

GENERAL SITE INFORMATION, CHARACTERISTICS, AND STATUS

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| Project Name | <u>COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)</u> | ProjectID: 10-08 |
| Last Updated: | 11/20/03 | |
| City: | Tacoma | |
| County: | Pierce | |
| State: | WA | |
| Country: | USA | |
| Bodies of Water: | Commencement Bay at southern end of Puget Sound; intertidal areas; 7 inland waterways | |
| US EPA Region: | X | |
| Status (Active, Complete, or Monitoring Only): | Active | |
| Date On NPL: | 1983 | |
| ROD/ESD Date: | 1989; 1997 (ESD); 1999 (ESD); 2000 (ESD) | |
| Operable Unit: | OU-1 (sediments); OU-5 (source control) | |
| Areas of Concern (length or acres): | Thea Foss Waterway (formerly City Waterway), about 1.2 miles long by about 600 feet wide, narrowing to about 400 feet wide; also, the appended Wheeler-Osgood Waterway, about 1,500 feet long by about 150-200 feet wide. | |
| Other Characteristics of Water Body: | A portion of the width of the Thea Foss Waterway is a designated navigational channel, with a designated water depth of 29 feet (mean low water) at the mouth up to a designated water depth of 19 feet (mean low water) at the head. | |
| Contaminants of Concern: | PAHs; bis (2-ethylhexyl) phthalate (BEP) | |
| Source of Contamination: | Numerous industrial operations; stormwater runoff; contaminated groundwater | |
| Contaminated Area Physical Characteristics: | <p>The overall Commencement Bay Superfund site includes 10-12 square miles of shallow water shoreline, and adjacent land, most of which is highly developed and industrialized. The upland boundaries of the site are defined according to the contours of localized drainage basins that flow into the marine waters. The marine boundary of the site is limited to the shoreline, intertidal areas, bottom sediments, and water of depths less than 60 feet below mean low water level. The nearshore portion of the site is defined as the area along the Ruston shoreline from the mouth of Thea Foss Waterway to Pt. Defiance. The tideflats portion of the site includes the Hylebos, Blair, Sitcum, Milwaukee, St. Paul, Middle, Wheeler-Osgood, and Thea Foss Waterways; the Puyallup River upstream to the Interstate-5 bridge; and the adjacent land areas. In 1996, EPA deleted the St. Paul and Blair Waterways from the NPL.</p> <p>The areas within the waterways that require cleanup have been identified in a 1999 ESD (Reference A-482). The Thea Foss and Wheeler-Osgood Waterways have been organized into Superfund Sediment Management Areas (SSMAs). There are seven SSMAs. The studies that have been completed indicate that the most severe contamination at surface and at depth occurs in segments 6 and 7 and tapers off gradually towards the mouth of Thea Foss in segments 2 and 1. Primary contaminants found throughout the waterways that require cleanup both at surface and subsurface are bis (ethylhexyl) phthalate (BEP) and PAHs. Other contaminants, such as metals, are more localized.</p> | |
| Type of Regulatory Action: | Superfund. Final | |
| Overall Status Summary: | The Commencement Bay Nearshore/Tideflats (CB/NT) site was placed on the NPL in 1983 and an RI/FS at the site was completed in 1988. The RI/FS identified types and levels of chemicals of concern in sediments and developed priority areas based on the potential impact of these chemicals on humans and wildlife. In 1989, EPA issued a ROD that designated two OUs: source | |

GENERAL SITE INFORMATION, CHARACTERISTICS, AND STATUS

| | | |
|----------------------|---|-------------------------|
| Project Name | <u>COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)</u> | ProjectID: 10-08 |
| Last Updated: | 11/20/03 | |

control (OU-5) to focus efforts on controlling upland sources and discharges to the Bay and sediment remediation (OU-1) to focus on cleanup of contaminated sediments at the CB/NT. The Washington Department of Ecology is the lead agency for source control and EPA is the lead agency for sediment remediation.

In addition, the ROD selected the remedial actions to be used at eight of the nine contaminated sediment problem areas identified as being the most contaminated. These problem areas include: 1) Mouth of Hylebos Waterway, 2) Head of Hylebos Waterway, 3) Sitcum Waterway, 4) St. Paul Waterway, 5) Middle Waterway, 6) Mouth of Thea Foss Waterway, 7) Head of Thea Foss Waterway, and 8) Wheeler-Osgood Waterway. The ninth problem area, an area offshore from the Asarco Smelter, is to be addressed by a separate ROD. Problem areas (6), (7), and (8) are this project, 10-08. Problem areas (1) and (2) are in this Database as Project ID 10-01; problem area (3) is in this Database as Project ID 10-05; problem area (5) is Project ID 10-11; and the ninth problem area is Project ID 10-15.

EPA's 1989 ROD for the Site established cleanup levels, called Sediment Quality Objectives (SQOs), for several problem chemicals found to be causing adverse effects to human health and the environment. The SQO for PCBs was set at 150 parts per billion. The ROD required that the SQOs be met within ten years after completion of sediment remedial action. The ROD predicted that if sediments with PCB concentrations greater than a Sediment Remedial Action Level (SRAL) of 240-300 ppb were removed, the 150 ppb PCB SQO would be met in ten years through natural recovery processes. In the 1989 ROD, the volume targeted for remediation in the Thea Foss and Wheeler-Osgood Waterways was 437,000 cy at an estimated cost of \$9.1 million. During pre-design sampling, new data were collected from the Hylebos Waterway showing that approximately twice the amount of sediment originally estimated in the 1989 ROD would require cleanup. Further, EPA lowered the toxicity factor used to assess human cancer risks associated with PCBs. In response to concerns about these issues, EPA decided to reevaluate the PCB sediment cleanup level for the entire Commencement Bay Site. The result is an ESD issued in 1997 in which EPA modified the PCB cleanup level for the entire Site to 450 ppb, to be achieved during cleanup, and 300 ppb, to be achieved within ten years after cleanup through natural recovery processes. (On March 17, 1999, environmental groups filed suit in U.S. District Court against EPA opposing this cleanup level modification; the lawsuit was withdrawn shortly after it was filed). In the 1997 ESD, EPA stated that the volume of sediments requiring remediation in problem areas at the Site are relatively insensitive to the PCB cleanup level, except in the Hylebos Waterway.

Cleanup to 450 ppb is expected to result in a post-cleanup average PCB concentration of less than 150 ppb in all waterways at the Site. EPA estimates that the post-cleanup average PCB sediment concentration after cleanup to 450 ppb will be 74 ppb for the entire Site, 124 ppb for the Hylebos Waterway, and 108 ppb for the Thea Foss Waterway. PCB sediment concentrations are expected to be further reduced over time due to natural recovery processes to approximately 63 ppb for the entire Site, 80 ppb for the Hylebos Waterway, and 81 ppb for the Thea Foss Waterway.

As a result of ongoing pre-remedial design studies of the remaining waterways requiring remedial action (Hylebos, Middle, Thea Foss, and Wheeler-Osgood), USEPA, in November 1999, issued the draft of a second ESD. In general, this draft ESD contains changes to the remedial actions specified in the 1989 ROD regarding: 1) the size of the problem areas, estimated volume of sediments to be removed, and subsequent revised project costs, 2) institutional controls related to contaminated sediments contained onsite, 3) inclusion of enhanced natural recovery as a remedy option, and 4) additional specificity regarding the remedial actions for the

GENERAL SITE INFORMATION, CHARACTERISTICS, AND STATUS

Project Name

COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

Last Updated:

11/20/03

Hylebos, Thea Foss, and Wheeler-Osgood Waterways.

In March 1994, the City of Tacoma entered into an Administrative Order on Consent with EPA to carry-out the design of the remedial action for the Thea Foss and the Wheeler-Osgood waterways. The City subsequently analyzed previous data, conducted additional studies regarding the nature and extent of contamination in the waterways, and prepared a pre-design evaluation. The studies and evaluations included three rounds of sampling, a feasibility study to evaluate cleanup actions for NAPL seeps located at the head of the Thea Foss Waterway, an evaluation of potential disposal sites for dredged contaminated sediments, and an evaluation of the potential for sediment recontamination after cleanup. As a result of this work, areas within the Thea Foss and Wheeler-Osgood Waterways requiring remediation were identified, and designated by seven Superfund Sediment Management Areas (SSMAs).

The proposed remediation of the seven SSMAs would result in a dredging volume of about 620,000 cy and capping volumes in the range of 255,000 to 257,000 cy (1999 ESD). Cap thickness would be a minimum of three feet. The remedial action would result in the complete dredging of approximately 24 acres; dredging and/or capping of approximately 33 acres; natural recovery (including enhanced natural recovery for 4 acres) of approximately 25 acres; and no action for 37 acres. Complete removal of contaminated sediments will occur in a substantial portion of the navigation channel. The cost of this remedy, including disposal of contaminated sediments at the St. Paul Nearshore Fill (to be built as part of the remedy), was estimated at \$35 million (1999 ESD).

In May 2002, the design contractor submitted the final design for remediation to the City of Tacoma Dept. of Public Works and the USEPA, for approval. The quantities in the final design changed (from those proposed in the Explanation of Significant Differences) and included dredging of about 525,000 cy of contaminated sediments, capping about 20 acres of sediments in place, constructing new slopes and erosion protections along 10,000 feet of shoreline, and installing 400 feet of permanent sheetpile bulkhead.

Source control at the Thea Foss Waterway has been difficult since it has three segments, each with its own unique aspects. Source control was completed first for two of the three segments, the Mouth of Thea Foss Waterway (in 1997) and the Wheeler-Osgood Waterway (in 2000). Controlling contaminant sources to the third segment, the Head of the Thea Foss Waterway, proved especially difficult because it is a fairly small area which receives stormwater drainage from a large upland area, and many are older industrial sources. Oil seeps had been found in sediments at the Head of Thea Foss Waterway. In order to control these seeps, they were covered with an absorbent material as part of the clean material cap. In addition, a metal sheetpile wall will be placed at the head of the waterway across its entire width to contain the oil and eliminate its migration to the remainder of the waterway.

