Sediment Cleanup

Status Report

Washington State Department of Ecology

Toxics Cleanup Program

DEPARTMENT OF
ECOLOGY
State of Washington

November 2008
Publication no. 08-09-046

How to Get More Information On Sediment Cleanup Issues

This report summarizes current knowledge of the many known and suspected sediment cleanup sites located in Washington State. A copy of the report can be found at the following Department of Ecology web address: http://www.ecy.wa.gov/biblio/0809046.html

If you have questions about the report or would like additional copies, please contact the Toxics Cleanup Program Publications Coordinator at 360-407-7170.

Readers interested in more information about sediment quality and sediment management issues in Washington can explore Ecology's parent website:
http://www.ecy.wa.gov/programs/tcp/smu/sediment.html

Highlights of the information found at this web address include the following.

- Regulations for managing contaminated sediments in Washington, the Sediment Management Standards (Chapter 173-204 WAC):
  http://www.ecy.wa.gov/biblio/wac173204.html
  Regulations may also be ordered by contacting the agency's publication department at ecypub@ecy.wa.gov or (360) 407-7472.
- The Aquatic Lands Cleanup Unit's bibliography of technical reports related to sediments:
  http://www.ecy.wa.gov/programs/tcp/smu/sed_pubs.html

Other websites related to managing sediments in Washington State include:

- **US Army Corps of Engineers**
  [http://www.nws.usace.army.mil/PublicMenu/Menu.cfm?sitename=DMMO&pagename=HOME]
- **WA Department of Natural Resources**
  [http://www.dnr.wa.gov/ResearchScience/AquaticMarineSciences/Pages/Home.aspx]
- **US EPA Region 10 Aquatic Resources**
  [http://yosemite.epa.gov/r10/ecocomm.nsf/bd5af81c438305ea88256b58006146ea/f25bad58f59599058825679a005c6983!OpenDocument]
- **US EPA Superfund/CERCLA**
  [http://yosemite.epa.gov/r10/cleanup.nsf/webpage/Superfund+(CERCLA)]
- **Puget Sound Partnership**
  [http://www.psp.wa.gov/]

The Department of Ecology is an Equal Opportunity agency and does not discriminate on the basis of race, creed, color, disability, age, religion, national origin, sex, marital status, disabled veteran's status, Vietnam Era veteran's status or sexual orientation.

If you have special accommodation needs or need this document in an alternative format, please call Toxics Cleanup Program at (360) 407-7170 (Voice) or 1-800-833 6388 or 711 (TTY).

Cover image by Ted Benson: Sediment sampling in the San Juan Islands, Washington State.

printed on recycled paper

Sediment Cleanup Status Report

Toxics Cleanup Program

Washington State Department of Ecology
Olympia, Washington 98504-7710

This page is purposely left blank.

Table of Contents

List of Figures and Tables

Page

Figures

Tables

Introduction

The Department of Ecology (Ecology) is Washington State's environmental management agency. Ecology's mission is to protect, preserve, and enhance Washington's natural environment and promote the wise management of our air, land, and water. This includes cleaning up and restoring contaminated sites, including aquatic sediment sites.

This report summarizes information about the location, nature, and status of contaminated sediment sites. As the lead state agency for environmental cleanup activities, Ecology plays an important role in restoring sediment quality. Under the authority of the Model Toxics Control Act (MTCA), the Water Pollution Control Act (WPCA), and Sediment Management Standards (SMS), the Toxics Cleanup Program (the Program) is charged with getting contaminants out of the environment and keeping them out. The SMS prescribes criteria, source control, assessment, and cleanup procedures specific to the sediment media.

What is sediment?

Sediment consists of *"particles of soil that are discharged or washed into water and fall out onto seafloors and lake and riverbeds. Many contaminants adhere to sediment and soil which concentrate contamination. It is that muck that squishes up between your toes when you run out into a lake to go swimming…"* Sediments are in all bodies of water, including marine waters such as oceans and Puget Sound, and fresh waters such as rivers and lakes.

How do sediments become contaminated?

Sources of contamination to sediments can be from waterfront industries, municipal and industrial discharges, stormwater (including point and nonpoint sources of runoff), and air deposition. Rain may wash contaminants from the air, contaminants on land may be washed off by runoff or wind, or some contaminants on land seep into groundwater and are discharged. Many of these contaminants eventually end up in water and sediment. Much contamination is due to pollutant discharges and past industrial practices. However, there are still current contaminant sources to sediment as well as new chemicals discharged that are toxic to aquatic life and humans.

Figure 1. Contaminants can be discharged into water from industrial sources and stormwater, air deposition, or runoff land from rain.

Sediment throughout Puget Sound and freshwater rivers and lakes are contaminated. At high levels, contaminants are a threat to the aquatic life that live in the sediment, aquatic life that feed on these animals, as well as the humans who eat fish or shellfish or come in contact with contaminated sediment. Importantly, chemical contaminants can impair habitat and kill aquatic life that live in the sediment that much of the aquatic ecosystem relies on for survival. Also, chemical contaminants can bioaccumulate and harm other life such as humans, orcas and eagles.

Contaminants wash into water and collect in sediment. These contaminants can kill the aquatic life that lives in sediment or they can bioaccumulate in their tissue. Fish then eat this contaminated aquatic life and animals such as orcas, eagles and humans eat the contaminated fish and shellfish.

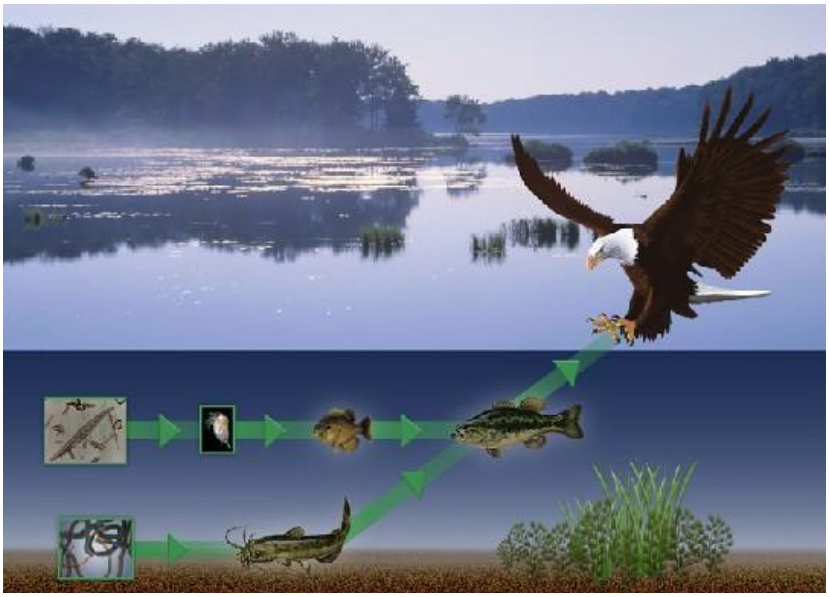

Figure 2. The role of clean sediment is important in aquatic ecosystems.

Why should we clean up contaminated sediments?

We clean up contaminated sediments to protect human health and the environment and to help ensure that the aquatic environment remains "swimmable, fishable, and diggable". Puget Sound and our freshwater rivers and lakes have abundant natural resources that have high economic and aesthetic importance to our state. Clean sediment contributes to a healthy ecosystem which will help ensure these valuable natural resources remain safe and sustainable for the family digging clams on their favorite beach, the tribal subsistence fishers, the commercial and recreational fishers, and the tourists that visit our state.

Contaminated sediments typically are impacted from multiple contaminants at a single site. Most of the impacted sediments are in the productive coastal and nearshore estuarine areas which are some of the most diverse and productive habitats in the aquatic environment. These ecosystems contain valuable natural resources and important habitat that is critical to a healthy ecosystem. These environments provide rearing habitat for early life stages of fish species, support valuable recreational and commercial fish and shellfish populations, and play a vital role for the recovery of

threatened and endangered species. Contaminated sediment can cause closure of recreational beaches and valuable recreational and commercial shellfish beds and can severely impair highly productive habitat in the nearshore. Cleaning up these contaminated areas has multiple benefits including:

- Decreasing contaminant exposure risk to humans at a local, community level. This can be from physical contact by recreating on beaches, digging for shellfish, or by eating fish and shellfish.

- Reclaiming and restoring critical habitat in the productive nearshore environment.

- Decreasing contaminant exposure to aquatic life in the productive nearshore environment.

- Reducing acute and chronic toxicity impacts to aquatic life that can be due to single contaminants, combined effects from multiple contaminants, or bioaccumulative contaminants.

- Protecting and restoring local shellfish populations for commercial or recreational purposes.

Some site specific examples of the benefits of cleanup include:

- Eagle Harbor Superfund site: A May 2008 article published in Aquatic Toxicology by the National Marine Fisheries Service has shown that liver lesions in English sole have significantly decreased after the interim action sediment cleanup was completed. This data has shown that the cleanup has been effective in reducing harm to biota in this area.

- Bellingham Bay Log Pond: Monitoring data has shown that mercury concentrations in crab has significantly decreased to concentrations similar to clean reference sites after the cleanup was completed. In addition, the restored area has resulted in improved habitat that is utilized by juvenile salmonids and is being recolonized by the benthic community. This data has shown that the cleanup has contributed to reducing bioaccumulation of mercury to biota and has improved habitat.

Regulatory Framework

Sediment Management Standards Rule

In 1991, Ecology adopted the Sediment Management Standards, Chapter 173-204 WAC. The Sediment Management Standards (SMS) were promulgated primarily pursuant to MTCA and the WPCA because they have a dual use:

- To guide sediment cleanup under MTCA.

- To provide protective standards for wastewater discharge permits under the WPCA.

Ecology has a mandate to address contaminated sediment and sediment impacts from NPDES permitted dischargers. The SMS are used to:

- Set standards for sediment quality (there are both numeric chemical and biological criteria and narrative standards).

- Assess the nature and extent of sediment contamination.
- Provide a decision process for the cleanup of sediment contamination.

- Provide procedures to reduce pollutant concentrations from discharges to prevent future sediment contamination.

The SMS were developed to include the long-term goal of reducing and ultimately eliminating adverse effects on biological resources (such as shellfish, aquatic worms, and crustaceans) and threats to human health from surface sediment contamination.

The SMS contain two different levels of criteria for Puget Sound sediment:

- The *Sediment Quality Standards* correspond to sediment quality that will result in no adverse effects to biological resources or significant risk to human health. The SQS serve as the cleanup objective for cleanup actions.

- The *Cleanup Screening Levels* Minimum Cleanup Levels or Maximum Chemical Criteria for Sediment Impact Zones correspond to sediment quality that may result in minor adverse effects. The different names correspond to how the criteria are used in three different situations, but the criteria are the same.

The SMS contains only narrative standards for sediment in freshwater and brackish water areas. However, numeric criteria are developed on a site-specific basis for freshwater sites by using biological tests to meet the narrative standards in the SMS. For more detailed information regarding the SMS rule, please visit Ecology's website: http://www.ecy.wa.gov/programs/tcp/smu/sediment.html

Model Toxics Control Act Regulation

In March of 1989, a citizen-mandated toxic waste cleanup law went into effect in Washington, changing the way hazardous waste sites in this state are cleaned up. The Model Toxics Control Act Statute (Chapter 70.105D RCW) and Cleanup Regulation (Chapter 173-340 WAC) define a two-step approach for establishing cleanup requirements for individual sites:

Establishing Cleanup Standards

The standards provide a uniform, statewide approach to cleanup that can be applied on a site-by-site basis.

Selecting Cleanup Actions

This step involves evaluating methods that could be used to clean a site and then deciding which of those methods would best achieve cleanup standards.

The purpose of the Model Toxics Control Act is to protect human health and the environment. The law provides for compliance monitoring to ensure effectiveness, permanent cleanup to the maximum extent practicable, within a reasonable restoration time frame, and considers public concerns.

Toxics Cleanup Program Initiatives

Puget Sound Initiative (PSI) and Initial Priority Areas

Puget Sound is a unique ecosystem and an economically important natural resource for Washington State. Unfortunately, Puget Sound's ecosystem is in trouble. While its symptoms are not easily visible, the science is undeniable and impacts from pollution are getting worse. The state has recognized the need to protect and restore this national treasure. In 2006, legislation was approved that provides substantial funding for the restoration and recovery of Puget Sound by the year 2020.

In response to the Governor's Initiative to make Puget Sound swimmable, fishable, and diggable by 2020, Ecology has committed the resources and funding for a healthier Puget Sound under the Puget Sound Initiative (PSI). This is a collaborative effort where Ecology is working with local, tribal, state and federal governments, business, and the public to contribute to the cleanup, restoration, and protection of the Sound by the year 2020.

To prioritize cleanup under the PSI, the Toxics Cleanup Program (TCP) has identified contaminated sites within one-half mile of the Sound in seven priority bays and has speeded up efforts to clean and restore these contaminated sites. These areas are the cornerstones of TCP's approach to protect and restore Puget Sound.

TCP is taking a bay-wide or area-wide approach, rather than site-specific approach to cleaning up many sites within a geographic area. This will result in restoring and reclaiming highly productive habitat in the nearshore for fish, wildlife, and people. TCP has negotiated numerous cleanup agreements to meet PSI objectives.

The PSI cleanup site selection process included a focus on bays with state owned aquatic lands having important natural resources and habitat outside the heavily urbanized bays (Commencement and Elliott Bays, etc.). These are areas impacted by contaminated sediments as well as adjacent upland cleanup sites and/or upland sources. Conducting early cleanup and source control in these impacted bays will result in an improvement of the overall health of the aquatic ecosystem by restoration and protection of valuable natural resources and critical habitat. Early cleanup and source control will prevent them from becoming mega-sites and avert costlier future cleanup. The selected projects will integrate aquatic cleanup with adjacent upland source removal and source control.

These priority areas include: (1) Fidalgo/Padilla Bays, (2) Port Gardner/Snohomish River Estuary, (3) Port Gamble, (4) Dumas Bay, (5) Budd Inlet, (6) Oakland Bay, and (7) Port Angeles. Their locations are mapped in Figure 3 below.

These areas have:

- Impaired critical habitat that supports nursery grounds for fish, salmon migration corridors, and eelgrass.
- Degraded valuable natural resources.
- Impacts to shellfish in outfall areas.
- Chemical contamination and wood waste from historical and current sources.

Working with the Department of Natural Resources

Ecology works with several agencies to ensure aquatic lands are cleaned up and restored. The agency is strengthening ties with the Department of Natural Resources (DNR) to speed up cleanups. Much of the aquatic lands in the state are owned by the citizens of the state and managed by DNR. Working more closely with DNR on the Puget Sound Initiative Priority Areas has speeded up the cleanup of aquatic lands. Also, DNR is working to develop accurate GIS coverage across Washington State to better determine the extent of state-owned aquatic lands.

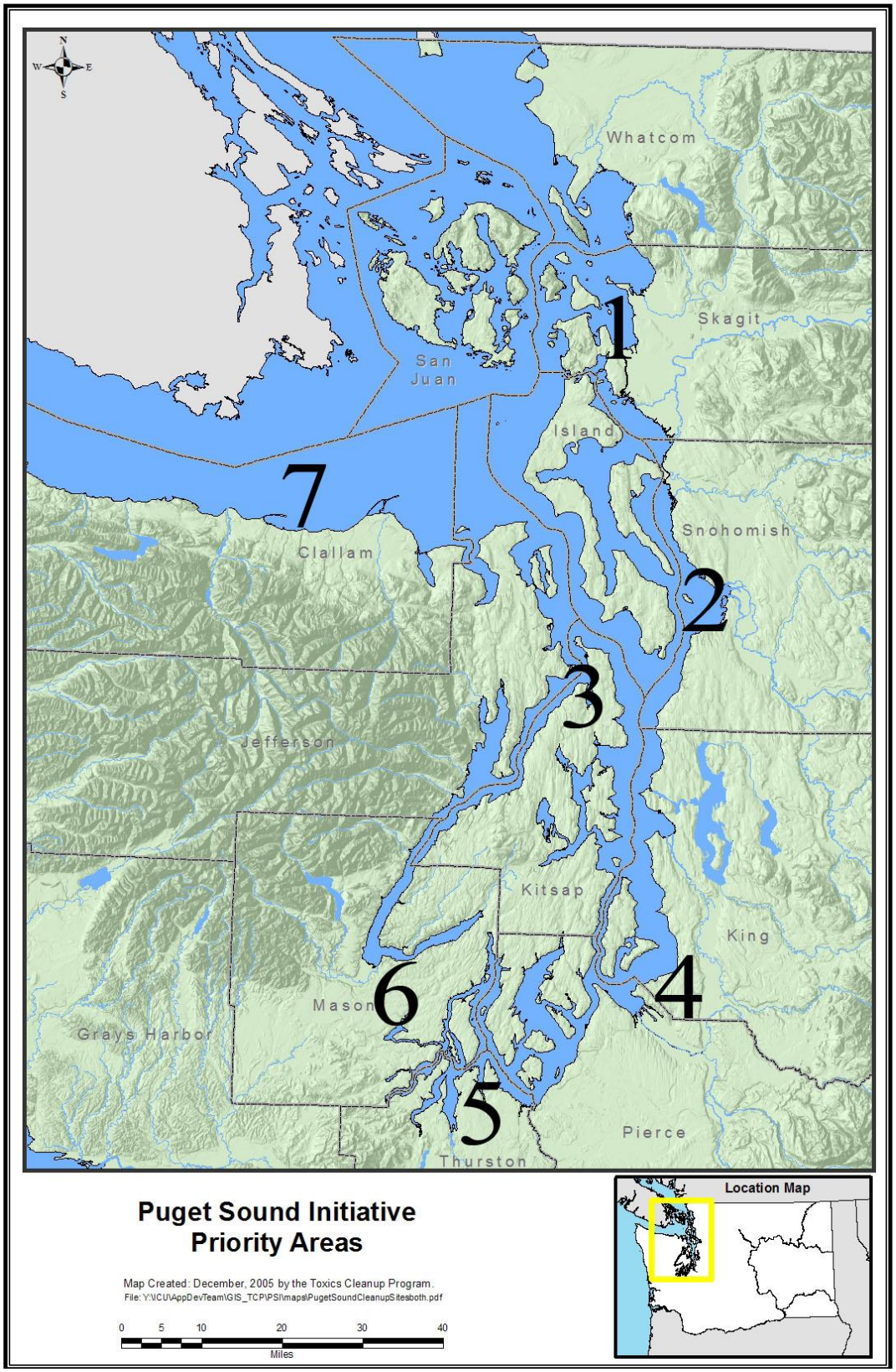

Figure 3. Puget Sound Initiative Priority Areas

Ten-Year Financial Report

State House Bill 1761 requires Ecology to prioritize sufficient funding to clean up hazardous waste sites and prevent the creation of future hazards because of improper disposal of toxic wastes. Ecology is developing a comprehensive 10-year financial report that identifies long-term remedial action project costs, tracks expenses, and projects future needs. State House Bill 1761 also provides Ecology additional strategies to speed up cleanups and encourage land revitalization. Ecology is also creating financing tools to clean up large-scale hazardous waste sites needing multiyear commitments.

Also, State House Bill 1761 allows for additional funding strategies for cleanup sites in the form of Oversight Remedial Action Grants and Integrated Planning Grants. State House Bill 1761 allows Ecology to use additional strategies to expedite cleanups and encourage revitalization at properties where reuse has been hindered by contamination. The Ten-Year Financial Report is in its first year and should be complete by December 2008. This report projects 10-year cleanup costs for individual site cleanups. These projections will be further clarified in the next biennial budget.

Control of Toxics Chemicals in Puget Sound: Toxics Loading Study

The Puget Sound Partnership (Partnership) began a multiagency effort to develop a source control strategy to reduce and control toxics that enter Puget Sound and contaminate sediment, water and aquatic life. These efforts will support developing the Partnerships Action Agenda to protect and restore Puget Sound by the year 2020.

Ecology, in collaboration with other agencies, completed an initial investigation of toxics loading to determine the relative contributions of sources of toxics to Puget Sound. This investigation identified the major pathways of toxics to Puget Sound and data gaps that must be filled to inform decisions to restore Puget Sound. The report, "Control of Toxic Chemicals in Puget Sound, Phase 1: Initial Estimate of Loadings," is available online at: http://www.ecy.wa.gov/biblio/0710079.html

One finding of the Phase 1 report is that surface-water runoff from the land is the largest contributor of many toxic chemicals to Puget Sound. The report recommends the state improve its estimates of the amounts of toxic pollutants getting into the Sound, and better identify the contributions from the various sources and pathways. This work will help to inform policy development to conduct source control to reduce and control toxics entering Puget Sound.

Combined efforts to cleanup and restore contaminated sites and improve and implement source control and prevention strategies will contribute to the protection and restoration of Puget Sound. For more information on this work visit: http://www.ecy.wa.gov/programs/wq/pstoxics/index.html.

Phthalate Work Group

Phthalates are wide spread pollutants found in our air, soil, and water and can be toxic to aquatic life. Phthalates are plasticizers found in common products used in everyday life. Phthalates enter

waters through many ways, so identifying precise sources of contamination is difficult. We know little about how to control or treat phthalate contamination.

In 2007, the cities of Tacoma and Seattle, King County, Ecology, and the EPA formed a workgroup to better understand how phthalates are reaching Puget Sound sediments and what the related impacts to humans and animals are. The work group evaluated existing information about phthalate sediment concentrations, identified data gaps, and recommended possible short-term actions. For more information regarding this work group please visit: http://www.ecy.wa.gov/programs/tcp/smu/phthalates/phthalates_hp.htm.

