ACTION MEMORANDUM

DATE: September 30, 2010

SUBJECT: Action Memorandum for a Non-Time-Critical Removal Action at the Terminal 117 Early Action Area of Lower Duwamish Waterway Superfund Site, Seattle, Washington

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Site ID: 10DT

I. PURPOSE

The purpose of this Action Memorandum is to request and document approval of the selected non-time-critical removal action (NTCRA) described herein for the Port of Seattle Terminal 117 (T-117) Early Action Area (EAA) of the Lower Duwamish Waterway (LDW) Superfund Site, Seattle, King County, Washington (Figure 1). The T-117 EAA NTCRA consists of the removal and disposal of approximately two acres of contaminated marine sediments, three acres of Terminal upland soils (formerly an industrial facility), and ten acres of soils in specified adjacent streets, rights of way and residential yards (Figure 2). The proposed non-time critical removal action is expected to be conducted by potentially responsible parties (PRPs), the Port of Seattle (Port) and the City of Seattle (City), with oversight by EPA pursuant to an EPA enforcement order on consent to be negotiated after the issuance of this Memorandum. The Port and City performed the recently completed Engineering Evaluation/Cost Analysis (EE/CA) for this NTCRA pursuant to such an order.

II. SITE CONDITIONS AND BACKGROUND

The CERCLIS ID No. is WA0002329803 and the Site ID No. is 10DT.

The LDW Superfund Site consists of an approximately 5.5- mile engineered waterway, formerly the northern portion of the Duwamish River which flows into Seattle, Washington (see Figure 1). It was listed on the National Priorities List (NPL) on September 13, 2001. EPA and the Washington State Department of Ecology (Ecology) jointly issued an order on consent pursuant to CERCLA and the state Model Toxics Control Act (MTCA) for a remedial investigation and feasibility study (RI/FS) for the LDW Site on December 21, 2000, to The Boeing Company (Boeing), City, Port and King County. A Record of Decision is anticipated within the next few years. EPA and Ecology also agreed for their mutual convenience in a Memorandum of Understanding that EPA will generally be lead agency for in-water portions of the LDW Site and Ecology will generally be lead agency for upland source control, and that the Agencies may alter these lead-support roles at any time for any portions of the LDW Site.

The T-117 EAA is one of five EAAs identified during the RI by EPA and Ecology to address sediment hot spots. At T-117, EPA took the lead on both the sediments and adjacent upland areas with Ecology's support.

For purposes of this NTCRA, the area being addressed by this NTCRA is divided into 3 study/action areas; Sediment Study Area, T-117 Upland Study Area (facility), and Adjacent Streets and Residential Yards Study Area. T-117 was purchased by the Port in 1999 following six decades of asphalt product production, particularly roofing shingles, by two successive now defunct owner/operator small businesses. During the oil embargo of the 1970s, the City supplied the owner/operator at the time with inexpensive used fuel oil as part of a small business assistance program. Much of this fuel oil came from City electrical utility equipment and contained poly-chlorinated biphenyls (PCBs).

Two Time Critical Removal Actions (TCRAs) were performed in 1999 and 2006 by the Port with EPA oversight to remove the highest concentrations of PCBs from T-117 upland soils. Independent cleanup actions were also implemented by the City, with no formal EPA or State oversight, to install temporary capping and provide storm water collection in the adjacent residential area. The 1999 removal was conducted under an EPA Consent Order with the assumption that the Terminal would be limited to industrial uses in the future. In response to strong sentiment from the adjacent community after release of an earlier version of this EE/CA, the Port elected not to restrict future land use and to clean up the facility to unrestricted use standards. This prompted revision of the EE/CA. The 2006 TCRA removal consent order was issued to remove high concentrations of PCB contaminated soil in limited areas, prior to EE/CA revision. The revised EE/CA was expanded to include a portion of the surrounding residential area, including streets, rights of way, and residential yards, in addition to the former industrial facility and the adjacent sediments. Sediment removal, completion of upland Terminal soil removal, and soil removal from specified adjacent residential areas that could recontaminate nearby T-117 sediments, will be accomplished by this NTCRA.

A. Site Description

1. Removal Site Evaluation

The T-117 EAA is characterized by gently sloping intertidal mudflat habitat, a steep vegetated riprap bank, and a relatively flat adjacent upland area. For administrative ease, the EE/CA divided the T-117 EAA into 3 study areas; Sediment Study Area, T-117 Upland Study Area, and Adjacent Streets and Residential Yards Study Area. The T-117 EAA is also adjacent to the South Park Marina and Basin Oil facilities, which were evaluated in the EE/CA and determined not to be potential sources of recontamination to T-117 sediments. For any future LDW purposes, they will be managed by Ecology. These facilities will remain under Ecology management for long-term cleanup. These areas are all shown on Figure 2.

The Duwamish Manufacturing Company owned and operated the T-117 Uplands Study Area from 1937 to 1978, and was succeeded by the Malarkey Asphalt Company from 1978 to 1993. PCBs in oils used as fuel in the facility furnace, as well as spills of such oils and releases of other process wastes, and the redistribution of contaminated soils by facility operations led to significant PCB contamination in the off-shore sediments and the facility upland, along with elevated concentrations of dioxin/furans, arsenic, total petroleum hydrocarbons (TPH), carcinogenic poly-aromatic hydrocarbons (cPAHs), and phenol. Transport mechanisms of the contaminants include the erosion of onsite surface or subsurface soil, track out of soils on vehicles, storm water and groundwater movement from upland areas, sediment movement within the LDW, and atmospheric deposition.

A former ponding area was located just inland from the top of the shoreline bank and was the lowest point on the T-117 Upland Study Area. This area collected all water that flowed across the facility, including non-contact cooling water from the main manufacturing area. Periodic overflow from the former ponding area to the LDW was noted during extended rainy periods. The former ponding area was located within the former King County Commercial Waterway District No. 1 (KCCWD1) ROW and was subsequently excavated as part of the contaminated soil TCRA in 1999 and backfilled. KCCWD1 was the Port's predecessor as the owner of most LDW sediments (those that are not natural tidelands and bedlands of the state). KCCWD1 was created by the state legislature to own & lease the newly engineered LDW tidelands and bedlands and thereby sustain itself. Shortly after the Washington Supreme Court invalidated KCCWD1 revenue generating authority in 1962, the Port acquired its interests, including a 50- to 60-ft (15- to 18-m)-wide section of land adjacent to the shoreline.

On the T-117 Upland property, current land uses include north and south buildings that have been used for storage but are currently vacant, a small office/carport and a truck scale. The

remainder of the facility is covered in asphalt or concrete pavement. It is fenced and the gates are locked. There is a 12-foot easement across the property for an overhead power line that is scheduled for reconstruction following completion of the NTCRA. The adjacent streets are paved with some gravel shoulder areas. There are some sidewalks. The alleyways are not paved. Residential yards are generally landscaped and covered with grass. A temporary storm water collection system was installed by the City in this residential neighborhood.

Several storm drain outfalls located along the T-117 shoreline bank are owned by the Port and discharge runoff from storm water conveyances located on the T-117 Upland Study Area. These two outfalls discharge directly to the LDW and Sediment Study Area. Three storm drain outfalls are located north of T-117 along the shoreline bank of the Marina and discharge to the LDW. Two of the outfalls are owned by the Marina and the northernmost one is owned by King County and drains the South Park Bridge (which was closed permanently in June 2010). Runoff from a 1.8 acre catchment area west of the T-117 facility is now collected in the five storage tanks and released at a controlled rate to the City's combined sewer system at 17th Ave S and S Donovan St under a discharge authorization from King County. Emergency discharges to the LDW occur during large or prolonged storm events that exceed the capacity of the storage tanks.

Aerial photographs show that the current street configuration in the South Park area was largely established as early as 1936. S Cloverdale Street, between 14th Avenue S and 16th Avenue S, was paved or resurfaced with asphalt in 1947. Other streets in the area (Dallas Avenue S, S Donovan Street, 16th Avenue S, and 17th Avenue S) remained unpaved until the mid-1970s or later, which extends into the period when used oils were handled at the Upland Study Area facility. Prior to an independent cleanup action by the City in 2004-2005, only portions of the Adjacent Streets portion of the EAA had a formal storm water collection system. For this NTCRA, contaminants of concern (COCs) in this area are PCBs in soils and dioxin/furans when co-located with PCBs.

For this NTCRA, contaminats of concern (COCs) in this area are PCBs in soils and kiosin/furans when co-located with PCBs. Past releases from the former asphalt manufacturing operations are the primary source of COCs in T-117 sediments, soils and adjacent streets and residential yards. However, the source of the dioxin/furans in the residential yards is not well understood, and a South Park/Duwamish Area sampling and analysis initiative led by Ecology will further explore this issue. For this reason this NTCRA will not fully address dioxin/furan releases in the Adjacent Streets and Residential Yards. Ecology and EPA will evaluate the additional data and will determine if further action is warranted.

Recontamination Assessment Areas: Basin Oil site was a collector, transporter, and marketer of used oil until 2007. The facility is currently inactive, and some independent cleanup actions by the owner have occurred since 2007. The South Park Marina has had and continues to have numerous boating related businesses and uses. Since both facilities were determined during the EE/CA not to be potential sources of recontamination to T-117 uplands or sediments, they

are not part of this NTCRA. They will be addressed by Ecology to the extent necessary. They were not fully characterized for purposes beyond potential T-117 recontamination.

2. Physical Location

The T-117 EAA is situated on the west bank of the LDW, between approximately River Mile (RM) 3.5 and RM 3.7 (relative to the southern tip of Harbor Island) (Map 1-1). The street address of the former industrial facility is 8700 Dallas Avenue South, Seattle, Washington, 98108, immediately south of the former 14th Avenue South bridge (also known as the South Park Bridge). The Adjacent Streets and Residential Yards Study Area is located between 14th Avenue South, South Donovan Street and Dallas Avenue South. The EAA is across the LDW from the Boeing Plant 2 and Jorgensen Forge facilities, also LDW EAAs. The T-117 Upland Study Area is a narrow strip of unincorporated King County that lies between the LDW to the east and the South Park neighborhood of Seattle to the west. There are approximately 24 residences within the adjacent neighborhood and an elementary school within a mile. The precise location of the T-117 parcel is 47d 31m 24s N, 122d 18m 39s W.

The South Park community is an Environmental Justice area of concern, one of Seattle's most diverse and historically interesting neighborhoods. Of approximately 3,000 residents, approximately 37 percent are of Hispanic origin, compared to 5.3 percent citywide, with approximately 50 percent Caucasians, and small percentages of African-Americans and Asian Pacific Islanders, among others. Eleven percent of the neighborhood lives in poverty, and 89 percent of the students at the local elementary school qualify for free or reduced-fare lunches. Unlike the citywide average of nearly 90 percent of people over age 25 having completed high school, the South Park rate is only approximately 33 percent. Many essential services must be sought outside of the neighborhood: there is no post office, full-service grocery store, bank, or neighborhood service center, and there are inadequate public transportation options connecting South Park with other neighborhoods where services can be found. Violence and crime have also plagued the neighborhood, with an increase in gang-related activity and gun violence in recent years. In June 2010, the South Park Bridge, which carried 20,000 vehicles/day, was closed, adding another hardship in terms of longer commute times and decreased traffic and patrons to local businesses. This will also reduce the number of transportation routes from the EAA for disposal of contaminated material. If a new bridge is funded, it will be a minimum of 4 years before it is constructed.

The LDW, including the T-117 Sediment Study Area, is within the treaty-protected fishing grounds of the Muckelshoot Indian Tribe, and in very close proximity to those of the Suquamish Indian Tribe. No seafood from the LDW other than salmonids should be consumed by people according to advisories issued by the Washington State Department of Health. Recreational activities within and near the EAA include kayaking, canoeing, and motor boating.

Threatened or endangered species potentially occurring within the local area include Chinook salmon (*Oncorhynchus tshawytscha*), Puget Sound steelhead (*Oncorhynchus mykiss)* and Bull trout (*Salvelinus confluentus*). The Duwamish River and T-117 are designated critical habitat for Chinook salmon and bull trout. Designated habitat for steelhead is currently under development.

There are no known potential historical landmarks and/or structures with historical significance identified at the T-117 EAA.

Specific meteorological data for this area is as follows: The average rainfall/snowfall is 36”/year, the average temperature is 53°, the average high 79°, the average low 30°, extreme high 95°, extreme low 16°, the average/peak wind speeds are 8 to 39 mph with gusts to 53 mph with the prevailing wind direction to the south.

3. Site Characteristics

The Sediment Study Area (Figure 2) is approximately 2 acres in size and consists primarily of intertidal sediment with some subtidal sediment. It extends from the top of the shoreline bank; at an elevation of approximately +13.8 ft mean lower low water (MLLW), into the LDW (60 to 80 ft), at an elevation between 0 and -5 ft MLLW. It is bordered by the LDW to the north and south, the LDW navigation channel to the east, and the T-117 Upland Study Area to the west.

The T-117 Upland Study Area consists of the Port’s T-117 upland facility between the Sediment Study Area and the Adjacent Streets and Residential Yards Study Area. It is relatively flat with an elevation that ranges from approximately +13.8 ft MLLW at the top of the bank to approximately +21 ft MLLW along the property boundaries at Dallas Avenue S and the Marina. It is bordered by the Marina to the north, a Boeing facility to the south, Dallas Avenue S to the west, and the Sediment Study Area and the LDW to the east.

Nearly all of the T-117 shoreline is steep and covered in blackberries, underlain with concrete slabs, rock, debris, rotting pilings and aging tar that was disposed of over the embankment. The top of the bank was improved in summer 2008 as part of the second Port TCRA operations and maintenance activities. A silt fence and curbing has been installed to limit runoff of water and silt over the top of the bank into the sediments. Temporary storm water management controls have been implemented to isolate contaminated surface water from entering the LDW and to determine where the contaminants in the storm water (PCBs and dioxin/furans) originate. Storm water and groundwater monitoring and catch basin cleaning occur several times per year.

The Adjacent Streets and Residential Yards Study Area consist of two subareas: the Adjacent Streets and the Residential Yards. The Adjacent Streets portion is the street and right of

way (ROW) areas bounded by Dallas Avenue S, S Donovan Street, and 14th Avenue S. These streets and ROWs are relatively flat with the exception of S Donovan Street. The lanes of this street are separated by a steep bank and the southern-most lane is elevated relative to other streets in the area. The Adjacent Streets are bordered by the Upland Study Area to the east and the Marina to the north. The Adjacent Streets also surround, but do not include the Residential Yards within the bounding streets above. The Residential Yards consist of the residential properties within the boundaries of Dallas Avenue S, S Donovan Street, and 14th Avenue S. These yards are relatively flat with some local minor variations in topography.

No portion of the T-117 EAA is federally-owned. Two prior Port TCRAs were completed in 1999 and 2006, respectively (see Section II, second paragraph above, and Section II.B., Other Actions, below for a full description of these TCRAs).

4. Release or threatened release into the environment of a hazardous substance, or pollutant, or contaminant

Documented hazardous substances released in Sediment and Upland Study Areas include PCBs, dioxin/furans, arsenic, silver, phenol, and cPAHs. There are PCBs and dioxin/furans in the Adjacent Streets and Residential Areas. The contaminated soils and groundwater upgradient serve as a continuing source of contamination to the sediment and need to be addressed to minimize continuing releases of contaminants. In addition, the contaminated soils in the adjacent street and residential yard areas pose an unacceptable risk to human health.

Hazardous substances in nearshore groundwater will be removed when T-117 Upland soils are removed (i.e., the source material will be removed that is currently contributing contamination to groundwater). Groundwater entering the T-117 Uplands Study Area does not have levels that generally exceed Water Quality Criteria (WQC), but occasionally shoreline wells have yielded exceedences which will continue to be evaluated. In general, other contaminants of concern (COCs) are co-located with PCBs in the soil, therefore actions to address PCBs should address all COCs, subject to conformational sampling. The COCs are hazardous substances, or pollutants or contaminants as defined by Section 101(14) and (33) of CERCLA, as amended, 42 U.S.C. §9601(14) and (33).

Sediments. Extensive sediment sampling was conducted from 1998-2008, primarily focused on PCBs, however PAHs, TPH, phenol, SVOCs, pesticides, dioxin and furans, and metals including tributyltin were also analyzed. Detected organic carbon (OC) normalized PCB concentrations (concentrations are expressed in this manner rather than as dry weight concentrations for purposes of comparison to the Washington State Sediment Management Standards (SMS) numerical criteria which are expressed as organic carbon normalized concentrations) in surface sediment ranged from 4.6 to 2,200 ppm OC normalized. The T-117 EAA-wide surface sediment PCB concentration is 627 ppm OC normalized, 95% upper

confidence limit (UCL). The subsurface sediment ranged from 0.78 to 2,600 ppm OC normalized. The EAA-wide subsurface sediment PCB concentration is 520 ppm OC normalized, 95% UCL. Detected dry weight (dw) PCB concentrations in surface sediment ranged from 54 to 38,000 ppb dw, with a 95% UCL of 14,000 ppb dw. The subsurface sediment ranged from 9.5 to 51,000 ppb dw with a 95% UCL of 4,800 ppb dw. Sediment concentrations at sites in other states are more commonly expressed as dry weight concentrations. Both the surface and subsurface data indicate a spatial trend of PCB concentrations decreasing from the bank out towards the navigation channel. The highest PCB concentrations were collected from within 100 horizontal feet of the shoreline bank and were typically confined to the upper 1 to 2 feet of sediment in the nearshore cores. PCB concentrations were also generally higher in the northern portion of the T-117 EAA at similar depths. This trend suggests the presence of a historical and ongoing upland source which was subsequently conveyed to the LDW via storm water runoff and upland and bank erosion. Dioxin/furan was only sampled in the sediments on the removal area boundary to determine if dioxin/furan concentrations were below cleanup levels. Sampling indicated that these values were low (2.1 – 9.4 parts per trillion (ppt) TEQ on the surface) and no modifications to the Study Area boundary were necessary. It was assumed that dioxin/furan concentrations within the removal area footprint would be much higher closer to the shoreline and that this COC would be removed during the removal action.