In 2003, two consent decrees were lodged in federal district court prescribing performance of the cleanup work by the City of Tacoma, Puget Sound Energy, Advance Ross Sub Company, and Pacificorp, while designating 77 other parties that would pay money to help fund the work. Under the consent decree, the City of Tacoma will clean up 80 percent of the waterway, starting near the SR 509 Bridge down to the mouth of the waterway and including the Wheeler-Osgood Waterway. Puget Sound Energy, Advance Ross Sub Company, and Pacificorp will clean up the other 20 percent of the waterway, an area extending south of the SR 509 Bridge to the head of the waterway.

In early 2003, the City of Tacoma completed six initial projects in preparation for the dredging

GENERAL SITE INFORMATION, CHARACTERISTICS, AND STATUS

| | | |
|----------------------|---|-------------------------|
| Project Name | <u>COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)</u> | ProjectID: 10-08 |
| Last Updated: | 11/20/03 | |

project -- work that had to be completed by February 15 to avoid the "fish window" for salmon and other migratory fish. The six projects included (1) pulling and disposing of 460 pilings; (2) stabilizing shoreline with steel sheetpile; (3) removing slag piles and debris from two wharf areas, and capping with sand and rocks; (4) removing two sunken boats and debris from the waterway banks; (5) excavating debris from along a bank and placement of a cap and grout blanket; and (6) capping another sloped bank along the waterway.

For the remainder of the 2003 construction season, the City of Tacoma has implemented other preparatory projects including removal and disposal of additional pilings; dismantling a marina; and building a new marina to hold boats moved temporarily during dredging. Contractors for the City of Tacoma are also preparing the disposal site in the St. Paul Waterway, where the dredged sediments will be confined. Clean sediments that will be removed from the St. Paul Waterway will be placed on the Puyallup Delta to build up the Delta as a benefit to salmon.

The City of Tacoma portion of the project is expected to include dredging of 525,000 cy, placement of about 210,000 tons of capping material, and habitat mitigation at multiple locations. Dredging is expected to start in 2004 and be completed in 2006. Estimated cost is \$88 million. Dredged material will be disposed into the St. Paul Waterway CDF.

At the Head of the Thea Foss Waterway, Puget Sound Energy, Advance Ross Sub Company, and Pacificorp completed plans to dredge about 7,500 cy of sediments near outfalls, cap the head of the waterway area, and build a submerged barrier wall across the waterway just north of the SR 509 Bridge. Demolition and debris removal preceded dredging and capping. Dredging and capping began in September and completion is expected in February 2004. Habitat restoration along the banks will be placed over an oily seep area near the SR 509 Bridge. The cap for one underwater area will be made of thick plastic, with a 3-to-6-foot sand cap; the cap for the remainder of the area will be a continuous clean layer of soil.

Remedial Action Planned: ☒

Risk Assessment: ☒

Remedial Action Implemented: ☐

Status of Dredging ☐

PRPs: ☒

Contacts: ☒

References: ☒

Modeling: ☐

Fishing Advisory: ☒

Key Conditions: capping; confined disposal facility; dredging; fish spawning limitations; floating oil; natural recovery; navigational dredging component; tidal fluctuations

REMEDIAL ACTION PLANNED

| | | |
|--|---|-------------------------|
| Project Name | <u>COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)</u> | ProjectID: 10-08 |
| Last Updated: | 02/18/02 | |
| Target Sediment Cleanup Standards (TSCS): | <p>Head of Thea Foss: (1) Cadmium – 6.6 ppm after cleanup (SRAL), not greater than 5.1 ppm ten years after cleanup (SQO); (2) Lead – 580 ppm (SRAL), 450 ppm (SQO); (3) HPAH – 22,000 ppb (SRAL), 17,000 (SQO); (4) Mercury – 0.77 ppm (SRAL), 0.59 ppm (SQO).</p> <p>Mouth of Thea Foss: (1) HPAH – 25,000 ppb (SRAL), 17,000 ppb (SQO); (2) Mercury: 0.89 ppm (SRAL), 0.59 ppm (SQO).</p> <p>Wheeler-Osgood: (1) HPAH – 20,000 ppm (SRAL), 17,000 ppm (SQO); zinc – 490 ppm (SEAL), 0.59 ppm (SQO).</p> | |
| How TSCS Established: | <p>The 1989 ROD established cleanup levels, called Sediment Quality Objectives (SQOs), for several problem chemicals in each waterway judged to be causing adverse effects to human health and the environment. For developing SQOs for the site, EPA relied heavily on the 1989 Puget Sound Water Quality Management Plan (PSWMP) which specified goals and policies applicable to the CB/NT area.</p> <p>Two elements of the PSWMP cited in the ROD as being of particular importance to the development of SQOs were 1) standards for classifying sediments having adverse effects (Element P-2) and 2) guidelines for sediment cleanup decisions (Element S-7). The PSWMP provided (in Element P-2) a conceptual target condition, called a Sediment Quality Goal (SQG), that was intended as a long-term goal for the Puget Sound area and was to be achieved through numerous actions over a period of years. The SQG was defined as “the absence of acute or chronic adverse effects on biological resources or significant human health risk.” The SQOs were developed as discrete and measurable target levels for specifically targeted chemicals that, when obtained in the CB/NT, would assist in meeting the SQGs for the Puget Sound area.</p> <p>In addition to SQOs, the ROD also established Sediment Remedial Action Levels (SRALs), developed using mathematical modeling and below which chemical concentrations would be expected to reach SQOs levels within 10 years through natural recovery processes. It appears that SRALs were developed as an upper boundary chemical concentration in sediment, to be used as a basis for the selection of natural recovery as a remedial option.</p> <p>PCBs are an indicator chemical for only the Hylebos. The SQO and the SRAL for PCBs provided in the ROD were 150 ppb and 240-300 ppb, respectively. These values indicate, as an example, that for sediments with existing PCB concentrations at or below the SRAL of 240-300 ppb or where sediments with PCB concentrations greater than the SRAL are removed to between the SRAL and SQO, the SQO of 150 ppb will be achieved in 10 years or less through natural recovery processes. PCBs were not selected as an indicator chemical for the Thea Foss due to the lower surface sediment concentrations that limited potential exposure. It is likely that the EPA’s position is that the removal of sediments in the Thea Foss as a result of the selected indicator chemicals will sufficiently reduce PCB concentrations in surface sediments to acceptable levels.</p> <p>During pre-remedial design sampling, new data were collected from the Hylebos Waterway showing that approximately twice the amount of sediment originally estimated in the ROD would require cleanup. Further, EPA had lowered the toxicity factor used to assess human cancer risks associated with PCBs. In response to concerns about these issues, EPA decided to reevaluate the PCB sediment cleanup level for the entire site. The result is an ESD issued in 1997 in which EPA modified the PCB SRAL for the entire site to 450 ppb and the SQO to 300 ppb.</p> | |

REMEDIAL ACTION PLANNED

| | | |
|----------------------|---|-------------------------|
| Project Name | <u>COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)</u> | ProjectID: 10-08 |
| Last Updated: | 02/18/02 | |

Further, as explained in the 1997 ESD, the PCB TSCS of 450 ppb/300 ppb (ten years):

- Is within the EPA's acceptable risk range for Superfund cleanups and is protective of human health cancer risks. EPA's human health risk calculations show that a PCB SQO of 300 ppb will result in post-cleanup residual risks for persons consuming fish from the Site of 1×10^{-4} for the Hylebos Waterway and the Site as a whole. Residual risks during the ten-year natural recovery period will be only slightly higher, at 1×10^{-4} for the Site and 2×10^{-4} for the Hylebos Waterway.
- Meets the NCP standard for non-cancer risks by providing post-cleanup concentration levels to which the human population, including sensitive subgroups, may be exposed without adverse effect during a lifetime or part of a lifetime, with an adequate margin of safety. Although the non-cancer HQ of 7 for the high-end tribal fishing scenario is greater than one, EPA believes that there is a sufficient margin of safety built into the estimates of toxicity and exposure to provide for protection of human health.
- Is protective of ecological receptors below the 1,000 ppb PCB AET calculated in the 1989 ROD as being protective of benthic infauna, falls between the no adverse effects level and minor adverse effects level as promulgated under the State's SMS to protect aquatic life, and is protective of juvenile salmonids, shorebirds, and piscivorous birds.

The ROD also stipulated that biological test results be used as a means to attain the CB/NT cleanup objective for chemicals for which SQOs were not developed. The ROD allows for conclusions based on chemical data to be overridden by conclusions based on biological data (except for PCBs for which SQOs were derived based on potential human health risks).

Target Bank and Floodplain Cleanup Levels (if applicable): N/A

Other Target: metals

Environmental Sample Data References:

- **Sediment:**
- **Water:**
- **Fish:**

Estimated Target Volume: Removal: 620,000 cy (24 acres); capping 256,000 cy (33 acres); enhanced natural recovery (thin-cap) for 4 acres; natural recovery for 21 acres.

Planned Disposal Method: The St. Paul Nearshore Fill (a nearshore confined disposal facility, to be built), will consist of a containment berm and dike of clean dredge material and/or select fill occupying 13.6 acres constructed across the mouth of the St. Paul Waterway. The area within the wall will need to be deepened to provide sufficient volume for the dredged sediments. New intertidal habitat will be built on the face of the wall.