Sediment Cleanup Sites

This report summarizes information about all known or suspected sediment cleanup sites in Washington State. It provides an overall sense of cleanup status and sediment cleanup issues. This report is intended to inform policy and technical decision-making and is not intended to be a definitive site list.

Under the Puget Sound Initiative, TCP has increased emphasis in the Puget Sound area. To support this, we are redesigning information systems to meet this expanded business need. Sediment areas are dynamic in nature. Unlike upland contaminated areas, contamination in sediments is more likely to move. This movement can alter definitive boundaries of contaminated sites, sometimes merging individual sites. This has created challenges for the Program in reporting progress in our traditional method of counting sites.

We are establishing methods to more clearly track the progress of contaminated sediment site cleanups. We are also merging contaminated sediment site information into a single data system. Sediment cleanup status in this report will be on primary sediment areas, which will soon match the more specific site information in our data system.

TCP is transitioning to more current data collection and reporting methods. Data collection, tracking, and reporting methods are being improved to keep up with newer technologies as well as increasing process efficiency. These transitions will create several changes and should provide more emphasis on direction and results.

Two examples include the TCP's sediment database (SEDQUAL) and cleanup site database (ISIS). The SEDQUAL database and analytical tool has been redeveloped. Ecology's Environmental Information Management System now houses all sediment data, and the new MyEIM analytical tool has been developed for Ecology to conduct all regulatory analysis of sediment data. This will provide Ecology with more efficient and accurate data tracking and submittal, more comprehensive data analysis, and updated technology. MyEIM is available to the public. The new analytical tool, MyEIM, was deployed in the spring of 2008. Also, the internal data tracking program for site cleanups, ISIS, is being improved for more efficient and extensive data collection, tracking, and reporting. These improvements are expected to be in place in 2009.

Defining the *Universe* of Sediment Cleanup Sites

By January 2008, Ecology site managers identified 150 sediment cleanup sites or areas of concern with enough information to perform some degree of environmental analysis. Most sites are in marine sediment in Puget Sound (115 sites), while a smaller number are found in freshwater sediment (35 sites). The measures, indicators, and statistics developed for this report are based on those 150 sites or subsets of those sites. The size of a site is not a good measure of the severity of contamination. Therefore, the number of sites is not necessarily the best tool to measure the amount of sediment contamination or the magnitude of the problem.

The various statistics found in this report are based on current counts of marine and freshwater sites. The high number of marine sites is reflective of industrial practices and waterfront development in Washington State, where early efforts were focused on Puget Sound's contaminated urban bays and inlets. While the number of sites reflects what is known today, it is likely that other sites will continue to be identified, in areas previously not studied.

Cleanup Progress

Progress Since 2005 Cleanup Status Report

This report also provides an analysis of where the state is overall regarding sediment cleanup, and reports the progress made since the 2005 Sediment Cleanup Status Report. Of the 150 total sediment sites identified in this report, 84 sites, or 56 percent of identified sites, have been cleaned up or are in the process of being cleaned up. Figure 4 shows the percentages of sites under each stage of the cleanup process.

Although sites have been cleaned up since 2005, Ecology has identified more sites that warrant cleanup, thus the total number of cleanup sites has remained similar to that of 2005. The Puget Sound Initiative targeted several sites that were not initially targeted but will result in large areas of remediated and restored aquatic lands. Also, several large areas containing many smaller cleanup sites were merged into one large site and received federal funding for cleanup. An example of this is the approximate 5.5 miles of the Lower Duwamish River in south Seattle which has been named one Superfund cleanup site.

In addition, Ecology is conducting (or has completed) bay-wide sediment investigations in the Puget Sound Initiative Priority Areas including Budd Inlet, Fidalgo Bay, Port Gardner, Port Angeles, and Oakland Bay. The results from these investigations will help Ecology identify and prioritize new cleanup sites.

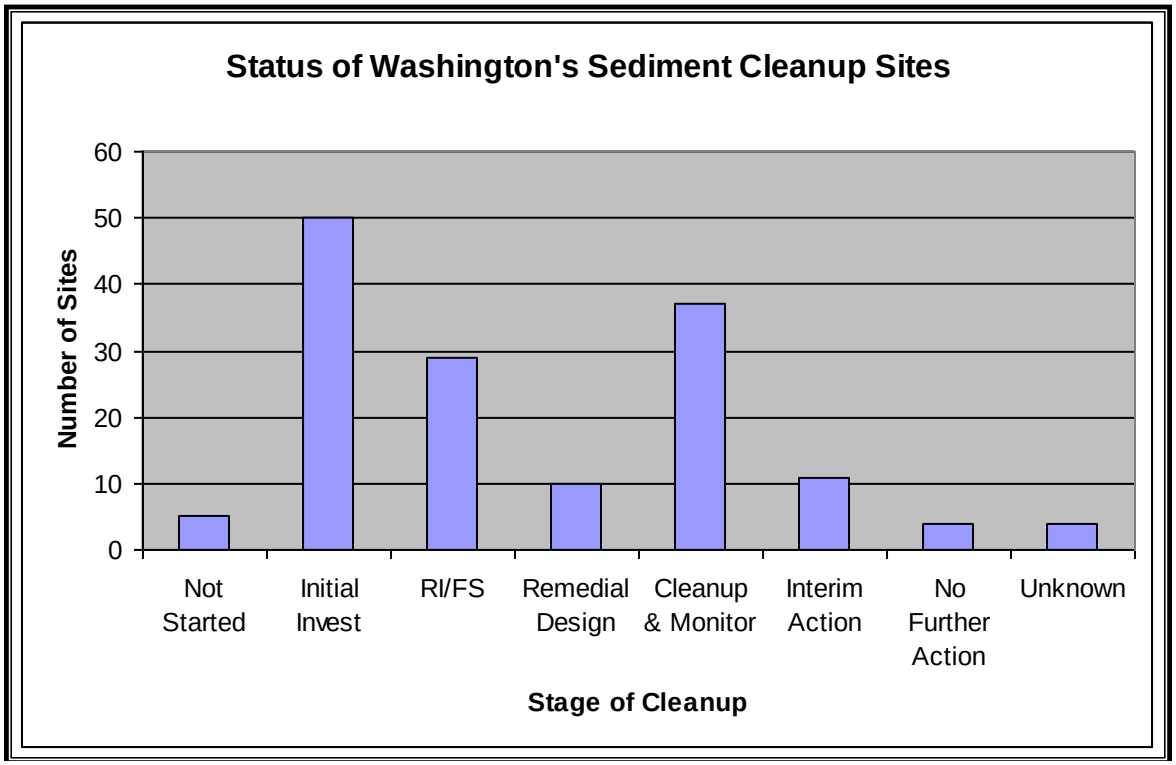

Figure 4: Status of All Washington State Sediment Sites

The Program is working toward streamlining cleanups under MTCA to reduce the time it takes to remediate contaminated sites. This streamlining includes:

- Establishing geographic teams to coordinate cleanups as a bay-wide approach. Teams are simultaneously working on many sites with stakeholders and potentially liable parties or persons.

- Cleanup schedules, travel, stakeholder meetings, and fieldwork are more efficiently conducted by early coordination, and some phases are conducted in parallel.

- Early engagement and establishment of relationships with stakeholders and the affected community by launching stakeholder discussions and forming partnerships early in the cleanup process.

- Negotiating cleanup agreements that clarify cleanup schedules, expectations, and goals early in the cleanup process.

- Conducting interim and emergency removal actions to remove contamination faster and reduce exposure risk to the humans and the environment.

- Bay-wide sediment characterizations are being conducted by Ecology to speed up the cleanup process.

- Combining public and private sector resources to maximize financial leverage to conduct cleanups.

Marine Sediment Sites in the Cleanup Process

Of the 115 marine sediment sites, nearly 40 percent (47 sites) are in the process of being cleaned up. This includes all ongoing sites with initial investigations, remedial investigations, feasibility studies, design phase, and cleanup and monitoring actions. As well as the sites in the process of cleanup, other sites have been cleaned up or have been determined to be clean enough to not warrant further cleanup ("no further action" sites). At 54 sites, no cleanup process has started other than the identification that sediment contamination is suspected. At 61 marine sites (53%), cleanup is ongoing or is completed.

Freshwater Sediment Sites in the Cleanup Process

There are 35 freshwater sediment cleanup sites, nearly half or 50 percent are in the process of being cleaned (16 sites). At 12 sites, no cleanup process has started other than the identification that sediment contamination is suspected. At 23 freshwater sites (66%), cleanup is ongoing or is completed.

Freshwater sites are complicated by the lack of promulgated numeric chemical criteria similar to those adopted for marine sediments. However, it is still possible to identify sediments that cause impacts on a case-by-case basis by using the *2002 – 2003 Development of Freshwater Sediment Quality Values for use in Washington State: Phases I & II* (available at http://www.ecy.wa.gov/programs/tcp/smu/sed_pubs.htm) and biological testing.

How is Cleanup Accomplished?

Various authorities are used to perform cleanup of contaminated sediment sites. Which authority is applied depends on the site, sources of contaminants, and sometimes even the liable parties. Mostly, cleanup is performed using either the state cleanup law, Model Toxics Control Act (MTCA), or the federal cleanup law, Comprehensive Environmental Response Compensation Liability Act (CERCLA or Superfund).

Several sediment cleanup actions with low levels of contamination have also been accomplished voluntarily or in conjunction with development/dredging activities through the Dredge Material Management Program (DMMP). Sediment cleanup is also performed incidental to or with maintenance dredging for navigation purposes and new construction dredging for development purposes. This is done using sediment quality evaluation guidelines and best management practices established by the DMMP, which draws its authority from the Clean Water Act (CWA) as well as other federal and state laws and rules. However, all cleanup actions must meet the requirements in both the SMS and MTCA.

Table 1 shows the cleanup authorities applied at sediment sites. Some aquatic cleanup sites within the state have cleanups being conducted under Resource Conservation and Recovery Act and Water Pollution Control Act authorities.

Table 1: Cleanup Authorities used at Sediment Sites

Cleanup Area	MTCA	CERCLA	WPCA/ RCRA
Fidalgo & Padilla Bays	5	0	0
Bellingham Bay	13	1	1
Commencement Bay	12	5	1
Elliott Bay & Harbor Island	19	3	
Port Gardner & Snohomish River Estuary	12	0	0
Kitsap Peninsula & Sinclair Inlet	10	9	0
Lower Duwamish River	3	1	0
Lake Union & Ship Canal	9	0	0
Lake Washington	9	0	0
Columbia & Spokane Rivers	8	1	0
Other Water Bodies	18	3	7

How Much Sediment Is Contaminated?

Puget Sound

While the total area of sediment contamination is an important metric for determining aquatic health, it is as important to understand the relative severity of contamination, the types of contamination, and where the contamination is found. The estimated area of the cleanup sites presented here is for the most contaminated sediment in Puget Sound. Other areas of Puget Sound have levels of contamination, impacts, and risks that do not currently warrant active cleanup.

The area of contaminated sediment in Puget Sound has been reported in previous documents such as *Sediment Cleanup Status Reports*, the *Puget Sound Confined Disposal Site Study Programmatic Environmental Impact Statement*, or the *Puget Sound's Health 1998*, published by the Puget Sound Water Quality Action Team.

As shown in Table 2 below, acreage data exists for about 60 percent of marine sites, totaling about 2,700 acres and averaging nearly 34 acres per site of the sites with acreage reported. If the same acreage per site is assumed for the remaining Puget Sound sites (33.9 acres/site), the estimated contaminated sediment site area within the boundaries of Puget Sound is 3,902 acres.

Understanding the total area of sediment contamination is an important measure of the aquatic environment's health, as is defining the basis for calculating areas of contamination. However, acreage is not a clear or consistent measure of the complexity or severity of contamination and does not reflect the depth, degree, and exposure risks of contamination. Acreage values or site boundaries can change based on new sampling data, one site can split into multiple sites or be combined into another site based on new data, and contamination can move around in the aquatic environment to create a different site.

Table 3 is a comparison of the estimated cleanup site acreage to other measures of Puget Sound. The total known Puget Sound area exceeding the Sediment Quality Standards (SQS) is included in Table 3, and has been the most commonly reported measurement of sediment contamination by Ecology.

The SQS shows contamination is present at levels lower than would trigger a cleanup. These low levels of contamination are considered areas of concern. They may not define an area that needs to have active cleanup activities conducted. These areas may be watched by the state to determine if the contamination levels are increasing that may warrant cleanup. About 7,804 acres in Puget Sound exceed the SQS. This is about twice the acreage calculated for cleanup sites.

Table 2: Estimated Sediment Site Acreage for Puget Sound/Marine Sites

	No. of Sites	Acres
Puget Sound/Marine Sites with Acreage Data	73	2477
Puget Sound/Marine Sites without Acreage Data	42	1425*
Estimated Area of Marine/Puget Sound within Cleanup Site Boundaries	115	3902

*Assumes 33.9 acres/site multiplied by number of sites without reported acreage. Includes Strait of Juan de Fuca, Strait of Georgia, and Hood Canal.

In Table 3, Puget Sound acreage has been used for this report. However the Programs measures for Puget Sound are by number of sites. In the Puget Sound, less than one percent of Puget Sound has been surveyed. Roughly half the surveyed area reveals no contamination at sediment stations compared to current SMS criteria. Conversely, even less than that amount shows areas of contamination exceeding Sediment Quality Standards. The total area of Puget Sound, almost two million acres, dwarfs the other measures of area shown in Table 3.

Much of the surveyed area is focused in the nearshore/intertidal zones, urban bays, and other areas where contamination is suspected. However, the area of Puget Sound surveyed and impacted by contaminants may be changing due to the presence of ubiquitous bioaccumulative chemicals such as dioxin/furans and polychlorinated biphenyls. This is due to the fact that the current SMS chemical criteria, to which the areas surveyed have been compared, may not be representative of bioaccumulative effects to biota. There are currently multiple monitoring efforts being conducted in Puget Sound focusing on bioaccumulative chemicals that may help update these survey estimates.

Table 3: Puget Sound Cleanup Acreage Compared with Other Puget Sound Measures

	Area	Percent of Puget Sound
Area of Puget Sound	1,798,239	100.00
Approximate Area of Puget Sound Surveyed	15,240	<1.0
Approximate Area Exceeding Sediment Quality Standards	7804	<0.5
Approximate Area of Puget Sound Cleanup Sites	3902	<0.5

Includes Strait of Juan de Fuca, Strait of Georgia, and Hood Canal.

The Puget Sound Ambient Monitoring Program (PSAMP) is a multiagency effort to monitor the health of Puget Sound. As part of PSAMP, Ecology's Marine Sediment Monitoring Team conducts annual monitoring of Puget Sound sediments. This program provides regional and ecosystem-wide information on Puget Sound sediment quality, which can be used by environmental managers and decision-makers to:

- Evaluate the overall condition of Puget Sound sediments.
- Assess effectiveness of environmental action over time.
- Place sediment conditions at local sites into a larger comparative perspective.

Cleanup Challenges

While many sediment sites have started the first investigative phase of cleanup, obstacles often exist that prevent sites from moving further along in the cleanup. Also, barriers exist that prevent some new sites from beginning the cleanup. Listed below are the major impediments to cleanup.

Policies on State-Owned Aquatic Lands

Increased interagency coordination and identification of common goals have resulted in speeding up sediment cleanups involving state-owned aquatic lands. When the state is involved, either as the land manager where a contaminated site is found or as the land manager of a dredged material disposal site, concerns about long-term liability must be addressed. These concerns include protection of human health and the environment, long-term maintenance of a cleaned up site, financial responsibility for the cleanup and post-remediation maintenance, and the legal ramifications of any remedy that does not include full removal of the contamination. Ecology and DNR have worked collaboratively on these issues site by site. However, the over arching policy issues remains the funding status for sites on state-owned aquatic lands.

Dredged Material Management Program

The Dredged Material Management Program is an interagency program that consists of the U.S. Army Corps of Engineers (Seattle District), the EPA (Region 10), Ecology, and DNR. Each agency brings to the table its unique management responsibilities and specialized knowledge and expertise.

The DMMP works as a cooperative group to manage the disposal and beneficial use of sediments dredged from the waters of Washington State. This includes sediment dredged for navigation and maintenance purposes or for cleanup. The DMMP conducts in-depth analyses to determine if dredged material is suitable for open water disposal.

The state is working on developing a framework to manage ubiquitous, bioaccumulative chemicals such as dioxin/furans in dredged material. This involves developing a strategy to determine the appropriateness of an open water disposal site and how to assess the impacts of bioaccumulative chemicals on human health and the environment at these disposal sites. Ecology has led and conducted public workshops to listen to stakeholder concerns and gain more in-depth technical information to help inform a strategy. The presence of these types of chemicals at cleanup sites can substantially increase the cost of cleanup if, based on the new framework that is in development, the dredged material is determined unsuitable for open water disposal.

Uncooperative Liable Party

For cleanup work to progress efficiently, a liable party must be willing and able to work toward common cleanup goals. When the liable party is unable or unwilling to work with Ecology and other liable parties, cleanup may become temporarily stalled at the initial investigation stage. In addition, a greater amount of staff resources are required to progress the cleanup to the Remedial Investigation/Feasibility Study and Cleanup Action Plan stage which are the stages that take the most time to complete. Under the Puget Sound Initiative, new staff and funding has been provided that is enabling Ecology to progress on some of these cleanups.

Ongoing Sources Not Yet Controlled

Performing costly cleanup only to have the sediments become re-contaminated by continuing sources is a concern. A key to being successful with this type of cleanup is identifying and controlling upland sources of contamination by cleaning up sources of contamination to sediments first. This often requires involving water quality permit managers as well as cleanup of upland properties including contaminated groundwater before sediment cleanup begins.

However, there are times when controlling all potential sources, such as stormwater, is not feasible and sediment cleanup must progress. There are numerous benefits to cleaning up severe contamination, including decreasing the risks of contaminant exposure to humans and the environment, even if a site may become re-contaminated at some point in the future. This is because the new contaminants typically are different and are at much lower concentrations than before the cleanup.

The Puget Sound Partnership has identified surface water runoff, including stormwater, as the primary source of pollutants to Puget Sound. Ecology is working with the Partnership, other local and state agencies to develop effective policy to address nonpoint and point sources of pollution. Recently, this is evidenced by the formation of the Phthalate Work Group, coordinating with the Water Quality Program to address sediment impacts from NPDES permitted dischargers by integrating cleanup and source control efforts and implementing a new 303(d) policy for sediments, supporting PSAMP studies and utilizing internal and external data to make better decisions.

High Cost of Cleanup

High cost of cleanup can be an obstacle at some sites. Contaminated-site cleanups that involve sediment are usually more complex, take longer, and are more costly. Disposal capacity, alternatives for contaminated materials, and costs often play a major role. Ecology is addressing this by utilizing the PSI funding to supplement cleanups by unwilling PLP's, integrating cleanup, mitigation and restoration efforts on a baywide scale, and streamlining the cleanup process and the time it takes to remediate a site.

Regulatory Uncertainties

Some liable parties resist expediting cleanup because of concerns that non-cleanup laws, such as recent salmon listings under the Endangered Species Act or TMDL provisions of the Clean Water Act, may result in added cleanup requirements. Because of new staff and funding under the Puget Sound Initiative, Ecology has enhanced coordination with other natural resource agencies to prevent this from happening and avoid duplication between agencies whenever possible. Some sites are also slowed by the need to develop cleanup levels on a case-by-case basis at freshwater sites. Ecology is currently working on developing freshwater criteria and is an integral part of the Regional Sediment Evaluation Team that is working toward a sediment evaluation framework for freshwater dredging.

Area-wide Contamination

Sites under investigation for contamination or cleanup may be a small subset of a bay-wide or even larger regional problem. Many areas of Washington State are contaminated from historical smelter emissions, historical use of lead arsenate pesticides, and past combustion of leaded gasoline. Elevated levels of arsenic and lead have been measured in soil, for instance, from one Tacoma smelter plume that is estimated to extend over three counties and many watersheds.

Persistent bioaccumulative compounds are also of wide scale concern, especially for human health. Examples of this are the lower level widespread tributyl tin and polychlorinated biphenyl contaminated areas in Lake Union. Given such area-wide considerations, major cleanup actions on a site-by-site basis are sometimes postponed until a coordinated system-wide strategy is developed.

How Much Does Cleanup Cost?

Cleanup Cost Ranges

In previous Sediment Status Cleanup Reports, staff developed estimates for the cost of cleanups at sediment sites. The accuracy of cost estimates varies depending on the stage of cleanup at the individual sites. Sites in the early investigation phases have more uncertainty about the extent of contamination. Sites in later stages of cleanup have more information and have likely completed a feasibility study that will help determine more accurate costs.

Costs also vary depending on the potential remedy or combination of remedies as well as the disposal choices selected for the site. Remedies may include, but may not be limited to, dredging, capping,

natural recovery, and active treatment. While disposal options can vary from nearshore placement and confined aquatic disposal to disposal at regulated landfills. Each option can significantly change final cost estimates.

Estimating Cost of Remaining Cleanup

In the 2005 Sediment Cleanup Status Report, costs were estimated for completing all unfinished sediment cleanups. The range was between $436 million and $1.862 billion, with an intermediate cost estimate of $1.15 billion. Costs will be estimated for a broader range of sites in a new report required by the Legislature under State House Bill 1761. The Agency is developing a Ten-Year Financing Report that will be completed by the end of 2008. This report will include cost estimates for cleanup projects that are sediment and/or upland contaminated sites. These cost estimates may more accurately reflect the true cost of sediment cleanup by including the upland source(s) of contamination that may continue to flow to the sediment area. At this initial stage, the 2005 estimates appear to be consistent with the State House Bill 1761 estimates.

