Feasibility Phase Final Report

Puget Sound Confined Disposal Site Study, Washington

US Army Corps
of Engineers ®
Seattle District

September 2003

EXECUTIVE SUMMARY

In the mid-1990's, it was the collective judgment of Cooperative Sediment Management Program (CSMP)[1] agencies in the State of Washington that a lack of confined disposal capacity for contaminated marine sediments was a significant public problem that impeded both navigation dredging and the effective and timely cleanup of contaminated sediment sites in Puget Sound. A cost-shared feasibility study was initiated in July 1997 when the Corps of Engineers and the State of Washington signed a feasibility cost-sharing agreement for the Puget Sound Confined Disposal Site Study, Washington. Co-sponsors of the feasibility study were the Washington Department of Ecology, Washington Department of Natural Resources, and Puget Sound Water Quality Action Team. Cooperating agencies were the U.S. Environmental Protection Agency, Region 10; U.S. Fish and Wildlife Service, Western Washington Office; and Washington Public Ports Association.

The Puget Sound Confined Disposal Site Study focused public and private attention on the issue of contaminated marine sediment disposal and treatment, yielding a number of tools, policies and actions to achieve this success. These efforts have provided the foundation for the private sector to pursue workable solutions and it has become clear that a public investment is not necessary to achieve the study objective. The study sponsors and co-sponsors have determined that private sector regional landfill operators can meet the near-term needs of the Puget Sound region for environmentally acceptable and cost-effective disposal and management of contaminated marine sediment. As a direct result of the feasibility study, at least two regional landfill operators are now actively marketing their facilities for disposal of contaminated marine sediments. The State of Washington and the U.S Army Corps of Engineers have thus concluded that the Puget Sound Confined Disposal Site Study should be terminated. No further Federal action is required to meet the objective of the feasibility study.

The study objective was to determine the feasibility of establishing one or more multi-user/multi-source facilities for the disposal and/or treatment of contaminated sediments that are not acceptable for unconfined open-water disposal or for beneficial uses. A common, cost-effective, environmentally acceptable and readily available disposal option has long been recognized as needed to advance our collective abilities to clean up and manage contaminated sediments. The study examined alternative facility configurations and management roles, evaluated the ecosystem restoration opportunities afforded by the establishment of disposal capacity for contaminated sediment, and evaluated alternative disposal and sediment treatment options.

A programmatic environmental impact statement (EIS) completed in October 1999 demonstrated a need to remove a large volume of moderately contaminated sediment from the greater Puget Sound and transfer it to one or more appropriate locations for disposal and/or treatment. Puget Sound and adjacent areas, such as Lake Union and Lake Washington, contain between four and eleven million cubic yards of sediment that are designated "contaminated" either by Federal and/or state standards. The sediments that pose unacceptable risks to the environment or human

[1] U.S. Army Corps of Engineers, Seattle District; U.S. Environmental Protection Agency, Region 10; Washington Department of Ecology; Washington Department of Natural Resources; and Puget Sound Water Quality Action Team.

health, and that cannot be capped in place or otherwise isolated, will need to be dredged. This estimate includes sediment from contaminated site cleanup projects, navigation and maintenance dredging, waterfront development, and habitat restoration projects. Seven discrete alternatives were evaluated in the programmatic EIS. In addition to "no action", the alternatives included contained aquatic disposal, nearshore confined disposal, upland confined disposal, disposal at existing solid waste landfills, multi-user access to otherwise single-user confined disposal projects, sediment treatment, and combination of alternatives. All "action" alternatives were found to be technically feasible.

Puget Sound is an inland sea of 2,500 square miles with deepwater ports, saltwater beaches and sheltered inlets along interior waterways. It is located at the northwestern corner of the State of Washington and is a major corridor for interstate and international marine transportation. A reliable system of navigable waterways is needed to ensure the continued viability and expansion of the economic base of the Puget Sound region, the State of Washington as a whole, and the nation. The cities of Seattle, Tacoma, Everett, Bremerton, Bellingham, and Olympia – the state capitol – are located on the shoreline of Puget Sound. There are 34 public port districts along Puget Sound, 54 miles of Federal navigation channels, 10 miles of port terminal ship berths along these channels, and more than 200 small boat harbors that require periodic dredging to maintain depths for efficient navigation.

In 2000, following completion of the programmatic phase of study, a siting phase investigation was initiated. The goals of this "siting" phase were to: (a) determine who should own and operate a multi-user facility; (b) identify and select preferred sites for a multi-user disposal or treatment facility; (c) evaluate the feasibility of developing regional capacity to treat contaminated sediment; and (d) actively engage the public. Initially focused on confined disposal capacity, the scope of the study was widened in late 2000 to also investigate sediment treatment technologies as a component of any management option(s) that might ultimately be recommended for Federal and/or State of Washington implementation. There was optimism that the collective efforts of the agencies would establish the foundation upon which the management of contaminated sediments disposal (either long-term confinement or treatment) would be taken over by the private sector. It was assumed, however, that the public sector (Federal and/or State of Washington) would need to construct and operate one or more multi-user contaminated sediment disposal or treatment facilities initially in order to demonstrate its utility and viability and also to work out a variety of liability concerns.

By mid-year 2001, overtures from two private sector regional landfill operators had made it clear that an initial public investment might not be necessary to meet near-term needs for development of a cost-effective and environmentally acceptable solution to the management of contaminated sediments in the Puget Sound region. This new interest from the private sector strongly suggested that a primarily local government/ private sector solution was achievable and desirable to meet foreseeable needs for management of contaminated sediment. The State of Washington concurred in this finding and is satisfied that the private sector solution crafted by the study team is both viable and in the overall public interest. Of particular note is the competition for business that exists between these two firms, a fact that should tend to keep landfill transportation and disposal fees competitive with other options available to dredgers.

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ACRONYMS AND ABBREVIATIONS

CAD	Contained Aquatic Disposal
CDF	Confined Disposal Facility
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Corps	United States Army Corps of Engineers
CSMP	Cooperative Sediment Management Program
CWA	Clean Water Act
cy	Cubic Yard
DMMP	Dredged Material Management Program
DNR	Washington Department of Natural Resources
DO	Dissolved Oxygen
EAC	External Advisory Committee
Ecology	Washington Department of Ecology
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
FCSA	Feasibility Cost Sharing Agreement
GIS	Geographical Information System
HWIR	Hazardous Waste Identification Rule
LBC	Level Bottom Capping
MTCA	Model Toxics Control Act (State of Washington)
MUDS	Multi-User Disposal Site
NEPA	National Environmental Policy Act of 1969
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
PEIS	Programmatic Environmental Impact Statement
PL	Public Law
PSDDA	Puget Sound Dredged Disposal Analysis (now DMMP)
PSWQAT	Puget Sound Water Quality Action Team (under the office of the Governor)
PSWQA	Puget Sound Water Quality Authority (now PSWQAT)
RCRA	Resource Conservation and Recovery Act
RFP	Request for Proposal
SAIC	Science Applications International Corporation (Ecology consultant)
SEPA	Washington State Environmental Policy Act
SMS	Sediment Management Standards (State of Washington)
USFWS	United States Fish and Wildlife Service
WAC	Washington Administrative Code (State of Washington)
WPPA	Washington Public Ports Association
WQ	Water Quality
WQS	Water Quality Standards
WRDA	Water Resources Development Act

SECTION 1 – INTRODUCTION

In the mid-1990's, it was the collective judgment of Cooperative Sediment Management Program (CSMP)[2] agencies in the State of Washington that a lack of confined disposal capacity for contaminated marine sediments was a significant public problem that impeded both navigation dredging and the effective and timely cleanup of contaminated sediment sites in Puget Sound. A cost-shared feasibility study was initiated in July 1997 when the Corps of Engineers and the State of Washington signed a feasibility cost-sharing agreement for the Puget Sound Confined Disposal Site Study, Washington. Co-sponsors of the feasibility study were the Washington Department of Ecology, Washington Department of Natural Resources, and Puget Sound Water Quality Action Team. Cooperating agencies were the U.S. Environmental Protection Agency, Region 10; U.S. Fish and Wildlife Service, Western Washington Office; and Washington Public Ports Association.

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By mid-year 2001, overtures from private sector regional landfill operators had made it clear that an initial public investment might not be necessary to meet near-term needs for development of a cost-effective and environmentally acceptable solution to the management of contaminated sediments in the Puget Sound region. This new interest from the private sector strongly suggested that a primarily local government/ private sector solution was achievable and desirable to meet foreseeable needs for management of contaminated sediment. The State of Washington concurred in this finding and is satisfied that the private sector solution crafted by the study team is both viable and in the overall public interest. Of particular note is the competition for business that exists between these two firms, a fact that will tend to keep landfill transportation and disposal fees competitive with other options available to dredgers.

SECTION 2 – STUDY AUTHORITY

2.1 RECONNAISSANCE PHASE

The Puget Sound Confined Disposal Site Study reconnaissance phase was conducted under the authority of the Energy and Water Development Appropriations Act, 1995 (Public Law 103-316). Funding for the U.S. Army Corps of Engineers (Corps) to initiate the reconnaissance study was included in the 1995 Appropriations Act by Congress in response to requests by the State of Washington for participation by the Corps. Washington U.S. Senator Slade Gorton was instrumental in obtaining the congressional add, following his exchange of correspondence with Dr. John H. Zirschky, Acting Assistant Secretary of the Army for Civil Works. In a letter to Senator Gorton dated March 28, 1994, Dr. Zirschky wrote as follows (see Appendix A):

> *"This is in reply to your letter of January 13, 1994, regarding Army Corps of Engineers involvement in a study for the establishment of a confined disposal site for contaminated dredged material in Puget Sound. We support such involvement."*

This expression of Administration support to achieve an equitable division of work and responsibility among the various stakeholders led Congress to add General Investigations funds to initiate the reconnaissance phase to the 1995 Energy and Water Development Appropriations Act.

2.2 FEASIBILITY PHASE

The feasibility study was conducted under the authority of Section 209 (Puget Sound and Adjacent Waters) of the Flood Control Act of 1962 (PL 87-874). The study is an interim study under this Section 209 "parent" authority. The feasibility study was initiated in July 1997 with signing of a Feasibility Cost Sharing Agreement (FCSA) between the Corps' Seattle District and the State of Washington (represented by Washington Department of Ecology, Washington Department of Natural Resources, and the Puget Sound Water Quality Action Team). The U.S. Environmental Protection Agency Region 10, U.S. Fish and Wildlife Service, and the Washington Public Port Association also signed the FCSA as cooperating agencies.

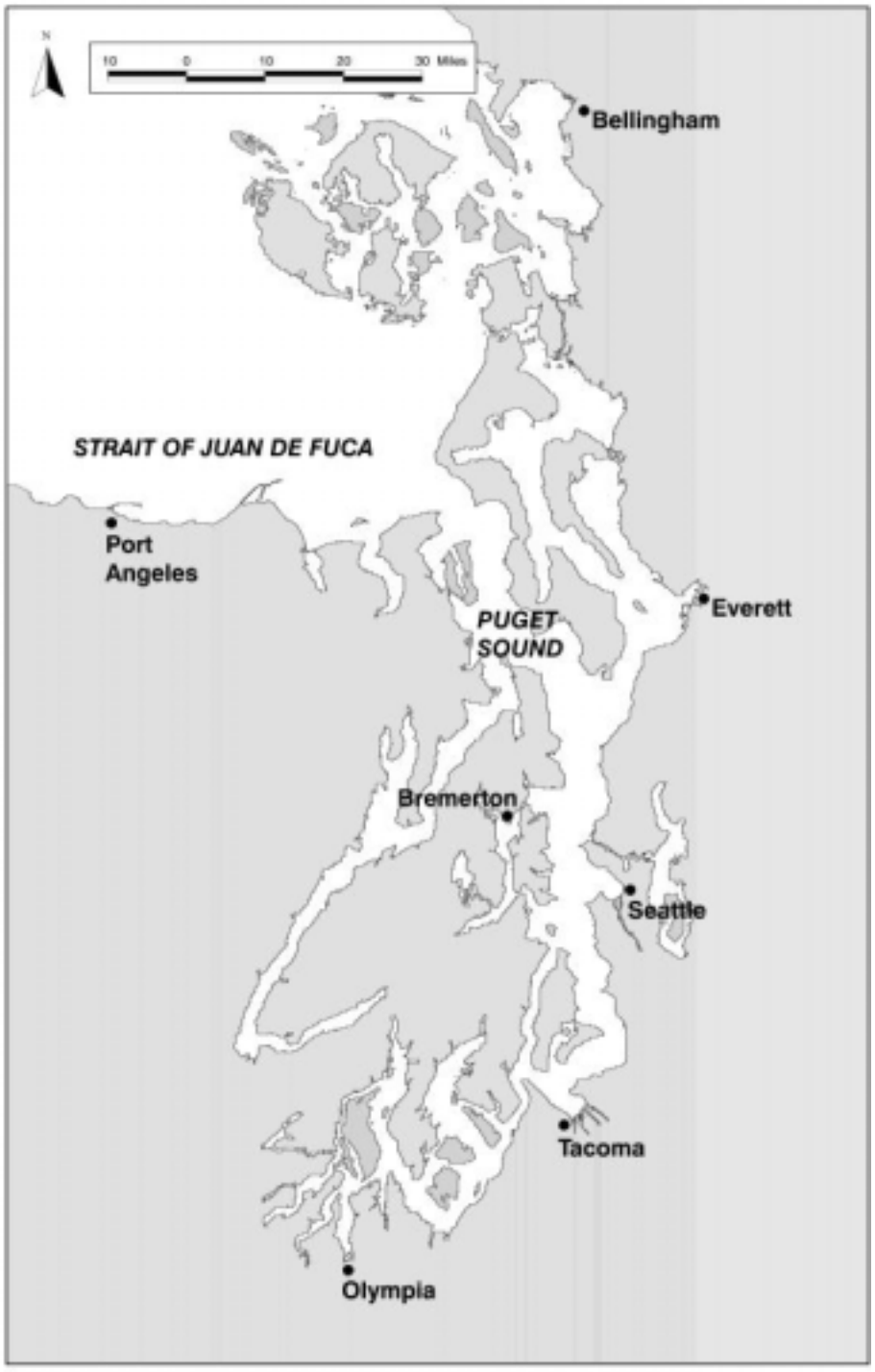
SECTION 3 – LOCATION AND DESCRIPTION OF STUDY AREA

Puget Sound is an inland sea of 2,500 square miles with deepwater ports, saltwater beaches and sheltered inlets along interior waterways (Figure 1). It is located at the northwestern corner of the State of Washington and is a major corridor for interstate and international marine transportation. A reliable system of navigable waterways is needed to ensure the continued viability and expansion of the economic base of the Puget Sound region, the State of Washington as a whole, and the nation. The cities of Seattle, Tacoma, Everett, Bremerton, Bellingham, and Olympia – the state capitol – are located on the shoreline of Puget Sound. There are 34 public port districts along Puget Sound, 54 miles of Federal navigation channels, 10 miles of port terminal ship berths along these channels, and more than 200 small boat harbors that require periodic dredging to maintain depths for efficient navigation.

