

## **GENERAL SITE INFORMATION, CHARACTERISTICS, AND STATUS**

|   |   |                         |
|---|---|-------------------------|
| <b>Project Name</b>                                   | <b><u>COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)</u></b>   | <b>ProjectID:</b> 10-01 |
| <b>Last Updated:</b>                                  | 11/20/03  |                         |
| <b>City:</b>  | Tacoma  |                         |
| <b>County:</b>  | Pierce  |                         |
| <b>State:</b>   | WA  |                         |
| <b>Country:</b>                                       | USA   |                         |
| <b>Bodies of Water:</b>                               | Commencement Bay at southern end of Puget Sound; intertidal areas; 7 inland waterways   |                         |
| <b>US EPA Region:</b>                                 | X   |                         |
| <b>Status (Active, Complete, or Monitoring Only):</b> | Active  |                         |
| <b>Date On NPL:</b>                                   | 1983  |                         |
| <b>ROD/ESD Date:</b>                                  | 1989; 1997 (ESD); 1999 (ESD); 2000 (ESD); 2003 (proposed ESD)   |                         |
| <b>Operable Unit:</b>                                 | OU-1 (sediments); OU-5 (source control)   |                         |
| <b>Areas of Concern (length or acres):</b>            | Hylebos Waterway; approximately 2.5 miles long; total area of 285 acres; individual target areas, target lengths and acres not yet defined (preliminary estimates in Reference A-383 identify 15 separate target areas for dredging and 9 separate target areas for natural recovery).  |                         |
| <b>Other Characteristics of Water Body:</b>           | Depth of unconsolidated sediments, above native sediments, averages 7 feet. Maximum PCB concentration measured in sediment anywhere at the Commencement Bay Superfund Site is 25 ppm. Maximum measured in Hylebos is 24 ppm. Multiple studies of the Hylebos Waterway show extensive areas of sediments contaminated with chlorinated organic compounds (including PCBs, pesticides, hexachlorobenzene, and hexachlorobutadiene), PAHs, and metals.   |                         |
| <b>Contaminants of Concern:</b>                       | PCBs (1254, 1260); metals; PAHs   |                         |
| <b>Source of Contamination:</b>                       | Industrial operations; stormwater runoff; contaminated groundwater; for the Hylebos Waterway, all identified sources will be under control by early 2000; intertidal sediments are considered the most important and will be addressed following completion of the other source control efforts.  |                         |
| <b>Contaminated Area Physical Characteristics:</b>    | 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. |                         |
| <b>Type of Regulatory Action:</b>                     | Superfund. Final.   |                         |
| <b>Overall Status Summary:</b>                        | 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 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.  |                         |

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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 (1) and (2) are this project, 10-01. Problem area (3) is in this Database as Project ID 10-05; problem area (5) is in this Database as Project ID 10-11; problem areas (6), (7), and (8) are Project ID 10-08; 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 PCBs were removed, the 150 ppb PCB SQO would be met in ten years through natural recovery processes.

During pre-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 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 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.)

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 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.

In the 1997 ESD, EPA stated that the volume of sediments requiring remediation in problem areas at the Site is relatively insensitive to the PCB cleanup level, except in the Hylebos Waterway. Using the 1989 ROD SRAL of 300 ppb PCBs and an updated cost estimate, EPA had calculated a removal program for the Hylebos Waterway (with either confined aquatic or nearshore disposal) of 891,000 cy and \$31 million. Subsequently, with the ESD level of 450 ppb PCBs after cleanup and 300 ppb in ten years, the target for the Hylebos Waterway became 508,000 cy and \$18 million. The 508,000 cy were estimated to be made up of 247,000 cy of PCB-contaminated sediment and 261,000 cy of sediment contaminated with non-PCB contaminants.

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

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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 Hylebos, Thea Foss, and Wheeler-Osgood Waterways.

Based on the pre-design studies, the proposed remediation of the Hylebos Waterway contemplates dredging 845,000 cy from 85.5 acres, capping 11.6 acres (representing 95,000 cy), and allowing natural recovery to remediate 20.7 acres (1999 ESD and 2000 ESD). Areas dredged will be dredged deep enough to expose clean sediments. Proposed removal thicknesses range from 2 to 20 feet, with an average of 6 feet. Disposal of about 640,000 cy of dredged material would be into one newly constructed nearshore confined disposal facility, Blair Slip 1, located at the mouth of the Blair Waterway, and the remainder would be at the Upland Regional Landfill. The cost of this remedy was estimated at \$39.1 million (1999 ESD) and now \$46.1 million (2000 ESD).

EPA also worked with the U.S. Army Corps of Engineers to determine whether the Superfund cleanup could be combined with maintenance dredging of the Hylebos Waterway navigation channel. This would obviously increase the volume of sediments needing dredging and increase the required disposal capacity. As explained by EPA in the 2000 ESD . . . "To pursue any Corps dredging project would require resolution of a number of issues that cannot be fully addressed at this time, including level of interest by private parties. For example, any navigation dredging would need to be initiated by a local sponsor and would require private parties to coordinate with the Corps to determine the precise dredging volume and subsequent cost sharing arrangements required for dredging and disposal. EPA encourages parties with an interest in additional dredging to work together to resolve these issues."

In addition to the pre-design investigations and cleanup planning, source control work has been ongoing. Twenty-nine active industrial facilities on the Hylebos Waterway have been required to take source control actions; all source control work was completed by the end of Summer of 2000.

Pre-design studies pursuant to an AOC, ongoing since 1993, determined that two areas of the Hylebos Waterway should be addressed separately because the materials present are different than the rest of the waterway sediments. In one area, a group of wood products companies (known as the "Wood Debris Group") are investigating the extent of wood debris in the turning basin at the head of Hylebos Waterway and are evaluating options for remediation of the wood debris. A Cleanup Plan was issued; this cleanup work is under state oversight.