Estimated costs of cleaning up sites will be based on specific sites and projects. These cleanup estimates will include mostly cleanup of contaminated sites initiated by local governments. Local governments are eligible for a minimum 50% grant match from the state for their cleanup projects. Ports are engaged in cleaning up contaminated sites around Puget Sound and in developing cost estimates for the next ten years.

State-Owned Aquatic Lands

Most aquatic lands in Washington State are publicly owned by the state and are referred to as *state-owned aquatic lands* or SOAL. Many shoreline, harbor areas, and tidelands (land over which the tide ebbs and flows) are owned and managed by local governments such as port authorities. In addition, these areas can be owned by the state but managed by the local port authority. For many sites on state-owned aquatic land, addressing liability and policy for these lands has been difficult. Figure 5 shows a rough estimate of the percent of state-owned aquatic land at all 150 sediment sites, both marine and freshwater. Table 4 shows a summary of marine and freshwater state owned aquatic lands.

Table 4: Summary of State-Owned Aquatic Lands

	Number of Sites
Known SOAL Sites (1-50% SOAL)	10
Known SOAL Sites (51-100% SOAL)	37
Known Non-SOAL sites	41
Unknown if site is SOAL	43

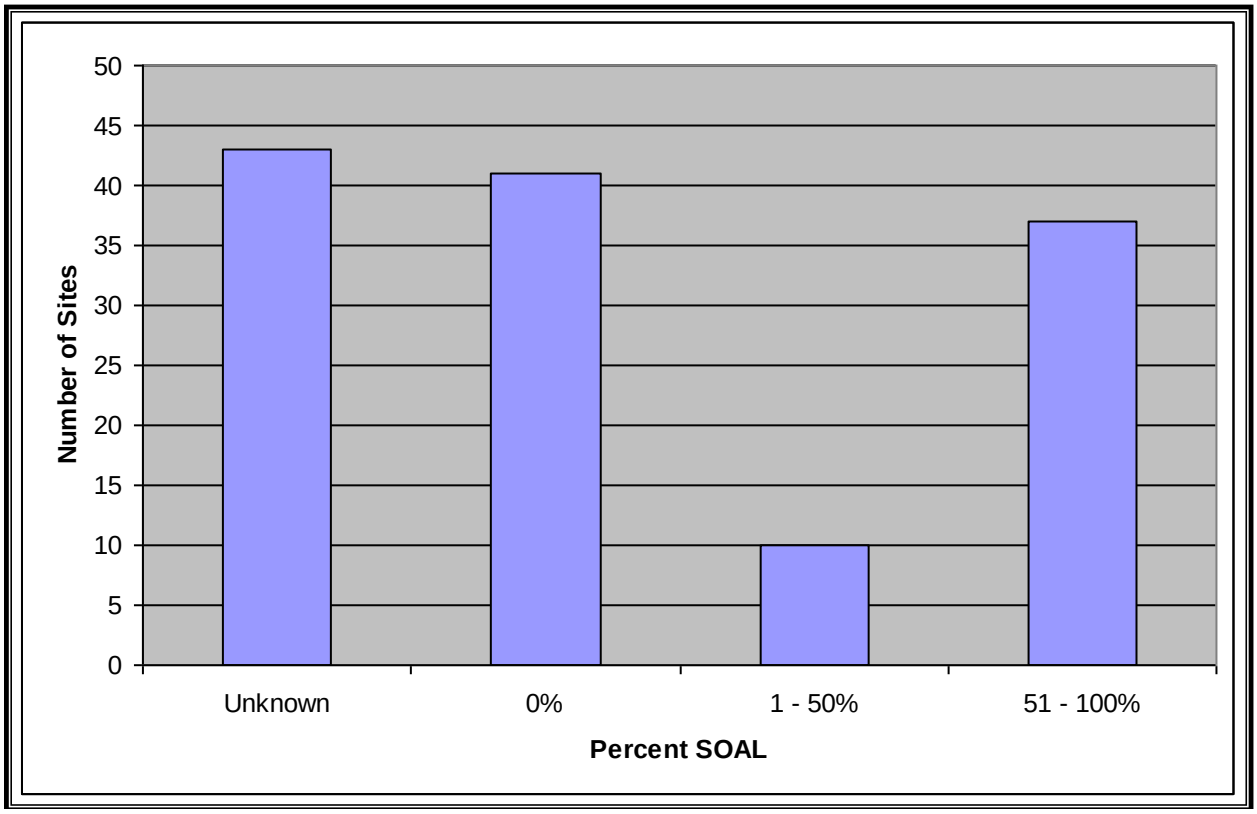

Figure 5: Percent State-Owned Aquatic Lands at Sediment Cleanup Sites

Sources of Contamination

Much of the previously identified sediment contamination identified in Washington State has resulted from historical industrial practices that have ended or been improved. Both residential and industrial point source and nonpoint source stormwater runoff appears to be the major source to newly contaminated sites and re-contamination of cleaned up sites. Stormwater is rain and snowmelt that runs off surfaces such as rooftops, paved streets, highways, and parking lots. As water runs off these surfaces, it can pick up pollution such as oil, fertilizers, pesticides, soil, trash, and animal waste. From here, the water might flow directly into a local stream, bay, or lake. Or, it may go into a storm drain and continue through storm pipes until it is released untreated into a local waterway. Pollutants transported by stormwater gather in sediments, degrading and damaging aquatic habitat.

A majority of urban creeks, streams, and rivers that provide habitat for fish and wildlife are harmed by stormwater pollution. Stormwater is a major contributor to water quality pollution of urban waterways in Washington State. Changes to the watershed, such as building homes and other structures and clearing away trees and shrubs, are the leading causes for stormwater pollution. Federal agencies identified habitat loss from stormwater runoff as one of the primary obstacles to salmon recovery.

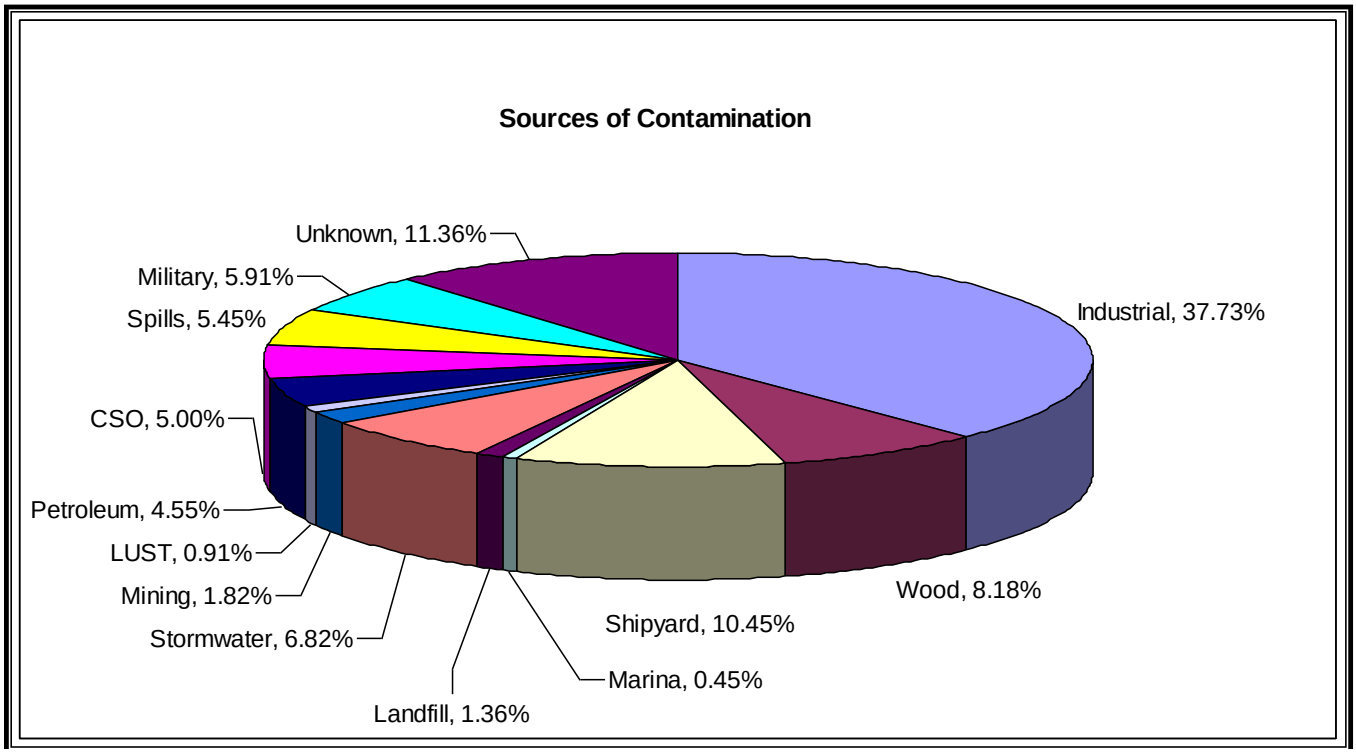

Figure 6. Sources of Contamination

The "Industrial" source category is most commonly cited by program site managers as the primary or secondary source of contamination. This category is general and describes a wide range of manufacturing activities. Three more specific categories of industrial activities and sources are displayed separately: "Wood/Timber/ Paper" (including wood treatment), "Mining/Industrial," and "Petroleum/Industrial" (refining, transport and storage). When combined, these sources comprise nearly one-half of all source citations. "Stormwater" is the only category that is cited more often as a secondary source than as a primary source of contamination. The relative contribution of source-to-sediment contamination by major category is shown in Figure 6.

Industrial and municipal discharges are now regulated to prevent the release of significant quantities of contaminants that historically caused the cleanup sites discussed in this report. Water quality discharge permits issued by Ecology today include requirements to prevent future sediment contamination. In addition, Ecology's Water Quality and Toxics Cleanup Programs are working to better identify and address sediment contamination by stormwater. Methods and procedures for assessing potential sources of sediment contamination are provided in the source control section of the Sediment Management Standards (WAC 173-204-400 through 420).

Water Body Focus

Most sediment cleanup sites are found in a few bays, lakes, and rivers. Most of these cleanup sites are found in the highly productive nearshore and intertidal environments, deltas, and estuaries. These are areas with important and valuable natural resources and habitat that is critical to the health of the Puget Sound ecosystem.

Ecology does not track sites by specific bays, lakes, or rivers. These geographic boundaries are difficult to define with regularity throughout the state and region. We do track sites that are within one-half mile of Puget Sound. Individual sites are dynamic, and boundaries can change for many reasons (new data, sale, combining, splitting,).

Table 6 shows the number of sites within particular water bodies. For this report, the eastern Kitsap Peninsula inlets near Bremerton with sediment sites - Sinclair Inlet, Eagle Harbor, and Liberty Bay - are combined. The next sections of the report focus on the most significant of the individual water bodies where all but 32 of the sediment cleanup sites are found.

Table 6: Sediment Cleanup Site Locations

Water Body	2003 Sites*	2005 Sites*	2007 Sites*
Fidalgo & Padilla Bays	8	8	6
Bellingham Bay	12	12	15
Commencement Bay	12	13	19
Elliott Bay & Harbor Island	20	24	22
Port Gardner & Snohomish River Estuary	13	11	13
Kitsap Peninsula & Sinclair/Dyes Inlets	18	16	19
Lake Union	7	7	9
Lake Washington	6	6	10
Lower Duwamish River	11	12	5
Spokane & Columbia Rivers	18	16	9
Other Water Bodies	32	26	23
Totals	**145**	**142**	**150**

*May include completed sites

As mentioned earlier, the listing of sites in the next section focusing on water bodies is not the same as the formal site listing and ranking process described in the Sediment Management Standards (WAC 173-204-540).

Impaired Water Bodies

Clean Water Act § 303(d) List of Impaired Waters – Water Quality Assessment

Under Sections 303(d) and 305(b) of the Clean Water Act, Washington is required to develop a Water Quality Assessment of impaired waters that do not meet Water Quality Standards. The Sediment Management Standards (SMS), issued under Chapters 90.48 RCW, Water Pollution Control Act, and 70.105D RCW, Model Toxics Control Act, set marine, low salinity, and freshwater surface sediment management standards for Washington State. In 1991, the EPA approved the SMS Sediment Quality Standards criteria as Water Quality Standards. Because of these authorities under the Clean Water Act, sediments exceeding the SQS must be considered for inclusion in the Water Quality Assessment.

In 2006, the Toxics Cleanup Program developed Section 8.c. of Policy 1-11 "Assessment of Water Quality for the Clean Water Act Sections 303(d) and 305(b) Integrated Report" for 303(d) impaired sediment listings. This policy describes the listing process for impaired sediment and their ranking within categories 1 – 5. A copy of the policy is available on Ecology's website at: http://www.ecy.wa.gov/programs/wq/303d/policy1-11_rev.html.

For sediment, the Water Quality Assessment lists the status of sediment quality in one of five categories recommended by EPA. The Assessment includes the Integrated Report for Clean Water Act Sections 303(d) and 305(b). Categories 1 – 4 represent sediment areas for the 303(b) report, and Category 5 represents sediment areas placed on the 303(d) list. For further detail, please refer to Policy 1 – 11. The 303(d) list for sediments is not necessarily directly correlated to the sediment cleanup sites that have been designated. Instead, it is meant as a broad-brush approach to classify sediment areas that have some contamination but may not be a cleanup site.

Sediment areas placed in Category 5 require more follow-up by TCP and may become an official MTCA cleanup site. Also, sediment areas in Category 5 may already be named as MTCA cleanup sites, but do not yet have an approved Cleanup Action Plan, Record of Decision, or similar tool. Sediment areas placed in Category 4b are MTCA cleanup sites and have an approved Cleanup Action Plan, Record of Decision, or similar tool.

The 2008 Water Quality Assessment covers chemical and biological sediment data up to December 31, 2006. For the first time, sediment listings may be viewed by a GIS Interactive Mapping Tool and Simple Query Tool. These listings are found on Ecology's website:
http://www.ecy.wa.gov/programs/wq/303d/2008/index.html

For more information regarding the Water Quality Assessment for both sediment and water quality, please visit Ecology's website:
http://www.ecy.wa.gov/programs/wq/303d/index.html or
http://www.ecy.wa.gov/programs/tcp/smu/sediment.html

Appendix A

Fidalgo & Padilla Bays

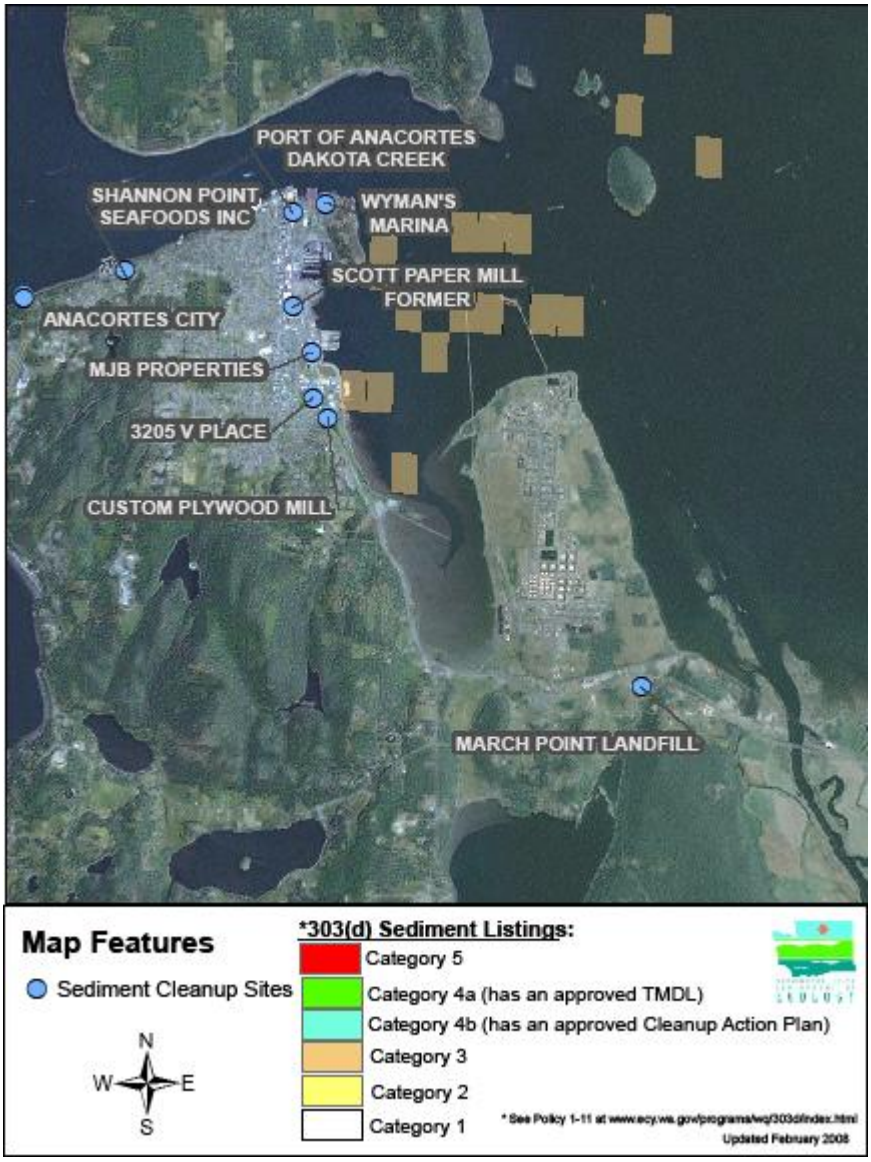

Figure A-1: Fidalgo and Padilla Bays

A Puget Sound Priority Area

Fidalgo and Padilla Bays are part of the Puget Sound Initiative. Both embayments have important aquatic resources and habitat that involve state-owned aquatic land. The bays and the mouth of the Skagit River delta support highly productive habitat for salmon migration, perch and crab nursery grounds. In addition, the embayments are impacted by both declining herring population and eelgrass beds. Toxic contamination from upland sources in Padilla and Fidalgo Bays has created sediment contamination that is likely impacting important habitat and state resources in both bays.

Part of the cleanup work includes conducting a bay-wide sediment characterization study to inform cleanup and restoration decisions, identify potential areas of sediment contamination, and confirm the priority areas for cleanup in the Bay. The data report for this study can be found at: http://www.ecy.wa.gov/programs/tcp/sites/psi/overview/psi_baywide.html

Past sediment sampling in Anacortes and Fidalgo Bay has shown that levels of several toxic chemicals exceed state cleanup standards. Ecology used special funding from the Puget Sound Initiative to investigate sediment quality throughout the Bay and develop a strategy for cleaning up areas in the Bay. Based on sediment quality data collected previously, six sites are identified in Fidalgo Bay near Anacortes and are listed in Table 7, located in Appendix B. Most of the sites are in the early stages of cleanup. Much of the information about area, land ownership, and cost of cleanup has not been determined. Although two refineries are located in Fidalgo Bay, the sites listed here do not appear to be associated with refinery operations. Instead, these sites are associated with maritime and historical industrial activities near Anacortes.

Port Gardner & Snohomish River Estuary

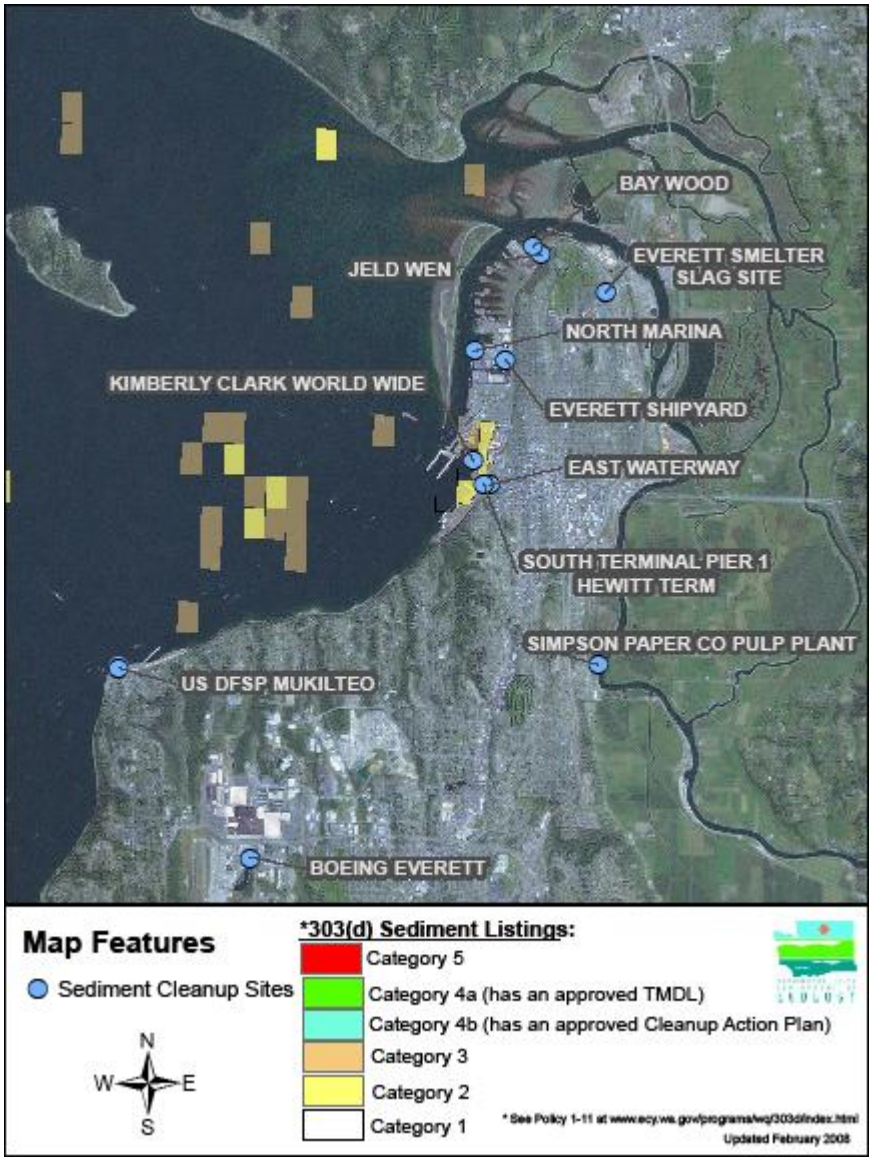

Figure A-2: Everett and Port Gardner

A Puget Sound Priority Area

The lower Snohomish River Estuary and its sloughs are an important salmon migration route to and from spawning grounds and also support spawning habitat and juvenile rearing areas. The Bay is very industrial, populated, and is impacted by wood waste and chemical contamination from upland sources. Addressing sediment and upland cleanup and identifying other upland sources is vital to restoring critical habitat and natural resources and preventing re-contamination of sediment. There are 13 cleanup sites located near Everett that are listed in Table 14. These sites cover at least 130 acres of intertidal and sub tidal sediments, but involve little state-owned aquatic land. Most of the

completed sites were associated with the former Weyerhaeuser Everett facility. Sale of that facility helped expedite cleanup of associated sites. These sites are summarized in Table 13, located in Appendix B.

