below MLLW, but dredging will be required in the future to maintain navigation depth. Such dredging would resuspend impacted sediments unless the dredging were precluded below the current mudline. This would effectively limit the usable and maintainable water depth in this area to a minimum of approximately 25 to 26 feet below MLLW, which is less than anticipated navigation requirements. This impact to navigation uses is integral to the alternative. The restoration of deep draft use

capabilities at the Bellingham Shipping Terminal consistent with the current infrastructure and land use plans would require implementation of sediment removal as provided under other project alternatives (Alternatives 2 through 8).

- **Adverse Impacts – Inner Whatcom Waterway Navigation**: The Inner Whatcom Waterway area has highly variable mud-line elevations. Shoaling is present particularly at the head of the waterway (near the Roeder Avenue bridge) and along the berth areas of the Central Waterfront shoreline. Effective water depths (the usable water depth along the current pierhead line) in this area vary from about -7 feet MLLW to areas that are exposed at low tide. Under Alternative 1, navigation in many of these areas would be impaired or effectively precluded, because insufficient depth would remain to allow for vessel traffic or for future waterway maintenance and navigation. Because waterway sediments would not be managed actively through capping and/or removal as under other project alternatives, project construction planning and permitting for any future shoreline activities along the Waterway would have greater recontamination risks, and this would tend to limit redevelopment flexibility of these nearshore areas. Mitigation of these impacts would require implementation of additional active remediation as provided under other project alternatives.

- **Adverse Impact – Conflict with Planned ASB Reuse:** The ASB has been identified in previous land use studies as the preferred location for development of a future environmentally sustainable marina with integrated public access and habitat enhancements. Alternative 1 remediates the ASB by capping, which directly conflicts with this planned reuse. Mitigation of this impact would require remediation of the ASB as provided under other project alternatives (Alternatives 5, 6, 7 or 8).

Air and Noise

Alternative 1 involves new construction activities associated with the placement of environmental caps in Unit 8, Unit 5B and Units 6B and 6C. Potential impacts to area noise and air quality levels will need to be mitigated to avoid environmental impacts. However, mitigation can be accomplished through the use of best practices for project design, permitting and construction.

Potential mitigation measures for noise impacts include 1) contractual requirements to avoid exceedances of ambient noise level restrictions, 2) contractor use of appropriate equipment including mufflers as required, and 3) use of appropriate work periods if required to comply with noise level restrictions.

Air quality impacts associated with capping activities could be experienced either through emissions from construction equipment, or through dust from temporary stockpiles of capping material prior to placement. These impacts can be mitigated through 1) contractual requirements to avoid impacts to air quality, 2) the use of appropriate equipment meeting applicable air quality control requirements, 3) the use of appropriate construction measures (e.g., wetting or covering of cap material stockpiles to control fugitive dust emissions), or 4) the direct supply of cap material by barges to the capping site without stockpiling. These mitigation measures can be incorporated during project design and permitting.

Cultural Resources

Alternative 1 does not involve any dredging activities or other construction activities that are likely to disrupt existing historical or archaeological resources. Additional review of these issues would be conducted as part of project permitting (e.g., through Section 106 consultations as part of Army Corps of Engineers permitting).

4.3 Project Alternative 2

Alternative 2 uses monitored natural recovery, institutional controls and containment technologies to comply with SMS cleanup levels and MTCA cleanup requirements. The design concept for alternative 2 is shown in Figure 4-3.

4.3.1 Alternative Description

Unlike Alternative 1, dredging of sediments from within the Whatcom Waterway channel is conducted. These sediments are managed in a new Confined Aquatic Disposal (CAD) facility that would be developed offshore of the Cornwall Avenue Landfill. The Cornwall CAD site location was selected during the 2000 EIS after evaluation of potential alternative locations.

Alternative 2 represents a modification of the preferred alternative from the 2000 RI/FS and EIS process. These analyses were based on continued industrial uses of the Central Waterfront and New Whatcom areas. These analyses also assumed that future land uses would comply with the restrictions applicable to continued maintenance of the 1960s industrial navigation channel in the Whatcom Waterway. Current zoning and land use planning have significantly changed since the 2000 evaluation.

Actions by Site Unit

Actions conducted as part of Alternative 2 are described below by site area. Specific actions are listed by Site Unit in Table 4-2.

- **Outer Whatcom Waterway (Unit 1):** Under Alternative 2, the outer portion of the waterway would be dredged to a minimum depth of

35 feet below MLLW. Where technically feasible, the dredging depths would be increased to allow dredging to the base of the impacted sediments in the channel areas. Anticipated dredge depths vary from 35 feet below MLLW to about 41 feet below MLLW. The sediments removed during this dredging would be barged to the Cornwall CAD site location, and placed within the containment facility. The sediments from Units 1A and 1B would be used in upper portions of the CAD site, and the facility would be completed as described below. Some capping may be required in areas that are not technically feasible to dredge (to be determined during remedial design and permitting). Dredging methods used for the Outer Whatcom Waterway would likely be mechanical, reducing the entrained water management concerns applicable to hydraulic dredging, and producing dredge materials with physical properties appropriate for CAD site management. Detailed dredging and construction procedures and alternatives would be evaluated in project design and permitting.

- **Inner Whatcom Waterway (Units 2 & 3):** Under Alternative 2, sediment dredging would be performed as necessary to provide for future use and maintenance of the 1960s industrial navigation channel to the head of the waterway. The 1960s federal channel boundaries specify a water depth of 30 feet below MLLW from the Port terminal area to Maple Street. A depth of 18 feet is specified from Maple Street to the head of the waterway. In the Outer Whatcom Waterway, the dredging cut would be established at an elevation at least 35 feet below MLLW. This would remove sediments where technically feasible, and would provide sufficient overdepth to allow residual sediments to be capped without impeding future maintenance of the federal channel. The design concept assumes a cap thickness of 3 feet over dredged areas with residual subsurface sediment impacts. Due to historical encroachment of shoreline fills on the federal channel boundaries, many of the Inner Whatcom Waterway shoreline areas have fill and bulkheads located near or at the pierhead line. Most of these bulkheads would require replacement and/or substantial upgrades in order to maintain shoreline stability in these areas during and after dredging. Most docks and bulkheads along the Central Waterfront shoreline were constructed historically when the channel depth was shallower (18 feet below MLLW) and these docks and bulkheads would need to be either removed or replaced in order to accommodate channel dredging and future use.

- **Log Pond (Unit 4):** The Log Pond area was previously remediated as part of an Interim Action implemented in 2000. Subsequent monitoring has demonstrated the protectiveness of the subaqueous cap, and the effectiveness of habitat enhancement actions

completed as part of that project. Actions in this area will be limited to enhancements to the shoreline edges of the cap, to ensure long-term stability of the cap edges. These enhancements are described in Appendix D of the FS Report.

- **Areas Offshore of ASB (Unit 5):** Exceedances of site-specific cleanup goals within Unit 5-B will be remediated using sub-aqueous capping. Appendix C of the FS Report describes the design concept for this area, including methods to maintain cap stability in a manner compatible with anticipated permitting requirements. The remaining areas of Unit 5 comply with site-specific cleanup goals. No sediment capping or dredging is proposed for these areas at this time. Additional evaluations of sediment stability will be conducted as part of engineering design. These areas will be monitored to document the continued effectiveness of natural recovery at complying with cleanup levels. Additional measures will be taken in this area only if engineering design evaluations indicate that such measures are required.

- **Areas Adjacent to BST (Unit 6):** The area south of the barge docks at the Bellingham Shipping Terminal (Units 6-B and 6-C) exceeds SMS cleanup levels. This area will be remediated using a deep-water sub-aqueous cap. Final water depths in this area will be greater than -18 feet MLLW in most areas, consistent with shoreline infrastructure and navigation uses historically conducted there. The cap will be constructed of coarse granular materials and will be designed to resist potential prop-wash erosion effects. The remaining portions of Unit 6 comply with site-specific cleanup goals. No sediment capping or dredging is proposed for these areas. These areas will be monitored to document the continued effectiveness of natural recovery at complying with cleanup levels.

- **Starr Rock (Unit 7):** Sediments in the Starr Rock area currently comply with site-specific cleanup levels. No sediment capping or dredging is proposed for these areas. These areas will be monitored to document the continued effectiveness of natural recovery at complying with cleanup levels.

- **ASB (Unit 8):** The ASB will will be remediated using a thick sub-aqueous cap. Prior to cap placement, the treatment equipment (aerators, weirs, etc.) would be removed from the ASB. The conceptual design for the cap includes a nominal 3-foot layer of sandy capping material, with coarse materials placed in nearshore areas where wind-driven wave action may be significant. If the ASB is to be used for future stormwater/cooling water treatment, then the ASB would need to either remain connected to the current GP-owned outfall, or be provided with an alternate, appropriate-

sized discharge outfall. Other modifications may be required depending on planned future uses.

Sediment Disposal

Unlike Alternative 1, Alternative 2 involves substantial sediment dredging. The sediments dredged from the Waterway areas will be managed by containment in a new Confined Aquatic Disposal (CAD) area adjacent to the Cornwall Avenue landfill. The design concept estimates disposal of approximately 472,000 cubic yards of sediments dredged from the Outer and Inner Whatcom Waterway areas, and an additional 113,000 cubic yards of sediments dredged from Units 1A and 1B.

The Cornwall CAD site location was identified through the Bellingham Bay Pilot process, after evaluation of balancing criteria including costs, navigation, land use and habitat factors. The CAD location was incorporated into the range of remedial alternatives discussed in the 2000 RI/FS. The principal benefit of the Cornwall location as identified under the Pilot was the ability to create nearshore aquatic habitat using the CAD design approach. The geography of the area requires initial construction of an armored containment berm, prior to placement of the dredged materials within the site. Armoring of the outer edges of the berm is required to ensure long-term stability of the completed structure under anticipated wave energy and erosion conditions.

During filling of the CAD site, the containment berms would be constructed above tidal elevations. Sediments would be loaded into the facility and allowed to consolidate. The design and permitting for the CAD site would optimize sediment handling and offloading procedures to ensure compliance with water quality criteria near the CAD site location.

After the facility has been filled to design capacity, a capping layer of clean sediments would be placed to provide the final cap surface. The capping sediments will need to be appropriately sized and the cap edges will need to be appropriately constructed to resist wave-induced erosion.

Long-term monitoring and maintenance and institutional controls for the CAD facility would be required as part of the remedy. The construction of the CAD facility would also require coordination with the Cornwall Avenue Landfill and RG Haley cleanup sites, located adjacent to the CAD site location.

Costs & Schedule

The probable costs of Alternative 2 are $34 million. In order of decreasing cost, this estimate addresses dredging and CAD site disposal of Waterway sediments, capping costs for the ASB and harbor areas, enhancements to the Log Pond shoreline, and provisions for long-term monitoring. Long-term monitoring costs are higher than under Alternative 1, because of the additional monitoring and periodic maintenance required for the completed CAD

facility. The Alternative 2 costs listed above do not include costs of required mitigation of SEPA environmental impacts.

The construction activities in Alternative 2 can likely be completed within four construction seasons. With the exception of the ASB area, work activities would be confined to appropriate "fish windows." Because the ASB area is not connected to Bellingham Bay, the capping activities within the ASB will not necessarily be time-limited by the "fish windows."

Monitoring of capped and natural recovery areas will occur under Alternative 2. Monitoring will also be performed at the CAD site to ensure long-term effectiveness of the sediment containment.

4.3.2 Impacts, Benefits and Mitigation

Table 4-2 summarizes the environmental impacts, benefits and mitigation associated with Alternative 2.

Geology, Water and Environmental Health

Alternative 2 produces net adverse impacts under the category including geology, water and environmental health. Significant impacts, benefits and potential mitigation requirements include the following:

- **Beneficial Impact – Sediment Cleanup:** Alternative 2 produces a beneficial impact through remediation and compliance with site cleanup levels consistent with MTCA and SMS requirements. Active cleanup is performed in the ASB Shoulder (Unit 5-B) area, the Barge Dock (Unit 6-B/C) and within the ASB. Monitored natural recovery and institutional controls are used to remediate other areas.

- **Mitigated Impacts – Construction Water Quality:** Alternative 2 involves extensive in-water construction activities associated with dredging, capping, and CAD site construction, operation and closure. The project likely will require 4 in-water construction seasons to complete, plus additional time to upgrade shoreline infrastructure. These construction activities will need to be mitigated to avoid adverse water quality impacts. Examples of potential mitigation actions include 1) completion of additional water quality review as part of project design and permitting (i.e., Section 401 Water Quality Certification), 2) use of best practices for design, permitting, contracting and construction of dredging activities to minimize water quality impacts and dredge residuals, 3) appropriate design and construction of the CAD site to minimize sediment release during construction, operation and post-closure of the facility, 4) water quality monitoring during construction, and 5) timing of CAD site actions to ensure completion of source control actions at the RG Haley site prior to CAD facility completion.

- **Beneficial Impact – Control of Sediment Resuspension:** Alternative 2 conducts active remediation by capping in Site Units 5-B, 6-B/C and in the Whatcom Waterway channel. These actions reduce the potential for future resuspension of contaminated sediments in navigation areas.

- **Adverse Impact – Shoreline Destabilization:** Alternative 2 includes deep dredging in the Inner Whatcom Waterway in order to comply with the dimensions of the 1960s industrial channel. This deep dredging will tend to further destabilize existing shorelines in this area. To avoid shoreline stability failures, the shoreline will need to be stabilized with new infrastructure compatible with the deep dredging patterns. Mitigation will be required, including the construction of hardened shoreline treatments including bulkheads and over-water wharves. The potential costs to construct this type of shoreline infrastructure has been estimated at $20 to $40 million for the Inner Whatcom Waterway. These costs are not included in the remediation cost estimates of Alternative 2.

- **Beneficial Impact – Log Pond Shoreline Stabilization:** Limited erosion has been noted in some shoreline edges of the Log Pond cap. Under Alternative 2, these erosional areas would be corrected, resulting in improved long-term performance of the Log Pond cap, and prevention of erosion and/or recontamination.

Fish and Wildlife

Alternative 2 provides net beneficial impacts to fish and wildlife. Significant impacts, benefits and potential mitigation requirements include the following:

- **Beneficial Impacts – Environmental Protection:** Completion of site remediation provides protection of fish and wildlife from the potential effects of contaminated sediments.

- **Mitigated Impacts – Construction Disturbances:** Construction of Alternative 2 includes significant construction-related habitat disturbances. These disturbances will occur in several areas, including both dredging and cap areas and the site of the proposed Cornwall CAD site. Potential disturbances to fish and wildlife can be mitigated in these areas through the use of best practices for project design, permitting and construction. Examples of best practices include 1) the timing of work activities during appropriate “fish windows” to avoid migration periods for juvenile salmonids or other sensitive species, 2) the use of construction equipment, dredge methods, cap materials and placement methods that minimize water quality impacts, noise and physical disturbances to aquatic habitats, and 3) completion of additional

environmental reviews as part of project design and permitting. These measures are considered likely to mitigate the short-term habitat impacts associated with construction disturbances under Alternative 2.

- **Mitigated Impact – Inner Whatcom Waterway Nearshore Habitat:** Through dredging of the 1960s industrial channel, Alternative 2 eliminates existing emergent shallow-water habitats at the head and along the sides of the Inner Whatcom Waterway. These impacts would be mitigated by creation of new replacement habitat in alternative site areas (i.e., at the ASB shoulder and/or CAD site locations). Impact avoidance would require the use of alternative channel dimensions inconsistent with Alternative 2 (as in Alternative 4, 5 and 6). In addition to the direct impacts associated with the deep dredging, additional habitat impacts will be incurred during the construction of hardened shoreline infrastructure as necessary to stabilize shorelines and support the use and maintenance of the deep draft waterway uses in the Inner Whatcom Waterway under Alternative 2. Mitigation for these impacts would also occur through construction of new habitat at the ASB shoulder and/or CAD site locations.

- **Mitigated Impacts – Log Pond Shoreline Enhancements:** Construction of Alternative 2 will involve some in-water construction activities within the Log Pond to enhance the stability of area shorelines. These actions will involve a change in substrate conditions in limited areas, with placement of pebbles and beach gravels in some areas, and placement of stone groins for material retention in other areas. The actions are expected to result in minimal changes to the area of intertidal habitat. Potential adverse impacts associated with substrate changes in some areas are offset by other nearshore habitat gains under the alternative.

- **Beneficial Impact -- Development of Nearshore Habitat:** Alternative 2 achieves a net habitat gain through the development of new nearshore habitat on the surface of the Cornwall CAD site. Consistent with the design concept presented in the 2000 FEIS, the elevation of the CAD site surface would be designed to support shallow-water habitat uses. Existing intermediate and deep-water habitats in the CAD site area would be converted to these shallow-water elevations upon completion and closure of the containment facility. New shallow-water habitat would also be created as part of the cap constructed within Unit 5B. The combined habitat benefits of the new CAD facility and the habitat bench in Unit 5B are likely to offset the habitat losses within the Inner Whatcom Waterway. However, the treatment of the Inner Whatcom

Waterway will continue to represent a "gap" in nearshore habitat along the juvenile salmonid migration corridors (see Figure 1-3).

Land Use, Navigation and Public Shoreline Access

Alternative 2 was initially designed to support industrial waterfront uses, consistent with historical land uses. However, waterfront land and navigation uses have changed. Alternative 2 conflicts with these changed uses. These conflicts can only be mitigated through the implementation of alternative channel treatments, as in project alternatives 4, 5 or 6. A summary of significant impacts, benefits and mitigation for Alternative 2 is provided below:

- **Beneficial Impact – Outer Whatcom Waterway Navigation Benefits:** The shoreline infrastructure in the Outer Whatcom Waterway areas is similar to that shown in Figure 3-5 and currently supports deep draft navigation uses. Alternative 2 provides for dredging of deep draft areas of the Outer Whatcom Waterway, consistent with continued deep draft use capabilities. This alignment of dredging patterns with land use and navigation needs represents a benefit of Alternative 2.

- **Adverse Impact – Conflict with Inner Whatcom Waterway Land Uses**: The Inner Whatcom Waterway dredging plan and associated infrastructure requirements under Alternative 2 conflict with planned navigation and land uses. Land use and navigation planning for the Inner Whatcom Waterway area has focused on mixed-use redevelopment, with extensive enhancements to public shoreline access and transient moorage facilities. Significant interest has also been expressed for incorporating habitat restoration into shoreline land uses where such actions are compatible with land use and navigation needs. In contrast to this planned mixed-use redevelopment, Alternative 2 conducts the remediation of the Inner Whatcom Waterway using deep dredging consistent with deep-draft industrial uses. This dredging requires construction of hardened shorelines, bulkheads and industrial shoreline infrastructure to stabilize the deep shorelines and allow maintenance and use of the target dredge depths. These actions result in conflicts with planned land uses for the Inner Whatcom Waterway. These conflicts are intrinsic to Alternative 2, 3, 7 and 8.

- **Beneficial Impacts – Habitat Preservation and Enhancement:** Alternative 2 would enhance habitat quality at the shoulder of the ASB (Unit 5-B). Preserving and enhancing habitat in this area is consistent with the Bellingham Bay Comprehensive Strategy and will benefit juvenile salmonids and other fish and wildlife species.

- **Adverse Impact – Conflict with Planned ASB Reuse:** The ASB has been identified in previous land use studies as the preferred location for development of a future environmentally sustainable marina with integrated public access and habitat enhancements. Alternative 2 remediates the ASB by capping and directly conflicts with this planned reuse. Mitigation of this impact would require remediation of the ASB as provided under other project alternatives (Alternatives 5, 6, 7 or 8).

Air and Noise

Alternative 2 involves extensive construction activities associated with project dredging, capping and CAD site construction activities. These activities will take place in most areas of the site. Potential impacts to area noise and air quality levels will need to be mitigated to avoid environmental impacts. However, mitigation can be accomplished through the use of best practices for project design, permitting and construction.

Potential mitigation measures for noise impacts include 1) contractual requirements to avoid exceedances of ambient noise level restrictions, 2) contractor use of appropriate equipment including mufflers as required, and 3) use of appropriate work periods if required to comply with noise level restrictions.

Air quality impacts associated with capping activities could be experienced either through emissions from construction equipment, or through dust from temporary stockpiles of capping material prior to placement. These impacts can be mitigated through 1) contractual requirements to avoid impacts to air quality, 2) the use of appropriate equipment meeting applicable air quality control requirements, 3) the use of appropriate construction measures (e.g., wetting or covering of cap material stockpiles to control fugitive dust emissions, or 4) the direct supply of cap material by barges to the capping site. These mitigation measures should be incorporated during project design and permitting.

Cultural Resources

Alternative 2 involves extensive dredging activities, including dredging at the head of the Whatcom Waterway in the area near Citizens Dock. This was an area that was identified during previous archaeological assessment activities as potentially containing undisturbed historical or cultural resources. Potential measures to mitigate impacts to these resources would need to be developed during project design and permitting. This would likely be performed as part of the Section 106 consultations as part of Army Corps of Engineers permitting. This consultation would also cover other site areas, though the potential for presence of undisturbed cultural or historical resource in these other areas is much lower.

4.4 Project Alternative 3

Alternative 3 uses a combination of institutional controls, monitored natural recovery and containment to achieve compliance with SMS cleanup levels. Alternative 3 uses dredging to remove sediments from the Whatcom Waterway as necessary to allow use and maintenance of the 1960s federal navigation channel. These sediments are managed by creating a nearshore fill within the majority of the ASB. The portion of the ASB not required for the fill would be retained for stormwater or cooling water treatment uses.

4.4.1 Cleanup Description

The design concept for Alternative 3 is shown in Figure 4-4. A detailed description of the alternative is provided below.

Actions by Site Area

Cleanup Alternative 3 represents a modification of the cleanup Alternative "J" evaluated in a previous Supplemental Feasibility Study (Anchor, 2002) after closure of the Pulp Mill and Chlor-Alkali Plant. The original evaluation of this remedial alternative was based on continued industrial uses of the ASB and upland properties adjacent to the Whatcom Waterway site. These land uses are no longer applicable. A description of Alternative 3 by site unit follows:

- **Outer Whatcom Waterway (Unit 1):** Under Alternative 3, the outer portion of the waterway would be dredged to a minimum depth of 35 feet below MLLW. Where technically feasible, the dredging depths would be increased to allow dredging to the base of the impacted sediments in the channel areas. Anticipated dredge depths vary from 35 feet below MLLW to about 41 feet below MLLW. Under this alternative, dredging from the Outer Whatcom Waterway areas could potentially be conducted using either hydraulic or mechanical dredging. Hydraulic dredging could provide the most cost-effective initial placement of the sediments within the ASB, and may potentially reduce turbidity levels at the point of dredging. However, hydraulic dredging is not well suited for areas containing woody debris, as expected in the Waterway. Further, hydraulic dredging with a cutter-head dredge can leave significant dredging residuals, up to a foot in thickness. Finally, hydraulic dredging would create large quantities of dredge slurry and entrained water. That contaminated water would ultimately be discharged back to Bellingham Bay. Assuming typical operating parameters (i.e., a controlled 2,000 cubic yard per day dredge production rate, a 10:1 water to sediment ratio and either one or two dredge units operating simultaneously) the hydraulic dredging would result in discharge of between 4 million and 8 million gallons per day of produced dredge waters to the Bay. Mechanical dredging and hydraulic dredging would need to be evaluated

during remedial design to optimize project design and ensure protection of water quality during the dredging, both at the point of dredging and at the point of disposal for any generated waters. Sediments dredged from the waterway would be contained within the ASB fill as described below.

- **Inner Whatcom Waterway (Units 2 & 3):** Under Alternative 3, sediment dredging would be performed within the Inner Whatcom Waterway as necessary to provide for future use and maintenance of the federal navigation channel to the head of the waterway. The 1960s federal channel boundaries specify a water depth of 30 feet below MLLW from the BST area to Maple Street. A depth of 18 feet is specified from Maple Street to the head of the waterway. In the deeper portion of the waterway, the dredging cut would be established at depths at least 35 feet below MLLW. This would remove sediments where technically feasible, and would provide sufficient over-depth to allow residual sediments to be capped without impeding future maintenance of the federal channel. The design concept assumes a cap thickness of 3 feet over dredged areas with residual subsurface sediment impacts. Due to historical encroachment of the shoreline on the federal channel boundaries, many of the Inner Whatcom Waterway shoreline areas have fill and bulkheads up to or near to the pierhead line. Most of these bulkheads would require replacement and/or substantial upgrades in order to maintain shoreline stability in these areas during and after dredging. Docks may also have to be upgraded or replaced as described in Alternative 2 in order to accommodate channel channel dredging and future use. After dredging, the effective water depth (water depth at the pierhead line) will vary with location along the shoreline. The effective water depth will be controlled mostly by the type of shoreline infrastructure (i.e., nearshore fill, docks and bulkheads) that is established there. Without substantial infrastructure investments, the effective water depth for the Inner Whatcom Waterway will be significantly less in most areas than the federal channel project depth. The remedial costs of this alternative address only sediment removal. The costs of the shoreline infrastructure required to improve the effective waterway depth would be borne by area redevelopment actions.

- **Log Pond (Unit 4):** The Log Pond area was previously remediated as part of an Interim Action implemented in 2000. Subsequent monitoring has demonstrated the protectiveness of the subaqueous cap, and the effectiveness of habitat enhancement actions completed as part of that project. Actions in this area will be limited to enhancements to the shoreline edges of the cap, to ensure long-term stability of the cap edges. These enhancements are described in Appendix D of the FS report.

- **Areas Offshore of ASB (Unit 5):** Exceedances of site-specific cleanup goals within Unit 5-B will be remediated using sub-aqueous capping. Appendix C of the FS Report describes the design concept for this area, including methods to maintain cap stability in a manner compatible with anticipated permitting requirements. The remaining areas of Unit 5 comply with site-specific cleanup goals. No sediment capping or dredging is proposed for these areas at this time. Additional evaluations of sediment stability will be conducted as part of engineering design. These areas will be monitored to document the continued effectiveness of natural recovery at complying with cleanup levels. Additional measures will be taken in this area only if engineering design evaluations indicate that such measures are required.

- **Areas Adjacent to BST (Unit 6):** The area south of the barge docks at the Bellingham Shipping (Units 6-B and 6-C) exceeds SMS cleanup levels. This area will be remediated using a deep-water sub-aqueous cap. Final water depths in this area will be greater than -18 feet MLLW in most areas, consistent with shoreline infrastructure and navigation uses historically conducted there. The cap will be constructed of coarse granular materials and will be designed to resist potential prop-wash erosion effects. The remaining portions of Unit 6 comply with site-specific cleanup goals. No sediment capping or dredging is proposed for these areas. These areas will be monitored to document the continued effectiveness of natural recovery at complying with cleanup levels.

- **Starr Rock (Unit 7):** Sediments in the Starr Rock area currently comply with site-specific cleanup levels. No sediment capping or dredging is proposed for these areas. These areas will be monitored to document the continued effectiveness of natural recovery at complying with cleanup levels.

- **ASB (Unit 8):** Under Alternative 3, the ASB sludges would be contained within the existing ASB. Most sludges would simply be buried beneath the nearshore fill. However, the Alternative assumes that the sludges located in the outer portion of the ASB (the area not required for a nearshore fill) would be dredged and consolidated within the fill area. Construction sequencing would involve initial lowering of the water level of the ASB, followed by the removal of the wastewater treatment equipment (aerators, weirs, etc.). Dredging of sludges from the future edge of the nearshore fill would then be conducted. A berm would be constructed along this alignment. Finally, the remaining sludges would be dredged from the area outside of the berm, for consolidation within the new fill area. Because construction within the ASB would disrupt the bentonite sealant present along the

bottom and sides of the ASB, some additional measures (in addition to lowering of the water level of the ASB during construction) may be required to prevent significant water leakage through the berm during and after construction. These actions may include driving of sheet-piling, placement of new bentonite sealant, or other measures. Some residual sludges would likely remain in the dredged area of the ASB, and these would be managed by sediment capping.

Sediment Disposal

Under Alternative 3, the sediments dredged from the Waterway areas will be managed by containment in nearshore fill constructed in a portion of the ASB. The design concept estimates disposal of approximately 472,000 cubic yards of sediments dredged from the Outer and Inner Whatcom Waterway areas, and an additional 113,000 cubic yards of sediments dredged from Units 1A and 1B. Approximately 71,000 cubic yards of ASB sludges in the outer portion of the ASB would be consolidated in the fill area, along with the dredged sediments. Additional materials would be used to construct the containment berm within the ASB, and to cap the facility after placement of dredged sediments.

The principal remedial benefit associated with the ASB fill site is that the main ASB berm already exists, and does not need to be constructed. Secondly, the use of the ASB provides for consolidation of the ASB sludges as well as the dredged sediments from the Waterway.

Whether the Waterway dredging is conducted using hydraulic or mechanical dredging, the existing berms of the ASB facility would be maintained largely in their current configuration. A new berm would be constructed within the interior of the facility as described above.

Previous leachability studies conducted as part of the 2000 RI/FS and the PRDE investigation report (Anchor 2003) included evaluation of contaminant mobility under various conditions. Mobility of mercury was lowest in those tests under anoxic conditions. The design of the fill would place the dredged materials and ASB sludges below the elevation at which groundwater levels are anticipated to stabilize after facility construction. The elevated TOC content of the sediments and ASB sludges, combined with long-term groundwater saturation would tend to retain anoxic conditions within the impacted portion of the fill. Sediments from Unit 1A and 1B would be placed in upper portions of the fill, and clean sediments and/or soils would be placed on top of the final fill as a capping layer. The design and construction of the facility would provide for sediment and sludge consolidation.

The land created by the fill would be subject to further consolidation over time, due to decomposition of high-organic materials in the ASB sludges and the decomposition of woody materials in waterway sediments. This process

would be similar to the long-term settlement that occurs in solid waste landfills. Any future use of the property would need to allow for such settlement to occur. Pile-supported foundations would likely be required for most buildings, involving penetration of the pilings through the fill materials and into underlying sandy soils. Water quality evaluations conducted during design and permitting would need to address water quality issues within the fill, to ensure long-term protection of surface waters. If maintenance of the bentonite sealing layer within the fill is required for long-term surface water protection, then penetration of this layer with foundation pilings could be subject to significant limitations or could be prohibited altogether. Future development of enclosed structures within the fill area would also be subject to requirements for under-building methane-control systems, similar to those used for buildings constructed on peat deposits or for buildings on or adjacent to municipal landfills.

Long-term monitoring and maintenance and institutional controls for the nearshore fill would be required as part of the remedy.

The construction of the nearshore fill would need to be coordinated with the activities at the adjacent Central Waterfront site. This would mainly involve ensuring that construction and any future reuse of the fill area does not adversely impact groundwater conditions within the Central Waterfront site.

Costs & Schedule

The probable costs of Alternative 3 are approximately $34 million. In order of decreasing cost, this estimate address dredging and ASB site disposal of Waterway sediments, preparation and completion of the ASB facility, capping costs for harbor areas, enhancements to the Log Pond shoreline, and provisions for long-term monitoring. Long-term monitoring costs include provisions for groundwater and vapor monitoring associated with the fill area. The costs for Alternative 3 do not include the costs required to mitigate for SEPA environmental impacts.

The construction activities in Alternative 3 can likely be completed within three construction seasons. The range of construction time requirements is 2 to 4 years, depending on dredging rates and construction sequencing. Higher dredging rates reduce the restoration time, but are logistically more difficult to maintain. For hydraulic dredging, use of high production rates significantly increases the rates of water generation requiring treatment and discharge to Bellingham Bay. With the exception of the initial and final work within ASB area, work activities would be confined to appropriate “fish windows”. Because the ASB area is not connected to Bellingham Bay, some of the initial ASB preparation and the final capping activities within the ASB will not necessarily be time-limited by the “fish windows.”

4.4.2 Impacts, Benefits and Mitigation

Table 4-2 summarizes the environmental impacts, benefits and mitigation associated with Alternative 3.

Geology, Water and Environmental Health

Alternative 3 produces net adverse impacts under the environmental category including geology, water and environmental health. Significant impacts, benefits and potential mitigation requirements include the following:

- **Beneficial Impact – Sediment Cleanup:** Alternative 3 produces a beneficial impact through remediation and compliance with site cleanup levels consistent with MTCA and SMS requirements. Active cleanup is performed in the ASB Shoulder (Unit 5-B) area, the Barge Dock (Unit 6-B/C), the Inner and Outer Whatcom Waterway areas, and within the ASB. Monitored natural recovery and institutional controls are used to remediate other areas.