In the second area, Occidental Chemical Corporation worked with EPA under a separate AOC to investigate the extent of and cleanup options for sludge-like material and a contaminated intertidal area at the mouth of the Hylebos Waterway. This area is referred to as the "Area 5106 and Embankment Study Area." Area 5106 comprises subtidal sediments contaminated with high levels of organics and is an area which extends about 100 feet into the waterway at low tide. The Embankment area which contains the sludge-like material extends from the waterway inland about 100 feet. Area 5106 will be removed, treated, and disposed of with other Hylebos sediments. The dredged sediments would be treated with slurry aeration before disposal. The treatment plant will be on property owned by Occidental. The treated material is intended to be trucked to the Blair Slip 1 confined disposal facility for disposal. For the embankment area, a trial cap (and later final cap) will be placed on the bank of the former Occidental facility (now Pioneer) and the adjacent former PRI property (now owned by Occidental). Once placed, the trial cap will be monitored for one year. It has been decided that placement of a final cap must wait for removal of both Area 5106 materials and the adjacent Hylebos remedial action for

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sediments.

Two PRPs, General Metals and Atofina Chemicals, agreed to conduct a pilot project at the head of the waterway to collect information on how best to implement the upland disposal option selected in the 2000 ESD. Field work was performed over a one week period in December 2001. The one week effort involved dredging a total of 450 cy from three locations to test the logistics of dredging, off-loading, and transporting sediment to an upland landfill.

Dredging of Area 5106 took place between October 2002 and March 2003. A total of 36,000 cy was hydraulically dredged and piped to a new treatment plant on Occidental property. Primary contaminants were VOCs and SVOCs. The sediments were treated by slurry aeration and then dewatered; dewatered sediment was hauled by truck to the Blair Slip 1 confined disposal facility for disposal. Some heavily contaminated native sediment remained undredged in the waterway, as revealed by post-dredging sampling. As a result, Occidental is evaluating additional remedial measures.

In a separate remedial measure, Occidental plans to install a test cap along 200 feet of shoreline and monitor it for one year. Construction is expected sometime between August 2003 and February 2004. If the test cap proves acceptable, the cap will be extended along 1,700 feet of embankment. The cap is needed because steep slopes, docks, and utility lines make removing and replacing sediments impractical.

In 2002, EPA issued a UAO under CERCLA to General Metals and Atofina Chemicals to perform the cleanup at the Head of Hylebos Waterway. Dredged material will be off-loaded at the Atofina property and will be transported by rail to the Roosevelt Regional Landfill, a permitted Subtitle D solid waste landfill. About 200,000 cy are targeted for removal. In preparation for the dredging, General Metals and Atofina completed cleanup of an intertidal area at the Head of Hylebos. This effort included shoreline cleanup (done during low tides using shore-based equipment) and in-water demolition.

Also in 2002, EPA issued a UAO under CERCLA to the Port of Tacoma and Occidental Chemical to perform the cleanup at the Mouth of Hylebos Waterway. Several areas have been targeted, to be dredged in sequence. To prepare the first area for dredging, north of the 11th Street Bridge, the Port of Tacoma and Occidental accomplished the following:

- Removed two piers, including 3,500 piles taken either to a landfill or a recycling facility;
- Placed clean fill material behind a berm in Blair Silo 5 to prepare the area for new habitat to offset loss of habitat caused by filling Blair Slip 1; and
- Built a berm at the opening of Blair Slip 1 to receive contaminated sediments in 2003, by removing 63,900 cy of sediment from the opening of Blair Slip 1 and replacing it with clean gravel and sand.

The dredging north of the 11th Street Bridge (Mouth of Hylebos) commenced in 2003. The total sediment to be removed is estimated at 489,000 cy. Dredged sediments are being disposed in the Blair Slip 1 confined disposal facility.

Dredging southeast of the 11th Street Bridge (Head of Hybelos) is scheduled to begin in mid-2004. About 400,000 cy of sediment at an estimated cost of \$37 million are targeted for removal and 2,000 linear feet of bank will be capped. Removed sediment is expected to be disposed in

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Roosevelt Regional Landfill. Completion is anticipated by February 2005.

**Remedial Action Planned:**                      ☒

**Risk Assessment:**                      ☒

**Remedial Action Implemented:**                      ☐

**Status of Dredging**                      ☐

**PRPs:**                      ☒

**Contacts:**                      ☒

**References:**                      ☒

**Modeling:**                      ☐

**Fishing Advisory:**                      ☒

**Key Conditions:**                      capping, confined disposal facility, dredging, natural recovery, navigational dredging component, pilot/demonstration test, rail transport for disposal, tidal fluctuations

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**Target Sediment Cleanup Standards (TSCS):** Head of Hylebos: (1) PCBs – 450 ppb after cleanup (SRAL), not greater than 300 ppb ten years after cleanup (SQO); (2) Arsenic – 97 ppm (SRAL), 57 ppm (SQO); (3) HPAH – 32,000 ppb (SRAL), 17,000 (SQO).

Mouth of Hylebos: (1) PCBs – same as for Head of Hylebos; (2) Hexachlorobenzene: 100 ppb (SRAL), 22 ppb (SQO).

**How TSCS Established:** 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.

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.

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.

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.

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

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



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|   | <p>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 x 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 x 10-4 for the Site and 2 x 10-4 for the Hylebos Waterway.</p> <ul style="list-style-type: none"><li>• 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.</li><li>• 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.</li></ul> <p>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).</p> |                         |
| <b>Target Bank and Floodplain Cleanup Levels (if applicable):</b> | Bank and intertidal areas: not identified   |                         |
| <b>Other Target:</b>  | metals; PAHs  |                         |
| <b>Environmental Sample Data References:</b>                      | <ul style="list-style-type: none"><li>• <b>Sediment:</b></li><li>• <b>Water:</b> C-491</li><li>• <b>Fish:</b></li></ul>   |                         |
| <b>Estimated Target Volume:</b>                                   | Removal : 845,000 cy (85 acres); removal or capping 95,000 cy (11 acres); natural recovery for 20 acres.  |                         |
| <b>Planned Disposal Method:</b>                                   | Per the 2000 ESD, up to 640,000 cy into one new nearshore confined disposal facility (CDF) yet to be constructed and the remainder into an Upland Regional Landfill. The CDF, Blair Slip 1, located at the mouth of the Blair Waterway, will involve constructing a berm across the front of an existing slip, depositing dredged material behind the berm, then adding a 7-foot sand cap, which will convert aquatic land to upland. The CDF will be filled completely.  |                         |
| <b>Estimated Calendar Time to Implement Remedy:</b>               | undefined; start in year 2001, earliest   |                         |
| <b>Estimated Time to Implement Remedy:</b>                        | 2-3 years (2000 ESD)  |                         |
| <b>Estimated Cost to Implement Remedy:</b>                        | \$39.1 million (1999 ESD); \$46.1 million (2000 ESD)  |                         |