Kitsap Peninsula & Sinclair Inlet

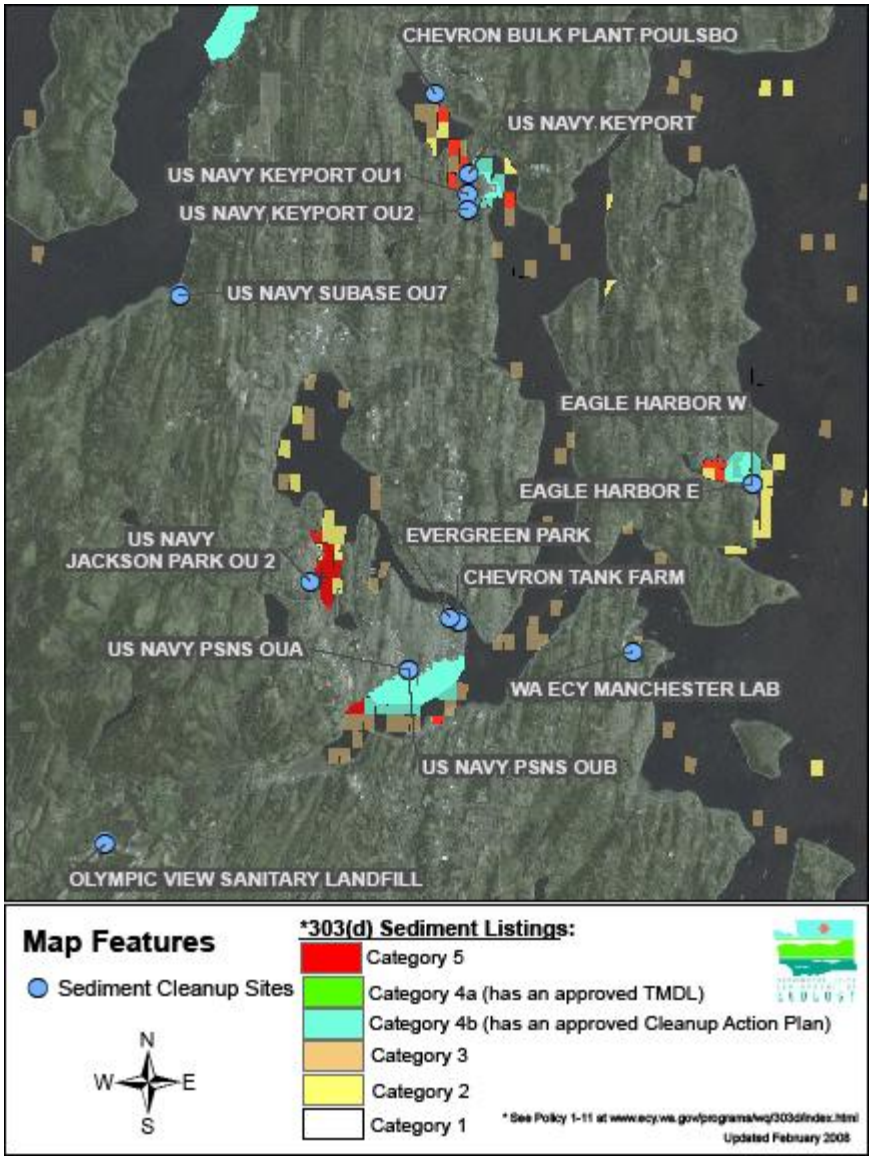

Figure A-3: Kitsap Peninsula and Sinclair Inlet

Sediment contamination of this region is due primarily to naval operations, timber industry, and municipal and stormwater discharges. All water bodies on the Kitsap Peninsula are considered together for purposes of this report. This includes Dyes Inlet, Eagle Harbor, Liberty Bay, Ostrich Bay, Port Townsend, and Sinclair Inlet.

All of the larger sites, such as Eagle Harbor, Sinclair Inlet and U.S. Navy Jackson Park are being investigated and remediate under EPA's CERCLA authority, with Ecology providing oversight under MTCA. These and most other sites in the Kitsap water body are in the late stages of the cleanup process. The sites here total approximately 370 acres, with about 60% being on state-owned and managed aquatic lands.

Based on the data from sampling locations shown above, 16 cleanup sites are listed in Table 14 for this area of the Puget Sound. Total costs may exceed $30 million. Factors that may be impeding progress on sites include continued sources of contamination and uncooperative liable parties.

Chevron Tank Farm in Bremerton

The site was a bulk fuel facility from about 1950 to 1988; it is currently vacant property. After the structures were taken down in 1988, Chevron collected soil samples and installed groundwater monitoring wells. Results showed gasoline, diesel, and oil contamination in soil and groundwater. Sediment investigation in 2007 showed that the marine sediments have not been impacted by the groundwater contamination. Some cleanup has taken place. However, more work remains to be done.

Port Gamble

Figure A-4. Port Gamble

A Puget Sound Priority Area

Port Gamble Bay has a high percent of state-owned aquatic land, supports a highly productive shellfish industry, and includes a declining herring population and eelgrass beds. The aquatic area is impacted by about 17 acres of wood debris with a few upland cleanup sites. Much of this embayment was leased or owned by Pope and Talbot Inc. to conduct mill operations. Within the Bay there are two sediment cleanup sites consisting of wood debris and some chemical contamination: 1) Sawmill site is located in the north portion of the bay and, 2) A log storage area leased to Pope & Talbot by DNR.

Ecology worked with DNR on an interim action cleanup of wood waste at the Sawmill site. ~17,400 cubic yards of wood waste was dredged from two acres of impacted area. A thin layer of clean sand

was placed on the native material to create healthy aquatic habitat for shellfish and eelgrass. In 2007 Pope & Talbot filed for bankruptcy but Ecology is proceeding with the cleanup actions at both sites.

Budd Inlet

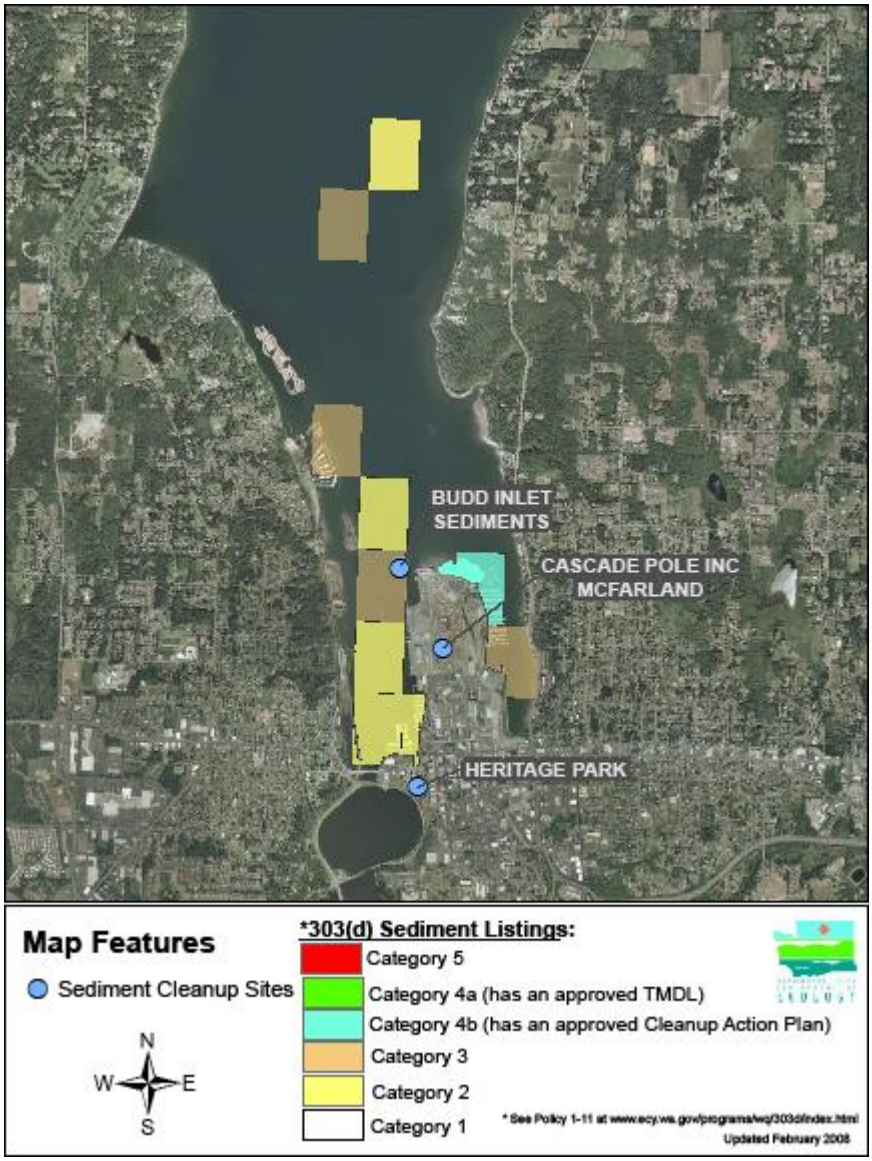

Figure A-5. Budd Inlet

A Puget Sound Priority Area

The South Sound area contains important commercial and recreational shellfish and is an important feeding area for salmon and trout. In 2007, Ecology began further investigations to determine the extent and possible sources of dioxin contamination of sediments in Budd Inlet. Ecology initiated this investigation after elevated levels of dioxins were discovered by the Port of Olympia in an area scheduled for routine maintenance dredging. Although dioxins were found in areas throughout the inlet, the highest levels of dioxins were found in sediments near stormwater discharge pipes and the Port's shipping berths. The specific source of dioxins in Budd Inlet has been fingerprinted to be consistent with the Cascade Pole site.

Oakland Bay

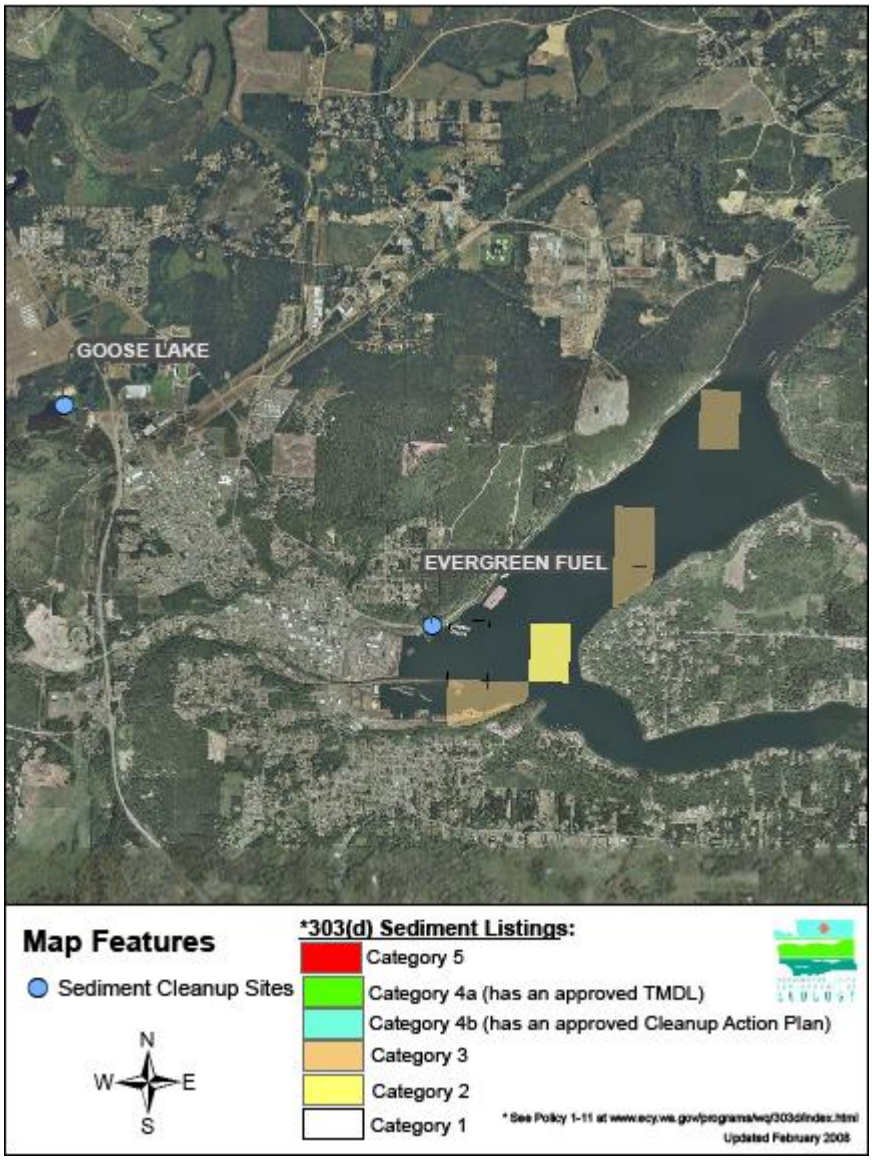

Figure A-6. Oakland Bay

A Puget Sound Priority Area

The Oakland Bay area supports important habitat, oyster beds, salmon bearing streams, spawning grounds, and a salmon migration corridor. It contains state-owned aquatic land sub tidal areas and highly productive oyster beds. Industrial practices such as the timber processing and paper production has resulted in about 20 acres of wood waste with some chemical contamination in the intertidal area which may threaten this highly productive habitat and valuable resources. Part of the cleanup work will involve conducting a bay-wide sediment characterization study to help inform cleanup priorities and determine the general sediment quality throughout the area.

Port Angeles

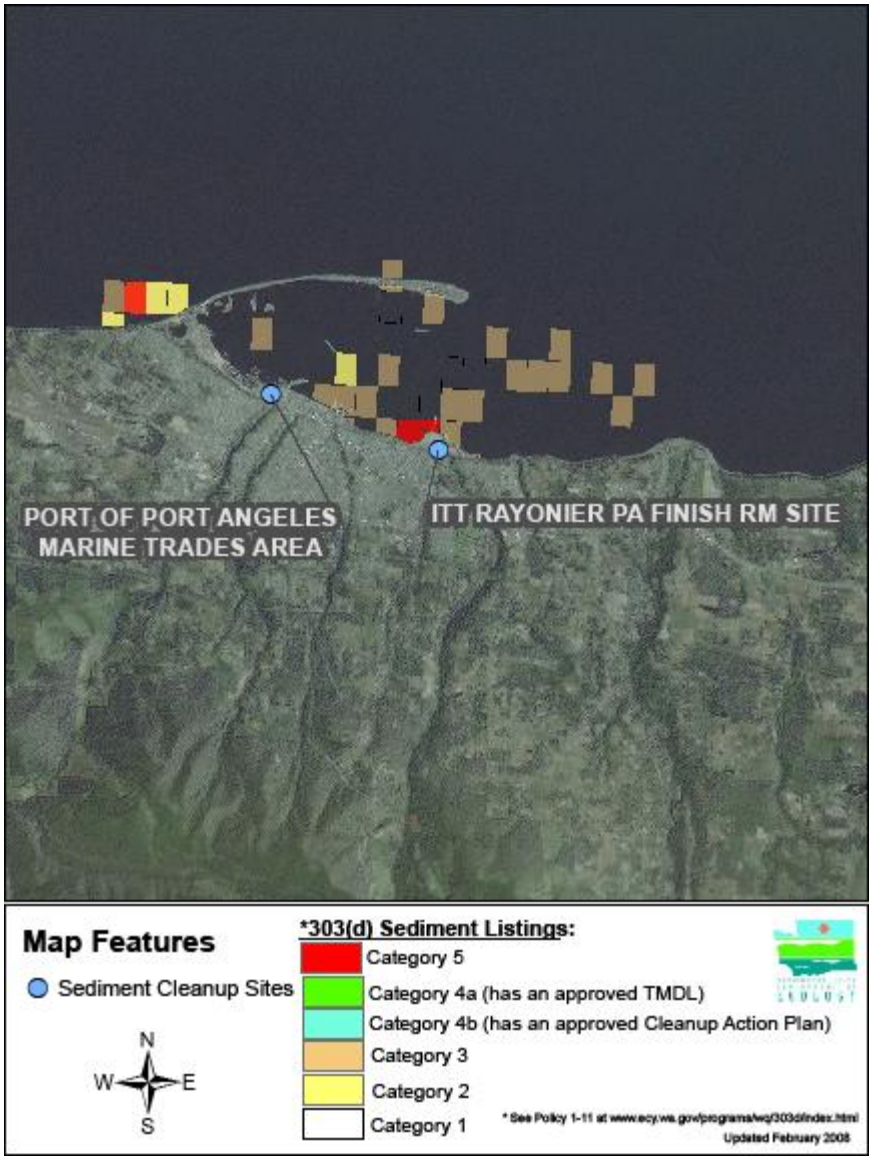

Figure A-7: Port Angeles

A Puget Sound Priority Area

Port Angeles Harbor is one of the Puget Sound bays being targeted by the Puget Sound Initiative. This embayment is about 90% state-owned aquatic land and has potential for restoration and improvement of a diverse benthic intertidal community and habitat where one has historically existed. This area supports a diverse aquatic biological community including shellfish. The embayment is impacted by a large, approximately 100-acre wood debris site and sediment chemical contamination. There are complex upland cleanup sites/sources including multiple types of industrial facilities and leaking underground storage tanks that are suspected to have impacted

sediment. Ecology is using special funding from the Puget Sound Initiative to investigate sediment pollution and develop a strategy for cleaning up the harbor.