The Puget Sound and adjacent waters drain a 13,515-square mile area known as the Puget Sound Basin. The Puget Sound Basin is elongated north to south and extends approximately 200 miles, from the Fraser River in Canada (north of Bellingham, Washington) to near Centralia, Washington (south of Olympia). From east to west, the basin extends from the crest of the Cascade Range to the Olympic Mountains and the Strait of Juan de Fuca. A glacial lobe of the Cordilleran ice sheet formed the main body of Puget Sound during the Pleistocene epoch, which occurred between 10,000 and 1.6 million years ago. Puget Sound is one of the deepest marine basin areas in the United States. The northern portion consists of the straits of Juan de Fuca and Georgia, with water depths of 600 to 800 feet. The southern portion includes the various inlets of south Puget Sound where depths typically range to 300 feet. As part of the Pacific Northwest, the Puget Sound Basin is in an active geological area. The Pacific Northwest contains a boundary between two of the tectonic plates that make up the earth's surface. This boundary, called the Cascadia subduction zone, is the largest active fault in North America outside Alaska, and runs along the Pacific Coast between southern British Columbia and northern California. Many smaller faults have been identified in the Puget Sound region.

The majority of contaminated sediments in Puget Sound are in its south-central urban/industrial embayments. Considering all existing sites, about 41 percent of contaminated sediment volume is located in the Seattle/Elliott Bay/Lake Washington area (including the Lake Washington Ship Canal and Lake Union). Another 30 percent is found at Tacoma in Commencement Bay, and about 18 percent is in the Bellingham Bay region. The remaining relatively minor volumes are found in Bremerton/Sinclair Inlet (5 percent), Everett/Port Gardner (4 percent) and Olympia/Budd Inlet (1 percent). Because the Sinclair Inlet area is geographically close to the Seattle/Elliott Bay region, nearly 50 percent about half of Puget Sound's contaminated sediments are situated in this central Puget Sound area. Three-quarters of the contaminated sediments are located in the area bounded by Seattle, Tacoma, and Bremerton.

Figure 1 – Puget Sound, Washington



SECTION 4 – REVIEW OF PRIOR STUDIES, REPORTS, EXISTING WATER PROJECTS AND PROGRAMS

The Puget Sound Confined Disposal Site Study is but one element of a coordinated and cooperative interagency sediment management program underway in the Puget Sound region. In 1985, the Puget Sound Water Quality Authority (PSWQA) was established by state law to develop a comprehensive plan to protect water quality in Puget Sound. In 1988, Puget Sound was designated by EPA as an estuary of national significance under Section 320 of the Clean Water Act, as amended. In 1987, the *Puget Sound Water Quality Management Plan* (*Puget Sound Plan*) endorsed the Puget Sound Dredged Disposal Analysis (PSDDA) program. Implemented in 1989, PSDDA is a Federal/non-Federal cooperative effort by the Corps, EPA, Ecology and DNR. PSDDA resulted in the siting of eight public multi-user unconfined open-water disposal sites for relatively clean dredged material. Today, PSDDA is officially known as the Dredged Material Management Program (DMMP).

The 1987 *Puget Sound Plan* also called for a study of the feasibility and need for multi-user confined disposal sites, an inventory of contaminated sediment sites, and establishment of sediment disposal standards. In response, Ecology undertook background studies that established the need for multi-user confined disposal sites to serve the Puget Sound region. Subsequently adopted by PSWQA, these studies concluded that development of a multi-user disposal site program would require a state/Federal cooperative effort to plan, site, construct and operate such facilities. In 1991, the State of Washington adopted Sediment Management Standards (SMS). The SMS serve as the basis for management and reduction of pollutant discharges and provide a management and decision process for the cleanup of contaminated sediment sites that threaten the environmental, economic, and social health of Puget Sound.

In May 1994, the Cooperative Sediment Management Program (CSMP) agencies (Corps Seattle District, EPA Region 10, Ecology, DNR, and PSWQA) recommended that studying the feasibility of establishing a multi-user disposal site (MUDS) facility in Puget Sound should be a regional priority. These agencies signed an Interagency/ Intergovernmental Agreement to (1) develop a comprehensive management strategy for cleanup of contaminated sediments, (2) prepare an Action Plan for development of one or more multi-user confined disposal sites, and (3) define interagency/ intergovernmental policies to facilitate projects involving the beneficial uses of dredged material. A Puget Sound cooperative sediment cleanup strategy emerged from the May 1994 Agreement, and was to be implemented in concert with the Puget Sound Confined Disposal Site Study. The study soon became widely known as the multi-user disposal site (MUDS) study. Accordingly, the term "MUDS" is thus used extensively throughout the remainder of this report.

As further evidence of their commitment, study sponsors agreed to accelerate the planning process by initiating three feasibility level studies during the reconnaissance phase. A study funded by Ecology and EPA evaluated alternative approaches to siting a MUDS site and developed recommendations for how to locate suitable and publicly acceptable sites for that purpose. A second study, funded by DNR, was a legal services contract to develop a formula for

shared multi-user disposal site contingency liability management. A third study, funded by the Corps, produced a scoping document for a joint Federal-state programmatic environmental impact statement that was to be prepared as part of the feasibility phase study.

SECTION 5 – RECONNAISSANCE PHASE STUDY

5.1 PURPOSE

The Corps of Engineers completed the reconnaissance report for this site study in October 1995. According to the report, the purpose of the reconnaissance phase of planning was to enable the Corps and non-Federal sponsors to determine whether or not planning should proceed to the more detailed feasibility phase. The planning objective for the Puget Sound Confined Disposal Site Study was to find an effective solution to the contaminated sediment disposal problem in Puget Sound by establishing one or more multi-user sites for the safe disposal of contaminated sediments.

5.2 SCOPE

The reconnaissance study included an examination of the current and likely future need for confined disposal facilities; measures capable of satisfying identified needs; the associated economic, environmental, and institutional considerations and issues; and coordination with concerned agencies. The study has also included an assessment of the level of interest and support of Federal and non-Federal agencies in continuing to work cooperatively in addressing the regional issue of how best to manage contaminated sediment. Contaminated sediments are generated from dredging for navigation purposes, as well as increasing quantities of contaminated sediment resulting from aquatic site cleanup under Federal and state programs.

5.3 FINDINGS

The reconnaissance report recommended the initiation of a cost-shared feasibility phase study, based on a determination that the planning objective was in the Federal interest, was in accord with current policies and budgetary priorities, and was strongly supported by the identified non-Federal sponsors and by cooperating Federal and non-Federal agencies. The feasibility study was to address only the contaminated sediments disposal needs resulting from navigation dredging and environmental cleanup and habitat restoration actions. Further, the feasibility study did not address issues associated with what contaminated sites to clean up, how cleanup remedies are selected, or what the clean up levels should be.

A number of Federal and non-Federal agencies expressed a willingness to work in partnership with the Corps and other interested parties to achieve an equitable division of work and responsibility among the various stakeholders in effecting a solution to the lack of capacity for disposal of contaminated sediments. As evidence of their commitment following completion of the reconnaissance study, a number of agencies provided letters of strong endorsement of the findings and recommendation of the study and their intent to actively participate in the feasibility phase study. Letters were received from the Governor, State of Washington; Director of the Washington Department of Ecology; Commissioner of Public Lands, Washington Department of Natural Resources; Executive Director of the Puget Sound Water Quality Authority; Region 10 Administrator of the U.S. Environmental Protection Agency; and Executive Director of the Washington Public Ports Association.

The reconnaissance study reaffirmed findings by the Washington Department of Ecology that there is a significant need for the establishment of multi-user sites for the disposal of contaminated sediments derived from: (1) dredging of Federal and non-Federal navigation channels, (2) waterfront development projects, (3) environmental cleanup projects directed through Federal or state enforcement actions, and (4) projects with restoration of aquatic habitat as their primary purpose. These sites would be accessible to both the private and public sectors. The reconnaissance study found a high level of determination on the part of non-Federal and Federal agencies to work cooperatively to resolve the lack of disposal capacity for contaminated sediments. There was a strong regional commitment to creating disposal sites for contaminated sediments that must be dredged to improve and maintain navigation channels and related facilities and to enable State of Washington and Federal contaminated sediment cleanup actions to occur.

In 1990, Ecology estimated that between 5 and 12 million cubic yards (cy) of contaminated sediments would, if dredged, require confined disposal between 1989 and 2000. Between 1989 and 1998, the actual volume of sediments that were dredged and disposed of in a confined facility was only about 2,000,000 cy. The discrepancy between the volume predicted to require confined disposal and the actual volume dredged and disposed of over this period reflects: (1) delays in cleanup project [e.g., Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or Model Toxics Control Act (MTCA)] schedules because of complex technical, policy, and legal issues that require resolution between regulatory agencies and potentially responsible or liable parties before sites are actually cleaned up; (2) redesigned or abandoned dredging plans due to a lack of feasible disposal options for the material found to be unsuitable for disposal at one of eight multi-user unconfined disposal sites in Puget Sound ; and (3) selection of alternative remedies (i.e., in-place capping or natural recovery rather than dredging and disposal) as part of the remedial action. This reality was a driving factor in the determination by the study sponsors and cooperating agencies continue the study into the cost-shared feasibility phase.

SECTION 6 – FEASIBILITY PHASE STUDY

6.1 OBJECTIVE AND PURPOSE

In May 1994, it was the collective judgment of the CSMP agency directors and staff that the lack of confined disposal capacity for contaminated sediments was a significant public problem that was impeding both navigation dredging and the effective and timely cleanup of contaminated sediment sites in Puget Sound. The feasibility study, funded by the Corps of Engineers and the State of Washington, was initiated in July 1997 when the Corps and the State signed a feasibility cost-sharing agreement. The feasibility study was conducted under the authority of Section 209 (Puget Sound and Adjacent Waters) of the Flood Control Act of 1962 (PL 87-874). The study is an interim study under this Section 209 "parent" authority.

Co-sponsors of the feasibility study were the Washington Department of Ecology (Ecology), Washington Department of Natural Resources (DNR) and Puget Sound Water Quality Action Team (PSWQAT, formerly Puget Sound Water Quality Authority). The cooperating agencies were the U.S. Environmental Protection Agency (EPA), Region 10, Washington Public Ports Association (WPPA), and the U.S. Fish and Wildlife Service (USFWS).

The primary study objective was to determine the feasibility of establishing one or more multi-user/multi-source facilities for the management (disposal and/or treatment) of contaminated sediments. A common, cost-effective, environmentally acceptable and readily available disposal option has long been recognized as needed to advance our collective abilities to clean up and manage contaminated sediments.

The study examined alternative facility configurations and management roles, evaluated the ecosystem restoration opportunities afforded by the establishment of disposal capacity for contaminated sediment, and evaluated alternative disposal and sediment treatment options. Ecosystem restoration goals that would result from establishment of disposal and/or treatment capacity for contaminated sediment were to: (1) enhance the physical nature of existing degraded habitats; (2) improve existing ecosystem functions and processes; (3) address limiting factors to fish and wildlife production; and (4) restore habitats for anadromous fish. The feasibility study initially consisted of three elements: (1) a programmatic phase, including development of a programmatic National Environmental Policy Act/State Environmental Policy Act (NEPA/SEPA) environmental impact statement (EIS); (2) a siting phase; and (3) a site-specific phase, including development of a feasibility report and a site-specific NEPA/SEPA EIS.

6.2 PROGRAMMATIC PHASE – PROGRAMMATIC NEPA/SEPA ENVIRONMENTAL IMPACT STATEMENT

In October 1999, the programmatic phase was completed with the release of a final programmatic NEPA/SEPA environmental impact statement (PEIS). The following discussion on the programmatic phase of the MUDS project is based to a large extent on material contained in the final PEIS.

6.2.1 Programmatic EIS Objective

The objective of the PEIS was to provide a broad initial environmental review and cost analysis of major alternatives for the confined disposal and treatment of contaminated sediments dredged from Puget Sound. Pending the outcome of this evaluation of alternatives, a site-specific EIS in support of a specific confined disposal or treatment alternative may be pursued in that region of Puget Sound that might benefit most from such an effort. The long-term goal of this effort was to address the regional need for disposal or treatment of contaminated sediments that require dredging. Alternatives solutions evaluated at the programmatic level include the following:

- Disposal in constructed confined aquatic, nearshore, or upland multi-user disposal sites.
- Disposal in existing solid waste landfills.
- Multi-user disposal in large, privately developed, confined disposal facilities.
- Sediment treatment (decontamination).
- Combinations of alternatives.
- No-action.