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| <b>Stated Remedial Action Objectives (and Source):</b>   | <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> |                         |
| <b>Measures of Success to be Used:</b>                   | Not identified   |                         |
| <b>Planned Monitoring and Restoration:</b>               | <p>Not identified, however, the following is pertinent from the 1999 ESD: "This cleanup plan will result in the dredging and/or capping of approximately 96 acres of bottom area over the construction period. These actions include the dredging and capping of 14.1 acres of intertidal and shallow subtidal habitat and the dredging and capping of 78.4 acres of subtidal habitat. In the intertidal area, approximately 2.7 acres of intertidal habitat will be converted to subtidal habitat. The remedial actions may also result in the loss of a very small area of salt marsh (approximately 25 square feet) and an equally small area of mudflat. It may be possible to avoid these areas during development of the final project design. Mitigation will be required to offset any loss of habitat. Habitat quality for the site overall will increase because of the removal of contaminated sediments. Additionally, provision of soft substrates beneficial to salmonids will be investigated during remedial design and may be required by EPA as part of the cleanup."</p>  |                         |
| <b>Agency Position on Sediment Removal (and Source):</b> | <p>ROD, September 1989 (Reference A-58):</p> <ul style="list-style-type: none"><li>- 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.</li><li>- CERCLA does not address maintenance dredging. Contaminated sediments from such dredging will be disposed of per Puget Sound Water Quality or other applicable guidelines.</li></ul> <p>Source: 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</p>  |                         |



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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.

Source: Responsiveness Summary in 1997 ESD (Reference A-20):

- "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 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

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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 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."

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- "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 salmon."

Source: 1999 Draft ESD (Reference A-482)

- "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'

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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-78

### 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 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 (Reference A-58) 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

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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:

- 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

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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 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

For evaluating sediments in the Hylebos, the waterway has been separated into sediment management areas (SMAs), each being identified with one of the three possible remedy selections: No Action, Natural Recovery/Enhanced Natural Recovery, or Sediment Removal. Reportedly, 557 surface sediment samples and 200 subsurface sediment samples (taken from 109 sediment cores) have been collected from the Hylebos since 1990 and analyzed. In addition, also since 1990, sediment biological toxicity has been evaluated from 87 subtidal and 27 intertidal samples typically using one or all of three bioassays: 10-day amphipod, larval development, and Neanthes growth.

The following describes the methodology and rationale used to designate the different areas of the Hylebos as SMAs:

- No Action

No Action areas were identified for the Hylebos based on the criteria described above.

- Natural Recovery/Enhanced Natural Recovery

Natural recovery areas were developed through a series of screening steps to determine areas



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that would meet the criteria described in Section 3.0 (page 7). It is important to note that data collected since 1990 and before indicate that chemical concentrations in nearly all surface sediments in the Hylebos are continuing to decrease, indicating that natural recovery is presently underway.

The following criteria were used to initially identify candidate natural recovery areas based on the results of surface sediment testing, Hylebos Cleanup Committee 1999:

- "Sediment biological testing results that do not meet the "no adverse" biological criteria set by the AOC and the sediment quality standards (SQS) of the Washington State Sediment Management Standards (SMS) [(WAC 173-204-320, (Ecology 1995)], but do not exceed the MCUL criteria of the SMS."
- "In the absence of biological testing results, sediment chemistry results that are between 1 and 2 times the numerical sediment quality objectives."
- "Sediment PCB concentrations in the range of 300-450 ug/kg."

The application of these criteria resulted in the selection of 46 candidate natural recovery stations. A natural recovery model was then used to predict whether sediments from the 46 stations would recover naturally within the required 10-year timeframe. Input parameters to the model included:

- initial sediment concentrations at a station;
- estimated input concentration of new sediment following remediation;
- sedimentation rate;
- sediment mixing rate as a result of burrowing organisms; and
- sediment porosity

Sedimentation was considered a key input parameter. Data from sediment core samples were compared to results from a mathematical model to develop sedimentation rates for input to the natural recovery model. The model output was applied as follows to further refine the number of stations for natural recovery, Hylebos Cleanup Committee 1999:

"For chemicals that exceed the chemical SQOs at the time of sampling, the natural recovery analysis predicted a concentration in the surface sediments after 10 years. The predicted concentration is used to derive a recovery factor for each chemical exceedance. The recovery factor is defined as the ratio of the surface sediment concentration at time zero (Ci) to the concentration predicted to occur 10 years later. The exceedance factor is defined as the ratio of the surface sediment concentration at time zero (Ci) to the SQO. If the recovery factor is greater than the exceedance factor, then the surface sediment is predicted to recover to below the SQO level after a 10-year period following active sediment remediation."

"Stations that had chemicals with recovery factors that were within ten percent of the exceedance factors were considered to possibly recover."

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The application of this methodology resulted in a total of 11 SMAs being designated for natural recovery (20.7 acres). Nearly all of the stations not predicted to recover within 10 years through natural recovery had low sedimentation rates.