T-117 Upland. A total of 682 samples from 282 locations have been analyzed from the Upland Study Area for PCBs. During the two TCRAs, soil associated with 83 sampling locations was excavated, leaving 539 samples that are representative of current conditions in the depth range of 0-7 feet (ft), 7 to 12 ft and > 12 ft. PCBs (predominantly Aroclor 1260) are generally found within the uppermost 2 ft of surface soil, and concentrations tend to decrease with depth. Exceptions to this trend have been found at the following locations:

- Beneath the 1999 TCRA removal area (Subarea C, EE/CA Map 2-16) and the 2006 TCRA removal area (Subarea B, EE/CA Map 2-15), where the highest PCB concentrations were located at 2 to 8 ft below ground surface (bgs) (531-9200 ppm) and then decreased with depth (this area is in the northern and central area of the upland study area).
- Near Catch Basin 5 (Subarea E, EE/CA Map 2-18), where elevated PCB concentrations ranged from 0 to 6.5 ft in depth (in the central area of the upland study area).

The highest remaining PCB concentrations (i.e., greater than 1,000 ppm) were detected in the upper 2 ft at location T-117-D-11 (4,200 ppm) and between 2 and 5 ft bgs at location T-117-E-1 (1,100 ppm). Below 7 ft, PCBs were detected above 50 ppm only at locations PS-7 (110 ppm) and T-117-6 (94 ppm). As a result of the 1999 and 2006 TCRAs, 5,200 tons of contaminated soils were removed from the Upland Area. All available soil data (for excavated and remaining areas) for the Upland Study Area are provided in the EE/CA. The average remaining PCB concentration, post TCRA removals is 29 ppm. The anticipated concentration of PCBs remaining on the Upland Study Area after this NTCRA will not exceed 1 ppm.

Adjacent Streets. A total of 367 soil, street dust (i.e., fine soil accumulated on street surfaces and shoulders), catch basin solids and Multi-Increment Samples (MIS) were collected and analyzed for PCBs within the Adjacent Streets from 2004 through 2006, and 2008 through 2009. The contaminated soil associated with 17 of the 367 samples (i.e., 4 soil, 7 street dust, and 6 catch basin samples) was removed by the City's independent actions of 2004-2005. The sampling locations that had PCB concentrations greater than the Screening Level (SL) (1 ppm; MTCA Method B/Toxic Substances Control Act (TSCA)) were located on Dallas Avenue S, between 16th and 17th Avenues S, the north portion of 17th Avenue S, and in other isolated areas on Dallas Avenue S and S Donovan Street. The detected PCB concentrations in point samples ranged from 0.0025 ppm to 480 ppm located at 8601 17th Avenue S near the intersection with Dallas Avenue S.

Concentrations greater than 1 ppm were detected in street dust (upper 0.1 in. of soil) along S Cloverdale Street, along S Donovan Street near 17th Avenue S, and along Dallas Avenue S. PCB concentrations greater than 1 ppm, but less than 10 ppm, were generally detected only in the upper 1.0 ft of soil, with isolated exceedances at depths of up to 4.0 ft. Concentrations greater than 10 ppm were limited to surface samples (0-to-6-in. depth interval) next to the Upland Study Area, with these exceptions; ten exceedances between 0.0 and 1.0 ft below ground surface (bgs), and five between 0.0 and 2 ft bgs.

MIS samples were collected from 12 Decision Units in the Adjacent Streets. Total PCBs were detected in all samples at concentrations that ranged from 0.055 ppm to 8.1 ppm (0.2 to 0.5 ft bgs). The second highest total PCB concentration was also detected in the 0.0-to-0.2-ft interval (5.7 ppm). A total of four Adjacent Streets DUs had total PCB concentrations (expressed as means for locations with sample replicates) that exceeded 1 ppm. There were no total PCB concentrations higher than 1 ppm in DUs at the southern extent (south side of upper S Donovan Street) of the area investigated for PCBs in 2009 (EE/CA Appendix L). Figure 4 indicates where PCB and dioxin/furans were detected.

Residential Yards. A total of 175 point and MIS soil samples from Residential Yards have been analyzed. The source soil for 44 samples was removed by the City in 2004-2005 cleanup actions, and 47 additional samples were superseded by the 2009 MIS sampling.

Sampling performed during the City's cleanup of a residential yard near the intersection of Dallas Avenue S and 17th Avenue S (across from the entrance to the T-117 Upland Study Area) indicated that total PCB concentrations greater than the screening level extended to depths that were similar to those in the Adjacent Streets. All PCB-contaminated soil detected within the residential yard was excavated and disposed of at an offsite landfill.

Concentrations from thirty 2008 Residential Yard point samples collected to assess residential soils near the ROWs ranged up to 4.7 ppm. Most of these sampling results (24) were superseded by 2009 MIS sampling designed to identify average total concentrations in soil within individual yards as DUs (factoring in differences in uses for front and backyards and

proximity to potential PCB track-out in Adjacent Streets). Fifty Residential Yards MIS samples ranged from 0.043 ppm to 2.1 ppm (0.0-to-0.2-ft depth interval) (EE/CA Appendix L).

Dioxin/furans/Residential Yards. There are uncertainties regarding the origin of dioxin/furans found in T-117 EAA Residential Yards. Dioxins were only found in comparatively low levels (4.69 J – 51.0 ppt TEQ J). However a total of 5 yards, and several individual sampling location, had dioxin/furan sample results (up to 30.6 ppt TEQ) greater than 11 ppt TEQ, Washington's MTCA soil cleanup level. Figure 4 indicates where dioxin/furans were found to be above cleanup levels based on MTCA's one in one million (10-6) excess cancer risk standard. Dioxin-only contaminated areas are not part of this NTCRA which is limited in this area to source control for protection of LDW sediments. These yards or locations will not be remediated as part of this NTCRA. They will remain in Ecology's MTCA site inventory and will be included in the South Park/Duwamish Area sampling and analysis initiative led by Ecology to further explore sources and levels of dioxin/furans in this area.

5. NPL status

The T-117 EAA is geographically within the LDW Superfund site listed on the NPL on September 13, 2001.

6. Maps, pictures, and other graphic representations

Relevant figures are attached to this memorandum.

B. Other Actions

1999 TCRA. The Port removed most uplands soils exceeding 25 ppm of PCBs, and capped the remaining soil in the Upland Study Area with asphalt pavement pursuant to an EPA consent order. Higher concentrations were left in a few areas to avoid potentially undermining older building foundations. Work included excavation and disposal of 2,061 tons of soil with PCB concentrations up to 500 ppm; removal for offsite treatment of approximately 50,000 gallons of water during excavation; disposal of several drums containing asphalt; and improvement of storm drains (e.g., new catch basins in excavated area). Additional information is in Section 2.2 of the EE/CA.

2004 Independent Port Cleanup. In 2004, the Port removed approximately 26 tons of TPH-contaminated soil, along with asphalt, pipe and metal debris, and oil from an approximately 150-ft of a 2-ft-wide, 2.5-ft-deep, below-grade utility corridor in the Upland Study Area. All removed materials were disposed of at an approved landfill, or treated or recycled at approved facilities.

2004-2005 Independent City Cleanup. Soil with PCB concentrations above 1 ppm was removed from residential yards at 8601 and 8609 17th Avenue S, in a boat storage yard on Dallas

Avenue S, and along the west side of 16th Avenue S. Street ROWs surrounding Basin Oil and a 100-ft section of road shoulder on Dallas Avenue S were paved, along with shallow excavations and the placement of clean gravel along portions of Dallas Avenue S and, 16th Avenue S. Streets in the Study Area were pressure washed and various catch basins were cleaned or removed. A temporary storm water collection and treatment system was installed to capture runoff from the ROW independent cleanup action area.

2006 TCRA. Pursuant to another consent order, the Port removed high concentrations of PCBs in soil from the Upland Study Area that were missed during the 1999 TCRA in an area along the riverbank and two areas west of the riverbank. Approximately 3,100 tons of soil, over 500 tons of asphalt and 2.7 tons of metal debris were removed and properly disposed of in landfills. Clean backfill topped with asphalt as a temporary cap was placed in all excavation areas. Semi-annual TCRA operations and maintenance activities have been performed since July 2007.

The EE/CA contains a more detailed summary of all actions at the T-117 EAA.

2. Current actions

Cleanup of the LDW under CERCLA (Superfund), other than in EAAs, will be remedial (rather than removal) action. T-117 was identified as an EAA that required cleanup as a result of risks to human health and the environment from high PCB concentrations in the sediments and soils (see page 7 above), groundwater (as a source to sediments and surface water) and surface water. There are no other actions associated with the T-117 EAA except as follows. Potentially significant nearby sources of recontamination were considered during the EE/CA.

Potentially significant T-117 upland sources of recontamination, particularly for PCBs and dioxin/furans, were continued erosion of bank material and contaminant loading from storm drains. For this reason, removal of these banks and surface water management are part of this NTCRA. Contaminant loading from storm drains is currently being addressed through drain cleaning, source tracing, isolating catch basins from direct storm water runoff, and related measures which will continue, along with further investigation and monitoring.

C. State and Local Authorities

1. State and local actions to date

As part of their work sharing agreement for the joint management of the LDW Site, EPA and Ecology agreed EPA would be the lead agency for this EAA. Ecology has assisted on all T-117 EAA NTCRA documents, briefings, and public meetings. The Muckelshoot Indian Tribe and Ecology have followed the development of this NTCRA and are supportive of the cleanup

decision. The City and Port have performed prior actions described above, and developed the EE/CA pursuant to an EPA consent order.

2. Potential for continued State/local response

Coordination with Ecology will continue throughout the project. Tribes and other stakeholders will continue to be fully informed.

D. Tribal Interests

For the LDW Site, including EAAs and source control actions, EPA has initiated formal consultation with the Muckleshoot and Suquamish Tribes. Tribes have participated in document reviews, special meetings upon Tribal request, and frequent coordination meetings such as quarterly updates and project-specific briefings. For this removal action, EPA has provided information to the Tribes at LDW quarterly meetings and has asked the Tribes if they have any concerns about the proposed removal action. Most recently, in May 2010, EPA provided a project update to the Muckleshoot Tribe and the Tribe did not express any environmental or cultural resources concerns related to the removal action for EPA to consider.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

The current conditions at this EAA meet the following factors which indicate that it is a threat to the public health or welfare or the environment, and a removal action is appropriate under the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) , 40 C.F.R. § 300.415(b)(2). Any or all of these factors may be present at a site, and any one of these factors may determine the appropriateness of a removal action.

Consistent with EPA guidance for conducting an EE/CA, a streamlined risk evaluation was conducted for the T-117 EAA (Section 3.0 of the EE/CA) to assess risks from exposure to contaminated sediments and upland soils in the absence of a removal action. The streamlined risk assessment is based on this EAA serving as a source of contamination to the LDW and the resultant unacceptable levels of contaminants in fish and shellfish that pose a risk of 3 x 10-3 for Adult Tribal RME scenario for the LDW based on Tulalip Tribe's fish consumption data. The total Hazard Index is 47 (based on the risk assessment conducted for the LDW Superfund Site). Supplemental risk information is provided through comparison of State MTCA standards and the corresponding level of risk the contaminants pose. The LDW RI risk assessment has also been used and made a part of the Administrative Record for this NTCRA.

1. <u>Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants (300.415(b)(2)(i)).</u>

Human Health: Primary exposure pathways for human health and ecological risks are direct contact with contaminated sediment, and/or contaminated upland soils, and ingestion of contaminated LDW fish and/or shellfish. Arsenic, PCBs, cPAHs and dioxin/furans are human carcinogens which accumulate and magnify in the aquatic food chain. Silver, TPH, phenol, non-carcinogenic PAHs, and BEHP are not considered carcinogenic or bioaccumulative, but they are still toxic to aquatic organisms and/or people if the concentrations exceed state or federal risk based threshold criteria. Promulgated standards or criteria used to evaluate toxicity from these other COCs included SMS numerical criteria for the protection of benthic invertebrate organisms, MTCA Method A (for unrestricted land use) for the protection of human health, and both state and federal water quality criteria/standards for the protection of aquatic organisms, along with the LDW site-wide risk assessment. Figure 3-1 (EE/CA 2010) describes the conceptual site model for current conditions.

Human health risk-based concentrations (RBCs) for the T-117 EAA were taken from the LDW site-wide Risk Assessment. Sediment concentrations were compared to human health RBCs that are protective of direct sediment contact for individuals engaged in net fishing or beach play activities, as well as for seafood consumption. Since EAA-wide PCB concentrations at T-117 are greater than the LDW-wide PCB concentrations, the human health seafood consumption risk posed by T-117 PCB concentrations is greater than the 3 x 10-3 for Adult Tribal RME scenario risk for the LDW site-wide. Based on RBCs developed for the LDW site-wide, there are unacceptable risks to human health from T-117 EAA sediment concentrations which trigger action by EPA. Based on these analyses, PCBs are the primary risk driver for these exposure pathways at the T-117 EAA. See section II.A.4 above and sections 3 and 4 of the EE/CA for data analyses of PCBs and the other COCs. Other COCs which exceed RBCs in sediment at T-117 are TPH, cPAH, arsenic, phenol, and dioxin/furans.

The baseline cancer and non-cancer risks for PCBs for the exposure pathways are as follows:

Netfishing:
cumulative*: 3 x 10-5, HI = 0.1
PCBs only: 4 x 10-6, HI = 0.07

Beach play: risks were calculated for areas accessible to the pubic by land, so T-117 was not included in that risk scenario. It was included in the tribal clam harvesting exposure scenario (because it is accessible by boat). Values are based on direct contact to sediment, not clam consumption:
cumulative: 2 x 10-4; HI = 0.4

PCBs only: 3 x 10-5; HI = 0.2

Seafood consumption:
cumulative: 3 x 10-3 for Adult Tribal RME scenario based on Tulalip consumption data.
Total Hazard Index should also be reported -- it is 47
PCBs only: 2 x 10-3, HI = 40

* The "cumulative contaminants" known as "risk drivers" for LDW are PCBs, dioxin/furans, cPAHs and arsenic.

As set forth above, PCBs were identified as the primary driver at T-117 of risks to human health and the environment. These risks prompted the selection of T-117 as a LDW EAA. As noted above, the EAA-wide surface sediment PCB concentration is 627 ppm OC normalized, 95% upper confidence limit (UCL). These PCB concentrations also exceeded SMS Cleanup Screening Levels (CSL) (65 ppm OC normalized for PCBs) which defined them as likely to cause ecological risk to benthic invertebrates. These risks were the basis for the selection of all LDW EAAs. In the "Technical Memorandum: Data Analysis and Candidate Site Identification," June 12, 2003, from the LDW RI, candidate sites were identified by EPA and Ecology if they had at least 3 stations above the CSL for PCBs (based on limited pre-RI data). The memorandum states that for T-117 "(f)ive sediment sampling stations had PCB concentrations in excess of the CSL (maximum exceedance factor of 12.9,), " i.e., this maximum exceedance was over 8,300 ppm OC normalized, 12.9 times the CSL.

People using the LDW for recreation or food, including fishers (tribal and recreational), kayakers, clammers, seafood consumers, and children playing in the intertidal area are directly exposed to LDW COCs by incidental ingestion or dermal contact with sediment, soil, seeps, or LDW water and are indirectly exposed through the consumption of seafood. Other than incidental contact with seep water exiting the bank (a mixture of groundwater and surface water), there is no direct contact with groundwater or any reasonable expectation of direct contact in the future (see Appendix B of the EE/CA for further details).

Access to the Upland Study Area is currently secured by a chain link fence and locked gate. Current receptors are workers who perform occasional maintenance associated with the 2006 TCRA, and potentially trespassers. These workers could be directly exposed by incidental ingestion or dermal contact with uncapped soils, e.g., on the bank, or during construction despite standard protective equipment and controls; and could be indirectly exposed by inhalation and ingestion of windblown dust in outdoor air from relatively small areas on the shoreline bank that are only covered with vegetation, or from maintenance or construction activities.

People in Adjacent Streets, including area residents, workers and visitors, could be directly exposed by incidental ingestion or dermal contact with uncapped soils, e.g., along street shoulders, while workers performing maintenance on streets or residents doing maintenance or

gardening in ROWs would have similar but potentially more concentrated exposures, as well as indirect exposure through dust inhalation. Incidental ingestion and inhalation of dust generally, exacerbated by wind and vehicular traffic, are a risk particularly for outdoor workers. Soils that are capped or paved generally pose no risk as long as the pavement remains intact, though there is a potential for future direct contact if people excavate such areas. Direct contact with storm water which may pool in some roadside areas is a further potential exposure.

People in Residential Yards, including residents, workers and visitors, would additionally be directly exposed to uncapped soils in lawns, flowerbeds, and gardens for incidental dermal contact or ingestion (including some unwashed home-grown produce). Planting and other digging by children and pets could create similar exposures to subsurface soil. Residents' children and pets would further be expected to bring soil residues into their living spaces on clothing and coats. Incidental ingestion and inhalation of dust would therefore extend indoors.

Ecological: Ecological Screening Levels (SLs) for sediment were based primarily on SMS numerical standards (WAC 173-204) which are designed to protect benthic invertebrates in marine sediment. COCs at T-117, as set forth above, exceed the SMS criteria, and result in elevated ecological risk to benthic invertebrates. There are no SMS numerical standards for the protection of fish and wildlife (or human health). However, based on the LDW Ecological Risk Assessment (ERA) (Windward 2007a), only river otter among LDW fauna, with a RBC range (0.128 to 0.159 ppm) exceeded the site-specific dry-weight equivalent of the Sediment Quality Standards (SQS) of the SMS for PCBs (0.13 ppm), based on a marginal exceedance of the hazard quotient (HQ) of 1, thereby requiring marginally greater protection than the SQS (the SQS for PCBs is 12 ppm OC normalized).