Estimated Calendar Time to Implement Remedy: Not identified

Estimated Time to Implement Remedy: 1-2 years (2000 ESD)

REMEDIAL ACTION PLANNED

| | | |
|--|--|-------------------------|
| Project Name | <u>COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)</u> | ProjectID: 10-08 |
| Last Updated: | 02/18/02 | |
| Estimated Cost to Implement Remedy: | \$36.9 million (1999 ESD); \$35 million (2000 ESD) | |
| Stated Remedial Action Objectives (and Source): | <p>Source: 1997 ESD: "The cleanup goal for the Commencement Bay problem areas is reduction of contaminant concentrations in sediments to levels that will support a healthy marine environment and will protect the health of people eating seafood from the Bay. The ROD designated biological test requirements and associated sediment chemical concentrations referred to as Sediment Quality Objectives (SQOs) in order to achieve this goal. The goal is established to allow a diverse range of uses in the bay including industrial, commercial, navigation, fisheries, and recreation."</p> <p>"SQOs for all problem chemicals were set based on an evaluation of the ecological and human health risks posed by these chemicals. The SQO for PCBs was based on the human health risk assessment. SQOs for all other chemicals were based on the ecological risk assessment, because the ecologically-based cleanup levels were determined to be also protective of human health."</p> <p>Further, cleanup to 450 ppb is expected to result in a post-cleanup average PCB concentration of less than 150 ppb in all waterways at the site. EPA estimates that the post-cleanup average PCB sediment concentration after cleanup to 450 ppb will be 75 ppb for the entire site, 124 ppb for the Hylebos Waterway, and 108 ppb for the Thea Foss Waterway. PCB sediment concentrations are expected to then be reduced further over time due to natural recovery processes to approximately 63 ppb for the entire site, 80 ppb for the Hylebos Waterway, and 81 ppb for the Thea Foss Waterway.</p> | |
| Measures of Success to be Used: | <p>Implementation of these remedial actions at the Thea Foss and Wheeler-Osgood Waterways is estimated to result in the removal of ~646,000 cy of sediment and the use of 255,000 to 257,000 cy of capping material. The remedial action will result in complete dredging of ~24 acres (mainly within the navigational channel); dredging and/or capping of ~33 acres; natural recovery, including enhanced natural recovery, in ~ 25 acres; and no action in 37 acres.</p> <p>At the Thea Foss Waterway, the selection of natural recovery and/or enhanced natural recovery appears to be based on the SQOs and SRALs for designated indicator chemicals present in surface sediments in each designated area. It appears that the selection of whether to cap or dredge a particular area is more a function of the required water depth following remediation. For areas where the maintenance of the current waterway depth is not critical, mainly along the upland bank areas and the area near the waterway mouth, a cap will be placed directly over sediments contaminated above the SRALs. Where maintenance of a particular depth is important (such as with the required navigational channel depths or for habitat restoration requirements), it appears that dredging will first be performed followed by capping/backfilling as necessary. In SSMA 4 (Wheeler-Osgood Waterway), dredging in two areas will be followed by capping/backfilling to maintain the current depth for habitat benefit.</p> <p>In addition, dredging is being selected in some areas with only surface sediments contaminated above the SRLs if the total depth of contaminated sediments in the area does not exceed ~4 feet. According to Hart Crowser, design contractor for the Thea Foss Waterway sediment remediation project, the amount of material dredged and the areas selected for capping were not always selected using the SRALs. As an example, areas where surface sediments were shown to exceed SRALs but gradually declined to levels below SQOs with depth (to a maximum of about 4 feet below the sediment surface), all contaminated sediments will be removed down to clean sediment. Dredging is being selected in these areas regardless of the need to maintain a</p> | |

REMEDIAL ACTION PLANNED

| | | |
|----------------------|---|-------------------------|
| Project Name | <u>COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)</u> | ProjectID: 10-08 |
| Last Updated: | 02/18/02 | |

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|--|--|
| | minimum water depth. It appears that dredging is being selected as a mass removal technique to eliminate the need for future monitoring in these areas. Thus, the volume of sediment being dredged from the Thea Foss is most likely biased high when compared to the amount of sediment that would be required to be dredged based solely on the use of SRALs. |
| Planned Monitoring and Restoration: | Not identified, however, the following is pertinent from the 1999 ESD: "The cleanup plan for the Thea Foss and Wheeler-Osgood Waterways will result in the dredging and capping of approximately 60 acres of intertidal and subtidal aquatic land. These actions will result in the conversion of 4.6 acres of intertidal habitat in the Thea Foss Waterway to subtidal habitat. The dredging and capping actions also will result in the temporary disruption of fish and wildlife access to and use of construction areas. There will be a time lag until the substrate supports benthic and epibenthic organisms, however, EPA expects re-colonization to be rapid. EPA expects a net increase in sediment quality because of the removal and/or isolation of contaminated materials. Compensatory mitigation will be required to offset any loss of habitat, and provision of soft substrates beneficial to salmonids will be investigated during remedial design and may be required by EPA as part of the cleanup." |
| Agency Position on Sediment Removal (and Source): | <p>ROD, September 1989:</p> <ul style="list-style-type: none">- Main deterrent to dredging is availability of disposal areas. However, confined disposal was selected for seven of the eight problem areas, but selection of type of disposal area (aquatic, nearshore, or upland) was deferred to the design phase when more accurate sediment volumes will be known.- CERCLA does not address maintenance dredging. Contaminated sediments from such dredging will be disposed of per Puget Sound Water Quality or other applicable guidelines. <p>Source: 1997 ESD: Figure A-1 in the 1997 ESD provides an interesting display of Target PCB Cleanup Level vs. Sediment Removal Volume for the Hylebos Waterway. The figure shows that the total contaminated volume (presumably above the background level of 30 ppb PCBs) is 1,115 million cy, yet the contaminated volume above 1 ppm PCBs is only about 75,000 cy. The target removal volume of 508,000 cy is made up of an estimated 247,000 cy of PCB-contaminated sediments and 261,000 cy of sediments contaminated with other (non-PCB) contaminants. Of the 247,000 cy, about 70% is contaminated at < 1 ppm PCBs. Of the 261,000 cy, there is barely a mention in the ESD (only a footnote on page 20) -- and no definition of either the types or levels of contaminants.</p> <p>Source: Responsiveness Summary in 1997 ESD:</p> <ul style="list-style-type: none">• "Cleanup at several Superfund sites with PCB contamination in sediments is limited by practical constraints that are not present at this Site. For example, at many areas in the East Coast and Great Lakes, PCB contamination is so widespread that 1 ppm is the lowest practical PCB cleanup level that can be achieved. At some sites, PCB concentrations are so high (thousands of ppm) that extensive engineering controls are necessary to control migration of PCBs into the water and air during dredging. Because the highest PCB concentrations at this Site are on the order of 25 ppm, potential releases of PCBs during dredging can be controlled much more easily."• "Surface samples represent depths up to 0.3 foot. Surface sample concentrations will be used to evaluate the need for remediation of a given area. Remediation depths are anticipated to be determined by the depth to reach native sediment. Based on existing data, this depth is anticipated to average approximately 7 feet in the Hylebos and roughly 6 feet in the Thea Foss Waterway . . . EPA agrees that the primary exposure to contaminated sediments by aquatic |

REMEDIAL ACTION PLANNED

Project Name

**COMMENCEMENT BAY - PROJECT 3 (Thea Foss
Waterway)**

ProjectID: 10-08

Last Updated:

02/18/02

organisms occurs at the surface layer. Cleanup decisions will be based on PCB concentrations in surface sediment, not concentrations at all depths. At the Site, it has been found that contaminants generally reside in the unconsolidated sediments which lie above the native sediments (i.e., sediments which have accumulated since the waterway was last dredged), and that native sediments contain only low concentrations of contaminants. Therefore, dredging depths were determined based on the depths necessary to reach native sediment. Average residual PCB sediment concentrations were calculated from surface PCB sediment concentrations expected to remain at each sampling station after cleanup."

- "EPA used a cost estimate of \$35 per cubic yard for dredging and disposal of contaminated sediments. This estimate is based on a June 26, 1996, report prepared by Hartman and Associates and other consultants to the Hylebos Cleanup Committee entitled "Hylebos Waterway Pre-Remedial Design Preliminary Disposal Site Evaluation." The report was reviewed by EPA, the U.S. Army Corps of Engineers, and EPA's contractor, Roy F. Weston, Inc. This estimate is also based on experience with the Sitcum Waterway sediment remediation project, which was completed in 1994."
- "The six projects cited (Note: Bayou Bonfouca, Marathon Battery, Waukegan Harbor, GM Central Foundry, New Bedford Harbor, and Sheboygan R.) have significantly different situations and features than the Hylebos Waterway, or other problem areas within the Site. Costs associated with dredging projects are extremely equipment- and location-specific, making it very difficult to reasonably compare costs among different projects unless the specific project requirements and features are compared. PCB contamination levels for the referenced projects are significantly higher than at the Site. Many of the projects listed in the comment have proposed some sort of sediment treatment option, either incineration, low temperature thermal desorption, or fixation/stabilization; and confinement of some type, generally using upland disposal methods. All of these remedial options require operational, equipment and handling methods which add significant costs to these projects, compared to the Site. In addition, the New Bedford project included items such as water treatment, and the Sheboygan project included upland sediment storage, armoring and stabilization, none of which is included in this cleanup plan. This cleanup plan includes capping or dredging and disposal of contaminated sediment in an upland or aquatic disposal facility. Because contaminant concentrations are low compared to other contaminated sites, it is not anticipated that specialized equipment, sediment treatment, water treatment, or special handling will be needed to protect water quality during cleanup. These items justify a significantly reduced unit price estimated for this project, compared to the other projects."
- "In general, the achievement of the cleanup level via dredging is not predominantly a function of dredging technology itself but more a function of how much contaminated material exists and how much requires removal to achieve the cleanup objective. In most areas of Commencement Bay, sediment contamination is associated with overlying unconsolidated sediments. The underlying native sediments are, with a few exceptions, relatively free of contamination. Sediment cores have been used to identify the depth of contaminated material, which in many areas is only a few feet deep. EPA's experience with the St. Paul and Sitcum Waterway cleanups in Commencement Bay shows that cleanup to the Sediment Quality Objectives in the ROD is feasible and, with sufficient sampling, is predictable with regard to schedule and cost."
- "During the initial investigations of the Hylebos Waterway, a side-scan sonar survey was conducted to identify the quantity and location of subsurface debris. This survey showed that there is some metal debris and some sunken logs in the Hylebos Waterway, but the extent of

REMEDIAL ACTION PLANNED

Project Name

COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

Last Updated:

02/18/02

debris was not as great as has been seen at other Puget Sound dredging projects. A similar survey has not yet been conducted for the Thea Foss Waterway, but we have no reason to believe there would be more debris at Thea Foss than at Hylebos Waterway."