Bellingham Bay

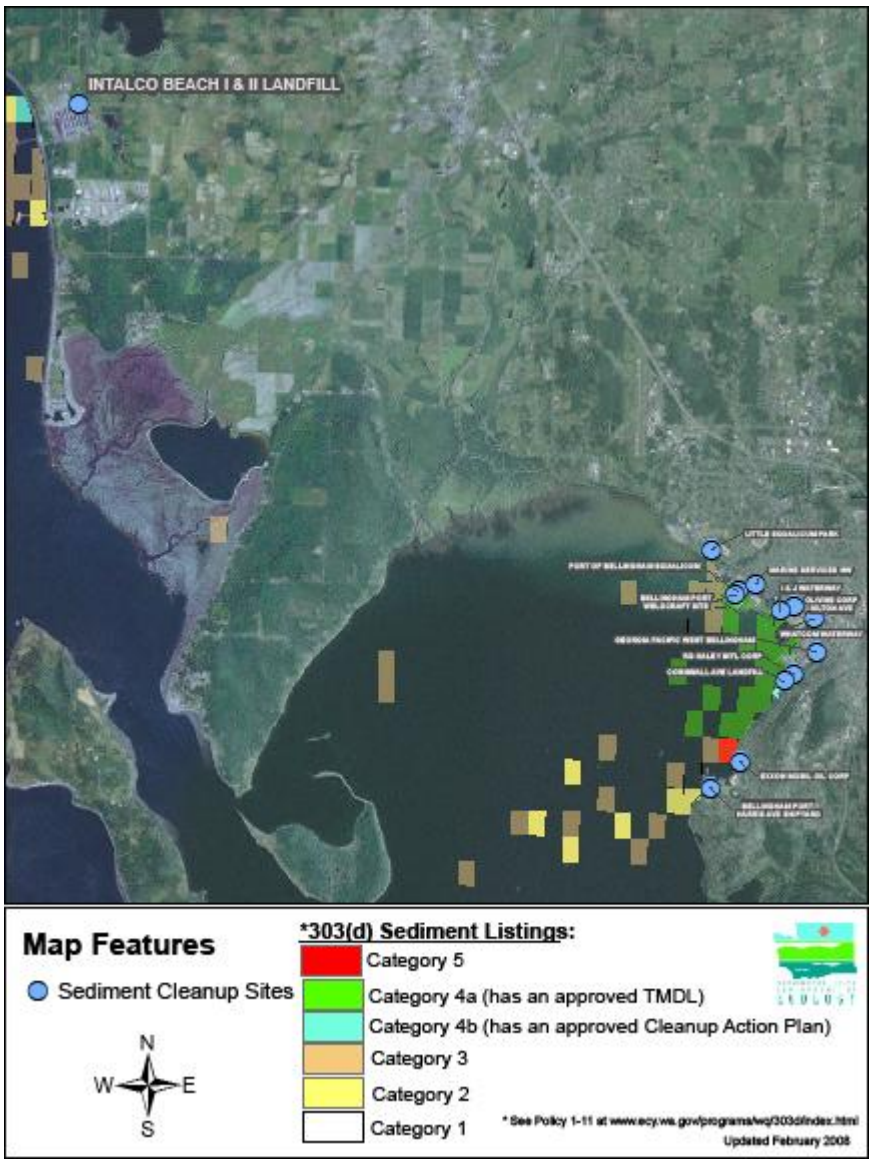

Figure A-8: Bellingham Bay including Intalco

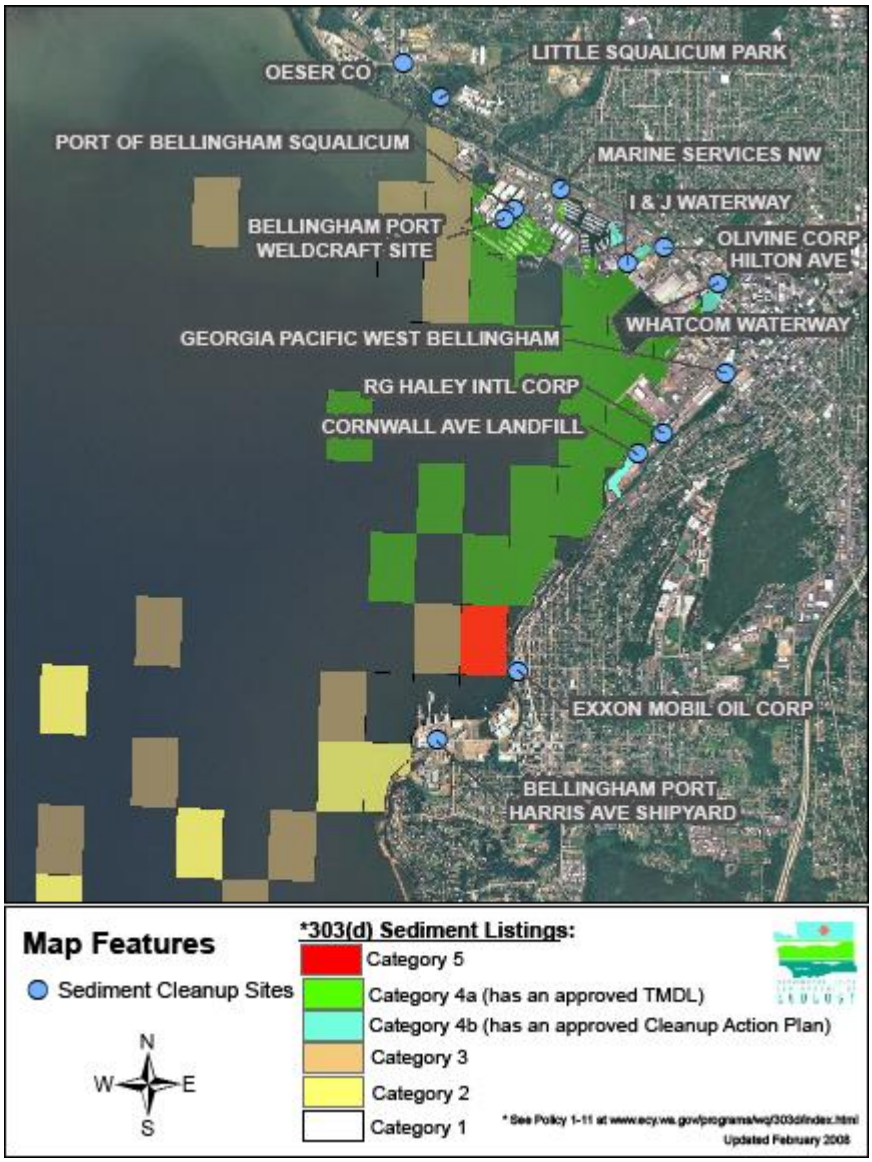

Figure A-9: Bellingham Bay

In 1996, a cooperative partnership of 15 federal, state, tribal, and local stakeholders joined to form the Bellingham Bay Demonstration Pilot Team. The mission of the Pilot Team was to develop a new cooperative approach to expedite sediment cleanup, source control, and habitat restoration for sediment cleanup sites around Bellingham Bay.

In July 1999, an Environmental Impact Statement (EIS) for the Bellingham Bay Comprehensive Strategy was completed and a supplemental EIS was issued in March 2000. In October 2000, the Department of Ecology, as lead agency for the Pilot, issued the Pilot Team's planning efforts in the Bellingham Bay Comprehensive Strategy/Final Environmental Impact Statement. The Comprehensive Strategy was designed to help guide future decisions on control of pollution sources, cleanup and disposal of polluted sediments, restoration of habitat, and in-water and shoreline land uses from a bay-wide perspective.

Discussions of site-wide issues with the Port and Bellingham, landowners, potentially liable parties, tribes, natural resource agencies, and the public have promoted several cleanups. Although Ecology does not make future site use decisions, Ecology has strongly encouraged the public to engage and consider future use of the waterfront throughout the cleanup.

Bellingham Bay's 15 sediment cleanup sites are summarized in Table 8 (located in Appendix B) and are based on ISIS data and data collected at the sampling locations shown in Figures 13 & 14. The size of sites ranges from <1 – 210 acres. Most are located on state-owned aquatic lands and most are in advanced phases of investigation, such as the Remedial Investigation/Feasibility Study stage. The total cost of sediment cleanups is estimated to be in the $60-$180 million range, but may decrease with completion of the Whatcom Waterway Cleanup Action Plan, which was signed in 2007.

Four of the 15 Bellingham Bay sites in this report were also on Ecology's 1996 Contaminated Sediment Site List. Results of biological testing effectively refuted the listing of the Georgia Pacific Outfall site, but it continues to be monitored. The Georgia Pacific Log Pond site, considered part of the Whatcom Waterway site, is being tracked separately because contaminated sediments have been capped in place as an interim action/partial cleanup to be monitored.

Columbia & Spokane Rivers

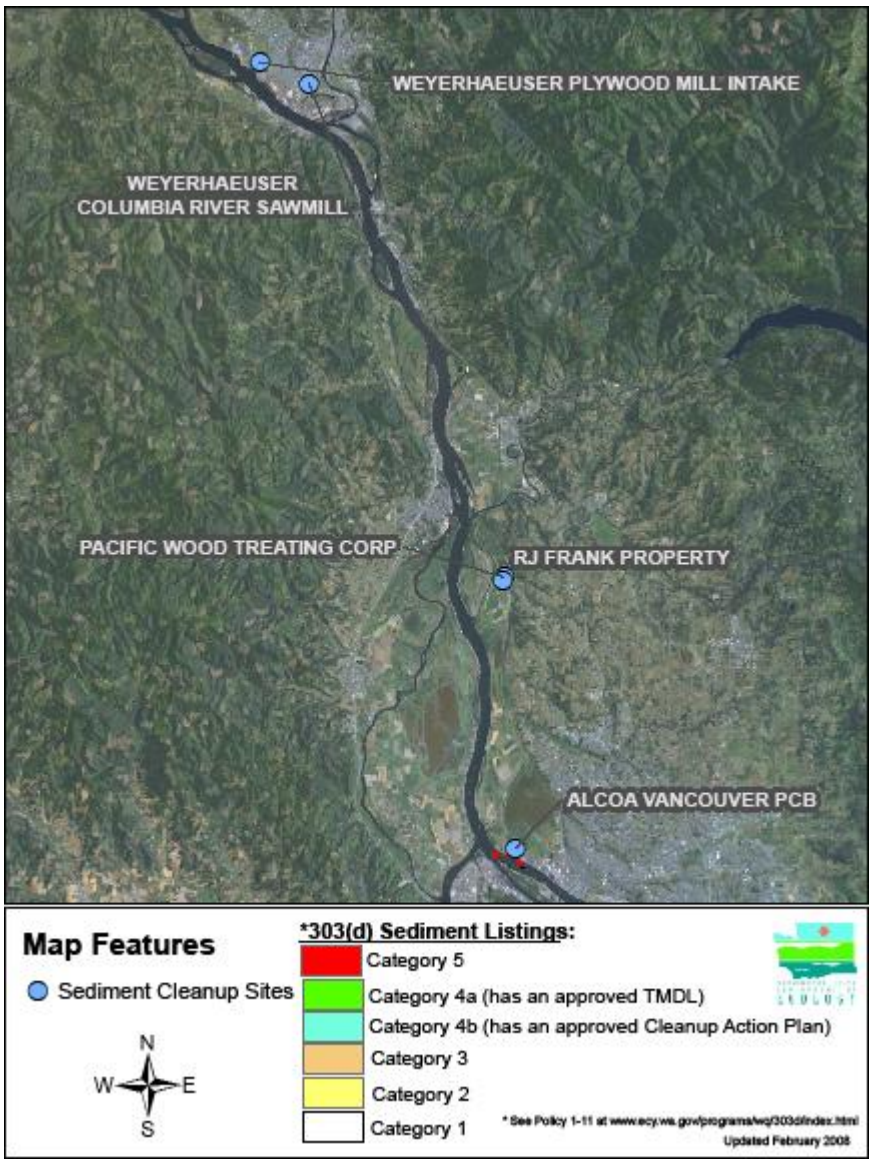

Figure A-10: Lower Columbia River

Lower Columbia River

Investigations of sediment contamination in the Columbia River system generally began much later and involved fewer resources than similar investigations in the Puget Sound region. Based on the sediment quality data, Ecology has identified the seven known or suspected cleanup sites listed in Table 9, in Appendix B. With the exception of the Port of Vancouver copper ore spill site and the ALCOA Vancouver site, all of the Columbia River sites are in the initial stages of investigation and cleanup. Consequently, not much is known about sediment cleanup site area, ownership, or costs for this area. As investigations progress, it is likely that some sites will need "no further action" while other new sites will be identified.

Upper Columbia River

Areas of the Upper Columbia River (UCR), and its banks have been shown to contain elevated concentrations of various heavy metal contaminants including arsenic, cadmium, copper, lead, and zinc. Much of the observed heavy metal contamination has been attributed to sources located north of the U.S.-Canada international border. The USEPA initiated Remedial Investigation activities in 2005 to characterize the nature and extent of contamination, focusing the Phase I sampling and analytical efforts on sediment and fish tissue. The UCR site is located in northeast Washington State and extends approximately 147 river miles from the U.S.-Canada international border to Grand Coulee Dam. In June 2006, a formal settlement contract was established between the Federal Government, Teck Cominco American Incorporated and a separately incorporated affiliate, Tech Cominco Metals Ltd. This agreement places responsibility for implementation of the remaining remedial investigation and feasibility study activities with Teck Cominco. Sampling to support Phase 2 of the RI is scheduled to begin in 2008.

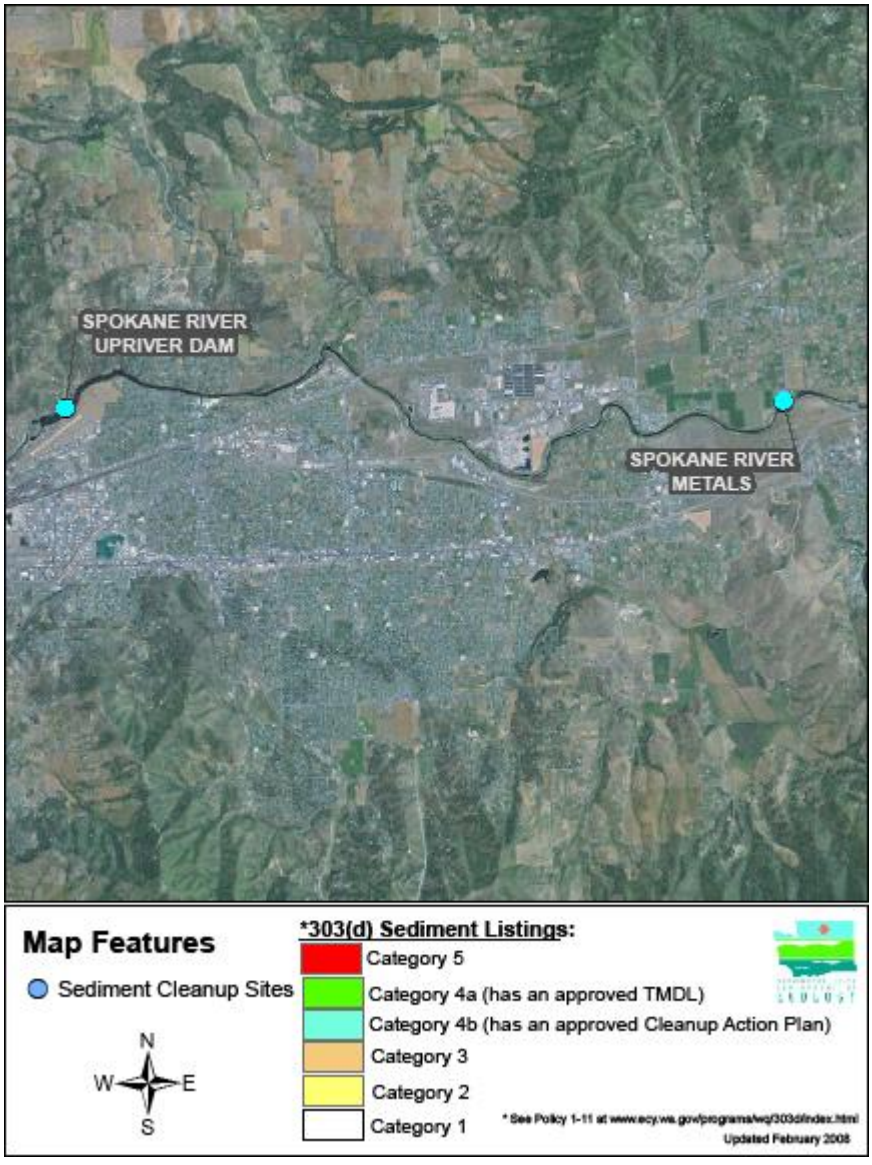

Figure A-11: Spokane River

Spokane River

Historic mining practices in the Coeur d'Alene basin resulted in heavy metals washing downstream from Idaho. These metals settled in soil and sediments at shoreline areas on the Spokane River. Several restoration projects are taking place along the Spokane River in Washington State to address the contamination. The projects in this update are part of Governor Gregoire's priority to reduce toxic chemicals in the environment.

Three Projects Completed in 2007

Island Complex

This project is located about 1.5 miles west of the Idaho border. Cleanup work focused on the south and west banks of the island in the river. Restoration included stabilizing and capping certain areas of the river bank where lead and arsenic exceed state standards. The work helps reduce erosion and limits human and wildlife exposure to contaminants. It also restores portions of the river bank with natural vegetation. A footpath leading to the island recreational area was also built.

Starr Road

This restoration area runs along the north bank of the Spokane River near the intersection of Starr and River Roads close to the Idaho state line. In 2006 the USEPA in coordination with Ecology removed contaminated shoreline sediments and soils and replaced them with clean materials. In 2007, Ecology did additional work to improve the quality of the site for Rainbow Trout spawning.

Murray Road

The work area for this project lies along the north bank of the river about one mile downstream from the Island Complex site. A sand and gravel cap was placed over the lead, arsenic, zinc, and cadmium contamination. Part of the cap was used to create a new spawning area for Rainbow Trout. A new footpath that leads to the newly cleaned recreational area was also built.

Projects Beginning in 2008

Harvard Road North

This project lies on the north bank of the river about three miles west of the Idaho border. The cleanup action proposed for this site is to replace contaminated soil and sediments with clean material on the upper portion of the river bank. A protective cap of clean sand and gravel would be placed on the lower portion of the river bank where contaminants will not be removed. The cap is designed to prevent people and wildlife from exposure. In addition, contractors will build a gravel boat launch.

Commencement Bay

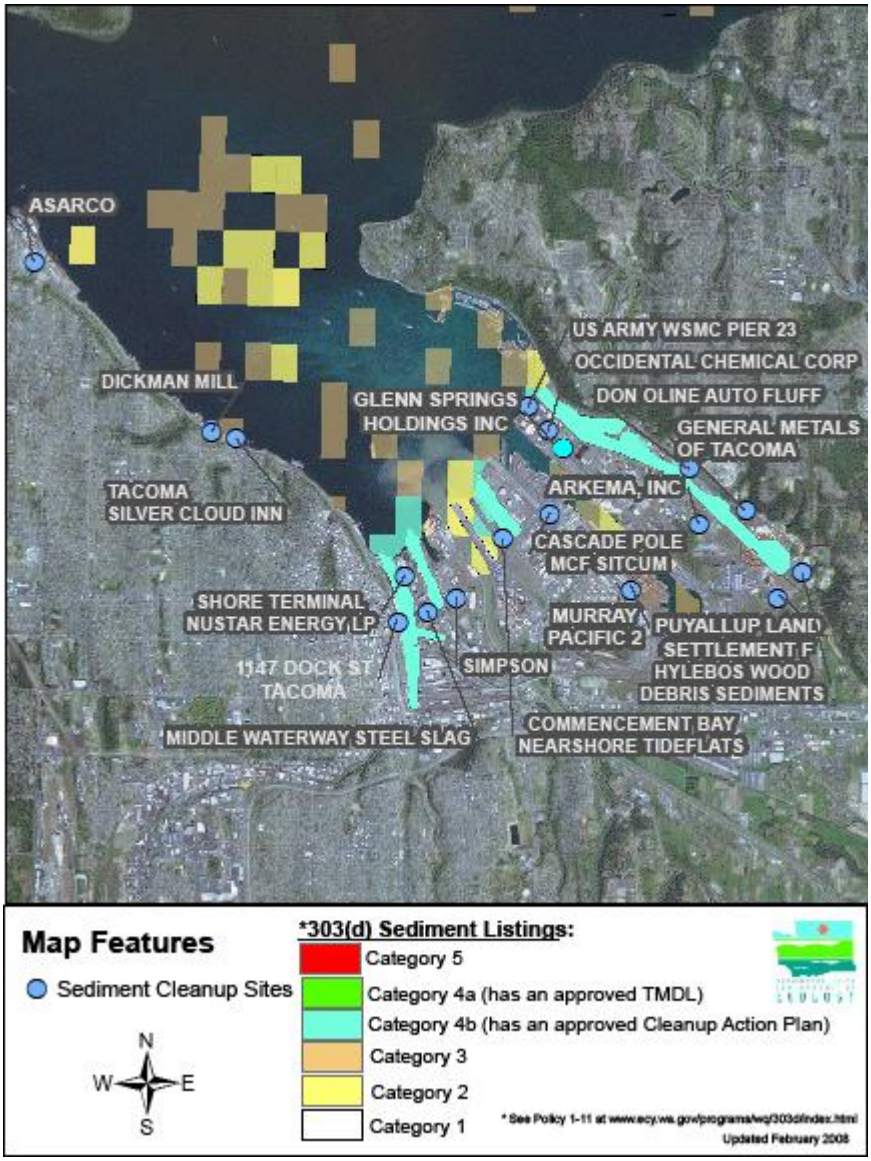

Figure A-12: Commencement Bay and the City of Tacoma

In the early 1980s, EPA placed the Commencement Bay nearshore tideflats and waterways on the CERCLA/Superfund National Priorities List. This area was among the first in Washington State where contaminated sediment was evaluated in detail and remediation took place. The characterization of impacts and assessment of risks due to exposures to Commencement Bay sediments was fundamental to the development of sediment management programs in the state.

Based on data collected, there are 19 sediment cleanup sites listed in Table 10, located in Appendix B. Sediment quality at these sites reflects the long industrial history of Tacoma, including the former Asarco smelter, maritime commerce, and stormwater discharges. The sites cover at least 275 acres and perhaps as much as 370 acres, more than one-third of which is likely owned and managed by the state.

Over one-half of the Commencement Bay site cleanups, including all the major ones, have been or are being conducted under EPA's CERCLA authority. Nearly all sites are in late stages of cleanup; e.g., feasibility studies, remedial design, cleanup, or monitoring. Total cost of cleanup is likely to exceed $225 million. The main remaining challenge is to ensure that sources have been controlled and that industrial and municipal discharges do not cause recontamination.

Phthalate re-contamination of the Thea Foss Waterway is a concern. Phthalates are pollutants found in air, soil, and water. They are plasticizers used widely in consumer products such as cosmetics, vinyl flooring, children's toys, flexible plastics, lubricants, and adhesives. Each chemical has different characteristics and potential effects. Recent sediment sampling data from the Thea Foss Waterway has confirmed that phthalates are re-contaminating the remediated site.

We have several concerns about phthalates. Sediments in urban areas of Puget Sound frequently contain phthalates above the Washington Department of Ecology cleanup levels, which are set to protect aquatic organisms. Research shows phthalates wind up in marine sediments and can cause harm to organisms that live there and humans that consume them. Phthalates are pervasive in the environment because they are contained in hundreds of common products found in everyday life and they enter water through many ways, so identifying precise sources of contamination is difficult.

The cities of Tacoma and Seattle, King County, Ecology, and EPA are working together to better understand how phthalates are reaching Puget Sound sediments and what the related impacts are to humans and animals. A work group has been voluntarily created with representatives from each public agency. The work group recognizes the challenges that municipal governments face regarding phthalates in sediments at important cleanup sites such as the Thea Foss Waterway and Lower Duwamish River.

Lower Duwamish Waterway

Figure A-13: Lower Duwamish Waterway

Ecology and the EPA are working to clean up contaminated sediments and control sources of recontamination in the Lower Duwamish Waterway in cooperation with the City of Seattle, King County, the Port of Seattle, and the Boeing Company. The Superfund site is the approximate 5.5-mile portion of the Lower Duwamish River that flows into Elliott Bay.