The lower of the SQS and EPA screening values for residential soil as a surrogate for sediment exposure for each COC were used as SLs to establish in-water boundaries for the T-117 EAA. SLs presented in Table 3-2 in the EE/CA were compared to concentrations in T-117 sediment. A 5% frequency of detection threshold was employed to focus the evaluation consistent with EPA risk assessment guidelines when large numbers of chemicals are present (EPA 1989) along with an analysis based on the conceptual site model which only retained contaminants related to former facility operations. Table 3-3 in the EE/CA lists potential sediment COCs with a rationale for COC designation. Approximately 50% of total PCB sample locations had concentrations above the SL, evidencing widespread PCB contamination. The highest concentration was 2,600 ppm OC (51 ppm dw), over 200 times the SL. The average total PCB concentration was an order of magnitude above the SL. Concentrations of other COCs exceeded the applicable SLs much less frequently and by much smaller magnitudes (see Appendix E in the EE/CA for all screening results). Removal Action levels (RvALs) set forth in Section V.4, EE/CA, below, and explained in greater detail in the EE/CA, shall be met in all three Study Areas of the EAA, including unrestricted soil cleanup standards in the Upland Area and the Adjacent Street and Residential Yards Study Areas.

2. <u>Actual or potential contamination of drinking water supplies or sensitive ecosystems.</u>

The LDW is a sensitive estuarine ecosystem in which species of salmonids listed as endangered species live as juveniles, along with the full complement of wildlife typical of such systems in urban areas of the Pacific Northwest. Estuarine intertidal and near-shore subtidal ecosystems in the LDW provide important habitat for juvenile salmonid growth, physiological transition, and predator avoidance during their outmigration. The estuarine environment also provides refuge for various marine fish during larval stages and supports an array of preferred prey for all salmonid life stages. The intertidal zone is located approximately between -4 ft and +13 ft MLLW, and the near-shore subtidal zone is just slightly deeper than the intertidal zone.

Within the intertidal areas, mudflats serve many ecosystem functions, including providing food and habitat for benthic invertebrates, fish, shorebirds, and aquatic mammals. A diverse assemblage of invertebrate species, including larvae, clams, worms, and crustaceans, can be found in these habitats, which typically consist of unconsolidated silts and clays and sand flats of unconsolidated sandy sediments. Mudflats containing gravel may support high densities of bivalve populations.

The features of the T-117 EAA intertidal mudflat make the area suitable habitat for the organisms described above and provide potentially important habitat for organisms within the juvenile salmonid food web. The intertidal mudflat of the T-117 EAA extends approximately 15 to 65 ft (4.6 to 20 m) from the immediate shoreline, around +5 ft MLLW, to a depth of approximately -4 ft MLLW, and includes more than 43,000 ft^2 (4,000 m^2) of gently sloping, fine-grained sediment. An LDW clam survey conducted in 2003 identified harvestable clams within the T-117 intertidal area.

The groundwater beneath the Upland Study Area and a portion of the Adjacent Streets and Residential Yards around Basin Oil (17th Ave S, Dallas Ave S and S Donovan St—Map 3-1 in EE/CA) is not potable due to marine tidal intrusion per salinity criteria in WAC 173-340-720(2). Drinking water standards are therefore not appropriate for this area. Groundwater beneath the Adjacent Streets and Residential Yards was not characterized for nature and extent of contamination for this NTCRA. It was considered as part of the EAA solely as a potential source of contamination to the LDW.

3. <u>High levels of hazardous substances or pollutants in soils largely at or near the surface that may migrate (300.415(b)(2)(iv)).</u>

In general, principal threat wastes (PTW) are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner and/or would present a significant risk to human health or the environment should exposure occur. EPA believes that though certain source materials are addressed best through treatment because of technical limitations to the long-term reliability of containment technologies, or the serious consequences of exposure should a release occur; these expectations also reflect the fact that

other source materials can be safely contained and that treatment for all waste will not be appropriate or necessary to ensure protection of human health and the environment.

While isolated samples of soil and sediment that have PCBs detected above levels that might constitute a principal threat, these were generally not collocated and it was not determined that there was an identifiable area that posed a principal threat. Sufficient information was not available for other contaminants to identify the presence of a principal threat waste.

4. Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released.

Contaminants found in the off-shore sediments could migrate or be released in the event of a severe flood and/or significant damage to the upriver Howard Hansen Dam. Presently, surface water from average and above average precipitation events in the Upland Study Area and adjacent streets mobilizes PCBs and dioxins/furans that are entrained in the water and then collected in local catch basins, storm water catchment systems and holding tanks. Occasionally, emergency discharges directly to the LDW occur.

5. The availability of other appropriate federal or state response mechanisms to respond to the release (300.415(b)(2)(vii)).

No other federal or state response mechanisms are available. It is fully anticipated that the Port and City will perform the work with EPA oversight pursuant to an EPA order on consent. Other than CERCLA, there are no known other appropriate federal or state response mechanisms capable of providing the appropriate resources in the prompt manner needed to address the potential human health and ecological risks associated with the T-117 EAA.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Action Memorandum, may present an imminent and substantial endangerment to public health, or welfare, or the environment.

V. PROPOSED ACTIONS AND ESTIMATED COSTS

A. Proposed Actions

RvALs are based on the objective of protecting human health and the environment for exposure pathways present throughout the T-117 EAA in sediment and soil. This overall objective has been divided into removal action objectives (RAOs), which are:

Sediment

- **Human health – seafood consumption**. Reduce human health risks associated with the consumption of resident LDW fish and shellfish to protective levels. This RAO is expected to be consistent with the RAO for future remedial actions in the LDW.
- **Human health – direct contact**. Reduce human health risks associated with exposure to COCs through direct contact with sediments and incidental sediment ingestion by reducing sediment concentrations of COCs to protective levels. This RAO is expected to be consistent with the RAO for future remedial actions in the LDW.
- **Ecological health – benthic**. Reduce toxicity to benthic invertebrates by reducing sediment concentrations of COCs to comply with the SMS.
- **Ecological health – seafood consumption**. Reduce risks to crabs, fish, birds and mammals from exposure to COCs by reducing sediment and surface water concentrations of COCs to protective levels.

Soil

- **Sediment protection.** Reduce PCB concentrations in upland soils to ensure protection of sediments.

Groundwater

- **Groundwater and Sediment protection. Reduce migration of contaminants in groundwater to sediments to** reduce risk to human health and the environment.

The removal action will meet these RAOs, with the exception of the RAO for human seafood consumption over the long term. The RBCs necessary to protect unlimited human seafood consumption are very stringent. The goal for the LDW as a whole is to get as close to them as practicable. Achieving them may be impossible as they are more stringent than background concentrations. However, this sediment removal will remove all contaminant concentrations over its aerial extent and will replace them with clean fill material. Upon completion therefore, these formerly contaminated sediments will meet all cleanup goals and levels until they are recontaminated, to however marginal a degree, by surrounding LDW concentrations, and LDW sources generally. These later post-NTCRA levels will be addressed by the LDW Record of Decision in a manner consistent with the rest of the LDW since the T-117 EAA will remain part of the LDW Site after this NTCRA is completed. It is important to emphasize that protective levels of some COCs, particularly PCBs, are well below background concentrations, so it will be not be possible, based on everything we know at this time, over the long term, to completely eliminate any unacceptable risk from this pathway without limiting fish consumption to some degree.

Through an evaluation of effectiveness, implementability and costs, the proposed action (Alternative 2 in the EE/CA) was selected as the proposed removal action. The selection of this alternative was not revised in response to public comment.

1. Proposed action description

Through an evaluation of effectiveness, implementability and costs, the proposed action (Alternative 2 in the EE/CA) was selected as the proposed removal action. The selection of this alternative was not revised in response to public comment.

The proposed action consists of a combination of excavating and dredging sediments in the LDW adjacent to the T-117 Upland Study Area; excavation of the bank and all T-117 Upland Study Area soils exceeding removal action levels (RvALs); excavation of soils in the Adjacent Streets and Residential Yards Study Area exceeding PCB RvALs; storm water management system upgrade and replacement; and long-term monitoring to determine that the removal objectives are achieved for the cleanup action within the approximately 15-acre T-117 EAA (Figure 3). The actions include:

- Removal of contaminated sediment and soil with disposal at an off-site commercial disposal facility, followed by backfilling with clean material, as detailed below:

  - Dredge approximately 14,000 cubic yards (cy) of contaminated sediment, concrete and other debris from the Sediment Study Area (as shown in Figures 7-7 of the EE/CA). This variable depth dredging (2-7 feet) will remove all sediments with contaminant concentrations higher than the removal action levels for all COCs. Clean backfill material (10,000 cy) will be placed in the clean dredged prism and be re-contoured to support intertidal habitat.

  - Excavate approximately 37,000 cy of Upland Study Area soil and debris (as shown in Figures 7-2 to 7-5 in the EE/CA) and backfill to elevation +14 MLLW with clean material (18,000 cy). The spatial extent of the action is designed to address COCs in the upland soil and include the removal of the berm of the shoreline bank. This is called the "baseline approach." Two other approaches are compatible with, and may also be implemented following the NTCRA depending on the future site use, to be determined by the Port following a public process. Option A would backfill to achieve surface elevations similar to those existing currently (elevation of approximately +18 to +21 MLLW). Option B has no

backfilling and transitions directly to habitat creation. General cross sections of Options A and B are shown on Figure 7-7 in the EE/CA, along with the baseline completion approach (used for costing purposes).

- Excavate approximately 10,100 cy of soil from Adjacent Streets and Residential Yards Study Area (as shown for the adjacent streets in Figures 7-5 and 7-6 and Map 7-2 and 7-3 EE/CA). Backfill with approximately 9,700 cy (which includes topsoil for yards and parking strips). These actions will be coordinated with property owners and/or occupants prior to initiation, and conducted to minimize disruption to the extent practicable, including to landscaping, fencing, utilities and other surface and subsurface features. Landscaping, fencing and other property that is damaged or disturbed will be restored, replaced and/or replanted and surface drainage will be maintained or improved as necessary.

- Prior to backfilling, collect samples (e.g., confirmation samples) on newly exposed surfaces to document the nature of the material beneath the backfilled area. In the sediments and T-117 Upland areas, excavations and dredging will continue until the RvALs in each media are reached. In the adjacent streets and or rights of way, the City may decide, with EPA concurrence, to stop excavating and place a cap in these areas. It is fully anticipated that that all the contamination in the residential yards will be removed and no capping will be necessary.

- Dispose of excavated and dredged material in an off site landfill that meets all state and federal requirements for disposal of such materials.

- Install or construct supporting facilities, staging areas, drainage and erosion controls, dust suppression equipment and effective decontamination facilities prior to initiation of the NTCRA.

- Evaluate the most feasible means of remediating the sediments under the floating docks in the South Park Marina area during project design. Necessary portions of South Park Marina floating docks may be temporarily removed from the removal action area.

- Water Control Systems.

  - Collection, treatment and disposal systems are required to address surface runoff coming into or originating from removal areas, as are engineered well-point systems and/or subsurface barriers or interceptor systems to limit the influx of groundwater into deeper upland excavations in the Upland Study Area.

- A shoreline barrier (i.e., sheet pile wall or soil berm) must be used as needed to limit tidal influence of groundwater and prevent tidal inundation of upland removal areas. Additional water extraction and treatment will likely be necessary for any water that may collect within temporary shoreline/bank barriers and the deeper inland soil removal prisms.

- Baseline groundwater monitoring, during and after removal action, is required to demonstrate that the action adequately removed contaminants from the soils which caused groundwater to exceed RvALs. If groundwater exceedances persist, additional measures will be evaluated.

- The temporary storm water system in the Adjacent Streets will be replaced by a permanent storm water collection and treatment system in accordance with Seattle Municipal Code (SMC) 22.800 and Directors' Rule 2009-005 (SPU), 17-2009 (Department of Planning and Development [DPD]

- Storm water must be monitored to ensure any water released to the LDW will not result in recontamination of sediments or harmful exposures to benthic organisms.

- Demolition and removal or relocation of structures and utilities.

  - The north, central and south buildings and associated shelters, loading docks and foundations will be demolished and disposed at either an appropriate disposal facility, recycled or reused to the extent practicable based on contaminant levels. Best Management Practices (BMPs) will apply to these activities. Demolition is necessary to determine if the soil beneath these structures needs to be excavated.

- Institutional controls.

  - Institutional controls (ICs) are required if hazardous substances remain under the asphalt of Adjacent Streets at levels that do not allow unlimited use and unrestricted exposure in such streets. An IC Implementation Plan and final IC Implementation Report are required. The specific objectives of the ICs are to:

    - Prevent any uncontrolled excavation or construction that may compromise the cap integrity of the paved streets if contaminated soil is left at depth;
    - Prevent any current or future land uses that could compromise the cap integrity;

- Require notification of the state and EPA prior to development or maintenance actions that may damage the cap;
- Ensure that these restrictions will run with the land, and are enforceable by EPA and Ecology, presumably in the form of a restrictive covenant pursuant to the Uniform Environmental Covenant Act (UECA).
- Currently, the Washington State Department of Health has issued a fish advisory in effect for the LDW. This fish advisory will remain in place after this removal action. Further fish consumption advisories, public education programs and/or limitations with respect to the T-117 EAA will be re-evaluated in the LDW-wide remedial decision making process.

- Performance of long-term monitoring and reporting.

  - Long-term monitoring and reporting is required to measure initial efficacy and recontamination. A Long-Term Monitoring and Reporting Plan must be developed to specify monitoring activities, including frequencies, and protocols. Recontamination from other than T-117 sources is expected to be addressed as part of the future long-term monitoring plan for the LDW.

2. Contribution to remedial performance

The T-117 EAA NTCRA will remove all contaminated sediments and sources to those sediments above RvALs within the T-117 EAA, a delineated PCB sediment hot spot from the LDW RI, thereby eliminating in the short term, and reducing over the long term, exposures to T-117 receptors while fully complementing and contributing to the long-term remediation of the LDW Site pursuant to CERCLA and the NCP.

3. Description of alternative technologies

Candidate technologies for sediment remediation were identified and screened prior to developing alternatives for further engineering analysis, and then further refined to a preferred alternative in EE/CA. General categories of removal action technologies considered at the screening stage included: no action, institutional controls, monitored natural recovery and enhanced natural recovery (MNR/ENR), containment, in-situ treatment, removal and treatment, and removal and disposal. Each of these candidate technologies were evaluated based on effectiveness, implementability, and cost. All technologies except containment and removal and disposal (along with no action for comparative purposes only) were eliminated at the screening stage from further consideration due to lack of sufficient projected efficacy, low expected

technical feasibility, and/or excessive comparative cost ineffectiveness, i.e., technologies that were not cost-effective relative to other equally-protective options were also not retained.

4. Engineering Evaluation/Cost Analysis (EE/CA)

The EE/CA Approval Memorandum was issued by EPA on July 7, 2004. The final EE/CA was approved by EPA on June 3, 2010. The Executive Summary is provided as Attachment A. A 30-day public comment period was held from June 7, 2010 through July 7, 2010, during which 12 comments were received and comments were recorded by a court reporter at the June 17, 2010, public meeting. The EE/CA Responsiveness Summary is attached (Attachment B). Other supporting documentation is found in the project administrative record.

The two active alternatives carried through the EE/CA, along with the no action alternative, differed principally in the amount of sediment contamination left in the Sediment Study Area upon completion of the NTCRA. The selected remedy removes all contaminated sediment in the SL-defined Sediment Study Area above RvALs, and replaces it with clean backfilling material. As explained in Section V on page 18 above, this will allow all cleanup goals and levels for sediments, however stringent, to be met over the aerial extent of the sediment action for the very short term, before any recontamination from surrounding concentrations or sources occurs. However, the sediment RvALs listed below are limited, e.g., for PCBs, to the SQS of the SMS numerical standards (for protection of benthic invertebrates) because: 1) the rate at which PCB levels could rise above the very stringent RBC or background levels is unknown but some recontamination is all but certain to occur; 2) these recontamination levels are not in any case projected to rise above SQS concentrations; and 3) the T-117 EAA will remain part of the LDW Site subject to its remedial action decisions with regard to whatever contaminant levels may reoccur.

The rejected active alternative removed substantially less contaminated sediment and contained all remaining contaminated sediments under an engineered cap. The removal action alternative for the Upland Area and the Adjacent Streets and Residential Yards was similar – removal of soil and backfill with clean material. When consideration of the cost of the second alternative that is much more permanent and protective in the long-term by removing and disposing of all EAA contaminated sediments above RvALs was compared to the cost of removing fewer sediments and designing, building, monitoring, maintaining and assuring an engineered cap, and the difference amounted to substantially less than a ten percent cost increment. The selection of this action was readily apparent and fully concurred on by the Port and City, the State and the Tribe. This action was also enthusiastically supported by the community as well (see Responsiveness Summary, Attachment B).