- **Mitigated Impacts – Construction Water Quality:** Alternative 3 involves extensive in-water construction activities associated with dredging, capping, and ASB fill construction, operation and closure. The project likely will require 3 in-water construction seasons to complete. These construction activities will need to be mitigated to avoid adverse water quality impacts. Examples of potential mitigation actions include 1) completion of additional water quality review as part of project design and permitting (i.e., Section 401 Water Quality Certification), 2) use of best practices for design, permitting, contracting and construction of dredging activities to minimize water quality impacts and dredge residuals, 4) water quality monitoring during construction, and 5) further evaluation of contaminant leachability and potential measures to protect against contaminant migration via groundwater to adjacent surface waters during long-term care of the completed fill. Alternative 3 may provide the ability to use hydraulic dredging for management of some sediments. Hydraulic dredging can produce lower turbidity levels at the point of dredging than many mechanical dredging methods. However, further evaluations would need to be conducted to determine potential impacts to water quality and associated treatment requirements for produced dredge waters, because of the high production of impacted dredged waters associated with hydraulic dredging.

- **Beneficial Impact – Control of Sediment Resuspension:** Alternative 3 conducts active remediation by capping in Site Units 5-B, 6-B/C and dredging and capping in the Whatcom Waterway channel. These actions reduce the potential for future resuspension of contaminated sediments in navigation areas.

- **Adverse Impact – Shoreline Destabilization:** Alternative 3 includes deep dredging in the Inner Whatcom Waterway in order to comply with the dimensions of the 1960s industrial channel. This deep dredging will tend to further destabilize existing shorelines in this area. To avoid shoreline stability failures, the shoreline will need to be stabilized with new infrastructure compatible with the deep dredging patterns. Mitigation will be required, including the construction of hardened shoreline treatments including bulkheads and over-water wharves. The potential costs to construct this type of shoreline infrastructure has been estimated at $20 to $40 million for the Inner Whatcom Waterway. These costs are not included in the remediation cost estimates of Alternative 3.

- **Beneficial Impact – Log Pond Shoreline Stabilization:** Limited erosion has been noted in some shoreline edges of the Log Pond cap. Under Alternative 3, these erosional areas would be corrected, resulting in improved long-term performance of the Log Pond cap, and prevention of erosion and/or recontamination.

- **Mitigated Impact – ASB Fill Settlement & Use Restrictions:** The reuse options for the ASB fill will be subject to geotechnical and environmental use restrictions. Geotechnical restrictions will be associated with primary and secondary settlement of the completed fill. This settlement is similar to the settlement that occurs with municipal landfills and will affect the construction methods for any buildings to be placed on the fill. Secondly, provisions to maintain groundwater quality could prohibit, or at least minimize, the use of foundation pilings to avoid compromising the bentonite lining of the ASB and increasing the migration potential of impacted fill leachate. The nature of the final use restrictions will be determined in future design and permitting activities and will be subject to further environmental review by Ecology and permitting agencies. Any planning for reuse of the fill area developed under Alternative 3 must take into account the effect of such restrictions.

Fish and Wildlife

Alternative 3 results in net adverse impacts to fish and wildlife. Under alternative 3 significant impacts, benefits and potential mitigation requirements include the following:

- **Beneficial Impacts – Environmental Protection:** Completion of site remediation provides protection of fish and wildlife from the potential effects of contaminated sediments.

- **Mitigated Impacts – Construction Disturbances:** Construction of Alternative 3 includes significant construction-related habitat disturbances. These disturbances will occur in several areas, including the dredging and cap areas. Potential disturbances to fish and wildlife must be mitigated in these areas through the use of best practices for project design, permitting and construction. Examples of best practices include 1) the timing of work activities to avoid migration periods for juvenile salmonids or other sensitive species, 2) the use of construction equipment, dredge methods, cap materials and placement methods that minimize water quality impacts, noise and physical disturbances to aquatic habitats, and 3) completion of additional environmental reviews as part of project design and permitting. These measures are considered likely to mitigate the short-term habitat impacts associated with construction disturbances under Alternative 3.

- **Adverse Impact – Inner Whatcom Waterway Nearshore Habitat:** Through dredging of the 1960s industrial channel, Alternative 3 eliminates existing emergent shallow-water habitats at the head and along the sides of the Inner Whatcom Waterway. These impacts likely exceed the level that will be mitigated by creation of new replacement habitat in alternative site areas (i.e., at the ASB shoulder). Impact avoidance would require the use of alternative channel dimensions (as in Alternative 4, 5 and 6). In addition to the direct impacts associated with the deep dredging, additional habitat impacts will be incurred during the construction of hardened shoreline infrastructure as necessary to stabilize shorelines and support the use and maintenance of the deep-draft waterway uses in the Inner Whatcom Waterway under Alternative 3.

- **Mitigated Impacts – Log Pond Shoreline Enhancements:** Construction of Alternative 3 will involve some in-water construction activities within the Log Pond to enhance the stability of area shorelines. These actions will involve a change in substrate conditions in limited areas, with placement of pebbles and beach gravels in some areas, and placement of stone groins for material retention in other areas. The actions are expected to result in minimal changes to the area of intertidal habitat. However, potential adverse impacts associated with substrate changes may require mitigation through habitat gains in other areas under the alternative.

- **Beneficial Impact – Development of New Habitat:** Alternative 3 includes development of a new habitat bench within Unit 5B. This habitat benefit is significant, but is likely offset by the other habitat impacts associated with completion of the project. The treatment of

the Inner Whatcom Waterway will continue to represent a "gap" in nearshore habitat along the salmonid migration corridors (see Figure 1-3) which is not addressed by development of the new habitat bench.

Land Use, Navigation and Public Shoreline Access

As with Alternative 2, Alternative 3 was initially designed to support industrial waterfront uses, consistent with land uses that predominated in the 1960s. The same conflicts with area zoning and planned land uses that were discussed for Alternative 2 are applicable to Alternative 3. A summary of significant impacts, benefits and mitigation for Alternative 3 is provided below:

- **Beneficial Impact – Outer Whatcom Waterway Navigation Benefits:** The shoreline infrastructure in the Outer Whatcom Waterway areas is similar to that shown in Figure 3-5 and currently supports deep draft navigation uses. Alternative 3 provides for dredging of deep draft areas of the Outer Whatcom Waterway, consistent with continued deep draft use capabilities. This alignment of dredging patterns with land use and navigation needs represents a benefit of Alternative 3.

- **Adverse Impact – Conflict with Inner Whatcom Waterway Land Uses**: The Inner Whatcom Waterway dredging plan and associated infrastructure requirements under Alternative 3 conflict with planned navigation and land uses. Land use and navigation planning for the Inner Whatcom Waterway area has focused on mixed-use redevelopment, with extensive enhancements to public shoreline access and transient moorage facilities. Significant interest has also been expressed for incorporating habitat restoration into shoreline land uses where such actions are compatible with land use and navigation needs. In contrast to this planned mixed-use redevelopment, Alternative 3 conducts the remediation of the Inner Whatcom Waterway using deep dredging consistent with deep-draft industrial uses. This dredging requires construction of hardened shorelines, bulkheads and industrial shoreline infrastructure to stabilize the deep shorelines and allow maintenance and use of the target dredge depths. These actions result in conflicts with planned land uses for the Inner Whatcom Waterway. These conflicts are intrinsic to Alternative 2, 3, 7 and 8.

- **Adverse Impact – Conflict with Planned ASB Reuse:** The ASB has been identified in previous land use studies as the preferred location for development of a future environmentally sustainable marina with integrated public access and habitat enhancements. Alternative 3 remediates the ASB by constructing a nearshore fill within the ASB for management of sludges and sediments dredged

from other site areas. This cleanup approach directly conflicts with the planned aquatic reuse of the ASB. Mitigation of this impact would require remediation of the ASB as provided under other project alternatives (Alternatives 5, 6, 7 or 8).

Air and Noise

Alternative 3 involves extensive construction activities associated with project dredging, capping and fill site construction activities. These activities will take place in most areas of the site. Potential impacts to area noise and air quality levels will need to be mitigated to avoid environmental impacts. However, mitigation can be accomplished through the use of best practices for project design, permitting and construction.

Potential mitigation measures for noise impacts include 1) contractual requirements to avoid exceedances of ambient noise level restrictions, 2) contractor use of appropriate equipment including mufflers as required, and 3) use of appropriate work periods if required to comply with noise level restrictions.

Air quality impacts associated with capping activities could be experienced either through emissions from construction equipment, or through dust from temporary stockpiles of capping material prior to placement. These impacts can be mitigated through 1) contractual requirements to avoid impacts to air quality, 2) the use of appropriate equipment meeting applicable air quality control requirements, 3) the use of appropriate construction measures (e.g., wetting or covering of cap material stockpiles to control fugitive dust emissions, or 4) the direct supply of cap material by barges to the capping site. These mitigation measures should be incorporated during project design and permitting.

Cultural Resources

Alternative 3 involves extensive dredging activities, including dredging at the head of the Whatcom Waterway in the area near Citizens Dock. This was an area that was identified during previous archaeological assessment activities as potentially containing undisturbed historical or cultural resources. Potential measures to mitigate impacts to these resources would need to be developed during project design and permitting. This would likely be performed as part of the Section 106 consultations as part of Army Corps of Engineers permitting. This consultation would also cover other site areas, though the potential for presence of undisturbed cultural or historical resource in these other areas is much lower.

4.5 Project Alternative 4

Cleanup Alternative 4 uses removal and upland disposal technology, in addition to institutional controls, monitored natural recovery and containment

to comply with SMS cleanup levels. The alternative uses capping in-place for management of the ASB sludges.

4.5.1 Cleanup Description

The design concept for Alternative 4 is shown in Figure 4-5. A detailed description of the alternative follows.

Actions by Site Area

Cleanup actions are described below by site unit. Dredging activities within the Whatcom Waterway are targeted on appropriate areas to support a multi-purpose Waterway concept, including a mix of deep-draft navigation, public access, transient moorage and habitat enhancement uses. Sediments dredged from the Waterway are managed by upland disposal at appropriately-permitted off-site facilities.

- **Outer Whatcom Waterway (Unit 1):** Under Alternative 4, the outer portion of the waterway would be dredged to a depth of approximately 35 feet below MLLW. The sediments removed during this dredging would be barged to an offload facility within Port-owned property. The sediments would be transferred to lined railcars for transportation to an appropriately-permitted offsite disposal facility. The cost estimates are based on the use of Subtitle D permitted landfills that can accept wet sediments for reuse as daily cover. Other disposal facilities that have appropriate environmental permits may be used, subject to applicable regulations and logistical considerations. The costs for sediment transportation and disposal under this alternative were based on pricing for eastern Washington and eastern Oregon landfills. This does not preclude potential use of alternate locations subject to final remedy design, permitting and contractor discretion. After removal of sediments to -35 feet MLLW, a thick sediment cap would be placed over residual impacted sediments. The cap would be designed to resist erosive forces of prop wash, and to minimize the potential for aquatic wildlife exposures. Based on previous sediment testing, the sediments from Units 1A and 1B appear to be suitable for beneficial reuse or PSDDA disposal, subject to final testing and suitability determinations. These sediments could potentially be reused as part of the project for capping subgrade within the Inner Whatcom Waterway. However, the fine particle size distribution within the Unit 1A/1B sediments makes this use subject to logistical and long-term stability considerations. The Alternative 4 cost estimate assumes that Unit 1A and 1B sediments that are dredged are managed by open water disposal consistent with PSDDA program requirements. Mechanical dredging methods would likely be used for the Outer Whatcom Waterway area, as hydraulic dredging is impracticable without a large area

for management of produced dredge waters and for separating entrained waters from dredge materials. Detailed dredging and construction procedures would be determined in project design and permitting.

- **Inner Whatcom Waterway (Units 2 & 3):** The design concept included in Alternative 4 assumes that the majority of the Inner Whatcom Waterway is to be managed for effective water depths of between 18 feet and 22 feet. This water depth range provides for navigation opportunities consistent with the mixed-use zoning of the waterfront properties. The central portion of the waterway is dredged to depths at least 5 feet below the planned effective water depth. A sediment cap is then applied over any residual sediments, with the cap grading from a minimum thickness of 3 feet, to a maximum thickness of 6 feet near the Log Pond. Shoreline slopes would be stabilized using appropriately designed side-slopes and materials that maximize nearshore habitat quality and quantity, while maintaining stability and providing for appropriate navigation needs within the Waterway. Under Alternative 4, the emergent tideflats at the head of the waterway are preserved, and shallow-water habitat areas along the sides of the waterway are preserved and enhanced.

- **Log Pond (Unit 4):** The Log Pond area was previously remediated as part of an Interim Action implemented in 2000. Subsequent monitoring has demonstrated the protectiveness of the subaqueous cap, and the effectiveness of habitat enhancement actions completed as part of that project. Actions in this area will be limited to enhancements to the shoreline edges of the cap, to ensure long-term stability of the cap edges. These enhancements are described in Appendix D of the FS Report report.

- **Areas Offshore of ASB (Unit 5):** Exceedances of site-specific cleanup goals within Unit 5-B will be remediated using sub-aqueous capping. Appendix C of the FS Report describes the design concept for this area, including methods to maintain cap stability in a manner compatible with anticipated permitting requirements. The remaining areas of Unit 5 comply with site-specific cleanup goals. No sediment capping or dredging is proposed for these areas at this time. Additional evaluations of sediment stability will be conducted as part of engineering design. These areas will be monitored to document the continued effectiveness of natural recovery at complying with cleanup levels. Additional measures will be taken in this area only if engineering design evaluations indicate that such measures are required.

- **Areas Adjacent to BST (Unit 6):** The area south of the barge docks at the Bellingham Shipping (Units 6-B and 6-C) exceeds of SMS cleanup levels. This area will be remediated using a deep-water sub-aqueous cap. Final water depths in this area will be greater than -18 feet MLLW in most areas, consistent with shoreline infrastructure and navigation uses historically conducted there. The cap will be constructed of coarse granular materials and will be designed to resist potential prop-wash erosion effects. The remaining portions of Unit 6 comply with site-specific cleanup goals. No sediment capping or dredging is proposed for these areas. These areas will be monitored to document the continued effectiveness of natural recovery at complying with cleanup levels.

- **Starr Rock (Unit 7):** Sediments in the Starr Rock area currently comply with site-specific cleanup levels. No sediment capping or dredging is proposed for these areas. These areas will be monitored to document the continued effectiveness of natural recovery at complying with cleanup levels.

- **ASB (Unit 8):** As with Alternatives 1 and 2, the ASB will be remediated using a thick sub-aqueous cap.

Sediment Disposal

Sediments removed from Waterway areas under this Alternative will be managed by disposal at a Subtitle D upland disposal facility. Subtitle D facilities are commercially available, and are designed and permitted for management of solid waste. The design of Subtitle D facilities includes a liner, a cap, a monitoring network, and institutional controls and financial assurance provisions under state and federal solid waste regulations.

The design concept for Alternative 4 estimates disposal of approximately 68,000 cubic yards of sediments dredged from the Outer and Inner Whatcom Waterway areas at upland disposal sites. An additional 113,000 cubic yards of sediments dredged from Units 1A and 1B would be managed by beneficial reuse or PSDDA disposal.

Options for transportation of dredged materials to upland disposal sites include barge, truck and rail. Barge transportation can utilize alternate offloading locations located away from the site. Such offloading facilities exist in Seattle, Vancouver B.C. and elsewhere. The sediments are generally then transferred to truck or rail for final shipment to the disposal facility. Truck transportation is commonly used for small sediment volumes. Multiple intermodal yards exist around the region where truck containers can be transloaded for final rail shipment to the disposal site. However, for large sediment volumes, truck transportation results in additional traffic burdens and is less fuel efficient than rail transportation. The design concept and cost estimate assumes the placement of temporary rail improvements at the former

GP mill site, and shipment of sediments directly from the site to the upland disposal site by rail. Stormwater management and "surge" stockpile areas are included in the project cost assumptions.

Costs & Schedule

The probable costs of Alternative 4 are approximately $21 million. The costs of Alternative 4 are the second lowest of all of the evaluated alternatives. In order of decreasing cost, this estimate addresses dredging and upland disposal of Whatcom Waterway sediments, capping costs for the ASB and harbor areas, enhancements to the Log Pond shoreline, and provisions for long-term monitoring.

The in-water construction activities in Alternative 4 can likely be completed within a single construction season. With the exception of the ASB area, and initial preparation and final demobilization of the upland sediment offload area, work activities would be confined to appropriate "fish windows". Because the ASB area is not connected to Bellingham Bay, the capping activities within the ASB will not necessarily be time-limited by the "fish windows".

Monitoring of capped and natural recovery areas will occur under Alternative 4. Because natural recovery is only applied in areas that have already achieved compliance with cleanup standards, additional restoration time would not be required.

4.5.2 Impacts, Benefits and Mitigation

Table 4-2 summarizes the environmental impacts, benefits and mitigation associated with Alternative 4.

Geology, Water and Environmental Health

Alternative 4 includes net beneficial impacts in the category including geology, water and environmental health. Significant impacts, benefits and potential mitigation requirements include the following:

- **Beneficial Impact – Sediment Cleanup:** Alternative 4 produces a beneficial impact through remediation and compliance with site cleanup levels consistent with MTCA and SMS requirements. Active cleanup is performed in the ASB Shoulder (Unit 5-B) area, the Barge Dock (Unit 6-B/C), the Inner and Outer Whatcom Waterway areas, and within the ASB. Monitored natural recovery and institutional controls are used to remediate other areas.

- **Mitigated Impact – Construction Water Quality:** Alternative 4 involves in-water construction activities that can likely be completed within 1, or at most 2 construction seasons. This alternative has a lower potential for water quality impacts than any

alternatives except for Alternative 1 and the No Action Alternative. To minimize the potential for adverse water quality impacts, these construction activities will need to be mitigated to avoid adverse water quality impacts. Examples of potential mitigation actions include 1) completion of additional water quality review as part of project design and permitting (i.e., Section 401 Water Quality Certification), 2) use of best practices for design, permitting, contracting and construction of dredging activities to minimize water quality impacts and dredge residuals, and 3) water quality monitoring during construction.

- **Beneficial Impact – Control of Sediment Resuspension:** Alternative 4 conducts active remediation by capping and dredging in the impacted harbor areas and in the Whatcom Waterway channel. These actions reduce the potential for future sediment resuspension in these areas.

- **Beneficial Impact – Channel Updating & Stabilization:** Alternative 4 includes updating of Whatcom Waterway channel dimensions, consistent with plans for a locally-managed multi-purpose channel. Under this alternative, dredging activities within the waterway are graded, to provide deep draft use areas in the Outer Whatcom Waterway, and to address planned land uses within the Inner Whatcom Waterway. Because the infrastructure exists in the Outer Whatcom Waterway to accommodate deep draft uses, no impacts are associated with deep dredging in that location. For the Inner Whatcom Waterway, Alternative 4 avoids the adverse impacts associated with destabilization of the existing shorelines under Alternatives 2 and 3. Rather, Alternative 4 provides for effective water depths of between 18 and 22 feet, consistent with the needs for transient moorage and planned uses for the Inner Whatcom Waterway area. Additionally, Alternative 4 provides for stabilization of the side-slopes of the Inner Whatcom Waterway without requiring extensive use of hardened shoreline infrastructure. Alternative 4 allows for shorelines to be softened using slope treatments similar to those shown in Figure 3-6, without adversely impacting navigation opportunities. This shoreline stabilization approach provides significant benefits to habitat conditions within the Inner Whatcom Waterway, as described below.

- **Beneficial Impact – Log Pond Shoreline Stabilization:** Limited erosion has been noted in some shoreline edges of the Log Pond cap. Under Alternative 4, these erosional areas would be corrected, resulting in improved long-term performance of the Log Pond cap, and prevention of erosion and/or recontamination.

Fish and Wildlife

Alternative 4 results in net beneficial impacts to fish and wildlife. Significant impacts, benefits and potential mitigation requirements relative to fish and wildlife include the following:

- **Beneficial Impacts – Environmental Protection:** Completion of site remediation provides protection of fish and wildlife from the potential effects of contaminated sediments.

- **Mitigated Impact – Construction Disturbances:** Construction disturbances of Alternative 4 are significant, but are less than under Alternatives 2 and 3. These short-term disturbances will occur in the dredging and cap areas shown in Figure 4-5. Potential disturbances to fish and wildlife must be mitigated in these areas through the use of best practices for project design, permitting and construction. Examples of best practices include 1) the timing of work activities to avoid migration periods for juvenile salmonids or other sensitive species, 2) the use of construction equipment, dredge methods, cap materials and placement methods that minimize water quality impacts, noise and physical disturbances to aquatic habitats, and 3) completion of additional environmental reviews as part of project design and permitting. These measures are considered likely to mitigate the short-term habitat impacts associated with construction disturbances under Alternative 4.

- **Beneficial Impact – Inner Whatcom Waterway Habitat:** Alternative 4 preserves and enhances existing nearshore aquatic habitats at the head and along the sides of the Inner Whatcom Waterway. The shoreline stabilization and channel patterns provided under Alternative 4 incorporate habitat enhancement in their design. The alternatives provides for large stretches of continuous habitat enhancement along important salmonid migration corridors, and provides habitat connectivity with recent restoration actions completed by the City in the Whatcom Creek Estuary and Maritime Heritage Park (see Figure 1-2).

- **Mitigated Impacts – Log Pond Shoreline Enhancements:** Construction of Alternative 4 will involve some in-water construction activities within the Log Pond to enhance the stability of area shorelines. These actions will involve a change in substrate conditions in limited areas, with placement of pebbles and beach gravels in some areas, and placement of stone groins for material retention in other areas. The actions are expected to result in minimal changes to the area of intertidal habitat. However, potential adverse impacts associated with substrate changes may require mitigation through habitat gains in other areas under the alternative.

- **Beneficial Impact – Development of New Habitat:** Alternative 4 includes development of a new habitat bench within Unit 5B. This is likely to result in a net beneficial impact for fish and wildlife in conjunction with other project actions of Alternative 4.

Land Use, Navigation and Public Shoreline Access

Alternative 4 is the first of the evaluated alternatives that specifically addresses local land use and navigation plans for the Whatcom Waterway. This provides a beneficial impact under this Alternative, supporting waterfront revitalization efforts. However, the capping of the ASB under Alternative 4 offsets these benefits and results in a net impact to land use, navigation and public shoreline access under Alternative 4. A summary of significant impacts, benefits and mitigation for Alternative 4 is provided below:

- **Beneficial Impacts – Outer Whatcom Waterway Navigation:** Like Alternatives 2 and 3, Alternative 4 supports continued deep draft navigation capabilities in the Outer Whatcom Waterway where the shoreline infrastructure currently supports deep draft navigation uses. This alignment of dredging patterns with land use and navigation needs represents a benefit of Alternative 4.

- **Beneficial Impact – Inner Whatcom Waterway Land Use**: Alternative 4 includes updating of Whatcom Waterway channel dimensions, consistent with plans for a locally-managed multi-purpose channel. Alternative 4 provides for effective water depths of between 18 and 22 feet, consistent with historical authorized depths in the Inner Whatcom Waterway, and consistent with the needs for transient moorage and other uses planned for the Inner Whatcom Waterway area. Additionally, Alternative 4 provides for stabilization of the side-slopes of the Inner Whatcom Waterway without requiring extensive use of hardened shoreline infrastructure. Alternative 4 allows for shorelines to be softened using slope treatments similar to those shown in Figure 3-6, without adversely impacting navigation opportunities. Infrastructure costs are reduced while simultaneously maximizing land use flexibility and improving both habitat conditions and navigation opportunities. Effective water depths within the Inner Whatcom Waterway will be between 18 and 22 feet under this Alternative. Deeper draft vessels can be accommodated in the Outer Whatcom Waterway near the Bellingham Shipping Terminal. The navigation uses for the Inner Whatcom Waterway would accommodate transitional uses by tug boats and barges. Compatible navigation uses consistent with the long-term redevelopment of the waterfront include access by recreational vessels, whale watching boats, intermediate-draft institutional vessels (i.e., research boats), sailing ships (i.e., most “Tall Ships Festival” vessels) and most passenger-only ferries. Alternative 4

stabilizes Inner Whatcom Waterway shoreline without triggering requirements for substantial new shoreline infrastructure. This substantially reduces the mitigation costs and land use and habitat impacts associated with preceding Alternatives 2 and 3.

- **Adverse Impact – Conflicts with planned ASB Reuse:** The ASB has been identified in previous land use studies as the preferred location for development of a future environmentally sustainable marina. Alternative 4 does not remove contaminated sludges from the ASB. The capping of the ASB sludges in place would prevent future use of the area for development of an environmentally sustainable marina with integrated public access and habitat enhancements. This conflict between cleanup and planned land use represents an adverse impact of Alternative 4 that cannot be mitigated. Avoidance of this impact would require remediation of the ASB as provided under other project alternatives (Alternatives 5, 6, 7 or 8).

Air and Noise

Alternative 4 involves significant construction activities associated with project dredging and capping. These activities will take place over the course of one or two construction seasons. Potential impacts to area noise and air quality levels will need to be mitigated to avoid environmental impacts. However, mitigation can be accomplished through the use of best practices for project design, permitting and construction.

Potential mitigation measures for noise impacts include 1) contractual requirements to avoid exceedances of ambient noise level restrictions, 2) contractor use of appropriate equipment including mufflers as required, and 3) use of appropriate work periods if required to comply with noise level restrictions.

Air quality impacts associated with capping activities could be experienced either through emissions from construction equipment, or through dust from temporary stockpiles of capping material prior to placement. These impacts can be mitigated through 1) contractual requirements to avoid impacts to air quality, 2) the use of appropriate equipment meeting applicable air quality control requirements, 3) the use of appropriate construction measures (e.g., wetting or covering of cap material stockpiles to control fugitive dust emissions, or 4) the direct supply of cap material by barges to the capping site. These mitigation measures should be incorporated during project design and permitting.

Cultural Resources

Alternative 4 does not include dredging at the head of the Whatcom Waterway in the area near former Citizens Dock. This was an area that was identified during previous archaeological assessment activities as

potentially containing undisturbed historical or cultural resources. While additional historical and cultural resource review will be performed as part of the Section 106 consultations as part of project permitting, Alternative 4 has a low probability of impacting historical or archaeological resources.

4.6 Project Alternative 5

Alternative 5 uses multiple technologies to comply with SMS cleanup levels. Institutional controls, monitored natural recovery and containment are used in various portions of the site. Removal and upland disposal are used for ASB sludges and impacted sediments from outside of the ASB. The ASB sludges are treated to achieve volume reduction prior to disposal.

4.6.1 Cleanup Description

The design concept for Alternative 5 is shown in Figure 4-6. A detailed description of the alternative follows.

Actions by Site Area

Under Alternative 5 dredging activities within the Whatcom Waterway are targeted on appropriate areas to support a multi-purpose Waterway concept, including a mix of deep-draft navigation, public access, transient moorage and habitat enhancement uses. Sediments dredged from the Waterway and the sludges removed from the ASB are managed by upland disposal at appropriately-permitted off-site Subtitle D facilities. Specific actions within each site unit are described below:

- **Outer Whatcom Waterway (Unit 1):** Under Alternative 5, the outer portion of the waterway would be dredged to a depth approximately 35 feet below MLLW, as with Alternative 4. The residual sediments in this area would be capped with a thick sediment cap. The cap would provide a sufficient thickness of cap material to allow for future waterway maintenance dredging, and would provide resistance against potential erosion by prop wash. Sediments removed during this dredging would be barged to an offload facility within Port-owned property, and would be transferred to for transportation to an appropriately-permitted offsite disposal facility. The sediments from waterway Units 1A and 1B are managed by PSDDA disposal, as in Alternative 4. Mechanical dredging methods would likely be used in the Outer Whatcom Waterway area.

- **Inner Whatcom Waterway (Units 2 & 3):** The cleanup of the Inner Whatcom Waterway will be performed using the same approach as with Alternative 4. The alternative assumes that the 1960s federal channel will be updated at the head of the waterway to provide for integrated public access, habitat enhancement and navigation uses. The design concept for Alternative 5 assumes that the majority of

the Inner Whatcom Waterway is managed for effective water depths of between 18 feet and 22 feet. This water depth range provides for navigation opportunities consistent with the mixed-use zoning of the waterfront properties. Under Alternative 5, the emergent tideflats at the head of the waterway are preserved, and shallow-water habitat areas along the sides of the waterway are preserved and enhanced. At the same time, the central portion of the waterway is dredged to depths 5 feet below the planned effective water depth. A sediment cap is then applied over any residual sediments, with the cap grading from a minimum thickness of 3 feet, to a maximum thickness of 6 feet in areas near the Log Pond and Bellingham Shipping Terminal. Shoreline slopes would be stabilized using appropriate side-slopes and materials.

- **Log Pond (Unit 4):** The Log Pond area was previously remediated as part of an Interim Action implemented in 2000. Subsequent monitoring has demonstrated the protectiveness of the subaqueous cap, and the effectiveness of habitat enhancement actions completed as part of that project. Actions in this area will be limited to enhancements to the shoreline edges of the cap, to ensure long-term stability of the cap edges. These enhancements are described in Appendix D of the FS Report.

- **Areas Offshore of ASB (Unit 5):** Exceedances of site-specific cleanup goals within Unit 5-B will be remediated using sub-aqueous capping. Appendix C of the FS Report describes the design concept for this area, including methods to maintain cap stability in a manner compatible with anticipated permitting requirements. The remaining areas of Unit 5 comply with site-specific cleanup goals. No sediment capping or dredging is proposed for these areas at this time. Additional evaluations of sediment stability will be conducted as part of engineering design. These areas will be monitored to document the continued effectiveness of natural recovery at complying with cleanup levels. Additional measures will be taken in this area only if engineering design evaluations indicate that such measures are required.

- **Areas Near Bellingham Shipping Terminal (Unit 6):** The area south of the barge docks at the Bellingham Shipping (Units 6-B and 6-C) exceeds SMS cleanup levels. This area will be remediated using a deep-water sub-aqueous cap. Final water depths in this area will be greater than -18 feet MLLW in most areas, consistent with shoreline infrastructure and navigation uses historically conducted there. The cap will be constructed of coarse granular materials and will be designed to resist potential prop-wash erosion effects. The remaining portions of Unit 6 comply with site-specific cleanup goals. No sediment capping or dredging is proposed for these

areas. These areas will be monitored to document the continued effectiveness of natural recovery at complying with cleanup levels.

- **Starr Rock (Unit 7):** Sediments in the Starr Rock area currently comply with site-specific cleanup levels. No sediment capping or dredging is proposed for these areas. These areas will be monitored to document the continued effectiveness of natural recovery at complying with cleanup levels.

- **ASB (Unit 8):** Under Alternative 5, the ASB sludges would be removed from the waterfront. The design concept is based on a five-step process. First, the water level in the ASB will be lowered and the connection between the ASB and the outfall plugged. Second, the water treatment equipment (aerators, weirs, etc.) will be removed, and the tops of the berms removed. These berm materials consist of clean sand and stone materials used to construct the ASB and can be reused within other portions of the project area. The exterior of the berm will be reduced in elevation to approximately 16 feet above MLLW. The interior of the berm will be removed to elevations approximately 10 feet above MLLW. Sheet piling will be driven along the berm to prevent migration of impacted water through the berm during dredging. Third, the majority of the ASB sludges will be removed by hydraulic dredging. The hydraulic dredge slurry will be treated in centrifuges or hydrocyclones to separate sludge solids form the entrained waters. Solids separated from the dredge slurry will be shipped by rail for upland disposal. Water from the hydraulic dredging will be returned to the ASB in a closed-loop system, to minimize the overall generation of contaminated waters. The use of hydraulic dredging and maintenance of a water layer overlying the sludges during removal will also minimize odors and potential wildlife exposures during sludge removal. During the fourth step, the impacted waters from the ASB will be pumped out, treated to remove suspended and dissolved contaminants, and will be discharged to the sanitary sewer. If sewer capacity is limited, the treated waters will be managed using a permitted temporary surface water discharge. Finally, the residual solids within the dewatered ASB will be removed by land-based excavation equipment. By conducting this final phase of removal without overlying water, the result will maximize sludge removal and minimize residual contamination. Following cleanout of the sludges, the sheet-piling may be removed from the ASB, the ASB filled to appropriate elevations with surface water, and the berm opened. Some additional impacted sediments will be generated for upland disposal at the time the new access channel to the ASB (Unit 2-B) is created.

Sediment Disposal

Sediments removed from Waterway under this Alternative will be managed by disposal in appropriately-permitted upland disposal sites. The design concept for Alternative 5 estimates disposal of approximately 76,000 cubic yards of sediments dredged from the Outer and Inner Whatcom Waterway areas and the disposal of approximately 412,000 cubic yards of sludges removed from the ASB. An additional 113,000 cubic yards of sediments dredged from Units 1A and 1B would be managed by beneficial reuse or PSDDA disposal.