This report combines all of Elliott Bay with portions of the Duwamish River associated with Harbor Island into one water body, and treats the Duwamish River south of Harbor Island as a separate water body called the Lower Duwamish Waterway. Sediment sites in the Lower Duwamish are considered to be marine because of the deep wedge of saltwater that extends upriver to just past the turning basin that is overlain by a much thinner layer of buoyant freshwater.

The sediments along the river contain a wide range of contaminants due to years of industrial activity and runoff from residential areas. These contaminants include polychlorinated biphenyls, polycyclic aromatic hydrocarbons, metals, and phthalates. Discharges from urban stormwater and combined sewer overflows have also contaminated sediments.

EPA is leading the sediment contamination investigation and cleanup for the Lower Duwamish Waterway site. In 2001, several public and private parties signed an Administrative Order on Consent leading to extensive investigations of the Lower Duwamish Waterway. The site is considered both a CERCLA/Superfund and a state (MTCA/SMS) site. EPA oversees remedial investigations and actions, while Ecology has the lead role in source control activities. This approach, coupled with participation of many other parties in the RI/FS process, should facilitate a comprehensive and technically-sound cleanup.

Five sites in the Lower Duwamish River are listed in Table 11, located in the Appendix. All of them including the sites identified by Ecology in its 1996 Contaminated Sediment Sites List and lie within the working boundaries of the 495-acre Lower Duwamish Waterway Superfund - MTCA site, as defined by EPA and Ecology. Virtually all of the contaminated aquatic lands within this site are privately or port owned.

Two of the individual sites listed are in the stage of cleanup and post-action monitoring, while two "early action areas" (or "partial cleanups" under the SMS) are in the Feasibility Study (FS) stage. The Boeing Plant 2 sediment site is also in the FS stage of cleanup but the cleanup is being conducted as a RCRA Corrective Action.

The remaining sites are in the Remedial Investigation or RI stage of the cleanup process. Investigations of these sites are progressing well, but potential impediments include: a) the complexity of sites; b) the estimated cost for cleanup of $30-$130 million; and, c) the need for considerable human and dollar resources from liable parties and oversight agencies.

A draft Remedial Investigation Report is currently under review. The comprehensive report covers the entire Lower Duwamish Waterway site. Studies include (but not limited to) ecological and human health risk assessments, sediments data, habitat and human utilization of the area. The report is being reviewed by Ecology, EPA Region 10, National Oceanic and Atmospheric Agency (NOAA), local tribes, Army Corps of Engineers, and interested environmental groups. Potentially Liable Parties are working on a response to comments. A Record of Decision is tentatively scheduled for 2010.

Source Control

Ecology is leading efforts to control sources of sediment pollution in the Lower Duwamish Waterway in cooperation with the City of Seattle, the Port of Seattle, King County, the City of Tukwila, and EPA. Source control is the process of finding and controlling releases of pollution to waterway sediments to prepare for cleanup and prevent sediment recontamination. Finding and controlling sources is difficult, and even with aggressive source control some re-contamination may occur. Seven areas along the river have been identified as candidates for high-priority sediment cleanup.

The initial source control focus is on three early action areas: Duwamish/Diagonal, Terminal 117, and Slip 4. Ecology is leading the interagency Source Control Work Group. This Work Group

shares information, discusses strategy, develops action plans, implements source control measures, and tracks progress.

Recent source control activities include the Port of Seattle removing contaminated soil at several areas in South Park. This action will keep contaminated soil from washing into the LDW during rain events. The City of Seattle and King County are conducting source tracing to identify contaminant sources as well as inspecting potential sources. The City of Seattle is also evaluating air deposition as a pollution source and exploring new technologies for stormwater treatment.

Elliott Bay & Harbor Island

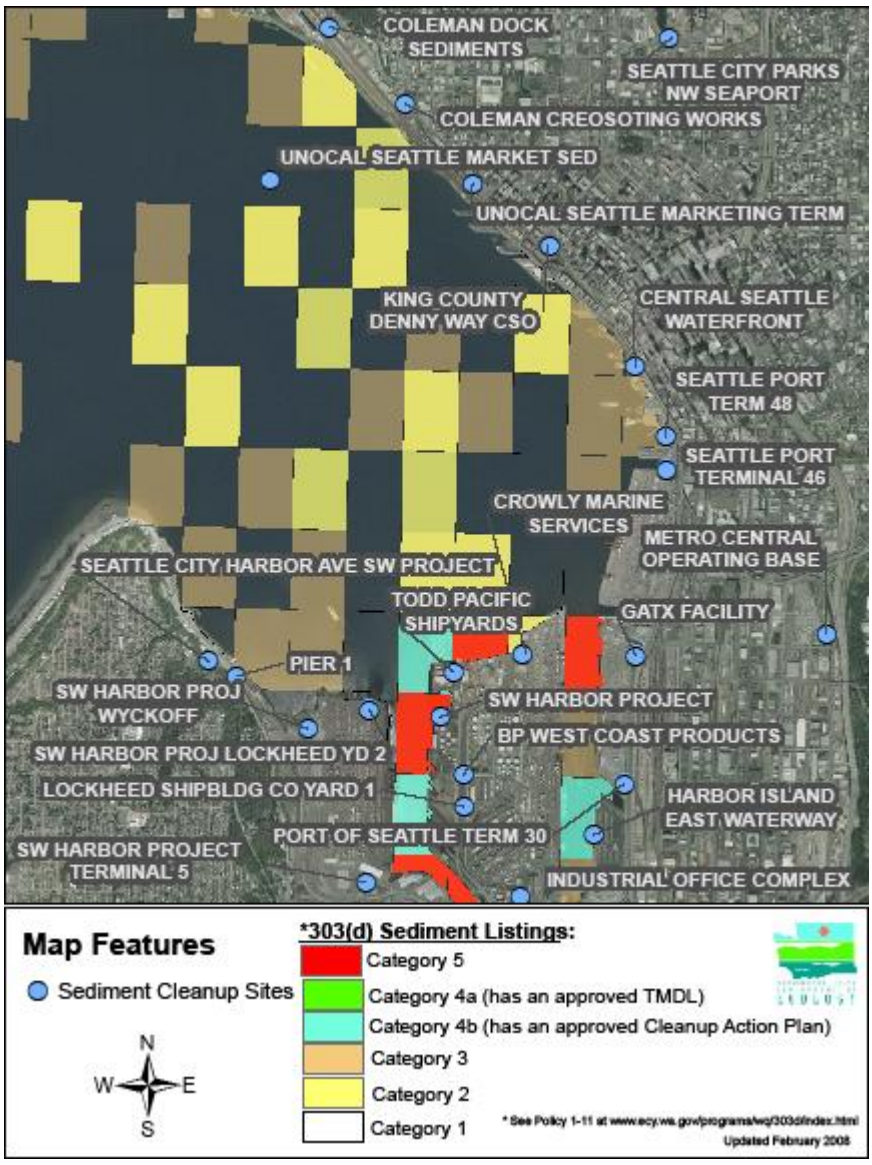

Figure A-14: Elliott Bay and Harbor Island

Sediment cleanup sites in Elliott Bay and near Harbor Island are summarized separately from the Duwamish River - Lower Waterway, with the south end of Harbor Island being the boundary between the water bodies for the sake of convenience. Contamination here is the result of various industrial activities and maritime commerce that, in part, has made Seattle the state's largest city. Municipal discharges of treated wastewater, stormwater, and combined sewer overflows have also contributed to the contamination. There are 24 sediment cleanup sites listed in Table 12 for Elliott Bay and Harbor Island. Most of these sites tend to surround Harbor Island, with a few more isolated sites located along the eastern shore of Elliott Bay on the Seattle downtown waterfront.

The majority of contaminated sediment sites is either in the late stages of the cleanup process, completed, or need no further action. This is in part due to the EPA's earlier listing of Harbor Island as a Superfund site. The Denny Way Combined Sewer Outfall (CSO) contaminated sediment

removal has been completed. The site is currently in a post-dredging monitoring program. Sediment monitoring began in April 2008 and will continue for five years.

Together, the 24 sites encompass approximately 375 acres; approximately one-half exist on state-owned or managed aquatic lands. Final costs of sediment cleanup actions in this water body are estimated to exceed $200 million. Continuing sources of contamination, including the recent use of Pier 66 as a point of embarkation for large cruise ships, will likely lead to additional monitoring of previous cleanups in the future.

Lake Union & Ship Canal

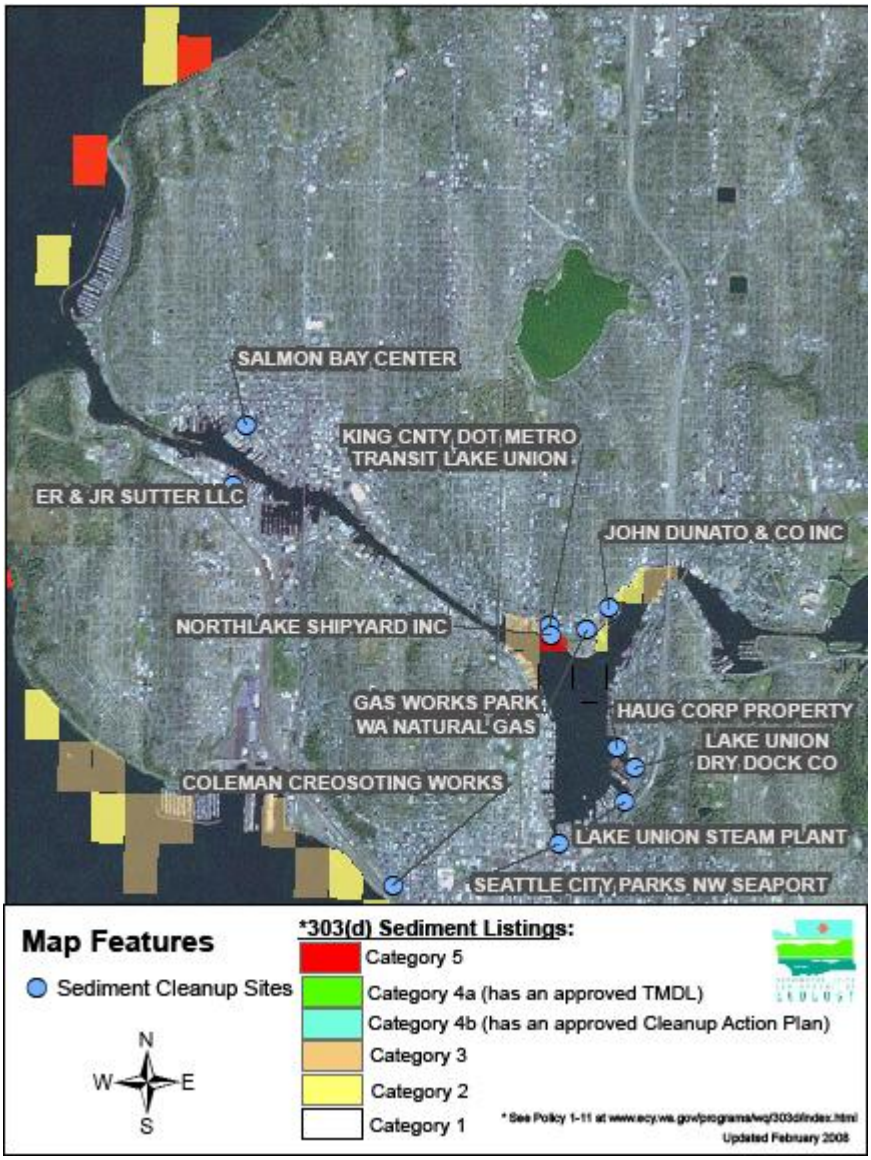

Figure A-15: Lake Union and the Ship Canal

Lake Union and the Ship Canal are located in the heart of Seattle. Seven sediment sites comprise over 100 acres of mostly state-owned aquatic lands that have been contaminated as a result of maritime and industrial activities. The Gas Works Park site is contaminated with petroleum hydrocarbons and PAHs. Other nearshore sites may involve contaminated fill material that pre-dates the WW II era. These are considered freshwater sediment sites despite the marine water influence from the locks at the Ship Canal.

Most Lake Union sites are in early stages of cleanup. Cleanup is estimated to cost $12-$45 million. One of the significant issues that somewhat hinders site-by-site cleanup is the ubiquitous nature of lower but still toxic levels of bioaccumulative contaminants of concern in the lake, namely tributyl tin (TBT) and PCBs. Ecology site managers identified source control as a primary impediment to progress in Lake Union. These sites are summarized in Table 15, located in the Appendix.

Lake Washington

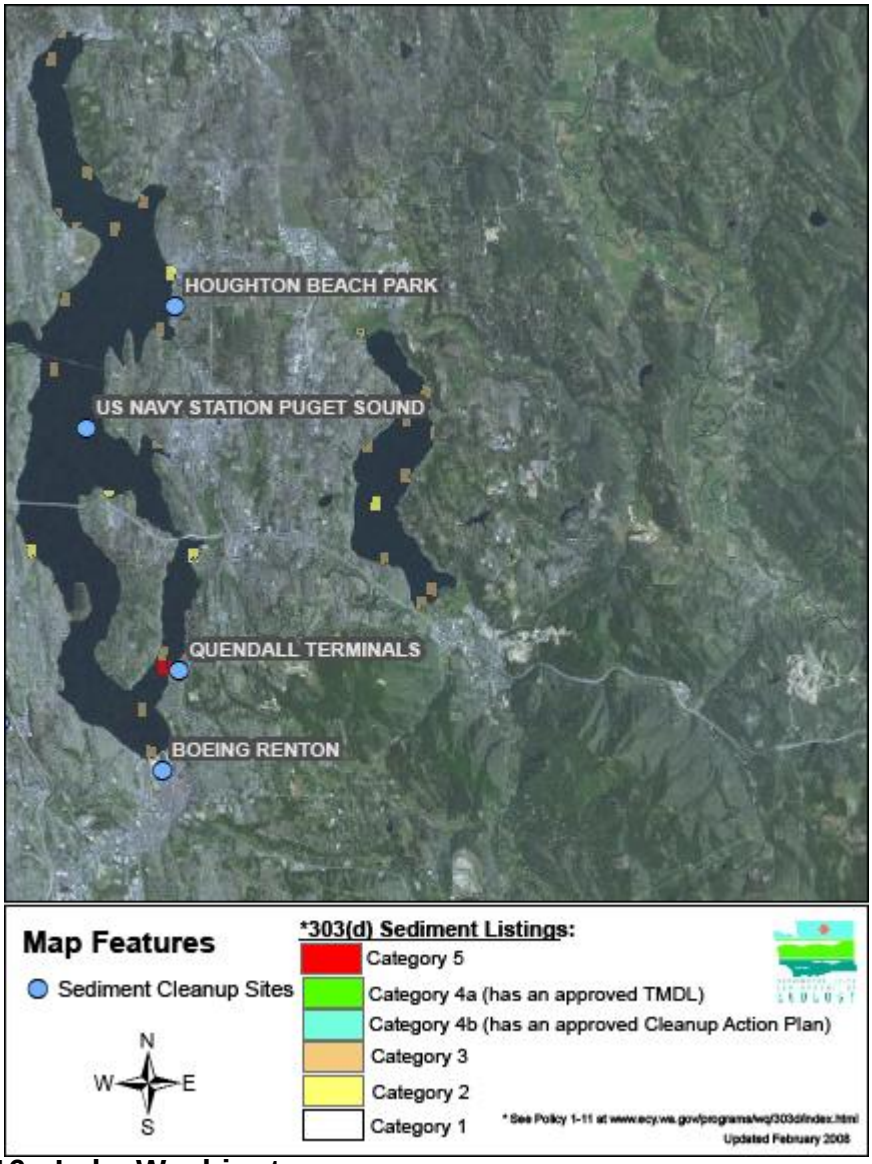

Figure A-16: Lake Washington

Most of the sediment quality data for Lake Washington have been collected from around a few distinct sites near the south end, with little known about sediments in the rest of the lake. Much of the lake does not have the influences that cause sediment contamination; however, it is not likely to have sediment causing adverse impacts or risks to human health with the possible exception of lake-wide PCBs.

Contaminants from historical wood treatment and other industries are the predominant concern in the southern part of the lake. Based on the available data, there are six sites listed for Lake Washington in Table 16. These sites represent approximately 23 acres, of which roughly one-half may be owned by the state. Two of the sites are in early stages of cleanup. Costs are estimated to be in the range of $6-$19 million, primarily associated with cleanup of Port Quendall.

Other Water Bodies

There are at least 23 known or suspected sediment cleanup sites listed in Table 17 (located in the Appendix) for water bodies other than those illustrated and described in the previous pages. The 23 sites include both freshwater and marine sites. The list contains several Puget Sound Priority sites such as Budd Inlet, Dumas Bay, Oakland Bay, and Port Angeles Harbor. These maps are located at the beginning of this section with other Puget Sound Priority sites.