RvALs selected in the EE/CA are as follows:

T-117 EAA Sediment, Soil, and Groundwater Cleanup Levels

COCs	Sediment[a]	Soil[b]			Groundwater
	T-117 Sediment Study Area	T-117 Upland Study Area	Adjacent Streets	Residential Yards	T-117 Upland Study Area[c]
Metals					
Arsenic	12 ppm	7.3 ppm	na	na	5 µg/L
Silver	na	2.0/400 ppm[d]	na	na	1.9 µg/L
PAHs					
2-Methylnaphthalene	0.59 ppm[e]	na	na	na	na
Acenaphthene	0.25 ppm[e]	na	na	na	na
Anthracene	3.4 ppm[e]	na	na	na	na
Benzo(a)anthracene	1.7 ppm[e]	na	na	na	na
Benzo(a)pyrene	1.5 ppm[e]	na	na	na	na
Benzo(g,h,i)perylene	0.48 ppm[e]	na	na	na	na
Total benzofluoranthenes	3.6 ppm[e]	na	na	na	na
cPAH TEQ	0.09 ppm[f]	0.14 ppm[f]	na	na	0.15 µg/L
Chrysene	1.7 ppm[e]	na	na	na	na
Dibenzo(a,h)anthracene	0.19 ppm[e]	na	na	na	na
Dibenzofuran	0.23 ppm[e]	na	na	na	na
Fluoranthene	2.5 ppm[e]	na	na	na	na
Fluorene	0.36 ppm[e]	na	na	na	na
Indeno(1,2,3-cd)pyrene	0.53 ppm[e]	na	na	na	na
Phenanthrene	1.6 ppm[e]	na	na	na	na
Total HPAH (calc'd)	15 ppm[e]	na	na	na	na
Total LPAH (calc'd)	5.7 ppm[e]	na	na	na	na
TPH					
Diesel- and lube oil-range hydrocarbons	na	200/2,000 ppm[g]	na	na	500 µg/L
Other SVOCs					
BEHP	na	nc	na	na	1.7 µg/L
Phenol	0.420 ppm	na	na	na	na
PCBs					

COCs	Sediment[a]	Soil[b]			Groundwater
	T-117 Sediment Study Area	T-117 Upland Study Area	Adjacent Streets	Residential Yards	T-117 Upland Study Area[c]
Total PCBs	0.13 ppm dw[e] or 12 ppm OC	0.65/1.0 ppm[h]	1.0 ppm	1.0 ppm	0.01 µg/L
Dioxins and Furans					
Dioxin/furan TEQ	13 ng/kg	11 ng/kg	11 ng/kg	11 ng/kg	na

[a] Sediment point of compliance for the intertidal area is the top 10 cm for protection of benthic organisms and human health; the subtidal point of compliance is the top 45 cm for protection of human health.

[b] Upland soil point of compliance is the depth at which the RvAL is reached, not to exceed 15 ft.

[c] The point of compliance for the groundwater RvALs is the point of exposure or the location where groundwater discharges to surface water (see Figure 4-1).

[d] The TEE-based RvAL is 2.0 ppm in the upper 0 to 6 ft of soil for areas to be protective for terrestrial ecological exposures defined under MTCA and as determined by the type of biota to be present. The RvAL is 400 ppm for soils deeper than 6 ft.

[e] These RvALs were established based on SQS values, which are presented in units of ppm OC. The OC-normalized units were converted to ppm dw using a TOC concentration of 1.55%, reflecting the average TOC concentration in the T-117 Sediment Study Area based on both surface and subsurface sample results. For PCBs, if the SQS value of 12 ppm OC cannot be used because the TOC value in a sediment sample is outside the range of acceptability for TOC normalization (0.5 to 4.0%), then the LAET (upon which the SQS is based) in dry-weight units of 0.13 ppm can be applied as a surrogate value.

[f] These RvALs are likely to be lower than applicable background concentrations and may need to be adjusted upward.

[g] The TEE-based RvAL is 200 ppm in the upper 0 to 6 ft of soil for areas to be protective for terrestrial ecological exposures defined under MTCA and as determined by the type of biota to be present. The RvAL is 2,000 ppm for soils deeper than 6 ft.

[h] TEE-based RvAL is 0.65 ppm in the upper 2 ft of soil for areas to be protective for terrestrial ecological exposures defined under MTCA. The RvAL is 1.0 ppm for soils deeper than 2 ft.

na COCs are not applicable for every media and are denoted as such

BEHP – bis(2-ethylhexyl) phthalate

cPAH – carcinogenic polycyclic aromatic hydrocarbon

COC – contaminant of concern

dw – dry weight

HPAH – high-molecular-weight polycyclic aromatic hydrocarbon

LAET – lowest apparent effects threshold

LDW – Lower Duwamish Waterway

LPAH – low-molecular-weight polycyclic aromatic hydrocarbon

MTCA – Model Toxics Control Act

na – not applicable

nc – no criteria

OC – organic carbon

PAH – polycyclic aromatic hydrocarbon

PCB – polychlorinated biphenyl

RBTC – risk-based threshold concentration

RvAL – removal action level

SQS – sediment quality standards

SVOC – semivolatile organic compound

TEE – terrestrial ecological evaluation

TEQ – toxic equivalent

TOC – total organic carbon

TPH – total petroleum hydrocarbons

5. Applicable or relevant and appropriate requirements (ARARs)

SMS and upland soil MTCA/TSCA standards will be fully complied with. A comprehensive list of ARARs for this NTCRA is provided in Attachment C. Primary federal ARARs include the Clean Water Act (CWA), particularly Sections 303-304 and 404 and TSCA. Primary State ARARs include MTCA, the SMS and state water quality standards. Federal/State water quality criteria/standards for some contaminants may not be met through this action.

Aquatic organisms, including seafood, in water body sites like the LDW (including all its EAAs) are exposed to COCs in the water column, which is part of the areal extent of contamination from releases at or from the site. Many federal water quality criteria and/or state standards are calculated to protect such organisms, either directly as ecologically-based criteria, or to protect human seafood consumers (other water quality criteria or standards are based on drinking water exposures which are not relevant to the LDW, a marine estuary). Water quality is improved by removing sources of COCs to the water by actions like the sediment and upland actions selected in this Action Memorandum, i.e., by addressing contaminated sediment areas within the water body, and upland, including indirect source discharges which are not subject to CWA permitting. Improvement in water quality in localized areas following source removal can be dramatic.

The actions selected in this Action Memorandum will improve water quality in the LDW to an unknown degree, likely most demonstrably within the EAA and areas in its immediate proximity. Monitoring water quality with the legal standards as the goal to the extent practicable is fully consistent with CERCLA and the NCP, especially since this NTCRA constitutes "early action" that would otherwise be taken later as remedial action. This temporal distinction provides no basis for an alternate standard regarding promulgated requirements, since the only distinguishing legal feature of the early action standard is that it is merely to the extent practicable. Early actions and subsequent remedial actions at an NPL site should have the same goals and standards before them. Having such consistency does not prolong, extend, alter or harm the early action or subsequent remedial action, To the exent that water quality criteria or standards or any other ARARs prove unachievable at the LDW Site, including its EAAs, they may be subject to waiver pursuant to Section 121(d)(4) of CERCLA prior to completion of LDW remedial action.

Sediment and soil cleanup standards (RvALs) have been developed based primarily on the SMS and MTCA Method B soil cleanup standards (which default in this instance to TSCA standards in accordance with WAC 173-340-740(5)(b)), in coordination with Ecology in a manner consistent with many CERCLA removal and remedial actions over at least the last

decade. The SMS are part of MTCA (when they are employed to address contaminated sediments at CERCLA or MTCA sites), and may function independently for other applications, In-water dredging and filling shall comply with regulation pursuant to Section 404 of the CWA.

EPA will prepare a Biological Assessment that evaluates the potential effects on threatened and endangered species from this NTCRA, along with an evaluation of Essential Fish Habitat (EFH), and will consult with the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (FWS) (together, the "Services") and obtain a Biological Opinion prior to NTCRA implementation, particularly with respect to the taking of listed fish (NMFS has jurisdiction over commercial fisheries and FWS has jurisdiction over sport fisheries; salmon among other species are both commercial and sport species).

Off-site activities will comply with all applicable local, state, and federal laws, including the Off-Site Disposal Rule (40 CFR 300.440).

6. Project schedule

The project schedule for is anticipated to be set forth in the anticipated enforcement order on consent (Statement of Work) issued to the Port and City for this NTCRA. The construction phase of this project is currently scheduled for September 2012 through December 2013.

B. Estimated Costs

The projected costs to implement this NTCRA are estimated at $33.2 million (see Section 8.3 of the EE/CA).

EPA estimated costs per this Action Memorandum are anticipated only for costs associated with oversight of work performed by the PRPs. This work includes, but is not limited to, review and comments on required deliverables, field oversight of work, and other EPA responsibilities with respect to implementation of this response action. If EPA were to undertake implementation of the work described in this Action Memorandum, with its own resources, an Action Memorandum Amendment and cost Ceiling Increase would be required

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

If the proposed removal action should be delayed or not taken, hazardous substances will remain as potential human health and ecological threats, and hazardous substances will remain a continuing source of solid and dissolved-phase contaminants to the environment until the remedial action for LDW is selected and implemented.

VII. OUTSTANDING POLICY ISSUES

There are no outstanding policy issues at this site.

VIII. COMMUNITY RELATIONS

Throughout the development of the EE/CA, and the development of the completed LDW RI and ongoing FS, the region has provided access to any and all interested persons to all draft and final submissions under the T-117 EE/CA and LDW RI/FS Orders on Consent, on one or more sponsored websites, and has held regular briefings with stakeholders at numerous key points in the process. EPA also consulted with the community, formally and informally, with and without the Duwamish River Cleanup Coalition (DRCC), EPA's Technical Advisory Group (TAG) for the LDW site, and with and without the Port and City, both of whom as local governments have engaged in their own substantial outreach.

The EE/CA was available for public review and comment from June 7 through July 7, 2010. Notice of this comment period was published in the *Seattle Times, South Seattle Beacon* and *Highline Times* at the start of the 30-day public comment period. Notice of the comment period, public meeting, and a summary of the proposed EE/CA alternatives were described in a T-117 Fact Sheet (June-July 2010) mailed to approximately 3000 addresses, including a zip code saturation of South Park and neighboring Georgetown. Fact sheets in Spanish and Vietnamese (about 200) were also distributed. Announcements were placed on EPA's website, the EPA web calendar, the City of Seattle Neighborhoods web calendars, and on the South Park, West Seattle, and Georgetown blogs and listservs.

EPA provided information about the comment period, public meeting, and EE/CA at several community events and neighborhood meetings, including an April 24, 2010, neighborhood meeting for residents within the T-117 Study Area, a June 5, 2010, Duwamish Health Fair, the South Park food bank, and at the South Park and Georgetown Neighborhood Association monthly meetings from January through June. Fliers announcing the public meeting in English, Spanish and Vietnamese were distributed door-to-door in the immediate T-117 neighborhood.

Public outreach was also performed by DRCC-TAG. EPA included DRCC-TAG's public meeting flier in English and Spanish in EPA's T-117 Fact Sheet mailing. EPA provided information about the comment period, public meeting, and EE/CA at two DRCC community meetings on June 8 and June 15, 2010. EPA held a public meeting in the South Park neighborhood on June 17, 2010, attended by approximately 100 people. Public comments were recorded by a court reporter. EPA also received 12 comment letters and comment forms during the public comment period, and 10 individuals provided spoken comment at the public meeting.

Responses to all significant comments are provided in the Responsiveness Summary (Attachment B).

An Administrative Record was prepared for this action and notice of availability of that record was published in the above-referenced newspapers and the Superfund Fact Sheet. The Administrative Record was available at EPA, and copies of key documents were made available at the South Park Library which is an information repository, on the EPA LDW website, on the terminal117.com website and via CD-ROM.

IX. ENFORCEMENT

It is anticipated that this removal action will be implemented by the Port and City pursuant to an enforcement Order on Consent. If a consent order were to prove unachievable for any reason, EPA would likely issue a unilateral order. Alternatively, EPA could include this action as part of the LDW ROD if action has not been taken by that time. In any case the LDW ROD will acknowledge this EAA when that ROD issued, and the EAA will remain a part of the LDW Site.

X. RECOMMENDATION

This decision document sets forth the selected removal action for the T-117 EAA of the LDW Superfund Site, Seattle, King County, Washington, that has been developed in accordance with CERCLA, and is consistent with the NCP. This decision is based on the administrative record for the Site.

Conditions at the site meet the NCP 40 C.F.R. § 300.415(b) criteria for a removal action and I recommend your approval of the proposed removal action. The proposed removal action is expected to be conducted by the PRPs, the Port of Seattle and the City of Seattle, with oversight by EPA.

IX. APPROVAL/DISAPPROVAL

APPROVAL:

Daniel D. Opalski, Director
Office of Environmental Cleanup

9/30/10
Date

DISAPPROVAL:

Daniel D. Opalski, Director
Office of Environmental Cleanup

Date

IX. APPROVAL/DISAPPROVAL

APPROVAL:

_____ _____

Daniel D. Opalski, Director
Office of Environmental Cleanup

Date

DISAPPROVAL:

_____ _____

Daniel D. Opalski, Director
Office of Environmental Cleanup

Date

CONCURRENCES						
Initials:	Piper Peterson Lee	Sheila Eckman	Chris Field	Charlie Ordine	Lori Cohen, Signature	
Name:	PPL	SME	for SC	CO	SC	
Date:	9/30/10	9/30/10	9/30/10	9/30/10		

List of Figures and Attachments

Figures

Figure 1	Lower Duwamish Waterway Superfund Site Vicinity Map
Figure 2	T-117 Early Action Areas Site Overview
Figure 3	T-117 EAA Removal Boundaries
Figure 4	PCBs and Dioxin/Furans above State Cleanup Levels in the Streets and Yards

Attachments

Attachment A	Executive Summary for the Engineering Evaluation/Cost Analysis, T-117 Early Action Area
Attachment B	Responsiveness Summary for Public Comments on the Engineering Evaluation/Cost Analysis, T-117 Removal Action
Attachment C	ARARs

Figures

Wind Ward environmental LLC

N

0 0.25 0.5 Miles

0 0.25 0.5 Kilometers

Figure 1. Lower Duwamish Waterway Superfund site

Prepared by CEH 06/28/2010; MAP #2387; W:\Projects\00-08-06_Duwamish_RI\data\gis\Phase2 RI\Intro - Env Setting

Figure 2. T-117 EAA site overview

Prepared by CEH 06/11/07, revised by MTY 11/23/09. Map #2939. W:\Projects\03-08-12 T-117 (Malarkey)\Data\GIS\2008 EECA

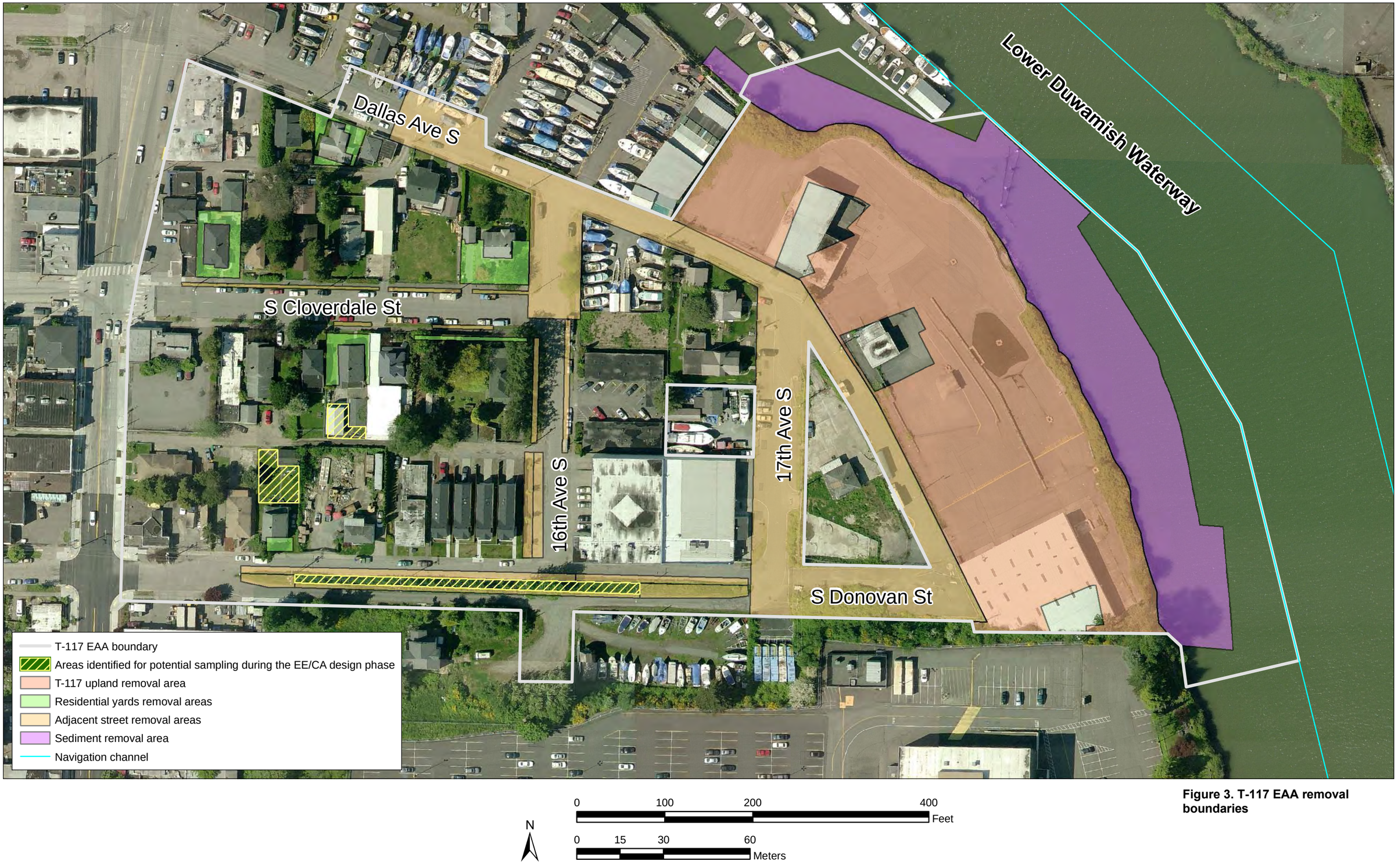

Figure 3. T-117 EAA removal boundaries

Prepared by MTY 01/11/10; CEH 06/02/10; Map #4039; W:\Projects\03-08-12 T-117 (Mallarkey)\Data\GIS\EECA\EECA_2009

Figure 4. Street and yard removal boundaries and locations with Dioxin TEQ greater than 11 ng/kg

Attachment A

Executive Summary

Engineering Evaluation/Cost Analysis
T-117 Early Action Area
Lower Duwamish Waterway Superfund Site, Seattle, WA

ATTACHMENT A

EE/CA Executive Summary

Lower Duwamish Waterway Superfund Site
Terminal 117 Early Action Area

REVISED ENGINEERING EVALUATION/COST ANALYSIS EXECUTIVE SUMMARY

Prepared for:

The Port of Seattle
and
The City of Seattle

For submittal to:

US Environmental Protection Agency, Region 10
1200 Sixth Avenue
Seattle, WA 98101

June 3, 2010

Prepared by:

Dalton, Olmsted & Fuglevand, Inc.