- "Dredging plans have not yet been developed for either waterway. These plans will include plans for handling and disposition of debris. The presence of debris is one of the factors to be used in determining the dredging method, as use of a clamshell dredge rather than a hydraulic dredge will minimize difficulties in handling debris. Regardless of the selected dredging method, the debris will most likely be handled and disposed of separately. It is not anticipated that debris handling will significantly impact the cost of the remedy."
- "Capping is one of the sediment confinement options selected in the 1989 ROD. However, capping is only appropriate in areas where there are no or limited navigational constraints and where the cap is not likely to be disturbed through erosion, scour, or future dredging. Capping is precluded in much of the Hylebos Waterway due to these constraints. However, it is being considered for some of the intertidal areas in the Hylebos Waterway and portions of the Thea Foss Waterway."
- "Natural recovery of PCBs at the Site will occur primarily because of burial by clean sediments (sources include the Puyallup River sediment load and small streams entering the waterways). Dechlorination processes are extremely slow and sediment flux to water is negligible because of the binding of PCBs to sediment carbon. In assessing the potential for natural recovery of PCBs at the Site, EPA assumed there would be no biological or chemical degradation of PCBs, and that all natural recovery would be due to burial and mixing with clean sediments."
- "Natural recovery is determined for surface sediment as represented by the biologically active zone (top 10 cm). This is the stratum where most of the sediment-dwelling organisms that serve as prey to fish live. Receptors of concern are not exposed to deeper sediment."
- "EPA agrees that there is uncertainty associated with natural recovery estimates. A complete analysis of natural recovery potential at the Site was not conducted for the reevaluation of the PCB cleanup level. Instead, EPA relied upon the natural recovery estimates in the 1989 ROD."
- "In the revised ESD, EPA has added a requirement that sediments must naturally recover to at least 300 ppb PCBs. Even though EPA has not attempted to quantify uncertainties associated with natural recovery estimates, we believe an estimate of natural recovery to 300 ppb is conservative because it falls at the high end of the range of estimated natural recovery rates for PCBs in the Hylebos Waterway. Using natural recovery rates in the ROD, sediments are predicted to naturally recover to 280 to 225 ppb PCBs following cleanup to 450 ppb. Additional natural recovery modeling will be required as part of pre-design work to verify the estimates in the 1989 ROD."

Source: EPA Fact Sheet, June 1999

"Technical challenges associated with the in-water disposal sites vary. For the confined aquatic disposal (CAD) sites at the mouth of the waterways, the cap would have to be built to withstand erosion since sites like the Mouth of the Hylebos are in high energy areas. For the nearshore fills, berm stability is an issue particularly in the event of an earthquake. For the Hylebos Upper Turning Basin, construction will have to be staged somewhere, and all of this material will have to be moved while accommodating commercial ship traffic, and timed to avoid impacts to migrating

REMEDIAL ACTION PLANNED

Project Name

COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

Last Updated:

02/18/02

salmon."

Source: 1999 ESD

- "The ROD identified natural recovery as an important component of the overall remedy. The expectation is that if the natural processes of sedimentation, chemical degradation, and surface sediment mixing due to bioturbation occur over time, the contaminated sediments will recover to SQOs within 10 years after cleanup. Areas with marginally contaminated sediments that were expected to recover naturally to SQOs within 10 years after sediment remedial action would be initially exempt from sediment remedial action. Monitoring to confirm the long-term effectiveness of natural recovery is required under the ROD, and the need for active sediment remediation will be reconsidered if subsequent monitoring data indicates that natural recovery is not viable in a reasonable timeframe."

"Since the ROD, EPA has added a component to help accelerate the natural recovery process. In certain locations, natural recovery will be enhanced through the application of a thin layer of clean material in specific areas of marginal contamination. This method is being referred to as Enhanced Natural Recovery. The application of minimal volumes of clean material speeds up the natural sedimentation at the outset and enhances the recovery of bottom dwelling animals in surface sediments, which aids in building a larger base of clean material that will cover the marginally contaminated sediments."

- "An additional volume of contaminated sediments in the Hylebos Waterway may require confined disposal if dredged for navigation or future development purposes. Hylebos Waterway is a federally authorized navigation channel with an authorized depth of -30 feet MLLW. EPA is working with the Corps to determine whether the Superfund cleanup can be combined with additional dredging by the Corps at the request of waterway users. This would increase the volume of sediments dredged and require confined disposal, but would address waterway users' concerns about shoaling in the navigation channel. It would also minimize future ecological impacts due to dredging by helping to ensure that no further dredging of the Hylebos Waterway would be needed for many years."

"Some property owners may wish to include additional dredge areas if their future use plans may require dredging and risk future exposure of buried contaminated sediments. Because of the difficulties associated with disposing of contaminated sediments, EPA encourages property owners and waterway users to consider any current or future additional dredging needs and to discuss with EPA whether this dredging can be included with the cleanup."

Source: Reference L -80

CRITERIA FOR SELECTION OF REMEDIAL OPTIONS

The remedial actions for use at the remaining waterways containing contaminated sediments include no action, natural recovery/enhanced natural recovery, dredge and disposal, and in-situ capping. A description of each as they apply to the CB/NT follows:

- No Action: Areas in the waterway that have chemical concentrations below SQOs.
- Natural Recovery/Enhanced Natural Recovery: Reduction in contaminant concentrations within the upper mixed layer of sediment within 10 years following completion of the sediment

REMEDIAL ACTION PLANNED

Project Name

**COMMENCEMENT BAY - PROJECT 3 (Thea Foss
Waterway)**

ProjectID: 10-08

Last Updated:

02/18/02

remedial action through a variety of physical, chemical, or biological processes, with monitoring. The processes which occur over time include chemical degradation, diffusion from the sediment matrix into the water column, burial of contaminated sediments under newly deposited clean material, and mixing of the contaminated sediments with clean sediments above and below through bioturbation.

The 1989 ROD provided the following definitions for the purpose of applying natural recovery at the site:

- Minimum Chemical Concentration: Surface sediment concentrations exceed the long-term cleanup objective.
- Maximum Chemical Concentration: Surface sediment concentrations are less than sediment remedial action cleanup levels.

The 1999 Draft ESD (Reference A-482) loosely outlines the use of enhanced natural recovery and provides a definition of “marginally contaminated sediments” by stating:

“Since the ROD, EPA has added a component to help accelerate the natural recovery process. In certain locations, natural recovery will be enhanced through the application of a thin layer of clean material in specific areas of marginal contamination. This method is being referred to as Enhanced Natural Recovery. The application of minimal volumes of clean material speeds up the natural sedimentation at the outset and enhances the recovery of bottom-dwelling animals in surface sediments, which aids in building a larger base of clean material that will cover the marginally contaminated sediments.”

“At the CB/NT site, EPA considers marginally contaminated sediments as those with chemical concentrations less than the second lowest Apparent Effects Threshold (AET) value (the SQO is set at the lowest AET) or biological test results that do not exceed the minimum cleanup level (MCUL) values under Washington State Sediment Management Standards.”

- Sediment Remedial Action: Areas requiring sediment remedial actions do not meet the SQOs established in the ROD and are not expected to recover naturally within 10 years. Sediment remedial options provided in the ROD are:

- Dredge and Disposal: The removal and disposal of contaminated sediments using either mechanical (i.e., clamshell) or hydraulic (i.e., suction) dredges. Several issues, including production rates and potential water quality impacts, will influence the method of dredging selected for remediation.

- In Situ Capping: A cap of clean sediment or sand (3 feet minimum thickness) placed over contaminated sediments in situ. The cap will be designed to: physically isolate contaminated sediments from ecological receptors, stabilize the contaminated sediments, reduce the potential for contaminant transport into surface sediments by groundwater pathway mechanisms, and provide a surface that promotes colonization by aquatic organisms. Long-term monitoring and maintenance programs will also be required when capping is selected.

Criteria for each remedial option are defined as follows, Hylebos Cleanup Committee 1999:

- “No Action Areas - PCBs less than 300 ppb and either of the following:

REMEDIAL ACTION PLANNED

Project Name

**COMMENCEMENT BAY - PROJECT 3 (Thea Foss
Waterway)**

ProjectID: 10-08

Last Updated:

02/18/02

- Biological data showing no AOC/SQS exceedances
- No chemical SQO exceedances and no biological data”

(Note: “AOC/SQS designation is for biological testing results that exceed the “no adverse biological criteria” set by the Hylebos Pre-Remedial Design Administrative Order on Consent (AOC) and the Sediment Quality Standards (SQS) of the Washington State Sediment Management Standards (WAC 173-204-320), but which do not exceed the Minimum Cleanup Level (MCUL) criteria in the Sediment Management Standards (WAC 173-204-520).)”

- “Natural Recovery Areas - PCBs between 300 and 450 ppb that are predicted to naturally recover to less than 300 ppb within 10 years following sediment remedial action, and/or either of the following:
 - Chemical SQO exceedances predicted to naturally recover to below the SQO within 10 years following sediment remedial action, or
 - One AOC/SQS biological exceedance and one or more chemical SQO exceedances predicted to naturally recover to below the SQO within 10 years following sediment remedial action.”
- “Sediment Remedial Action Areas:
 - Chemical SQO exceedances not predicted to naturally recover to below the SQO within ten years following sediment remedial action, or
 - One AOC/SQS biological exceedance and one or more chemical SQO exceedances not predicted to naturally recover to below the SQO within 10 years following sediment remedial action, or
 - Two AOC/SQS biological exceedances or one MCUL biological exceedance, or PCBs greater than 450 ppb, or PCBs between 300 and 450 ppb not predicted to naturally recover to less than 300 ppb within 10 years following sediment remedial action, or
 - Intertidal areas with SQO exceedances of chemicals (zinc, hexachlorobutadiene, hexachlorobenzene, ethylbenzene) for which the benthic AET sets the SQO and with 2LAET/AET ratios that exceed 2.”
- “Caveats:
 - Boundary confirmation composite samples with biological AOC/SQS exceedances have not been modeled for potential natural recovery because sedimentation rates were calculated from point data.
 - No biological data were collected from Stations IHS-14 and IHS-15. These stations are located on the mudflat adjacent to the 11th Street Bridge. EPA has agreed that these stations are suitable for natural recovery.
 - No biological data were collected from intertidal source material samples (“SM” designations). Samples 220ISM, 3202SM, and 3208SM are composed of anthropogenic materials and are considered potential sources of contamination. These areas will be remediated.”

In addition to these definitions and criteria for the remedial options, the 1999 ESD also provided more specific requirements for the use of institutional controls because of the volume of

REMEDIAL ACTION PLANNED

Project Name

**COMMENCEMENT BAY - PROJECT 3 (Thea Foss
Waterway)**

ProjectID: 10-08

Last Updated:

02/18/02

contaminated sediments that would remain onsite either during natural recovery processes, buried beneath capping material, or deposited in an onsite disposal facility.