The design concept for Alternative 5 assumes that dredged sediments and ASB sludges are shipped by rail to the upland disposal site. Rail shipment is more fuel efficient and provides fewer traffic conflicts than truck transportation. As with Alternative 4, the Alternative 5 design concept and cost estimate assumes the placement of temporary rail improvements at the former GP mill site. Stormwater management and "surge" stockpile areas are included in the project cost assumptions.

Costs & Schedule

The probable costs of Alternative 5 are approximately $42 million. In order of decreasing cost, this estimate addresses removal and disposal of the ASB sludges, dredging and upland disposal of Whatcom Waterway sediments, capping costs for the Waterway and harbor areas, enhancements to the Log Pond shoreline, and provisions for long-term monitoring. Under Alternative 5, clean sediments and stone from the ASB berms are reused within the project as part of capping, shoreline stabilization and habitat enhancement actions.

Because of the work within the ASB, the construction activities are more complex than those in alternative 4, resulting in a longer construction period. The construction of alternative 5 will likely require a three-phase construction cycle, taking place over a 3 to 4 year period. The initial ASB preparation and waterway dredging activities will take place during the first construction phase. The second construction phase will involve ASB sludge removal, dewatering and final ASB cleanout. The final construction phase will involve opening of the ASB berm, completion of final dredging and capping activities within the waterway areas. The first and third phases of construction will be restricted to appropriate "fish windows." The second construction phase will not involve activities in areas connected to surface water, and will not necessarily be subject to "fish window" limitations.

Monitoring of capped and natural recovery areas will occur under Alternative 5. Because natural recovery is only applied in areas that have already achieved compliance with cleanup standards, additional restoration time would not be required.

4.6.2 Impacts, Benefits and Mitigation

Alternative 5 provides for substantial net benefits under three of the five environmental categories evaluated in this EIS, and mitigation of potential impacts under the other two categories. Table 4-2 summarizes the impacts, benefits and mitigation associated with Alternative 5.

Geology, Water and Environmental Health

Alternative 5 provides net beneficial impacts under the environmental category including geology, water and environmental health. Significant impacts, benefits and potential mitigation requirements include the following:

- **Beneficial Impact – Sediment Cleanup:** Alternative 5 produces a beneficial impact through remediation and compliance with site cleanup levels consistent with MTCA and SMS requirements. Active cleanup is performed in the ASB Shoulder (Unit 5-B) area, the Barge Dock (Unit 6-B/C), the Inner and Outer Whatcom Waterway areas, and within the ASB. Monitored natural recovery and institutional controls are used to remediate other areas.

- **Mitigated Impact – Construction Water Quality:** Alternative 5 involves extensive construction activities, requiring two in-water construction seasons, and 1-2 additional years for remediation of ASB sludges. To minimize the potential for adverse water quality impacts, these construction activities will need to be mitigated to avoid adverse water quality impacts. Examples of potential mitigation actions include 1) completion of additional water quality review as part of project design and permitting (i.e., Section 401 Water Quality Certification), 2) use of best practices for design, permitting, contracting and construction of dredging activities to minimize water quality impacts and dredge residuals, and 3) water quality monitoring during construction.

- **Beneficial Impact – Control of Sediment Resuspension:** Alternative 5 conducts active remediation by capping and dredging in the impacted harbor areas and in the Whatcom Waterway channel. These actions reduce the potential for future sediment resuspension in these areas.

- **Beneficial Impact – Channel Updating & Stabilization:** Alternative 5 includes updating of Whatcom Waterway channel dimensions, consistent with plans for a locally-managed multi-purpose channel. Under this alternative, dredging activities within the waterway are graded, to provide deep draft use areas in the Outer Whatcom Waterway, and to address multiple land use priorities for the Inner Whatcom Waterway. Because the infrastructure exists in the Outer Whatcom Waterway to accommodate deep draft uses, no impacts are associated with deep

dredging in that location. For the Inner Whatcom Waterway, Alternative 5 avoids the adverse impacts associated with destabilization of the existing shorelines under Alternatives 2 and 3. Rather, Alternative 5 provides for effective water depths of between 18 and 22 feet, consistent with the needs for transient moorage and planned land uses within the Inner Whatcom Waterway area. Additionally, Alternative 5 provides for stabilization of the side-slopes of the Inner Whatcom Waterway without requiring extensive use of hardened shoreline infrastructure. Alternative 5 allows for shorelines to be softened using slope treatments similar to those shown in Figure 3-6, without adversely impacting navigation opportunities. This shoreline stabilization approach provides significant benefits to habitat conditions within the Inner Whatcom Waterway, as described below.

- **Beneficial Impact – Log Pond Shoreline Stabilization:** Limited erosion has been noted in some shoreline edges of the Log Pond cap. Under Alternative 5, these erosional areas would be corrected, resulting in improved long-term performance of the Log Pond cap, and prevention of erosion and/or recontamination.

- **Beneficial Impact -- Berm Material Reuse:** Alternative 5 provides for reuse of clean sand and stone materials from the ASB berm. These materials can be used during site cleanup, habitat enhancement and area redevelopment activities. Material reuse conserves environmental resources, and avoids the need for quarrying of new materials from off-site locations. This provides a net environmental benefit relative to preceding project Alternatives.

Fish and Wildlife

Alternative 5 produces a substantial net environmental benefit for fish and wildlife. The alternative incorporates habitat enhancements within the Inner Whatcom Waterway, at the shoulder of the ASB and within the ASB interior. Significant impacts, benefits and potential mitigation requirements relative to fish and wildlife include the following:

- **Beneficial Impacts – Environmental Protection:** Completion of site remediation provides protection of fish and wildlife from the potential effects of contaminated sediments.

- **Mitigated Impact – Construction Disturbances:** Construction activities of Alternative 5 are significant, but are less than under Alternatives 2 and 3. These short-term disturbances will occur in the dredging and cap areas shown in Figure 4-6. The removal of the ASB sludges is conducted prior to opening of the ASB to

Bellingham Bay, reducing potential for impacts during this portion of the work. Potential disturbances to fish and wildlife can be mitigated through the use of best practices for project design, permitting and construction. Examples of best practices include 1) the timing of work activities to avoid migration periods for juvenile salmonids or other sensitive species, 2) the use of construction equipment, dredge methods, cap materials and placement methods that minimize water quality impacts, noise and physical disturbances to aquatic habitats, and 3) completion of additional environmental reviews as part of project design and permitting. These measures are considered likely to mitigate the short-term habitat impacts associated with construction disturbances under Alternative 5.

- **Beneficial Impact – Inner Whatcom Waterway Habitat:** Alternative 5 preserves and enhances existing nearshore aquatic habitats at the head and along the sides of the Inner Whatcom Waterway. This represents a benefit relative to other project alternatives (i.e., Alternatives 2, 3, 7 and 8) that permanently disrupt these emergent habitat areas. The shoreline stabilization and channel patterns provided under Alternative 5 specifically incorporate habitat enhancement in their design. The alternatives provides for large stretches of continuous habitat enhancement along important salmonid migration corridors, and provides habitat connectivity with recent restoration actions completed by the City in the Whatcom Creek Estuary and Maritime Heritage Park (see Figure 1-2). These benefits are achieved under Alternative 5 without adversely impacting shoreline land uses or anticipated navigation opportunities within the Inner Whatcom Waterway. Some conversion of nearshore habitat to deep water habitat is required to develop the marina access channel in Unit 2-B, but this change is offset by net habitat benefits achieved in other portions of the waterway and parts of the site.

- **Mitigated Impacts – Log Pond Shoreline Enhancements:** Construction of Alternative 5 will involve some in-water construction activities within the Log Pond to enhance the stability of area shorelines. These actions will involve a change in substrate conditions in limited areas, with placement of pebbles and beach gravels in some areas, and placement of stone groins for material retention in other areas. The actions are expected to result in minimal changes to the area of intertidal habitat. However, potential adverse impacts associated with substrate changes may require mitigation through habitat gains in other areas under the alternative.

- **Beneficial Impact – Unit 5-B Capping Area:** Alternative 5 achieves development of a new habitat bench within Unit 5B. This habitat benefit is significant. Under Alternative 5, this habitat area is contiguous with habitat enhancement areas in the Inner Whatcom Waterway, and with new habitat areas developed inside the restored ASB.

- **Beneficial Impact – Aquatic Reuse of ASB:** Alternative 5 also provides for sludge cleanout of the ASB, including opening of the remediated facility for future aquatic uses. This results in the development of 4,500 linear feet of new nearshore migration corridors for juvenile salmonids, and restoration of over 28 acres of new open water habitat.

Land Use, Navigation and Public Shoreline Access

Alternative 5 directly addresses identified land use, navigation and public shoreline access plans for the New Whatcom area. Like Alternative 4, the cleanup approach provides for development of a multi-purpose channel in the Whatcom Waterway. In addition, the alternative provides for aquatic reuse of the ASB for development of an environmentally sustainable marina with integrated public access and habitat enhancements. Alternative 5 provides net beneficial impacts under the categories of land use, navigation and public shoreline access. A summary of significant impacts, benefits and mitigation for Alternative 5 is provided below:

- **Beneficial Impacts – Outer Whatcom Waterway Navigation:** Like Alternatives 2, 3, and 4, Alternative 5 supports continued deep draft navigation capabilities in the Outer Whatcom Waterway where the shoreline infrastructure currently supports deep draft navigation uses. This alignment of dredging patterns with land use and navigation needs represents a benefit of Alternative 5.

- **Beneficial Impact – Inner Whatcom Waterway Land Use**: Alternative 5 includes updating of Whatcom Waterway channel dimensions, consistent with plans for a locally-managed multi-purpose channel. Alternative 5 provides for effective water depths of between 18 and 22 feet, consistent with historical authorized depths in the Inner Whatcom Waterway, and consistent with the needs for transient moorage and other uses planned for the Inner Whatcom Waterway area. Additionally, Alternative 5 provides for stabilization of the side-slopes of the Inner Whatcom Waterway without requiring extensive use of hardened shoreline infrastructure. Alternative 5 allows for shorelines to be softened using slope treatments similar to those shown in Figure 3-6, without adversely impacting navigation opportunities. Infrastructure costs are reduced while simultaneously maximizing land use flexibility and improving both habitat conditions and

navigation opportunities. Effective water depths within the Inner Whatcom Waterway will be between 18 and 22 feet under this Alternative. Deeper draft vessels can be accommodated in the Outer Whatcom Waterway near the Bellingham Shipping Terminal. The navigation uses for the Inner Whatcom Waterway would accommodate transitional uses by tug boats and barges. Compatible navigation uses consistent with the long-term redevelopment of the waterfront include access by recreational vessels, whale watching boats, intermediate-draft institutional vessels (i.e., research boats), sailing ships (i.e., most "Tall Ships Festival" vessels) and most passenger-only ferries. Alternative 5 stabilizes Inner Whatcom Waterway shoreline without triggering requirements for substantial new shoreline infrastructure. This substantially reduces the cost, land use and habitat impacts associated with preceding Alternatives 2 and 3.

- **Beneficial Impact – Consistency with Planned ASB Reuse:** The ASB has been identified in previous land use studies as the preferred location for development of a future environmentally sustainable marina. Alternative 5 removes contaminated sludges from the ASB and reconnects the remediated ASB to surface waters of Bellingham Bay using an access channel constructed in Unit 2-B. This cleanup approach allows for aquatic reuse of the ASB as part of waterfront revitalization efforts, consistent with waterfront design concepts shown in Figure 3-7 and Appendix E.

Air and Noise

Alternative 5 involves significant construction activities associated with project dredging and capping activities. These activities will take place over the course of three to four construction seasons. Potential impacts to area noise and air quality levels will need to be mitigated to avoid environmental impacts. However, mitigation can be accomplished through the use of best practices for project design, permitting and construction.

Potential mitigation measures for noise impacts include 1) contractual requirements to avoid exceedances of ambient noise level restrictions, 2) contractor use of appropriate equipment including mufflers as required, and 3) use of appropriate work periods if required to comply with noise level restrictions.

Air quality impacts associated with capping activities could be experienced either through emissions from construction equipment, or through dust from temporary stockpiles of capping material prior to placement. These impacts can be mitigated through 1) contractual requirements to avoid impacts to air quality, 2) the use of appropriate equipment meeting applicable air quality control requirements, 3) the use of appropriate construction measures (e.g., wetting or covering of cap material stockpiles to control fugitive dust

emissions, or 4) the direct supply of cap material by barges to the capping site. These mitigation measures should be incorporated during project design and permitting.

Cultural Resources

Alternative 5 does not include dredging at the head of the Whatcom Waterway in the area near former Citizens Dock. This was an area that was identified during previous archaeological assessment activities as potentially containing undisturbed historical or cultural resources. While additional historical and cultural resource review will be performed as part of the Section 106 consultations as part of project permitting, Alternative 5 has a low probability of impacting historical or archaeological resources.

4.7 Project Alternative 6

Cleanup Alternative 6 is in most respects the same as Alternative 5. The difference between the alternatives, is that under Alternative 6 additional dredging is conducted adjacent to the Bellingham Shipping Terminal. Other features of the Alternative, including the cleanout of the ASB and the remedial approach to the Inner Whatcom Waterway and Harbor areas are the same as in Alternative 5.

4.7.1 Cleanup Description

The design concept for Alternative 6 is shown in Figure 4-7. A detailed description of the Alternative follows:

Actions by Site Area

Because many aspects of this alternative are the same as with Alternative 5, the alternative description below focuses only on areas of difference between the two cleanup alternatives. Both conduct remediation of the ASB using removal, treatment and upland disposal technologies. They both remediate the Inner Whatcom Waterway with dredging and capping, consistent with the vision of a locally-managed multi-purpose channel. Remediation activities outside of the waterway are also similar, including development of a cap and habitat bench along the ASB shoulder (Unit 5-B) and capping in the barge dock area (Unit 6B and 6C). The principal difference between the two alternatives is the extent of dredging near the Bellingham Shipping Terminal (Unit 1-C).

Under Alternative 5, the extent of dredging provides for maintenance of the 30-ft federal channel in the Outer Whatcom Waterway. This requires dredging to depths of at least 35 feet below MLLW. Residual sediments are capped with a thick layer of sediment. In contrast, Alternative 6 conducts sediment removal in the Unit 1-C area to the extent technically practicable. Under this alternative, the depth of dredge cuts would be increased, in most areas extending dredging to the interface with clean native sediments. The depth of

dredging under Alternative 6 would range from 35 feet to 41 feet below MLLW in Unit 1-C. The dredging would need to address geotechnical and structural integrity limitations associated with existing piers and structures in the terminal area. However, it is expected that most portions of Unit 1C could be remediated, without requiring subsequent application of a thick cap.

Sediment Disposal

As with Alternative 5, all impacted sediments dredged from the Waterway and all of the sludges removed from the ASB would be managed by upland disposal at appropriately permitted facilities. Alternative 6 does not involve the creation of new disposal sites within Bellingham Bay.

The design concept for Alternative 6 estimates disposal of approximately 118,000 cubic yards of sediments dredged from the Outer and Inner Whatcom Waterway areas and the disposal of approximately 412,000 cubic yards of sludges removed from the ASB. An additional 113,000 cubic yards of sediments dredged from Units 1A and 1B would be managed by beneficial reuse or PSDDA disposal.

Transportation of sediments for upland disposal would be conducted by rail to minimize fuel use and avoid potential traffic impacts. The design concept and cost estimate assumes the placement of supplemental temporary rail improvements at the former GP mill site. Stormwater management and "surge" stockpile areas are included in the project cost assumptions.

Costs & Schedule

The probable costs of Alternative 6 are approximately $44 million. The costs of in order of decreasing cost, this estimate addresses removal and disposal of the ASB sludges, dredging and upland disposal of Whatcom Waterway sediments, capping costs for the portions of the Waterway and harbor areas, enhancements to the Log Pond shoreline, and provisions for long-term monitoring. Under Alternative 6, clean sediments and stone from the ASB berms are reused within the project as part of capping, shoreline stabilization and habitat enhancement actions.

The schedule and phasing of construction activities under Alternative 6 are similar to those under Alternative 5. The work will likely require a three-phase construction cycle, taking place over a 3 to 4 year period. The initial ASB preparation and waterway dredging activities will take place during the first construction phase. The second construction phase will involve ASB sludge removal, dewatering and final cleanout. The final construction phase will involve opening of the ASB berm, completion of final dredging and capping activities within the waterway areas. The first and third phases of construction will be restricted to appropriate "fish windows." The second construction phase will not involve activities in areas connected to surface water, and will not necessarily be subject to "fish window" limitations.

Monitoring of capped and natural recovery areas will occur under Alternative 6. Because natural recovery is only applied in areas that have already achieved compliance with cleanup standards, additional restoration time would not be required.

4.7.2 Impacts, Benefits and Mitigation

Table 4-2 summarizes the impacts, benefits and mitigation associated with Alternative 6. The Alternative and its environmental impacts/benefits are very similar to Alternative 5.

Geology, Water and Environmental Health

As with Alternative 5, Alternative 6 provides a significant net environmental benefit under the category including geology, water and environmental health. Significant impacts, benefits and potential mitigation requirements include the following:

- **Beneficial Impact – Sediment Cleanup:** Alternative 6 produces a beneficial impact through remediation and compliance with site cleanup levels consistent with MTCA and SMS requirements. Active cleanup is performed in the ASB Shoulder (Unit 5-B) area, the Barge Dock (Unit 6-B/C), the Inner and Outer Whatcom Waterway areas, and within the ASB. Monitored natural recovery and institutional controls are used to remediate other areas.

- **Mitigated Impact – Construction Water Quality:** Alternative 6 involves extensive construction activities, requiring two in-water construction seasons, and 1-2 additional years for remediation of ASB sludges. To minimize the potential for adverse water quality impacts, these construction activities will need to be mitigated to avoid adverse water quality impacts. Examples of potential mitigation actions include 1) completion of additional water quality review as part of project design and permitting (i.e., Section 401 Water Quality Certification), 2) use of best practices for design, permitting, contracting and construction of dredging activities to minimize water quality impacts and dredge residuals, and 3) water quality monitoring during construction.

- **Beneficial Impact – Control of Sediment Resuspension:** Alternative 6 conducts active remediation by capping and dredging in the impacted harbor areas and in the Whatcom Waterway channel. These actions reduce the potential for future sediment resuspension in these areas.

- **Beneficial Impact – Channel Updating & Stabilization:** Alternative 6 includes updating of Whatcom Waterway channel dimensions, consistent with plans for a locally-managed multi-purpose channel. Under this alternative, dredging activities within

the waterway are graded, to provide deep draft use areas in the Outer Waterway, and to address multiple land use priorities for the Inner Whatcom Waterway. Because the infrastructure exists in the Outer Whatcom Waterway to accommodate deep draft uses, no impacts are associated with deep dredging in that location. For the Inner Whatcom Waterway, Alternative 6 avoids the adverse impacts associated with destabilization of the existing shorelines under Alternatives 2 and 3. Rather, Alternative 6 provides for effective water depths of between 18 and 22 feet, consistent with the needs for transient moorage and other uses planned for the Inner Whatcom Waterway area. Additionally, Alternative 6 provides for stabilization of the side-slopes of the Inner Whatcom Waterway without requiring extensive use of hardened shoreline infrastructure. Alternative 6 allows for shorelines to be softened using slope treatments similar to those shown in Figure 3-6, without adversely impacting navigation opportunities. This shoreline stabilization approach provides significant benefits to habitat conditions within the Inner Whatcom Waterway, as described below.

- **Beneficial Impact – Log Pond Shoreline Stabilization:** Limited erosion has been noted in some shoreline edges of the Log Pond cap. Under Alternative 6, these erosional areas would be corrected, resulting in improved long-term performance of the Log Pond cap, and prevention of erosion and/or recontamination.

- **Beneficial Impact – ASB Sludge Remediation:** Alternative 6 conducts active remediation of the ASB using dredging, dewatering treatment and upland disposal.

- **Beneficial Impact -- Berm Material Reuse:** Alternative 6 provides for reuse of clean sand and stone materials from the ASB berm. These materials can be used during site cleanup, habitat enhancement and area redevelopment activities. Material reuse conserves environmental resources, and avoids the need for quarrying of new materials from off-site locations. This provides a net environmental benefit relative to other project Alternatives.

Fish and Wildlife

As with Alternative 5, Alternative 6 provides for substantial net beneficial impacts benefit for fish and wildlife. The alternative incorporates significant habitat enhancements within the Inner Whatcom Waterway, at the shoulder of the ASB and within the ASB interior. There are no significant differences between Alternatives 5 and 6 with respect to fish and wildlife.

Land Use, Navigation and Public Shoreline Access

Like Alternative 5, Alternative 6 directly addresses identified land use, navigation and public shoreline access priorities for the New Whatcom area. The cleanup approach provides for development of a multi-purpose channel in the Whatcom Waterway. In addition, the alternative provides for aquatic reuse of the ASB for development of an environmentally sustainable marina with integrated public access and habitat enhancements. Alternative 6 provides a net benefit under the categories of land use, navigation and public shoreline access.

The main difference between Alternatives 5 and 6 is the completion of additional dredging in the Outer Whatcom Waterway near the Bellingham Shipping Terminal. This expanded dredging may permit future deepening of the Outer Whatcom Waterway should a need for additional depth be identified. This represents a beneficial land use impact in that it provides additional long-term navigation and land use flexibility beyond that provided in Alternative 5. However, at this time there are no identified needs for that additional depth.

Other land use, navigation and public shoreline access benefits of Alternative 6 are the same as with Alternative 5. These benefits are summarized in Table 4-2.

Air and Noise

Air and noise impacts of Alternative 6 are similar to those of Alternative 5. As with Alternative 5, these impacts are associated with significant construction activities associated with project dredging and capping activities. These activities will take place over the course of three to four construction seasons. Potential impacts to area noise and air quality levels will need to be mitigated to avoid environmental impacts. However, mitigation can be accomplished through the use of best practices for project design, permitting and construction.

Potential mitigation measures for noise impacts include 1) contractual requirements to avoid exceedances of ambient noise level restrictions, 2) contractor use of appropriate equipment including mufflers as required, and 3) use of appropriate work periods if required to comply with noise level restrictions.

Air quality impacts associated with capping activities could be experienced either through emissions from construction equipment, or through dust from temporary stockpiles of capping material prior to placement. These impacts can be mitigated through 1) contractual requirements to avoid impacts to air quality, 2) the use of appropriate equipment meeting applicable air quality control requirements, 3) the use of appropriate construction measures (e.g., wetting or covering of cap material stockpiles to control fugitive dust emissions, or 4) the direct supply of cap material by barges to the capping site.

These mitigation measures should be incorporated during project design and permitting.

Cultural Resources

Alternative 6 does not include dredging at the head of the Whatcom Waterway in the area near former Citizens Dock. This was an area that was identified during previous archaeological assessment activities as potentially containing undisturbed historical or cultural resources. While additional historical and cultural resource review will be performed as part of the Section 106 consultations as part of project permitting, Alternative 6 has a low probability of impacting historical or archaeological resources.

4.8 Project Alternative 7

Alternative 7 uses the same technologies as Alternatives 5 and 6 to comply with SMS cleanup levels. These include institutional controls, monitored natural recovery, containment, removal & disposal, treatment and reuse & recycling. The elements of Alternative 7 and the differences between it and alternatives 5 and 6 are described below by site Unit.

4.8.1 Cleanup Description

The design concept for Alternative 7 is shown in Figure 4-8. A detailed description of the alternative follows.

Actions by Site Area

Like Alternative 5 and 6, Alternative 7 uses a mix of technologies to accomplish the remediation of the Whatcom Waterway site. The ASB is remediated using removal, treatment and upland disposal technologies, consistent with alternatives 5 and 6. The Outer Whatcom Waterway areas are similarly remediated by dredging and upland disposal, as in Alternative 6. Unlike the preceding Alternatives, Alternative 7 removes sediment from the Inner Whatcom Waterway consistent with the dimensions of the 1960's industrial channel.

Under Alternative 7 dredging is conducted consistent with the dredge prisms used in Alternative 2 and Alternative 3. Impacted sediments that are more than 5 feet below the 1960s channel project depth are capped in place, using a thick sediment cap. Capping may also be used in nearshore berth areas where full sediment removal is technically impracticable, or where the shoreline infrastructure does not allow sediments to be removed without compromising side-slope stability or the integrity of existing structures.

Other aspects of Alternative 7 remain the same as in alternative 6. These include the capping of the ASB shoulder and barge dock areas, the enhancements to the Log Pond shoreline, and the use of monitored natural recovery for other bottom areas that currently comply with site cleanup levels.

Sediment Disposal

Sediments removed from the Waterway under Alternative 7 will be managed by disposal in appropriately-permitted upland disposal sites. The design concept for Alternative 7 estimates disposal of approximately 479,000 cubic yards of sediments dredged from the Outer and Inner Whatcom Waterway areas and the disposal of approximately 412,000 cubic yards of sludges removed from the ASB. This represents an increase of 113,000 cubic yards of sediment disposal over that provided in Alternative 6.

As with Alternative 6, the design concept for Alternative 7 assumes that dredged sediments and ASB sludges are shipped by rail to the upland disposal site. Rail shipment is more fuel efficient and provides fewer traffic conflicts than truck transportation.

Costs & Schedule

The probable costs of Alternative 7 are $74 million. The costs of in order of decreasing cost, this estimate addresses dredging and upland disposal of the 1960s federal channel sediments, removal and disposal of the ASB sludges, capping costs for the portions of the Waterway and harbor areas, enhancements to the Log Pond shoreline, and provisions for long-term monitoring.

Like Alternatives 2 and 3, implementation of Alternative 7 must be integrated with shoreline infrastructure upgrades along the Inner Whatcom Waterway shoreline. This will increase the time required for project design and permitting relative to Alternative 6. The additional dredging involved in Alternative 7 also increases the duration and complexity of project construction activities. Alternative 7 is likely to require an additional year of construction over that required in Alternative 6.

Monitoring of capped and natural recovery areas will occur under Alternative 7. Because natural recovery is only applied in areas that have already achieved compliance with cleanup standards, additional restoration time would not be required for natural recovery to occur.

4.8.2 Impacts, Benefits and Mitigation

Table 4-2 summarizes the environmental impacts, benefits and mitigation associated with Alternative 7.

Geology, Water and Environmental Health

Alternative 7 produces net adverse impacts under the category including geology, water and environmental health. Significant impacts, benefits and potential mitigation requirements include the following:

- **Beneficial Impact – Sediment Cleanup:** Alternative 7 produces a beneficial impact through remediation and compliance with site

cleanup levels consistent with MTCA and SMS requirements. Active cleanup is performed in the ASB Shoulder (Unit 5-B) area, the Barge Dock (Unit 6-B/C), the Inner and Outer Whatcom Waterway areas, and within the ASB. Monitored natural recovery and institutional controls are used to remediate other areas.

- **Mitigated Impacts – Construction Water Quality:** Alternative 7 involves extensive in-water construction activities associated with dredging and capping. The project will also trigger the need for additional shoreline infrastructure improvements in the Inner Whatcom Waterway. The project likely will likely require 4 in-water construction seasons to complete, plus additional time to remediate the ASB and upgrade shoreline infrastructure. These construction activities will need to be mitigated to avoid adverse water quality impacts. Examples of potential mitigation actions include 1) completion of additional water quality review as part of project design and permitting (i.e., Section 401 Water Quality Certification), 2) use of best practices for design, permitting, contracting and construction of dredging activities to minimize water quality impacts and dredge residuals, 3) water quality monitoring during construction, and 4) coordination of cleanup and shoreline infrastructure projects to minimize water quality disturbances.

- **Beneficial Impact – Control of Sediment Resuspension:** Alternative 7 conducts active remediation by capping in Site Units 5-B, 6-B/C and dredging and capping in the Whatcom Waterway channel. These actions reduce the potential for future resuspension of contaminated sediments in navigation areas.

- **Adverse Impact – Shoreline Destabilization:** Alternative 7 includes deep dredging in the Inner Whatcom Waterway in order to comply with the dimensions of the 1960s industrial channel. This deep dredging will tend to further destabilize existing shorelines in this area. To avoid shoreline stability failures, the shoreline will need to be stabilized with new infrastructure compatible with the deep dredging patterns. To sustain use of the deep navigation depths, mitigation will be required, including the construction of hardened shoreline treatments including bulkheads and over-water wharves will be required. The potential costs to construct this type of shoreline infrastructure have been estimated at $20 to $40 million for the Inner Whatcom Waterway. These costs are not included in the remediation cost estimates of Alternative 7.

- **Beneficial Impact – Log Pond Shoreline Stabilization:** Limited erosion has been noted in some shoreline edges of the Log Pond cap. Under Alternative 7, these erosional areas would be corrected,

resulting in improved long-term performance of the Log Pond cap, and prevention of erosion and/or recontamination.

- **Beneficial Impact – Berm Material Reuse:** Alternative 7 provides for reuse of clean sand and stone materials from the ASB berm. These materials can be used during site cleanup, habitat enhancement and area redevelopment activities. Material reuse conserves environmental resources, and avoids the need for quarrying of new materials from off-site locations. This provides a net environmental benefit relative to project Alternative 1-4 and the No Action Alternative.

Fish and Wildlife

Alternative 7 includes a mix of benefits and impacts to fish and wildlife. Benefits are achieved through restoration of aquatic uses in the ASB, and development of a habitat bench offshore of the ASB. Impacts are incurred in the Inner Whatcom Waterway associated with the destruction of emergent nearshore habitat and the requirements for hardened shoreline infrastructure to stabilize Inner Whatcom Waterway shorelines. Habitat improvements may be sufficient to mitigate for project impacts, though additional review would need to be conducted during remedial design and permitting. Significant impacts, benefits and potential mitigation requirements associated with Alternative 7 include the following:

- **Beneficial Impacts – Environmental Protection:** Completion of site remediation provides protection of fish and wildlife from the potential effects of contaminated sediments.

- **Mitigated Impact – Construction Disturbances:** Construction of Alternative 7 includes significant construction-related habitat disturbances. These disturbances will occur in several areas, over four construction seasons. Potential disturbances to fish and wildlife must be mitigated in these areas through the use of best practices for project design, permitting and construction. Examples of best practices include 1) the timing of work activities to avoid migration periods for juvenile salmonids or other sensitive species, 2) the use of construction equipment, dredge methods, cap materials and placement methods that minimize water quality impacts, noise and physical disturbances to aquatic habitats, and 3) completion of additional environmental reviews as part of project design and permitting. These measures are considered likely to mitigate the short-term habitat impacts associated with construction disturbances under Alternative 7.

- **Mitigated Impact -- Inner Whatcom Waterway Habitat:** Through its aggressive dredging of the 1960s industrial channel, Alternative 7 triggers the permanent destruction of emergent

shallow-water habitats at the head and along the sides of the Inner Whatcom Waterway. These impacts are integral to the alternative and cannot be mitigated except by creation of new replacement habitat in alternative site areas. Impact avoidance would require the use of alternative channel dimensions (as in Alternative 4, 5 and 6). In addition to the direct impacts associated with the deep dredging, additional habitat impacts will be incurred during the construction of hardened shoreline infrastructure as necessary to stabilize shorelines and support the use and maintenance of the deep draft waterway uses in the Inner Whatcom Waterway under Alternative 7. However, because Alternative 7 includes significant development of new nearshore habitat, it appears that the impacts to habitat in the Inner Whatcom Waterway are mitigated within the Alternative.

- **Mitigated Impacts – Log Pond Shoreline Enhancements:** Construction of Alternative 7 will involve some in-water construction activities within the Log Pond to enhance the stability of area shorelines. These actions will involve a change in substrate conditions in limited areas, with placement of pebbles and beach gravels in some areas, and placement of stone groins for material retention in other areas. The actions are expected to result in minimal changes to the area of intertidal habitat. However, potential adverse impacts associated with substrate changes may require mitigation through habitat gains in other areas under the alternative.

- **Beneficial Impact – Development of New Habitat:** Alternative 7 includes development of new premium nearshore habitat in the location of the habitat bench within Unit 5B, as in preceding alternatives 1 through 6.

- **Mitigated Impact -- Alternative ASB Access Channel:** Under Alternative 7, the alignment of the marina and the placement of the marina access channel may require modification to avoid conflicts with navigation traffic associated with the industrial channel. The alternative alignment will require a greater disruption to existing shallow-water areas offshore of the ASB, and will reduce the area available for habitat bench development. However, it is likely that Alternative 7 maintains sufficient habitat enhancement to mitigate for the effects of this change.