Environmental Consultants

Executive Summary

ES.1 INTRODUCTION

This document presents an overview of the results of an engineering evaluation/cost analysis (EE/CA) performed to identify and select a removal action for the Terminal 117 (T-117) Early Action Area (EAA), which is located within the Lower Duwamish Waterway (LDW) Superfund site. The T-117 EAA is a 15.2-acre site located in Seattle's South Park neighborhood on the west bank of the LDW between River Miles 3.5 and 3.7. The T-117 EAA is one of seven sites identified by the US Environmental Protection Agency (EPA) in 2003 as being highly contaminated by polychlorinated biphenyls (PCBs).

The EE/CA describes the non-time critical removal action (NTCRA), referred to as the "removal action," being conducted at the T-117 EAA and has been prepared in accordance with the Superfund regulation and the requirements set forth in EPA guidance (EPA 1993). The EE/CA uses site background information and a comprehensive compilation of site sampling data to identify contaminants of concern (COCs) in soil, sediment, and groundwater that pose potential human health and ecological risks. The EE/CA also establishes the boundaries for removal areas and develops and proposes two removal action alternatives (as well as a No Action alternative, which is included for comparison purposes). The EE/CA also presents the rationale for the recommended removal action alternative. The final removal action to be implemented at the T-117 EAA will be determined by EPA based on the proposed alternative in the final EE/CA and in consideration of public comment. EPA will document its decision in an Action Memorandum.

The T-117 EAA removal action is being performed by the Port of Seattle (Port) and the City of Seattle (City) under the oversight of EPA. The proposed removal action includes the cleanup of contaminated soil, sediment, and groundwater at the T-117 EAA through the removal or combined removal and capping of contaminated soil and sediment and completion of a permanent stormwater system.

The T-117 EAA consists of three areas (Figure ES-1), referred to as study areas:

- **T-117 Sediment Study Area –** the aquatic portion of the site within the LDW
- **T-117 Upland Study Area –** an upland area that was the site of historical industrial activities
- **Adjacent Streets and Residential Yards Study Area –** the streets and residential yards adjacent to the T-117 Upland Study Area that were investigated for contamination resulting from historical industrial activities at T-117. This area is east of 14th Avenue S and bounded by Dallas Avenue S and S Donovan Street.

Figure ES-1. Site map

The EE/CA also presents an assessment of the potential for the recontamination of the T-117 EAA once the removal action has been completed. This recontamination assessment also includes an analysis of known contaminants from historical industrial activities at two neighboring properties, Basin Oil and the South Park Marina, collectively referred to as the recontamination assessment areas (RAAs) (Figure ES-1). The assessment also qualitatively considers other offsite contaminant sources (e.g., airborne contaminants originating from non-specific areas beyond the T-117 EAA) and the transport of contaminants in groundwater within the T-117 EAA. This assessment was necessary to evaluate the long-term permanence of the removal action; however, additional stormwater and groundwater data are needed and will be collected during the T-117 EAA removal action design.

ES.2 SITE BACKGROUND AND DATA

The T-117 EAA was selected for early action in 2003 as part of the LDW Superfund project. The T-117 EAA was specifically selected to reduce PCB contamination in sediment. Much of the PCB contamination at the site is associated with historical

industrial activities that involved asphalt manufacturing in the T-117 Upland Study Area. Asphalt manufacturing operations included the use of recycled oils, some of which contained PCBs and were released to the surrounding environment. Asphalt manufacturing activities ceased in the early 1990s; and the former asphalt plant, tanks, and some contaminated soil were removed in 1996 and 1997. The Port acquired the former asphalt plant property in 2000. Currently, the T-117 Upland Study Area is fenced, secured, and vacant.

Since T-117 was selected as an EAA, the Port and the City have conducted a series of environmental investigations to further characterize environmental conditions, identify the removal action boundary, and investigate potential sources of contamination. These investigations primarily focused on PCB contamination and led to several interim cleanup actions that have been conducted throughout portions of the T-117 EAA.

Between 1999 and 2006, the Port conducted several removal actions that focused on the removal of asphalt plant residues and PCB-contaminated soil that remained within the T-117 Upland Study Area. In 1999, a soil removal action was conducted within the T-117 Upland Study Area to remove PCB-contaminated soil from the eastern portion of the T-117 Upland Study Area. In 2003, several old drums and other large debris were removed from the offshore intertidal area. In 2004, former asphalt plant underground pipes, contaminated soil, and debris were removed. In 2006, an additional removal action was conducted to remove newly discovered PCB-impacted soil that had the highest concentrations of PCBs within the T-117 Upland Study Area.

In 2004 and 2005, the City implemented a series of independent cleanup actions to address PCBs discovered in soil in the adjacent streets and residential yards near the T-117 EAA (City of Seattle 2005). The City removed soil that had PCB concentrations that exceeded 1 mg/kg from two residential yards on 17th Avenue S and unpaved street shoulders along Dallas Avenue S and portions of 16th Avenue S and placed a temporary asphalt cap or gravel over areas with residual contamination within the street areas on 17th Avenue S and to the east. In 2007, these street areas were included as part of the T-117 EAA and referred to as the Adjacent Streets.

In 2008, two archived LDW source control samples from two locations near T-117 were evaluated for dioxins and furans, and concentrations were above the Washington State Department of Ecology's (Ecology's) Model Toxics Control Act (MTCA) Method B cleanup level (CUL). EPA ordered an additional analysis for PCBs and dioxins and furans in streets, rights-of-way, and residential yards in 2008, and both contaminants were discovered in these areas. EPA requested that additional PCB and dioxin and furan investigations be conducted in all three T-117 EAA study areas. These investigations were conducted in 2008 and 2009 (Ecology 2009; Integral 2009; Windward and Integral 2009). The 2008 investigation resulted in detections of dioxins and furans and PCBs in sediment, upland soil, streets, parking strips, and residential

yards. These results led to EPA's request for additional sampling of yards and street shoulders in 2009 in order to refine the removal area boundary and determine the concentrations of PCBs and dioxin and furans in the yards. This additional soil sampling effort resulted in the detection of PCBs and dioxins and furans at concentrations above the MTCA Method B CUL in portions of the Adjacent Streets and in some residential yards. As a result of the 2008-2009 investigations, EPA directed that the Adjacent Streets portion of the T-117 EAA be expanded to include the area bounded by Dallas Avenue S to the north and east, 14th Avenue S to west, and S Donovan Street to the south (EPA 2009). The T-117 EAA boundary and samples used for decision-making from the T-117 Sediment, T-117 Upland, and Adjacent Streets and Yards Study Areas are shown on Figure ES-2.

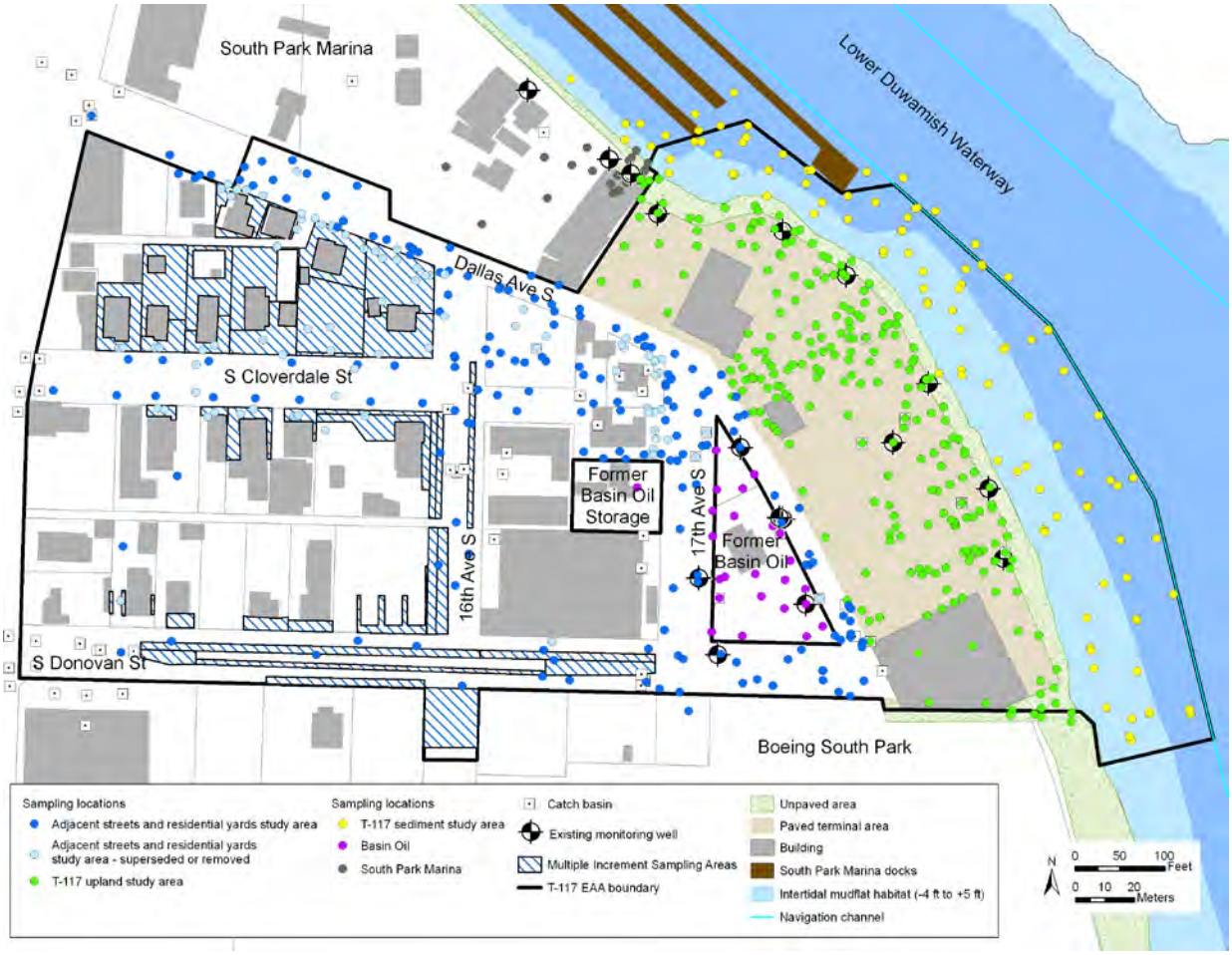

Figure ES-2. Sampling locations in T-117 EAA and vicinity

In total, 37 field investigations were conducted between 2003 and 2009 to characterize the nature and extent of PCBs and other contaminants in the T-117 EAA and vicinity. During these investigations, approximately 1,200 soil samples, over 100 groundwater

samples, and nearly 200 sediment samples were collected and principally analyzed for PCBs as well as other contaminants in select samples. The field investigations were iterative events; each additional field effort was based on the results of the preceding effort. Figure ES-2 presents the sampling locations in the T-117 EAA and vicinity.

ES.3 STREAMLINED RISK EVALUATION

A streamlined risk evaluation was performed to assess the need for a removal action. This evaluation was conducted in accordance with both Ecology (i.e., MTCA) and EPA (i.e., the Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA]) risk evaluation frameworks. Soil, sediment, and groundwater data were evaluated to identify soil, sediment, and groundwater COCs that will be addressed by the removal action to eliminate or reduce the ecological and human health risks associated with these contaminants. The streamlined risk evaluation also demonstrated that upon completion of the removal action, COC concentrations will be at or below the ecological and human health risk levels established for the T-117 EAA. The streamlined risk evaluation first used a conceptual site model to identify complete exposure pathways, sources, potential transport mechanisms, and receptors (e.g., people, fish) within each of the three T-117 EAA study areas, as presented in Table ES-1.

Table ES-1. Summary of exposure pathways and receptors identified in the streamlined risk evaluation

Exposure Pathway by Receptor	Receptor Type	Sediment Study Area	Soil		Groundwater
			T-117 Upland Study Area	Adjacent Streets and Residential Yards Study Area	
Aquatic Organisms					
Ingestion, direct contact	benthic invertebrates	X			X
	mammals	X			
	Fish	X			X
	Birds	X			
People Who Use the LDW and Reside or Work in the Adjacent Streets and Residential Yards Study Area					
Ingestion, direct contact	kayakers	X			X
	fishermen	X			X
	clammers	X			X
	beachgoers	X			X
	residents			X	
	Workers	X	X	X	X

Exposure Pathway by Receptor	Receptor Type	Sediment Study Area	Soil		Groundwater
			T-117 Upland Study Area	Adjacent Streets and Residential Yards Study Area	
Inhalation	residents		X	X	
	Workers		X	X	
People, Fish, and Wildlife					
Seafood consumption	Fish	X			
	Birds	X			
	mammals	X			
	people	X			

LDW – Lower Duwamish Waterway
T-117 – Terminal 117

Risk-based screening levels for soil, sediment, and groundwater relative to the pathways (e.g., direct contact, seafood consumption, and inhalation) were then used to identify COCs. The COCs identified for sediment, soil, and groundwater are presented in Table ES-2.

Table ES-2. T-117 EAA contaminants of concern

Contaminant of Concern	Sediment Study Area	Soil		Groundwater
		T-117 Upland Study Area	Adjacent Streets and Residential Yards Study Area	
Arsenic	X	X		X
Silver		X		X
PAHs[a]	X			
Carcinogenic PAHs	X	X		X
TPH(diesel and oil range)		X		X
Bis(2-ethyhexyl) phthalate				X
Phenol	X			
Total PCBs	X	X	X	X
Dioxin and furans	X	X	X[b]	

[a] PAHs include individual PAH compounds, total LPAHs, and total HPAHs.
[b] Dioxins and furans were designated as COCs where co-located with PCBs above the PCB removal action level in the Adjacent Streets and Residential Yards Study Area

EAA – early action area
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
PAH – polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
T-117 – Terminal 117
TPH – total petroleum hydrocarbons

ES.4 REMOVAL ACTION GOALS AND OBJECTIVES

The goal of the removal action is to reduce human health and ecological risks to acceptable levels in the T-117 EAA. In addition, the removal action will make the site available for a variety of potential future land uses, including unrestricted land uses, industrial and commercial activities, and non-industrial uses such as river and/or shoreline habitat, public access, and recreational facilities. The removal action is believed to be sufficient to prevent the recontamination of the T-117 Sediment Study Area from sources within the T-117 EAA and RAAs.

To accomplish this goal, the scope of the removal action includes the removal of soil and the removal or containment of sediment from within the T-117 EAA that will be sufficient to achieve concentrations at or below specific risk-based levels. These levels are referred to as removal action levels (RvALs). The T-117 EAA is located within the LDW, and sediment cleanup goals, including chemical-specific CULs, have not been determined for the LDW remediation because a cleanup decision has not been finalized. Therefore, EPA has specified that the T-117 removal action must use site-specific RvALs until the final LDW cleanup goals have been determined. These RvALs are based on federal and state cleanup and remediation levels and will be reviewed as the removal action progresses into the design phase. The RvALs are presented in Table ES-3.

Table ES-3. T-117 EAA sediment, soil, and groundwater removal action levels

Contaminant of Concern	Removal Action Level				
	Sediment	Soil			Groundwater
		T-117 Upland Study Area	Adjacent Streets	Residential Yards	
Arsenic	12 mg/kg	7.3 mg/kg	na	na	5 µg/L
Silver	na	2.0/400 mg/kg[a]	na	na	1.9 µg/L
PAHs	0.25 – 15 mg/kg[b]	na	na	na	na
Carcinogenic PAHs	0.09 mg/kg	0.14 mg/kg	na	na	0.15 µg/L
TPH (diesel and oil range)	na	200/2,000 mg/kg[a]	na	na	500 µg/L
Bis(2-ethylhexyl) phthalate	na	na	na	na	1.7 µg/L
Phenol	0.420 mg/kg	na	na	na	na
Total PCBs	12 mg/kg OC or 0.13[d] mg/kg dw	0.65/1.0 mg/kg[c]	1.0 mg/kg	1.0 mg/kg	0.01 µg/L
Dioxin/furan TEQ	13 ng/kg	11 ng/kg	11 ng/kg[e]	11 ng/kg[e]	na

[a] First RvAL is for the upper 0 to 6 ft of soil, and the second RvAL is for soil deeper than 6 ft as defined by MTCA (see Table 4-6 of the EE/CA for details).

[b] PAHs include individual PAH compounds, total LPAHs, and total HPAHs and are presented as the range of RvALs for these compounds.

[c] First RvAL is for the upper 0 to 2 ft of soil, and the second RvAL is for soil deeper than 2 ft as defined by MTCA (see Table 4-6 of the EE/CA for details).

[d] If the SQS of 12 mg/kg OC cannot used because the TOC in a sediment sample is outside the range of acceptability for TOC normalization (0.5 to 4.0%), then the lowest apparent effects threshold (upon which the

SQS is based) in dry-weight units of 0.13 mg/kg can be applied as a surrogate value. This dry-weight value of 0.13 mg/kg was used for the purposes of risk estimation.

[e] Where co-located with PCBs above the PCB RvAL.

dw – dry weight
EE/CA – engineering evaluation/cost analysis
HPAH – high-molecular-weight polycyclic aromatic hydrocarbon
LPAH – low-molecular-weight polycyclic aromatic hydrocarbon
na – not applicable
OC – organic carbon
PAH – polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
TOC – total organic carbon
TPH – total petroleum hydrocarbons
RvAL – removal action level

Sediment RvALs for the T-117 Sediment Study Area are based on Washington State Sediment Management Standards (SMS) and EPA risk-based goals developed for the LDW remedial project. EPA has also specified that RvALs for soil in the Upland Study Area and the Adjacent Streets and Residential Yards Study Area must be developed based on the methodology set forth under MTCA for calculating soil cleanup levels and defining appropriate points of compliance. RvALs are thus based on the objective of protecting human health and the environment for exposure pathways present throughout the T-117 EAA in sediment and soil. This overall objective has been divided into removal action objectives (RAOs), which are:

Sediment

- **Human health – seafood consumption**. Reduce human health risks associated with the consumption of resident LDW fish and shellfish by reducing sediment and surface water concentrations of COCs to protective levels.
- **Human health – direct contact**. Reduce human health risks associated with exposure to COCs through direct contact with sediments and incidental sediment ingestion by reducing sediment concentrations of COCs to protective levels.
- **Ecological health – benthic**. Reduce toxicity to benthic invertebrates by reducing sediment concentrations of COCs to comply with the SMS.
- **Ecological health – seafood consumption**. Reduce risks to crabs, fish, birds and mammals from exposure to COCs by reducing sediment and surface water concentrations of COCs to protective levels.