6.2.2 Authority and Jurisdiction

The PEIS was prepared pursuant to the National Environmental Policy Act (NEPA) and the Washington State Environmental Policy Act (SEPA) to support Federal, state, and local decision making in regards to the confined disposal of contaminated sediments. The Corps of Engineers (Corps), Seattle District, was the NEPA lead agency for this project, and Ecology and DNR were the co-lead SEPA agencies. The Corps' authority in this case was derived from both Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act (1977).[3]

For any Federally permitted project that requires a Section 10/404 permit, Ecology has authority through Section 401 of the Clean Water Act to issue a water quality certification. A Section 401 certification is a precondition to receiving a Section 404 permit and is designed to ensure that the proposed action does not violate any applicable Federal and state water quality criteria.

Dredging, confined disposal and/or treatment of contaminated sediments in Puget Sound also would need to comply with other state and local laws and regulations. In addition to Federal and State regulatory agencies (Corps, EPA, Ecology, and DNR), participating agencies and groups that might have authority over activities described in the PEIS, depending on the alternative and geographic location, include the following:

- U.S. Department of the Interior, Fish and Wildlife Service.
- U.S. Department of Commerce, NOAA and National Marine Fisheries Service.
- Washington Department of Fish and Wildlife.
- City and county governments.

[3] Note that a Section 10 permit is required for dredging operations of any kind whether for navigation or environmental cleanup. A Section 404 permit is required for discharges of dredged or fill material into waters of the U.S. including wetlands. This includes upland disposal environments when there is return flow (e.g., runoff) to the waters of the U.S.

- Native American Tribes.
- Local health departments.

6.2.3 Purpose and Need

Dredging of sediments from shipping channels and berths to maintain or deepen navigable water depths, from waterfront development and habitat restoration projects, and from aquatic site cleanup projects, results in a need to safely handle and dispose or treat dredged material that is unsuitable for unconfined, open-water disposal. These contaminated sediments require confined disposal or treatment to eliminate or minimize the risk of short- and long-term contaminant release to the environment.

To date in Puget Sound, dredging and disposal of contaminated sediments have been done on a project-by-project basis. The contaminated sediment dredging and disposal process can be time-consuming, expensive, uncertain, and often controversial for dredging proponents, regulators, and the public. Efforts to clean up contaminated sediments have also been hindered by the lack of viable confined disposal or treatment options and the time and cost required to obtain project approval from permitting agencies. The overall goal of the MUDS project is to find environmentally sound and affordable solutions for the confined disposal and/or treatment of contaminated sediments.

Based on recent information, the volume of contaminated sediment in Puget Sound that will be dredged over the next 15 years is projected to be between about 6 and 13 million cubic yards (cy). Subtracting the volume of sediment that will likely be cleaned up before a multi-user disposal or treatment facility could become available, from 3 to 7 million cy of contaminated dredged material will require confined disposal or treatment. These estimates include sediment from contaminated site cleanup projects, navigation and maintenance dredging, waterfront development, and habitat restoration projects.

The majority of the contaminated sediments in Puget Sound are located in the Sound's south-central urban/industrial embayments (see Figure 1). Considering all existing sites, about 41 percent of the contaminated sediment volume is located in the Seattle/Elliott Bay/Lake Washington area (including the Lake Washington Ship Canal and Lake Union). Another 30 percent is found in Tacoma/Commencement Bay and about 18 percent is in the Bellingham/Bellingham Bay region. The remaining relatively minor volumes are found in Bremerton/Sinclair Inlet (5 percent), Everett/Port Gardner (4 percent) and Olympia/Budd Inlet (1 percent). Because the Bremerton/Sinclair Inlet area is geographically close to the Seattle/Elliott Bay region, about half of Puget Sound's contaminated sediments are situated in this central Puget Sound area. Three-quarters of the contaminated sediments are located in the area bounded by the cities of Seattle, Tacoma, and Bremerton. This is the region with the greatest contaminated sediment disposal need and the logical focus for the site-specific confined disposal/treatment portion of the study.

As existing contaminated areas (which can be sources of contamination to adjacent areas) are cleaned up, and as improved source control efforts continue to be implemented throughout Puget Sound, it is reasonable to assume that the input of contaminants to Puget Sound will decrease

over the study's planning horizon. Natural processes such as sedimentation (burial) and chemical and biological degradation should also reduce contaminant levels in surface sediments over time. Consequently, a long-term decrease in contaminated sediment disposal or treatment needs may be observed as the contaminated volumes identified above are addressed. Alternatively, delays in on-going cleanup actions and/or the adoption of more restrictive sediment cleanup standards could increase long-term contaminated sediment disposal or treatment needs.

6.2.4 Alternatives

At the conclusion of the programmatic phase of the study, the Study Team identified seven discrete alternatives (including no-action) for the confined disposal of contaminated sediments from Puget Sound. An eighth alternative, sediment treatment, was added to the final PEIS in response to increased awareness of recent research and development in this field and to public comments on the draft PEIS. The major features of each alternative are described below. The constructed alternatives for multi-user disposal sites [level bottom capping and contained aquatic disposal, nearshore and upland confined disposal facilities (CDFs), and the use of existing solid waste landfills] were defined in the PEIS in sufficient detail to allow evaluation and comparison of their potential environmental impacts and costs. Much of this detail was based on information developed specifically for the MUDS study by the Environmental Laboratory at the Corps' Engineer Research and Development Center located at Vicksburg, Mississippi.

To allow evaluation of the constructed alternatives in this programmatic EIS, it was necessary to make assumptions about the design, shape, layout, capacity, and operational life of each alternative. For each constructed alternative, a conceptual design was developed and both 500,000 cubic yard (cy) and 2,000,000 cy facilities were considered. Also, each facility was assumed to be operational (i.e., accept contaminated dredged material) for a10-year period. It is important to note, however, that other realistic design and operational options exist. For example, a MUDS facility could have more than a 2,000,000 cy capacity and be in operation for more than 10 years. So while the PEIS presents and evaluates plausible scenarios for a Puget Sound MUDS, other reasonable scenarios could emerge during site-specific planning and design efforts.

6.2.4.1 No-action

Under the no-action alternative, no multi-user disposal or treatment facility would be established. Contaminated sediment cleanup and dredged material disposal would continue as it is currently done. Confined disposal solutions would be developed on a case-by-case basis, and some contaminated sediments would be left in place and exposed to the environment until remedial action or dredging was required. These actions would likely be conducted under the existing framework of regulations and options. In addition, changes to existing policies or regulations might be pursued (i.e., even in the absence of additional confined disposal studies) to facilitate contaminated sediment disposal or cleanup.

6.2.4.2. Level Bottom Capping and Contained Aquatic Disposal

Three alternatives are considered the main constructed alternatives because they include disposing of contaminated sediments in a constructed confined disposal facility (Figure 2). For environmental impact evaluation, feasibility, and costing purposes, it is assumed that each constructed facility would have a 10-year operational life. Both 500,000 cy and 2,000,000 cy capacity sites were considered.

Level bottom capping (LBC) and contained aquatic disposal (CAD) are two types of underwater sediment disposal that are discussed as one alternative because they have similar features and potential environmental impacts. LBC is the placement of contaminated material in a mound on an existing flat or very gently sloping natural bottom and covering the mound with clean sediments (Figure 3). The cap isolates the marine environment from the contaminated material and minimizes the potential for contaminant migration. Biological communities re-colonize these areas following final cap placement.

CAD is similar to LBC but includes some form of lateral confinement (e.g., placement in natural or excavated bottom depressions, or behind berms) to minimize spread of the materials on the bottom (Figure 3). CAD is generally used where the bottom conditions (e.g., slopes) require lateral control measures to limit the spread of the contaminated sediments.

Both LBC and CAD include dredging of contaminated sediments from one or more locations, transportation to the disposal site, and accurate placement of the contaminated sediments and clean capping materials at the site. LBC sites have been successfully constructed on relatively flat bottoms (0-1 percent) in depths up to about 200 feet. CAD sites are generally constructed in water depths less than or equal to 100 feet, but can be constructed in areas with slopes up to 6 percent. Given the relatively steep slopes that are characteristic of the shallower depths in much of Puget Sound, the CAD option was considered a more likely aquatic disposal scenario and was therefore developed as the aquatic alternative conceptual design in the PEIS. However, this does not preclude consideration of a LBC design as part of future site-specific confined disposal efforts if suitable site conditions exist.

The dredging, disposal, and monitoring technologies associated with LBC and CAD facilities are well established. The effectiveness of an LBC/CAD facility in avoiding or minimizing environmental risks is a function of appropriate site location, design and construction, technology and operational controls, and effective short- and long-term monitoring and site closure. Two successful CAD projects have been completed in Puget Sound. In others areas of the U.S. and throughout the world, numerous effective CAD and LBC sites have been constructed.

For the PEIS, the conceptual design for this alternative consisted of series of CAD pits that are excavated, backfilled with contaminated sediments, and capped with clean sediments (one CAD pit per year over the 10-year operational life). Cost estimates for disposal at the conceptual CAD site described in the PEIS range from $15/cy to $21/cy (exclusive of dredging and transport costs to the CAD site and land acquisition costs).

Figure 2 – Conceptual Illustration of Confined Disposal Alternatives

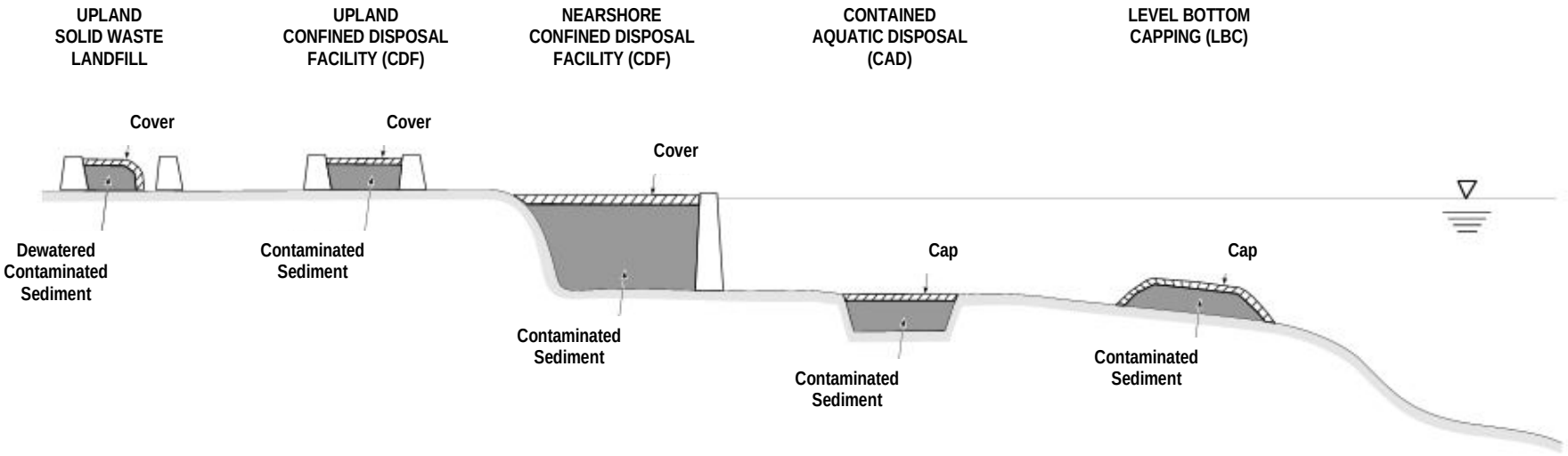
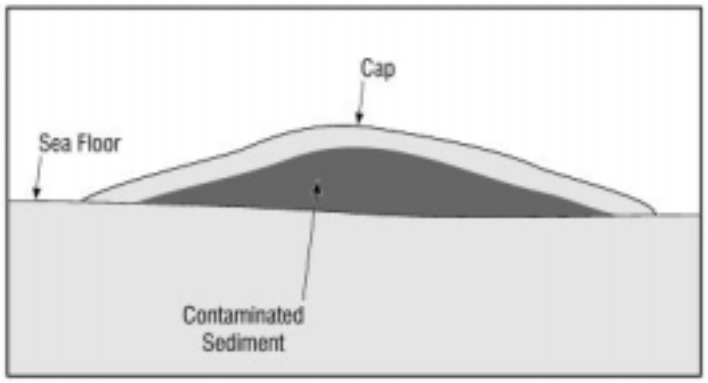
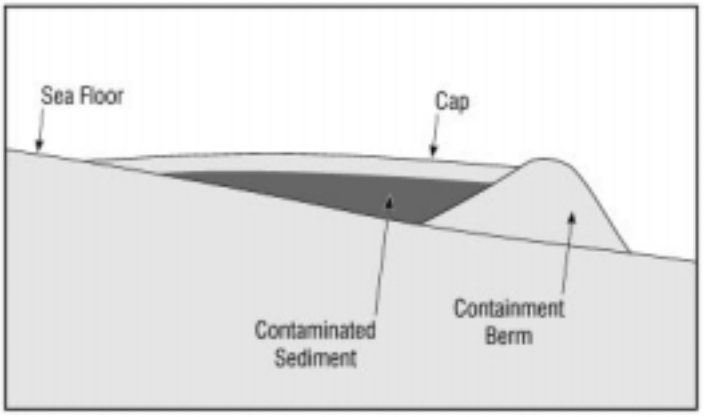


Figure 3 – Level Bottom Capping and Contained Aquatic Disposal

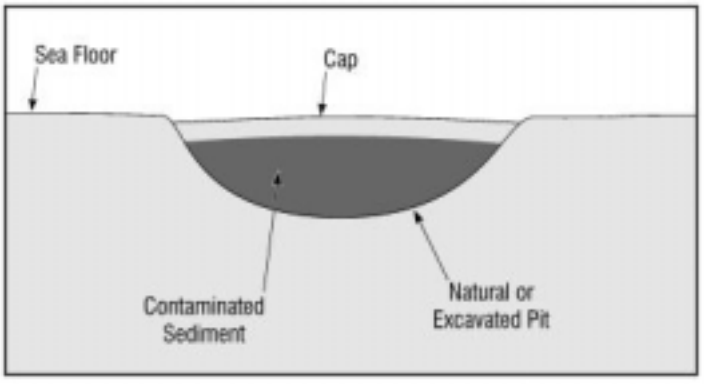
LEVEL BOTTOM CAPPING (LBC)



CONTAINED AQUATIC DISPOSAL (CAD)



CONTAINED AQUATIC DISPOSAL (CAD)



6.2.4.3. Nearshore Confined Disposal

Nearshore confined disposal is the placement of contaminated dredged material at a site constructed partially or completely in water adjacent to shore, where the dredged material is contained by a dike or berm (Figure 2). Nearshore sites use the shoreline as part of the containment structure, with in-water dikes constructed out from the shoreline to complete the enclosure. Once the contaminated material filling the diked area reaches a specified elevation, it is capped with clean material. The clean capping material raises the elevation to just below or at dike level. The nearshore sites can be finished to grade to allow beneficial reuse or development of the created uplands after completion. Alternatively, they can be finished to grade in the intertidal zone to create intertidal or shallow subtidal habitat.