- Sediment Remedial Action

Potential sites for remediation were determined using biological and chemical criteria, along with physical factors. Below is a description of the methodology used to evaluate the SMAs within the Hylebos for potential remedial action, Hylebos Cleanup Committee 1999:

“The following designations (MR, AR) were used to indicate the degree of biological risk:”

- “MR. The MR designation is for areas with biological testing results that exceed the MCUL standards of the Washington State Sediment Management Standards (WAC 173-204-520). The MCUL criteria represent a "minor adverse" biological condition in sediment. MR represents a higher level of biological risk than does AR. In addition, for the purpose of this report, MR areas include surface sediment stations where PCB concentrations exceed 450 ug/kg. In subtidal areas, stations with SQO exceedances but no biological data were analyzed for potential natural recovery as appropriate.”

- “AR. The AR designation is for areas with biological testing results that exceed the "no adverse" biological criteria set by the AOC and the sediment quality standards of the Washington State Sediment Management Standards (WAC 173-204-320), but which do not exceed the MCUL criteria described above. In some cases where there has been no biological testing at a station, the AR designation also applies if the chemical concentration is between 1x and 2x the SQO. The AR areas in this report are also not predicted to recover to the SQO in the 10 years following remediation. In addition, AR areas include surface sediment stations with PCB concentrations between 300 and 450 ug/kg that are not predicted to recover to 300 ug/kg within 10 years of remediation.”

“In the absence of biological data and natural recovery analyses, a chemical exceedance factor of 2 (i.e., twice the SQO value) was selected to distinguish between AR and MR areas because it represented the lower end of the range of expected recovery factors (1.2 to over 180), and was below the recovery factor of 2.5 to 6 predicted for many of the natural recovery areas.”

Physical factors were also considered in the decision-making process for the Hylebos Waterway and included: waterway and navigational channel geometry, water currents, side slopes, sediment characteristics, and in-water structures. From these five physical factors, five physical settings, two of which included the HWDS and Area 5106 and Embankment Study Area, were identified which control the remedial approach. The other three physical settings are open access, isolated intertidal areas, and docks/structures. These three are defined as follows, Hylebos Cleanup Committee 1999:

- “Open Access: This designation applies to open water subtidal and adjacent intertidal areas that are fully accessible to a floating derrick or barge and are free of structures that would restrict floating equipment. Remediation of these areas would most likely be completed by floating equipment.”
- “Isolated Intertidal: This designation applies to isolated intertidal areas that are not located immediately adjacent to a subtidal open access remediation area. Remediation of these areas

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would most likely be completed by land-based equipment.”

- “Docks/Structures: This designation applies to areas covered by docks, or behind docks, or adjacent to structures such as bulkheads or retaining walls that limit the access and operation of floating equipment. Remediation of these areas will be significantly more complex than that for open water areas, requiring design on a case-by-case basis.”

Implementation of this evaluation process for the Hylebos Waterway has resulted in 85.5 acres designated for open access sediment remedial actions, 2.8 acres designated for isolated intertidal sediment remedial actions, and 8.8 acres designated for dock/structure remedial actions.

Subsurface sediments were also evaluated for remedial action. As was previously mentioned, surface sediments in the Hylebos generally contain lower levels of contaminants than do deeper, subsurface sediments. The Hylebos Cleanup Committee drew two important conclusions from this finding: 1) it provides evidence that natural recovery processes are occurring in the Hylebos and 2) it indicates that recently deposited surface sediments are not becoming recontaminated as a result of exposure to contaminants in subsurface sediments. These conclusions were used to assist in the decision-making process for determining areas of subsurface sediments to target for remediation.

Twenty sediment stations with elevated subsurface chemical concentrations were identified for inclusion into SMAs for potential remedial action. Another eleven stations are identified for no action or monitoring since it appears that recontamination of surface sediment is not likely at these stations. The decision criteria used to designate subsurface sediment management areas are as follows, Hylebos Cleanup Committee 1999:

- “Surface sediment at the station passed SQO criteria with subsurface samples that passed Puget Sound Dredge Disposal Analysis (PSDDA) biological testing interpretive guidelines. Stations were designated for no action. Three stations fit these criteria.”
- “Surface sediment at the station passed SQO criteria and subsurface samples passed PSDDA chemical criteria. Station was designated for no action. One station fit these criteria.”
- “Surface sediment at the station passed SQO criteria with subsurface SQO chemical exceedance factors greater than 10 at a station located within a shoaling area of the navigation channel. One station fit these criteria. EPA directed the pre-remedial design to include the shoaling area along the northern boundary of the navigation channel from station 85+00 to 92+00 in the open access dredging volumes. Sediments located in this vicinity will be further investigated in remedial design, and the potential remedial action area will be refined based on the results.”
- “Surface sediment at the station passed SQO criteria with subsurface stations located within the boundaries of a potential natural recovery area and outside the navigation channel and away from docks or piers, with subsurface chemical exceedance factors similar to the anticipated natural recovery rates. These stations were designated for monitoring. Five stations fit these criteria.”
- “Surface sediment at the station passed SQO criteria with subsurface stations located outside the navigation channel and away from docks or piers within a broad no-action area, and a considerable distance (greater than 300 feet) from potential remedial action areas. These stations were designated for monitoring. One station fit these criteria.”

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- "Surface sediment at the station passed SQO criteria with subsurface stations located within the navigation channel or near docks/piers and close to potential remedial action areas. Twenty stations were designated for potential remedial action."