- **Beneficial Impact – ASB Habitat Gains:** Like Alternatives 5 and 6, Alternative 7 provides for sludge cleanout of the ASB, including opening of the remediated facility for future aquatic uses. This enables development of nearly 4,500 linear feet of new nearshore migration corridors for juvenile salmonids, and development of over 28 acres of new open water habitat.

Land Use, Navigation and Public Shoreline Access

For the ASB and Outer Whatcom Waterway, the land use benefits and impacts of Alternative 7 are identical to those of Alternatives 5 and 6. The principal difference for Alternative 7 is the reintroduction of a conflict (as in Alternatives 2 and 3) between the cleanup alternative and planned land uses within the Inner Whatcom Waterway. This conflict results in net adverse impacts for land use, navigation and public access.

As with Alternatives 2 and 3, Alternative 7 conducts dredging of the Inner Whatcom Waterway based on the 1960s industrial channel dimensions. That channel was established for an industrial land use pattern that is inconsistent with current zoning and redevelopment planning. Further, the infrastructure required to fully implement the 1960s federal channel was never fully developed, resulting in shorelines in most of the Inner Whatcom Waterway area that are incapable of achieving an effective water depth consistent with the 1960s channel dimensions without additional stabilization. These shorelines were constructed earlier based on the historical 18-foot waterway depth that existed prior to the 1960s.

As with Alternatives 2 and 3, the Implementation of Alternative 7 poses a significant source of conflict with current planned land use through inconsistency of dredging patterns with planned land uses and navigation requirements, and through requirements for new hardened shoreline infrastructure to stabilize project area shorelines. As with Alternatives 2 and 3, these impacts are significant and cannot be mitigated, except by selecting alternative dredging patterns (as in Alternatives 4, 5 or 6).

Air and Noise

Alternative 7 increases the quantity of construction activities associated with project dredging and capping. Additional impacts will be associated with the construction of new shoreline infrastructure required in the Inner Whatcom Waterway. Potential impacts to area noise and air quality levels will need to be mitigated to avoid environmental impacts. However, mitigation can be accomplished through the use of best practices for project design, permitting and construction.

Potential mitigation measures for noise impacts include 1) contractual requirements to avoid exceedances of ambient noise level restrictions, 2) contractor use of appropriate equipment including mufflers as required, and 3) use of appropriate work periods if required to comply with noise level restrictions.

Air quality impacts associated with capping activities could be experienced either through emissions from construction equipment, or through dust from temporary stockpiles of capping material prior to placement. These impacts can be mitigated through 1) contractual requirements to avoid impacts to air quality, 2) the use of appropriate equipment meeting applicable air quality

control requirements, 3) the use of appropriate construction measures (e.g., wetting or covering of cap material stockpiles to control fugitive dust emissions, or 4) the direct supply of cap material by barges to the capping site. These mitigation measures should be incorporated during project design and permitting.

Cultural Resources

Alternative 7 involves extensive dredging activities, including dredging at the head of the Whatcom Waterway in the area near Citizens Dock. This was an area that was identified during previous archaeological assessment activities as potentially containing undisturbed historical or cultural resources. Potential measures to mitigate impacts to these resources would need to be developed during project design and permitting. This would likely be performed as part of the Section 106 consultations as part of Army Corps of Engineers permitting. This consultation would also cover other site areas, though the potential for presence of undisturbed cultural or historical resource in these other areas is much lower.

4.9 Project Alternative 8

Alternative 8 is the last of the alternatives evaluated in the Feasibility Study. The Alternative uses the same range of technologies evaluated for Alternatives 5, 6 and 7 to comply with SMS cleanup levels. However, the extent of dredging and upland disposal is expanded under Alternative 8 relative to the preceding alternatives.

4.9.1 Cleanup Description

The design concept for Alternative 8 is shown in Figure 4-9. A detailed description of the alternative follows.

Actions by Site Area

Alternative 8 manages most site cleanup areas through sediment removal and upland disposal. Like preceding alternatives, Alternative 8 conducts removal and upland disposal for the sludges within the ASB and for sediments within the Waterway navigation areas. However, Alternative 8 also removes sediments in outlying portions of the site, including areas addressed by capping and monitored natural recovery under other alternatives.

- **Outer Whatcom Waterway (Unit 1):** Dredging of the Outer Whatcom Waterway is conducted the same as for Alternatives 6 and 7. Dredging is conducted to native bottom sediments except where this is not technically feasible. Sediments are managed by upland disposal, except for those sediments of Unit 1A and 1B that may be suitable for beneficial reuse or PSDDA disposal.

- **Inner Whatcom Waterway (Units 2 & 3):** Like Alternatives 2, 3 and 7, this alternative conducts dredging within the Inner Whatcom Waterway as necessary to provide for future use and maintenance of the federal navigation channel to the head of the waterway. The 1960s federal channel boundaries specify a water depth of 30 feet below MLLW from the BST area to Maple Street. A depth of 18 feet is specified from Maple Street to the head of the waterway. In the deeper portion of the waterway, the dredging cut would be established at depths at least 35 feet below MLLW. This would remove sediments where technically feasible, and would provide sufficient over-depth to allow residual sediments to be capped without impeding future maintenance of the federal channel. The design concept assumes a cap thickness of 3 feet over dredged areas with residual subsurface sediment impacts. Due to historical encroachment of the shoreline on the federal channel boundaries, many of the Inner Whatcom Waterway shoreline areas have fill and bulkheads up to or near to the pierhead line. Most of these bulkheads would require replacement and/or substantial upgrades in order to maintain shoreline stability in these areas during and after dredging. Docks may also have to be upgraded or replaced as described in Alternatives 2, 3 and 7 in order to accommodate channel dredging and future use. Containment by capping with appropriate institutional controls will be required for areas where removal is not technically feasible.

- **Log Pond (Unit 4):** The Log Pond area was previously remediated as part of an Interim Action implemented in 2000. Subsequent monitoring has demonstrated the protectiveness of the subaqueous cap, and the effectiveness of habitat enhancement actions completed as part of that project. Actions in this area will be limited to enhancements to the shoreline edges of the cap, to ensure long-term stability of the cap edges. These enhancements are described in Appendix D of the FS report.

- **Harbor Areas (Units 5, 6 & 7):** Under Alternative 8 dredging with upland disposal will be implemented in Unit 5 (ASB shoulder area), Unit 6 (Barge Dock areas) and Unit 7 (Starr Rock area). Sediments that currently exceed cleanup standards, as well as those that currently comply with cleanup standards would be removed. As with portions of the Inner Whatcom Waterway, some residual sediments would remain in areas where removal was not technically feasible. Some institutional controls, monitoring and/or containment would likely be required in portions of Units 5, 6 and 7.

- **ASB (Unit 8):** As with Alternatives 5, 6 and 7, the ASB sludges are removed, treated to reduce volume and are disposed at a permitted

upland disposal facility. Removal methods are the same as in Alternatives 5, 6 and 7.

Sediment Disposal

Sediments removed from Waterway under Alternative 8 will be managed by disposal in appropriately-permitted upland disposal sites. The design concept for Alternative 8 estimates disposal of approximately 1.26 million cubic yards of dredged sediments and the disposal of approximately 412,000 cubic yards of sludges removed from the ASB. This is a dramatic increase in the disposal volumes over the preceding alternatives.

Costs & Schedule

The probable costs of Alternative 8 are approximately $146 million. This cost is nearly double that of Alternative 7, and is over three times higher than the cost of Alternatives 5 and 6.

The implementation of Alternative 8 will require extensive design and permitting prior to initiation of construction. In areas of the Inner Whatcom Waterway, project planning must be coordinated with future shoreline infrastructure improvements. A design and permitting period of 3 to 6 years is estimated.

The additional dredging involved in Alternative 8 will result in a substantial increase to the duration of project construction. All of the additional dredging will involve work in restricted “fish windows.” The project is expected to require between 5 and 7 construction seasons, with in-water work activities during each of those seasons. Including project design and permitting, the restoration time for Alternative 8 is estimated at 8 to 13 years.

Monitoring will likely be required in some areas where removal of sediments is not technically feasible and the application of capping and/or natural recovery is required. As with preceding alternatives, capping is assumed for these areas, resulting in no additional restoration time to achieve compliance with cleanup levels in these areas..

4.9.2 Impacts, Benefits and Mitigation

Table 4-2 summarizes the environmental impacts, benefits and mitigation associated with Alternative 8.

Geology, Water and Environmental Health

Alternative 8 produces net adverse impacts under the environmental category including geology, water and environmental health, but these are partially mitigated. Significant impacts, benefits and potential mitigation requirements include the following:

- **Beneficial Impact – Sediment Cleanup:** Alternative 8 produces a beneficial impact through remediation and compliance with site cleanup levels consistent with MTCA and SMS requirements. Active cleanup is performed in all of the site areas, including dredging and capping. Monitored natural recovery and institutional controls are used in a very limited manner under this Alternative.

- **Mitigated Impacts – Construction Water Quality:** Alternative 8 involves the most in-water construction activities of all of the project alternatives. The project will require extensive dredging within Bellingham Bay to occur over at least five and as many as seven construction seasons. As with Alternatives 2, 3 and 7, Alternative 8 will also trigger the need for additional shoreline infrastructure improvements in the Inner Whatcom Waterway. These construction activities will need to be mitigated to minimize adverse water quality impacts. Examples of potential mitigation actions include 1) completion of additional water quality review as part of project design and permitting (i.e., Section 401 Water Quality Certification), 2) use of best practices for design, permitting, contracting and construction of dredging activities to minimize water quality impacts and dredge residuals, 3) water quality monitoring during construction, and 4) coordination of cleanup and shoreline infrastructure projects to minimize water quality disturbances.

- **Beneficial Impacts – Controlling Sediment Resuspension:** Alternative 8 conducts active remediation by capping in the impacted harbor areas and in the Whatcom Waterway channel. These actions reduce the potential for future sediment resuspension.

- **Adverse Impact – Shoreline Destabilization:** Alternative 8 includes deep dredging in the Inner Whatcom Waterway in order to comply with the dimensions of the 1960s industrial channel. This deep dredging will tend to further destabilize existing shorelines in this area. To avoid shoreline stability failures, the shoreline will need to be stabilized with new infrastructure compatible with the deep dredging patterns. Mitigation will be required, including the construction of hardened shoreline treatments including bulkheads and over-water wharves. The potential costs to construct this type of shoreline infrastructure have been estimated at $20 to $40 million for the Inner Whatcom Waterway. These costs are not included in the remediation cost estimates of Alternative 8.

- **Beneficial Impact – Log Pond Shoreline Stabilization:** Limited erosion has been noted in some shoreline edges of the Log Pond

cap. Under Alternative 8, these erosional areas would be corrected, resulting in improved long-term performance of the Log Pond cap, and prevention of erosion and/or recontamination.

- **Beneficial Impact – Berm Material Reuse:** Alternative 8 provides for reuse of clean sand and stone materials from the ASB berm. These materials can be used during site cleanup, habitat enhancement and area redevelopment activities. Material reuse conserves environmental resources, and avoids the need for quarrying of new materials from off-site locations. This provides a net environmental benefit relative to project Alternative 1-4 and the No Action Alternative.

Fish and Wildlife

Alternative 8 includes net adverse impacts to fish and wildlife. Benefits are achieved through restoration of aquatic uses in the ASB, but these benefits are offset by short-term disturbances during project construction, the permanent destruction of emergent nearshore habitat in the Inner Whatcom Waterway and ASB shoulder areas, and the requirements for hardened shoreline infrastructure in the Inner Whatcom Waterway. Significant impacts, benefits and potential mitigation requirements associated with Alternative 8 include the following:

- **Beneficial Impacts – Environmental Protection:** Completion of site remediation provides protection of fish and wildlife from the potential effects of contaminated sediments.

- **Mitigated Impact – Construction Disturbances:** Construction of Alternative 8 includes significant construction-related habitat disturbances. The cleanup-related disturbances will occur in several areas, requiring between five and seven construction seasons. Additional disturbances will result from shoreline infrastructure improvements required under this Alternative. Potential disturbances to fish and wildlife must be mitigated in these areas through the use of best practices for project design, permitting and construction. Examples of best practices include 1) the timing of work activities to avoid migration periods for juvenile salmonids or other sensitive species, 2) the use of construction equipment, dredge methods, cap materials and placement methods that minimize water quality impacts, noise and physical disturbances to aquatic habitats, and 3) completion of additional environmental reviews as part of project design and permitting.

- **Adverse Impact -- Inner Whatcom Waterway Habitat:** Through its aggressive dredging of the 1960s federal channel, Alternative 8 triggers the permanent destruction of emergent

shallow-water habitats at the head and along the sides of the Inner Whatcom Waterway. These impacts are integral to the alternative and cannot be mitigated except by creation of new replacement habitat in alternative site areas. Impact avoidance would require the use of alternative channel dimensions (as in Alternative 4, 5 and 6). In addition to the direct impacts associated with the deep dredging, additional habitat impacts will be incurred during the construction of hardened shoreline infrastructure as necessary to support the use and maintenance of the deep draft waterway uses in the Inner Whatcom Waterway under Alternative 8. Alternative 8 includes less habitat development than the preceding alternatives, meaning that habitat losses in the Inner Whatcom Waterway may not be sufficiently mitigated within the Alternative. Additional habitat mitigation measures are likely to be required to offset habitat impacts.

- **Mitigated Impacts – Log Pond Shoreline Enhancements:** Construction of Alternative 8 will involve some in-water construction activities within the Log Pond to enhance the stability of area shorelines. These actions will involve a change in substrate conditions in limited areas, with placement of pebbles and beach gravels in some areas, and placement of stone groins for material retention in other areas. The actions are expected to result in minimal changes to the area of intertidal habitat. However, potential adverse impacts associated with substrate changes may require mitigation through habitat gains in other areas under the alternative.

- **Adverse Impact -- Alternative ASB Access Channel:** Under Alternative 8, the alignment of the marina and the placement of the marina access channel may require modification to avoid conflicts with navigation traffic associated with the federal channel. The alternative alignment will require a greater disruption to existing shallow-water areas offshore of the ASB, and will reduce the area available for habitat bench development. Additional habitat creation may be required to offset habitat impacts and mitigate for the effects of this change.

- **Beneficial Impact – ASB Habitat Gains:** Like Alternatives 5, 6 and 7, Alternative 8 provides for sludge cleanout of the ASB, including opening of the remediated facility for future aquatic uses. This enables development of nearly 4,500 linear feet of new nearshore migration corridors for juvenile salmonids, and development of over 28 acres of new open water habitat.

- **Adverse Impacts – Areas Offshore of ASB and Areas Adjacent to BST:** Under Alternative 8, sediment removal is conducted in areas offshore of the ASB, including the ASB shoulder area.

Removal will also be conducted in Unit 6 areas near BST. Rather than construction of a cap with the positive features of a habitat bench offshore of the ASB as in other project alternatives, Alternative 8 would adversely impact habitat quality in Unit 5 by deepening significant areas of shallow-water nearshore habitat. Some deepening of nearshore habitat in Unit 6 will also occur, with additional adverse impacts to fish and wildlife. The adverse fish and wildlife impacts in these areas contribute to an overall net adverse impact finding for Alternative 8 with respect to fish and wildlife.

Land Use, Navigation and Public Shoreline Access

The land use benefits and impacts of Alternative 8 are similar to those of Alternative 7, as shown in Table 4-2. As with Alternative 7, Alternative 8 results in a net adverse impact to land use, navigation and shoreline access.

Both Alternatives 7 and 8 conduct dredging of the Inner Whatcom Waterway based on the obsolete 1960s federal channel dimensions. That channel was established for an industrial land use pattern that is inconsistent with current zoning and redevelopment planning. Further, the infrastructure required to fully implement the 1960s industrial channel was never fully developed, resulting in shorelines in most of the Inner Whatcom Waterway area that are incapable of achieving an effective water depth consistent with the 1960s channel dimensions. These shorelines were constructed earlier based on the historical 18-foot waterway depth.

As with Alternatives 2, 3, and 7 the Implementation of Alternative 8 poses a significant source of conflict with current community land use priorities through inconsistency of dredging patterns with land use and navigation priorities, and through requirements for new hardened shoreline infrastructure to stabilize project area shorelines.

Air and Noise

Alternative 8 dramatically increases the quantity of construction activities relative to the other project alternatives. Additional impacts will be associated with the construction of new shoreline infrastructure required in the Inner Whatcom Waterway. Potential impacts to area noise and air quality levels will need to be mitigated to avoid environmental impacts. However, mitigation can be accomplished through the use of best practices for project design, permitting and construction.

As with the other project alternatives, potential mitigation measures for noise impacts include 1) contractual requirements to avoid exceedances of ambient noise level restrictions, 2) contractor use of appropriate equipment including mufflers as required, and 3) use of appropriate work periods if required to comply with noise level restrictions.

Air quality impacts associated with capping activities could be experienced either through emissions from construction equipment, or through dust from temporary stockpiles of capping material prior to placement. These impacts can be mitigated through 1) contractual requirements to avoid impacts to air quality, 2) the use of appropriate equipment meeting applicable air quality control requirements, 3) the use of appropriate construction measures (e.g., wetting or covering of cap material stockpiles to control fugitive dust emissions, or 4) the direct supply of cap material by barges to the capping site. These mitigation measures should be incorporated during project design and permitting.

Cultural Resources

Alternative 8 involves extensive dredging activities, including dredging at the head of the Whatcom Waterway in the area near Citizens Dock. This was an area that was identified during previous archaeological assessment activities as potentially containing undisturbed historical or cultural resources. Potential measures to mitigate impacts to these resources would need to be developed during project design and permitting. This would likely be performed as part of the Section 106 consultations as part of Army Corps of Engineers permitting. This consultation would also cover other site areas, though the potential for presence of undisturbed cultural or historical resource in these other areas is much lower.

Table 4-2. Summary of SEPA Analysis of Environmental Impacts

Alternative Name & Description		No Action Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7	Alternative 8
Design Concept Figure		Figure 4-1	Figure 4-2	Figure 4-3	Figure 4-4	Figure 4-5	Figure 4-6	Figure 4-7	Figure 4-8	Figure 4-9
Probable Cost ($ million)		--	$8 million	$34 million	$34 million	$21 million	$42 million	$44 million	$74 million	$146 million
Est. Time for Design/Construction (yrs)		--	6 to 12 yrs	6 to 9 yrs	5 to 8 yrs	3 to 4 yrs	5 to 6 yrs	5 to 6 yrs	7 to 9 yrs	8 to 13 yrs
ASB Area Summary [1]		No Action	Capping of ASB Sludges	Capping of ASB Sludges	Containment of ASB Sludges within Nearshore Fill	Capping of ASB Sludges	Removal, Treatment & Disposal of ASB Sludge in Subtitle D Facility [5]	Removal, Treatment & Disposal of ASB Sludge in Subtitle D Facility [5]	Removal, Treatment & Disposal of ASB Sludge in Subtitle D Facility [5]	Removal, Treatment & Disposal of ASB Sludge in Subtitle D Facility [5]
Waterway Area Summary [1]		No Action	Capping and Monitored Natural Recovery with Restricted Channel Depths [2]	Dredging of 1960s Federal Channel with Disposal at Cornwall CAD	Dredging of 1960s Federal Channel with Disposal in ASB Nearshore Fill	Dredging of Multi-Purpose Channel with Upland Disposal in Subtitle D Facility [5]	Dredging of Multi-Purpose Channel with Upland Disposal in Subtitle D Facility [5]	Expanded Dredging of Multi-Purpose Channel with Upland Disposal in Subtitle D Facility [5]	Dredging of 1960s Federal Channel with Upland Disposal in Subtitle D Facility [5]	Dredging of 1960s Federal Channel & Additional Areas with Upland Disposal in Subtitle D Facility [5]
Description of Project Alternatives (by Site Unit)										
Outer Waterway	Site Unit									
Outer Channel	Units 1A/1B	No Action	Monitored Natural Recovery & Institutional Controls	Dredging with Placement in Cornwall-Area CAD Site	Dredging with Placement in ASB Nearshore Fill	Dredging with Beneficial Reuse or PSDDA Disposal	Dredging with Beneficial Reuse or PSDDA Disposal	Dredging with Beneficial Reuse or PSDDA Disposal	Dredging with Beneficial Reuse or PSDDA Disposal	Dredging with Beneficial Reuse or PSDDA Disposal
Port Terminal Area	Unit 1C	No Action	Monitored Natural Recovery & Institutional Controls	Expanded Dredging[8] with Placement in Cornwall-Area CAD	Expanded Dredging[8] with Placement in ASB Nearshore Fill	Dredging for 30-ft Deep Draft Uses with Subtitle D Disposal, Followed by Capping & Institutional Controls	Dredging for 30-ft Deep Draft Uses with Subtitle D Disposal, Followed by Capping & Institutional Controls	Expanded Dredging[8] with Subtitle D Sediment Disposal	Expanded Dredging[8] with Subtitle D Sediment Disposal	Expanded Dredging[8] with Subtitle D Sediment Disposal
Inner Waterway										
Inner Waterway	Unit 2A, 2C & 3B	No Action	Monitored Natural Recovery & Institutional Controls	Dredging of 1960s Federal Channel with Placement in Cornwall-Area CAD Site, Followed by Capping & Institutional Controls	Dredging of 1960s Federal Channel with Placement in ASB Nearshore Fill, Followed by Capping & Institutional Controls	Dredging for Multi-Purpose Channel with Subtitle D Disposal, Followed by Capping & Institutional Controls	Dredging for Multi-Purpose Channel with Subtitle D Disposal, Followed by Capping & Institutional Controls	Dredging for Multi-Purpose Channel with Subtitle D Disposal, Followed by Capping & Institutional Controls	Dredging of 1960s Federal Channel with Subtitle D Disposal, Followed by Capping & Institutional Controls	Dredging of 1960s Federal Channel with Subtitle D Disposal, Followed by Capping & Institutional Controls
ASB Access Channel	Unit 2B	No Action	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Dredging for 18-ft Access Channel with Subtitle D Disposal	Dredging for 18-ft Access Channel with Subtitle D Disposal	Dredging for 18-ft Access Channel with Subtitle D Disposal	Dredging & Subtitle D Disposal
Emergent Tideflat	Units 3A	No Action	Monitored Natural Recovery & Institutional Controls	Dredging of 1960s Industrial Channel with Disposal in Cornwall-Area CAD Site	Dredging of 1960s Industrial Channel with Disposal in ASB Nearshore Fill	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Dredging of 1960s Federal Channel with Subtitle D Disposal	Dredging of 1960s Federal Channel with Subtitle D Disposal
Log Pond	Unit 4	No Action	Enhancements to Shoreline Cap Edges [6]	Enhancements to Shoreline Cap Edges [6]	Enhancements to Shoreline Cap Edges [6]	Enhancements to Shoreline Cap Edges [6]	Enhancements to Shoreline Cap Edges [6]	Enhancements to Shoreline Cap Edges [6]	Enhancements to Shoreline Cap Edges [6]	Enhancements to Shoreline Cap Edges [6]
Areas Offshore of ASB										
Offshore of ASB	Unit 5A	No Action	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Dredging & Subtitle D Disposal
Shoulder of ASB	Unit 5B	No Action	Sediment Capping[7] & Institutional Controls	Sediment Capping[7] & Institutional Controls	Sediment Capping[7] & Institutional Controls	Sediment Capping[7] & Institutional Controls	Sediment Capping[7] & Institutional Controls	Sediment Capping[7] & Institutional Controls	Sediment Capping[7] & Institutional Controls	Dredging & Subtitle D Disposal
Waterway Side of ASB	Unit 5C	No Action	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Dredging & Subtitle D Disposal
Areas Near Bellingham Shipping Terminal										
Recovered Harbor Areas	Unit 6A	No Action	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Dredging & Subtitle D Disposal
Barge Dock Area	Unit 6B, 6C	No Action	Sediment Capping & Insitutional Controls	Sediment Capping & Insitutional Controls	Sediment Capping & Insitutional Controls	Sediment Capping & Insitutional Controls	Sediment Capping & Insitutional Controls	Sediment Capping & Insitutional Controls	Sediment Capping & Insitutional Controls	Dredging & Subtitle D Disposal
Starr Rock Area	Unit 7	No Action	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Monitored Natural Recovery & Institutional Controls	Dredging & Subtitle D Disposal
ASB Sludges	Unit 8	No Action	Capping of ASB Sludges	Capping of ASB Sludges	Containment of ASB Sludges within Nearshore Fill	Capping of ASB Sludges	Removal of ASB sludges with Dewatering & Subtitle D Disposal	Removal of ASB sludges with Dewatering & Subtitle D Disposal	Removal of ASB sludges with Dewatering & Subtitle D Disposal	Removal of ASB sludges with Dewatering & Subtitle D Disposal
Sediment Disposal Methods										
ASB Sludges	Unit 8	-- NA[3] --	-- NA[3] --	-- NA[3] --	-- NA[3] --	-- NA[3] --	Removal, Dewatering & Subtitle D Disposal of 412,000 cyd ASB Sludges and Overdredge	Removal, Dewatering & Subtitle D Disposal of 412,000 cyd ASB Sludges and Overdredge	Removal, Dewatering & Subtitle D Disposal of 412,000 cyd ASB Sludges and Overdredge	Removal, Dewatering & Subtitle D Disposal of 412,000 cyd ASB Sludges and Overdredge
Aquatic Sediments	All Other Areas	-- NA[4] --	-- NA[4] --	Containment of 585,000 cyd sediments in Cornwall CAD	Containment of 585,000 cyd sediments in ASB Fill	Dredging & Subtitle D Disposal of 68,000 cyd Sediments	Dredging & Subtitle D Disposal of 76,000 cyd Sediments	Dredging & Subtitle D Disposal of 118,000 cyd Sediments	Dredging & Subtitle D Disposal of 479,000 cyd Sediments	Dredging & Subtitle D Disposal of 1.26 million cyd Sediments
						Beneficial Use or PSDDA Disposal of 113,000 cyd Unit 1A/1B Sediment	Beneficial Use or PSDDA Disposal of 113,000 cyd Unit 1A/1B Sediment	Beneficial Use or PSDDA Disposal of 113,000 cyd Unit 1A/1B Sediment	Beneficial Use or PSDDA Disposal of 113,000 cyd Unit 1A/1B Sediment	Beneficial Use or PSDDA Disposal of 113,000 cyd Unit 1A/1B Sediment

Notes:

1: All remedial alternatives involve the use of institutional controls, containment and monitoring to varying degrees. Refer to Sections 1 through 4 of this table for a specific description of remedial alternatives by Sediment Site Unit.
2: Channel depths will be restricted to depths shallower than current bathymetry under Alternative 1, as no dredging would be conducted either in the Inner Waterway or Outer Waterway areas.
3. Not applicable. Under this alternative, no removal of the ASB sludges will be conducted.
4. Not applicable. Under this alternative, no waterway sediment dredging will be conducted.
5. A Subtitle D Facility is a landfill that is designed and permitted for management of solid waste, and includes a liner, a cap, a monitoring network, and institutional controls and financial assurance provisions under state and federal solid waste regulations.
6. The design concept for stabilizing the shoreline cap edges is illustrated in FS Appendix D. The Log Pond area is subject to institutional controls recorded as part of the Log Pond Interim Remedial Action.
7. The design concept for the cap in the Unit 5B area is illustrated in FS Appendix C.
8. Dredging in this area will be conducted to the base of the contaminated sediments, and requirements for capping of the dredged area are not anticipated.