Construction, dredging, disposal, and monitoring technologies associated with nearshore disposal facilities are well established. Three nearshore CDFs for contaminated sediments have been successfully constructed in Puget Sound in recent years. The effectiveness of a nearshore site in minimizing environmental risks is a function of appropriate site location, design and construction, operational controls, and effective long-term monitoring and site closure. The three Puget Sound nearshore CDFs, initially constructed in-water, have become useful upland areas (e.g., shipping container terminals) following final capping and closure. The disposal cost estimates for nearshore CDF conceptual design described in the PEIS range from $28/cy to $46/cy (exclusive of dredging and barge transport costs to the CDF).

6.2.4.4. Upland Confined Disposal Facility

The upland confined disposal facility (upland CDF) alternative entails the placement of contaminated sediments within a diked confinement structure. The contaminated sediments are covered with clean material to allow beneficial reuse after completion (Figure 2). Upland CDFs are designed to retain dredged sediment solids, while providing acceptable suspended solids and/or contaminant concentrations in effluent for discharge to receiving waters. All dredged material at upland CDFs is placed above the water table. There are currently no upland CDFs for contaminated sediments in the Puget Sound area. Nationally, however, upland CDFs are one of the most common dredged material disposal methods and commonly used for clean sediments. Upland CDFs are extensively used in the Atlantic and Gulf Coast regions of the U.S.

The technologies associated with constructing and disposing of sediments in upland CDFs are similar to solid waste landfill technologies (see paragraph 6.2.4.5. below). In the PEIS, it was assumed that water content of the dredged sediments for disposal at both the upland CDF and solid waste landfill alternatives is reduced (if necessary) before disposal to minimize water management requirements at the facilities. The upland conceptual design includes dewatering of the contaminated sediments at a separate rehandling facility that is accessed from the water before transport and final placement at the upland CDF.

The dewatering facility is comprised of multiple cells where material would be actively disposed of, left for dewatering, re-handled for transport to the upland disposal site, or used to store excess sediments. Individual cells are lined or paved to control leachate infiltration into the groundwater, depending on regulatory requirements and the level of sediment contamination.

Dikes of compacted soil or concrete provide the outside walls and separate the dewatering facility into individual cells. All water within the dewatering operations area is collected and treated to meet state and local water quality requirements before discharge back to surface waters.

The estimated costs for disposal at an upland CDF, including dewatering at specially established rehandling facilities, range from $49 to $67/cy (exclusive of dredging and transport costs to the dewatering facility).

6.2.4.5. Disposal in Existing Solid Waste Landfills

The solid waste landfill alternative is the placement of contaminated sediments within an existing upland solid waste landfill. Solid waste landfills in the state of Washington are regulated primarily by the Minimum Functional Standards For Solid Waste Handling (Washington Administrative Code, WAC 173-304), Criteria For Municipal Solid Waste Landfills (WAC 173-351), and the Resource Conservation and Recovery Act (RCRA), Subtitle D). These regulations were established by the State of Washington and Federal Government to ensure protection of human health and the environment.

Sediments must often be dewatered prior to transport to a landfill because of the water content in dredged material. Dewatering requires rehandling of the contaminated sediments at a facility that is accessed from the water and is typically included and permitted as part of a project dredging plan. Under this alternative, dewatering is done at a specially constructed nearshore multi-user dewatering facility, as described above in the upland CDF alternative.

The technologies for disposing of contaminated sediments in an existing solid waste landfill are well established. The dewatered sediments are placed in lined containers for transport by truck or rail to a landfill. At the landfill, sediments are placed in an active cell for disposal or, if appropriate, used as daily cover material for other landfill waste materials.

Private and public landfills currently operating in Washington and Oregon have accepted contaminated sediments for disposal. There are two large operating private landfills in the region. The Roosevelt Regional Landfill is located Goldendale in the arid hills of south central Washington, and is operated by Regional Disposal Company, a subsidiary of Allied Waste. The Columbia Ridge Landfill is located in arid northern Oregon, and is operated by Waste Management, Incorporated. In western Washington, county governments operate solid waste landfills for disposal of material generated within their jurisdictions. While many of these sites can accept dewatered contaminated sediments, the capacity of these landfills is limited. Because of the difficulty in siting new landfills near metropolitan areas, most Puget Sound basin jurisdictions are reluctant to accept a large volume of unanticipated material such as dewatered contaminated sediments.

The cost estimates for disposal at a solid waste landfill have, in the past, ranged from $49 to $66/cy. These estimates include dewatering, transport, and disposal at current landfill disposal costs for large quantities of material (i.e., 500,000- and 2,000,000-cy), but are exclusive of dredging and transport costs to the dewatering facility.

6.2.4.6. Multi-user Access to Privately-Developed Confined Disposal Projects

This alternative calls for access to larger confined disposal projects by dredgers other than the project proponent. Project proponents of single-purpose disposal projects have generally been reluctant to provide multi-user access to their disposal projects because of the following concerns:

- Extended time frames for site development and closure.
- Lost site capacity for their project-specific disposal needs.
- Inherited liability of accepting contaminated sediments from other parties.

The environmental issues associated with multi-user access to a confined disposal project would be the same as for a multi-user facility of the same type (e.g., nearshore or upland CDF). Some differences between the multi-user disposal alternatives and this alternative include how long the site would be open for disposal to accommodate multiple users, how the liability would be managed for multiple parties, and how the site would be managed and operated. These issues would need to be addressed as part of a project- and site-specific environmental review.

6.2.4.7. Treatment (Decontamination) Of Dredged Material

In recent years, significant progress has been made in assessing the feasibility (technology and economics) of decontaminating dredged material. On-going studies, particularly in the New York/New Jersey harbor region, have progressed from bench through pilot-scale testing for several contaminated sediment treatment processes, and commercial scale (100,000+ cy/year) operations may be on-line very soon. A review was conducted of these recent developments as well as potentially applicable treatment technologies from other programs and regions.

Based on this review, sediment treatment was presented as a programmatic alternative for the MUDS study. Treatment has the potential to become a component of a regional management strategy for contaminated dredged material. At this time, it is not possible to provide specific conceptual designs and discuss specific environmental consequences of a multi-user sediment treatment alternative. However, the range of potential features and the relative resource requirements, limitations, and advantages of promising sediment treatment processes can be described in general terms. While sediment treatment could be a stand-alone alternative, it would more likely be part of a combination alternative that included a dewatering/rehandling facility, treatment, and upland disposal (either at an existing landfill or CDF) or end product (e.g., cement, light weight aggregate, manufactured topsoil) beneficial use.

The environmental pathways of concern associated with sediment treatment are fundamentally different from pathways associated with confined disposal. Sediment “treatment” can involve destruction or breakdown of the contaminants to non-hazardous forms using high temperature technologies or low temperature contaminant removal by chemical and/or physical methods. In these processes, contaminated side-streams may be created. These side-streams, which may be gas (vapor), liquid, or solid, must be effectively managed as part of the treatment process to insure that contaminants are not re-introduced into the environment. Other treatment technologies involve the binding of contaminants into the solids matrix.

The feasibility and cost-effectiveness of any treatment approach in Puget Sound will depend on a number of factors. Such factors include the quantity of material to be treated over time, contaminant types and concentrations, the target post-treatment contaminant concentrations, and perhaps the potential end uses and marketability of the treated material. Based on the apparently successful demonstrations in the New York/New Jersey harbor region, sediment treatment has the potential to become a viable alternative for Puget Sound sediments in the future. However, the total cost and feasibility of treatment must first approach the cost and feasibility of the confined disposal alternatives. Government and/or private sector funding of promising regional treatment approaches may be needed to develop treatment as a viable option in site-specific MUDS efforts in the Puget Sound region.

6.2.4.8. Combinations of Alternatives

A combination of two or more of the alternatives previously described is also an alternative. This alternative could be a hybrid composed of any of the action-based alternatives. For example, a CAD facility could be located adjacent to a nearshore CDF, or a location including both a nearshore CDF and shore-side rehandling/treatment facility could be developed. Siting and capacity criteria are critical elements in determining the feasibility of the combination alternative. Because a combination alternative would not be identified until after completion of the PEIS and initiation of the site selection process, the combination alternative is not directly evaluated in the PEIS. However, the environmental consequences and cost of any potential combination alternative can be assumed to be a composite of the consequences and costs of the individual alternatives.

6.2.5 Impacts and Mitigation

Potential impacts, mitigation, and unavoidable adverse impacts associated with the different alternatives are summarized below in Table 1. Impacts are associated with contaminant pathways and potential biological receptors. Mitigation involves controlling or minimizing the opportunities for contaminant release to the environment through effective siting, site design, technology and operational controls, site monitoring and management, and effective closure practices. Because the constructed alternatives involve the irretrievable commitment of aquatic, nearshore, and upland land resources to a sediment containment or treatment function, the siting process and decisions made during site-specific efforts will be critical in avoiding or minimizing significant impacts.

6.2.6 Conclusions of the Programmatic Phase

6.2.6.1 Need for a Multi-user Disposal Site

The PEIS demonstrated a need to remove a large volume of moderately contaminated sediment from the greater Puget Sound and transfer it to one or more appropriate locations for disposal and/or treatment. Because of the large volume, experience with existing confined disposal

Table 1 – Summary of Environmental Impacts by Alternative

Alternative	Potential Impact	Mitigation	Unavoidable Adverse Impacts
No Action	- Proliferation of smaller and more confined disposal sites - Inefficiency in sediment evaluation, site design, and permitting process - Possible legal actions to protect aquatic life and endangered species	- Existing regulatory mechanisms for cleanup (e.g., CERCLA, SMS) - Individual project mitigation requirements of federal, state, and local entities	- Delays in cleaning up contaminated sites and some maintenance dredging projects - Long-term exposure of contaminated surface sediments and continued harm to aquatic life and other biota
Contained Aquatic Disposal			
CAD Cell Excavation and Contaminated Sediment Placement	- Short-term exposure of biota to suspended solids, reduced dissolved oxygen (DO), dissolved contaminants, and particulate contaminants - Short-term aesthetic impact - Dispersal of contaminants - Long-term biological uptake by benthos, fish, and humans - Temporal loss of subtidal habitat - Destruction of sedentary benthos and displacement of mobile fauna	- Mechanically dredged, bottom-dumped material, and operational controls; use downpipe (tremie) placement, if needed - Water quality (WQ) monitoring to ensure compliance with appropriate water quality standards (WQS) and modify placement technique as needed - Avoid heavy public use areas in siting - Site in low energy areas, monitor accurate placement, tidal current windows - Place interim caps within 4 weeks of disposal, final cap of 3+ feet - Monitor bioaccumulation of shellfish and demersal fish in area - Avoid high resource areas in siting - Exclude critical or priority habitat areas in siting, monitor benthic recovery on cap - Pre-excavation benthic habitat assessment and, if needed, off-site mitigation - Compliance with dredging and disposal closure periods	- Minor amounts of sediment will settle outside of CAD cell
Cap Placement	- Short-term exposure of biota to suspended solids and reduced DO	- WQ monitoring to ensure compliance with appropriate WQS - Compliance with dredging closure periods	- None
Long-term Containment	- Cap erosion or disturbance and release of contaminants	- Site in low energy areas, adhere to land use restrictions (e.g., no anchor zone) - Effective cap design, placement, and verification - Long-term monitoring and cap replenishment, as needed	- Foreclosure of future use (e.g., navigation deepening)
Nearshore Confined Disposal Facility			
Site Preparation and CDF Construction	- Short-term exposure of biota to suspended solids and reduced DO - Loss of intertidal and shallow subtidal habitat and displacement of fauna - Long-term aesthetic impacts	- Runoff controls - WQ monitoring to ensure compliance with appropriate WQS - Pre-construction habitat assessment and habitat mitigation - Siting excludes critical or priority habitat and high value resource use areas - Siting preference for industrial/commercial area or contaminated sites	- Loss of nearshore habitat

Table 1 – Summary of Environmental Impacts by Alternative (continued)

Alternative	Potential Impact	Mitigation	Unavoidable Adverse Impacts
Nearshore Confined Disposal Facility			
Contaminated Sediment Placement and Redistribution	- Exposure of biota to contaminants in runoff/effluent discharge, leachate, seepage through dike, and air emissions (volatilization)	- Effective CDF siting, design, modeling, monitoring, and management - Ensure adequate dilution, determine and maintain effective fill rate - WQ monitoring to ensure compliance with appropriate WQS - Air quality monitoring to ensure compliance with standards - Maintain ponded water above sediments - Discourage access through fencing, cover, noise blasts - Periodic placement of interim caps, if warranted - Operational controls	- Uptake by foraging birds (gulls, waterfowl) - Long-term biological uptake by plants, birds, and mammals
Cap Placement	- Dispersal of contaminants	- Effective cap design, placement, and monitoring	- None
Long-term Confinement	- Mass release of contaminants due to catastrophic failure (e.g., major seismic event)	- Effective siting design, construction, monitoring, and management contingency plans	- Localized aesthetic impacts (e.g., noise, odor, view) - Minor long-term release of contaminants in effluent and seepage
Upland Dewatering Facility and Confined Disposal Facility			
Site Preparation and CDF Construction	- Short-term exposure of biota to suspended solids and sedimentation of streams - Loss of upland habitat	- Sedimentation ponds and runoff controls - WQ monitoring to ensure compliance with appropriate WQS - Avoid construction during storm events - Siting excludes critical habitat, wetlands, parks, preserves - Perform pre-construction habitat assessment - Siting excludes residential areas and recreational areas	- None
Dewatering and Disposal at Upland CDF	- Exposure of biota to contaminants in runoff/effluent from dewatering leachate at CDF - Volatilization from sediments - Contaminated dust dispersal - Long-term biological uptake by plants, birds, and mammals	- Collection and filtration of runoff/effluent - WQ monitoring to ensure compliance with appropriate WQS - Siting and design meets landfill minimum functional standards - Avoid sole-source aquifers; include CDF liners, leachate collection and treatment system, monitoring wells - Place interim covers, as needed, erect wind barriers - Compliance with air quality standards - Spray dust suppressant, as needed - Fencing, sound blasts, interim covers, as needed	- None