## ***RISK ASSESSMENT***

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| <b><i>Last Updated:</i></b> | 11/25/98  |                                |

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***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 eco and HH 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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"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  $1.2 \times 10^{-4}$  for the Site and  $1.1 \times 10^{-4}$  for the Hylebos Waterway, whereas for the revised PCB SRAL of 450 ppb risks are  $1.4 \times 10^{-4}$  for the Site and  $1.6 \times 10^{-4}$  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  $1 \times 10^{-4}$ . Cleanup to levels slightly greater than  $1 \times 10^{-4}$  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**

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**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**PRP Name:** PRP INFORMATION NOT RELEASED

**PRPID:**

**Street Address:**

**City:**

**State:**

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## **KEY CONTACTS**

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***Project Name*** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

***ProjectID:*** 10-01

***Last Name:*** KEY CONTACT INFORMATION NOT RELEASED

***Contact ID:***

***First Name:***

***Title:***

***Company:***

***Address:***

***City:***

***State:***

***Postal Code:***

***Work Phone # :***

***Other Phone #:***

***Fax # :***

***Email Address:***

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## REFERENCES

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**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** A

**ReferenceID:** 20

**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:**

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**Reference Type:** A

**ReferenceID:** 27

**Title:** *Superfund Fact Sheet - Puyallup Settlement Land Transfer - Blair Waterway and Blair Backup Properties, 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 20, 1992

**Key Words and Phrases:**

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## REFERENCES

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**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** A

**ReferenceID:** 35

**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

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Phrases:**

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**Reference Type:** A

**ReferenceID:** 36

**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

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**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** A

**ReferenceID:** 37

**Title:** *Superfund Fact Sheet - Commencement Bay Nearshore/Tideflats  
Comment on the "Proposed Prospective Purchaser Agreement"  
for Cascade Timber Yard # 1 on the Hylebos Waterway*

**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 16, 1997

**Key Words and  
Phrases:**

---

**Reference Type:** A

**ReferenceID:** 38

**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:** 39

**Title:** *Superfund Fact Sheet - Commencement Bay Nearshore/Tideflats  
The Notice of Intent to Delete Portions of Site from NPL*

**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 28, 1996

**Key Words and  
Phrases:**

---

## REFERENCES

---

**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** A

**ReferenceID:** 40

**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:** 41

**Title:** *Superfund Fact Sheet - Commencement Bay Nearshore/Tideflats  
(Middle Waterway)  
Public Comment Period on a "Prospective Purchaser Agreement"  
between EPA and the Mylet Limited Family Partnership*

**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 26, 1996

**Key Words and  
Phrases:**

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## REFERENCES

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**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** A

**ReferenceID:** 42

**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:**

---

**Reference Type:** A

**ReferenceID:** 43

**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:** November 9, 1995

**Key Words and Phrases:**

---

**Reference Type:** A

**ReferenceID:** 44

**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:**

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## REFERENCES

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**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** A

**ReferenceID:** 45

**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:**

---

**Reference Type:** A

**ReferenceID:** 46

**Title:** *Superfund Fact Sheet - Puyallup Settlement Land Transfer -  
Public Comment Requested on Consent Decree*

**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:** December 12, 1994

**Key Words and  
Phrases:**

---

**Reference Type:** A

**ReferenceID:** 47

**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:**

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## REFERENCES

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**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** A

**ReferenceID:** 48

**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:** 50

**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:**

---

**Reference Type:** A

**ReferenceID:** 51

**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:**

---

## REFERENCES

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**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** A

**ReferenceID:** 53

**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:** 54

**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:**

---

**Reference Type:** A

**ReferenceID:** 55

**Title:** *Record of Decision: Commencement Bay South Tacoma Channel - South Tacoma Field Operable Unit*

**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:** September 1994

**Key Words and Phrases:**

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## REFERENCES

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**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** A  
**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:**

---

**ReferenceID:** 56

**Reference Type:** A  
**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:**

---

**ReferenceID:** 57

**Reference Type:** A  
**Title:** *Record of Decision: Commencement Bay Nearshore/Tideflats*  
**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:** September 1989  
**Key Words and  
Phrases:**

---

**ReferenceID:** 58

## REFERENCES

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**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** A

**ReferenceID:** 59

**Title:** *Superfund Fact Sheet - Puyallup Settlement Land Transfer - Blair Waterway and Blair Backup Properties*

**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 12, 1993

**Key Words and Phrases:**

---

**Reference Type:** A

**ReferenceID:** 60

**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:**

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## REFERENCES

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**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** A

**ReferenceID:** 62

**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  
U S 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:**

---

**Reference Type:** A

**ReferenceID:** 264

**Title:** *Superfund Fact Sheet - Commencement Bay Nearshore/Tideflats - Tacoma, Washington - (Hylebos Waterway)*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:** US EPA Region X

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

**Prepared For:**

**Date Published:** April 23, 1998

**Key Words and Phrases:**

---

## REFERENCES

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**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** A

**ReferenceID:** 337

**Title:** *Superfund Fact Sheet - Commencement Bay Nearshore/Tideflats (Middle Waterway) Tacoma, Washington  
EPA Announces the Public Comment Period on a Proposed Consent Decree on Middle Waterway*

**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 1998

**Key Words and Phrases:**

---

**Reference Type:** A

**ReferenceID:** 371

**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:**

---



## REFERENCES

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**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** A

**ReferenceID:** 373

**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:** 382

**Title:** *Hylebos Waterway Pre-Remedial Design Preliminary Disposal  
Site Evaluation Report - 1996*

**Location:** AEM

**Category:** Remedial Design

**Prepared by/Author:** Hartman Associates, Inc.; Dalton, Olmstead and Fuglevand, Inc.; Parametrix,  
Inc. and Aura Nova Consultants

**Preparer/Author  
Address:**

**Prepared For:** Hylebos Cleanup Committee (six PRPs)

**Date Published:** June 26, 1996

**Key Words and  
Phrases:**

---

**Reference Type:** A

**ReferenceID:** 383

**Title:** *Hylebos Waterway Pre-Remedial Design Preliminary Disposal  
Site Evaluation Report - 1998*

**Location:** AEM

**Category:** Remedial Design

**Prepared by/Author:** Hartman Associates, Inc.; Dalton, Olmstead and Fuglevand, Inc.; Parametrix,  
Inc. and Aura Nova Consultants

**Preparer/Author  
Address:**

**Prepared For:** Hylebos Cleanup Committee (six PRPs)

**Date Published:** March 20, 1998

**Key Words and  
Phrases:**

---

## REFERENCES

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**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** A

**ReferenceID:** 397

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

**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:** December 1998

**Key Words and  
Phrases:**

---

**Reference Type:** A

**ReferenceID:** 482

**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

---

**Reference Type:** A

**ReferenceID:** 487

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

**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 1999

**Key Words and  
Phrases:**

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## REFERENCES

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**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** A