RATIONALE FOR IMPLEMENTATION OF REMEDIAL OPTIONS

The Thea Foss and Wheeler-Osgood Waterways both contain sediments contaminated in excess of SQOs along nearly their entire lengths. To assist in expediting the evaluation and cleanup processes for the waterways, EPA divided them into seven Superfund Sediment Management Areas (SSMAs). SSMA 1 is the area located at the mouth of the Thea Foss and SSMA 7 is the area located at its head. SSMA 4 encompasses the entire Wheeler-Osgood Waterway while the other SSMAs cover the remaining areas of the Thea Foss. Studies of waterway sediments indicate that the most severe contamination at surface and at depth occurs at the head of the Thea Foss (SSMAs 6 and 7) and gradually declines toward the mouth of the Thea Foss. In each SSMA, areas of sediments were evaluated for types and concentration levels of contaminants of concern and were compared to SQOs and SRALs to assist in selecting remedial actions.

The selected remedies for each SSMA as presented in the 1999 Draft ESD are presented below:

- SSMA 1 (Station 0+00 to 20+00)

“No action is required in most of this segment except for SSMAs 1e1 and 1e2, where a thick cap will be placed to ensure that an area of sediments contaminated with hexachlorobenzene is remediated. The approximate capping volume required to remediate this area is 15,000 cy of clean material. Because there are some marginal chemical exceedances of SQOs in a number of locations, EPA is requiring natural recovery at the locations where exceedances occur. The remedial action will maintain the current navigable elevation of at least -29 feet MLLW.”

- SSMA 2 (Station 20+00 to 35+00)

“The majority of sampling locations in this segment of the waterway indicate that chemical exceedances are marginal. The City proposed natural recovery for much of this area. However, biological test results indicate some adverse biological effects. Additionally, the projected natural recovery factor (time frame projection for natural recovery) suggests that natural recovery may not be achieved in the entire segment in the 10-year time frame. Therefore, areas where chemical exceedances are unlikely to achieve natural recovery in the 10-year time frame will receive some minimal volume of clean material to enhance the natural recovery process. In addition, a few discreet areas within SSMA 2 require either capping or dredging. SSMA 2a2 which is adjacent to an upland bank will receive a thick cap. Other areas, such as SSMA 2b4 and 2b5 will be dredged approximately four feet to remove all contaminated sediments. While this will eliminate the need for a cap, these areas will be backfilled with clean material to the approximate elevation of surrounding areas. The estimated total volume for dredging and capping/backfilling this segment is approximately 16,000 cy and 15,000 cy, respectively. The remedial action will maintain the current navigable elevation of -29 feet MLLW.”

- SSMA 3 (Station 35+00 to 46+40)

“The majority of areas within SSMA 3 have SQO exceedances that require removal and/or capping. SSMAs in the navigation channel between the 11th Street Bridge and the 15th Street right of way (ROW) (SSMAs 3b1, 3b2, 3b3, 3b4, 3b5a, and 3b5b) will be dredged to a specified elevation of -32 feet MLLW (elevation -30 feet MLLW with a 2-foot over dredge allowance) to

REMEDIAL ACTION PLANNED

Project Name

**COMMENCEMENT BAY - PROJECT 3 (Thea Foss
Waterway)**

ProjectID: 10-08

Last Updated:

02/18/02

remove all contaminants. Post-dredge samples will be taken to assess chemical concentrations of the dredged surface. If necessary, further dredging and/or some amount of capping may be required. Non-channel areas will undergo a combination of cleanup actions, including no action, natural recovery, thick capping, and dredging. SSMA 3al requires no action based on existing conditions. SSMA 3a2 and 3a3 are suitable for natural recovery. Chemical and biological sampling data indicate that sediments in much of SSMA 3cl are suitable for enhanced natural recovery. SSMA 3c2 and 3d are areas suitable for thick capping. The estimated capping volume for this segment is in excess of 26,000 cy; the dredging volume is approximately 220,000 cy. The navigation channel along this section is authorized to an elevation of -22 feet MLLW. As the channel will be dredged to -32 feet MLLW, this remedial action meets navigation requirements.”

- SSMA 4 (Wheeler-Osgood Waterway)

“Chemical exceedances in this segment indicate that active remediation needs to occur in two main areas: SSMA 4a and 4c. These areas will be dredged to remove contaminated sediments. It is expected that all contaminants will be removed. The City's studies suggest that dredging SSMA 4a four feet will remove all contaminants. It is expected that SSMA 4c will be dredged to an elevation of -8 feet MLLW (which includes 1 foot of over dredge) to remove all contaminants. This area will then be capped/backfilled to match the current bathymetry for habitat benefits. Approximately 5,000 cy and 22,100 cy will be dredged from SSMA 4a and 4c (and 4 b), respectively. The total volume of dredge and cap/backfill material from SSMA 4 will be nearly 27,000 and 20,000 cy, respectively. In addition, EPA requires that the need for remedial action, including natural recovery, be reexamined and evaluated against the performance criterion for natural recovery at locations within the City of Tacoma recommended no action area where there are chemical exceedances of the SQOs.”

“The Wheeler-Osgood Waterway is not part of the navigation channel. Current elevations will be maintained. Areas where dredging occurs will be backfilled to surrounding grade.”

- SSMA 5 (Station 46+40 to 52+40)

“The navigation channel along this section is divided into two authorized navigation elevations. Between the 11th Street Bridge and the 15th Street ROW, the navigation channel is authorized to an elevation of -22 feet MLLW. From the 15th Street ROW to Station 52+40, the navigation channel is authorized to an elevation of -19 feet MLLW. These areas (SSMA 5bl, 5b2a, 5b2b, 5b3a, 5b3b and 5b4) will be dredged to a specified elevation of -32 feet MLLW (which includes 2 feet of over dredge) to remove contaminants. It is expected that dredging to this depth will remove all contaminants.”

“Areas outside of the navigation channel will have a combination of remedial actions, including no action, natural recovery, thick capping, and dredging. Although SSMA 5al and 5a3 will require no action based on existing conditions, a portion of these SSMA 5s will be dredged as part of the channel slope. The portion of the bank that the City recommended as a no action area has chemical exceedances of the SQO for copper and zinc. EPA requires that this area be remediated either through thick capping or dredging because banks are not suitable for natural recovery. SSMA 5c and 5a2, which are located along the channel slope, will be partially dredged. Thick caps will completely cover these SSMA 5s to confine remaining contaminants.”

“The remedial actions in this segment will result in total dredge and cap volumes of approximately 108,000 cy and 54,000 cy, respectively.”

REMEDIAL ACTION PLANNED

Project Name

**COMMENCEMENT BAY - PROJECT 3 (Thea Foss
Waterway)**

ProjectID: 10-08

Last Updated:

02/18/02

- SSMA 6 (Station 52+40 to 62+30)

“The navigation channel along this section is authorized to an elevation of - 19 feet MLLW, however, it will be dredged to an elevation of -24 feet MLLW. Data collected by the City suggests that in places contamination may be considerably deeper. Consequently, a thick cap will be placed over dredged surfaces resulting in an elevation of -21 feet MLLW which will be 2 feet below the authorized channel depth.”

“Non-channel areas will receive a combination of no action, natural recovery, dredging and capping. Based on existing conditions, SSMA 6a2a and 6c will require no action. SSMA 6a1 will be monitored for natural recovery. SSMA 6a2b and 6b3, located on the east side of the waterway under the Fishing Fleet, will be dredged to an elevation of -17 feet MLLW to remove all contaminated sediments and accommodate marina users. If feasible, SSMA 6b4 and 6b5 will be dredged to - 15 feet MLLW so that all contaminants are removed and capping would not be required.”

“Dredging these areas will result in more than 92,000 cy of sediment needing disposal. Capping will require approximately 58,000 cy of clean material.”

- SSMA 7 (Stations 62+30 to 72+40 and 77+50 and 80+00)

“Contamination in this segment of the waterway is deep and in excess of the authorized navigation depth of -19 feet MLLW. Sediments in SSMA 7b2 within the navigation channel between Stations 62+30 and 68+00 will be dredged to elevation -26 feet MLLW (elevation -24 feet including 2-foot over dredge). This will result in a channel approximately 5 feet below the required channel depth for navigation (-19 feet MLLW) in this area. In SSMA 7b3a, the dredge cut within the navigation channel will taper from -26 feet MLLW at Station 72+00 to -13 feet MLLW near Station 72+40. A thick cap will be required throughout this area because the majority of sediments at this depth and deeper contain chemical concentrations above SQOs. Following placement of the thick cap, the mudline elevation will be 2 feet below the authorized channel depth up to Station 72+00 and taper to a final elevation of -10 feet MLLW near Station 72+40.”

“Non-channel areas including SSMA 7a and 7b I (located on the east side of the waterway) will be dredged to an elevation of -13 feet MLLW to provide room for potential marinas. WDNR requested that SSMA 7c, 7d1 and 7d2, located on the west side of the waterway, be dredged to - 15 feet MLLW. Dredging to - 15 feet MLLW should result in the removal of all contaminants and thereby eliminate the need for capping. EPA's preference is for the removal of all contaminated sediments, if feasible. Post-dredge sediments containing chemical concentrations in excess of SQOs will require capping.”

“Dredging the channel and slopes will result in approximately 81,000 cy of dredged sediments needing disposal. Caps will be placed throughout SSMA 7 resulting in a total cap volume of approximately 108,000 cy.”

RISK ASSESSMENT

Project Name ***COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)*** ***ProjectID:*** 10-08

Last Updated: 02/09/00

RA Type: Human Health and Ecological

RA Status: Complete

RA Objectives: Not Identified

***Company
Performing RA:*** Versar (Health, 1985); Tetra Tech (Health, 1998); Gradient (1995); Roy F. Weston (1997)

RA Reference Report:

***RA Summary and
Conclusions:*** A lengthy summary of both the ROD and ESD ecological and human health risk analyses results are presented in the ESD. Only a brief overview is presented below. Recognize that the RAs apply to the entire Site, not just the Hylebos Waterway.