Table 1 – Summary of Environmental Impacts by Alternative (continued)

Alternative	Potential Impact	Mitigation	Unavoidable Adverse Impacts
Upland Dewatering Facility and Confined Disposal Facility			
Long-term Confinement at Upland CDF	- Exposure of biota to dissolved contaminants and particulate contaminants - Groundwater contamination - Mass release of contaminants due to catastrophic failure (e.g., major seismic event)	- Monitor integrity of final cover - Siting and design; avoid sole-source aquifers - Monitor groundwater and develop contingency plan - Contingency plans	- Localized aesthetic impacts (e.g., noise, odor, view) - Some leachate leakage inevitable - Loss of upland habitat and alternative land uses
Disposal in Existing Solid Waste Landfills			
Dewatering and Overland Transport by Truck or Rail	- Exposure of biota to contaminants in runoff/effluent from dewatering - Volatilization from sediments - Contaminated dust dispersal - Spills/release during transport	- Collection and filtration of runoff/effluent - WQ monitoring to ensure compliance with appropriate WQS - Cover as needed and erect wind barriers to ensure compliance with air quality standards - Use lined rail cars or truck beds	- None
Long-term Confinement at Existing Landfill	- Exposure of biota to dissolved contaminants and particulate contaminants - Groundwater contamination - Mass release of contaminants due to catastrophic failure (e.g., major seismic event)	- Facility meets Minimum Functional Standards for Solid Waste Handling (WAC 173-304) - Siting and design; avoid sole-source aquifers - Contingency plans	- Localized aesthetic impacts (e.g., noise, odor, view)
Multiuser Access to CDF	- Impacts, mitigation, and unavoidable adverse impacts would be consistent with those at a multiuser CDF (nearshore or upland)		
Sediment Treatment (Specific impacts, mitigation dependent on site-specific sediment handling, treatment process, and end product re-use)	- Release of contaminants in waste side-streams (surface water/air quality) - Potential generation of hazardous or dangerous waste streams	- Effective control/monitoring of side-streams - Strict operational controls and process monitoring - Siting and design - Contingency plans	- Loss of alternative upland land uses
Combination of Alternatives	- Impacts, mitigation, and unavoidable adverse impacts would be dependent on project and site specific combination		

Source: U.S. Army Corps of Engineers, Washington Department of Ecology, and Washington Department of Natural Resources, Puget Sound Confined Disposal Site Study Programmatic Environmental Impact Statement, Prepared by the MUDS interagency team in cooperation with Striplin Environmental Associates, Anchor Environmental, Ogden Beeman Associates, ECO Resource Group, EnviroIssues, and Marshal and Associates (October 1999), Table S-1, Pages S-11– S-13.

alternatives, and the current regulatory climate, this could logically lead to building a MUDS facility and continuing to transport some of the sediment to existing solid waste landfills.

Puget Sound and adjacent areas, such as Lake Union and Lake Washington, contain between four and eleven million cubic yards of sediment that are designated "contaminated" either by Federal and/or state standards. The sediments that pose unacceptable risks to the environment or human health, and that cannot be capped in place or otherwise isolated, will need to be dredged. Current disposal options are limited to regional solid waste landfills, and to in-water sites chosen specifically as part of cleanups performed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the State of Washington Model Toxics Control Act (MTCA), or the Clean Water Act. However, there is general agreement that far too much aquatic and terrestrial habitat has been lost or degraded during the past, and that continued exposure of endangered salmonids and their prey to contaminated sediment is not consistent with recovery strategies for these species. Within the next 10-20 years, State official believe this volume of contaminated sediment needs to be dredged and either confined in some manner, treated, or else beneficially reused.

A large fraction of the total volume of contaminated sediment identified under existing regulatory programs, such as CERCLA and MTCA, may be capped or dredged and placed in single-user confined disposal facilities by the time a MUDS facility can be built. However, when the remaining cleanup volume – from one to five million cubic yards – is combined with other sources of contaminated sediment (e.g., maintenance dredging material), there is still adequate volume – estimated from three to seven million cubic yards – to justify establishing at least one MUDS facility.

It is also important to note that single-user, single-project sediment caps and confined aquatic disposal facilities already exist in the Puget Sound. Constructing a single-user disposal facility can be beneficial to planned cleanup actions and can be a viable alternative for responsible parties with adequate financial resources. However, the MUDS agency directors have made it very clear that a proliferation of such single-user sites in the region is not a favored alternative.

A readily available and cost-competitive MUDS facility is needed to ensure timely actions to remove and isolate contaminated sediments in the future. The potential adverse impacts to aquatic and/or terrestrial habitats from building a MUDS facility can be less than those associated with building many single-user disposal facilities. Fewer disposal sites located on State-owned aquatic or terrestrial lands, or any other lands, can minimize concerns over long-term liability associated with disposal of contaminated sediment. Because single-user disposal facilities can be too costly for many cleanup project proponents, a MUDS facility can help achieve the economy of scale needed to enable cleanups to proceed. In addition, it is more efficient to design, finance, build, operate, close, and monitor a few MUDS facilities than to do the same for numerous single-user facilities located in and/or around Puget Sound.

6.2.6.2 Technical Feasibility of Alternatives

The analysis contained in the PEIS indicates that all the "Action" alternatives for disposal of contaminated sediment are technically feasible today. The conceptual MUDS facility designs

presented and described in the PEIS can be modified to include site-specific considerations and built for effective long-term containment of sediment contaminants. For example, aquatic dikes can be engineered to withstand a certain level of seismic activity and prevent slow release of contaminants. Upland CDFs can be designed with liners to help collect and treat contaminants contained in leachate, although risks still remain. Furthermore, all disposal facility alternatives can be monitored to ensure contaminants are effectively confined. For example, there is ample national and regional experience with how to monitor the long-term stability of sediment caps. There is also an extensive body of knowledge on monitoring the effectiveness of solid waste landfill liners, as well as leachate collection and treatment systems, that can be applied to an upland CDF.

Disposal of contaminated sediment at existing solid waste landfills can be environmentally protective and address regional needs, but at the expense of lost capacity for disposal of municipal garbage. Current costs (dollars per cubic yard) for disposing of sediment in landfills has been prohibitive to some, and disposal rates for such practice in the future may or may not be competitive with costs for disposal at a MUDS facility. From a technical perspective, it is feasible for a private party to design and build a MUDS facility on private property. However, at least one previous attempt to build such a facility was unsuccessful, due in part to major liability concerns. These liability concerns will need to be resolved for this alternative to become a practical reality.

Large-scale, cost-competitive decontamination or treatment of contaminated sediment does not appear to be feasible today (in Puget Sound), but is still very promising. Many conceptual treatment strategies and their technical feasibility have been proposed and investigated. Some technologies have proven to be effective in reducing or removing contaminants from sediment, but are not yet cost-competitive when operated on a commercial scale. Other approaches propose treating contaminated sediment, using technology available for treating different raw materials or wastes on a commercial scale. Still others remain unsubstantiated from a technical perspective. Most decontamination or treatment processes result in usable products, by-products and wastes, some of which may not be publicly acceptable or easily disposed.

Although it appears that decontamination or treatment of sediment on a commercial scale is not yet feasible, there may be other factors that make this alternative as timely as building a MUDS facility. These include a potentially greater public acceptance of a treatment facility, endangered species listings, political will, regulatory preference for reuse/recycling of materials, and the time required to obtain necessary facility permits.

6.2.6.3 Cost-Competitiveness of Alternatives

The cost to dispose of or treat contaminated sediment at either a multi-user disposal facility or multi-user sediment treatment facility must closely approximate that of existing disposal options. Although some degree of subsidization of disposal or treatment fees may be publicly acceptable, a MUDS facility must be cost-competitive or offer significant non-dollar advantages for it to be successful.

Although not all of the costs associated with building, operating, closing and monitoring a MUDS have been identified, and some cannot be quantified easily at a programmatic level, there appears to be overlap between the disposal cost projected for the three conceptually designed MUDS facilities and the existing available alternatives (see Paragraph 5.2.4, Alternatives). This indicates that all "Action" alternatives can be cost-competitive on a site-specific basis. In other words, a confined disposal facility can be designed for a specific location that will result in user costs for disposal that are competitive with, for example, disposal in existing solid waste landfills.

6.2.6.4 Environmental Impacts

The environmental impacts of building, and to a lesser extent operating, a confined disposal or treatment facility are significant. Building a MUDS would effectively displace 25 to 100 acres (or more) of aquatic or terrestrial habitat, in perpetuity or at least for many years. On-site and adjacent habitat – soil and water resources – would be impaired, with numerous consequences to flora and fauna. However, because of differences in sites and designs, a detailed evaluation of environmental impacts is difficult prior to the preparation of a site-specific EIS. In general, however, an aquatic or nearshore MUDS facility could result in short-term and long-term impacts to aquatic habitat and resources. Impacts from construction of an upland CDF would depend on many factors, but particularly the geophysical and biological characteristics of the site selected and its nearby surroundings. The likely impacts would be similar to ones expected for existing solid waste landfills, except for the impacts associated with return flows resulting from the dewatering of sediments. It is difficult to evaluate the environmental impacts resulting from decontamination or treatment of contaminated sediments because there are many strategies and technologies that might be involved. The impacts would be evaluated at the site-specific phase when more information on specific treatment technologies, wastes, and by-products is available. Any MUDS disposal or treatment facility would likely result in an increase in barge, train and/or truck traffic and associated air pollution and noise.

Not all of the potential impacts identified can be avoided. Nor can adequate mitigation be planned or implemented in all cases. However, many mitigation and management measures can be taken to avoid or greatly reduce possible impacts and/or compensate for those impacts. Building one or more MUDS hastens the isolation and confinement of contaminated sediment from the healthy elements of the Puget Sound environment by facilitating sediment cleanup actions. This translates to a substantial reduction in the environmental impacts associated with "No Action", which derives from the current exposures of biota to surface sediment contaminants, contaminant transfers within food webs and exposure of humans to the biota.

6.2.6.5 Preferred Alternative

The PEIS did not select a single preferred alternative for the disposal or treatment of contaminated sediments from Puget Sound. The documented need for disposal and/or treatment capacity indicated that more than on location and type of facility may likely be required. Central Puget Sound appeared to be the most logical geographic focus of initial siting efforts. Needing more than one location and facility design dictated that maximum flexibility be maintained in selecting both sites and alternatives. For example, the first MUDS site selected might only be

suitable for a CAD facility. A second site might be amenable to both a nearshore and upland CDF. Another location might be suitable for development of a dewatering and decontamination and treatment facility. Or a nearshore site might only be suitable as a rehandling facility where contaminated sediment is dewatered and then transported to an existing landfill. Thus, although there is no preferred alternative in the PEIS, it appeared highly likely that the Combination Alternative is the most realistic eventuality. Over the next ten to twenty years, one could expect continued use of existing landfills, and establishment and use of at least a few of the following: a commercial dewatering facility, one or more MUDS facilities of different design, and a contaminated sediment treatment facility.

"No Action" was not considered an acceptable alternative by either the State of Washington, feasibility study cooperating agencies, or the public or interest groups at large. Although this alternative would continue to result in some limited number of successful sediment cleanup actions, current disposal alternatives provide a lack of adequate disposal capacity that continues to impede the dredging of contaminated sediment for remediation, habitat restoration, channel/harbor maintenance and industrial development. No action would result in a reduction in capacity at solid waste landfills and lost opportunities to dispose of some contaminated sediments that need to be dredged.

6.2.6.6 Trade-offs

On a site-specific basis, the advantages and disadvantages of each disposal or treatment alternative must be viewed in a context that considers the ability to meet regional disposal needs, environmental impacts, cost, irretrievable commitments of public resources, timing issues, policy and liability concerns, and public acceptability. Table 2 summarizes some of the broader advantages, disadvantages, and areas of uncertainty for each alternative based on the information presented in the PEIS.

6.2.6.7 Other Needs

Many additional issues would need to be resolved prior to building a first MUDS facility. Some of these issues include:

- Gaining widespread public support.
- Proceeding with a technically sound and publicly acceptable facility siting process.
- Financing the final design and construction of the facility.
- Determining who would own and operate the facility.
- Implementing meaningful contingency management agreements (that include evaluation and operational procedures and interagency oversight).