Soil

- **Sediment protection.** Reduce PCB concentrations in upland soils to ensure protection of sediments.

The removal action will meet these RAOs, with the exception of the RAO for human seafood consumption. Protective levels of some COCs, particularly PCBs, are well below background concentrations, so it will not be possible to completely eliminate any unacceptable risk from this pathway.

Removal areas include all locations where soil and sediment COC concentrations exceeded RvALs; however, in the Adjacent Streets and Residential Yards Study Area,

dioxins and furans are COCs in soil only where PCBs exceeded the PCB RvAL as directed by EPA. The removal areas are shown on Figure ES-3. The removal areas include most of the T-117 Sediment Study Area, nearly all of the T-117 Upland Study Area and portions of the Adjacent Streets and Residential Yards Study Area. A few areas need additional sampling during remedial design and may or may not be designated as removal areas. These areas are also identified on Figure ES-3.

Figure ES-3. T-117 EAA removal areas

RvALs were also developed for groundwater at the T-117 EAA to determine the groundwater concentrations needed in order to prevent the recontamination of sediment or unacceptable levels of groundwater contaminants to the LDW. It was determined that through the removal of contaminated soil, concentrations of COCs in groundwater at the point of discharge to surface water and sediment are expected to be reduced to below the RvALs. Therefore, specific groundwater treatment measures, other than the removal of soil, are not included as part of the removal action.

ES.5 RECONTAMINATION ASSESSMENT

The EE/CA also includes an assessment of the potential for the recontamination of the EAA after it has been cleaned up, identifies strategies to control potential sources of recontamination, and provides recommendations for post-removal action monitoring. The source control strategy for the T-117 EAA is governed by that outlined for the LDW (Ecology 2004). One goal of the strategy is to control sources so that the potential for contaminants in sediment to exceed the LDW cleanup goals and the SMS (Washington Administrative Code [WAC] 173-204) is minimized.

Potential source areas and transport mechanisms within or near the T-117 EAA are shown on Figure ES-4. These areas include upland portions of the T-117 EAA, Basin Oil, South Park Marina, the LDW, and offsite regional urban and industrial sources. Potential transport mechanisms include the erosion of onsite surface or subsurface soil, stormwater and groundwater movement from upland areas, sediment movement within the LDW, and atmospheric deposition from regional sources.

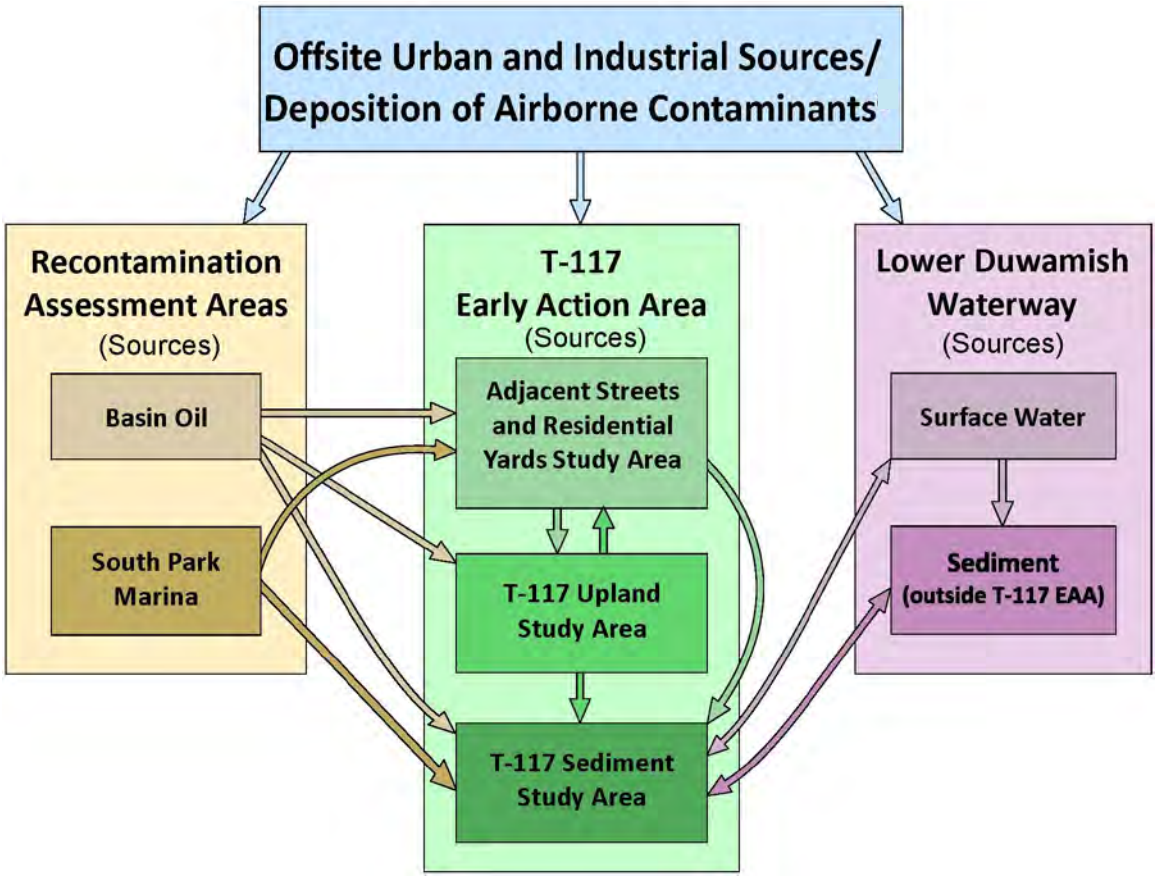

Figure ES-4. T-117 EAA potential recontamination sources and routes

The recontamination assessment concluded that potential recontamination of the T-117 Sediment Study Area after the planned removal action is not likely to occur because the primary source of contaminated soil and sediment within the T-117 EAA will be removed. The groundwater quality is expected to improve after the removal of the contaminated soil. In addition, potential contaminant transport from Basin Oil, South Park Marina, offsite urban sources, and the LDW (e.g., upstream sediment transport) is not expected to result in the recontamination of the T-117 Sediment Study Area at concentrations that exceed the sediment RvALs. Nevertheless, post-removal action monitoring of stormwater solids, groundwater, and sediment will be performed to ensure the long-term effectiveness of the removal action and support the objective of protecting ecological receptors and human health.

ES.6 REMOVAL ACTION TECHNOLOGIES

The EE/CA considers a range of removal action technologies, including soil excavation, sediment dredging, sediment capping, treatment, and disposal. The evaluation and selection process emphasized technologies that have been proven and are readily implementable at full scale (rather than research or pilot scale). Additional key selection criteria included the appropriateness of the technology for the size and site-specific conditions of the T-117 EAA, availability for implementation, and feasibility of implementation within the anticipated removal action timeframe. Removal, containment (capping), and disposal were selected as technologies appropriate for the removal action, as summarized in Table ES-4.

Table ES-4. Removal action technologies selected for the T-117 EAA

Category	Technology/ Method	Applicable Media	Rationale
Removal	land-based excavation	upland soil, nearshore sediment	Technology is appropriate and readily available for the scale and site-specific conditions at the T-117 EAA.
	over-water mechanical dredging	sediment	Technology is proven and available within the project area. Special bucket designs and operating procedures can be used for mechanical dredging to limit the release of solids.
Containment	in-water capping	sediment	Technology is appropriate for the T-117 Sediment Study Area but will likely require restrictive environmental covenants and monitoring to demonstrate effectiveness.
Disposal	hazardous and non-hazardous landfill disposal	soil or sediment	Method is available and typically used for managing contaminated material.

EAA – early action area
T-117 – Terminal 117

ES.7 REMOVAL ACTION ALTERNATIVES

The EE/CA identified two viable removal action alternatives. Both of these alternatives have the ability to meet the defined remedial action objectives using the selected technologies. A No Action alternative was also included in the analysis as a basis for the comparison of the two viable alternatives. The alternatives are:

- **No Action alternative –** This alternative does not remove or provide containment of any contaminated sediment or soil and does not meet the RAOs. It would also require the prolonged use of ongoing institutional controls, monitoring, and inspection, as well as the maintenance of erosion and stormwater controls. The No Action alternative is not considered acceptable for the T-117 EAA.
- **Alternative 1: Upland soil removal and sediment removal combined with sediment capping –** Alternative 1 involves the removal of soil from the T-117 Upland Study Area and adjacent shoreline bank as well as the Adjacent Streets and Residential Yards Study Area to meet the soil RAOs. The soil RvALs for COCs would be met to the appropriate point of compliance below completed grade per MTCA requirements for unrestricted land use. The Upland Study Area would be backfilled to an elevation of +14 ft mean lower low water (MLLW), and the Adjacent Streets and Residential Yards would be backfilled to near original grades. Alternative 1 includes the removal of contaminated sediment within the intertidal portion of the sediment removal area, as well as dredging within the Marina to re-establish navigation depths. The excavated nearshore areas would then be backfilled with clean material to re-establish site grades. The remainder of the sediment located farther offshore in the subtidal portion of the sediment removal area would be isolated beneath a sediment cap**.**
- **Alternative 2: Upland soil removal and sediment excavation/dredging –** Alternative 2 is the same as Alternative 1 with regard to excavation and backfilling within the T-117 Upland Study Area and adjacent shoreline bank, as well as the Adjacent Streets and Residential Yards Study Area. Alternative 2 only differs from Alternative 1 relative to the nature of the removal action in the T-117 Sediment Study Area. Alternative 2 would involve the dredging of all contaminated sediment within the sediment removal area, including dredging within the Marina to re-establish navigation depths. The dredged areas, except the Marina, would be backfilled with clean material to re-establish site grades.

Figure ES-5 graphically presents the principal difference between Alternatives 1 and 2, which is the removal action within the sediment removal area. The removal action for the Upland and Adjacent Streets and Residential Yards Study Areas is the same under both alternatives.

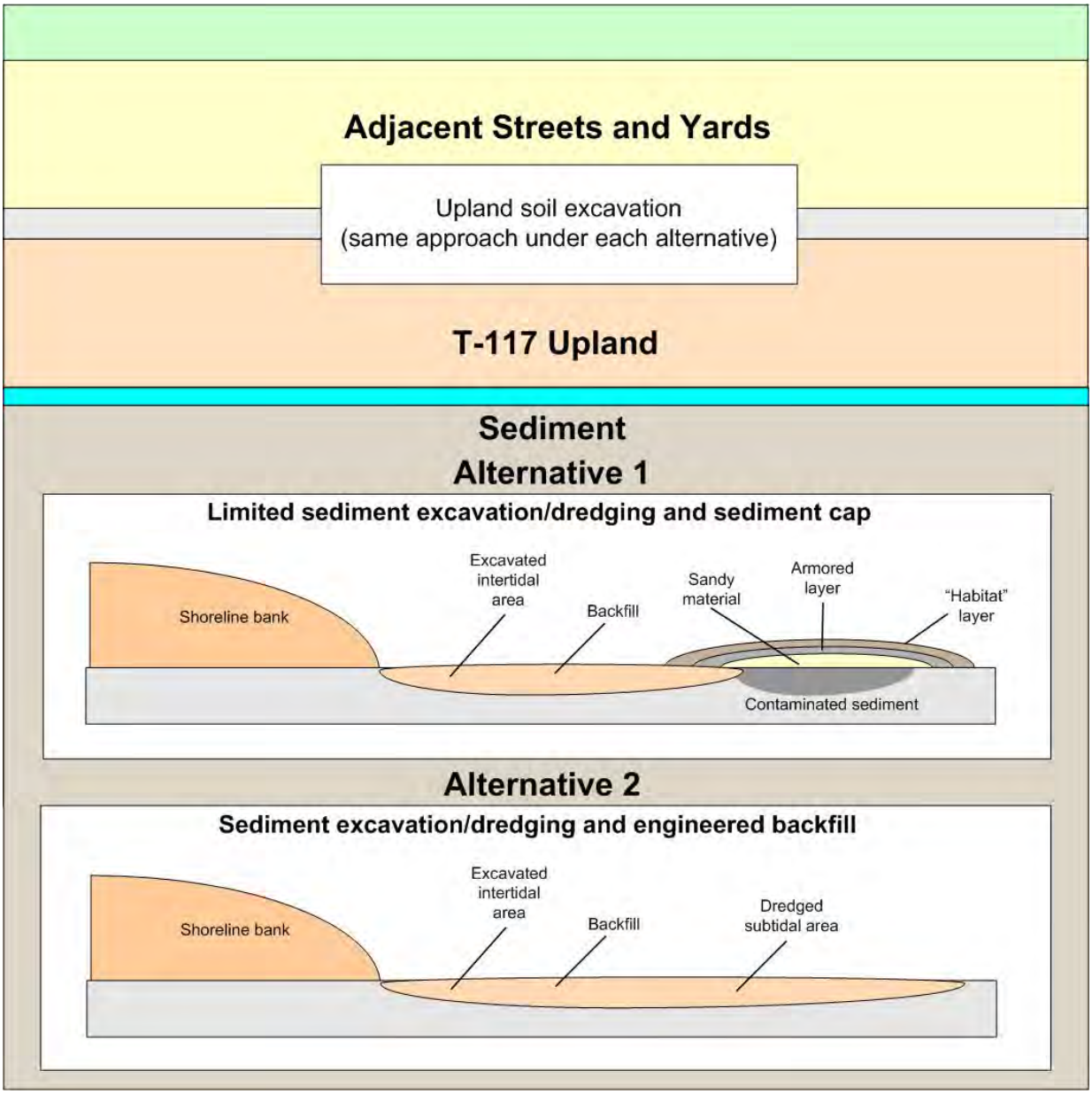

Figure ES-5. Comparison of Alternatives 1 and 2

The final redevelopment of the site is a separate action that will be conducted after the removal action has been completed. Under both Alternatives 1 and 2, it has been assumed that the T-117 Upland Study Area will be backfilled to an intermediate grade of approximately +14 ft MLLW in order to complete the removal action. This completion scenario has been assumed as the selected option for the purpose of developing costs and comparing alternatives.

However, other completion options are possible, including: 1) restoring the T-117 Upland Area to the existing elevation of approximately +20 ft MLLW, or 2) limiting backfilling to transition directly to create habitat or implement other aquatic-oriented

site improvements. The latter option would be the preferred option, but the precise coordination required between the removal and redevelopment projects cannot be planned at this time. The Port will work with the community to determine the final redevelopment design of the T-117 Upland Study Area and will facilitate a smooth transition between the removal and redevelopment projects.

ES.8 Comparative Analysis of Removal Action Alternatives

Both Alternatives 1 and 2 achieve the site-specific remedial action objectives described in Section ES.4, comply with all applicable or relevant and appropriate requirements (ARARs), and provide long-term effectiveness through the removal of the majority of the contaminated soil and sediment at the site. In addition, both alternatives are feasible, and the technologies required for their implementation are readily available. The notable differences between the two alternatives are that Alternative 1 is slightly less expensive, requires the removal of less sediment, and relies on the integrity of the sediment cap to provide long-term effectiveness. Table ES-5 provides a brief comparison of the two removal action alternatives.

Table ES-5. Summary of comparative analysis of Alternatives 1 and 2

Component	Alternative 1	Alternative 2
Protection of human health and the ecological receptors	Achieves protection of ecological receptors and reduces risk to human health.	Same as that for Alternative 1.
Achievement of RAOs	At the completion of the removal action, the EAA will remain part of the larger LDW Superfund site and will have the benefit of the remedial action to further reduce risks to human health and ecological receptors.[a]	Same as that for Alternative 1.
Compliance with ARARs	Complies with ARARs to the extent practicable.	Same as that for Alternative 1.
Effectiveness		
Long-term effectiveness and permanence	Achieves long-term effectiveness and permanence through dredging and the placement of a sediment cap that will require long-term monitoring and maintenance.[b]	Achieves long-term effectiveness and permanence through dredging.
Short-term effectiveness	Achieves short-term effectiveness and involves less dredging than does Alternative 2. The potential period of short-term impacts to water quality would be of slightly shorter duration than that for Alternative 2.	Achieves short-term effectiveness but involves more dredging than does Alternative 1. The potential period of short-term impacts to water quality would be of slightly longer duration than that for Alternative 1.
Implementability		
Upland removal	Alternative is readily implementable.	Alternative is readily implementable.
Sediment removal	Alternative is readily implementable.	Alternative is readily implementable.

Component	Alternative 1	Alternative 2
Volumes (cubic yards)		
Soil removed	47,000	47,000
Sediment removed	6,500	14,000
Sediment engineered cap material required	8,000	not applicable
Sediment engineered backfill material required	not applicable	10,000
Cost	$31,700,000	$33,200,000

[a] These actions are anticipated to consist of: 1) LDW-wide source control of lateral loading to reduce cap recontamination, 2) monitored natural recovery of expected sedimentation from the upper Green River system into the LDW system, and 3) institutional controls.

[b] Maintains long-term effectiveness and permanence to the extent that items 1 through 3 in footnote a are implemented.