Table 4-2. Summary of SEPA Analysis of Environmental Impacts

Alternative Name & Description		No Action Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7	Alternative 8
Design Concept Figure		Figure 4-1	Figure 4-2	Figure 4-3	Figure 4-4	Figure 4-5	Figure 4-6	Figure 4-7	Figure 4-8	Figure 4-9
Probable Cost ($ million)		--	$8 million	$34 million	$34 million	$21 million	$42 million	$44 million	$74 million	$146 million
Est. Time for Design/Construction (yrs)		--	6 to 12 yrs	6 to 9 yrs	5 to 8 yrs	3 to 4 yrs	5 to 6 yrs	5 to 6 yrs	7 to 9 yrs	8 to 13 yrs
ASB Area Summary [1]		No Action	Capping of ASB Sludges	Capping of ASB Sludges	Containment of ASB Sludges within Nearshore Fill	Capping of ASB Sludges	Removal, Treatment & Disposal of ASB Sludge in Subtitle D Facility [5]	Removal, Treatment & Disposal of ASB Sludge in Subtitle D Facility [5]	Removal, Treatment & Disposal of ASB Sludge in Subtitle D Facility [5]	Removal, Treatment & Disposal of ASB Sludge in Subtitle D Facility [5]
Waterway Area Summary [1]		No Action	Capping and Monitored Natural Recovery with Restricted Channel Depths [2]	Dredging of 1960s Federal Channel with Disposal at Cornwall CAD	Dredging of 1960s Federal Channel with Disposal in ASB Nearshore Fill	Dredging of Multi-Purpose Channel with Upland Disposal in Subtitle D Facility [5]	Dredging of Multi-Purpose Channel with Upland Disposal in Subtitle D Facility [5]	Expanded Dredging of Multi-Purpose Channel with Upland Disposal in Subtitle D Facility [5]	Dredging of 1960s Federal Channel with Upland Disposal in Subtitle D Facility [5]	Dredging of 1960s Federal Channel & Additional Areas with Upland Disposal in Subtitle D Facility [5]
1. Impacts, Benefits & Mitigation -- Geology, Water, Environmental Health										
Summary of Impacts & Benefits Geology, Water & Environmental Health		Net Adverse Impacts	Net Adverse Impacts	Net Adverse Impacts	Net Adverse Impacts	Net Beneficial Impacts	Net Beneficial Impacts	Net Beneficial Impacts	Net Adverse Impacts	Net Adverse Impacts
General Cleanup Issues	Varies by Alternative	Adverse Impact -- Cleanup not performed. Action does not protect aquatic receptors	Benefit -- Cleanup achieves environmental health protection through compliance with MTCA & SMS Requirements	Benefit -- Cleanup achieves environmental health protection through compliance with MTCA & SMS Requirements	Benefit -- Cleanup achieves environmental health protection through compliance with MTCA & SMS Requirements	Benefit -- Cleanup achieves environmental health protection through compliance with MTCA & SMS Requirements	Benefit -- Cleanup achieves environmental health protection through compliance with MTCA & SMS Requirements	Benefit -- Cleanup achieves environmental health protection through compliance with MTCA & SMS Requirements	Benefit -- Cleanup achieves environmental health protection through compliance with MTCA & SMS Requirements	Benefit -- Cleanup achieves environmental health protection through compliance with MTCA & SMS Requirements
		No change -- No construction disturbances to water quality.	Mitigated Impact -- Construction disturbances to water quality to be managed through use of best practices for design & construction.	Mitigated Impact -- Construction disturbances to water quality to be managed through use of best practices for design & construction.	Mitigated Impact -- Construction disturbances to water quality to be managed through use of best practices for design & construction.	Mitigated Impact -- Construction disturbances to water quality to be managed through use of best practices for design & construction.	Mitigated Impact -- Construction disturbances to water quality to be managed through use of best practices for design & construction.	Mitigated Impact -- Construction disturbances to water quality to be managed through use of best practices for design & construction.	Mitigated Impact -- Construction disturbances to water quality to be managed through use of best practices for design & construction.	Mitigated Impact -- Construction disturbances to water quality to be managed through use of best practices for design & construction.
Outer Waterway	Units 1A, 1B & 1C	Adverse Impact -- Area has naturally recovered. But subsurface sediments may be resuspended by prop wash in navigation areas.	Benefit -- Potential for disturbance of subsurface sediments by prop wash in navigation areas addressed by institutional controls & monitoring.	Benefit -- Active cleanup of Outer Waterway reduces risk of recontamination.	Benefit -- Active cleanup of Outer Waterway reduces risk of recontamination.	Benefit -- Active cleanup of Outer Waterway reduces risk of recontamination.	Benefit -- Active cleanup of Outer Waterway reduces risk of recontamination.	Benefit -- Active cleanup of Outer Waterway reduces risk of recontamination.	Benefit -- Active cleanup of Outer Waterway reduces risk of recontamination.	Benefit -- Active cleanup of Outer Waterway reduces risk of recontamination.
Inner Waterway										
Inner Waterway	Unit 2A, 2C & 3B	Adverse Impact -- Cleanup not completed. Area does not comply with SMS cleanup levels. Prop wash may resuspend subsurface sediments in navigation areas.	Benefit -- Potential for disturbance of subsurface sediments by prop wash in navigation areas addressed by institutional controls & monitoring.	Benefit -- Active cleanup in Inner Waterway minimizes risk of recontamination. Residual sediments addressed through capping, institutional controls & monitoring.	Benefit -- Active cleanup in Inner Waterway minimizes risk of recontamination. Residual sediments addressed through capping, institutional controls & monitoring.	Benefit -- Active cleanup in Inner Waterway minimizes risk of recontamination. Residual sediments addressed through capping, institutional controls & monitoring.	Benefit -- Active cleanup in Inner Waterway minimizes risk of recontamination. Residual sediments addressed through capping, institutional controls & monitoring.	Benefit -- Active cleanup in Inner Waterway minimizes risk of recontamination. Residual sediments addressed through capping, institutional controls & monitoring.	Benefit -- Active cleanup in Inner Waterway minimizes risk of recontamination. Residual sediments addressed through capping, institutional controls & monitoring.	Benefit -- Active cleanup in Inner Waterway minimizes risk of recontamination. Residual sediments addressed through capping, institutional controls & monitoring.
		Adverse Impact -- Shoreline not stabilized. Lack of completed cleanup will hamper future shoreline stabilization actions.	Adverse Impact -- Shoreline not stabilized. Presence of residual contamination will hamper future shoreline stabilization actions.	Adverse Impact -- Deep dredging of Inner Waterway further destabilizes shorelines. Hardened shoreline infrastructure will be required to mitigate instability and support dredging, use and maintenance of target depths. Intrastructure construction costs estimated $20-40 million.	Adverse Impact -- Deep dredging of Inner Waterway further destabilizes shorelines. Hardened shoreline infrastructure will be required to mitigate instability and support dredging, use and maintenance of target depths. Intrastructure construction costs estimated $20-40 million.	Benefit -- Cleanup stabilizes project shorelines in a manner consistent with planned multi-purpose channel, without requiring extensive new infrastructure.	Benefit -- Cleanup stabilizes project shorelines in a manner consistent with planned multi-purpose channel, without requiring extensive new infrastructure.	Benefit -- Cleanup stabilizes project shorelines in a manner consistent with planned multi-purpose channel, without requiring extensive new infrastructure.	Adverse Impact -- Deep dredging of Inner Waterway further destabilizes shorelines. Hardened shoreline infrastructure will be required to mitigate instability and support dredging, use and maintenance of target depths. Intrastructure construction costs estimated $20-40 million.	Adverse Impact -- Deep dredging of Inner Waterway further destabilizes shorelines. Hardened shoreline infrastructure will be required to mitigate instability and support dredging, use and maintenance of target depths. Intrastructure construction costs estimated $20-40 million.
ASB Access Channel	Unit 2B	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
Emergent Tideflat	Units 3A	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
Log Pond	Unit 4	Adverse Impact -- Erosion may continue to occur, resulting in recontamination of cap.	Benefit -- Shoreline stabilized and potential for recontamination reduced.	Benefit -- Shoreline stabilized and potential for recontamination reduced.	Benefit -- Shoreline stabilized and potential for recontamination reduced.	Benefit -- Shoreline stabilized and potential for recontamination reduced.	Benefit -- Shoreline stabilized and potential for recontamination reduced.	Benefit -- Shoreline stabilized and potential for recontamination reduced.	Benefit -- Shoreline stabilized and potential for recontamination reduced.	Benefit -- Shoreline stabilized and potential for recontamination reduced.
Areas Offshore of ASB										
Shoulder of ASB	Unit 5B	Adverse Impact -- Sediment not remediated. Area does not comply with SMS cleanup levels.	Benefit -- Cleanup action addresses contaminated sediments and prevents recontamination.	Benefit -- Cleanup action addresses contaminated sediments and prevents recontamination.	Benefit -- Cleanup action addresses contaminated sediments and prevents recontamination.	Benefit -- Cleanup action addresses contaminated sediments and prevents recontamination.	Benefit -- Cleanup action addresses contaminated sediments and prevents recontamination.	Benefit -- Cleanup action addresses contaminated sediments and prevents recontamination.	Benefit -- Cleanup action addresses contaminated sediments and prevents recontamination.	Benefit -- Cleanup action addresses contaminated sediments and prevents recontamination.
Other Unit 5 Areas	Units 5A & 5C	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
Areas Near Bellingham Shipping Terminal										
Barge Dock Area	Unit 6B, 6C	Adverse Impact -- Sediment not remediated. Area does not comply with SMS cleanup levels.	Benefit -- Cleanup action addresses contaminated sediments and prevents recontamination.	Benefit -- Cleanup action addresses contaminated sediments and prevents recontamination.	Benefit -- Cleanup action addresses contaminated sediments and prevents recontamination.	Benefit -- Cleanup action addresses contaminated sediments and prevents recontamination.	Benefit -- Cleanup action addresses contaminated sediments and prevents recontamination.	Benefit -- Cleanup action addresses contaminated sediments and prevents recontamination.	Benefit -- Cleanup action addresses contaminated sediments and prevents recontamination.	Benefit -- Cleanup action addresses contaminated sediments and prevents recontamination.
Other Unit 6 Areas	Unit 6A	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
Starr Rock	Unit 7	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
ASB	Unit 8	Adverse Impact -- ASB sludges not remediated.	Benefit -- ASB Sludges are Capped.	Benefit -- ASB Sludges are Capped.	Benefit -- ASB sludges are remediated through nearshore fill creation.	Benefit -- ASB Sludges are Capped.	Benefit -- ASB sludges are remediated.	Benefit -- ASB sludges are remediated.	Benefit -- ASB sludges are remediated.	Benefit -- ASB sludges are remediated.
					Mitigated Impact -- ASB fill will have settlement, vapor control and groundwater quality concerns which are to be mitigated through institutional controls.		Benefit -- ASB remediation permits reuse of clean berm sands for cleanup and/or habitat enhancement activities.	Benefit -- ASB remediation permits reuse of clean berm sands for cleanup and/or habitat enhancement activities.	Benefit -- ASB remediation permits reuse of clean berm sands for cleanup and/or habitat enhancement activities.	Benefit -- ASB remediation permits reuse of clean berm sands for cleanup and/or habitat enhancement activities.

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Alternative Name & Description		No Action Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7	Alternative 8
Design Concept Figure		Figure 4-1	Figure 4-2	Figure 4-3	Figure 4-4	Figure 4-5	Figure 4-6	Figure 4-7	Figure 4-8	Figure 4-9
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ASB Area Summary [1]		No Action	Capping of ASB Sludges	Capping of ASB Sludges	Containment of ASB Sludges within Nearshore Fill	Capping of ASB Sludges	Removal, Treatment & Disposal of ASB Sludge in Subtitle D Facility [5]	Removal, Treatment & Disposal of ASB Sludge in Subtitle D Facility [5]	Removal, Treatment & Disposal of ASB Sludge in Subtitle D Facility [5]	Removal, Treatment & Disposal of ASB Sludge in Subtitle D Facility [5]
Waterway Area Summary [1]		No Action	Capping and Monitored Natural Recovery with Restricted Channel Depths [2]	Dredging of 1960s Federal Channel with Disposal at Cornwall CAD	Dredging of 1960s Federal Channel with Disposal in ASB Nearshore Fill	Dredging of Multi-Purpose Channel with Upland Disposal in Subtitle D Facility [5]	Dredging of Multi-Purpose Channel with Upland Disposal in Subtitle D Facility [5]	Expanded Dredging of Multi-Purpose Channel with Upland Disposal in Subtitle D Facility [5]	Dredging of 1960s Federal Channel with Upland Disposal in Subtitle D Facility [5]	Dredging of 1960s Federal Channel & Additional Areas with Upland Disposal in Subtitle D Facility [5]
2. Impacts, Benefits & Mitigation -- Fish & Wildlife										
Summary of Impacts & Benefits Fish & Wildlife		Net Adverse Impacts	Net Beneficial Impacts	Net Beneficial Impacts	Net Adverse Impacts	Net Beneficial Impacts	Net Beneficial Impacts	Net Beneficial Impacts	Mitigated Impacts	Net Adverse Impacts
General Cleanup Issues	Varies by Alternative	Impact -- Cleanup not performed. Action does not protect aquatic receptors	Benefit -- Completion of cleanup action protects aquatic receptors.	Benefit -- Completion of cleanup action protects aquatic receptors.	Benefit -- Completion of cleanup action protects aquatic receptors.	Benefit -- Completion of cleanup action protects aquatic receptors.	Benefit -- Completion of cleanup action protects aquatic receptors.	Benefit -- Completion of cleanup action protects aquatic receptors.	Benefit -- Completion of cleanup action protects aquatic receptors.	Benefit -- Completion of cleanup action protects aquatic receptors.
		No change -- No construction disturbances to aquatic organisms.	Mitigated Impact -- Construction disturbances managed through use of best practices, appropriate work timing.	Mitigated Impact -- Construction disturbances managed through use of best practices, appropriate work timing.	Mitigated Impact -- Construction disturbances managed through use of best practices, appropriate work timing.	Mitigated Impact -- Construction disturbances managed through use of best practices, appropriate work timing.	Mitigated Impact -- Construction disturbances managed through use of best practices, appropriate work timing.	Mitigated Impact -- Construction disturbances managed through use of best practices, appropriate work timing.	Mitigated Impact -- Construction disturbances managed through use of best practices, appropriate work timing.	Mitigated Impact -- Construction disturbances managed through use of best practices, appropriate work timing.
Outer Waterway	Units 1A, 1B & 1C	No Change	No Change	No Change -- Dredging Occurs in Deep-Water Areas	No Change -- Dredging Occurs in Deep-Water Areas	No Change -- Dredging Occurs in Deep-Water Areas	No Change -- Dredging Occurs in Deep-Water Areas	No Change -- Dredging Occurs in Deep-Water Areas	No Change -- Dredging Occurs in Deep-Water Areas	No Change -- Dredging Occurs in Deep-Water Areas
Inner Waterway										
Inner Waterway	Unit 2A, 2C & 3B	Benefit -- Emergent Shallow-Water Habitat is Preserved	Benefit -- Absence of Deep Dredging Retains Shallow-Water Habitat in Nearshore Shoaled Areas	Mitigated Impact -- Dredging of 1960s Industrial Channel Removes Emergent Shallow-Water Habitat and Requires Use of Hardened Shorelines and Bulkheads to Achieve Target Dredge Depths. Impact mitigated by habitat creation at Cornwall CAD.	Adverse Impact -- Dredging of 1960s Industrial Channel Removes Emergent Shallow-Water Habitat and Requires Use of Hardened Shorelines and Bulkheads to Achieve Target Dredge Depths. Impact to require mitigation.	Benefit -- Use of Sloping Shoreline Stabilization Methods Consistent with Multi-Purpose Channel Dimensions Preserves and Enhances Shallow-Water Habitat Along Salmonid Migration Corridors	Benefit -- Use of Sloping Shoreline Stabilization Methods Consistent with Multi-Purpose Channel Dimensions Preserves and Enhances Shallow-Water Habitat Along Salmonid Migration Corridors	Benefit -- Use of Sloping Shoreline Stabilization Methods Consistent with Multi-Purpose Channel Dimensions Preserves and Enhances Shallow-Water Habitat Along Salmonid Migration Corridors	Mitigated Impact -- Dredging of 1960s Industrial Channel Removes Emergent Shallow-Water Habitat and Requires Use of Hardened Shorelines and Bulkheads to Achieve Target Dredge Depths. Impact mitigated through habitat restoration in other areas.	Adverse Impact -- Dredging of 1960s Industrial Channel Removes Emergent Shallow-Water Habitat and Requires Use of Hardened Shorelines and Bulkheads to Achieve Target Dredge Depths. Impact to require mitigation.
ASB Access Channel	Unit 2B	Benefit -- Emergent Shallow-Water Habitat is Preserved	Benefit -- Emergent Shallow-Water Habitat is Preserved	Benefit -- Emergent Shallow-Water Habitat is Preserved	Benefit -- Emergent Shallow-Water Habitat is Preserved	Benefit -- Emergent Shallow-Water Habitat is Preserved	Mitigated Impact -- Dredging of Channel Converts 0.7 Acres of Shallow-Water Habitat to Deep-Water Bottom Areas. Mitigated by habitat creation in other areas.	Mitigated Impact -- Dredging of Channel Converts 0.7 Acres of Shallow-Water Habitat to Deep-Water Bottom Areas. Mitigated by habitat creation in other areas.	Mitigated Impact -- Dredging of Channel Converts 0.7 Acres of Shallow-Water Habitat to Deep-Water Bottom Areas. Mitigated by habitat creation in other areas.	Adverse Impact -- Dredging of Channel Converts 0.7 Acres of Shallow-Water Habitat to Deep-Water Bottom Areas. Impact not fully mitigated by habitat creation in other areas.
Emergent Tideflat	Units 3A	Benefit -- Emergent Shallow-Water Habitat is Preserved	Benefit -- Emergent Shallow-Water Habitat is Preserved	Mitigated Impact -- Dredging of 1960s Industrial Channel Removes Emergent Shallow-Water Habitat. Impact mitigated by habitat creation at Cornwall CAD.	Adverse Impact -- Dredging of 1960s Industrial Channel Removes Emergent Shallow-Water Habitat. Impact to require mitigation.	Benefit -- Multi-Purpose Channel Preserves Emergent Shallow-Water Habitat	Benefit -- Multi-Purpose Channel Preserves Emergent Shallow-Water Habitat	Benefit -- Multi-Purpose Channel Preserves Emergent Shallow-Water Habitat	Mitigated Impact -- Dredging of 1960s Industrial Channel Removes Emergent Shallow-Water Habitat. Mitigated by habitat creation in other areas.	Adverse Impact -- Dredging of 1960s Industrial Channel Removes Emergent Shallow-Water Habitat. Not fully mitigated by habitat creation other areas.
Log Pond	Unit 4	No Change	Mitigated Impact -- Substrate Modifications and Elevation Changes Required to Stabilize Shoreline Edges of Log Pond. Impacts mitigated through design & permitting.	Mitigated Impact -- Substrate Modifications and Elevation Changes Required to Stabilize Shoreline Edges of Log Pond. Impacts mitigated through design & permitting.	Mitigated Impact -- Substrate Modifications and Elevation Changes Required to Stabilize Shoreline Edges of Log Pond. Impacts mitigated through design & permitting.	Mitigated Impact -- Substrate Modifications and Elevation Changes Required to Stabilize Shoreline Edges of Log Pond. Impacts mitigated through design & permitting.	Mitigated Impact -- Substrate Modifications and Elevation Changes Required to Stabilize Shoreline Edges of Log Pond. Impacts mitigated through design & permitting.	Mitigated Impact -- Substrate Modifications and Elevation Changes Required to Stabilize Shoreline Edges of Log Pond. Impacts mitigated through design & permitting.	Mitigated Impact -- Substrate Modifications and Elevation Changes Required to Stabilize Shoreline Edges of Log Pond. Impacts mitigated through design & permitting.	Mitigated Impact -- Substrate Modifications and Elevation Changes Required to Stabilize Shoreline Edges of Log Pond. Impacts mitigated through design & permitting.
Areas Offshore of ASB										
Shoulder of ASB	Unit 5B	No Change	Benefit -- Capping Design Concept Creates 4 to 6 Acres of Premium Nearshore Habitat	Benefit -- Capping Design Concept Creates 4 to 6 Acres of Premium Nearshore Habitat	Benefit -- Capping Design Concept Creates 4 to 6 Acres of Premium Nearshore Habitat	Benefit -- Capping Design Concept Creates 4 to 6 Acres of Premium Nearshore Habitat	Benefit -- Capping Design Concept Creates 4 to 6 Acres of Premium Nearshore Habitat	Benefit -- Capping Design Concept Creates 4 to 6 Acres of Premium Nearshore Habitat	Benefit -- Capping Design Concept Creates 4 to 6 Acres of Premium Nearshore Habitat	Adverse Imapct -- Dredging Converts 4 to 6 Acres of Shallow-Water Area to Deep-Water Area
Other Unit 5 Areas	Units 5A & 5C	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	Adverse Imapct -- Dredging Results in Deepening of Existing Shallow-Water Habitat Areas Along ASB Berm
Areas Near Bellingham Shipping Terminal										
Barge Dock Area	Unit 6B, 6C	No Change	No Change -- Capping Limited to Deep-Water Areas	No Change -- Capping Limited to Deep-Water Areas	No Change -- Capping Limited to Deep-Water Areas	No Change -- Capping Limited to Deep-Water Areas	No Change -- Capping Limited to Deep-Water Areas	No Change -- Capping Limited to Deep-Water Areas	No Change -- Capping Limited to Deep-Water Areas	No Change -- Dredging Limited to Deep-Water Areas
Other Unit 6 Areas	Unit 6A	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	Adverse Impact -- Dredging deepens Shallow-Water Nearshore Habitat Areas. Impacts to require mitigation.
Starr Rock	Unit 7	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change -- Dredging Limited to Deep-Water Areas
ASB	Unit 8	No Change -- ASB remains under non-aquatic use.	No Change -- ASB Sludges are Capped and Area Remains Isolated from Bellingham Bay	No Change -- ASB Sludges are Capped and Area Remains Isolated from Bellingham Bay	No Change -- Nearshore Fill is Constructed within ASB, Converting Area Permanently to Upland Characteristics	No Change -- ASB Sludges are Capped and Area Remains Isolated from Bellingham Bay	Benefit -- ASB is Sludges are Removed and Berm is Opened, Restoring Connection of ASB Basin with Bellingham Bay, restoring 28 acres of open-water habitat and nearly 4,500 linear feet of nearshore habitat along salmonid migration corridor. ASB restoration mitigates for impacts in other areas.	Benefit -- ASB is Sludges are Removed and Berm is Opened, Restoring Connection of ASB Basin with Bellingham Bay, restoring 28 acres of open-water habitat and nearly 4,500 linear feet of nearshore habitat along salmonid migration corridor. ASB restoration mitigates for impacts in other areas.	Benefit -- ASB is Sludges are Removed and Berm is Opened, Restoring Connection of ASB Basin with Bellingham Bay, restoring 28 acres of open-water habitat and nearly 4,500 linear feet of nearshore habitat along salmonid migration corridor. ASB restoration mitigates for impacts in other areas.	Benefit -- ASB is Sludges are Removed and Berm is Opened, Restoring Connection of ASB Basin with Bellingham Bay, restoring 28 acres of open-water habitat and nearly 4,500 linear feet of nearshore habitat along salmonid migration corridor. ASB restoration partially mitigates for impacts in other areas.

Table 4-2. Summary of SEPA Analysis of Environmental Impacts

Alternative Name & Description		No Action Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7	Alternative 8
Design Concept Figure		Figure 4-1	Figure 4-2	Figure 4-3	Figure 4-4	Figure 4-5	Figure 4-6	Figure 4-7	Figure 4-8	Figure 4-9
Probable Cost ($ million)		--	$8 million	$34 million	$34 million	$21 million	$42 million	$44 million	$74 million	$146 million
Est. Time for Design/Construction (yrs)		--	6 to 12 yrs	6 to 9 yrs	5 to 8 yrs	3 to 4 yrs	5 to 6 yrs	5 to 6 yrs	7 to 9 yrs	8 to 13 yrs
ASB Area Summary [1]		No Action	Capping of ASB Sludges	Capping of ASB Sludges	Containment of ASB Sludges within Nearshore Fill	Capping of ASB Sludges	Removal, Treatment & Disposal of ASB Sludge in Subtitle D Facility [5]	Removal, Treatment & Disposal of ASB Sludge in Subtitle D Facility [5]	Removal, Treatment & Disposal of ASB Sludge in Subtitle D Facility [5]	Removal, Treatment & Disposal of ASB Sludge in Subtitle D Facility [5]
Waterway Area Summary [1]		No Action	Capping and Monitored Natural Recovery with Restricted Channel Depths [2]	Dredging of 1960s Federal Channel with Disposal at Cornwall CAD	Dredging of 1960s Federal Channel with Disposal in ASB Nearshore Fill	Dredging of Multi-Purpose Channel with Upland Disposal in Subtitle D Facility [5]	Dredging of Multi-Purpose Channel with Upland Disposal in Subtitle D Facility [5]	Expanded Dredging of Multi-Purpose Channel with Upland Disposal in Subtitle D Facility [5]	Dredging of 1960s Federal Channel with Upland Disposal in Subtitle D Facility [5]	Dredging of 1960s Federal Channel & Additional Areas with Upland Disposal in Subtitle D Facility [5]
Cornwall CAD Location	Cornwall Ave Landfill Area	No Change	No Change	Benefit -- Signficiant area of premium nearshore habitat created as part of CAD site development, mitigating for habitat impacts in other site areas.	No Change	No Change	No Change	No Change	No Change	No Change

Table 4-2. Summary of SEPA Analysis of Environmental Impacts

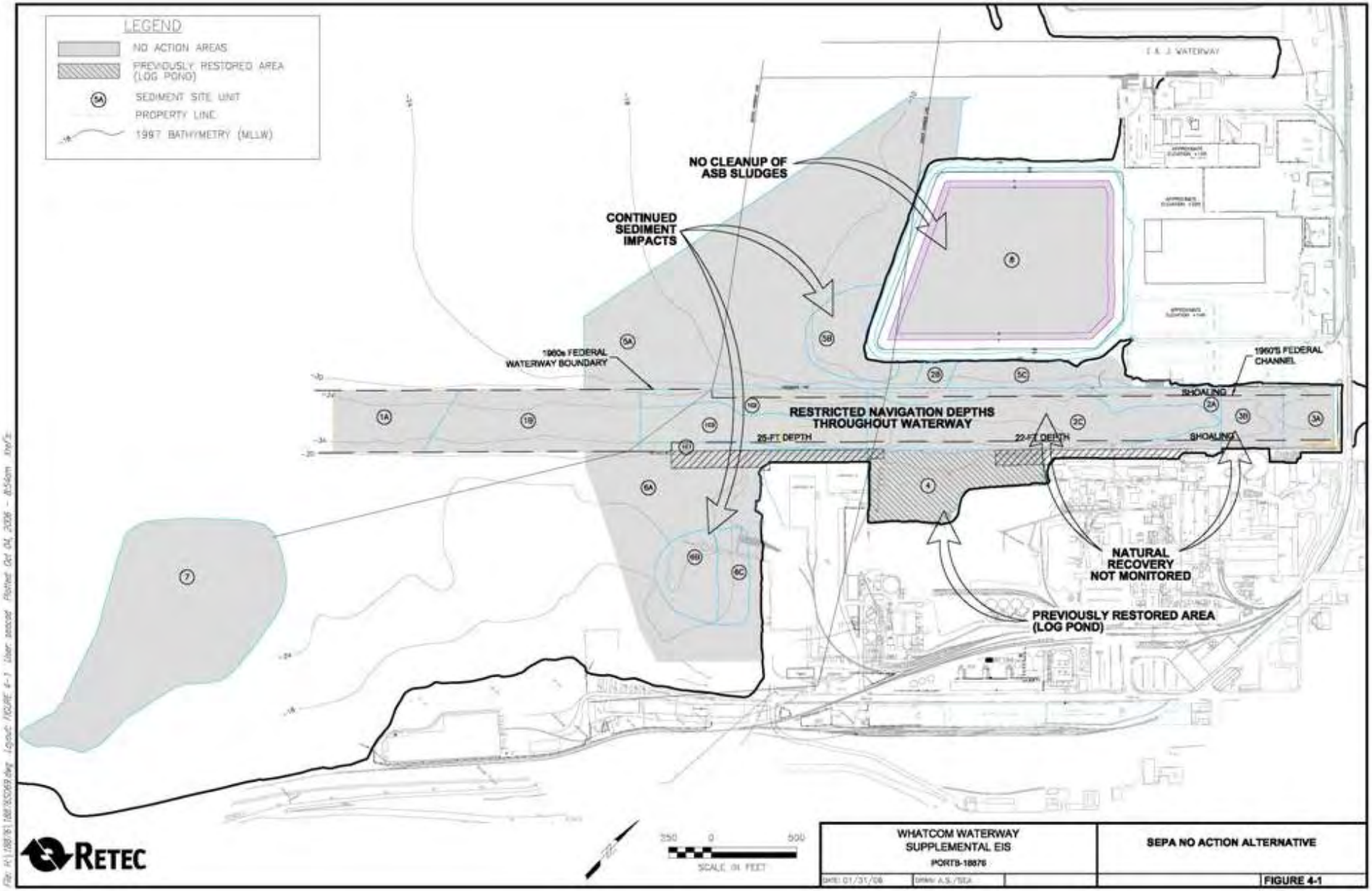
Alternative Name & Description		No Action Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7	Alternative 8
Design Concept Figure		Figure 4-1	Figure 4-2	Figure 4-3	Figure 4-4	Figure 4-5	Figure 4-6	Figure 4-7	Figure 4-8	Figure 4-9
Probable Cost ($ million)		--	$8 million	$34 million	$34 million	$21 million	$42 million	$44 million	$74 million	$146 million
Est. Time for Design/Construction (yrs)		--	6 to 12 yrs	6 to 9 yrs	5 to 8 yrs	3 to 4 yrs	5 to 6 yrs	5 to 6 yrs	7 to 9 yrs	8 to 13 yrs
ASB Area Summary [1]		No Action	Capping of ASB Sludges	Capping of ASB Sludges	Containment of ASB Sludges within Nearshore Fill	Capping of ASB Sludges	Removal, Treatment & Disposal of ASB Sludge in Subtitle D Facility [5]	Removal, Treatment & Disposal of ASB Sludge in Subtitle D Facility [5]	Removal, Treatment & Disposal of ASB Sludge in Subtitle D Facility [5]	Removal, Treatment & Disposal of ASB Sludge in Subtitle D Facility [5]
Waterway Area Summary [1]		No Action	Capping and Monitored Natural Recovery with Restricted Channel Depths [2]	Dredging of 1960s Federal Channel with Disposal at Cornwall CAD	Dredging of 1960s Federal Channel with Disposal in ASB Nearshore Fill	Dredging of Multi-Purpose Channel with Upland Disposal in Subtitle D Facility [5]	Dredging of Multi-Purpose Channel with Upland Disposal in Subtitle D Facility [5]	Expanded Dredging of Multi-Purpose Channel with Upland Disposal in Subtitle D Facility [5]	Dredging of 1960s Federal Channel with Upland Disposal in Subtitle D Facility [5]	Dredging of 1960s Federal Channel & Additional Areas with Upland Disposal in Subtitle D Facility [5]
3. Impacts, Benefits & Mitigation -- Land Use, Navigation & Public Shoreline Access										
Summary of Impacts & Benefits Land Use, Navigation & Public Access		Net Adverse Impacts	Net Adverse Impacts	Net Adverse Impacts	Net Adverse Impacts	Net Adverse Impacts	Net Beneficial Impacts	Net Beneficial Impacts	Net Adverse Impacts	Net Adverse Impacts
Outer Waterway	Units 1A, 1B & 1C	Adverse Impact -- Restricted Water Depths will Limit Future Deep-Draft Uses of Terminal Area, Conflicting with Current and Planned Uses	Adverse Impact -- Restricted Water Depths will Limit Future Deep-Draft Uses of Terminal Area, Conflicting with Current and Planned Uses	Benefit -- Dredging in Outer Waterway Preserves Deep Draft Uses of Terminal Area, Consistent with Current and Planned Uses	Benefit -- Dredging in Outer Waterway Preserves Deep Draft Uses of Terminal Area, Consistent with Current and Planned Uses	Benefit -- Dredging in Outer Waterway Preserves Deep Draft Uses of Terminal Area, Consistent with Current and Planned Uses	Benefit -- Dredging in Outer Waterway Preserves Deep Draft Uses of Terminal Area, Consistent with Current and Planned Uses	Benefit -- Dredging in Outer Waterway Preserves Deep Draft Uses of Terminal Area, Consistent with Current and Planned Uses	Benefit -- Dredging in Outer Waterway Preserves Deep Draft Uses of Terminal Area, Consistent with Current and Planned Uses	Benefit -- Dredging in Outer Waterway Preserves Deep Draft Uses of Terminal Area, Consistent with Current and Planned Uses
Inner Waterway										
Inner Waterway	Unit 2A, 2C & 3B	Adverse Impact -- Restricted Water Depths and Lack of Stabilized Shorelines will Hamper Development of Transient Moorage & Public Access Enhancements as Part of Planned Mixed-Use Redevelopment	Adverse Impact -- Restricted Water Depths and Lack of Stabilized Shorelines will Hamper Development of Transient Moorage & Public Access Enhancements as Part of Planned Mixed-Use Redevelopment	Adverse Impact -- Industrial Shoreline Infrastructure Requirements and Land Use Restrictions Associated with Federal Channel Conflict with Planned Development of Transient Moorage & Public Access Enhancements as Part of Planned Mixed-Use Redevelopment	Adverse Impact -- Industrial Shoreline Infrastructure Requirements and Land Use Restrictions Associated with Federal Channel Conflict with Planned Development of Transient Moorage & Public Access Enhancements as Part of Planned Mixed-Use Redevelopment	Benefit -- Cleanup & Shoreline Stabilization Conducted Consistent with Locally-Managed Multi-Purpose Waterway and Planned Mixed-Use Redevelopment, Including Infrastructure and Navigation Planning	Benefit -- Cleanup & Shoreline Stabilization Conducted Consistent with Locally-Managed Multi-Purpose Waterway and Planned Mixed-Use Redevelopment, Including Infrastructure and Navigation Planning	Benefit -- Cleanup & Shoreline Stabilization Conducted Consistent with Locally-Managed Multi-Purpose Waterway and Planned Mixed-Use Redevelopment, Including Infrastructure and Navigation Planning	Adverse Impact -- Industrial Shoreline Infrastructure Requirements and Land Use Restrictions Associated with Federal Channel Conflict with Planned Development of Transient Moorage & Public Access Enhancements as Part of Planned Mixed-Use Redevelopment	Adverse Impact -- Industrial Shoreline Infrastructure Requirements and Land Use Restrictions Associated with Federal Channel Conflict with Planned Development of Transient Moorage & Public Access Enhancements as Part of Planned Mixed-Use Redevelopment
ASB Access Channel	Unit 2B	No Change	No Change	No Change	No Change	No Change	Benefit -- Area Dredged Consistent with Plans for Access Channel for Multi-Purpose ASB Marina	Benefit -- Area Dredged Consistent with Plans for Access Channel for Multi-Purpose ASB Marina	Possible Adverse Impact -- Adherence to 1960s Industrial Channel May Require Use of Alternate Access Channel Location for Planned Marina [9]	Possible Adverse Impact -- Adherence to 1960s Industrial Channel May Require Use of Alternate Access Channel Location for Planned Marina [9]
Emergent Tideflat	Units 3A	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
Log Pond	Unit 4	No Change	No Change -- Log Pond Cap & Habitat Enhancements Are Preserved. Some Modifications Required to Stabilize Shoreline Edges of Log Pond.	No Change -- Log Pond Cap & Habitat Enhancements Are Preserved. Some Modifications Required to Stabilize Shoreline Edges of Log Pond.	No Change -- Log Pond Cap & Habitat Enhancements Are Preserved. Some Modifications Required to Stabilize Shoreline Edges of Log Pond.	No Change -- Log Pond Cap & Habitat Enhancements Are Preserved. Some Modifications Required to Stabilize Shoreline Edges of Log Pond.	No Change -- Log Pond Cap & Habitat Enhancements Are Preserved. Some Modifications Required to Stabilize Shoreline Edges of Log Pond.	No Change -- Log Pond Cap & Habitat Enhancements Are Preserved. Some Modifications Required to Stabilize Shoreline Edges of Log Pond.	No Change -- Log Pond Cap & Habitat Enhancements Are Preserved. Some Modifications Required to Stabilize Shoreline Edges of Log Pond.	No Change -- Log Pond Cap & Habitat Enhancements Are Preserved. Some Modifications Required to Stabilize Shoreline Edges of Log Pond.
Areas Offshore of ASB										
Shoulder of ASB	Unit 5B	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
Other Unit 5 Areas	Units 5A & 5C	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
Areas Near Bellingham Shipping Terminal										
Barge Dock Area	Unit 6B, 6C	No Change	No Change -- Capping Design Not Expected to Impact Planned Navigation Uses.	No Change -- Capping Design Not Expected to Impact Planned Navigation Uses.	No Change -- Capping Design Not Expected to Impact Planned Navigation Uses.	No Change -- Capping Design Not Expected to Impact Planned Navigation Uses.	No Change -- Capping Design Not Expected to Impact Planned Navigation Uses.	No Change -- Capping Design Not Expected to Impact Planned Navigation Uses.	No Change -- Capping Design Not Expected to Impact Planned Navigation Uses.	No Change -- Dredging Has No Impact on Planned Navigation Uses.
Other Unit 6 Areas	Unit 6A	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change -- Dredging Has No Impact on Planned Navigation Uses
Starr Rock	Unit 7	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change -- Dredging Has No Impact on Planned Navigation Uses
ASB Area	Unit 8	Adverse Impact -- Lack of ASB Cleanup Conflicts with Planned Restoration of Aquatic Uses within the ASB, Including Development of Marina with Integrated Public Access and Habitat Enhancements.	Adverse Impact -- ASB Cleanup Conflicts with Planned Restoration of Aquatic Uses within the ASB, Including Development of Marina with Integrated Public Access and Habitat Enhancements.	Adverse Impact -- ASB Cleanup Conflicts with Planned Restoration of Aquatic Uses within the ASB, Including Development of Marina with Integrated Public Access and Habitat Enhancements.	Adverse Impact -- ASB Cleanup Conflicts with Planned Restoration of Aquatic Uses within the ASB, Including Development of Marina with Integrated Public Access and Habitat Enhancements.	Adverse Impact -- ASB Cleanup Conflicts with Planned Restoration of Aquatic Uses within the ASB, Including Development of Marina with Integrated Public Access and Habitat Enhancements	Benefit -- ASB Sludge Removal and Berm Opening is Consistent with Planned Reuse of ASB as Marina with Integrated Public Access and Habitat Enhancements	Benefit -- ASB Sludge Removal and Berm Opening is Consistent with Planned Reuse of ASB as Marina with Integrated Public Access and Habitat Enhancements	Benefit -- ASB Sludge Removal and Berm Opening is Consistent with Planned Reuse of ASB as Marina with Integrated Public Access and Habitat Enhancements	Benefit -- ASB Sludge Removal and Berm Opening is Consistent with Planned Reuse of ASB as Marina with Integrated Public Access and Habitat Enhancements