Table 2 – Advantages and Disadvantages of Each Alternative

Alternative	Potential Advantages	Potential Disadvantages	Uncertainty/Controversy
No Action	- Less dredging and disturbance of contaminated sediments	- Stalled cleanups/contaminated sediments remain exposed - Only large entities address problem - Potential proliferation of CDFs	-Whether policy/regulatory solutions can address disadvantages
LBC/CAD	- Effective containment - Minimal rehandling - Sediments remain saturated, anaerobic - Few aesthetic impacts - Relatively low cost	- Some contaminant release during placement - Siting may be difficult due to Puget Sound slopes/depths - Requires highly coordinated and relatively costly monitoring/ management - Forecloses some future aquatic land use	- Siting - Use of State-owned Aquatic Land - Tribal fishing rights - Public acceptability
Nearshore CDF	Effective containment - Sediments remain saturated, anaerobic - Can provide public access, habitat as part of design - Commercial/industrial land use following closure - Use of contaminated sediment site for MUDS	- Loss of nearshore aquatic habitat - Uncontrolled pathway (bird/animal foraging) prior to final closure - Aesthetic impacts (view, odor, noise) on shoreline - Forecloses some future nearshore land use - Relatively high cost	- Siting - Permitting/mitigation requirements - Use of State-owned Aquatic Land - Tribal fishing rights
Upland CDF	- Effective containment - No aquatic land or aquatic habitat impacts - Potential abandoned property use - Commercial or recreational land use following closure	- Multiple rehandling and release opportunities - Sediments dried and aerated (contaminants potentially mobilized) - Aesthetic impacts (view, odor, noise) - Siting of CDF and dewatering facility difficult due to real estate constraints - Relatively high cost	- Siting - Public acceptability - Permitting/mitigation requirements
Existing Landfills	- Effective containment - No aquatic land or aquatic habitat impacts - Use of existing permitted facility - No CDF design/permitting issues	- Multiple rehandling and release opportunities - Sediments dried and aerated (contaminants potentially mobilized) - Uses disposal capacity targeted for municipal wastes - Relatively high cost	- Dewatering provided or project-by-project - Exporting contaminants to other regions
Multi-user Access	- Effective containment - Proponent constructs, designs, and manages CDF	- Timing relative to regional need - Liability management	- Project specific
Treatment	- Re-use/recycle - Possible conversion of contaminants to inert forms - No long-term commitment of land resources to contaminated sediment confinement function - Public acceptability	- Mobilization of contaminants and creation of waste side-streams - Potential generation of more hazardous contaminants - Not yet feasible in the region on a large scale	- Research and development needed to determine feasibility in Puget Sound - Site-specific processes and facility configuration not yet defined
Combinations	- Effective containment - Project specific - Most flexible solution	- Project specific - Increased capacity	Project specific

Source: U.S. Army Corps of Engineers, Washington Department of Ecology, and Washington Department of Natural Resources, Puget Sound Confined Disposal Site Study Programmatic Environmental Impact Statement, Prepared by the MUDS interagency team in cooperation with Striplin Environmental Associates, Anchor Environmental, Ogden Beeman Associates, ECO Resource Group, EnviroIssues, and Marshal and Associates (October 1999), Table S-2, Page S-18.

6.3 SITING PHASE INVESTIGATIONS

6.3.1 Introduction

In October 1999, the MUDS agency directors[4] met and directed the Study Team to proceed with a second phase of MUDS project development. The goals of this "siting" phase were to: (a) determine who should own and operate a MUDS facility; (b) identify and select preferred sites for a MUDS disposal or treatment facility; (c) evaluate the feasibility of developing regional capacity to treat contaminated sediment; and (d) actively engage the public. In April 2000, the siting phase was initiated. A team of consultant experts, headed by Science Applications International Corporation (SAIC), was selected to be under contract with the Washington State Department of Ecology to assist the MUDS Study Team in meeting siting phase goals. The siting phase contract with SAIC, completed in 2001, consisted of four major tasks: (a) identification and evaluation of options for management of a multi-user facility; (b) selection of sites for the development of a MUDS facility; (c) evaluation of the feasibility of a large-scale sediment treatment feasibility; and (d) formation of an external advisory committee.

6.3.2 Facility Management Options

6.3.2.1 Background

The facility management options task was comprised of several objectives. A major objective was to develop a short list of MUDS facility site/design configurations that would be most likely to be successful. At least one of each conceptual design (i.e., CAD/LBC, nearshore CDF, dewatering alone, upland CDF, and treatment) would be included in the short list. The evaluation would also determine what level of design would be necessary to evaluate alternative management options for each type of MUDS facility on the short list. Another objective was to evaluate three management options for each MUDS alternative and compile a list of advantages and disadvantages associated with each management option. Still another objective was to develop draft evaluation criteria for selecting one or more management options and use them to recommend preferred options for each type of MUDS facility to the MUDS Study Team and external advisory committee. A final objective was that if public management of a MUDS facility was selected as the preferred option, then a list of barriers discouraging or hindering public management, as well as potential incentives or legislation addressing each barrier, would be compiled.

6.3.2.2 Conclusions Regarding Facility Management Options

The facility management options investigation reached the following conclusions:

- The PEIS identified the most feasible types of new MUDS disposal facilities, including: an upland confined disposal facility (CDF), a nearshore CDF, a confined aquatic

[4] The MUDS agency directors included the Director of Ecology; Commissioner of Public Lands, DNR; Chair, PSWQAT; District Engineer, Corps, Seattle District; Regional Administrator, EPA Region 10; Manager, USFWS Western Washington Office; and Executive Director, WPPA.

disposal/level bottom capping (CAD/LBC) facility, and a dewater/transfer facility which would be used in combination with a disposal facility. Various other combinations of these types of facilities are also feasible. This report confirmed these as the most feasible facility types, described potential scenarios for ownership and operation, and identified the advantages and disadvantages of public and private ownership and/or operation of these types of facilities.

- Based in part on a concurrent analysis of the feasibility of a sediment treatment facility in the Puget Sound region, the MUDS agency directors decided that treatment should be seriously considered as part of the first MUDS facility in Puget Sound. It was considered likely that such a facility would be privately owned and operated, but that the land might be public land, possibly leased to a private operator.

- A survey indicated some private sector interest in owning and operating a MUDS disposal facility. Private firms expressed concern about, and would welcome assistance regarding, siting and permitting, public involvement, public acceptance, financing, and legislation encouraging use of a MUDS facility.

- Developing a MUDS disposal facility in Puget Sound would face significant challenges in terms of economic feasibility, permitting, public resistance, and liability. There are, however, potential institutional solutions to all of these challenges.

- Public agencies and private entities have varying strengths and weaknesses in terms of the principal issues related to owning or operating a MUDS facility. A public-private partnership is likely to be the most feasible arrangement for solving the challenges facing a MUDS facility. The MUDS agency directors determined that a public-private partnership should be pursued as part of developing a MUDS facility in Puget Sound.

- A nearshore CDF is economically feasible under most types of public-private partnerships at a tipping fee of $35-40/cubic yard.

- An upland CDF is economically feasible only under a land lease arrangement at a tipping fee of $60/cubic yard. Other types of arrangements are feasible at higher tipping fees.

- Washington port districts have the authority to perform most of the functions required for owning and operating a MUDS facility.

- The Washington Department of Natural Resources does not have the authority to dispose of or treat *contaminated* sediments from *other than public* lands, but does have most of the other necessary authorities for owning and operating a MUDS facility. The Legislature could grant to the DNR this missing authority, and clarify ambiguous authorities.

- The information and analysis contained in the report should be useful to the MUDS agency directors in determining which public entity should take the necessary steps to

form a partnership with a private sector entity to develop regional capacity for treatment and/or disposal of contaminated sediment.

6.3.3 Facility Siting Process

6.3.3.1 Background

Developing a viable siting process was the goal of the facility siting process task. The task was divided into five subtasks: (a) development of final criteria for siting a facility; (b) designing a process for identifying potential facility sites; (c) identification and screening for these sites; (d) development of a site ranking process, and (e) coordination with the public participation task (discussed later in this section).

The siting process adopted by this phase of the MUDS Program is, in general, the process described in the MUDS PEIS. The process is tiered; it moves from the general to the specific. In the first tier, central Puget Sound was identified as the Geographic Siting Area. This Geographic Siting Area was divided into three smaller, circular siting areas, each forty miles in diameter. These smaller siting areas include the Everett/Port Gardner, Seattle/Elliott Bay, Bremerton/Sinclair Inlet and Tacoma/Commencement Bay regions, which are the locations within central Puget Sound where most of the contaminated sediment is located. The process endorses the concept of Geographic Areas of Interest, and the involvement of representative and diverse interest groups in final siting. The concept of Geographic Areas of Interest carries with it an indication that the lead agency with responsibility for final siting will be open in its communications and willing to negotiate. The process embraces the importance of volunteer communities who may want a MUDS facility in their area. In addition, the process encourages the use of available environmental and non-environmental data, much of which is available on agency websites on the Internet. Finally, the process recommends the early and continuous involvement of local and tribal governments, industry, and the public.

SAIC, in coordination with the MUDS Study Team and the External Advisory Committee, identified 26 environmental and non-environmental criteria for assisting final MUDS siting decisions. Eight of the criteria are preliminary screening criteria. These are used to identify areas that are unlikely to receive further siting consideration. However, there is a screening criteria for Brownfields sites that is a positive screen and that suggests it would be worthwhile to combine Brownfields redevelopment with a MUDS facility. The rest of the criteria are site evaluation criteria. They lend themselves to coordination with natural resource agencies and the public, and could involve discussions about changes in zoning and shoreline management plans. While all of the screening criteria are important, the exercise of applying them makes it evident that some are much more powerful than others in reducing land area from further MUDS consideration.

The application of the preliminary screening criteria identified 9,089 acres of upland, 74,759 acres of nearshore, and 113,002 acres of deep-water area of interest within the central Puget Sound siting area. Brownfields sites were not mapped and are not included in these numbers.

However, the information that would lead to that calculation is included in this report. The application of the site evaluation criteria will reduce the acreage numbers. When shellfish beds were mapped and used to identify nearshore and deep water areas that might be affected by these resources, the nearshore acreage was reduced by 30 percent and the deep-water acreage was reduced by 21 percent. Other natural resource criteria are likely to have a similar effect.

Tribal and military reservation lands are included in the above acreage estimates, but with the understanding that coordination with the tribal and military communities would precede any consideration of these properties for a MUDS facility.

6.3.3.2 Conclusions of the Facility Siting Process Investigation

Principal conclusions of the MUDS facility siting process investigation included the following:

- The siting of contaminated sediment treatment or disposal facilities is achievable through a process that has a strong foundation in good science and engineering, and that is committed to a program of early and continuous involvement of local governments, industry, and the public.

- Volunteer communities represent a very important means to identify viable MUDS facility locations.

- Conservatively defined screening criteria may be too exclusionary, and lead to the elimination of large amounts of real estate. Some of this real estate could lend itself to site-specific evaluation. Some of the screening criteria used in this study may be overly conservative.

- The application of the site evaluation criteria is likely to lead to a significant reduction in the areas of interest for a nearshore or a deepwater-located CAD site. This has at least two implications. This will respond to possible pubic and agency concerns that the Siting Process was designed to give preference to nearshore and CAD MUDS facilities. Additionally, the loss of nearshore and CAD area of interest acreage may be very significant due to the effects of the Endangered Species Act and the general importance of natural resources within central Puget Sound.

6.3.3.3 Recommendations Regarding Facility Siting

The conclusions of the facility siting investigation resulted in the following recommendations:

- There is considerable interest from multiple Federal and state agencies in the MUDS Program, either because of the contaminated sediment management problems it may alleviate, or because of concern about environmental impact of a MUDS facility. Given this fact, the concept of a lead agency with all of the authorities necessary to make MUDS a reality is strongly recommended.

- The lead agency should buy into the siting process, and to the preliminary screening criteria, or they must devise a process and criteria of their own.

- The lead agency should buy into the site evaluation criteria, and to the values and procedures that will affect the application of the site evaluation criteria.

- A geographical information system (GIS)-based siting model would be a useful tool to demonstrate the relative importance of different criteria and evaluation strategies on MUDS siting alternatives. Such a tool was recently devised by the Massachusetts Institute of Technology. It could be modified for the MUDS program quite easily. An effort along these lines is recommended.

6.3.4 Feasibility of Treatment of Contaminated Sediments in Puget Sound

6.3.4.1 Background

While the final PEIS provided a cursory review of sediment treatment (decontamination) techniques and recognized that treatment of contaminated sediments appeared promising, it was clear that more information on these technologies was necessary and eventually they would need to be demonstrated on a larger scale. The evaluation of all aspects of treatment technologies continues to be an ongoing evolutionary process. A key event was the MUDS agency directors in August 2000 determining that the first MUDS sited in Puget Sound should include both disposal and treatment components.

To obtain additional information on the current state of treatment technologies, the scope of work for an in-depth investigation into the feasibility of treatment of contaminated sediments contained the following objectives:

- Identify and evaluate the most technically feasible treatment methods;

- Determine the marketability of products of treatment;

- Assess the potential liability of the products of treatment;

- Characterize the potential environmental impacts of four of the more promising treatment technologies;

- Assess the barrier of episodic flow of sediments on the feasibility of treatment;

- Identify barriers to siting a treatment facility and solutions or incentives that may overcome the barriers; and

- Identify funding mechanisms available for a treatment facility, and, as a pilot project, assess the economics of three public private partnership models for one vendor.

6.3.4.2 Conclusions of the Sediment Treatment Investigation

A number of treatment technologies show promise for treating the contaminated sediments found in Puget Sound on a large or commercial scale. At least one of these technologies has been demonstrated to be feasible at this scale as part of a Brownfields site remediation in Elizabethtown, New Jersey. Several other treatment technologies have been successfully demonstrated at the pilot scale through the WRDA Decontamination Program, but their commercial viability has yet to be demonstrated. The State of New Jersey and the Maryland Port Administration are evaluating additional technologies. New, and improved, treatment technologies continue to emerge.

Economic viability of each of the treatment technologies is based the balance of revenue and costs. Revenues depend to a large degree on the marketability of the products they produce. The limited market study conducted for the treatment investigation was not designed to definitively identify potential markets in the Pacific Northwest for each of the treatment vendors. A detailed market survey would require a substantial effort, and would most effectively be conducted by the vendors themselves, with prescribed evaluation parameters to ensure comparability among vendors. This effort could be included as part of an expanded Request for Proposal (RFP) process if and when a lead agency proceeds with the site-specific phase of sediment treatment facility planning and design.