Ecological Risk-Based Cleanup Goals (1989 ROD)

"The chemical SQOs for protection of aquatic life were set using the Apparent Effects Threshold (AET) method. An AET is the sediment concentration of a chemical above which statistically significant biological effects are always observed in the test organism used to generate AET values. In other words, if any chemical exceeds its AET value for a particular biological indicator, then an adverse biological effect is predicted for that indicator. The three biological effects used to define the AET-derived SQOs were benthic infauna abundance, amphipod mortality, and oyster larvae abnormality. This method has subsequently been used, with some modifications, to develop the State of Washington's Sediment Management Standards (SMS-Chapter 173-204 WAC). The AET method predicted that a sediment PCB concentration of 1,000 ppb (dry weight) would be protective of aquatic life for the species tested. The AET method does not address bioaccumulation, and thus may underestimate risks to organisms who eat invertebrates or fish contaminated with bioaccumulative compounds like PCBs. It was determined that the SQO for PCBs should be set based on the risks to human health from eating PCB-contaminated seafood, because a lower PCB cleanup level was necessary to protect human health."

Ecological Concerns (1997)

"To re-evaluate ecological concerns in 1997, EPA used information provided by NOAA, FWS, and other sources to evaluate potential threats to wildlife, including invertebrates, fish, and piscivorous (fish-eating) birds, at a range of PCB sediment cleanup levels."

"Although the AET database used to estimate risks to invertebrates was developed using Commencement Bay data, along with data from other areas in Puget Sound, recent biological data collected for the Hylebos Waterway indicate that the AET database may have overestimated the chemical concentration at which impacts were expected to occur."

"For birds, the biomagnification factor (an estimate of contaminant transfer between predators and prey) was developed based on empirical data on alewives and herring gull in the Great Lakes. The accuracy of this estimate when applied to other species, especially species higher on the food chain, is uncertain."

"The calculation of a protective sediment concentration for juvenile salmonids is uncertain because of the extrapolation of Duwamish estuary data to Commencement Bay and application of a biota-sediment accumulation factor (an estimate of the transfer of contaminants from sediments to organisms) developed for bottom fish to a water column species. Use of these data and associated assumptions may either over- or underestimate risks to juvenile salmonids, and should not be extrapolated to other types of fish."

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|----------------------|---|-------------------------|
| Project Name | <u>COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)</u> | ProjectID: 10-08 |
| Last Updated: | 02/09/00 | |

"The estimated HQ's for fish and birds assume that they obtain all of their food from within the Site. The actual foraging habits and foraging range of fish and birds varies by species and in many cases, by season. The assumption used in the ecological risk evaluation will overestimate the exposure of species or individuals with large foraging ranges (such as migratory birds) but the Site-wide risk estimate may underestimate the exposure of resident species that preferentially feed at a specific location."

Summary of Ecological Risk Evaluation (1997)

"In summary, the updated ecological risk analysis showed that the 300 ppb PCB SQO and 450 ppb PCB SRAL is protective of the benthic community, juvenile salmonids, shorebirds and piscivorous birds. Cleanup to the 300 ppb PCB SQO will reduce all HQs estimated for these species to 1 or below."

Human Health Risk Evaluation (1997 ESD)

Exposure Assumptions

"EPA updated the human health risk evaluation and used it as a basis to evaluate the risks associated with a variety of potential PCB cleanup levels. Although EPA's risk assessment methodology has not been modified substantially since the original risk assessment was performed in 1988, some of the exposure and toxicity assumptions have been changed based on new information and new Superfund guidance."

"As with the 1989 ROD, the updated risk evaluation focused on risks due to consumption of PCB-contaminated seafood. The National Contingency Plan (40 CFR Part 300) calls for EPA to use a reasonable maximum exposure (or "high-end") scenario for making Superfund cleanup decisions. EPA also recommends calculating an average exposure scenario for comparison purposes. Four scenarios were used in the updated risk evaluation: average recreational fishing, "high-end" recreational fishing, average tribal fishing, and "high-end" tribal fishing.

Because the Puyallup Tribe of Indians has treaty rights to fish in Commencement Bay, high-end tribal fishing was used as the reasonable maximum exposure scenario for EPA's decision-making purposes."

(Assumed fish ingestion rates ranged from 123 gms per day (20 half-pound fish meals per month) for high-end tribal fishing to 12.3 gms per day (two meals per month) for avg. recreational fishing.)

(The method used for relating future fish PCB concentrations to residual sediment PCB concentrations is not explained with any specificity in the ESD.)

The post-cleanup residual cancer risks, using the high-end tribal fishing scenario and the revised PCB SQO of 300 ppb, are 1.2×10^{-4} for the Site and 1.1×10^{-4} for the Hylebos Waterway, whereas for the revised PCB SRAL of 450 ppb risks are 1.4×10^{-4} for the Site and 1.6×10^{-4} for the Hylebos Waterway. As further explained by EPA in the ESD: "EPA policy states that the upper boundary of the risk range is not a discrete line at 1×10^{-4} . Cleanup to levels slightly greater than 1×10^{-4} may be considered acceptable if justified based on site-specific conditions. People are more likely to fish in more than one location in Commencement Bay than in Hylebos Waterway alone, so the Site-wide risk estimate is the best estimate of risks to area fisherpersons."

POTENTIALLY RESPONSIBLE PARTIES

Project Name COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

PRP Name: PRP INFORMATION NOT RELEASED

PRPID:

Street Address:

City:

State:

KEY CONTACTS

Project Name COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

Last Name: KEY CONTACT INFORMATION NOT RELEASED

Contact ID:

First Name:

Title:

Company:

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State:

Postal Code:

Work Phone # :

Other Phone #:

Fax # :

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REFERENCES

Project Name COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

Reference Type: A

ReferenceID: 492

Title: *Explanation of Significant Differences: Operable Unit 01 - Sediments; and Operable Unit 05 - Sources*

Location: AEM

Category: ROD/Proposed Plan/Action Memo/Decision Document

Prepared by/Author: US EPA Region X

Preparer/Author Address: 1200 Sixth Avenue
Seattle, WA 98101

Prepared For: General Public

Date Published: July 28, 1997

Key Words and Phrases:

Reference Type: A

ReferenceID: 493

Title: *Superfund Fact Sheet - Commencement Bay Nearshore/Tideflats EPA Requests Comments on its Proposal to Modify the Cleanup Level for PCBs in Commencement Bay*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

Preparer/Author Address: 1200 Sixth Avenue
Seattle, WA 98101

Prepared For: General Public

Date Published: March 4, 1997

Key Words and Phrases:

Reference Type: A

ReferenceID: 494

Title: *Superfund Fact Sheet - Commencement Bay Nearshore/Tideflats - Tacoma-Wide Update*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

Preparer/Author Address: 1200 Sixth Avenue
Seattle, WA 98101

Prepared For: General Public

Date Published: February 1997

Key Words and Phrases:

REFERENCES

Project Name COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

Reference Type: A

ReferenceID: 495

Title: *Superfund Fact Sheet - Commencement Bay Nearshore/Tideflats (CB/NT) - Update on Hazardous Waste Cleanup Projects*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

Preparer/Author Address: 1200 Sixth Avenue
Seattle, WA 98101

Prepared For: General Public

Date Published: September 1996

Key Words and Phrases:

Reference Type: A

ReferenceID: 496

Title: *Superfund Fact Sheet - Commencement Bay Nearshore/Tideflats Community Participation for Sediment Disposal*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

Preparer/Author Address: 1200 Sixth Avenue
Seattle, WA 98101

Prepared For: General Public

Date Published: May 29, 1996

Key Words and Phrases:

Reference Type: A

ReferenceID: 497

Title: *Superfund Fact Sheet - Commencement Bay Nearshore/Tideflats (CB/NT) - Update on Hazardous Waste Cleanup Projects*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

Preparer/Author Address: 1200 Sixth Avenue
Seattle, WA 98101

Prepared For: General Public

Date Published: February 1996

Key Words and Phrases:

REFERENCES

Project Name COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

Reference Type: A

ReferenceID: 498

Title: *Superfund Fact Sheet - Commencement Bay
Nearshore/Tideflats - Bay-Wide Update*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

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Address:** 1200 Sixth Avenue
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Prepared For: General Public

Date Published: November 9, 1995

**Key Words and
Phrases:**

Reference Type: A

ReferenceID: 499

Title: *Superfund Fact Sheet - Commencement Bay Nearshore/Tideflats
(CB/NT) - Update on Hazardous Waste Cleanup Projects*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

**Preparer/Author
Address:** 1200 Sixth Avenue
Seattle, WA 98101

Prepared For: General Public

Date Published: August 1995

**Key Words and
Phrases:**

Reference Type: A

ReferenceID: 500

Title: *Superfund Fact Sheet - Commencement Bay
Nearshore/Tideflats - Bay-Wide Update*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

**Preparer/Author
Address:** 1200 Sixth Avenue
Seattle, WA 98101

Prepared For: General Public

Date Published: April 12, 1995

**Key Words and
Phrases:**

REFERENCES

Project Name COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

Reference Type: A

ReferenceID: 501

Title: *Superfund Fact Sheet - Commencement Bay Nearshore/Tideflats (CB/NT) - Update on Hazardous Waste Cleanup Projects*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

Preparer/Author Address: 1200 Sixth Avenue
Seattle, WA 98101

Prepared For: General Public

Date Published: January 1995

Key Words and Phrases:

Reference Type: A

ReferenceID: 502

Title: *Superfund Fact Sheet - Commencement Bay Nearshore/Tideflats (CB/NT) - Update on Hazardous Waste Cleanup Projects*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

Preparer/Author Address: 1200 Sixth Avenue
Seattle, WA 98101

Prepared For: General Public

Date Published: August 1994

Key Words and Phrases:

Reference Type: A

ReferenceID: 503

Title: *Superfund Fact Sheet - Commencement Bay Nearshore/Tideflats (CB/NT) - Update on Hazardous Waste Cleanup Projects*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

Preparer/Author Address: 1200 Sixth Avenue
Seattle, WA 98101

Prepared For: General Public

Date Published: January 24, 1994

Key Words and Phrases:

REFERENCES

Project Name COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

Reference Type: A

ReferenceID: 504

Title: *Superfund Fact Sheet - Commencement Bay
Nearshore/Tideflats - Bay-Wide Update*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