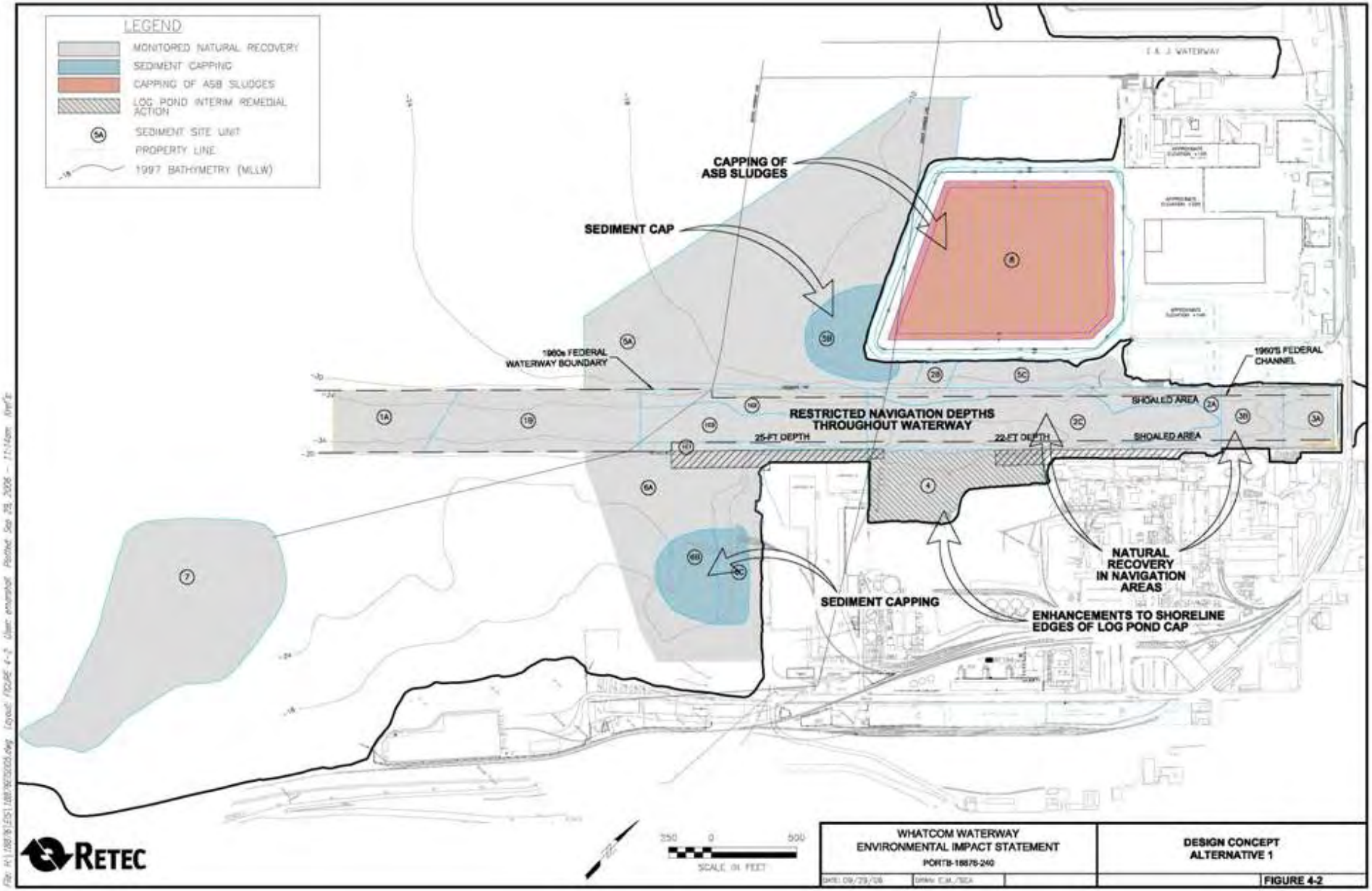
Notes:

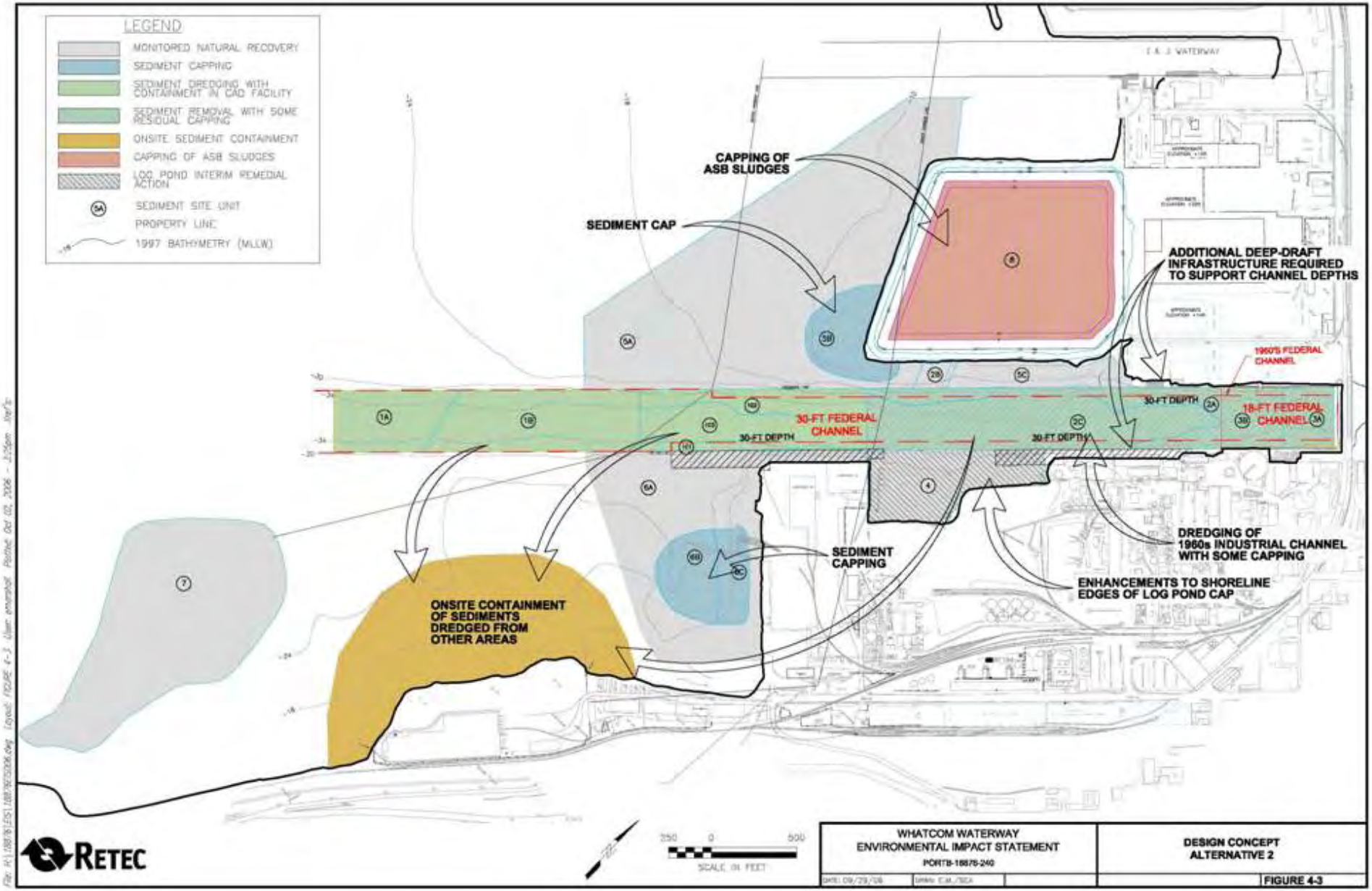
9. Under Alternatives 7 & 8, the marina access channel may have to be relocated to the area offshore of the ASB in order to avoid navigation conflicts between the marina entrance and large-vessel navigation patterns in the Whatcom Waterway.

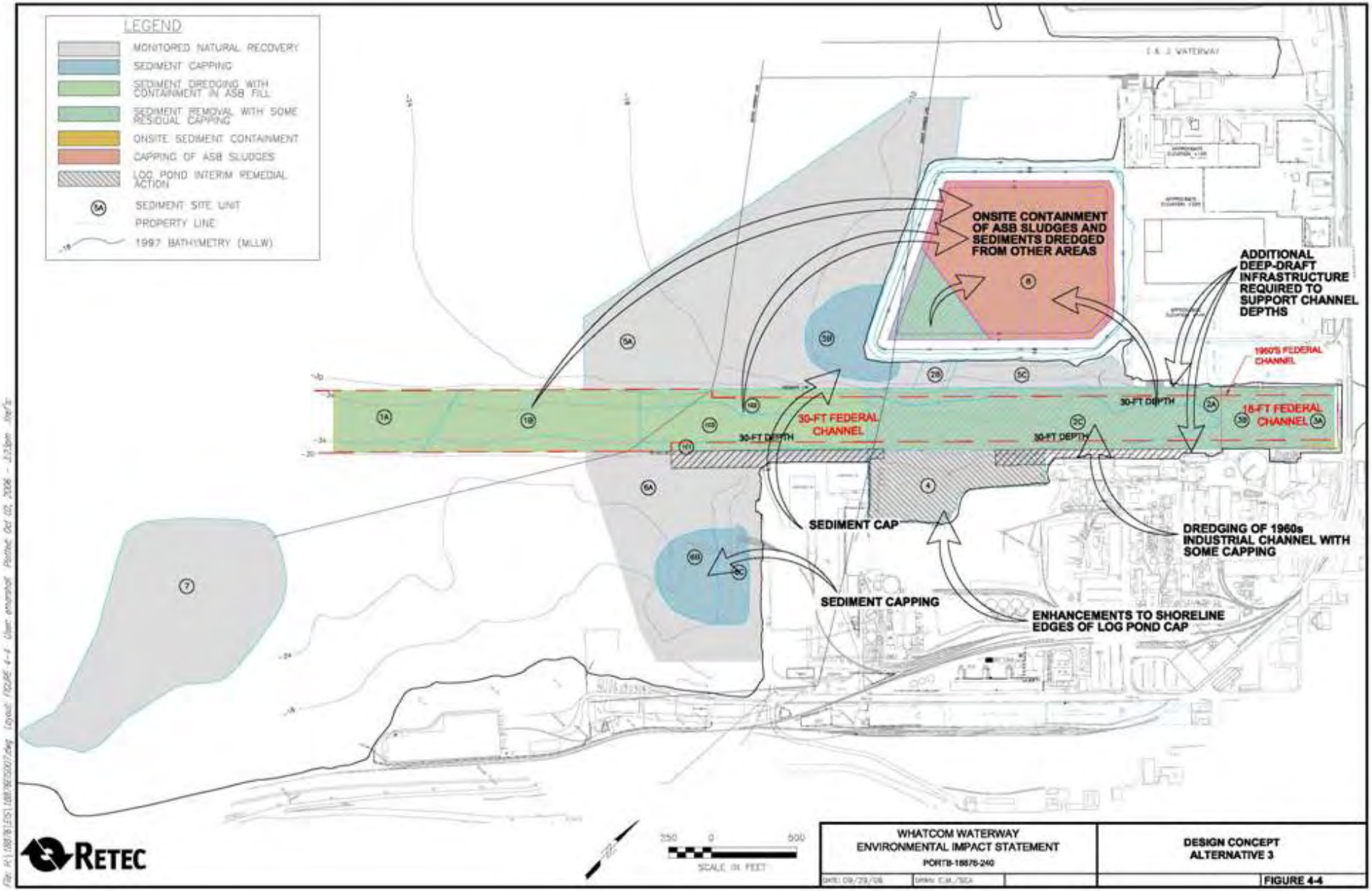
Table 4-2. Summary of SEPA Analysis of Environmental Impacts

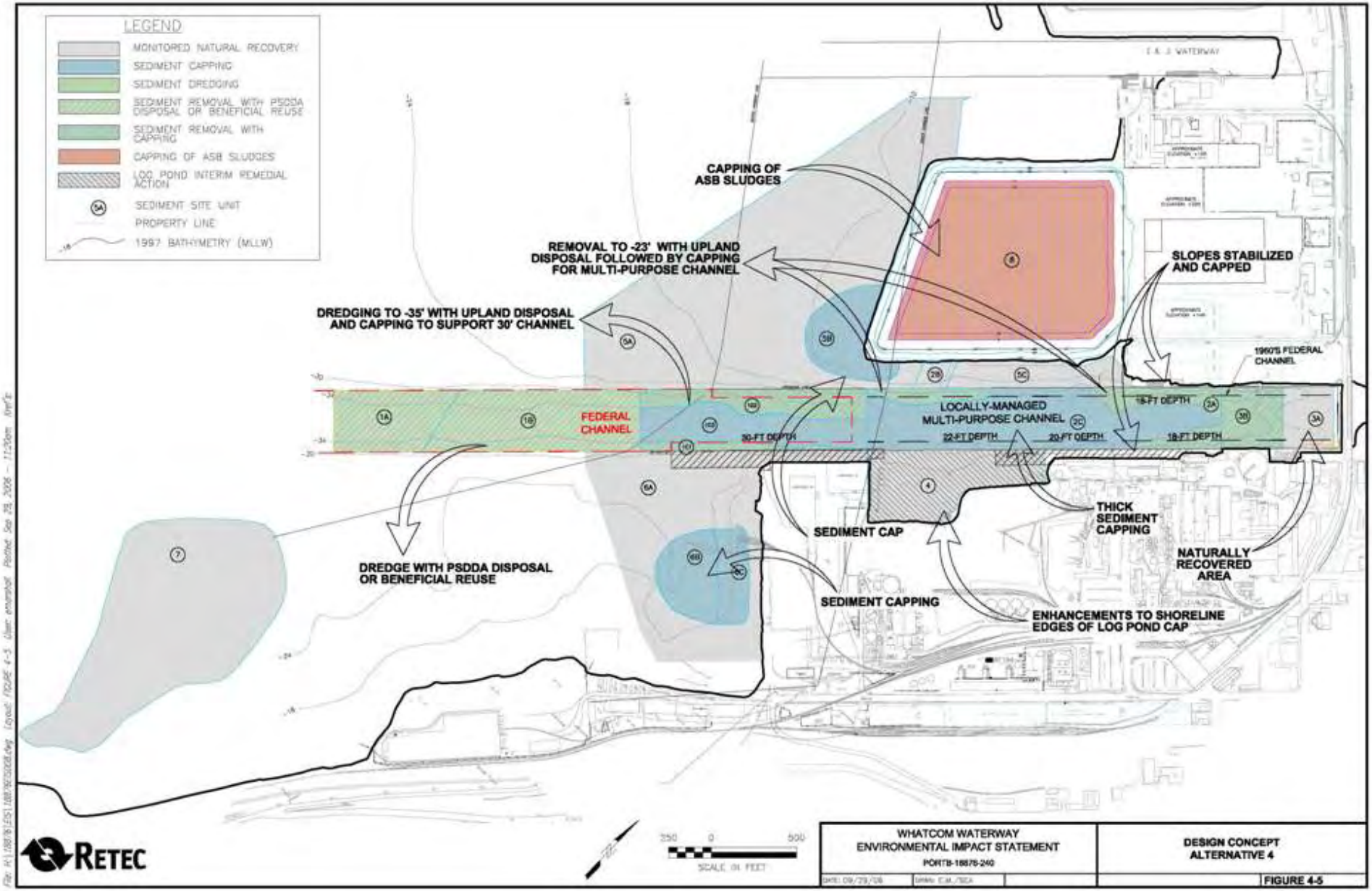
Alternative Name & Description		No Action Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7	Alternative 8
Design Concept Figure		Figure 4-1	Figure 4-2	Figure 4-3	Figure 4-4	Figure 4-5	Figure 4-6	Figure 4-7	Figure 4-8	Figure 4-9
Probable Cost ($ million)		--	$8 million	$34 million	$34 million	$21 million	$42 million	$44 million	$74 million	$146 million
Est. Time for Design/Construction (yrs)		--	6 to 12 yrs	6 to 9 yrs	5 to 8 yrs	3 to 4 yrs	5 to 6 yrs	5 to 6 yrs	7 to 9 yrs	8 to 13 yrs
ASB Area Summary [1]		No Action	Capping of ASB Sludges	Capping of ASB Sludges	Containment of ASB Sludges within Nearshore Fill	Capping of ASB Sludges	Removal, Treatment & Disposal of ASB Sludge in Subtitle D Facility [5]	Removal, Treatment & Disposal of ASB Sludge in Subtitle D Facility [5]	Removal, Treatment & Disposal of ASB Sludge in Subtitle D Facility [5]	Removal, Treatment & Disposal of ASB Sludge in Subtitle D Facility [5]
Waterway Area Summary [1]		No Action	Capping and Monitored Natural Recovery with Restricted Channel Depths [2]	Dredging of 1960s Federal Channel with Disposal at Cornwall CAD	Dredging of 1960s Federal Channel with Disposal in ASB Nearshore Fill	Dredging of Multi-Purpose Channel with Upland Disposal in Subtitle D Facility [5]	Dredging of Multi-Purpose Channel with Upland Disposal in Subtitle D Facility [5]	Expanded Dredging of Multi-Purpose Channel with Upland Disposal in Subtitle D Facility [5]	Dredging of 1960s Federal Channel with Upland Disposal in Subtitle D Facility [5]	Dredging of 1960s Federal Channel & Additional Areas with Upland Disposal in Subtitle D Facility [5]
4. Impacts, Benefits & Mitigation -- Air & Noise										
Summary of Impacts & Benefits Air & Noise		-- No Change	Mitigated Impacts	Mitigated Impacts	Mitigated Impacts	Mitigated Impacts	Mitigated Impacts	Mitigated Impacts	Mitigated Impacts	Mitigated Impacts
General Cleanup Issues	Varies by Alternative	No Change -- No construction disturbances to existing noise levels or air quality.	Mitigated Impact -- Construction disturbances to be managed through use of best practices for design & construction.	Mitigated Impact -- Construction disturbances to be managed through use of best practices for design & construction.	Mitigated Impact -- Construction disturbances to be managed through use of best practices for design & construction.	Mitigated Impact -- Construction disturbances to be managed through use of best practices for design & construction.	Mitigated Impact -- Construction disturbances to be managed through use of best practices for design & construction.	Mitigated Impact -- Construction disturbances to be managed through use of best practices for design & construction.	Mitigated Impact -- Construction disturbances to be managed through use of best practices for design & construction.	Mitigated Impact -- Construction disturbances to be managed through use of best practices for design & construction.
5. Impacts, Benefits & Mitigation -- Historical & Cultural Preservation										
Summary of Impacts & Benefits Historical & Cultural Preservation		-- No Change	-- No Change	Mitigated Impacts	Mitigated Impacts	Mitigated Impacts	Mitigated Impacts	Mitigated Impacts	Mitigated Impacts	Mitigated Impacts
General Cleanup Issues	Varies by Alternative	No Change -- Alternative does not involve dredging that could potentially disturb historical or archaeological resources.	No Change -- Alternative does not involve dredging that could potentially disturb historical or archaeological resources.	Mitigated Impact -- Construction distrubances to be managed through use of best practices for design & construction.	Mitigated Impact -- Construction distrubances to be managed through use of best practices for design & construction.	Mitigated Impact -- Construction distrubances to be managed through use of best practices for design & construction.	Mitigated Impact -- Construction distrubances to be managed through use of best practices for design & construction.	Mitigated Impact -- Construction distrubances to be managed through use of best practices for design & construction.	Mitigated Impact -- Construction distrubances to be managed through use of best practices for design & construction.	Mitigated Impact -- Construction distrubances to be managed through use of best practices for design & construction.
Inner Waterway	Unit 3A	No Change	Benefit -- No dredging in shallow-water areas near former Citizens' Dock, which may have historical or archaeological resources.	Mitigated Impact -- Potential for disturbance of historical or archaeological resources near former Citizens' Dock during dredging to be addressed during design, permitting & construction.	Mitigated Impact -- Potential for disturbance of historical or archaeological resources near former Citizens' Dock during dredging to be addressed during design, permitting & construction.	Benefit -- No dredging in shallow-water areas near former Citizens' Dock, which may have historical or archaeological resources.	Benefit -- No dredging in shallow-water areas near former Citizens' Dock, which may have historical or archaeological resources.	Benefit -- No dredging in shallow-water areas near former Citizens' Dock, which may have historical or archaeological resources.	Mitigated Impact -- Potential for disturbance of historical or archaeological resources near former Citizens' Dock during dredging to be addressed during design, permitting & construction.	Mitigated Impact -- Potential for disturbance of historical or archaeological resources near former Citizens' Dock during dredging to be addressed during design, permitting & construction.
Other Site Areas		No Change	No Change -- Alternative does not involve dredging that could potentially disturb historical or archaeological resources.	Mitigated Impact -- Risks of disturbance to historical & archaeological resources lower in other site areas. Risk of disturbance to be mitigated through appropriate project reviews & permitting.	Mitigated Impact -- Risks of disturbance to historical & archaeological resources lower in other site areas. Risk of disturbance to be mitigated through appropriate project reviews & permitting.	Mitigated Impact -- Risks of disturbance to historical & archaeological resources lower in other site areas. Risk of disturbance to be mitigated through appropriate project reviews & permitting.	Mitigated Impact -- Risks of disturbance to historical & archaeological resources lower in other site areas. Risk of disturbance to be mitigated through appropriate project reviews & permitting.	Mitigated Impact -- Risks of disturbance to historical & archaeological resources lower in other site areas. Risk of disturbance to be mitigated through appropriate project reviews & permitting.	Mitigated Impact -- Risks of disturbance to historical & archaeological resources lower in other site areas. Risk of disturbance to be mitigated through appropriate project reviews & permitting.	Mitigated Impact -- Risks of disturbance to historical & archaeological resources lower in other site areas. Risk of disturbance to be mitigated through appropriate project reviews & permitting.

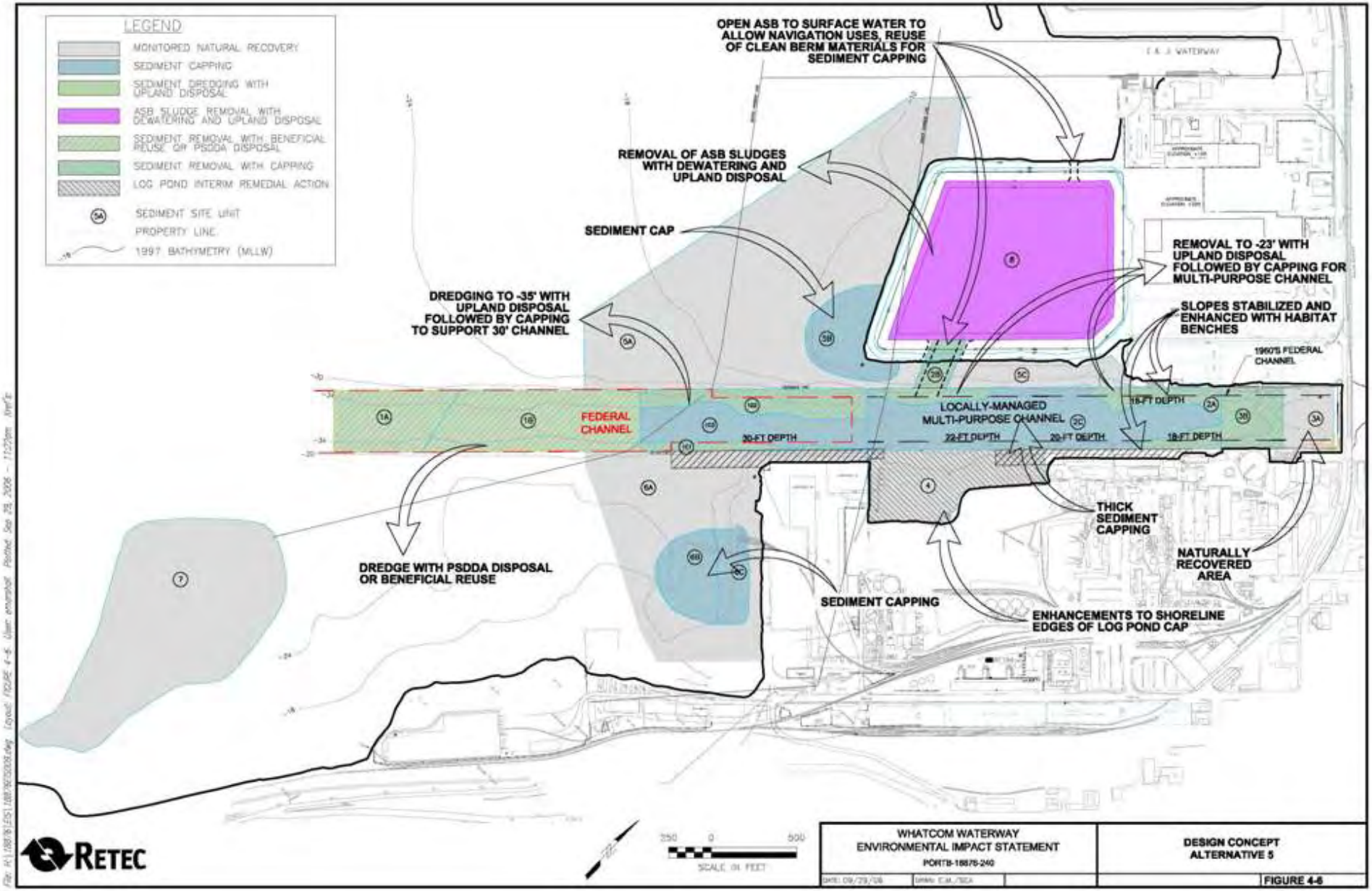

LEGEND
NO ACTION AREAS
PREVIOUSLY RESTORED AREA (LOG POND)
SEDIMENT SITE UNIT
PROPERTY LINE
1987 BATHYMETRY (MLLW)
NO CLEANUP OF ASB SLUDGES
CONTINUED SEDIMENT IMPACTS
1900s FEDERAL WATERWAY BOUNDARY
1960'S FEDERAL CHANNEL
SHOALING
RESTRICTED NAVIGATION DEPTHS THROUGHOUT WATERWAY
25-FT DEPTH
22-FT DEPTH
SHOALING
NATURAL RECOVERY NOT MONITORED
PREVIOUSLY RESTORED AREA (LOG POND)
250 0 500
SCALE IN FEET
RETEC
WHATCOM WATERWAY SUPPLEMENTAL EIS
PORTB-18876
SEPA NO ACTION ALTERNATIVE
DATE: 01/31/08
FIGURE 4-1

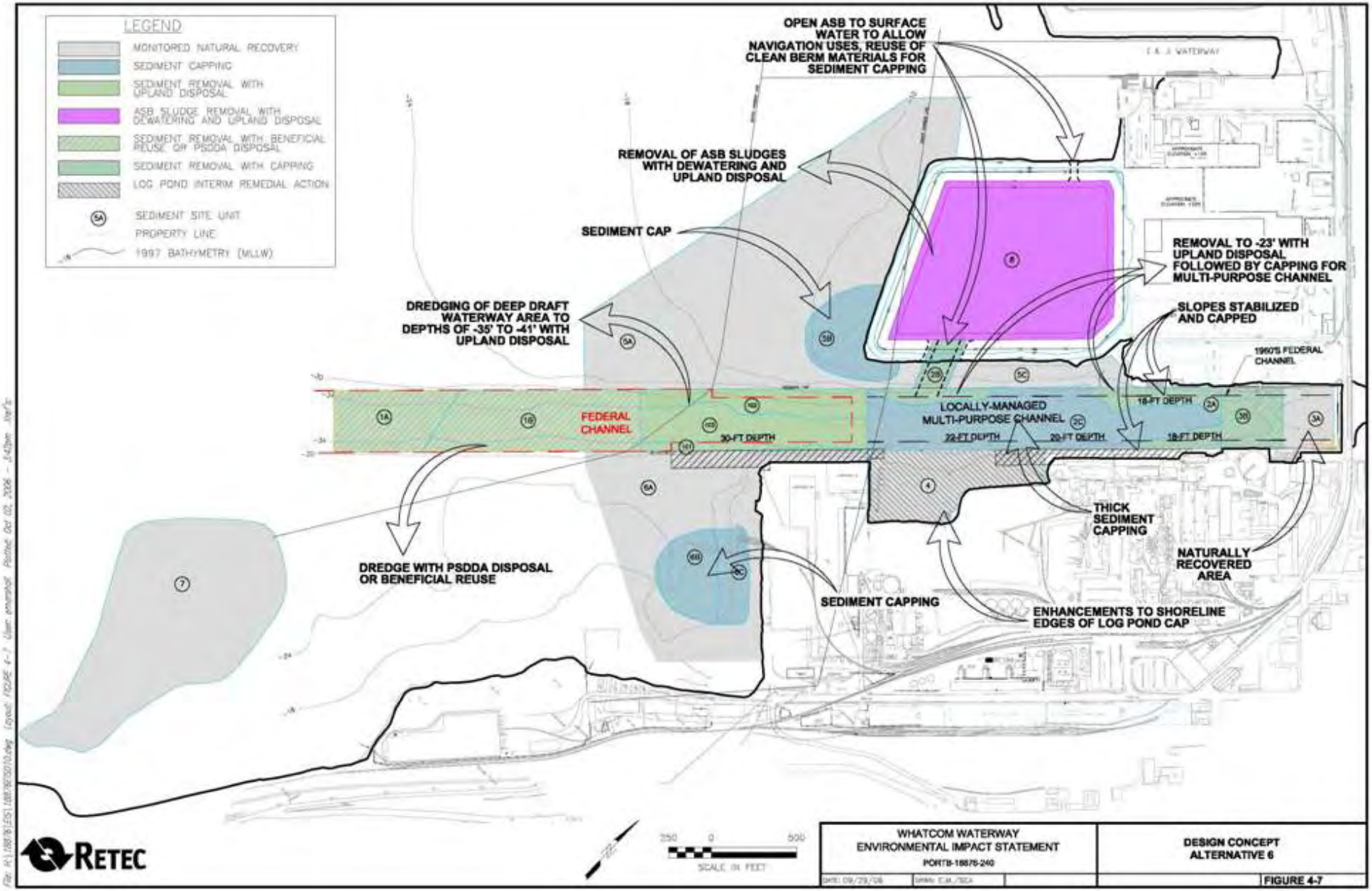

LEGEND
MONITORED NATURAL RECOVERY
SEDIMENT CAPPING
CAPPING OF ASB SLUDGES
LOG POND INTERIM REMEDIAL ACTION
SEDIMENT SITE UNIT
PROPERTY LINE
1997 BATHYMETRY (MLLW)
CAPPING OF ASB SLUDGES
SEDIMENT CAP
1900s FEDERAL WATERWAY BOUNDARY
1960'S FEDERAL CHANNEL
RESTRICTED NAVIGATION DEPTHS THROUGHOUT WATERWAY
25-FT DEPTH
22-FT DEPTH
SHOALED AREA
SHOALED AREA
NATURAL RECOVERY IN NAVIGATION AREAS
SEDIMENT CAPPING
ENHANCEMENTS TO SHORELINE EDGES OF LOG POND CAP
250 0 500
SCALE IN FEET
RETEC
WHATCOM WATERWAY ENVIRONMENTAL IMPACT STATEMENT
PORTB-18878-240
DESIGN CONCEPT ALTERNATIVE 1
FIGURE 4-2