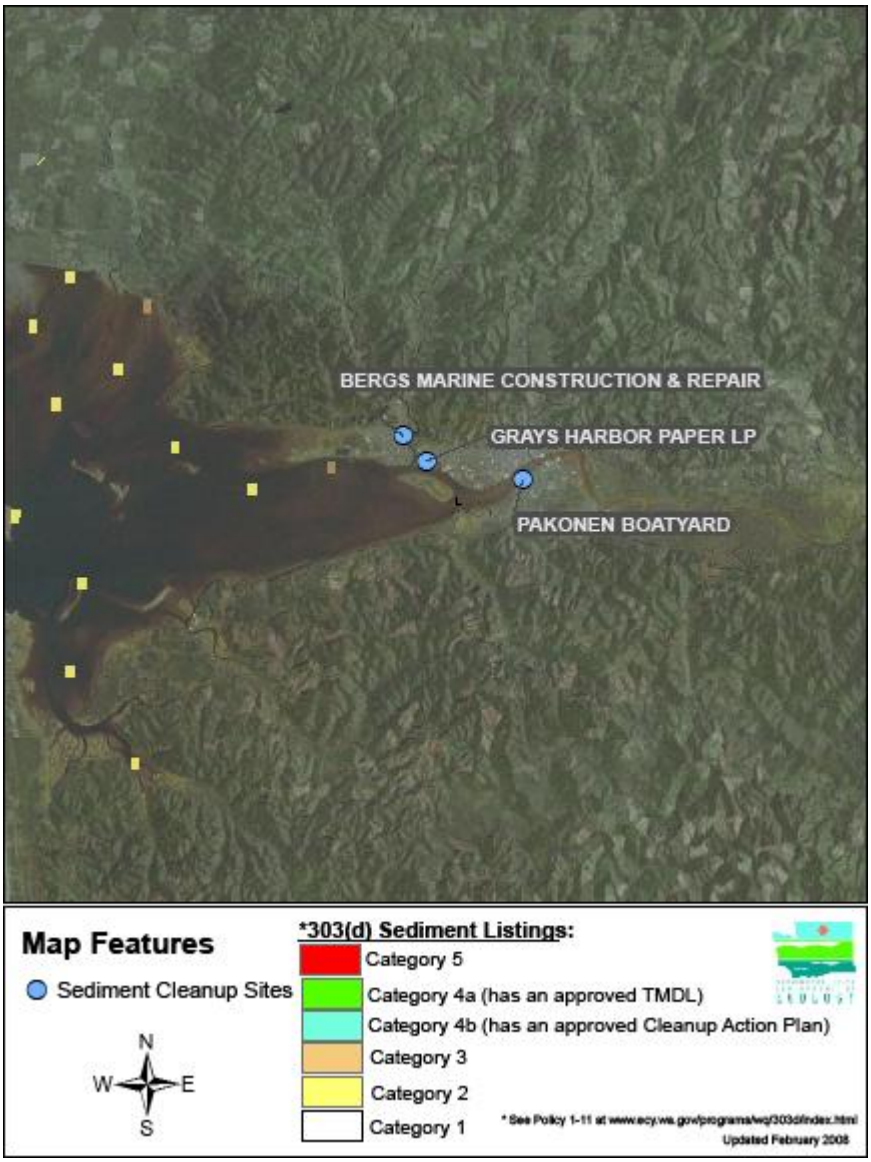

Figure A-17: Grays Harbor

Figure A-18: Kent

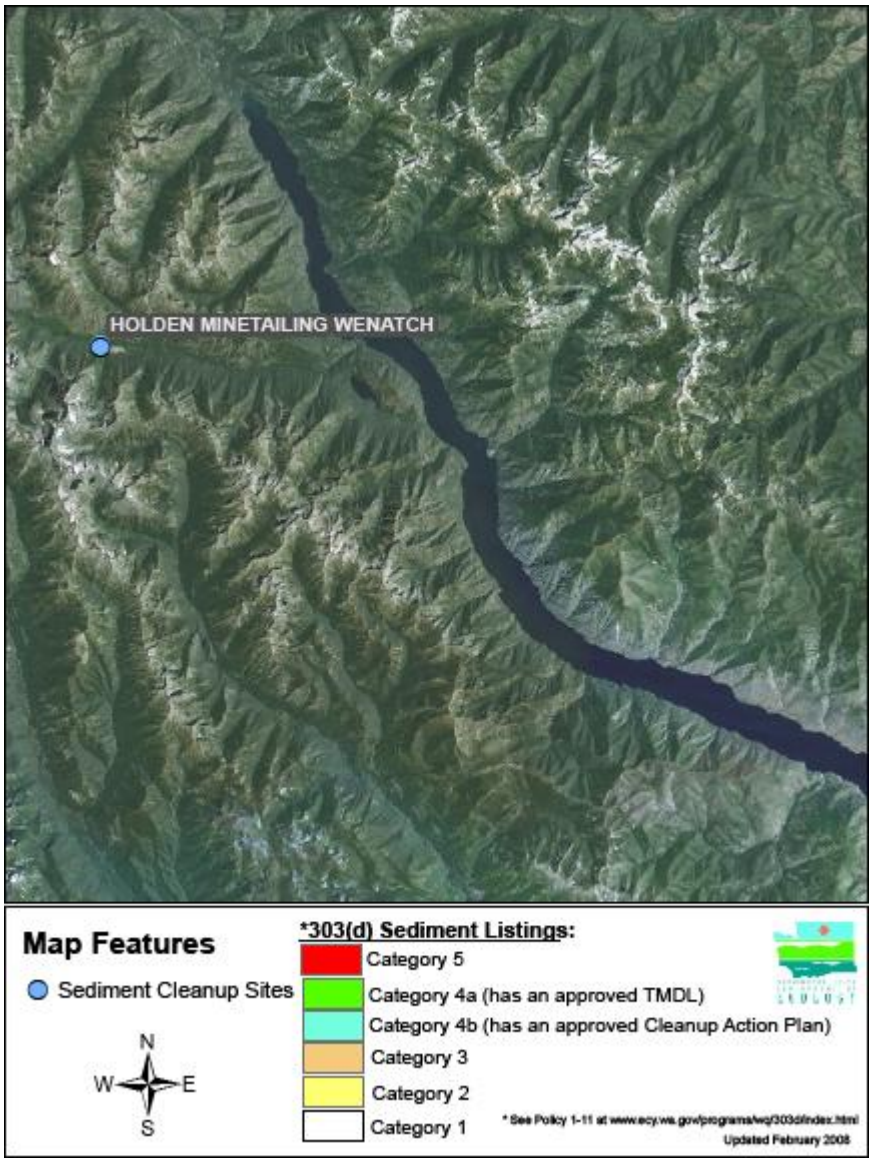

Figure A-19: Lake Wenatchee

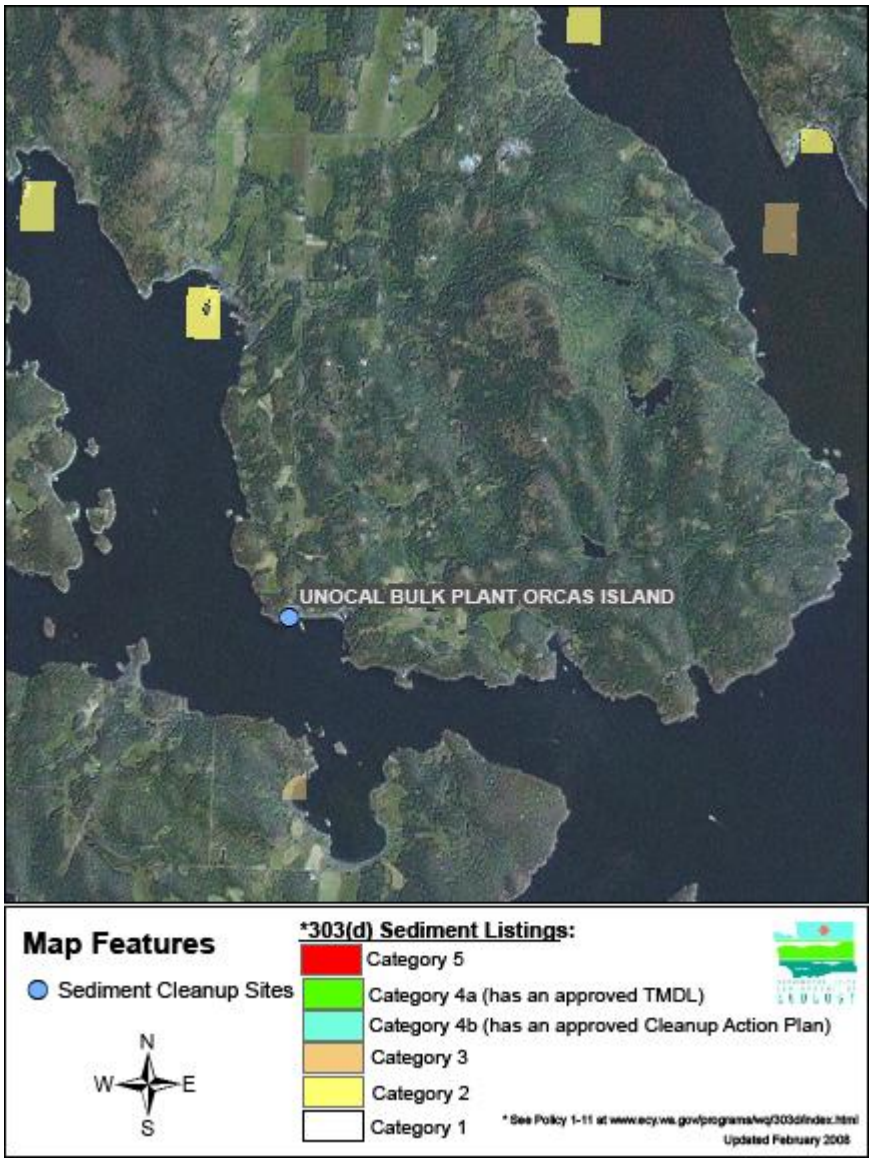

Figure A-20: San Juan Islands

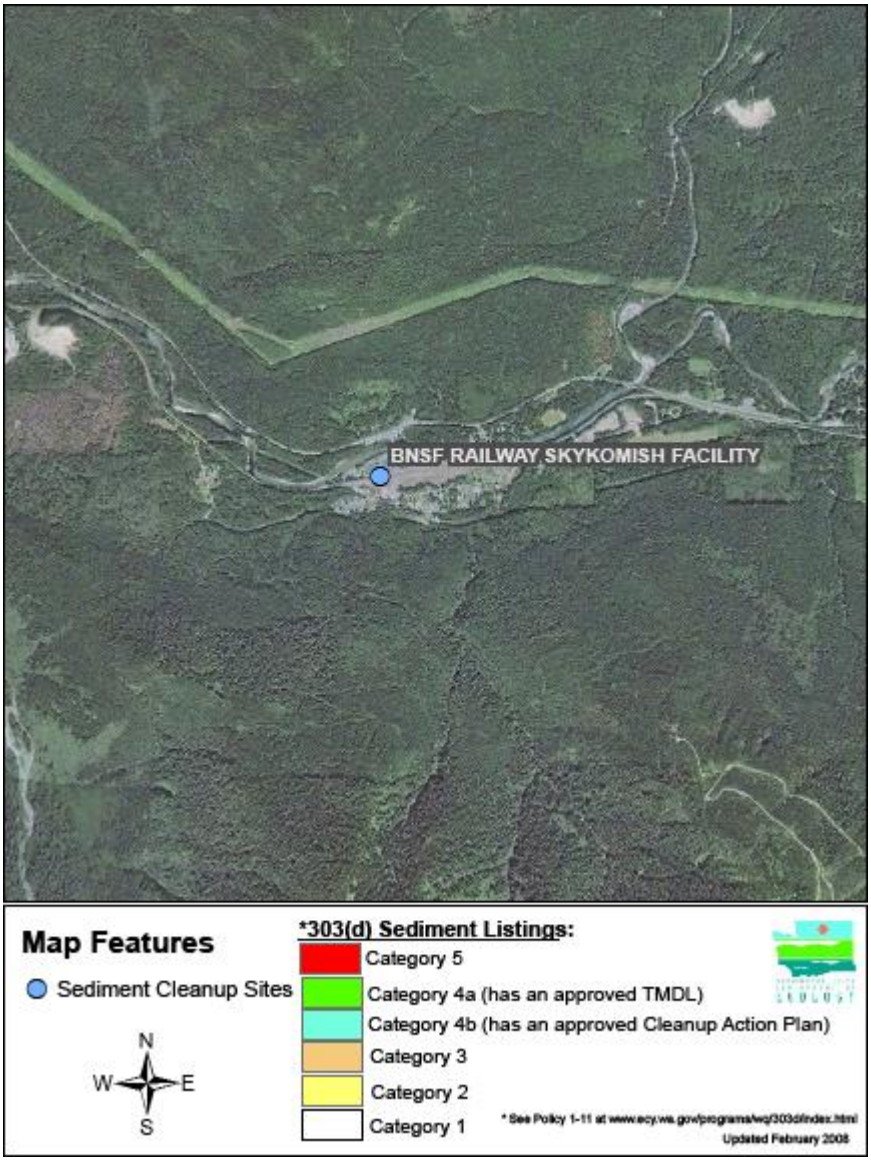

Figure A-21: Skykomish River

Operated by BNSF Railway Company, former railway maintenance and fueling facility is located in Skykomish. Historical activities at the site included refueling and maintaining locomotives as well as operating an electrical substation. These activities resulted in the release of petroleum and heavy metals to the surrounding environment. BNSF is conducting a cleanup of the contamination at the site with Ecology oversight.

The Phase I cleanup, which focused primarily on the in-water sediment cleanup of the Skykomish River waterfront, has been completed. Areas of riverbank and river sediments showed petroleum contamination. The river was temporarily diverted and contaminated sediments and near shore soils were removed. Habitat restoration completed the project. The entire in-water work was completed during an open fish window, or at the time of year least invasive and disruptive to local salmon spawning. The Phase II cleanup focuses mainly upon the contaminated uplands area in the town as well as the sediments in Maloney Creek. The

Phase II remediation is still in progress. The town portion of the cleanup work includes the installation of a hydraulic control and containment system along the north boundary of the BNSF Rail yard, clean up of two properties and Railroad Avenue, and installing a wastewater treatment system for the town.

Figure A-22: Whidbey Island

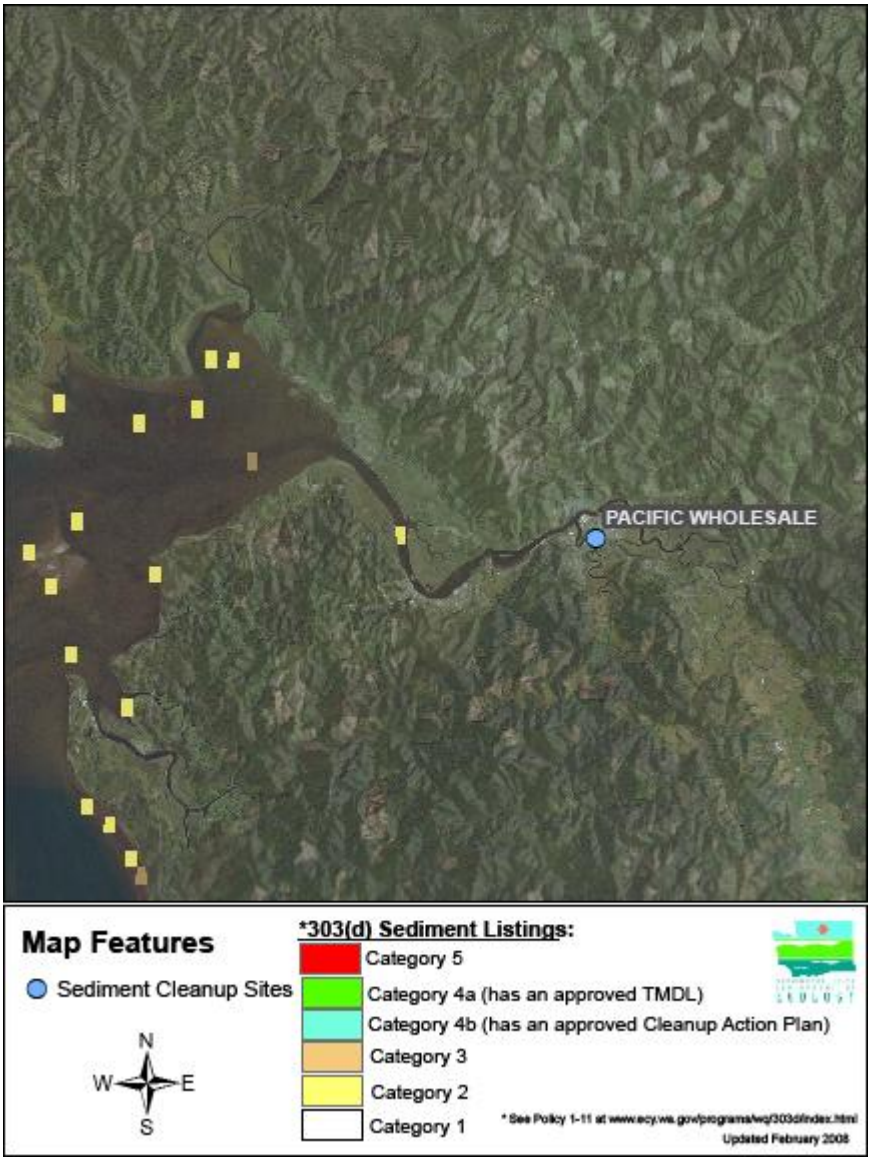

Figure A-23: Willapa Bay

Appendix B

Sediment Site Tables

Table B-1: Fidalgo & Padilla Bay Summary

ISIS Site Name	Also known as	Area (acres)	% State Owned Land	Causes of Contamination	Site Cleanup Status	Authority
Anacortes City	City of Anacortes	unknown	unknown	unknown	Site Hazard Assessment Completed, Hazardous Sites Listing Completed	MTCA
Custom Plywood Mill	Anacortes Plywood (Inc), Anacortes Plywood Mill, Custom Plywood	4	0	Wood, timber, paper	Initial Investigation, Site Discovery/Report Received Completed	MTCA
March Point Landfill	Texaco PS Offsite Dump, Whitmarsh Dump Texaco PS OFFS, Whitmarsh Landfill (Padilla Bay)	unknown	unknown	Landfill	Site Hazard Assessment Completed - Initial Investigation	CWA
MJB Properties	Former Scott Paper Site, Port of Anacortes, City of Anacortes, Scott Paper Anacortes	unknown	unknown	Industrial	Site Hazard Assessment Completed - Initial Investigation	MTCA
Port of Anacortes Dakota Creek	Dakota Creek Industries, Dakota Creek Shipyard	unknown	0	Shipyard, marina, industrial	Early Notice Letter Completed	MTCA
Cap Sante Marina		unknown	unknown	Shipyard, marina	Initial Investigation	MTCA

Table B-2. Bellingham Bay Summary

ISIS Site Name	Also known as	Area (acres)	% State Owned Land	Causes of Contamination	Site Cleanup Status	Authority
Bellingham Port Harris Ave Shipyard	Harris Ave Shipyard, Maritime Contractors Inc, Harris Ave Shipyard (Puglia), MCI Bellingham	4	100	Shipyard, Industrial	Remedial Investigation/Feasibility Study In Process	MTCA
Bellingham Port Weldcraft Site	Weldcraft Steel & Marine Inc, Weldcraft Steel & Marine Gate 2 Boatyard	0.8	0	Shipyard, Industrial	Remedial Investigation/Feasibility Study In Process; Interim Action	MTCA
Cornwall Av Landfill	Georgia Pacific DNR 22002353, Cornwall Avenue Landfill	14	100	Historic Municipal Landfill	Remedial Investigation/Feasibility Study Completed	MTCA
Exxon Mobil Oil Corp	Bellingham City of/Gilmore Oil Co	unknown	100	Industrial	Removal From Hazardous Sites List Completed	SMS
Georgia Pacific West Bellingham	Georgia Pacific, Georgia Pacific Corp, Georgia Pacific Corporation UST 7482, Georgia Pacific West Bellingham, Georgia Pacific West Inc, Georgia Pacific Inc Chlor-Alkali Plant, Hilltop Farm WW Landfill	unknown	100	Industrial	Remedial Investigation/Feasibility Study In Progress	MTCA
I & J Waterway	I & J Waterway (includes Olivine - Hilton Ave Sediments)	15	20	Industrial	Remedial Investigation/Feasibility Study In Process	MTCA
Intalco Beach I & II Landfill	Intalco	48	100	Industrial	Cleanup Construction Completed	MTCA
Little Squalicum Park	Little Squalicum Creek	25	0	Industrial, Stormwater	Remedial Investigation/Feasibility Study In Process	MTCA
Marine Services NW	Marine SVCS NW, Squalicum Harbor - Inner Boat Basin	1	0	Shipyard, Industrial	Early Notice Letters Completed; Remedial Investigation	SMS
Olivine Corp Hilton Ave	Port of Bellingham Property, I & J Waterway	1	60	Industrial	Remedial Investigation/Feasibility Study In Process	MTCA
Port of Bellingham Squalicum	Squalicum Harbor Tidal Grid	unknown	unknown	Industrial	Site Discovery/Report Received Completed	SMS
RG Haley Intl Corp	RG Haley	7	25	Industrial, Wood, Timber, Paper	Remedial Investigation/Feasibility Study In Process	CWA
Squalicum Shipyard		unknown	unknown	Shipyard	Initial Investigation	MTCA*
Whatcom Waterway	Georgia Pacific Log Pond	190	95	Industrial, Wood, Timber, Paper	Cleanup Engineering Design In Process	MTCA
Oeser Co	CERCLA site	unknown	unknown	unknown	Site Hazard Assessment & HSL completed	CERCLA/CWA

Table B-3: Columbia River and Spokane River Summary

ISIS Site Name	Also known as	Area (acres)	State Owned Land %	Causes of Contamination	Site Cleanup Status	Authority
UPPER COLUMBIA RIVER						
Lake Roosevelt		unknown	unknown	Mining, industrial, wood, timber, paper,	Remedial Investigation	MTCA*
LOWER COLUMBIA RIVER						
Alcoa Vancouver PCB	Alcoa Aluminum PCB, Vancouver	unknown	100	Industrial	Hazardous Site Listing Completed	MTCA
Gibbons Creek		unknown	0	Wood, timber, paper	Not started	MTCA*
Pacific Wood Treating Corp	Wood Treating Corp, Lake River Industrial Site	unknown	unknown	unknown	Interim Action In Progress	MTCA
Port of Vancouver, Copper Ore		unknown	unknown	Industrial	Monitoring	MTCA*
RJ Frank Property	Ridgefield Marina, Port of Ridgefield	unknown	unknown	Industrial	Hazardous Site Listing Completed; Initial Investigation	MTCA
Weyerhaeuser Plywood Mill Intake	Weyerhaeuser Log Barkers	unknown	unknown	Wood, timber, paper	Cleanup Construction In Progress	MTCA
SPOKANE RIVER						
Spokane River Upriver Dam	Spokane River PCBs	unknown	80	Mining, Industrial	Cleanup Operation and Maintenance In Process	MTCA
Spokane River Metals			100	A series of small beach locations along the Spokane River between the Idaho state line in the east to Upriver Dam in the west.	RA in Progress; Cleanup Construction in Progress	CERCLA

Table B-4: Commencement Bay Summary

ISIS Site	Also known as	Area (acres)	% State Owned Land	Causes of Contamination	Site Cleanup Status	Authority
Asarco Offshore	CB1-Asarco	35	100	Mining, industrial, spills, stormwater	Periodic (5 year) review Completed	CERCLA
Commencement Bay Nearshore Tideflats	Hylebos/Thea Foss	103	90	Stormwater, industrial	Cleanup Operation & Maintenance In Process	CERCLA
Commencement Bay Nearshore Tideflats	Hylebos/Thea Foss	192	90	Stormwater, industrial	Cleanup Operation & Maintenance In Process	---
CB2 - Thea Foss		71	90	Industrial, Stormwater	Cleanup & Monitoring	---
CB3 - Hylebos		80	0	Industrial, Stormwater	Cleanup & Monitoring	---
CB3 - Hylebos wood debris		unknown	0	Wood, timber, paper	Cleanup & Monitoring	---
Tacoma Silver Cloud Inn LLC	Silver Cloud Inn LLC, Silver Cloud Inn Ruston	unknown	unknown	Industrial, leaking underground storage tank	Cleanup Operation & Maintenance In Process	MTCA
Cascade Pole MCF Sitcum	McFarland Sitcum, Sitcum Waterway	55	unknown	Industrial	Interim Action Completed	MTCA
Dickman Mill		unknown	unknown	Wood, timber, paper	Interim Action Completed	MTCA
Don Oline Auto Fluff	Oline Autofluff, CB Complete	0	0	Industrial	Cleanup Construction Completed, not on HSL	MTCA
Hylebos Wood Debris Site Sediments	Bay Superfund Site, Hylebos Waterway Problem	unknown	0	Industrial	Cleanup Construction In Process	MTCA
Occidental Chemical Corp	Pioneer Americas Inc, Pioneer Americas LLC, Pioneer Chlor Alkali Co Inc, Hylebos Waterway	3	0	Industrial	Remedial Investigation/Feasibility Study In Process	MTCA
Glenn Springs Holdings Inc	PRI Northwest Inc, Occiddental Chemical	unknown	unknown	Industrial	Remedial Investigation/Feasibility Study In Process	CERCLA
Middle Waterway Steel Slag	Middle Waterway Estuarine National Resouc, Steel Slag Site, City of Tacoma, CB4 - Middle Waterway	13	100	Industrial, Stormwater	Cleanup Operation & Maintenance Completed	MTCA
Olympia View Sanitary Landfill Inc	Brem Air Disposal, Kitsap County Sanitary Landfill Inc, Olympic View Landfill, Olympic View Sanitary Landfill (Inc), Olympia View Resource Area (Commencement Bay)	3	100	Industrial	Remedial Investigation/Feasibility Study In Process	MTCA
US Army WSMC Pier 23	Pier 23, US Army Reserve	1.5	25	Industrial, Shipyard	Remedial Investigation/Feasibility Study In Process	MTCA
Simpson	Champion International, St Paul Waterway	17	unknown	Industrial	Site Discovery/Report Received Completed, Cleanup Completed, not on HSL	MTCA
Shore Terminal Nustar Energy LP	Shore Terminal LLC, Valero LP, Shore Terminals LLC, ST Services, Superior Oil, Time Oil	unknown	unknown	unknown	Cleanup Engineering Design Completed, Cleanup Operation & Maintenance In Process	MTCA
Puyallup Land Settlement F		unknown	unknown	unknown	RA Conducted, residual contamination left, institutional controls	CERCLA
Murray Pacific 2	MP2, Murray Pacific Timber LLC Yard 2	unknown	unknown	unknown	Cleanup Completed, Periodic Review	MTCA