**ReferenceID:** 488

**Title:** *Superfund Fact Sheet - Commencement Bay  
Nearshore/Tideflats - Tacoma, Washington  
EPA's Refined List of Sediment Disposal Sites*

**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 1999

**Key Words and  
Phrases:**

---

**Reference Type:** A

**ReferenceID:** 489

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

**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:** October 1999

**Key Words and  
Phrases:**

---

## REFERENCES

---

**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** A

**ReferenceID:** 490

**Title:** *Superfund Fact Sheet - Commencement Bay  
Nearshore/Tideflats - Tacoma, Washington  
EPA Announces Proposed Cleanup Plans and Proposed Sediment  
Disposal Plan*

**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 1999

**Key Words and  
Phrases:**

---

**Reference Type:** A

**ReferenceID:** 566

**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:**

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## REFERENCES

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**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** A

**ReferenceID:** 569

**Title:** *Pre-Remedial Design Evaluation Report*

**Location:** AEM

**Category:** Remedial Design

**Prepared by/Author:** Hylebos Cleanup Committee

**Preparer/Author**

**Address:**

**Prepared For:** US EPA, Washington Department of Ecology, US ACOE

**Date Published:** November 1999

**Key Words and  
Phrases:**

---

**Reference Type:** A

**ReferenceID:** 747

**Title:** *Superfund Fact Sheet - Commencement Bay  
Nearshore/Tideflats - Tacoma, Washington  
Occidental Chemical Removal Action*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:** US EPA Region X

**Preparer/Author**

**Address:**

**Prepared For:** General Public

**Date Published:** July 2001

**Key Words and  
Phrases:**

---

## REFERENCES

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**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** A

**ReferenceID:** 748

**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:** 749

**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

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**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** A

**ReferenceID:** 766

**Title:** *Superfund Fact Sheet: Pilot Project in the Hylebos Waterway and Cleanup Plan for Middle Waterway to be Finalized Early Next Year*

**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:** December 2001

**Key Words and Phrases:**

---

**Reference Type:** A

**ReferenceID:** 891

**Title:** *Engineering Evaluation / Cost Analysis Report: Area 5106 Removal Action: Former OCC Tacoma Facility: Tacoma, Washington*

**Location:** AEM

**Category:** Remedial Action Plan/Work Plan

**Prepared by/Author:** Conestoga-Rovers & Associates

**Preparer/Author Address:** 2055 Niagara Falls Boulevard  
Niagara Falls, NY 14304

**Prepared For:** US EPA Region X

**Date Published:** July 2000

**Key Words and Phrases:**

---

**Reference Type:** A

**ReferenceID:** 1002

**Title:** *Fact Sheet: Cleanup work at Hylebos is Starting in August*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:** US EPA Region X

**Preparer/Author Address:**

**Prepared For:** General Public

**Date Published:** July 2002

**Key Words and Phrases:**

---

## REFERENCES

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**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** A

**ReferenceID:** 1003

**Title:** *Commencement Bay Newsletter: An Update on Superfund Sediment Cleanup*

**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:** A

**ReferenceID:** 1004

**Title:** *Explanation of Significant Differences: Commencement Bay Nearshore/Tideflats Superfund Site: Mouth of Hylebos Waterway Problem Area (Draft)*

**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:** July 2003

**Key Words and Phrases:**

---

**Reference Type:** A

**ReferenceID:** 1005

**Title:** *Commencement Bay Newsletter: An Update on Superfund Sediment Cleanup*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:** US EPA Region X

**Preparer/Author Address:**

**Prepared For:** General Public

**Date Published:** November 2003

**Key Words and Phrases:**

---



## REFERENCES

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**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** B

**ReferenceID:** 3

**Title:** *Letter from US EPA Region X*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:** Allison Hiltner

**Preparer/Author  
Address:** US EPA Region X

**Prepared For:** AEM, Inc.

**Date Published:** July 31, 1997

**Key Words and  
Phrases:**

---

**Reference Type:** B

**ReferenceID:** 213

**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:** 358

**Title:** *Memo re: PCB Residual Concentration, Arithmetic Mean*

**Location:** AEM

**Category:** Dredging: Contaminated

**Prepared by/Author:** Paul Fuglevand

**Preparer/Author  
Address:** Dalton, Olmsted and Fuglevand, Inc.  
11711 Northcreek Parkway South  
Suite 101  
Bothell, WA 98011

**Prepared For:** Allison Hiltner, US EPA, Region X

**Date Published:** December 18, 1996

**Key Words and  
Phrases:**

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**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** B

**ReferenceID:** 472

**Title:** *Spotlight On: Commencement Bay Nearshore/Tideflats*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:** Susan Pastor

**Preparer/Author  
Address:** US EPA Region V

**Prepared For:** Fox River Current

**Date Published:** July/August 2000

**Key Words and  
Phrases:**

---

**Reference Type:** B

**ReferenceID:** 483

**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:**

---

**Reference Type:** B

**ReferenceID:** 854

**Title:** *Superfund Fact Sheet: Occidental Chemical Removal Action*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:** US EPA Region X

**Preparer/Author  
Address:**

**Prepared For:** General Public

**Date Published:** July 2000

**Key Words and  
Phrases:** Area 5106

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**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** B

**ReferenceID:** 944

**Title:** *e-mail re: Questions re Hylebos Waterway*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:** Ken Marcy

**Preparer/Author  
Address:** US EPA Region X

**Prepared For:** AEM, Inc.

**Date Published:** February 19, 2002

**Key Words and  
Phrases:**

---

**Reference Type:** B

**ReferenceID:** 945

**Title:** *e-mail re: Questions re Hylebos Waterway*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:** Peter Contreras

**Preparer/Author  
Address:** US EPA Region X

**Prepared For:** AEM, Inc.

**Date Published:** February 19, 2002

**Key Words and  
Phrases:**

---

**Reference Type:** B

**ReferenceID:** 957

**Title:** *e-mail re: Followup Question on Hylebos*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:** Peter Contreras