LEGEND
MONITORED NATURAL RECOVERY
SEDIMENT CAPPING
SEDIMENT DREDGING WITH CONTAINMENT IN CAD FACILITY
SEDIMENT REMOVAL WITH SOME RESIDUAL CAPPING
ONSITE SEDIMENT CONTAINMENT
CAPPING OF ASB SLUDGES
LOG POND INTERIM REMEDIAL ACTION
SEDIMENT SITE UNIT
PROPERTY LINE
1997 BATHYMETRY (MLLW)
CAPPING OF ASB SLUDGES
SEDIMENT CAP
ADDITIONAL DEEP-DRAFT INFRASTRUCTURE REQUIRED TO SUPPORT CHANNEL DEPTHS
1960'S FEDERAL CHANNEL
30-FT DEPTH
18-FT FEDERAL CHANNEL
30-FT FEDERAL CHANNEL
30-FT DEPTH
30-FT DEPTH
SEDIMENT CAPPING
DREDGING OF 1960s INDUSTRIAL CHANNEL WITH SOME CAPPING
ENHANCEMENTS TO SHORELINE EDGES OF LOG POND CAP
ONSITE CONTAINMENT OF SEDIMENTS DREDGED FROM OTHER AREAS
250 0 500
SCALE IN FEET
RETEC
WHATCOM WATERWAY ENVIRONMENTAL IMPACT STATEMENT
PORTS-18878-240
DESIGN CONCEPT ALTERNATIVE 2
FIGURE 4-3


LEGEND
MONITORED NATURAL RECOVERY
SEDIMENT CAPPING
SEDIMENT DREDGING WITH CONTAINMENT IN ASB FILL
SEDIMENT REMOVAL WITH SOME RESIDUAL CAPPING
ONSITE SEDIMENT CONTAINMENT
CAPPING OF ASB SLUDGES
LOG POND INTERIM REMEDIAL ACTION
SEDIMENT SITE UNIT
PROPERTY LINE
1997 BATHYMETRY (MLLW)
ONSITE CONTAINMENT OF ASB SLUDGES AND SEDIMENTS DREDGED FROM OTHER AREAS
ADDITIONAL DEEP-DRAFT INFRASTRUCTURE REQUIRED TO SUPPORT CHANNEL DEPTHS
1960'S FEDERAL CHANNEL
30-FT DEPTH
30-FT FEDERAL CHANNEL
30-FT DEPTH
30-FT DEPTH
18-FT FEDERAL CHANNEL
SEDIMENT CAP
DREDGING OF 1960s INDUSTRIAL CHANNEL WITH SOME CAPPING
SEDIMENT CAPPING
ENHANCEMENTS TO SHORELINE EDGES OF LOG POND CAP
250 0 500
SCALE IN FEET
RETEC
WHATCOM WATERWAY
ENVIRONMENTAL IMPACT STATEMENT
PORTB-18878-240
DESIGN CONCEPT
ALTERNATIVE 3
FIGURE 4-4

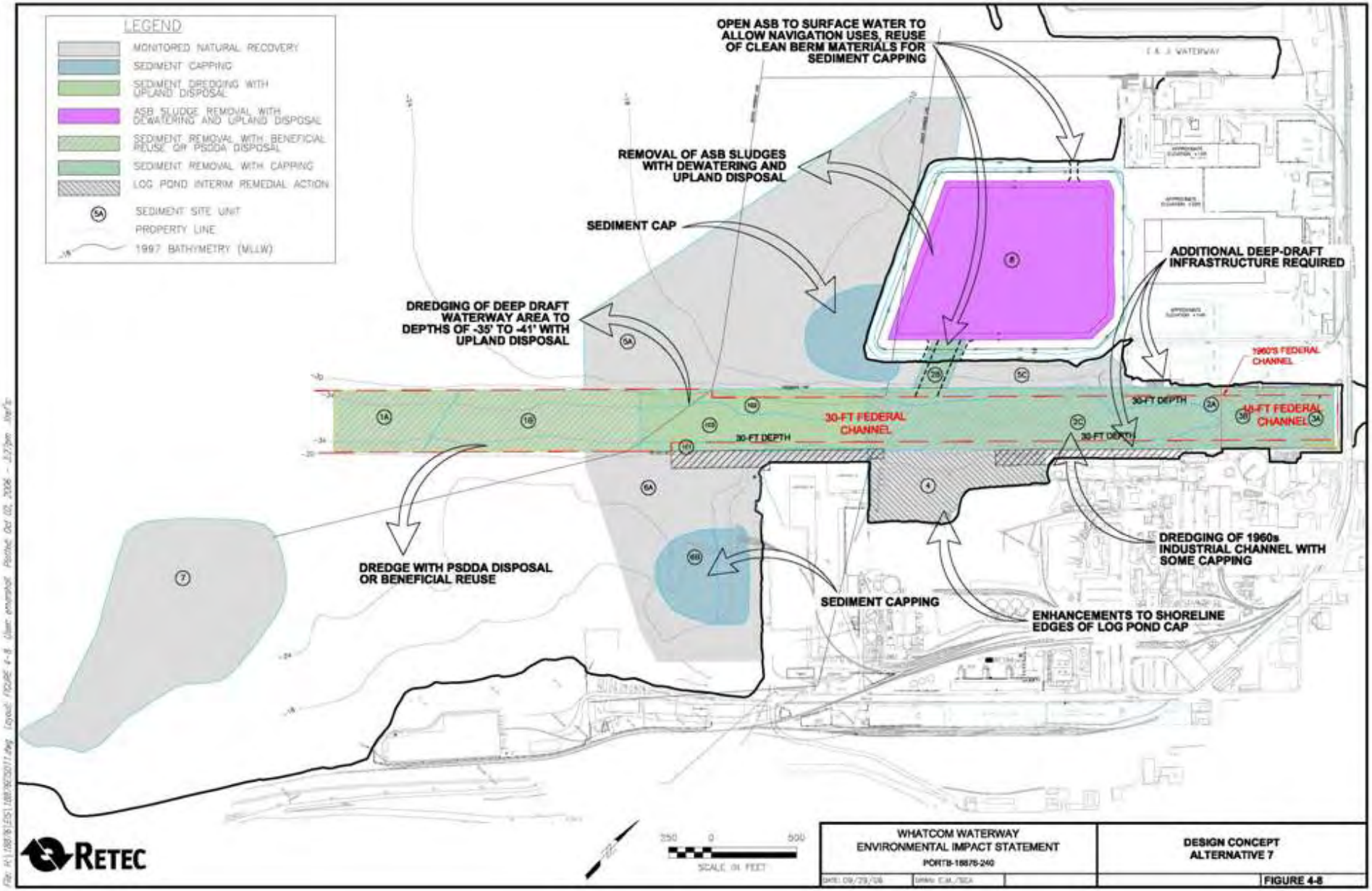

LEGEND
MONITORED NATURAL RECOVERY
SEDIMENT CAPPING
SEDIMENT DREDGING
SEDIMENT REMOVAL WITH PSDDA DISPOSAL OR BENEFICIAL REUSE
SEDIMENT REMOVAL WITH CAPPING
CAPPING OF ASB SLUDGES
LOG POND INTERIM REMEDIAL ACTION
SEDIMENT SITE UNIT
PROPERTY LINE
1997 BATHYMETRY (MLLW)
CAPPING OF ASB SLUDGES
REMOVAL TO -23' WITH UPLAND DISPOSAL FOLLOWED BY CAPPING FOR MULTI-PURPOSE CHANNEL
SLOPES STABILIZED AND CAPPED
DREDGING TO -35' WITH UPLAND DISPOSAL AND CAPPING TO SUPPORT 30' CHANNEL
1960'S FEDERAL CHANNEL
FEDERAL CHANNEL
LOCALLY-MANAGED MULTI-PURPOSE CHANNEL
30-FT DEPTH
22-FT DEPTH
20-FT DEPTH
18-FT DEPTH
THICK SEDIMENT CAPPING
SEDIMENT CAP
NATURALLY RECOVERED AREA
DREDGE WITH PSDDA DISPOSAL OR BENEFICIAL REUSE
SEDIMENT CAPPING
ENHANCEMENTS TO SHORELINE EDGES OF LOG POND CAP
250 0 500
SCALE IN FEET
RETEC
WHATCOM WATERWAY ENVIRONMENTAL IMPACT STATEMENT
PORTB-18878-240
DESIGN CONCEPT ALTERNATIVE 4
FIGURE 4-5

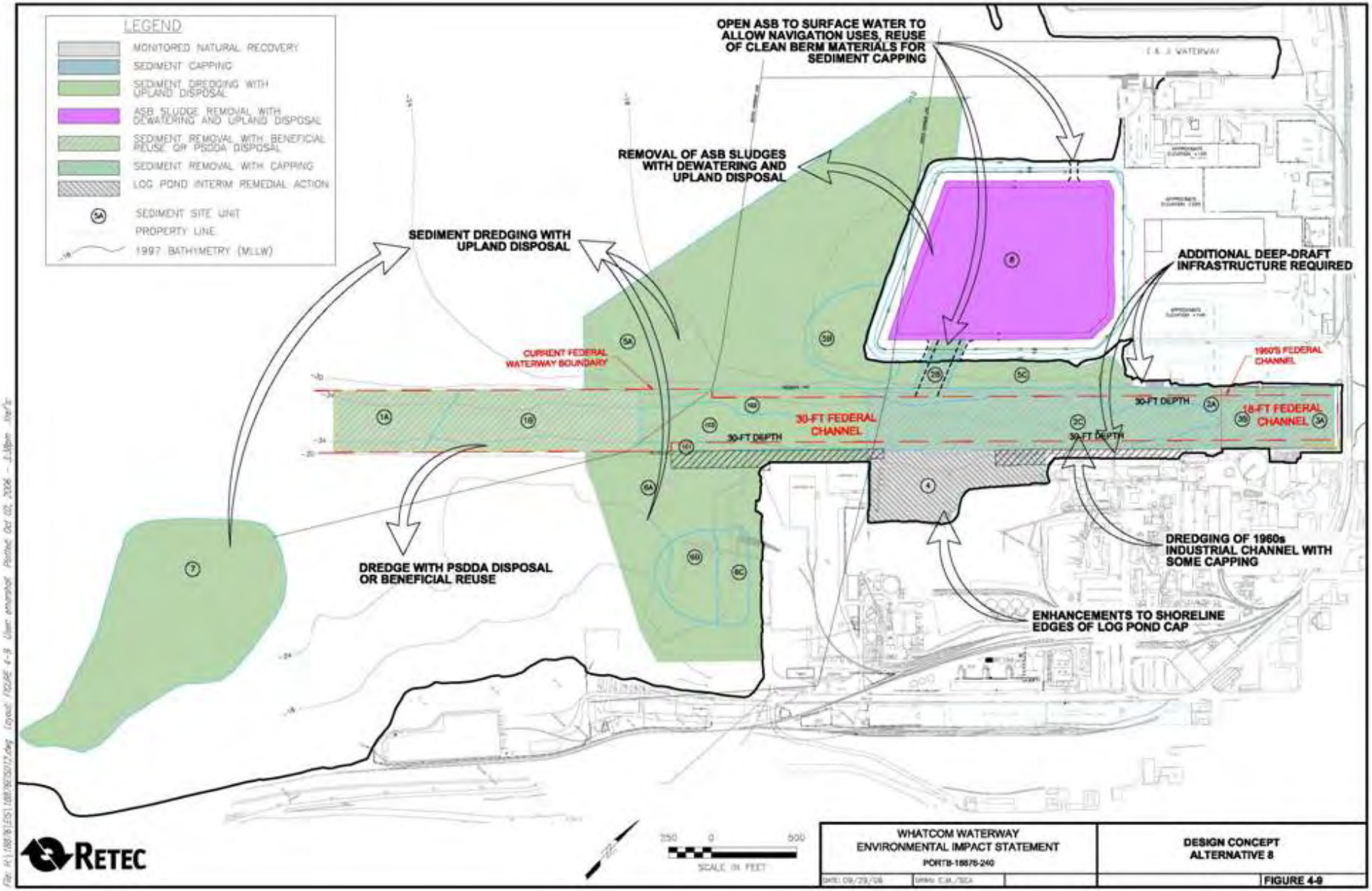

LEGEND
MONITORED NATURAL RECOVERY
SEDIMENT CAPPING
SEDIMENT DREDGING WITH UPLAND DISPOSAL
ASB SLUDGE REMOVAL WITH DEWATERING AND UPLAND DISPOSAL
SEDIMENT REMOVAL WITH BENEFICIAL REUSE OR PSDDA DISPOSAL
SEDIMENT REMOVAL WITH CAPPING
LOG POND INTERIM REMEDIAL ACTION
SEDIMENT SITE UNIT
PROPERTY LINE
1997 BATHYMETRY (MLLW)
OPEN ASB TO SURFACE WATER TO ALLOW NAVIGATION USES. REUSE OF CLEAN BERM MATERIALS FOR SEDIMENT CAPPING
REMOVAL OF ASB SLUDGES WITH DEWATERING AND UPLAND DISPOSAL
SEDIMENT CAP
DREDGING TO -35' WITH UPLAND DISPOSAL FOLLOWED BY CAPPING TO SUPPORT 30' CHANNEL
REMOVAL TO -23' WITH UPLAND DISPOSAL FOLLOWED BY CAPPING FOR MULTI-PURPOSE CHANNEL
SLOPES STABILIZED AND ENHANCED WITH HABITAT BENCHES
1960'S FEDERAL CHANNEL
FEDERAL CHANNEL
LOCALLY-MANAGED MULTI-PURPOSE CHANNEL
30-FT DEPTH
22-FT DEPTH
20-FT DEPTH
18-FT DEPTH
18-FT DEPTH
DREDGE WITH PSDDA DISPOSAL OR BENEFICIAL REUSE
THICK SEDIMENT CAPPING
NATURALLY RECOVERED AREA
SEDIMENT CAPPING
ENHANCEMENTS TO SHORELINE EDGES OF LOG POND CAP
250 0 500
SCALE IN FEET
RETEC
WHATCOM WATERWAY ENVIRONMENTAL IMPACT STATEMENT
PORTB-18878-240
DESIGN CONCEPT ALTERNATIVE 5
FIGURE 4-6



RETEC

WHATCOM WATERWAY ENVIRONMENTAL IMPACT STATEMENT PORTB-18878-240		DESIGN CONCEPT ALTERNATIVE 6
DATE: 09/29/06	DRWN: E.M./SEA	FIGURE 4-7


LEGEND
MONITORED NATURAL RECOVERY
SEDIMENT CAPPING
SEDIMENT DREDGING WITH UPLAND DISPOSAL
ASB SLUDGE REMOVAL WITH DEWATERING AND UPLAND DISPOSAL
SEDIMENT REMOVAL WITH BENEFICIAL REUSE OR PSDDA DISPOSAL
SEDIMENT REMOVAL WITH CAPPING
LOG POND INTERIM REMEDIAL ACTION
SEDIMENT SITE UNIT
PROPERTY LINE
1997 BATHYMETRY (MLLW)
OPEN ASB TO SURFACE WATER TO ALLOW NAVIGATION USES. REUSE OF CLEAN BERM MATERIALS FOR SEDIMENT CAPPING
REMOVAL OF ASB SLUDGES WITH DEWATERING AND UPLAND DISPOSAL
SEDIMENT CAP
ADDITIONAL DEEP-DRAFT INFRASTRUCTURE REQUIRED
DREDGING OF DEEP DRAFT WATERWAY AREA TO DEPTHS OF -35' TO -41' WITH UPLAND DISPOSAL
1960'S FEDERAL CHANNEL
30-FT DEPTH
30-FT FEDERAL CHANNEL
30-FT DEPTH
30-FT DEPTH
30-FT FEDERAL CHANNEL
DREDGE WITH PSDDA DISPOSAL OR BENEFICIAL REUSE
SEDIMENT CAPPING
DREDGING OF 1960s INDUSTRIAL CHANNEL WITH SOME CAPPING
ENHANCEMENTS TO SHORELINE EDGES OF LOG POND CAP
250 0 500
SCALE IN FEET
RETEC
WHATCOM WATERWAY
ENVIRONMENTAL IMPACT STATEMENT
PORTB-18878-240
DESIGN CONCEPT
ALTERNATIVE 7
FIGURE 4-8


LEGEND
MONITORED NATURAL RECOVERY
SEDIMENT CAPPING
SEDIMENT DREDGING WITH UPLAND DISPOSAL
ASB SLUDGE REMOVAL WITH DEWATERING AND UPLAND DISPOSAL
SEDIMENT REMOVAL WITH BENEFICIAL REUSE OR PSDDA DISPOSAL
SEDIMENT REMOVAL WITH CAPPING
LOG POND INTERIM REMEDIAL ACTION
SEDIMENT SITE UNIT
PROPERTY LINE
1997 BATHYMETRY (MLLW)
OPEN ASB TO SURFACE WATER TO ALLOW NAVIGATION USES, REUSE OF CLEAN BERM MATERIALS FOR SEDIMENT CAPPING
REMOVAL OF ASB SLUDGES WITH DEWATERING AND UPLAND DISPOSAL
SEDIMENT DREDGING WITH UPLAND DISPOSAL
ADDITIONAL DEEP-DRAFT INFRASTRUCTURE REQUIRED
CURRENT FEDERAL WATERWAY BOUNDARY
1960'S FEDERAL CHANNEL
30-FT DEPTH
30-FT FEDERAL CHANNEL
18-FT FEDERAL CHANNEL
DREDGE WITH PSDDA DISPOSAL OR BENEFICIAL REUSE
DREDGING OF 1960s INDUSTRIAL CHANNEL WITH SOME CAPPING
ENHANCEMENTS TO SHORELINE EDGES OF LOG POND CAP
250 0 500
SCALE IN FEET
RETEC
WHATCOM WATERWAY
ENVIRONMENTAL IMPACT STATEMENT
PORTB-18878-240
DESIGN CONCEPT
ALTERNATIVE 8
FIGURE 4-9

5 Pilot Comparative Evaluation of Remedial Alternatives

In addition to its strict SEPA regulatory role, this EIS also evaluates each of the eight FS alternatives and the SEPA No Action alternative for its consistency with the seven goals of the Bellingham Bay Demonstration Pilot. Consistency with these goals is not required under MTCA or SMS regulations. However, the Pilot Goals capture the results of over ten years of coordinated cleanup, source control and habitat restoration planning in Bellingham Bay. Alternatives that have a high degree of consistency with the Pilot goals are considered to provide greater overall benefits relative to the stated priorities of the Pilot team members.

The Pilot analysis of alternatives summarized in this Section is different from MTCA or SEPA in that it is not required under existing regulatory authorities. Consistency with the Pilot Comprehensive Strategy and the Pilot Goals is voluntary. However, the use of the Pilot goals provides an additional basis by which the qualitative benefits or short-comings of a remedial alternative can be measured.

5.1 Seven Baywide Pilot Goals

As described in Section 2.2 of this document, the Bellingham Bay Demonstration Pilot was established in 1996 with the stated mission to use a new cooperative approach to expedite source control, sediment cleanup and associated habitat restoration in Bellingham Bay. The Pilot Team included regulatory and resource agencies, the City of Bellingham, the Port of Bellingham, the Lummi Nation, the Nooksack Tribe and other key community groups and stakeholders. The Pilot included an unprecedented level of community involvement and public outreach activities.

Using consensus-based decision-making, the Pilot Team established seven "baywide" goals that it wanted to ultimately achieve. The goals were formally adopted by the multi-agency work group in 1997. The seven Pilot goals are as follows:

> ***Goal 1 -- Human Health and Safety:*** *Implement actions that will enhance the protection of human health.*
>
> ***Goal 2 – Ecological Health****: Implement actions that will protect and improve the ecological health of the bay.*
>
> ***Goal 3 – Protect and Restore Ecosystems:*** *Implement actions that will protect, restore or enhance habitat components making up the bay's ecosystem.*

Goal 4 – Social and Cultural Uses: *Implement actions that are consistent with or enhance cultural and social uses in the bay and surrounding vicinity.*

Goal 5 – Resource Management: *Maximize material re-use in implementing sediment cleanup actions, minimize the use of non-renewable resources, and take advantage of existing infrastructure where possible instead of creating new infrastructure.*

Goal 6 – Faster, Better, Cheaper: *Implement actions that are more expedient and more cost-effective, through approaches that achieve multiple objectives.*

Goal 7 – Economic Vitality: *Implement actions that enhance water-dependent uses of shoreline property.*

5.2 Pilot Evaluation of Alternatives

Table 5-1 summarizes the results of the comparative evaluation and ranking of the remedial alternatives performed using the seven "baywide" Pilot goals. As shown in Table 5-1, each of the alternatives was qualitatively ranked under each of the seven goals based on the ability of the alternative to further that goal. Qualitative rankings were applied as either "Low," "Medium," or "High." A "high" ranking indicates that the alternative provides better progress toward that Pilot goal than other alternatives ranked as "Low," or "Medium."

The following discussion presents the composite Pilot rankings for each of the eight RI/FS alternatives and the No Action Alternative, along with a summary of key differences among the alternatives.

With the exception of Goals 1, 2, and 6 the Pilot rankings of the alternatives are developed independent of the MTCA rankings performed in the FS Report. In the FS Report, the alternatives are evaluated against MTCA criteria, and preferred cleanup alternatives are identified using a disproportionate cost analysis (refer to Section 7.3 of the FS Report). That analysis defines the extent of active remedial measures that are considered "permanent to the maximum extent practicable" as defined under MTCA. The analysis of environmental protectiveness performed in this document using Pilot Goals 1 and 2 (Human Health and Safety, and Ecological Health) incorporates the output of the MTCA analysis, and the analysis of Goal 6 (Faster, Better, Cheaper) considers the analysis of disproportionate costs as one element of the evaluation. Refer to Section 7 of the FS Report for additional information regarding the MTCA analysis of remedial alternatives.

5.2.1 No Action Alternative

Pilot rankings for the No Action Alternative are summarized in Table 5-1. The overall Pilot ranking for the No Action Alternative is low, based on the average of the seven individual rankings. Individual rankings are discussed below:

- **Goals 1 & 2 (Human Health & Safety & Ecological Health):** The No Action Alternative ranked low for Goal 1 and Goal 2. The No Action Alternative does not ensure compliance with MTCA cleanup levels protective of human health and the environment. Therefore, low rankings are applicable.

- **Goal 3 (Habitat Protection & Restoration):** The No Action Alternative was ranked low under Goal 3. Under the No Action Alternative, shallow-water habitat areas at the head and along the sides of the Inner Whatcom Waterway would not be disturbed by dredging or other remediation measures. This lack of disturbance provides a habitat benefit in the short term. However, this habitat benefit is offset by the lack of environmental protectiveness of the alternative. Further, the alternative does not provide any long-term protection of the habitat areas, nor does it actively restore or enhance habitat in other areas, as in other project alternatives. For these reasons, the low ranking is appropriate.

- **Goal 4 (Social & Cultural Uses):** The No Action Alternative receives a low ranking for Goal 4, because the Alternative does not support revitalization of the Bellingham Waterfront. Under the No Action Alternative, environmental effects of impacted sediments will continue, and liability uncertainty will hamper potential navigation or land use improvements within and in waterfront areas of the site.

- **Goal 5 (Resource Management):** The No Action Alternative ranks low for Goal 5. In theory the No Action Alternative represents a significant cost savings relative to the costs of the remedial alternatives, and conserves resources by not taking action. However, the No Action alternative does not achieve site cleanup, does not support planned land and navigation uses, and will encumber the use of existing properties and waterfront infrastructure. These “hidden” costs are significant for the No Action Alternative, and justify the low ranking of this Alternative.

- **Goal 6 (Faster, Better, Cheaper):** As with Goal 5, the No Action Alternative receives a low ranking under the Faster, Better Cheaper Goal. Though the alternative provides short-term cost savings over the other more costly alternatives, the No Action Alternative does not address environmental protection, and does not address the long-term

waterfront land and navigation uses. While the No Action Alternative is "cheap" it is clearly not "better" with respect to environmental protection, habitat or land use benefits. Costs of mitigating the adverse impacts of the No Action Alternative would be substantial. These mitigation costs justify additional cleanup actions even if Goal 6 is viewed in isolation from the other Pilot Goals.

- **Goal 7 (Economic Vitality, Shoreline Land Use):** Under Goal 7 the No Action Alternative receives a low ranking, because the alternative is not consistent with planned land or navigation uses for either the Whatcom Waterway or the ASB area. The Alternative would adversely affect the economic vitality of the Bellingham Waterfront area, and would adversely affect future shoreline land use.

5.2.2 Alternative 1

Alternative 1 rankings are summarized in Table 5-1. The overall Pilot ranking for Alternative 1 is low, based on the average of the seven individual rankings. Individual rankings are discussed below:

- **Goals 1 & 2 (Human Health & Safety & Ecological Health):** Alternative 1 received a low composite ranking under the Pilot evaluation. The Alternative ranked medium for Goal 1 (human health & safety) and Goal 2 (ecological health). Though the cleanup is expected to comply with MTCA cleanup levels protective of human health and the environment, the alternative does not conduct cleanup using solutions considered to be permanent to the maximum extent practicable under MTCA. Therefore, Alteriative 1 does not receive a high ranking under these two goals.

- **Goal 3 (Habitat Protection & Restoration):** Alternative 1 was ranked medium under Goal 3. Under Alternative 1, shallow-water habitat areas are preserved at the head and along the sides of the Inner Whatcom Waterway, and capping produces a beneficial change in sediment elevation and energy levels in the area offshore of the ASB. However, the alternative does not facilitate the removal of Inner Whatcom Waterway bulkheads or over-water structures as in Alternatives 5 and 6, nor does it achieve restoration of aquatic uses for the ASB as in Alternatives 5 through 8.

- **Goal 4 (Social & Cultural Uses):** Alternative 1 receives low rankings for Goal 4, because the dredging plan for the Inner Whatcom Waterway is not consistent with land use and navigation planning for this area, and the capping of the ASB is inconsistent with planned aquatic reuse of the ASB.

- **Goal 5 (Resource Management):** Alternative 1 ranks low for Goal 5. Alternative 1 conserves resources by minimizing construction activity.

However, Alternative 1 impedes the continued use of the existing deep draft navigation infrastructure present at the Bellingham Shipping Terminal.

- **Goal 6 (Faster, Better, Cheaper):** For Goal 6 Alternative 1 receives a low ranking. Though the alternative provides short-term cost savings over the other more costly alternatives, Alternative 1 does not address planned waterfront land and navigation uses. Therefore, this alternative is cheaper, but is not necessarily better.

- **Goal 7 (Economic Vitality, Shoreline Land Use):** Under Goal 7 Alternative 1 receives a low ranking, because the alternative is not consistent with planned land or navigation uses for either the Whatcom Waterway or the ASB area. The relatively long restoration time for this Alternative will also hinder community redevelopment activities in waterfront areas.

5.2.3 Alternative 2

Alternative 2 rankings are summarized in Table 5-1. The overall Pilot ranking for Alternative 2 is medium, based on the average of the seven individual rankings. Individual rankings are discussed below:

- **Goals 1 & 2 (Human Health & Safety, Ecological Health):** Alternative 2 ranked medium for Goal 1 and Goal 2. Though the cleanup is expected to comply with MTCA cleanup levels protective of human health and the environment, the alternative does not conduct cleanup using solutions considered to be permanent to the maximum extent practicable under MTCA. Therefore, Alternative 2 does not receive a high ranking under these two goals.

- **Goal 3 (Habitat Protection & Restoration):** Alternative 2 receives a high ranking under Goal 3. Alternative 2 produces negative habitat impacts in the Inner Whatcom Waterway, through the removal of emergent shallow-water habitat from the head and sides of the waterway, and the triggering of shoreline infrastructure requirements that further affect habitat quality in the Inner Whatcom Waterway. The Alternative does not restore aquatic habitat within the ASB. However, Alternative 2 creates new premium shallow-water aquatic habitat at the Cornwall CAD facility, offsetting other habitat losses and providing an anticipated net gain of nearshore habitat. The high ranking under Goal 3 is based on this anticipated net gain in nearshore habitat for Alternative 2.

- **Goal 4 (Social & Cultural Uses):** Alternative 2 receives a low ranking under Goal 4 (social and cultural uses) because the dredging plan for the Inner Whatcom Waterway is not consistent with planed mixed-use redevelopment of this area, and because the alternative triggers

shoreline infrastructure requirements that are in conflict with area land use and navigation plans. The deep dredging performed under this alternative results in potential disturbance to cultural or historical resources in the former Citizen's Dock area at the head of Whatcom Waterway. Alternative 2 also does not support planned aquatic reuse of the ASB.

- **Goal 5 (Resource Management):** Alternative 2 receives a medium ranking under Goal 5. Alternative 2 minimizes the use of non-renewable fuel resources required to transport dredged materials off of the waterfront. However, Alternative 2 triggers the creation of new infrastructure that will be costly to create, will produce redundancies with the existing infrastructure present at the Bellingham Shipping Terminal, and will be in conflict with community land use plans for the Inner Whatcom Waterway.

- **Goal 6 (Faster, Better, Cheaper):** Alternative 2 receives a medium ranking under Goal 6. While the costs of the alternative are lower than those of Alternatives 5 and 6, this cost-effectiveness is eliminated after the costs of additional shoreline infrastructure requirements are taken into account. Further, the alternative does not capture new funding sources (i.e., marina revenues) which the Port plans to apply to offset a portion of the cleanup costs for the ASB area under Alternatives 5 through 8.

- **Goal 7 (Economic Vitality, Shoreline Land Use):** Under Goal 7 Alternative 2 receives a low ranking, because the alternative is inconsistent with planned land or navigation uses for either the Whatcom Waterway or the ASB area.

5.2.4 Alternative 3

Alternative 3 rankings are summarized in Table 5-1. The overall Pilot ranking for Alternative 3 is medium, based on the average of the seven individual rankings. Individual rankings are discussed below:

- **Goals 1 & 2 (Human Health & Safety & Ecological Health):** Alternative 3 ranks medium for Goals 1 and 2. The cleanup is expected to comply with MTCA cleanup levels protective of human health and the environment, but the alternative does not conduct cleanup using solutions considered to be permanent to the maximum extent practicable under MTCA.

- **Goal 3 (Habitat Protection & Restoration):** Alternative 3 receives a low ranking under Goal 3. Alternative 3 produces negative habitat impacts in the Inner Whatcom Waterway, through the removal of emergent shallow-water habitat from the head and sides of the waterway, and the triggering of shoreline infrastructure requirements

that further affect habitat quality in the Inner Whatcom Waterway. The Alternatives does not restore aquatic habitat within the ASB. The Alternative includes some enhancement of habitat quality offshore of the ASB.

- **Goal 4 (Social & Cultural Uses):** Alternative 3 receives a low ranking under Goal 4 because the dredging plan for the Whatcom Waterway is not consistent with planed mixed-use redevelopment of this area, and because the alternative triggers shoreline infrastructure requirements that are in conflict with area land use and navigation plans. The deep dredging performed under these alternatives results in potential disturbance to cultural or historical resources in the former Citizen's Dock area at the head of Whatcom Waterway. Alternative 3 also does not support planned aquatic reuse of the ASB.

- **Goal 5 (Resource Management):** Alternative 3 receives a medium ranking under Goal 5. Alternative 3 minimizes the use of non-renewable fuel resources required to transport dredged materials off of the waterfront. However, Alternative 3 triggers the creation of new infrastructure that will be costly to create, will produce redundancies with the existing infrastructure present at the Bellingham Shipping Terminal, and will be in conflict with community land use plans for the Inner Whatcom Waterway.

- **Goal 6 (Faster, Better, Cheaper):** Alternative 3 receives a medium ranking under Goal 6. While the costs of the alternative are lower than those of Alternatives 5 and 6, this cost-effectiveness is eliminated after the costs of additional shoreline infrastructure requirements are taken into account. Further, the alternative does not capture new funding sources (i.e., marina revenues) which the Port plans to apply to offset a portion of the cleanup costs under Alternatives 5 through 8.

- **Goal 7 (Economic Vitality, Shoreline Land Use):** Under Goal 7 Alternative 3 receives a low ranking, because the alternative is inconsistent with land use and navigation requirements for either the Whatcom Waterway or for the ASB area. Alternative 3 creates a new fill that will be encumbered by geotechnical and environmental use restrictions.