ARAR – applicable or relevant and appropriate requirements

RAO – remedial action objective

ES.9 RECOMMENDATION

Alternative 2 is the recommended alternative for the T-117 removal action. The key advantage of Alternative 2 is that it provides for maximum long-term effectiveness and permanence. Although Alternative 2 would cost more to implement because of the added quantity of dredged material, this additional cost will be offset, in part, by the fact that there will be no post-removal action cap monitoring and performance review costs, which would be required under Alternative 1. Alternative 2 also has the potential for slightly greater short-term impacts associated with sediment disturbance resulting from additional dredging, compared with those associated with less dredging and the placement of a cap, but these can be mitigated through the use of proper dredging project design and controls. Alternative 2 also allows for maximum design flexibility, which may be needed to accommodate final site uses that will be selected in cooperation with the South Park community. Final site contours can be designed without the need to accommodate permanent intertidal cap structures.

ES.10 PRE-DESIGN AND POST-REMOVAL ACTIVITIES

Supplementary information needs for the removal action design will be addressed before the removal action is implemented. These needs relate to the items listed below and are described in further detail in the Section 9.4 of the EE/CA.

- Adjacent Streets and Residential Yards Study Area soil and groundwater data
- RAA groundwater, catch basin, and stormwater data
- T-117 Upland Study Area groundwater and geotechnical data
- Pre-removal confirmation sampling
- Site preparation and constraints

- Coordination of final grade for restoration grading plan
- Development of community protective measures

Post-removal activities will include monitoring and maintenance to ensure that the RAOs are being met and that there is compliance with ARARs. A long-term operation, monitoring, and maintenance plan will be prepared in accordance with appropriate guidance documents during the design phase of the removal action and will address the final site configuration, potential site uses, and additional redevelopment details. The post-removal action plan will be prepared in association with EPA and Ecology and stakeholder review and input. The plan will address the principal study areas; groundwater monitoring; and the operation, monitoring and maintenance requirements for storm drainage systems that serve the upland portions of the EAA. The post-removal monitoring plan will be designed to evaluate the effectiveness of source control measures put in place.

ES.11 SCHEDULE

The EE/CA will be used to assist EPA in the selection of the final removal action alternative and preparation of an Action Memorandum. The removal action design will begin once EPA issues the Action Memorandum. Figure ES-6 presents a timeline for these key milestones as well as the anticipated duration of removal action activities.

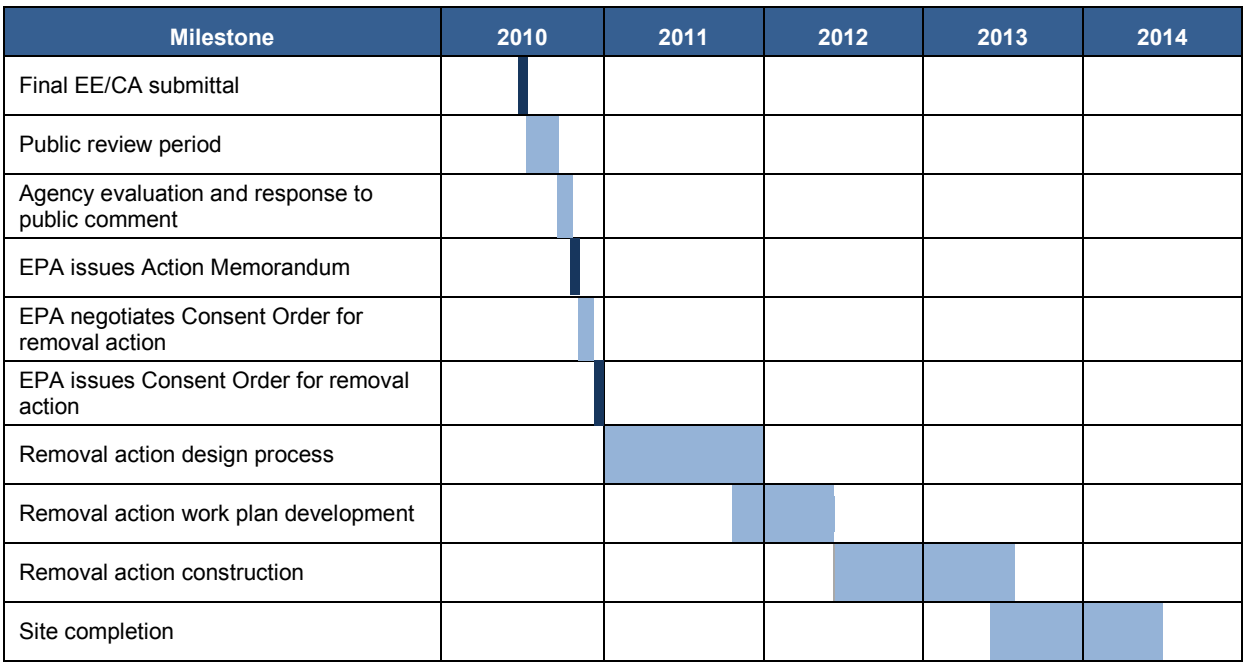

Figure ES-6. T-117 NTCRA schedule

Upon completion of the removal action, a significant early action site within the LDW Superfund site will be addressed, reducing contamination in the LDW and providing the potential for a broad range of potential future site uses at T-117.

ES.12 REFERENCES

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Ecology. 2009. Personal communication (e-mail communication from R. Thomas to P. Peterson Lee, EPA Region 10, regarding dioxin data). Washington State Department of Ecology, Bellevue, WA. July 7, 2009.

EPA. 1993. Guidance on conducting non-time-critical removal actions under CERCLA. EPA/540-R-93-057. Office of Emergency and Remedial Response, US Environmental Protection Agency, Washington, DC.

EPA. 2009. Management meeting administrative decision made directing the Adjacent Streets to be expanded. August 10, 2009. US Environmental Protection Agency Region 10, Seattle, WA.

Integral. 2009. PCB boundary refinement data report. Draft. Prepared for the Port of Seattle and the City of Seattle. Integral Consulting Inc., Seattle, WA.

Windward, Integral. 2009. Lower Duwamish Waterway Superfund site, Terminal 117 early action area. Dioxin investigation and PCB sediment removal boundary delineation data report. Prepared for the Port of Seattle and the City of Seattle. Windward Environmental LLC, Seattle, WA; Integral Consulting, Inc., Mercer Island, WA.

Glossary

Terminology	Definition
Action Memorandum	An EPA document that provides a concise, written record of the decision to select the appropriate removal action alternative
applicable or relevant and appropriate requirement (ARAR)	The requirement that any legally applicable or relevant and appropriate remediation requirement, standard, criteria, or limitation promulgated under federal or state environmental law be consistent with CERCLA
cleanup level (CUL)	The concentration of a hazardous substance that does not threaten human health or the environment
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)	A 1980 federal law that created a trust fund to investigate and clean up abandoned or uncontrolled hazardous waste sites; also referred to as the Superfund act
conceptual site model	A schematic diagram that identifies the relationships between sources of environmental contamination in the environment, potential exposure pathways (e.g., ingestion or contact with skin), and potential receptors (e.g., fish or people who might come into contact with contaminated media), and lists the potential exposure pathways (e.g., dermal contact with contaminated soil)
contaminant of concern (COC)	Chemical that has been evaluated and determined to be likely to cause risk to human health and the environment
early action area (EAA)	A site along the Lower Duwamish Waterway that has been selected for remediation prior to the establishment of site-wide Lower Duwamish Waterway remediation goals
engineering evaluation/cost analysis (EE/CA)	A preliminary remediation design process to evaluate engineering options and analyze costs
mean lower low water (MLLW)	The average of the lower of the two daily low tides; typically used as an elevation reference
Model Toxics Control Act (MTCA)	A 1988 Washington State law designed to clean up hazardous waste sites
non-time-critical removal action (NTCRA)	A removal action at a site that does not pose imminent and substantial threat to public health or the environment
point of compliance	The depth at which the RvALs are met
polycyclic aromatic hydrocarbons (PAHs)	A group of chemicals present in fuels, oils, and creosote; some PAHs are known to cause cancer (i.e., are carcinogenic)
polychlorinated biphenyls (PCBs)	A group of toxic chemicals that is persistent in the environment despite the fact that the use of PCBs in the US was banned in 1979
recontamination assessment areas (RAAs)	Nearby contaminated areas that have been identified for investigation as potential sources of recontamination once the site has been cleaned up; Basin Oil and the South Park Marina were identified as RAAs for T-117
removal action objective (RAO)	The goal of the cleanup action
removal action level (RvAL)	The cleanup level that must be met at the T-117 EAA
total petroleum hydrocarbons (TPH)	A measured portion of oil that is contained in motor oil and fuels that are derived from the refining of crude oil
US Environmental Protection Agency (EPA)	The federal agency responsible for protecting the environment
Washington State Department of Ecology (Ecology)	The Washington State agency responsible for protecting the environment
Washington State Sediment Management Standards (SMS)	Washington State sediment quality criteria developed by Ecology

Attachment B

Responsiveness Summary for Public Comments

Engineering Evaluation/Cost Analysis
T-117 Early Action Area
Lower Duwamish Waterway Superfund Site, Seattle, WA

Action Memorandum
Attachment B
September 30, 2010

Responsiveness Summary

for Public Comments on the Engineering Evaluation/Cost Analysis
Terminal 117 Early Action Area
Lower Duwamish Waterway Superfund Site, Seattle, WA

This document summarizes and responds to public comments submitted on the Engineering Evaluation/Cost Analysis (EE/CA) for the proposed removal action at the Terminal 117 (T-117) Early Action Area at the Lower Duwamish Waterway Superfund Site in Seattle, Washington.

The EE/CA for this removal action was available for public review and comment from June 7 through July 7, 2010. Notice of this comment period was published in the *Seattle Times* and *South Seattle Beacon* and *Highline Times* at the start of the 30-day public comment period. Notice of the comment period, public meeting, and a summary of the proposed EE/CA alternatives were described in a T-117 Fact Sheet (June-July 2010) that was mailed to approximately 3000 addresses, including a zip code saturation of South Park and Georgetown. Fact sheets in Spanish and Vietnamese (about 200) were also distributed. Announcements were placed on EPA's website, the EPA web calendar, the Port of Seattle (Port) T-117.com website, the City of Seattle (City) Neighborhoods web calendars, and on the South Park, West Seattle, and Georgetown blogs and listservs. Public outreach was also performed by the Duwamish River Cleanup Coalition (DRCC), EPA's Community Advisory Group for the site.

EPA participated in monthly meetings of the South Park Neighborhood Associations and other frequent local meetings including the Georgetown Neighborhood Association, Greater Duwamish District Council, South Park Community Association Advisory Council, University of Washington/Duwamish River Cleanup Coalition (DRCC) Charette, Study Area Neighborhood meeting, Duwamish River Festival, Duwamish Alive Celebration, South Park Food Bank at the Providence Regina House and the Environmental Health Fair at Concord elementary school, from January through June 2010. Community questions and comments were noted at each of these meetings and responses from the EPA, Port, and City were published in an informal "Listening Log" posted on the T-117.com website.

EPA held a public meeting in the South Park neighborhood on June 17, 2010. The meeting was attended by approximately 100 people. Public comments were recorded by a court reporter.

EPA received 12 comment letters and comment forms during the public comment period, and 10 individuals provided spoken comments at the public meeting. Original public comment documents and the transcript from the public meeting are provided in the administrative record. Consistent with EPA guidance (OSWER Directive 9360.3-01), responses to all significant comments are provided below. Each response includes a paraphrased summary of the original comment, as well as reference to the source of the comment. Several comments were made more than once. In these cases, the paraphrased summary may include more than one reference or may cross-reference other responses. Some EPA responses include references to the *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites (EPA 2005)*, available on EPA's Superfund program website at http://www.epa.gov/superfund/resources/sediment/guidance.htm.

Document	Author(s)	Description
DRCC1	Duwamish River Cleanup Coalition	"DRCC-TAG Talking Points for the Terminal 117 public meeting on June 17, 2010" (referenced in comments submitted by Robert Cronn)
PC	10 individuals at the June 17, 2010 Public Meeting	Public comments provided at June 17, 2010 public meeting, as recorded in the court reporter's transcript
RC	Robert Cronn	Comment letters dated June 17, 2010 and June 29, 2010
DC	Dagmar Cronn	Comment letter dated June 17, 2010
DM	D. Mondschein	Comment letter dated June 18, 2010
McNeil	Deborah McNeil	Email dated June 18, 2010
NR	Nicole Rea	Comment letter dated June 25, 2010
EPMT	Elliot Partin and Michelle Tobin	Comment letter dated June 25, 2010
AS	Adam Serafin	Email dated June 27, 2010
PF	Patty Foley	Comment letter dated June 29, 2010
FF	Fred Frevert	Comment letter dated July 1, 2010
PNE	PNE Corporation	Comment letter dated July 2, 2010
DRCC2	Duwamish River Cleanup Coalition	Comment letter dated July 7, 2010
KF	Katie Frevert	Comment letter received July 7, 2010

Sources of Comments on the Engineering Evaluation/Cost Analysis

The comments in these documents have been numbered, and the document(s) and comment number(s) are identified in parentheses after each comment in this responsiveness summary.

An Action Memorandum has been written and modified to the extent necessary in response to these comments. Comments that address the design process will be considered then, and comments addressing other aspects of cleanup and investigation in the South Park community are responded to below and will be forwarded on to the parties overseeing and conducting this work.

<u>Responses to Comments</u>

Cleanup Alternatives

1. DRCC/TAG agrees with EPA's support of Alternative #2 as the preferred alternative for the T-117 cleanup as being the most protective of human and wildlife health. Please proceed with Alternative #2 cleanup of the T-117 site. It is less expensive and more efficient to clean it up now, do the right thing now rather than come back later, 10, 15, 20 years down the road, and have to spend millions more dollars in redoing the job that should have been done in the first place. I want to support Alternative Number 2, because I see it as an essential investment in prevention of more-expensive problems down the road. As president of the South Park Neighborhood Association, South Park supports Alternative Number 2 for the cleanup. (DRCC2, RC-1, RC-2, DC-1, DM-1, AS-1, PC-1, PC-5, PC-6, PC-7, PC-8, KT-1))

   EPA Response: EPA agrees and believes that by selecting Alternative 2 no further cleanup of this area will be necessary.

2. I am strongly in favor of doing a complete cleanup of the old Malarkey Asphalt site at T-117. Capping toxins with sand will only prolong the problem. Clean it all up now so future generations will not have to do it again. (DMN-1, FF-1)

   EPA Response: EPA's selection of Alternative 2 ensures that this complete cleanup will occur.

3. Clean all property within the T-117 test areas. Don't leave holes of untreated properties between cleanup areas just because they were barely within the "standard." (NR-1)

   EPA Response: EPA, the Port, and the City carefully considered past land use and present practices in residential yards in order to select appropriate soil sampling locations. A sampling technique called Multi-Increment Sampling was also used to collect a lot of samples in each sampling space (called a Decision Unit) in order to simulate the type of exposure people would have while using this space. Then, to make sure that the scientific equipment used to analyze the soil samples was as sensitive and consistent as possible, EPA required a statistical approach to give us confidence that 95% of the PCB contaminated soils in the streets and yards will be removed. To make sure, instead of only removing soils known to have 1 part per million (ppm) PCBs, EPA will require the removal of soil with as little as 0.5 ppm PCBs. By using this conservative statistical approach, at least 6 additional properties will be cleaned up as part of this removal action.

4. Clean up the Duwamish River to the most stringent standards possible. (PC-5)

   EPA Response: The Removal Action Levels are described in Section 4.3 of the EE/CA. EPA has identified the sediment cleanup standards based on the more stringent State of

Washington sediment management standards and risk-based calculations based on direct human contact with sediment. Remediation of sediments will reduce sediment contaminant associated seafood consumption risks. Background PCB sediment levels, as well as ongoing PCB sources to the LDW, preclude attaining PCB sediment levels that will result in acceptable seafood consumption risks. These cleanup levels have been set to try to make sure that future cleanup in this area after this removal action will not be necessary.

Remedial Design

5. The EE/CA uses both sampling results and computer estimated interpolations to approximate the removal boundaries for the upland areas. The EE/CA should state explicitly that the actual removals will be determined on the basis of confirmation sampling. If this confirmation sampling is to be conducted prior to the start of excavation, then the EE/CA should indicate that pre-confirmation sampling will be used as the basis for determining final depth and lateral extent of removals. (DRCC2)

   EPA Response: Samples were generally collected at locations adjacent to where previous investigations revealed elevated PCBs, dioxins, or other contaminant concentrations (see EE/CA Section 3). EPA believes that there is enough information to make decisions about the T-117 Study Area cleanup boundaries. Where PCBs exceed the state standard for soil cleanup, any dioxins and other contaminants in the soil will also be removed.

   Cleanup decisions will be based on both “design samples” taken prior to excavation and dredging within the entire cleanup area, and post-excavation/dredging samples will also be taken. Post-excavation/dredging samples are important in order to assess the adequacy of material removal during the cleanup of these sediments and soils. In addition, although it is not now anticipated that contaminated material above the removal action levels will be left in the EAA, if for some reason not all of the material can be removed, EPA needs to document this so that the material placed on top of this (these) area(s) can be managed as a cap.