**Preparer/Author
Address:** 1200 Sixth Avenue
Seattle, WA 98101

Prepared For: General Public

Date Published: April 7, 1994

**Key Words and
Phrases:**

Reference Type: A

ReferenceID: 505

Title: *Superfund Fact Sheet - Commencement Bay Nearshore/Tideflats
(CB/NT) - Update on Hazardous Waste Cleanup Projects*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

**Preparer/Author
Address:** 1200 Sixth Avenue
Seattle, WA 98101

Prepared For: General Public

Date Published: November 1992

**Key Words and
Phrases:**

Reference Type: A

ReferenceID: 506

Title: *Superfund Fact Sheet - Commencement Bay Nearshore/Tideflats
(CB/NT) - Update on Hazardous Waste Cleanup Projects*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

**Preparer/Author
Address:** 1200 Sixth Avenue
Seattle, WA 98101

Prepared For: General Public

Date Published: March 1992

**Key Words and
Phrases:**

REFERENCES

Project Name COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

Reference Type: A

ReferenceID: 507

Title: *Superfund Fact Sheet - Commencement Bay
Nearshore/Tideflats - Bay-Wide Update*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

**Preparer/Author
Address:** 1200 Sixth Avenue
Seattle, WA 98101

Prepared For: General Public

Date Published: July 30, 1997

**Key Words and
Phrases:**

Reference Type: A

ReferenceID: 508

Title: *Superfund Fact Sheet - Commencement Bay
Nearshore/Tideflats -
Tacoma-Wide Update*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

**Preparer/Author
Address:** 1200 Sixth Avenue
Seattle, WA 98101

Prepared For: General Public

Date Published: February 1998

**Key Words and
Phrases:**

Reference Type: A

ReferenceID: 509

Title: *Record of Decision: Commencement Bay Nearshore/Tideflats*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

**Preparer/Author
Address:** 1200 Sixth Avenue
Seattle, WA 98101

Prepared For: General Public

Date Published: September 1989

**Key Words and
Phrases:**

REFERENCES

Project Name COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

Reference Type: A

ReferenceID: 510

Title: *Superfund Fact Sheet - Commencement Bay Nearshore/Tideflats (CB/NT) - Update on Hazardous Waste Cleanup Projects*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

Preparer/Author Address: 1200 Sixth Avenue
Seattle, WA 98101

Prepared For: General Public

Date Published: June 1993

Key Words and Phrases:

Reference Type: A

ReferenceID: 511

Title: *General Decision Making Framework for Management of Dredged Material: Example Application to Commencement Bay - Final Report*

Location: AEM

Category: Contaminated Sediments: Disposal Methods

Prepared by/Author: Charles R. Lee, Henry E. Tatem, Dennis L. Brandon, Stratford H. Kay, Richard K. Peddicord, Michael R. Palermo, Norman R. Francingues, Jr.

Preparer/Author Address: U.S. Army Corps of Engineers
US Army Engineer Waterways Experiment Station
Environmental Laboratory
3909 Halls Ferry Road
Vicksburg, MS 39180-6199

Prepared For: State of Washington Department of Ecology
Olympia, WA 98504

Date Published: June 1991

Key Words and Phrases:

REFERENCES

Project Name COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

Reference Type: A

ReferenceID: 512

Title: *Superfund Fact Sheet - Commencement Bay
Nearshore/Tideflats - Tacoma, Washington*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

**Preparer/Author
Address:** 1200 Sixth Avenue
Seattle, WA 98101

Prepared For: General Public

Date Published: November 25, 1996

**Key Words and
Phrases:**

Reference Type: A

ReferenceID: 513

Title: *Superfund Fact Sheet - Commencement Bay
Nearshore/Tideflats - Bay-Wide Update*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

**Preparer/Author
Address:** 1200 Sixth Avenue
Seattle, WA 98101

Prepared For: General Public

Date Published: September 1998

**Key Words and
Phrases:**

Reference Type: A

ReferenceID: 527

Title: *Explanation of Significant Differences: Commencement Bay
Nearshore/Tideflats Superfund Site (Draft)*

Location: AEM

Category: ROD/Proposed Plan/Action Memo/Decision Document

Prepared by/Author: US EPA Region X

**Preparer/Author
Address:** 1200 Sixth Avenue
Seattle, WA 98101

Prepared For: General Public

Date Published: November 1999

**Key Words and
Phrases:** Thea Foss Waterway, Wheeler-Osgood Waterway, Hylebos Waterway

REFERENCES

Project Name COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

Reference Type: A

ReferenceID: 567

Title: *Sediment Management Standards; Table III - Puget Sound Marine Sediment Cleanup Screening Levels and Minimum Cleanup Levels -- Chemical Criteria (Ch. 173-204 WAC-46)*

Location: AEM

Category: Cleanup Levels and Risks

Prepared by/Author: The State of Washington

Preparer/Author Address:

Prepared For: General Public

Date Published: December 29, 1995

Key Words and Phrases:

Reference Type: A

ReferenceID: 568

Title: *Appendix N - Cost Estimates for Thea Foss Waterway Remediation Project (Excerpted from "Round 3 Data Evaluation and Pre-Design Evaluation Report")*

Location: AEM

Category: Cost Summary Reports

Prepared by/Author: City of Tacoma

Preparer/Author Address:

Prepared For:

Date Published: September 1999

Key Words and Phrases:

REFERENCES

Project Name COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

Reference Type: A

ReferenceID: 750

Title: *Superfund Fact Sheet - Commencement Bay/Nearshore
Tideflats - Tacoma, Washington
Final Cleanup Plan and Final Disposal Sites Approved for
Commencement Bay Contaminated Sediments*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

**Preparer/Author
Address:**

Prepared For: General Public

Date Published: August 2000

**Key Words and
Phrases:**

Reference Type: A

ReferenceID: 751

Title: *Explanation of Significant Differences: Commencement Bay
Nearshore/Tideflats Superfund Site*

Location: AEM

Category: ROD/Proposed Plan/Action Memo/Decision Document

Prepared by/Author: US EPA Region X

**Preparer/Author
Address:**

Prepared For: General Public

Date Published: August 2000

**Key Words and
Phrases:**

REFERENCES

Project Name COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

Reference Type: A

ReferenceID: 892

Title: *Round 3 Data Evaluation Report and Pre-Remedial Design Evaluation Report*

Location: AEM

Category: RI/FS

Prepared by/Author: City of Tacoma and Hart Crowser

**Preparer/Author
Address:**

Prepared For: US EPA Region X

Date Published: September 30, 1999

**Key Words and
Phrases:**

Reference Type: A

ReferenceID: 893

Title: *Section 3.0 (Capping Plan) from the 100% Draft Final Design, Design Analysis Report for Thea Foss and Wheeler-Osgood Waterways*

Location: AEM

Category: Capping/Placement

Prepared by/Author: City of Tacoma and Hart Crowser

**Preparer/Author
Address:**

Prepared For: US EPA Region X

Date Published: April 25, 2002

**Key Words and
Phrases:**

REFERENCES

Project Name COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

Reference Type: A

ReferenceID: 1006

Title: *Superfund Fact Sheet: The Department of Justice has announced a 30-day public comment period on three proposed settlement agreements between the U.S. Environmental Protection Agency (EPA) and 111 parties to resolve liability for hazardous waste cleanup at the Hylebos and Thea Foss and Wheeler-Osgood Waterways*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

**Preparer/Author
Address:**

Prepared For: General Public

Date Published: March 2003

**Key Words and
Phrases:**

Reference Type: A

ReferenceID: 1007

Title: *Superfund Fact Sheet: City of Tacoma: Completed Six Initial Cleanup Actions; Plan to Start a Major Dredge Project in August*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

**Preparer/Author
Address:**

Prepared For: General Public

Date Published: March 2003

**Key Words and
Phrases:**

REFERENCES

Project Name COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

Reference Type: A

ReferenceID: 1008

Title: *Environmental Fact Sheet: Proposed Agreement with the Washington Department of Natural Resources - Comments due by November 17, 2003*

Location: AEM

Category: Legal

Prepared by/Author: US EPA Region X

Preparer/Author Address:

Prepared For: General Public

Date Published: October 2003

Key Words and Phrases:

Reference Type: B

ReferenceID: 327

Title: *One Page Summary of RAOs from 1989 ROD.*

Location: AEM

Category: ROD/Proposed Plan/Action Memo/Decision Document

Prepared by/Author: US EPA Region X

Preparer/Author Address: 1200 Sixth Avenue
Seattle, WA 98101

Prepared For: 1989 ROD

Date Published: September 30, 1989

Key Words and Phrases:

Reference Type: B

ReferenceID: 484

Title: *Superfund Fact Sheet - Commencement Bay/Nearshore Tideflats*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

Preparer/Author Address: 1200 Sixth Avenue
Seattle, WA 98101

Prepared For: General Public

Date Published: August 20, 2000

Key Words and Phrases:

REFERENCES

Project Name COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

Reference Type: B

ReferenceID: 712

Title: *Hart Crowser Completes Final Design For Remediation Of The Thea Foss Waterway, Tacoma, WA*

Location: AEM

Category: Site Update

Prepared by/Author: Hart Crowser, Inc.

Preparer/Author Address: 1910 Fairview Avenue East
Seattle, WA 98102-3699

Prepared For: Press Release

Date Published: May 3, 2002

Key Words and Phrases:

Reference Type: B

ReferenceID: 739

Title: *Letter re: (comments on) 100% Draft Final Design, Design Analysis Report (April 25, 2002) - Thea Foss and Wheeler-Osgood Waterways, Commencement Bay/Nearshore Tideflats, Tacoma, Washington*

Location: AEM

Category: Capping/Placement

Prepared by/Author: Piper L. Peterson Lee, Remedial Project Manager

Preparer/Author Address: US EPA Region X

Prepared For: Mary Henley, City of Tacoma, Public Works Department

Date Published: June 17, 2002

Key Words and Phrases:

Reference Type: B

ReferenceID: 969

Title: *e-mail re: Thea Foss Waterway Source Control*

Location: AEM

Category: Site Update

Prepared by/Author: Kris Flint

Preparer/Author Address: US EPA Region X

Prepared For: AEM, Inc.

Date Published: February 15, 2002

Key Words and Phrases:

REFERENCES

Project Name COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

Reference Type: B

ReferenceID: 970

Title: *e-mail re: Thea Foss*

Location: AEM

Category: Site Update

Prepared by/Author: Blasland, Bouck & Lee, Inc.