The sediment treatment investigation identified various challenges to siting a contaminated sediment treatment facility and evaluated potential solutions to each. Some challenges may be a result of perceptions more than reality (e.g., liability associated with treatment products). Most other challenges can be overcome using practical solutions that were identified. The following challenges and solutions are worth highlighting:

1. A significant challenge recognized by the MUDS Study Team and by treatment vendors is the need for a consistent flow of sediments to the treatment/manufacturing process. This challenge could be met through one or more of the following solutions:

- *Building and operating a MUDS facility.* Providing disposal and/or treatment capacity that was cost-competitive with current options may, in and of itself, encourage voluntary and other cleanups (i.e., "build it and they will come").

- *Building capacity to store up to a one-year supply of contaminated sediment.* Whether owned and operated by the public sector or the private treatment vendor, a storage facility would act as a repository from which contaminated sediment can be metered into the treatment process.

- *Identifying and using alternative raw materials when contaminated sediment is not available.*

2. These solutions may need to be coupled with the following institutional changes:

- Legislation, regulatory amendments, and/or policies that provide significant incentives for contaminated sediment to be treated rather than disposed.

- Additional resources from the state legislature aimed at accelerating the remediation of contaminated sediment sites.

- Identification and elimination of any regulatory and policy conflicts that hinder efforts to remediate state-owned aquatic lands.

3. The challenge of public resistance and "NIMBY-ism" is surmountable with extensive public outreach. To improve public acceptability of a treatment facility, the state and the selected treatment vendor must conduct a broad and coordinated public outreach campaign. This campaign should begin as early as possible in the process and include consistent themes such as:

- Creation of a multi-user treatment facility provides a regional solution to lack of adequate capacity for confined disposal or treatment of contaminated sediments.

- Contaminated sediments in Puget Sound adversely affect endangered species, as well as commercial and recreational fishing.

- Removal of contaminated sediments from Puget Sound provides a substantial environmental benefit, while producing a useful product.

- The vendor is siting a manufacturing process that is capable of using contaminated sediments, as well as other precursors, to the final product.

- The process will be permitted so as to provide the same or higher level of environmental protection as other similar manufacturing processes in the state.

Another challenge is the lack of established standards for the products of treatment. There are at least two solutions to this. First, it may be possible that existing guidelines and regulations, product specifications, and technical research could be synthesized into standards for one selected treatment product. This would eliminate the need for development of a variety of standards for various products. A second solution to this challenge is for standards to be applied within a contractual agreement between the private treatment vendor and the lead MUDS agency, eliminating the lengthy and resource intensive rule-making process.

The economic viability of a large-scale multi-user treatment facility may depend on the management option and public/private partnership model chosen, as well as the cost of the waterfront property purchased for the site. Under specific scenarios, large-scale sediment treatment may not only be economically viable but extremely profitable. A turnkey partnership, with 100 percent public financing of capital costs, appears to provide the greatest economic incentive for a treatment vendor, while the privatization model is viable only with land acquisition costs being low. Most interesting is the finding that the land lease partnership alternative is not only economically viable, but may be quite profitable without public financing.

6.3.4.3 Recommended Sediment Treatment Approach

Of the three major economic alternatives evaluated in this study, one alternative was identified as the least costly to the public while providing treatment at a cost that is competitive with existing management options. This alternative proposes a long-term lease of 15 to 18 acres of a host port site for construction and operation of a treatment facility. The site would need to be barge accessible. Three acres of the site would be used to provide upland storage for a year's supply of sediment (100,000 cy). Dewatering of the sediments for storage adjacent to the shoreline would necessitate issuance of a Section 404 Clean Water Act permit, thus eliminating the potential applicability of RCRA based on the dredged material exclusion.

This option is economically viable even assuming market value lease rates of the most expensive port (lease rate of $0.10/square foot-year), with resulting tipping fees between $25 and $30/cy. These tipping fees are within the range of the fees associated with either nearshore confined disposal facility ($28-$46/cy), and only slightly higher than fees for contained aquatic disposal ($15-$21/cy).

This alternative would not require direct government assistance to the vendor, although Bond Cap Allocation Program (BCAP) bonds would further reduce the tipping fee. Alternatively, BCAP bonds could be applied toward the cost of construction of an interim storage area. Thus, construction of an interim storage site could precede selection of a final vendor, with an understanding by the applicant vendors that repayment to the state would be required under specified conditions. This would allow construction of the storage facility to precede construction and operation of the treatment facility and provide for stockpiling sediments. Such an approach provides a solution to the issue of potentially unreliable supply of contaminated sediment and has been demonstrated to be economically viable for at least one vendor.

Interestingly, this recommended alternative might require the least cross-agency coordination and negotiations, further reducing governmental cost through use of agency resources and minimizing time delays required for agency coordination. This alternative would benefit from new incentives, possibly provided through legislative action, for using a MUDS treatment facility if one is available. It would also require a long-term lease agreement with the host port. Most importantly, this alternative could be successfully implemented within a one- to two-year timeframe. Other technically feasible and economically viable alternatives were identified in the course of the sediment treatment investigation, but would probably require either a greater level of government expense/participation and/or require more resources and time to implement.

6.3.4.4 Possible Next Steps Regarding Sediment Treatment

Assuming the pilot testing results conducted under WRDA, the State of New Jersey, and the Maryland Port Administration can be evaluated to eliminate the need for such a pilot testing program in Puget Sound, a number of activities are proposed as possible future action items for specified agencies. These action items might comprise the next steps toward siting a MUDS treatment facility in central Puget Sound (see Table 3).

Table 3 – Summary of Proposed Action Items and Responsible Entity

Proposed Action Item	Responsible Entity
Identify a host port with land available	Lead public agency for MUDS; Port Authorities
Negotiate terms that attract a host port authority to accept the "lead" role in developing a MUDS treatment and/or disposal facility	Lead public agency for MUDS; Port Authorities
Assist the host port with development of the Request for Proposal (RFP) for a contaminated sediment treatment vendor	Lead public agency for MUDS
Evaluate vendor responses and select a vendor	Lead public agency for MUDS; Host Port
Develop a package of incentives, agreeable to the host port, for consideration by the state legislature, and solicit legislative support for the bill	Lead public state agency for MUDS; Host Port
Develop product treatment (beneficial use) standards that will be included in a vendor contract with the host port	Washington Department of Ecology and other state/Federal agencies
Assist the selected vendor with public outreach	Lead public agency for MUDS
Assist the selected vendor with permitting requirements	Designated team from applicable regulatory agencies

6.3.5 External Advisory Committee

6.3.5.1 Purpose

The primary purpose of this work task was to develop a MUDS public participation strategy. To address comments on the draft programmatic EIS that referred to the need for more public involvement with the MUDS project, an External Advisory Committee (EAC) was formed. The EAC was composed of representatives of various interest groups, including environmental organizations, business and industry, marine trade, Native American tribes, local governments, and community groups. Between June 2000 and June 2001, the EAC met several times and reviewed and commented on a number of reports and work products developed by the MUDS agencies and contractors. Recommendations of the EAC are presented below.

6.3.5.2 Recommendations on Facility Management Options

The EAC supported the need for a MUDS-type facility in Puget Sound. The MUDS agency directors believed that any MUDS facility would benefit from some sort of partnership between a lead public agency and the private sector to develop, build, and operate the facility. In entering such a partnership, however, the EAC believed the MUDS agencies should first choose the lead public agency and identify the authorities required for it to be effective. In addition, the risks and liabilities associated with the partnership and developing a MUDS would need to be clearly defined, including environmental liabilities (handling waste streams, opening and closing the

facility), and financial liabilities (risks to business capital, risks to public funds). EAC members felt it was very important that the State of Washington develop the "political will" necessary to define this lead public entity prior to moving forward with siting a MUDS facility.

The EAC recommended a number of issues to be addressed or resolved: (1) the role of the Ports should be determined, as well as those of local governments; (2) in a public/private partnership, there needs to be a balance of public and private financial risks to ensure that public dollars are indeed necessary and that private investment is provided reasonable incentive and assistance; and (3) if there are needs for any legislative actions to support MUDS, they should be identified and actively pursued. Questions also remained on: (4) how a MUDS site would be used after closure; (5) whether out-of-area sediments would be allowed (or necessary) in a MUDS facility; (6) how MUDS can integrate with other sediment programs and projects; and (7) how MUDS would relate to solid waste laws and plans.

6.3.5.3 Recommendations on Facility Siting Process and Criteria

EAC input on the siting process and criteria resulted in additions and changes to the siting strategy and the list of criteria that could be used for screening and evaluating potential MUDS sites. Reiterating the importance of clarifying legal authorities prior to any siting process, the EAC noted that initial decisions on MUDS alternatives, such as requiring that treatment be part of a MUDS facility, would affect the siting criteria and process. Options that would allow communities and individuals to volunteer locations for a MUDS facility should be an important component of the siting process, but how the siting criteria would be applied to volunteer sites would need to be more clearly defined. The MUDS agencies were urged to consider presenting the siting criteria to the broader public, to allow opportunities for refinement of the criteria or to add others that may be important to affected communities. The EAC agreed that the GIS mapping of screening criteria would help identify geographic areas of interest, and would also provide a strong visual tool for the public. However, preliminary maps using screening criteria alone could provide a misleading impression of the number of aquatic areas of interest in Puget Sound. Prior to showing the maps to the public, some of the evaluative criteria should also be overlaid on the maps to show only appropriate areas, and the agencies should explain to the public how the evaluative criteria would be used in determining potential MUDS sites. Other issues that need to be addressed by the MUDS agencies include: (1) whether the screening criteria could be revisited once a potential site is in the evaluative stage, and under what circumstances; (2) how special-use zoning or other site-specific considerations fit with the application of the siting criteria; and (3) how Endangered Species Act listings and subsequent habitat protection plans in Puget Sound would affect the siting of in-water and nearshore confined disposal facilities.

6.3.5.4 Recommendations on Feasibility of a Sediment Treatment

The EAC agreed that incorporating treatment in a MUDS facility was important to ensure that the sediments would be treated to the extent feasible rather than exclusively disposed. A combination of storage and treatment alternatives was believed to be a likely scenario. The EAC suggested that whether or not a "reliable supply" of material was necessary for treatment processes was an important issue that should be addressed in the process of selecting a treatment

vendor. Other important criteria for selection of a treatment vendor included: (1) evaluating the viability of a firm's business as well as its technical processes; (2) defining the actual costs of each treatment method to the extent possible (financial and environmental), as well as the markets for products resulting from treatment; (3) assuring that any vendor had experience working with communities (or was willing to contract for this experience); and (4) evaluating the flexibility of treatment technologies in handling different waste streams and types of sediments. The EAC believed that a Request For Proposal (RFP) could define many of these parameters, but that a lead public agency or entity should be determined prior to issuing a formal RFP. The EAC also thought the process of evaluating treatment technologies should emphasize adequate data for evaluation, but should not overemphasize data availability to the exclusion of emerging technologies.

6.3.5.5 Recommendations on Public Involvement and Education

Selecting a site for a MUDS facility will require a high degree of interaction with the public, particularly with potentially affected communities. There was strong support among EAC members for the MUDS agencies to involve the public as early as possible in any decisions, and to be clear whether the public will be merely informing decision makers about public opinions and knowledge or be a partner with an active role in shaping the process and decisions. To this end, the EAC supported a strategy that both educates the public about the need for a MUDS facility, and facilitates broad and active public involvement in shaping decisions. The education component should involve identifying priority audiences, disseminating fact sheets and other materials, developing a video that could be sent to community groups and local government entities, and contacting the press and media. The MUDS agencies should actively engage the public by scheduling meetings in smaller communities, using teleconferencing to facilitate broader participation, and by updating the MUDS web site to support both education and interactive opportunities for involvement.

The EAC believed the advisory committee model used during this phase of MUDS was helpful as a method of engaging interest groups, and that some form of this committee should be included in future MUDS siting efforts. EAC members placed a high value on the ability of the public to see and comment on documents while they were being developed. If an advisory committee continues to participate in the project, the MUDS agencies should recognize that it is not a substitute for involvement of the general public. The agencies should continue to encourage active participation and define creative ways to maintain good attendance of committee members, while assisting members to reach out to other interest groups and the general public.

SECTION 7 – CONCLUSIONS AND RECOMMENDATION

7.1 CONCLUSIONS

The planning objective for the Puget Sound Confined Disposal Site study was to determine the feasibility of establishing one or more multi-user/multi-source facilities for the management (disposal and/or treatment) of contaminated sediments. The MUDS agencies have long recognized that a common, cost-effective, environmentally acceptable and readily available disposal option is needed to advance our collective abilities to clean up and manage contaminated sediments in the Puget Sound region.

Initially focused on confined disposal capacity, the multi-agency CSMP widened the MUDS feasibility study scope in late 2000 to also investigate sediment treatment technologies as a component of any management option(s) that might ultimately be recommended for Federal and/or State of Washington implementation. The MUDS Study Team was hopeful that their collective efforts would establish the foundation upon which the management of contaminated sediments disposal (either long-term confinement or treatment) would be taken over by the private sector. It was assumed, however, that the public sector (Federal and/or State of Washington) would need to construct and operate one or more MUDS facilities initially in order to demonstrate its utility and viability and also to work out a variety of liability concerns.

7.1.1 Rationale for Not Proceeding with Facility Siting and Construction

By mid-year of 2001, the MUDS project was at a crossroads. Based upon the findings presented in Programmatic and Siting Phase documents, and related developments taking place after these documents were completed, the MUDS Executive Committee and Study Team evaluated the progress and direction of the entire MUDS project and reached concurrence on a number of conclusions and a specific recommendation to the MUDS agency directors that called for heading down a new path. Overtures from private sector regional landfill operators had made it clear that an initial public investment would not be necessary to meet near-term needs for development of a cost-effective and environmentally acceptable solution to the management of contaminated sediments in the Puget Sound region. The operators of both the Roosevelt Regional Landfill in eastern Washington (Regional Disposal Company) and the Columbia Ridge Landfill in northern Oregon (Waste Management, Incorporated) made it known that they had made business decisions to offer their facilities as repositories for contaminated dredged material and were prepared to offer competitive rates to the dredging community. Promotional brochures for the Roosevelt Regional Landfill estimate the cost of transporting and disposing of Puget Sound sediments at $30 to $36/cy ($25 to $30/ton). This compares to rates in the mid-1990's that ranged from $46 to $66/cy. These rates are all exclusive of dredging and transport costs to the dewatering/transfer site.