**Preparer/Author  
Address:** US EPA Region X

**Prepared For:** AEM, Inc.

**Date Published:** February 25, 2002

**Key Words and  
Phrases:**

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## REFERENCES

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**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** B

**ReferenceID:** 958

**Title:** *e-mail re: Followup Question on Hylebos Waterway*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:** Peter Contreras

**Preparer/Author Address:** US EPA Region X

**Prepared For:** AEM, Inc.

**Date Published:** February 26, 2002

**Key Words and Phrases:**

---

**Reference Type:** B

**ReferenceID:** 968

**Title:** *e-mail re: Questions re Hylebos Waterway*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:** Peter Contreras

**Preparer/Author Address:** US EPA Region X

**Prepared For:** AEM, Inc.

**Date Published:** March 15, 2002

**Key Words and Phrases:**

---

**Reference Type:** B

**ReferenceID:** 1142

**Title:** *e-mail re: Questions re Area 5106*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:** Jonathan Williams

**Preparer/Author Address:** US EPA Region X

**Prepared For:** AEM, Inc.

**Date Published:** February 23, 2004

**Key Words and Phrases:**

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## REFERENCES

---

**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** B

**ReferenceID:** 1143

**Title:** *e-mail re: Questions re Hylebos*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:** Peter Contreras

**Preparer/Author  
Address:** US EPA Region X

**Prepared For:** AEM, Inc.

**Date Published:** August 2, 2004

**Key Words and  
Phrases:**

---

**Reference Type:** C

**ReferenceID:** 63

**Title:** *Commencement Bay cleanups progress*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:**

**Preparer/Author  
Address:**

**Prepared For:** Superfund Week

**Date Published:** December 11, 1992

**Key Words and  
Phrases:**

---

**Reference Type:** C

**ReferenceID:** 64

**Title:** *Tacoma port agrees to Superfund dredging*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:**

**Preparer/Author  
Address:**

**Prepared For:** Superfund Week

**Date Published:** August 27, 1993

**Key Words and  
Phrases:**

---

## REFERENCES

---

**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** C

**ReferenceID:** 65

**Title:** *Tacoma, EPA talk cleanup*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:**

**Preparer/Author**

**Address:**

**Prepared For:** Superfund Week

**Date Published:** January 21, 1994

**Key Words and  
Phrases:**

---

**Reference Type:** C

**ReferenceID:** 66

**Title:** *Tainted homes get cleanup (Tacoma, WA)*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:**

**Preparer/Author**

**Address:**

**Prepared For:** Engineering News-Record (ENR)

**Date Published:** July 12, 1993

**Key Words and  
Phrases:**

---

**Reference Type:** C

**ReferenceID:** 67

**Title:** *State ignored NCP, can't recover costs*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:**

**Preparer/Author**

**Address:**

**Prepared For:** Superfund Week

**Date Published:** February 12, 1993

**Key Words and  
Phrases:**

---

## REFERENCES

---

**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** C

**ReferenceID:** 148

**Title:** *Equipment co. cleans Wash. bay*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:**

**Preparer/Author**

**Address:**

**Prepared For:** Superfund Week

**Date Published:** May 8, 1998

**Key Words and  
Phrases:**

---

**Reference Type:** C

**ReferenceID:** 155

**Title:** *Tacoma wetlands design to be bid soon*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:**

**Preparer/Author**

**Address:**

**Prepared For:** Superfund Week

**Date Published:** November 4, 1994

**Key Words and  
Phrases:**

---

**Reference Type:** C

**ReferenceID:** 274

**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 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** C

**ReferenceID:** 292

**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:** 348

**Title:** *Assessment of Contaminated Sediments in Commencement Bay  
(Puget Sound, Washington)*

**Location:** AEM

**Category:** Contaminated Sediments: Characteristics/Bioavailability

**Prepared by/Author:** Thomas C. Ginn

**Preparer/Author**

**Address:**

**Prepared For:** Journal (unidentified) Article

**Date Published:** 1989

**Key Words and  
Phrases:**

---

**Reference Type:** C

**ReferenceID:** 444

**Title:** *Natural Resources: Restoration of Commencement Bay  
Addressed in Proposed Consent Decree*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:** BNA Daily Environment Report, No. 110

**Preparer/Author**

**Address:**

**Prepared For:** General Public

**Date Published:** June 9, 1997

**Key Words and  
Phrases:**

---



## REFERENCES

---

**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** C

**ReferenceID:** 445

**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:** 446

**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:**

---

**Reference Type:** C

**ReferenceID:** 447

**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:**

---

## REFERENCES

---

**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** C

**ReferenceID:** 448

**Title:** *Superfund: Concentration Level of Metals Drops at Tacoma Site, State Agency Reports*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:** BNA Daily Environment Report, No. 48

**Preparer/Author  
Address:**

**Prepared For:** General Public

**Date Published:** March 12, 1999

**Key Words and  
Phrases:**

---

**Reference Type:** C

**ReferenceID:** 449

**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 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** C

**ReferenceID:** 491

**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:** 634

**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:** 939

**Title:** *Wash.: Firm to Remove Sediments*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:**

**Preparer/Author Address:**

**Prepared For:** Hazardous Waste/Superfund Week

**Date Published:** August 5, 2002

**Key Words and Phrases:**

---

## REFERENCES

---

**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** C

**ReferenceID:** 946

**Title:** *Wash.: PRP Funding Sought*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:**

**Preparer/Author**

**Address:**

**Prepared For:** Hazardous Waste/Superfund Week

**Date Published:** January 14, 2002

**Key Words and  
Phrases:**

---

**Reference Type:** C

**ReferenceID:** 999

**Title:** *Commencement Bay Subsite to get \$11M Pump-and-Treat*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:**