**Preparer/Author
Address:**

Prepared For: AEM, Inc.

Date Published: October 3, 2002

**Key Words and
Phrases:** map of Thea Foss targeted segments

Reference Type: B

ReferenceID: 1147

Title: *Commencement Bay Newsletter: EPA to Begin the Second Five-Year Review of Commencement Bay*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

**Preparer/Author
Address:**

Prepared For: General Public

Date Published: June 2004

**Key Words and
Phrases:**

Reference Type: C

ReferenceID: 529

Title: *PRPs plan large projects for Commencement Bay*

Location: AEM

Category: Site Update

Prepared by/Author:

**Preparer/Author
Address:**

Prepared For: Superfund Week

Date Published: February 20, 1998

**Key Words and
Phrases:**

REFERENCES

Project Name COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

Reference Type: C

ReferenceID: 530

Title: *EPA Halves Tacoma Cleanup Cost by Relaxing PCB Benchmark*

Location: AEM

Category: Site Update

Prepared by/Author:

Preparer/Author

Address:

Prepared For: Engineering News-Record (ENR)

Date Published: September 1, 1997

**Key Words and
Phrases:**

Reference Type: C

ReferenceID: 531

Title: *Superfund: EPA Drops PCB Cleanup Standard for
Commencement Bay Sediments*

Location: AEM

Category: Site Update

Prepared by/Author: BNA Daily Environment Report, No. 152

Preparer/Author

Address:

Prepared For: General Public

Date Published: August 7, 1997

**Key Words and
Phrases:**

Reference Type: C

ReferenceID: 532

Title: *Polychlorinated Biphenyls: Agency Reaffirms Cleanup Level for
Commencement Bay Superfund Site*

Location: AEM

Category: Site Update

Prepared by/Author: BNA Daily Environment Report, No. 136

Preparer/Author

Address:

Prepared For: General Public

Date Published: July 16, 1998

**Key Words and
Phrases:**

REFERENCES

Project Name COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

Reference Type: C

ReferenceID: 533

Title: *Superfund: Groups Announce Intent to Sue EPA Over Commencement Bay Cleanup*

Location: AEM

Category: Site Update

Prepared by/Author: BNA Daily Environment Report, No. 203

Preparer/Author Address:

Prepared For: General Public

Date Published: October 21, 1998

Key Words and Phrases:

Reference Type: C

ReferenceID: 534

Title: *Superfund: Groups Sue EPA over PCB Cleanup at Washington State Superfund Site*

Location: AEM

Category: Site Update

Prepared by/Author: BNA Daily Environment Report, No. 53

Preparer/Author Address:

Prepared For: General Public

Date Published: March 19, 1999

Key Words and Phrases:

REFERENCES

Project Name COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

Reference Type: C

ReferenceID: 535

Title: *Return to Clean - Washington state's source-control efforts cut metals concentrations in Commencement Bay by a factor of 10*

Location: AEM

Category: Site Update

Prepared by/Author: (1) Dave Smith, (2) Dom Reale, (3) Marv Coleman, (4) Joyce Marcuri, (5) Mohsen Kourehdar, (6) Garin Schrieve, (7) Dan Alexanian, (8) Art Johnson, (9) Dale Norton, and (10) John Summers

Preparer/Author Address: (1 thru 10) Washington Department of Ecology
Southwest Regional Office
Olympia, WA

Prepared For: Water Environment & Technology (WE&T)

Date Published: June 1999

Key Words and Phrases:

Reference Type: C

ReferenceID: 633

Title: *Commencement Bay Dredging Project Could Start as Early as Next Month*

Location: AEM

Category: Site Update

Prepared by/Author:

Preparer/Author Address:

Prepared For: Superfund Week

Date Published: November 24, 2000

Key Words and Phrases:

Reference Type: C

ReferenceID: 1034

Title: *Around the States: Washington*

Location: AEM

Category: Site Update

Prepared by/Author:

Preparer/Author Address:

Prepared For: Hazardous Waste/Superfund Week

Date Published: April 21, 2003

Key Words and Phrases:

REFERENCES

Project Name COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

Reference Type: C

ReferenceID: 1037

Title: *Notice of Future Bidding Opportunity: Thea Foss and Wheeler-Osgood Waterways Sediment Remediation Project*

Location: AEM

Category: Bid Package

Prepared by/Author:

**Preparer/Author
Address:**

Prepared For: Dredging News Online, Issue 100

Date Published: February 21, 2003

**Key Words and
Phrases:**

Reference Type: C

ReferenceID: 1038

Title: *Settlement Reached on Wash. Site; Cleanup Work to Begin Soon*

Location: AEM

Category: Legal

Prepared by/Author:

**Preparer/Author
Address:**

Prepared For: Hazardous Waste/Superfund Week

Date Published: March 10, 2003

**Key Words and
Phrases:**

Reference Type: C

ReferenceID: 1039

Title: *EPA, DOJ Propose Pact On Thea Foss Waterway*

Location: AEM

Category: Site Update

Prepared by/Author:

**Preparer/Author
Address:**

Prepared For: Hazardous Waste/Superfund Week

Date Published: November 10, 2003

**Key Words and
Phrases:**

REFERENCES

Project Name COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

Reference Type: C

ReferenceID: 1073

Title: *Wash.: EPA Approves Cleanup Design*

Location: AEM

Category: Site Update

Prepared by/Author:

Preparer/Author

Address:

Prepared For: Hazardous Waste/Superfund Week

Date Published: February 2, 2004

**Key Words and
Phrases:**

Reference Type: C

ReferenceID: 1102

Title: *Commencement Bay NEWSLETTER, Vol. 1, No. 1*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

Preparer/Author

Address:

Prepared For: General Public

Date Published: May 2003

**Key Words and
Phrases:**

Reference Type: E

ReferenceID: 32

Title: *Interim Status Report: Thea Foss and Wheeler-Osgood
Waterways Clean Up*

Location: AEM

Category: Site Update

Prepared by/Author: (1) P. A. Spadaro, (2) M.L. Henley and (3) J.R. Verduin

Preparer/Author (1 and 3) Hart Crowser, Inc.

Address: 1910 Fairview Avenue East
Seattle, WA 98102

(2) City of Tacoma Public Works Department
2201 Portland Avenue
Tacoma, WA 98102

Prepared For: Proceedings of the WEDA, 1997 (Charleston, SC)

Date Published: June 29 - July 2, 1997

**Key Words and
Phrases:**

REFERENCES

Project Name COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

Reference Type: E

ReferenceID: 191

Title: *Sediment Sequential Risk Mitigation at Thea Foss Waterway Superfund Site*

Location: AEM

Category: Contaminated Sediments: Remedial Options/Guidance

Prepared by/Author: Philip Spadaro

Preparer/Author Address: Hart Crowser, Inc.
Seattle, WA 98102

Prepared For: First International Conference on Remediation of Contaminated Sediments,
Venice, Italy

Date Published: October 10-12, 2001

Key Words and Phrases:

Reference Type: E

ReferenceID: 209

Title: *Thea Foss Waterway Remediation: Design Status Report*

Location: AEM

Category: Remedial Design

Prepared by/Author: (1) S.J. Graalum, (2) P.A. Spadaro, (3) M.L. Henley

Preparer/Author Address: (1), (2) Hart Crowser, Inc.
1910 Fairview Avenue East
Seattle, WA 98102
(3) City of Tacoma Public Works Department
2201 Portland Avenue
Tacoma, WA 98421

Prepared For: Western Dredging Association Twentieth Technical Conference, Warwick,
Rhode Island

Date Published: June 25-28, 2000

Key Words and Phrases:

REFERENCES

Project Name COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)

ProjectID: 10-08

Reference Type: E **ReferenceID:** 216
Title: *Innovative Capping Design and Implementation*
Location: AEM
Category: Capping/Placement
Prepared by/Author: Philip A. Spadaro
Preparer/Author Address: Blasland, Bouck & Lee, Inc.
Prepared For: Sediment Management Seminar 2003
Date Published: February 6-7, 2003
Key Words and Phrases:

Reference Type: L **ReferenceID:** 80
Title: *Memo re: Rationale for Remedy Selection at the Commencement Bay Nearshore/Tideflats Superfund Site*
Location: AEM
Category: Contaminated Sediments: Remedial Options/Guidance
Prepared by/Author: AEM, Inc.
Preparer/Author Address: Malvern, PA 19355
Prepared For: Distribution
Date Published: July 26, 2000
Key Words and Phrases:

Reference Type: L **ReferenceID:** 184
Title: *EPA's Evolving Position on Remedial Dredging*
Location: AEM
Category: ROD/Proposed Plan/Action Memo/Decision Document
Prepared by/Author: AEM, Inc.
Preparer/Author Address: Malvern, PA 19355
Prepared For: Internal Distribution
Date Published: Undated
Key Words and Phrases:

REFERENCES

Project Name **COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)**

ProjectID: 10-08

Reference Type: L

ReferenceID: 233

Title: ***None (Summary Sheet with Dredging Volumes by Location)***

Location: AEM

Category: Site Update

Prepared by/Author: AEM, Inc.

Preparer/Author

Address:

Prepared For: Internal File

Date Published: July 21, 2004

***Key Words and
Phrases:***

FISH ADVISORIES

Project Name ***COMMENCEMENT BAY - PROJECT 3 (Thea Foss Waterway)***

ProjectID: 10-08

Advisory: Commencement Bay

AdvisoryID: 794

Extent: Industrially developed waterways at South end

Pollutant: PCE

Species: all bottomfish

Population: NCGP

Population Definition: No Consumption-General Population: Advise against consumption by the general population.

Advisory Type: Estuary

Advisory Number: 4246

Status (Active or Rescinded): Active

Date Rescinded:

Contact Name: Dave McBride

Contact Number: 360-236-3176

Advisory: Commencement Bay

AdvisoryID: 795

Extent: Industrially developed waterways at South end

Pollutant: PCE

Species: shellfish-crab

Population: NCGP

Population Definition: No Consumption-General Population: Advise against consumption by the general population.

Advisory Type: Estuary

Advisory Number: 4246

Status (Active or Rescinded): Active

Date Rescinded:

Contact Name: Dave McBride

Contact Number: 360-236-3176