ISIS Site	Also known as	Area (acres)	% State Owned Land	Causes of Contamination	Site Cleanup Status	Authority
Arkema, Inc	ATO Chem, ATOFINA Chemicals Inc, Elf ATOCHEM 2901 Taylor Way, Elf ATOCHEM North America Tacoma, Pennwalt Corporation	unknown	unknown	unknown	Cleanup Operation & Maintenance In Process; Cleanup Action Plan	CWA
General Metals of Tacoma		unknown	unknown	unknown	Cleanup Complete, periodic review	CERCLA
1147 Dock Street Tacoma	Dock Street Development, Investco, Old Consumer Steam Heat Plant, Pacific Trustee Ltd	unknown	unknown	unknown	Cleanup Complete, periodic review	MTCA

Table B-5: Lower Duwamish River Summary

ISIS Site	Also known as	Area (acres)	% State Owned Land	Causes of Contamination	Site Cleanup Status	Authority
Duwamish Shipyard Inc	Alaska Marine Lines, Seattle Machine Works, DR36 - Duwamish Shipyard	2	unknown	Shipyard	Site Hazard Assessment Completed, Hazardous Sites Listing Completed, Negotiations for AO started Feb 2008	CWA
Lower Duwamish Waterway acreage unspecified for parcels (ISIS)	Brandon ST CSO; Duwamish River Main Channel; Duwamish Shipyard; Duwamish; Diagonal CSO; Slip 3, MP&E; South Harbor Island; DR31 - Duwamish	160	0	Industrial, spill, combined sewer overflow, stormwater run-off	Remedial Investigation/Feasibility Study in process	CERCLA/SMS
LDW - Boeing Plant 2						---
LDW - South Harbor Island (DR29)	South Harbor Island					---
LDW - Main Channel (DR31)	DR31 - Duwamish, Duwamish River Main Channel					---
LDW - Duwamish/Diagonal CSO (DR31)	Diagonal CSO					---
LDW - Brandon St. CSO (DR32)	Brandon ST CSO					---
LDW - Slip 3, MP&E (DR34)	Slip 3, MP&E					---
LDW - Duwamish Shipyard (DR36)	Duwamish Shipyard					---
LDW - Terminal 17	Malarkey Asphalt, Duwamish Manufacturing					---
LDW - Slip 4						---
--LDW - Rhone-Poulenc	Container Properties LLC				RCRA Corrective Action site - EPA lead	---
Boeing Plant 2	Boeing Plant II, Plant II	23	0	Industrial, Spill	RCRA Corrective Action site - EPA lead Interim Action In Process	MTCA
LDW - Norfolk CSO						---
Seattle City Light Steam Plant Georgetown	Georgetown Steam Plant, Seattle City Light	unknown	unknown	Unknown	Interim Action Completed. Negotiations for AO start April 2008	MTCA
Container Properties LLC	LDW – Rhone-Poulenc	unknown	Unknown	Site Discovery/Report Received Completed	unknown	MTCA

Table B-6: Elliott Bay & Harbor Island Summary

ISIS Site Name	Also known as	Area (acres)	%State Owned Land	Causes of Contamination	Site Cleanup Status	Authority
Coleman Dock Sediments		unknown	unknown	Recontamination of clean cap as result of DOT activities to renovate Seattle Ferry Terminal	RI/FS Completed	MTCA
BP West Coast Products	ARCO Products Co, ARCO Products Co Seattle Terminal, ARCO Tank Farm, Atlantic Richfield Co, Seattle Terminal, part of Harbor Island Superfund Site	7	0	Petroleum bulk plant	Cleanup Operation & Maintenance In Process	MTCA
Central Seattle Waterfront	Pier 53-55, EB25-Central Seattle Waterfront	36	unknown	Industrial, Combined Sewer Overflow, Spill	Remedial Investigation/Feasibility Study In Process	SMS
Coleman Creosoting Works	EB28- Colman Dock, Pier 58, Crawford Sea Grill, Ivar's Captain's Table, US Vining & The Furnance Oil Company	13	50	Industrial, CSO, Stormwater, Spills	Early Notice Letters Completed	MTCA
Crowley Marine Services Inc 8th Ave S	This includes sites known as parcels D and E	unknown	unknown	unknown	Initial Investigation Completed	MTCA
King County Denny Way CSO	EB26 - Denny Way CSO	2.4	unknown	Combined Sewer Overflow	Monitoring	MTCA
GATX Facility	EB17 - East Waterway part of Harbor Island Superfund Site GATX Tank Storage Terminals, GATX Terminals Corp, TOSCO GATX Seattle Term Tank S	19	50	Petroleum bulk plant	Early Notice Letters Completed	MTCA
Harbor Island East Waterway	EB8 - Harbor Island, partial T18	38	0	Shipyard, Industrial, Combined Sewer Overflow	Record of Decision (CERCLA)	SMS
Industrial Office Complex	EB13 - Harbor Island West Waterway. Property is part of Harbor Island Superfund site got listed	6	0	Combined Sewer Overflow	Site Discovery, Report Received Completed	CERCLA
Lockheed Shipbldg Co Yard 1	EB2 - Harbor Island West Waterway part of Harbor Island Superfund Site	9	0	Shipyard	Cleanup Engineering Design Completed, Record of Decision (CERCLA)	MTCA
Pier 1	United Marine Shipbuilding Harbor Ave	11	20	Industrial, Combined Sewer Overflow	Site Hazard Assessment Completed, Hazardous Site Listing Completed	MTCA
Port of Seattle Term 30	Chevron USA Seattle Plant	12	0	Industrial, Combined Sewer Overflow	Remedial Investigation/Feasibility Study In Progress	MTCA
Seattle City Harbor Ave SW Project		14	100	unknown	Site Discovery, Report Received Completed	SMS
Seattle Port Term 48	EB18 - Piers 48-52	16	90	Industrial, Combined Sewer Overflow, Spill	Initial Investigation In Progress	SMS
Seattle Port Terminal 46	EB27 - Piers 46-48 Terminal 46	2	5	Combined Sewer Overflow	Early Notice Letters In Progress	SMS

ISIS Site Name	Also known as	Area (acres)	%State Owned Land	Causes of Contamination	Site Cleanup Status	Authority
SW Harbor Proj Lockheed Yd 2	EB5 - Todd/Lockheed Lockheed Log Shipbuilding Yd 2	unknown	80	Shipyard	Cleanup Action Plan (MTCA) Completed	MTCA
SW Harbor Proj Wyckoff	EB6 - Pacific Sound Resources (Old Wyckoff), Pacific Sound Resources, Wyckoff W Seattle	11	100	Industrial	Site Discovery, Report Received Completed	CERCLA
SW Harbor Project	EB1 - Harbor Island West Waterway Lockheed Shipbldg Yd 2	12	0	Shipyard, Stormwater	Cleanup Action Plan (MTCA) Completed	MTCA
SW Harbor Project Terminal 5	EB12 - Harbor Island West Waterway	27	0	Shipyard, Stormwater	Site Discovery, Report Received Completed	MTCA
Todd Pacific Shipyards	EB3 - Todd/Lockheed part of Harbor Island Superfund Site Former Mobil Oil, Seattle Division, Todd Pacific Shipyard, Todd Pacific Shipyard	77	100	Shipyard and petroleum bulk plant	Site Discovery, Report Received Completed, Record of Decision (CERCLA)	MTCA/CERCLA
UNOCAL Seattle Market Sed	UNOCAL Seattle Marketing Terminal	2	unknown	Petroleum, Industrial	Hazard Site Listing Completed	MTCA
UNOCAL Seattle Marketing Term	UNOCAL Seattle Marketing Terminal SAM/Seattle Art Museum	unknown	unknown	Petroleum bulk plant	Cleanup Operation & Maintenance In process	MTCA

Table B-7: Port Gardner & Snohomish River Estuary Summary

ISIS Site Name	Also known as	Area (acres)	% State Owned Land	Causes of Contamination	Site Cleanup Status	Authority
Bay Wood		17	unknown	industrial, wood, timber	Agreed Order in Process	MTCA
Boeing Everett	Boeing Co Everett BLDG 40 37, Boeing Comm Airplane Grp Everett, Boeing Commercial Airplane Company, Powder Mill Creek	1	10	Industrial, Stormwater	Remedial Investigation/Feasibility Study In Process	RCRA
Chevron Tank Farm Port WA NAR		unknown	unknown	unknown	unknown	MTCA
Everett Shipyard		10	0	shipyard	Agreed Order Signed	MTCA
Everett Smelter Slag Site	Asarco Everett, Puget Sound Reduction Co., Mill E, Koppers	46	0	Industrial, wood, timber, paper	Cleanup Construction In Process, No Further Action (2005)	MTCA
Jeld-Wen	Nord Door	48	0	industrial, wood, timber, PCP	SAP reviewed; RI/FS in Process	MTCA
Kimberly Clark World Wide	Kimberly-Clark Worldwide, Inc.(formerly Scott Paper), Kimberly Clark Corp(oration), Kimberly Clark Tissue Co Everett, Scott Paper Co Everett, Scott Paper Co UST 5351	unknown	unknown	unknown	Site Discovery/Report Received Completed	MTCA
North Marina		27	unknown	shipyard. Industrial	Agreed Order Signed	MTCA
Northeast Waterway		13	unknown	Industrial	not started	MTCA*
Paramount Petroleum Corp LUST Site	Point Wells Chevron, Bulk Plant, Chevron Point Wells, Chevron Pt Wells LUST Site, Chevron USA Inc UST 5683, Chevron USA Pt Wells Dist Ctr,	14	60	Industrial	Initial Investigation In Progress	SMS
South Terminal Pier 1 Hewitt Term	South Terminal, Piers 1 & 3, Southwest Harbor Project	27	20	Industrial	Site Discovery/Report Received Completed	SMS
Southeast Waterway		7.3	unknown	Industrial, spills	not started	MTCA*
US DFSP Mukilteo	Mukilteo DFSP, Defense Fuel Support Point Mukilteo, DFSP Mukilteo Tank Farm, USAF Defense Fuel Sup Depot	25	unknown	Industrial, groundwater, military operations	Removal from Hazardous Sites List Completed	MTCA

Table B-8: Kitsap Peninsula & Sinclair Inlet Summary

ISIS Site Name	Also known as	Area (acres)	State Owned Land %	Causes of Contamination	Site Cleanup Status	Authority
Chevron Bulk Plant Poulsbo	Anderson Property, Chevron Bulk Terminal 100-1324, Chevron Station 91324, Chevron Poulsbo	unknown	unknown	Petroleum, Industrial	Site Discovery, Report Received, Completed	MTCA
Eagle Harbor East	Eagle Harbor - East OU1	34	100	Spill, Industrial	Cleanup Operation & Maintenance In Process	CERCLA
Eagle Harbor West	Eagle Harbor - West OU	9	100	Spill, Industrial	Cleanup Construction Completed	CERCLA
Eagle Harbor Wycoff		unknown	unknown	unknown	RA in Progress	CERCLA
Evergreen Park Bremerton	Bremerton Evergreen Park	4	0	Industrial	Hazardous Sites Listing Completed	MTCA
Pope & Talbot Inc Sawmill	Pope & Talbot Port Gamble Mill, Port Gamble	17	85	Industrial	Initial Investigation In Progress	MTCA
Port Gamble DNR Lease Area		unknown	unknown	unknown	unknown	MTCA*
Pope & Talbot Inc Sawmill	Port Gamble Mill Site	unknown	85	unknown	unknown	MTCA
Pope & Talbot Landfill No 4		unknown	unknown	unknown	Site Characterization Completed	MTCA
Rons Auto Wrecking	Strandley-Manning	unknown	unknown	unknown	Hazardous Sites Listing Completed	MTCA
US Navy Jackson Park OU 2	USN Jackson Park	169	85	Military Operations	Record of Decision (CERCLA) In Process	MTCA
US Navy Keyport	NUWES Keyport, USNAV Keyport NUWC, **USN Keyport Tide Flats**	0.2	0	Military Operations	Hazardous Sites Listing Completed	CERCLA
US Navy Keyport OU1	NUWES Keyport, USNAV Keyport NUWC, **USN Keyport Liberty 1**	23.8	unknown	Military Operations	Cleanup Operation & Maintenance In Process	CERCLA
US Navy Keyport OU2	NUWES Keyport, USNAV Keyport NUWC, **USN Keyport Liberty 2**	12	unknown	Military Operations	Cleanup Operation & Maintenance In Process	CERCLA
US Navy Port Hadlock	Indian Island, USN Port Hadlock	9.2	unknown	Military Operations	Hazardous Sites Listing Completed	CERCLA
US Navy PSNS OUA	USN PSNS - Sinclair	22	0	Military Operations	Cleanup Operation & Maintenance In Process	MTCA
US Navy PSNS OUB	USN PSNS - Sinclair	407	0	Military Operations	Cleanup Operation & Maintenance In Process	MTCA
US Navy Subase OU7	USN Subase Bangor	9	unknown	Military Operations	Cleanup Operation & Maintenance In Process	CERCLA
WA ECY Manchester Lab	Old Navy Dump, US Army COE Manchester Annex Beach Dr, USACE Manchester Annex	4.9	100	Military Operations, Landfill	Periodic (5 year) Review Completed, Monitoring	CERCLA

Table B-9: Lake Union & Ship Canal Area Summary

ISIS Site Name	Also known as	Area (acres)	State Owned Land %	Causes of Contamination	Site Cleanup Status	Authority
Gas Works Park WA Natural Gas	Washington Natural Gas Seattle, Gas Works Park	52	0	Petroleum, Industrial	Cleanup Operation & Maintenance In Progress	MTCA
Gas Works Park East		35	100	Industrial	RI/FS	---
Gas Works Park West		21	80	Industrial	RI/FS	---
Haug Corp Property	NOAA Pacific Marine Center, Seaboard	11	unknown	Shipyard	Early Notice Letters Completed	MTCA
John Dunato & Co Inc	Dunato Boatyard, Dunatos Marine Svc	unknown	unknown	Industrial	Early Notice Letters Completed	MTCA
King Cnty DOT Metro Transit Lake Union	Lake Union Fuel Facility, Metro Facility North Densmore, Metro Lake Union Facility, Unimar Northlake, Chevron Lake Union, Nor Tar	0.34	100	Petroleum, Industrial	Cleanup Operation & Maintenance Completed	MTCA
Lake Union Drydock Co		11	20	Stormwater, Refueling, Industrial	Initial Investigation, Hazard Site Listing Completed	MTCA
Lake Union Steam Plant		unknown	90	Combined Sewer Overflow, Stormwater, Industrial, Shipyard	Hazard Site Listing, Hazard Assessment Completed	MTCA
NOAA Dockside Facility		11.5	unknown	Shipyard	Initial Investigation	MTCA*
Northlake Shipyard	Marine Power & Equipment, Unimar United Marine Shipbuilding Inc, United Marine Shipyards, Woeck Family Industries	32	80	Shipyard	Remedial Investigation, Feasibility Study In Progress	MTCA
Salmon Bay Center	CD Stimson Co, Honeywell Inc, Stimson Marina, Salmon Bay	unknown	unknown	Industrial	Initial Investigation Completed	MTCA
						37

Table B-10: Lake Washington Summary

ISIS Site Name	Also known as	Area (acres)	% State Owned Land	Causes of Contamination	Site Cleanup Status	Authority
Barbee Mill Company		2.6	50-75	Wood, timber, paper	Monitoring	MTCA
JH Baxter & Co	JH Baxter Site, JH Baxter Renton	1	50-75	Wood, timber, paper	Cleanup construction in progress	MTCA
Boeing Renton		unknown	unknown	unknown	Remedial Investigation/Feasibility Study In Progress	RCRA
Houghton Beach Park	City of Kirkland Houghton Beach	unknown	unknown	unknown	Site discovery, report received, completed	MTCA
Lakepoint		1.1	0	Industrial	Not Started	MTCA*
Quendall Terminals	Quendall Log Yard, Reilly Tar & Chemical, Western Wood Lumber Co., Quendall Log, Port Quendall	13	40	Industrial, wood, timber, paper	Remedial Investigation/Feasibility Study In Progress	MTCA
South Lake Washington Renton		5	90	Industrial/outfalls	Remedial Investigation	MTCA*
Mill Creek Site		unknown	unknown		Awaiting SHA, Site Discovery/Report Received and Completed	MTCA
US Navy Station Puget Sound	Sand Point Station, NOAA Sandpoint	unknown	unknown	Military, stormwater	Cleanup Operation & Maintenance Completed	MTCA
Seattle City Parks NW Seaport		unknown	100	Industrial	Remedial Investigation/Feasibility Study In Progress	SMS

Table B-11: Other Water Bodies with Sediment Cleanup Sites

ISIS Site Name	Also known as	Area (acres)	% State Owned Land	Causes of Contamination	Site Cleanup Status	Authority
GRAYS HARBOR						
Bergs Marine Construction & Repair	Gray's Harbor Shipyard - Berg Marine	0	100 (ISIS)	Industrial	Hazardous Sites Listing Completed	MTCA
Grays Harbor Paper LP	Grays (Gray's) Harbor Paper Co, Grays Harbor Paper Hoquiam	unknown	unknown	Wood, timber, paper	Initial Investigation In Process - NFA (2005)	SMS
Pakonen Boatyard		0.25	unknown	Industrial	Cleanup Operation & Maintenance Completed	CWA
BUDD INLET/OLYMPIA						
Budd Inlet Sediment		unknown	unknown	unknown	Site Discovery received and completed, initial investigation completed	MTCA
Cascade Pole Inc McFarland	Cascade Pole Olympia, Cascade Pole	9	0	Industrial, wood, timber, paper	Interim Sediment Cleanup completed in 2002. Monitoring.	MTCA
Heritage Park	Heritage Park, Capitol Lake	unknown	100	Industrial	Routine Cleanup Completed	MTCA
SKYKOMISH RIVER						
BNSF Railway Skykomish Facility	BNR Maint & Fueling Facility, BNSF Former Maintenance & Fueling Facility Skykomish, Burlington Northern & Sante Fe RR, Burlington Northern Rail Yard	2	15	Industrial	Cleanup Construction In Process	MTCA
GIG HARBOR/ TACOMA NARROWS						
Eddon Boat Park	3711 & 3805 Harborview Dr Old Boathouse, NW Yachts & Boat Yard	unknown	0	Shipyard	Independent Report - Review Paid, In Process	SMS
Norwegian Salmon Industries	Manson Construction Co, Norwegian Seafoods	unknown	unknown	Industrial	Periodic (5 year) Review, In Process	MTCA
WA DOC McNeil Island Diesel Spill	McNeil Island Penitentiary	unknown	100	Shipyard, Industrial	Interim Action Completed (ISIS), NFA (2005)	MTCA
SHELTON						
Evergreen Fuels	CC Cole & Sons	16.8	0 (ISIS)	Petroleum, Industrial Spills	Cleanup Operation & Maintenance In Process	MTCA
Goose Lake		0	90	Industrial	Remedial Investigation/Feasibility Study In Process	CWA
Shelton Yacht Club		unknown	unknown	Shipyard	Early Notice Letters Completed, Initial Investigation Completed	SMS
LAKE WENATCHEE						
Holden Minetailing Wenatch	Wenatchee National Forest, Holden Mine	10	unknown	Mining, Industrial	Remedial Investigation/Feasibility Study In Process	MTCA
PORT ANGELES						
ITT Rayonier PA Finish RM Site	Rayonier Mill	12	80	Wood, paper, timber	Interim Action In Process, Marine Remedial Investigation in Process	MTCA
Port of Port Angeles Marine Trades Area	Port of Port Angeles Log Yard, Port of Port Angeles Marine Terminal, Port Angeles Harbor	100	50	Wood, paper, timber	Remedial Investigation/Feasibility Study In Process	MTCA
WILLAPA BAY						
Pacific Wholesale	City of Raymond, Pacific Wholesale Raymond	unknown	0	Industrial, leaking UST	Interim Action Completed, Cleanup Completed	MTCA

ISIS Site Name	Also known as	Area (acres)	% State Owned Land	Causes of Contamination	Site Cleanup Status	Authority
SAN JUAN ISLANDS						
UNOCAL Bulk Plant Orcas Island	Russells Orcas Landing Bulk Plant, Russell's Orcas Landing	unknown	unknown	unknown	Independent Report Reviewed - Paid, Completed	MTCA
WHIDBEY ISLAND						
US Navy Whidbey Lake Hancock	NAS Whidbey Island, USN Lake Hancock	7	0	Military Operations (bombing range)	UXO Safety Inspection, In Process	MTCA
US Navy Whidbey OU3 & OU4		unknown	unknown	Military Operations	CERCLA site; HSL; RI/FS	CERCLA
KENT - FRESHWATER STREAM						
Western Processing	Chemical Waste Management Western Processing, OHM Remediation SVCS CORP, Western Processing CO INC, Mill Creek Western Processing	unknown	0	Industrial	Cleanup Completed	CERCLA
BLAINE						
Blaine Shipyard		unknown	unknown	Site currently undergoing demolition of existing buildings.This site is part of the Puget Sound Initiative	Ranked, awaiting RA	MTCA
CHEHALIS						
American Crossarm & Conduit	ACC	unknown	unknown	Cleanup done, high dioxins found in Dillenbaugh creek sediment downstream of site	Cleanup Operation & Maintenance	CERCLA

***Ten sites were not specifically identified in ISIS as MTCA; for this report, they are placed under MTCA.**