**Preparer/Author**

**Address:**

**Prepared For:** Superfund Week

**Date Published:** August 4, 2000

**Key Words and  
Phrases:** Area 5106

---

**Reference Type:** C

**ReferenceID:** 1036

**Title:** *Wash.: Hylebos Waterway Dredged*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:**

**Preparer/Author**

**Address:**

**Prepared For:** Hazardous Waste/Superfund Week

**Date Published:** October 28, 2002

**Key Words and  
Phrases:**

---

## REFERENCES

---

**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** C

**ReferenceID:** 1101

**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:** D

**ReferenceID:** 37

**Title:** *Voyage of discovery: Commencement Bay's new life*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:** Ross Anderson

**Preparer/Author  
Address:**

**Prepared For:** The Seattle (WA) Times

**Date Published:** July 10, 1998

**Key Words and  
Phrases:**

---

**Reference Type:** D

**ReferenceID:** 466

**Title:** *Ecology News Release: Ecology Department gives another \$6 million for Commencement Bay*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:** Washington State Department of Ecology

**Preparer/Author  
Address:**

**Prepared For:** News Release

**Date Published:** December 5, 2002

**Key Words and  
Phrases:**

---

## REFERENCES

---

**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** D

**ReferenceID:** 538

**Title:** *Government reaches agreement on Hylebos Clean-up*

**Location:** AEM

**Category:** Legal

**Prepared by/Author:** US EPA Region X

**Preparer/Author  
Address:**

**Prepared For:** News Release

**Date Published:** June 2, 2004

**Key Words and  
Phrases:** Head of Hylebos

---

**Reference Type:** E

**ReferenceID:** 1

**Title:** *Capping of Contaminated Sediments - A Case Study (Puyallup River @ Commencement Bay)*

**Location:** AEM

**Category:** Capping/Placement

**Prepared by/Author:** Ronald S. Larson

**Preparer/Author  
Address:** Simpson Tacoma Kraft Company  
Tacoma, WA

**Prepared For:** WODCON 1990

**Date Published:** 1990

**Key Words and  
Phrases:**

---

**Reference Type:** E

**ReferenceID:** 69

**Title:** *Evaluation of Dredging as a Remedial Technology for the Commencement Bay Superfund Site*

**Location:** AEM

**Category:** Dredging: Remedial (Contaminated Sediments)

**Prepared by/Author:** Keith E. Phillips and John F. Malek

**Preparer/Author  
Address:** U.S. Army Corps of Engineers  
Seattle, WA

**Prepared For:** Eleventh Conference on Management of Bottom Sediments Containing Toxic Substances (Seattle, WA)

**Date Published:** November 4 - 6, 1985

**Key Words and  
Phrases:**

---

## REFERENCES

---

**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** E

**ReferenceID:** 265

**Title:** *Head of Hylebos Waterway Sediment Remediation Innovative Design, Dredging and Monitoring Methods*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:** (1) Robert S. Webb, (2) Paul F. Fuglevand, (3) Arie van den Adel, (4) John Lally

**Preparer/Author Address:** (1) Dalton, Olmsted & Fuglvand, Inc.  
Silverdale, Washington  
(2) Dalton, Olmsted & Fuglvand, Inc.  
Kirkland, Washington  
(3) and (4) Bean Environmental LLC  
New Orleans, Louisiana

**Prepared For:** WEDA XXIV, Orlando, FL

**Date Published:** July 6-9, 2004

**Key Words and Phrases:**

---

**Reference Type:** J

**ReferenceID:** 1

**Title:** *Fact Sheets: Commencement Bay Nearshore/Tideflats Superfund Site*

**Location:** AEM

**Category:** Site Update

**Prepared by/Author:** US EPA Region X

**Preparer/Author Address:** <http://www.epa.gov/r10earth/offices/oec/cercla.html>

**Prepared For:** General Public

**Date Published:** Undated

**Key Words and Phrases:**

---

## REFERENCES

---

**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** L

**ReferenceID:** 44

**Title:** *Memo re: Commencement Bay: Remedial Action Objective*

**Location:** AEM

**Category:** Cleanup Levels and Risks

**Prepared by/Author:** AEM, Inc.

**Preparer/Author Address:** Malvern, PA 19355

**Prepared For:** Internal file

**Date Published:** March 13, 1995

**Key Words and Phrases:**

---

**Reference Type:** L

**ReferenceID:** 78

**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:** 148

**Title:** *Maximum Baseline Cancer Risks for Contaminated Sediment Sites*

**Location:** AEM

**Category:** Risk Assessment

**Prepared by/Author:** AEM, Inc.

**Preparer/Author Address:**

**Prepared For:** Distribution

**Date Published:** October 22, 2001

**Key Words and Phrases:**

---



## REFERENCES

---

**Project Name** COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)

**ProjectID:** 10-01

**Reference Type:** L  
**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:**

---

**ReferenceID:** 181

**Reference Type:** L  
**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:**

---

**ReferenceID:** 232

**Reference Type:** S  
**Title:** *Consent Decree, U.S. District Court for the Western District of Washington, USA Plaintiff vs 22 PRPs (Defendants)*  
**Location:** AEM  
**Category:** Legal  
**Prepared by/Author:** U.S. Department of Justice  
**Preparer/Author Address:**  
**Prepared For:** US District Court (WA)  
**Date Published:** June 13, 1999  
**Key Words and Phrases:**

---

**ReferenceID:** 12

## ***FISH ADVISORIES***

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***Project Name*** ***COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)***

***ProjectID:*** 10-01

***Advisory:*** Commencement Bay

***AdvisoryID:*** 574

***Extent:*** Industrially developed waterways at South end

***Pollutant:*** PCBs (total)

***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:*** 573

***Extent:*** Industrially developed waterways at South end

***Pollutant:*** PCBs (total)

***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

---

***Advisory:*** Commencement Bay

***AdvisoryID:*** 576

***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

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## ***FISH ADVISORIES***

---

***Project Name*** ***COMMENCEMENT BAY - PROJECT 1 (Hylebos Waterway)***

***ProjectID:*** 10-01

***Advisory:*** Commencement Bay

***AdvisoryID:*** 575

***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

---