5.2.5 Alternative 4

Alternative 4 rankings are summarized in Table 5-1. The overall Pilot ranking for Alternative 4 is medium, based on the average of the seven individual rankings. Individual rankings are discussed below:

- **Goals 1 & 2 (Human Health & Safety, Ecological Health):** As with Alternatives 1-3, the Alternative 4 complies with cleanup standards, but

does not use permanent solutions to the maximum extent practicable. This results in medium rankings under Pilot Goals 1 and 2.

- **Goal 3 (Habitat Protection & Restoration):** The ranking against Goal 3 is medium. Alternative 4 preserves and restores some nearshore, shallow-water habitat within the Inner Whatcom Waterway and offshore of the ASB, but the alternative does not provide the extent of habitat restoration provided in Alternatives 5 and 6.

- **Goal 4 (Social & Cultural Uses):** Alternative 4 earns a "medium" ranking under Goal 4. The alternative provides for multiple uses of the Whatcom Waterway consistent with land use and navigation planning, and avoids disturbance of potential historical and cultural resources at the head of the Whatcom Waterway near former Citizen's dock. However, the alternative does not support planned aquatic reuse of the ASB.

- **Goal 5 (Resource Management):** Alternative 4 receives a medium ranking for Goal 5. Alternative 4 reduces the non-renewable resources consumed during construction activities, and avoids the redundant shoreline infrastructure requirements of alternatives 2 and 3. However, Alternative 4 does not restore productive reuse of the ASB area.

- **Goal 6 (Faster, Better, Cheaper):** Alternative 4 receives a medium ranking for Goal 6. While the alternative can be implemented quickly, and the project is cost-effective, the alternative does not achieve restoration of aquatic uses within the ASB, and does not provide the degree of habitat, navigation and public access enhancements achieved by Alternatives 5 and 6. Further, the alternative does not capture the additional funding source (marina revenues) of these other alternatives.

- **Goal 7 (Economic Vitality, Shoreline Land Use):** Alternative 4 achieves partial consistency with shoreline land use priorities, and receives a "medium" ranking under Pilot Goal 7. The alternative tailors the dredging and shoreline modifications within the Whatcom Waterway to the multi-purpose channel concept. However, the alternative does not restore aquatic uses of the ASB.

5.2.6 Alternative 5

Alternative 5 rankings are summarized in Table 5-1. The overall Pilot ranking for Alternative 5 is high, based on the average of the seven individual rankings. Individual rankings are discussed below:

- **Goals 1 & 2 (Human Health & Safety, Ecological Health):** Cleanup under Alternative 5 is conducted using solutions that are permanent to the maximum extent practicable under MTCA, resulting in high rankings under Goals 1 and 2.

- **Goal 3 (Habitat Protection & Restoration):** Alternative 5 receives a high ranking under Goal 3 because it results in net habitat benefits in the Whatcom Waterway, offshore of the ASB, and within the ASB. Under Alternatives 5 and 6, the ASB is cleaned up and then reconnected to Bellingham Bay. This restores nearly 4,500 linear feet of salmonid migration corridor, and opens approximately 28 acres of open water habitat.

- **Goal 4 (Social & Cultural Uses):** Alternative 5 also ranks high under Goal 4. The alternative enhances social and cultural uses by directly supporting revitalization of the Bellingham waterfront. The cleanup actions within the ASB and the Whatcom Waterway are consistent with and directly support community navigation, land use and habitat enhancement plans, while avoiding potential disruption of cultural and/or archaeological resources that may exist in the former Citizens Dock area at the head of the Whatcom Waterway.

- **Goal 5 (Resource Management):** Alternative 5 receives a "high" ranking under Pilot Goal 5. The alternative uses significant energy resources to accomplish project construction. However, these resources are used appropriately to manage the most heavily-contaminated materials requiring cleanup, and the cleanup action provides for reuse of the clean ASB berm materials. Alternative 5 avoids the creation of redundant shoreline infrastructure (as in Alternatives 2 and 3) that conflicts with area land use priorities. Further, the Alternative supports productive reuse of the ASB.

- **Goal 6 (Faster, Better, Cheaper):** Under Goal 6, Alternative 5 is ranked high because it provides a high-quality cleanup action consistent with planned land uses, while maintaining overall cost-effectiveness. The cleanup actions of Alternative 5 are more costly than Alternatives 1-4, but overall costs are reasonable if mitigation costs and land use impacts are considered as part of the analysis. Additionally, Alternative 5 provides for planned aquatic reuse of the ASB, which is expected to generate additional revenues (marina moorage fees) that help offset the costs of ASB sludge removal.

- **Goal 7 (Economic Vitality, Shoreline Land Use):** Alternative 5 receives a high ranking for Goal 7 by enhancing water-dependent uses of shoreline property, providing for a full range of waterfront uses, and contributing to the revitalization of Bellingham Bay waterfront.

5.2.7 Alternative 6

Alternative 6 rankings are summarized in Table 5-1. The overall Pilot ranking for Alternative 6 is high, based on the average of the seven individual rankings.

Most elements of Alternative 6 are the same as for Alternative 5. The principal difference is that Alternative 6 conducts additional deep dredging adjacent to the Bellingham Shipping Terminal, reducing the area of capping required within Whatcom Waterway. This additional dredging results in some increases to project costs, but with a corresponding potential benefit to future navigation uses at Bellingham Shipping Terminal, should additional navigation depths be required. Therefore, the additional costs of Alternative 6 do not affect rankings of the alternative under Goals 5 (resource management), or under Goal 6 (faster, better, cheaper). Individual rankings are discussed below:

- **Goals 1 & 2 (Human Health & Safety, Ecological Health):** Cleanup under Alternative 6 is conducted using solutions that are permanent to the maximum extent practicable under MTCA, resulting in high rankings under Goals 1 and 2.

- **Goal 3 (Habitat Protection & Restoration):** Alternative 6 receives a high ranking under Goal 3 because it results in net habitat benefits in the Whatcom Waterway, offshore of the ASB, and within the ASB. Under Alternatives 5 and 6, the ASB is cleaned up and then reconnected to Bellingham Bay. This restores nearly 4,500 linear feet of salmonid migration corridor, and opens approximately 28 acres of open water habitat.

- **Goal 4 (Social & Cultural Uses):** Alternative 6 also ranks high under Goal 4. The alternatives enhance social and cultural uses by directly supporting revitalization of the Bellingham waterfront. The cleanup actions within the ASB and the Whatcom Waterway are consistent with and directly support community navigation, land use and habitat enhancement priorities, while avoiding potential disruption of cultural and/or archaeological resources that may exist in the former Citizens Dock area at the head of the Whatcom Waterway.

- **Goal 5 (Resource Management):** Alternative 6 receives a "high" ranking under Pilot Goal 5. The alternative uses significant energy resources to accomplish project construction. However, these resources are used appropriately to manage the most heavily-contaminated materials requiring cleanup. The cleanup action provides for reuse of the clean ASB berm materials, and provides for productive reuse of the ASB. Alternative 6 avoids the creation of redundant shoreline infrastructure that conflicts with area land use priorities in Alternatives 2, 3, 7 and 8.

- **Goal 6 (Faster, Better, Cheaper):** Under Goal 6, Alternative 6 is ranked high because it provides a high-quality cleanup action consistent with planned land uses, while maintaining overall cost-effectiveness. The cleanup actions of Alternative 6 are more costly than Alternatives

1-4, but overall costs are reasonable if mitigation costs and land use impacts are considered as part of the analysis. Additionally, Alternative 6 provides for planned aquatic reuse of the ASB, which is expected to generate additional revenues (marina moorage fees) that help offset the costs of ASB sludge removal.

- **Goal 7 (Economic Vitality, Shoreline Land Use):** Alternative 6 receives a high ranking for Goal 7 by enhancing water-dependent uses of shoreline property, providing for a full range of waterfront uses, and contributing to the revitalization of Bellingham Bay waterfront.

5.2.8 Alternative 7

Alternative 7 rankings are summarized in Table 5-1. The overall Pilot ranking for Alternative 7 is medium, based on the average of the seven individual rankings.

- **Goals 1 & 2 (Human Health & Safety, Ecological Health):** Alternative 7 receives high rankings for Goals 1 and Goal 2, because the level of cleanup meets or exceeds MTCA requirements for use of permanent solutions to the maximum extent practicable. The use of dredging and upland disposal beyond the point considered the maximum extent practicable under MTCA does not affect the rankings against these goals, though it does impact the rankings under Goal 6.

- **Goal 3 (Habitat Protection & Restoration):** Alternative 7 receives a medium ranking under Goal 3. Alternative 7 enhances habitat quality through aquatic reuse of the ASB, and through creation of a cap and habitat bench offshore of the ASB. However, the deep dredging of the 1960s industrial channel removes emergent shallow-water habitat at the head and along the sides of the Inner Whatcom Waterway, and triggers requirements for hardened shoreline infrastructure that further limit habitat quality in this area.

- **Goal 4 (Social & Cultural Uses):** The ranking of Alternatives 7 against Goal 4 is low. The dredging of the 1960s federal channel and the associated requirements for hardened shoreline infrastructure are inconsistent with area land use and navigation planning, and could disturb historical or archaeological resources that may be present near the former Citizen's Dock area.

- **Goal 5 (Resource Management):** Ranking under Goal 5 is low, due to the higher consumption of non-renewable fossil fuel resources during dredging and infrastructure construction, and due to likely redundancy of newly-constructed infrastructure with existing infrastructure at the Bellingham Shipping Terminal.

- **Goal 6 (Faster, Better, Cheaper):** Alternative 7 receives a low ranking for Goal 6, because costs of this alternative are substantially higher than those of Alternative 6, while environmental, land use and habitat benefits are equivalent or lower. This poor cost/benefit relationship is compounded when the costs of required shoreline infrastructure are incorporated into project estimates, and associated land use and environmental impacts are considered.

- **Goal 7 (Economic Vitality, Shoreline Land Use):** Alternative 7 receives a low ranking for Goal 7 due to the poor cost-effectiveness of the alternative, and due to the conflicts between the alternative and planned land uses in the Inner Whatcom Waterway.

5.2.9 Alternative 8

Alternative 8 rankings are summarized in Table 5-1. The overall Pilot ranking for Alternative 8 is low, based on the average of the seven individual rankings.

- **Goals 1 & 2 (Human Health & Safety, Ecological Health):** Alternative 8 receives a low composite ranking relative to the seven Pilot criteria. Rankings for Goal 1 and for Goal 2 were high, because the level of cleanup meets or exceeds MTCA requirements for use of permanent solutions to the maximum extent practicable. However, the use of dredging and upland disposal well beyond the point at which it is considered practicable under MTCA results in a very low rankings for Goal 6 (faster, better, cheaper).

- **Goal 3 (Habitat Protection & Restoration):** Alternative 8 receives a low ranking under Goal 3. Alternative 8 removes emergent shallow-water habitat from the head and sides of the Inner Whatcom Waterway. In addition, Alternative 8 converts shallow-water habitat in portions of Units 5 and 6 to less-productive deep-water habitat, rather than enhancing habitat quality as in preceding alternatives. Despite habitat enhancements conducted within the ASB, this alternative likely results in a net loss of premium nearshore aquatic habitat, resulting in the low ranking under Goal 3.

- **Goal 4 (Social & Cultural Uses):** The ranking of Alternative 8 against Goal 4 is low. The dredging of the 1960s industrial channel and the associated requirements for hardened shoreline infrastructure are inconsistent with area land use and navigation planning in the Inner Whatcom Waterway area. The dredging at the head of the Waterway could disturb historical or archaeological resources that may be present near the former Citizen's Dock area.

- **Goal 5 (Resource Management):** Ranking under Goal 5 is low, because Alternative 8 has the highest consumption of non-renewable

fossil fuel resources during dredging and infrastructure construction, and because the new shoreline infrastructure will likely be redundant with existing infrastructure at the Bellingham Shipping Terminal.

- **Goal 6 (Faster, Better, Cheaper):** Alternative 8 receives a very low ranking for Goal 6 because costs of this alternative are between three and four times higher than the Alternatives 5 and 6, without producing a significant enhancement to site environmental conditions or other benefits. This poor cost-effectiveness is compounded when the costs of required shoreline infrastructure are incorporated into project estimates. The costs of Alternative 8 are well beyond identified funding mechanisms for the project.

- **Goal 7 (Economic Vitality, Shoreline Land Use):** Alternative 8 receives a low ranking for Goal 7 due to the very poor cost-effectiveness of the alternative, and due to the conflicts between the alternative and planned land uses in the Inner Whatcom Waterway. The relatively long restoration time for this Alternative will also hinder community redevelopment activities in waterfront areas.

5.3 Conclusions of Pilot Evaluation

The Pilot analysis of alternatives summarized in Section 5.2 is different from MTCA or SEPA in that it is not required under existing regulatory authorities. Consistency with the Pilot Comprehensive Strategy and the Pilot Goals is voluntary. However, the use of the Pilot goals provides an additional basis by which the qualitative benefits or short-comings of a remedial alternative can be measured.

Based on the Pilot evaluation as documented in Table 5-1, the two alternatives that provide the greatest overall benefits are Alternatives 5 and 6. These two alternatives are roughly equivalent to each other. Significant findings from the Pilot evaluation for these and the other alternatives are as follows:

- **No Action Alternative**: The Pilot evaluation resulted in very low rankings for the No Action Alternative. That alternative received low rankings under all seven of the individual Pilot Goals. The Pilot analysis suggests that even in the absence of MTCA and SMS requirements (which prevent use of the No Action Alternative at the site), further consideration of the No Action Alternative is not warranted.

- **Alternative 1:** A low Pilot ranking was also identified for Alternative 1. Alternative 1 received medium rankings for Goals 1, 2 and 3 (Human Health & Safety, Ecological Health and Habitat Protection & Restoration). However, this was offset by low rankings for other Pilot Goals 4 through 7 (Social & Cultural Uses; Resource Management; Faster, Better, Cheaper; and Economic Vitality, Shoreline Land Use).

- **Alternatives 2, 3 & 4:** Alternatives 2, 3 and 4 all ranked medium under the Pilot evaluation. These alternatives all ranked medium for Goals 1 and 2 (Human Health & Safety and for Ecological Health). The alternatives all received medium rankings for Goals 5 and 6 (Resource Management and Faster, Better, Cheaper), reflecting the cost-effectiveness of these alternatives relative to some other project alternatives. Alternatives 2 and 3 ranked low for Goals 4 and 7 (Social & Cultural Uses and Economic Vitality & Shoreline Land Use), because these alternatives conflict with planned land uses both within the Inner Whatcom Waterway and also within the ASB. The greatest differences in rankings between Alternatives 2, 3 and 4 were noted with respect to Goal 3 (Habitat Protection & Restoration). Habitat Protection and Restoration rankings varied from high (Alternative 2) to low (Alternative 3), reflecting the significant differences in net environmental impacts/benefits of these alternatives to fish and wildlife habitat.

- **Alternatives 5 & 6:** Alternatives 5 and 6 received the highest rankings against the Pilot goals. These alternatives received high rankings under each of the seven Pilot Goals. High rankings under Goals 1 and 2 (Human Health & Safety and Ecological Health) were achieved because cleanup is conducted to the maximum extent practicable as defined under MTCA. High rankings under Goal 3 (Habitat Protection and Restoration) were achieved, because these alternatives provide the greatest restoration benefits of any of the project alternatives. The remedies are specifically tailored to planned waterfront land uses, resulting in high rankings for Goals 4 and 7 (Social & Cultural Uses and Economic Vitality & Shoreline Land Uses). High rankings under goals 5 and 6 (Resource Use and Faster, Better Cheaper) apply to Alternatives 5 and 6. While the probable costs of the remedial alternatives are higher than Alternatives 1-4, these costs are proportionate to environmental, habitat and land use benefits achieved under Alternatives 5 and 6. Furthermore, some of the incremental mitigation costs and resource requirements incurred for Alternatives 2 and 3 are avoided. Finally, Alternatives 5 and 6 provide an opportunity to capture additional funding sources (i.e., moorage revenues) to help offset the costs of remediation.

- **Alternatives 7 & 8:** Alternatives 7 and 8 are the two highest-cost alternatives. Alternative 7 was ranked medium against the Pilot Goals, and Alternative 8 was ranked low. Both of these alternatives ranked high for Goals 1 and 2 (Human Health and Safety and Ecological Health), because they conduct cleanup to at least the level considered permanent to the maximum extent practicable under MTCA, as with Alternatives 5 and 6. However, Alternative 7 received only medium rankings for Goal 3 (Habitat Protection and Restoration). Alternative 7 is considered to roughly balance habitat impacts and benefits.

Alternative 8 receives a low ranking under Goal 3, because Alternative 8 appears to produce a net loss of premium nearshore habitat. The two alternatives ranked low for Goals 4 and 7 (Social & Cultural Uses and Economic Vitality, Shoreline Land Use) due to the conflicts between the cleanup alternatives and planned navigation and land uses. Alternatives 7 and 8 received low rankings for Goals 5 and 6 (Resource Management and Faster, Better, Cheaper) because of the disproportionately high costs of the alternatives relative to the environmental, land use and habitat benefits of the alternatives.

Table 5-1. Pilot Comparative Analysis of Project Alternatives

Alternative Number Design Concept Probable Cost ($Million)	**No Action** Fig 4-1 $0	**Alt. 1** Fig 4-2 $8	**Alt. 2** Fig 4-3 $34	**Alt. 3** Fig 4-4 $34	**Alt. 4** Fig 4-5 $21	**Alt. 5** Fig 4-6 $42	**Alt. 6** Fig 4-7 $44	**Alt. 7** Fig 4-8 $74	**Alt. 8** Fig 4-9 $146
Overall Ranking of Alternative Against Pilot Goals	Low	Low	Medium	Medium	Medium	High	High	Medium	Low
Detailed Pilot Comparison of Alternatives									
1 *Human Health & Safety*	Low – Action does not comply with MTCA or SMS requirements.	Medium – Action complies with cleanup levels, but does not use permanent solutions to the maximum extent practicable as defined under MTCA.	Medium – Action complies with cleanup levels, but does not use permanent solutions to the maximum extent practicable as defined under MTCA.	Medium – Action complies with cleanup levels, but does not use permanent solutions to the maximum extent practicable as defined under MTCA.	Medium – Action complies with cleanup levels, but does not use permanent solutions to the maximum extent practicable as defined under MTCA.	High – Alternative complies with cleanup levels and uses permanent solutions to the maximum extent practicable as defined under MTCA.	High – Alternative complies with cleanup levels and uses permanent solutions to the maximum extent practicable as defined under MTCA.	High – Alternative complies with cleanup levels. Removal and upland disposal conducted beyond limits of practicability as defined under MTCA.	High – Alternative complies with cleanup levels. Removal and upland disposal conducted beyond limits of practicability as defined under MTCA.
2 *Ecological Health*	Low – Action does not comply with MTCA or SMS requirements.	Medium – Action complies with cleanup levels, but does not use permanent solutions to the maximum extent practicable as defined under MTCA.	Medium – Action complies with cleanup levels, but does not use permanent solutions to the maximum extent practicable as defined under MTCA.	Medium – Action complies with cleanup levels, but does not use permanent solutions to the maximum extent practicable as defined under MTCA.	Medium – Action complies with cleanup levels, but does not use permanent solutions to the maximum extent practicable as defined under MTCA.	High – Alternative complies with cleanup levels and uses permanent solutions to the maximum extent practicable as defined under MTCA.	High – Alternative complies with cleanup levels and uses permanent solutions to the maximum extent practicable as defined under MTCA.	High – Alternative complies with cleanup levels. Removal and upland disposal conducted beyond limits of practicability as defined under MTCA.	High – Alternative complies with cleanup levels. Removal and upland disposal conducted beyond limits of practicability as defined under MTCA.
3 *Habitat Protection & Restoration*	Low – Alternative preserves some shallow-water habitats, but does not create new habitat areas. Benefits are offset by lack of completed cleanup and continued risks to environmental receptors.	Medium – Alternative preserves Inner Waterway habitat areas and creates some new shallow-water habitat offshore of ASB. However, alternative does not facilitate removal of bulkheads or over-water structures in Inner Waterway, nor does it provide for aquatic reuse of ASB.	High – Cornwall CAD site provides new habitat enhancement. This new habitat is extensive, and offsets habitat losses in the Inner Waterway triggered by dredging of 1960s industrial channel and construction of hardened shoreline infrastructure. However, alternative does not provide for aquatic reuse of ASB.	Low – Aggressive dredging of 1960s federal channel and requirements for hardened shoreline infrastructure remove existing nearshore habitat from the Inner Waterway, conflicting with habitat enhancement opportunities . Alternative represents net loss of premium nearshore habitat. Nearshore fill in ASB precludes aquatic restoration of ASB area.	Medium – Multi-purpose channel concept for Inner Waterway preserves and enhances nearshore habitat along salmon migration corridors, and nearshore habitat is enhanced as part of capping of Unit 5-B. But ASB sludges remain in place and preclude aquatic restoration of ASB area. Habitat benefits are less than under Alternatives 5 and 6.	High – Remedy produces net habitat benefits in the Inner Waterway, offshore of the ASB, and within the ASB. Nearshore habitat at head and along sides of Inner Waterway is enhanced. Unnecessary habitat impacts are avoided by integration of cleanup and reuse planning for waterfront. Approximately 4-6 acres of premium nearshore habitat is developed as part of capping of Unit 5-B. Remedy restores aquatic use of the ASB, providing 28 acres of aquatic habitat and nearly 4,500 linear feet of nearshore habitat along salmonid migration corridors.	High – Remedy produces net habitat benefits in the Inner Waterway, offshore of the ASB, and within the ASB. Nearshore habitat at head and along sides of Inner Waterway is enhanced. Unnecessary habitat impacts are avoided by integration of cleanup and reuse planning for waterfront. Approximately 4-6 acres of premium nearshore habitat is developed as part of capping of Unit 5-B. Remedy restores aquatic use of the ASB, providing 28 acres of aquatic habitat and nearly 4,500 linear feet of nearshore habitat along salmonid migration corridors.	Medium – Aggressive dredging of 1960s industrial channel removes existing nearshore habitat and requires new shoreline infrastructure conflicting with habitat enhancement opportunities in Inner Waterway. These habitat losses are offset by restoration of aquatic uses in the ASB and development of a cap and habitat bench offshore of ASB. Federal channel configuration may require use of sub-optimal access channel location for ASB marina, further restricting potential habitat gains.	Low – Aggressive dredging of 1960s industrial channel removes existing nearshore habitat and requires new shoreline infrastructure conflicting with habitat enhancement opportunities in Inner Waterway. These habitat losses are compounded by adverse habitat changes associated with dredging of nearshore habitat in multiple areas. Federal channel configuration may require use of sub-optimal access channel location for ASB marina, further restricting potential habitat gains. Habitat gains associated with aquatic reuse of ASB will not likely offset habitat impacts.
4 *Social & Cultural Uses*	Low – Alternative does not support cleanup and revitalization of the Bellingham waterfront.	Low – Alternative does not support community land use and navigation priorities for Whatcom Waterway areas. Does not provide for aquatic reuse of ASB.	Low – Dredging of 1960s industrial channel and associated requirements for hardened shoreline infrastructure in Inner Waterway are inconsistent with planned land and navigation uses in this area. Dredging may distrub archaeological or historical resources in the Citzen's Dock area. Alternative does not support planned aquatic reuse of the ASB.	Low – Dredging of 1960s industrial channel and associated requirements for hardened shoreline infrastructure in Inner Waterway are inconsistent with planned land and navigation uses in this area. Dredging may distrub archaeological or historical resources in the Citzen's Dock area. Alternative does not support planned aquatic reuse of the ASB.	Medium – Alternative supports some of the community waterfront revitalization efforts. Provides for multiple uses of the Whatcom Waterway, from public shoreline access and transient moorage to deep draft navigation. However, does not provides for aquatic reuse of the ASB. Does not disturb potential historical or archaeological resources near Citizens Dock area.	High – Alternative directly supports waterfront revitalization efforts. Provides for multiple uses of the Whatcom Waterway, from public shoreline access and transient moorage to deep draft navigation. Provides for planned aquatic reuse of the ASB for integrated navigation, public access and habitat enhancement improvements. Alternative avoids impacts to potential historical or archaeological resources near the Citizens Dock area.	High – Alternative directly supports waterfront revitalization efforts. Provides for multiple uses of the Whatcom Waterway, from public shoreline access and transient moorage to deep draft navigation. Provides for planned aquatic reuse of the ASB for integrated navigation, public access and habitat enhancement improvements. Alternative avoids impacts to potential historical or archaeological resources near the Citizens Dock area.	Low – Dredging of 1960s industrial channel and associated requirements for hardened shoreline infrastructure are inconsistent with land use and navigation planning for the Inner Waterway. New shoreline infrastructure likely redundant with existing infrastructure at BST. Dredging may disturb potential historical or archaeological resources in former Citizens dock area.	Low – Dredging of 1960s industrial channel and associated requirements for hardened shoreline infrastructure are inconsistent with land use and navigation planning for the Inner Waterway. New shoreline infrastructure likely redundant with existing infrastructure at BST. Dredging may disturb potential historical or archaeological resources in former Citizens dock area. Long project restoration time-frame will hamper community redevelopment.
5 *Resource Management*	Low – Alternative provides only short-term cost savings. Long-term needs of community and environment are not addressed.	Low – Alternative provides short-term cost savings and minimization of resource use. However, alternative impedes continued use of deep draft navigation infrastructure at the Bellingham Shipping Terminal.	Medium – Alternative provides cost-effective management for dredged materials and minimizes the use of resources otherwise needed to transport dredge materials off of the waterfront. However, the costly new industrial infrastructure required to stabilize shorelines in the Inner Waterway is inconsistent with planned land uses, and will produce redundancies with existing BST infrstructure.	Medium – Alternative provides cost-effective management for dredged materials and minimizes the use of resources otherwise needed to transport dredge materials off of the waterfront. However, the costly new industrial infrastructure required to stabilize shorelines in the Inner Waterway is inconsistent with planned land uses, and will produce redundancies with existing BST infrstructure.	Medium – Alternative has relatively low construction costs and resource demands. Alternative also avoids new redundant infrastructure requirements of Alternatives 2, 3, 7 and 8. Alternative prevents aquatic reuse of ASB area.	High – Alternative provides good balance between expended costs/resources for construction, and project benefits. Updating of channel dimensions provides for multiple uses in Inner Waterway area, consistent with planned mixed-use redevelopment of this area. Preserves deep draft navigation capabilities at Bellingham Shipping Terminal using existing infrastructure. Avoids new redundant infrastructure requirements of Alternatives 2, 3, 7 and 8. Allows reuse of clean ASB berm materials through remediation of ASB.	High – Alternative provides good balance between expended costs/resources for construction, and project benefits. Updating of channel dimensions provides for multiple uses in Inner Waterway area, consistent with planned mixed-use redevelopment of this area. Preserves deep draft navigation capabilities at Bellingham Shipping Terminal using existing infrastructure. Avoids new redundant infrastructure requirements of Alternatives 2, 3, 7 and 8. Allows reuse of clean ASB berm materials through remediation of ASB.	Low – Costs and resource use of Alternative 7 are substantially higher than Alternative 6, and benefits are not proportionate to additional costs. Deep dredging of 1960s industrial channel requires creation of substantial new infrastructure that is inconsistent with planned mixed-use redevelopment of Inner Waterway area. New infrstructure is redundant with existing BST infrastructure.	Low – Costs and resource use of Alternative 8 are nearly four times higher than Alternative 6, and benefits are not proportionate to additional costs. Deep dredging of 1960s industrial channel requires creation of substantial new infrastructure that is inconsistent with planned mixed-use redevelopment of Inner Waterway area. New infrstructure is redundant with existing BST infrastructure.
6 *Faster, Better, Cheaper*	Low – Alternative does not address site cleanup requirements and provides lower benefits under other goals.	Low – Alternative is fast and inexpensive, but does not provide the waterfront land use and navigation benefits of other alternatives.	Medium – Alternative is similar in cost to the preferred alternatives. However, additional costs of required shoreline infrastructure in Inner Waterway offset remedy cost-effectiveness. Alternative does not capture new funding sources (i.e., marina revenues) which the Port plans to use to offset a portion of cleanup costs under Alt. 5-8.	Medium – Alternative is similar in cost to the preferred alternatives. However, additional costs of required shoreline infrastructure in Inner Waterway offset remedy cost-effectiveness. Alternative does not capture new funding sources (i.e., marina revenues) which the Port plans to use to offset a portion of cleanup costs under Alt. 5-8.	Medium – Remedy can be implemented quickly and is cost-effectively. However, alternative does not provide the degree of habitat, land use and navigation benefit as the preferred alternatives. Does not capture additional funding sources (i.e., marina revenues) which the Port plans to use to offset a portion of the cleanup costs under Alt. 5-8.	High – Remedy is more costly than Alternatives 1-4, but incremental cleanup costs are offset by additional project benefits. Overall costs, including mitigation costs and infrastructure requirements, are lower than Alternatives 2 and 3, and environmental and land use benefits are greater than in Alternative 4. By supporting aquatic reuse of ASB, Alternative also provides for capture of additional funding sources (i.e., marina revenues) which the Port plans to use to offset a portion of the cleanup costs.	High – Remedy is more costly than Alternatives 1-4, but incremental cleanup costs are offset by additional project benefits. Overall costs, including mitigation costs and infrastructure requirements, are lower than Alternatives 2 and 3, and environmental and land use benefits are greater than in Alternative 4. By supporting aquatic reuse of ASB, Alternative also provides for capture of additional funding sources (i.e., marina revenues) which the Port plans to use to offset a portion of the cleanup costs. Additional costs relative to Alternative 5 increase depth flexibility at Bellingham Shipping Terminal.	Low – Costs of Alternative 7 are substantially higher than Alternative 6, and benefits are not proportionate to additional costs. Deep dredging of 1960s industrial channel requires creation of substantial new infrastructure that is inconsistent with planned mixed-use redevelopment of Inner Waterway area. Costs of new infrastructure compound the poor cost-effectiveness of the remedy. Aquatic reuse of ASB captures some additional funding (i.e., marina revenues), but project costs are well in excess of defined funding plans.	Very Low – Costs of Alternative 8 are almost 4 times higher than Alternative 6, and benefits are not proportionate to additional costs. Deep dredging of 1960s industrial channel requires creation of substantial new infrastructure that is inconsistent with planned mixed-use redevelopment of Inner Waterway area. Costs of new infrastructure compound the poor cost-effectiveness of the remedy. Despite capture of additional funding source (i.e., marina revenues) through aquatic reuse of ASB, costs of project dramatically exceed defined project funding plans.
7 *Economic Vitality, Shoreline Land Use*	Low – Alternative does not achieve cleanup, and restrictions on use of Waterway and ASB interfere with land use and habitat objectives.	Low – Use restrictions on Waterway are not consistent with planned land or navigation uses. Alternative is not consistent with planned aquatic reuse of the ASB.	Low – Deep dredging of 1960s industrial channel and associated requirements for hardened shoreline infrastructure produces conflicts with planned mixed-use redevelopment of Inner Waterway. Alternative does not provide for aquatic reuse of the ASB.	Low – Deep dredging of 1960s industrial channel and associated requirements for hardened shoreline infrastructure produces conflicts with planned mixed-use redevelopment of Inner Waterway. Alternative does not provide for aquatic reuse of the ASB. Value of new fill area within ASB will by limited by use restrictions associated with geotechnincal and environmental use restrictions.	Medium – Alternative directly supports waterfront revitalization and community land use, navigation, public access and habitat enhancement priorities for Inner Waterway area. Dredging and shoreline stabilization activities directly support these objectives. However, alternative does not provide for aquatic reuse of the ASB area.	High – Alternative directly supports waterfront revitalization efforts, providing for a full range of waterfront uses. Inner Waterway dredging and shoreline stabilization activities directly support area redevelopment objectives. Alternative restores ASB to aquatic uses. Project has defined funding plan.	High – Alternative directly supports waterfront revitalization efforts, providing for a full range of waterfront uses. Inner Waterway dredging and shoreline stabilization activities directly support area redevelopment objectives. Alternative restores ASB to aquatic uses. Project has defined funding plan.	Low – Dredging plan for Inner Waterway and associated requirements for hardened shoreline infrastructure are inconsistent with planned land and navigation uses in this area. Alternative does restore ASB to aquatic uses. However, costs of cleanup project and associated infrastructure requirements substantially exceed project funding plan.	Low – Dredging plan for Inner Waterway and associated requirements for hardened shoreline infrastructure are inconsistent with planned land and navigation uses in this area. Alternative does restore ASB to aquatic uses. However, costs of cleanup project and associated infrastructure requirements substantially exceed project funding plan. Long project restoration time will hamper community redevelopment.

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