The Executive Committee and Study Team believed that the course of the feasibility study should change, and that any further planning efforts to site and construct a MUDS facility should be placed on-hold. They concluded that it would be neither prudent nor necessary to continue to pursue siting and construction of either an aquatic disposal facility or an upland disposal facility

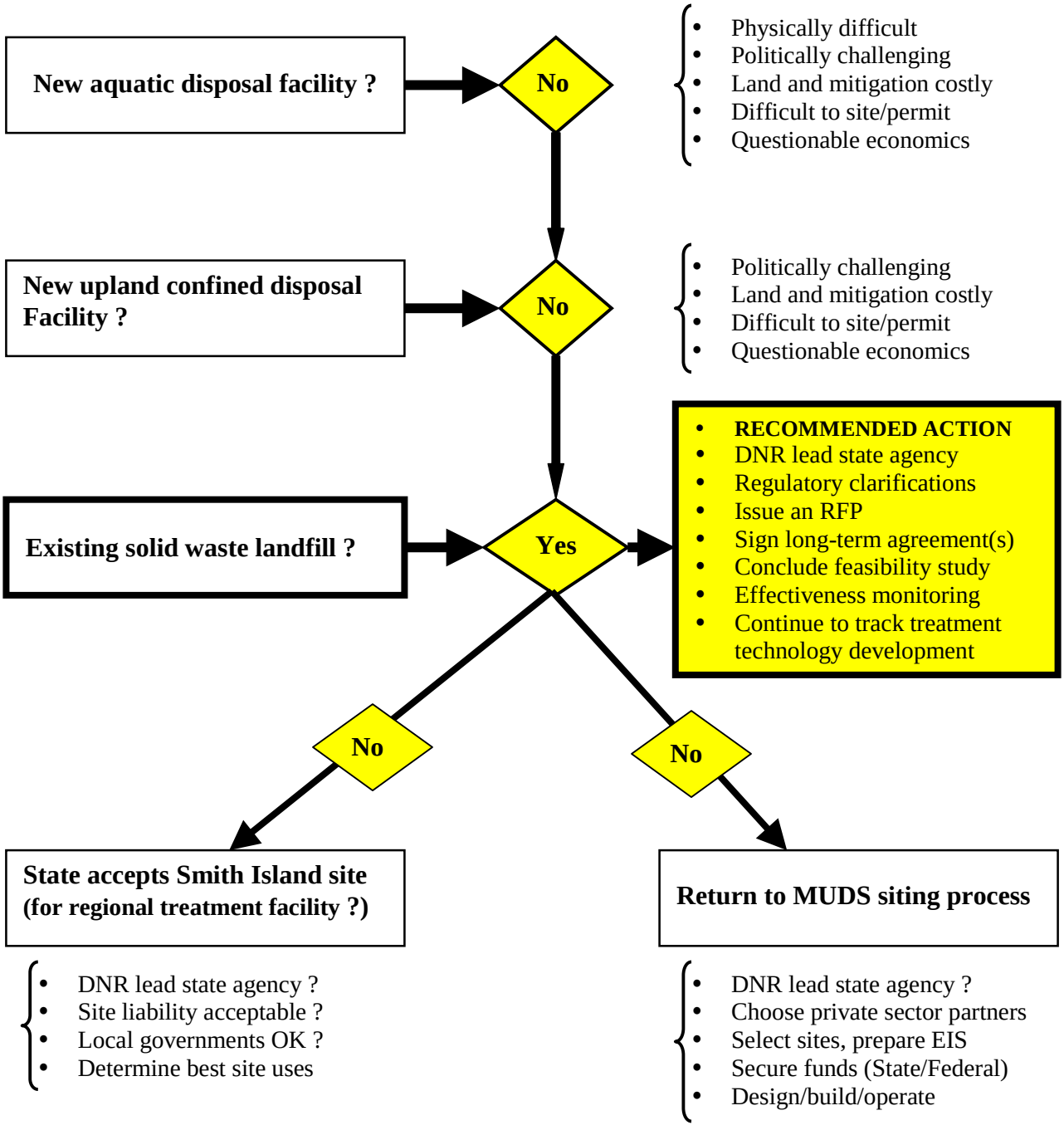
for contaminated marine sediments. The availability of one or more existing solid waste landfills for cost-effective disposal of contaminated sediment was an important consideration. From an economic standpoint, this availability meant that the need to site and construct a new MUDS facility of any kind was effectively eliminated for the foreseeable future. Site-specific investigations indicated that neither an aquatic or new upland disposal facility could have tipping fees that were competitive with those that could be assured through a long-term agreement with existing solid waste landfill operators. Moreover, the site-specific studies demonstrated that there were considerable obstacles, especially environmental and financial, that made it likely that siting and constructing such a facility, especially in the near term, would not be successful. Siting would be also be politically challenging, with a resource-intensive and uncertain permitting process. Land costs and mitigation would be very costly, as would long-term site performance monitoring. It became quite clear that it would not be rational to continue to pursue facility siting and construction funding when the private sector was expressing a willingness and immediate ability to meet regional needs for disposal and management of contaminated sediments.

7.1.2 Rationale for Reliance on Existing Solid Waste Landfill Disposal

This new interest from the private sector strongly suggested that a primarily local government/ private sector solution was achievable and desirable to meet foreseeable needs for management of contaminated sediment. This would provide a near-term disposal option to the dredging community and preclude the need for appreciable public investment. Adequate disposal capacity to meet regional needs, at a reasonable and affordable cost, is available at one or more existing regional solid waste landfills. Contaminated sediment could easily be transported by rail to landfills from most Puget Sound port locations. The Study Team felt that one or more long-term agreements between local governments and/or solid waste landfill owner/operators and the Washington Department of Natural Resources (DNR) could be executed through a competitive procurement process. Such an agreement would provide both public and private dredgers with a predictable tipping fee structure for disposal of contaminated sediment. The landfill option will work most obviously for large dredging projects that would benefits from economies of scale in the tipping fee structure. Small projects might not, however, be as able to take full advantage of the solid waste landfill option, but the Study Team believed that this could be handled on a case-by-case basis.

In August 2001, a joint recommendation of the Executive Committee and Study Team was made to the MUDS agency directors for a change in the course of the feasibility study from any further effort to site and construct a MUDS facility to consideration of developing an agreement with one or more private-sector solid waste landfill operators. The decision process leading to this conclusion is shown graphically in Figure 4. Contaminated sediment disposal capacity at existing solid waste landfills is immediately available at a reasonable cost. Further work by the state and Federal agencies should be completed to develop a way for both public and private dredgers to readily access these regional landfills at a predictable cost (perhaps through a long-term interlocal agreement). A number of actions deemed necessary if this disposal option were to be formalized through an agreement were identified. Such an agreement would allow the

Figure 4 – Multi-User Disposal Site (MUDS) Decision Process
(August 2001)



Dredged Material Management Program (DMMP) to provide a programmatic solution for dredged material that is not acceptable for unconfined open-water disposal or beneficial uses. The actions identified included the following:

- **DNR act as lead state agency.** DNR was considered as the most logical state agency to accept "lead state agency" status for administering a long-term agreement with the private sector. Many of the requisite DNR authorities are identified in a March 21, 200l memorandum prepared by the Washington State Attorney General's office.

- **Obtain appropriate regulatory clarifications.** A number of regulatory issues would require clarification, primarily by the Washington State Department of Ecology (Ecology), especially clarification on the status of dredged material as solid waste pursuant to the Federal position provided by EPA's 1999 Hazardous Waste Identification Rule (HWIR).

- **Develop and issue a request-for-proposal (RFP).** The Study Team would utilize consultant support to develop an appropriate RFP. The lead state agency, or other MUDS agency, would be the likely entity to award and administer this contract.

- **Evaluate proposals and sign appropriate agreement(s).** One or more long-term agreements with solid waste landfill operators would ensure dredgers access to this disposal option at a competitive and predictable sediment disposal tipping fee. Each agreement would outline the tipping fee rate structure, custody and liability issues, transfer procedures, allowable sediment characteristics, and related issues. An interlocal agreement would allow the Dredged Material Management Program (DMMP) agencies to provide a programmatic solution for material not passing screening criteria for unconfined open-water disposal. The interlocal agreement would allow for predictable disposal costs and get permit buy-in from all agencies, thereby increasing certainty and expediency for dredgers. Both of these would be especially important to smaller dredgers who typically don't have or understand all options available to them when material is not suitable for unconfined open-water disposal.

- **Work out details necessary to integrate this strategy into the DMMP.** The DMMP would ensure that dredgers are made aware of the solid waste landfill disposal option when sediments are not suitable for unconfined open-water disposal. Dredgers would not be required to utilize this option, though it is expected that most would. There would continue to cases where a dredger wants to fill a slip to create additional terminal space, for example, and would continue to follow the existing permitting process. The point is that the DMMP would publicize the availability of this disposal option.

- **Conclude the Corps/State of Washington feasibility study.** Whether or not a long-term agreement is executed, the MUDS feasibility study would end. This would involve submittal of an abbreviated feasibility report to Corps higher authority on how the project objective was met, followed by a final study cost accounting and termination of the Feasibility Cost Sharing Agreement between the Corps and the State of Washington.

- **Monitor effectiveness of long-term agreements on clean up.** The Study Team was not certain to what extent this or any other disposal option would accelerate cleanup of contaminated marine sediment. The effectiveness of this alternative could be monitored by the DMMP. While cleanup of sediments will no doubt be accelerated to some extent, it may be that cost reduction and a readily available disposal option would not be sufficient to accelerate Puget Sound cleanup. Other incentives, including public subsidization of the cost of dredging, may need to be considered by the multi-agency Cooperative Sediment Management Program (CSMP).

- **Continue building awareness of contaminated sediments as an environmental issue.** The Study Team believes there is significant value in continuing to build public awareness of the effects and consequences of contaminated sediments. As a part of the siting process studies, a public involvement and education strategy was developed that included public outreach materials. These outreach materials, including updating the Ecology MUDS website, could be used in conjunction with public notification activities related to the signing of a long-term disposal agreement.

- **Continue to track development of sediment treatment technology.** The Study Team recommended "keeping the door open" insofar as sediment treatment remediation technology is concerned. The technology has advanced steadily in the past ten years, and continues to do so. The siting studies recognize that while treatment of contaminated sediments appears very promising, the majority of treatment technologies still need to be demonstrated on a large scale. In spite of its high potential, the Study Team identified challenges to the establishment of a large-scale treatment facility in Puget Sound. These include: (1) uncertain initial construction and operating costs; (2) treatment vendors' need for a reliable supply of contaminated sediment to ensure financial viability; (3) regulatory issues; (4) permit requirements; (5) public concern about environmental impacts associated with various treatment processes; (6) markets for products of treatment; (7) potential product liability associated with products of treatment; and (8) uncertain funding sources. None of the challenges appear to be insurmountable, assuming appropriate steps are taken to overcome each one. New treatment technologies continue to emerge, and existing ones to evolve. The CSMP and DMMP will continue to track the progress of contaminated sediment treatment technology nationwide.

The State of Washington, the non-Federal sponsor of the feasibility study, has concurred in the recommendation of the Executive committee and study team that the study objective has been met. The State believes that the near-term needs of the Puget Sound region for environmentally acceptable and cost-effective management of contaminated marine sediment can, indeed, be met by the current private sector interest in providing disposal capacity at existing solid waste landfills. There have been numerous personal overtures over that past year by the two regional landfill operators (i.e., Regional Disposal Company and Waste Management, Incorporated). Both companies have held discussions with Director of the Washington Department of Ecology and the Commissioner of Public Lands from the Department of Natural Resources. The state is satisfied that the private sector solution crafted by the study team is both viable and in the overall public interest. Of particular note is the existence of competition for business between these two firms, and should tend to keep landfill transportation and disposal fees competitive with other

options available to dredgers. The Commissioner of Public Lands has thus concluded that no interlocal agreement with either landfill operator is necessary at this time. The State believes that the study objective has been met and that no further planning effort to site and construct a multi-user disposal facility is necessary at this time. They have thus shifted focus to facilitating actual contaminated sediment cleanups.

7.2 RECOMMENDATION

The Puget Sound Confined Disposal Site Study focused public attention on the issue of contaminated marine sediment disposal and treatment, yielding a number of tools, policies and actions to achieve this success. These efforts have provided the foundation for the private sector to pursue workable solutions and it has become clear that an initial public investment is not necessary to achieve the study objective.

The near-term needs of the Puget Sound region for environmentally acceptable and cost-effective management of contaminated marine sediment can be met by the current private sector interest in providing disposal capacity at existing solid waste landfills. This disposal alternative is immediately available to both public and private dredgers. Accordingly, any further facility siting activities under the guise of the Corps/State feasibility study should be postponed indefinitely. If, in the future, the private sector were either unable or unwilling to continue to provide an affordable and readily available disposal option to dredgers, restarting the siting process for a multi-user contaminated sediment disposal facility could once again become a regional priority. A significant advance in sediment treatment technology, and associated reduction in cost and/or demonstrated regional application, could also rekindle interest in a public/private sediment treatment partnership. More likely, however, the private sector will step forward on its own to provide this type of facility and service as they have done in providing solid waste landfill disposal capacity for contaminated sediments.

I therefore recommend that the Puget Sound Confined Disposal Site Study be terminated, with a finding that no further Federal action is required. The objective and purpose of the feasibility study have been fulfilled.

Date 30 Sep 03

Debra M. Lewis

DEBRA M. LEWIS
Colonel, Corps of Engineers
Commanding

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