6. EE/CA Section 4.4.3 states that dioxins and furans will be used as COCs, but only PCBs will be used as the driver chemical to determine soil removals in the residential areas. Thus, according to the EE/CA and EPA directive in appendix M, dioxin/furan contaminated soil will not be removed unless co-located with PCBs. This approach is based on several assumptions that have not been generally accepted and are likely false, in our estimation. The two assumptions are 1) that the source of dioxins/furans is PCB oil or contaminated oil that has dioxins/furans as incidental co-contaminants; and 2) that the levels of dioxins alone, in the absence of PCBs > 1ppm do not pose a health threat sufficient in nature and magnitude to warrant removal at this time. (DRCC2)

   EPA Response: Initially PCBs were identified in the off-shore sediments and were traced back to the T-117 uplands (the former Duwamish Manufacturing/Malarkey Asphalt facility). Combustible fuel oil contaminated with PCBs provided by the City was

identified as a primary PCBs contamination source. After cleanups in 1999 and 2006, and additional investigations in 2008-2009, EPA determined that PCBs were also tracked out onto the adjacent streets, and found in some of the Study Area yards. If the same pathway (track-out) accounted for both PCBs and dioxin/furans in the residential yards, then the dioxin/furan concentrations would be much lower than have been detected, based on reported yard PCB concentrations and the concentration of dioxins/furans in manufactured PCBs. Therefore, at this time, EPA does not believe that track-out of contamination from the T-117 uplands accounts for much of the measured dioxin/furans in residential yards. The possible contributions from burning of PCB-containing oils at the Duwamish Manufacturing/Malarkey Asphalt facility were also considered. However, chemical pattern analyses of the dioxins/furans in residential yards do not identify burning of PCB-laden oils (which would result in a dominant furan congener pattern) as a significant source for those yard dioxins/furans. Another possible pathway related to asphalt facility operations is air deposition of emissions from the oil fired burner absent PCB combustion. Multiple chemical pattern evaluations of residential yard dioxins/furans were not conclusive regarding the types of sources contributing to measured dioxin/furan concentrations. One chemical pattern analysis suggested that much of the yard soil dioxins/furans could be related to a dioxin/furan profile associated with oil fired burner emissions, but additional information (e.g., sufficient sampling to define spatial patterns in yard soil dioxins/furans and changes by location in chemical patterns of dioxins/furans) is required to further evaluate the sources of residential yard dioxins/furans. At this time, there is not enough information to clearly identify the oil fired burner at the former Duwamish Manufacturing/Malarkey Asphalt facility as a substantial or dominant source.

Additional dioxin/furan sampling is planned in South Park and within the regional Duwamish area, to help determine the extent and likely sources for this contaminant within the community. This additional sampling work will be led by the State of Washington Department of Ecology (Ecology) with support from EPA and the City. The decisions on how to address dioxins/furans in residential yards within this NTCRA reflect the absence of well-supported source determinations at this time and the plan to collect additional information to reduce the uncertainty regarding sources.

7. Dioxins/furans in the residential area may have come from several Malarkey sources or pathways: as co-contaminants in PCB oil spilled at the Malarkey facility; as tracked-out waste, in waste, oil, soil on trucks or other vehicles driven through the neighborhood; on dust or other particulates from the Malarkey facility and blown around the area; and in stack emissions from the Malarkey facility, especially if PCB oil was used as a fuel in the asphalt plant. (DRCC2)

   EPA Response: As stated above, Ecology, in coordination with EPA and the City, is planning a study to determine the likely sources for dioxin/furans found within South Park and within the regional Duwamish area.

8. The EE/CA needs to account for the scenario in which the former Duwamish Manufacturing/Malarkey Asphalt facility is a source of dioxin/furans independently of PCB oil. Dioxin/furans are known to be released in the burning of PCBs, as well as in various incinerator/industrial combustion processes (EPA Dioxin Reassessment, Exposures and Sources). (DRCC2)

   EPA Response: The EE/CA accounts for the scenario of dioxin/furans being created as a result of incinerator/industrial combustion processes (e.g, the oil fired burner on the T-117 uplands area. [See the response to comment #6]. Chemical pattern analyses do not identify emissions from burning of PCBs at the asphalt facility as a significant contributor to measured residential yard dioxins/furans. One chemical pattern evaluation suggests that a source profile related to emissions from an oil fired burner can account for much of the yard dioxins/furans, but multiple chemical pattern analyses are not conclusive regarding the primary source(s). At this time, there is not enough information to clearly identify the oil fired burner at the former Duwamish Manufacturing/Malarkey Asphalt facility as a substantial or dominant source

9. On the basis of the EPA evaluation of dioxin/furan sources, the EE/CA needs to make the reasonable and conservative assumption that dioxins/furans were released from the former Duwamish Manufacturing/Malarkey Asphalt facility stack and deposited in the neighborhood. (DRCC2)

   EPA Response: During 2008-2009, samples of T-117 Uplands soils, Adjacent Streets soils, and Residential Yards soils were analyzed for dioxins/furans. PCB-containing oils were received and burned at the former Duwamish Manufacturing/Malarkey Asphalt facility, and it is well established that during PCB manufacturing dioxins/furans (more specifically, furan congeners) co-occurred in commercial PCB products. The high concentrations of PCBs in T-117 Uplands soils reflect PCB spills/disposal. Evaluations of the PCB and dioxin/furan results for those T-117 Uplands soils provide convincing evidence that the elevated dioxin/furan concentrations there are associated with PCB spills and therefore with asphalt plant operations. Evaluations of the dioxin/furan results for Adjacent Streets and Residential Yards samples, with much lower PCB concentrations than T-117 Uplands soils, considered multiple pathways for asphalt plant-related contributions as well as other potential non-asphalt plant sources. Potential asphalt plant sources were PCB track-out, emissions from burning PCB-containing oils, and emissions from non-PCB related oil fuels. Common urban sources for dioxins/furans are numerous, and these common and numerous sources for dioxins/furans result in the pervasive occurrence of dioxins/furans at measurable levels in urban areas. The dioxin/furan concentrations reported for many of the Adjacent Streets and Residential Yards samples appear to be elevated in comparison to other studied urban areas, although comparative data for the Duwamish area are lacking. Source evaluations, notably through chemical pattern analyses of the dioxin/furan results, support a conclusion that the first two potential pathways related to asphalt plant operations – PCB track-out and burning of PCB-containing oils – did not contribute significantly to the measured dioxin/furan levels in street and yard samples. Multiple source evaluations do not yet support a determination of the relative contributions from the third potential asphalt-

related pathway – burning of non-PCB oils – and other potential sources, including typical urban sources. Additional information (e.g., sufficient sampling to define spatial patterns in the magnitude of dioxins/furans and changes by location in their chemical patterns) is required to further evaluate and interpret the sources of dioxins/furans near the former Duwamish Manufacturing/Malarkey Asphalt facility. Based on all of the source evaluations performed to date, the contributions of asphalt plant stack emissions to measured street and yard dioxins/furans remain uncertain.

10. The dioxin/furans already measured in the residential neighborhood present risks to the residents at current levels, not including the possibility that areas of the neighborhood that have not been sampled could have even higher dioxin/furan concentrations. Some areas were not sampled and some samples were not analyzed and the existing data indicate dioxin/furan concentrations greater than the state cleanup level of 11 ppt. (DRCC2)

    EPA Response: Several of the yards that will be removed due to elevated PCB concentrations also have elevated dioxin/furan concentrations as compared to state cleanup standards. As stated in previous responses above, EPA is also concerned about these concentrations. The Ecology dioxin/furans study will try to determine the sources of the elevated dioxin/furan concentrations. A potential source that the study will consider is air deposition from the former Duwamish Manufacturing-Malarkey Asphalt facility.

11. EPA proposed a potential soil Preliminary Remediation Goals (PRGs) for dioxin of 3.7 ppt in soil, calculated for cancer. EPA recently released the latest and final revisions to the Dioxin Reassessment that estimates a new and higher cancer potency and an RfD that is lower than any similar value used to date (EPA's Reanalysis of Key Issues Related to Dioxin Toxicity and Response to NAS Comments, External Review Draft, May 21, 2010, http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=222203). EPA estimates more than 6-fold greater cancer potency and a 30% increase in non-cancer toxicity. The state dioxin PRG of 11 ppt was determined prior to the latest EPA toxicity estimates and does not account for the greater toxicities. Dioxin levels exceeding the current state PRG of 11 ppt cannot be considered as "low risk." (DRCC2)

    EPA Response: The proposed dioxin slope factor is 1×10^{6}. However, the value is under external peer review, and it is unclear as to whether or not it will be adopted. There may be further discussion of use of a non-linear cancer dose response model that will result in a slope factor lower than 1×10^{6}. The timeline for review has been estimated to be approximately one year. The new slope factor, if adopted, will represent a 6.67 fold increase over the slope factor currently used, 1.56×10^{5}. The risk at Ecology's cleanup number of 11 parts per trillion (ppt) assuming use of the new slope factor is 2×10^{-5}. It is true that this value is at the middle, rather than the lower end of EPA's risk range. However, risks of one in one hundred thousand are often acceptable in EPA's regulatory context.

It is important to note that EPA's PRGs are not intended to act as site-specific cleanup levels; rather they are intended to serve as initial guidelines for use in scoping characterization and remediation alternatives at Superfund, Federal Facilities, Brownfields, and RCRA sites. Final cleanup levels for a site typically would be developed by modifying the PRGs based on consideration of site specific factors such as exposure frequency or acceptable cancer risk level (EPA's *Risk Assessment Guidance for Superfund, Part B, Development of Preliminary Remediation Goals* 1991, EPA/540/R-92/003).

EPA proposed a potential dioxin PRG of 3.7 ppt in soils, calculated for cancer effects. However, based on consideration of potential exposures to dioxin in soil, EPA *recommended* the interim PRGs for dioxin in residential soil of 72 ppt, calculated on non-cancer effects. EPA believes that the recommended interim PRGs generally provide adequate protection against non-cancer effects. In addition, they generally are protective for cancer effects within EPA's protective risk range (http://www.epa.gov/superfund/policy/remedy/pdfs/Interim_Soil_Dioxin_PRG_Guidance_12-30-09.pdf).

12. Yards and unpaved streets in the Adjacent Residential Neighborhood should be sampled and analyzed for PCBs and dioxin/furan. Test all of the alleys; some have been concreted over, with years of oil spraying in the alleys. (DRCC2, PC-2, PC-9, KT-4)

    EPA Response: EPA identified a removal "Study Area" that includes some nearby adjacent streets and residential yards between T-117 and 14th Avenue South, Dallas Avenue and South Donovan Street. This area was defined based on PCB samples since they are the primary concern for recontamination to the Lower Duwamish Waterway. Soil samples taken around the edge of the Study Area show much lower PCB levels. Residential yards and streets have not been sampled for PCBs on the west side of 14th Avenue South because samples collected from area catch basins show low enough levels of PCBs that this area is not a potential recontamination source to the waterway. The purpose of this cleanup is to remove soils with high enough levels of contaminants to prevent recontamination of the waterway, following this removal action. It is not within the scope of this early action to determine exact boundaries or concentrations of all contaminants in the area. Ecology is responsible for investigating contamination in upland areas beyond the Study Area and will be leading the additional dioxin/furan sampling study referenced above.

13. The archived soil samples should be analyzed for PCBs and dioxin/furans and all dioxin/furan soil contamination should be remediated to state cleanup levels in this cleanup action even when not co-located with PCBs. (DRCC2)

    EPA Response: As part of the planned Ecology sampling for dioxin/furans in South Park, these archived samples from the removal Study Area are being analyzed (with the exception of one location, where the owner would not participate). If elevated dioxin/furan concentrations are found in yards that are not planned for cleanup in this

early action, Ecology, in consultation with EPA, will determine what further actions will be needed.

14. Currently the EE/CA does not address other potential asphalt plant chemical emissions including PAHs, arsenic, lead, mercury, total petroleum hydrocarbons, and volatile chemicals for the residential yards. Given that this pathway has not been ruled out, these chemicals should be considered in the yard removals. (DRCC2)

    EPA Response: Contaminants of concern for the T-117 upland and off-shore sediments have been identified based on the former asphalt plant operations. These are arsenic, TPH, cPAH, PCBs, phenols and dioxin/furans. Likely some these contaminants have also been tracked into the adjacent neighborhood. However, contaminants like PAHs are also present in neighborhoods because they are also common urban contaminants from numerous and widespread combustion processes (both stationary source and vehicle emissions), asphalt paving, and other common urban sources and activities. This is an early action/removal action that is not designed to fully address all neighborhood soils, only those that are likely to recontaminate the Lower Duwamish Waterway.

15. The storm water system in the T-117 area presents a problem for the current remediation effort and future re-contamination. All of the storm water drains should be cleaned out. (DRCC2, PC-9)

    EPA Response: EPA directed the Port and the City to increase their efforts to control the storm water contamination. On the upland property, the Port has installed hay bales and collection socks in the catch basins, the Port and City have power washed and cleaned out the catch basin and storm lines, power washed and swept the paved surfaces, and created curbs to redirect street storm water to Seattle Public Utilities storage tanks and storm drains to the Combined Sewer System. These catch basins are regularly sampled to see if potential contaminant pathways were stopped or minimized. The approved cleanup plan will include a revised storm water management plan to upgrade the infrastructure and prevent contamination from re-entering the adjacent waterway and potential future habitat restoration site.

16. Please keep our neighborhoods and the river safe during the cleanup process by making sure that trucks that are removing the sediment are clean and covered. (PF-2)

    EPA Response: During all phases of the work, EPA will implement safety measures to contain contamination and prevent contaminants from being spread. A decontamination station will be built and all trucks and other vehicles leaving the cleanup site will be required to go through it before leaving the site or work area. The streets and yards will be cleaned up last to prevent trucks removing contaminated materials from the T-117 property from tracking contamination through the neighborhood after it has been cleaned up. The project team will work closely with each residence to try to minimize the impacts from cleanup activities. We will consider residents' work schedules, existing landscaping, children and other concerns when planning the cleanup work.

EPA will require contractors to implement environmental controls during the construction such as dust and noise controls and monitoring, designated truck hauling routes, signs, a 1-800 24 hr. hotline, and other safety measures. We do not anticipate increased health risks for residents near the T-117 site during construction.

17. In our previous comments, we suggested the use of hydraulic dredges, that's something that be explored in depth. (PC-3)

    EPA Response: The EE/CA includes general information on dredging, including a discussion about the effectiveness of mechanical versus hydraulic dredging at T-117 (EE/CA Section 6.1.2.1 and 7.1.1.4). Due to the risk of spillage, slurry, and debris and the relatively small volume of material to be dredged, hydraulic dredging was not considered practical for this removal action. Mechanical dredging is therefore the preferred technology for subtidal sediment removal at T-117. The specific type of dredging bucket will be selected based on water quality performance criteria established during the design phase of the cleanup. The sediment removal design requirements are not determined until after the cleanup alternative has been selected by EPA, after consideration of public comments on the EE/CA. Design requirements will be described in the project design documents, including prefinal and final designs and construction plans and specifications.

18. Ensure that the methods used for removing the sediment do not further pollute the River. There are very effective silt curtains that can be used. You heard the concerns of the neighbors about making sure that we don't have another Duwamish Diagonal situation in which there's recontamination.(PF-3, PC-3)

    EPA Response: Engineering controls will be implemented to limit the resuspension of contaminated sediment during removal. A primary method for minimizing sediment resuspension during removal in the intertidal zone is to complete the work when the tides are out while the sediment is exposed to the air. Using this approach, activity does not occur in the water column, and resuspension is essentially eliminated. Engineering controls to limit suspension during dredging include the use of enclosed dredging buckets to limit wash out during retrieval of the bucket through the water column and avoidance of overflow of turbid sediment from the sediment haul barge during dredging. Other examples of engineering controls include using slower dredge cycling times and containment structures to catch bucket spillage and direct materials into the receiving barge or platform. These techniques have been used at other sediment remediation projects in the Lower Duwamish Waterway and other sites.

    The use of silt curtains at the T-117 sediment cleanup is not considered practical because of the varying Duwamish currents and tidal stages. Deploying, maintaining, and working with a silt curtain within the intertidal portion of the T-117 sediment cleanup would be problematic, and the use of a silt curtain in the subtidal portion of the study area could interfere with navigation in the channel. According to an evaluation of resuspension controls for dredging (Bridges et al. 2008), the installation and maintenance of silt curtains in “moderate- or high-energy areas” can be difficult, and their effectiveness is questionable. Silt curtains that are not fastened to the bottom of the waterway, which

would be extremely difficult to do at T-117, can allow particles to escape beneath the skirt.

Water quality will be regularly monitored during dredging activities to assess potential water quality impacts. Water quality conditions must be within the limits prescribed by EPA's 401 Water Quality Certification. If necessary, the dredging activities can be adjusted to prevent water quality impacts.

19. We are currently testing a new bioremediation technology for treatment of soils and sediments for PCBs on site, without dredging. This technology can be used with minimum disturbance of residents, soils, sediments and the environment. We hope that this technology will be added to the NCP approval list in time for this project. (PNE-1)

    EPA Response: EPA has not selected treatment of soils and sediments for PCBs on this site as part of the removal activities that will be performed in upcoming years. This treatment technology was brought to EPA's attention at the end of the study phase of this project. As the technology is used on other projects with elevated PCBs, the company can provide this information to the agency and other parties performing the cleanup of sediment and soil projects.

Dioxin Testing

20. DRCC/TAG supports the agencies for moving ahead on a comprehensive dioxin/furan sampling and analysis in South Park and for the commitment to make sure that existing archived samples are analyzed for dioxin/furan contamination. (DRCC2)

    EPA Response: The existing archived samples, with the exception of one residence, are being analyzed by the City and results should be available shortly. Ecology's dioxin/furans sampling study in the South Park and regional Duwamish area should prove helpful for any further response actions that will be determined by Ecology in consultation with EPA.

21. In concert with EPA's environmental justice priority and to continue the excellent collaboration between the community, DRCC and the EPA, DRCC requests the Enhanced Public Participation protocol be followed for the dioxin/furan sampling design analysis and public outreach. DRCC/TAG would like to be part of the development of education and outreach plans that are specific to the residents. (DRCC2, KT-6)

    EPA Response: EPA will continue to follow the recommendations for meaningful community involvement described in the Lower Duwamish Waterway Superfund Site Community Involvement Plan and continue the additional, enhanced outreach specific to T-117 and the South Park community. EPA will also encourage Ecology and the City to communicate and engage with the public in designing and implementing the South Park dioxin sampling study. EPA encourages DRCC to maintain its active involvement in all aspects of cleanup in this community and EPA and Ecology will continue to try to identify opportunities for meaningful participation.

22. DRCC would like to be included as participants in the decision-making process for the Ecology dioxin/furans study sampling plan and analysis including development and review of the soil sampling plan to ensure that all areas are appropriately sampled and all chemicals of concern are sampled for and there is community agreement on how the results will be interpreted. As the community advisory group to EPA and the organization that also has a public- participation agreement with the Ecology, we would insist and assume that we would be part of the conversations for that design sampling at all phases during that process. (DRCC2, PC-3, PC-4)

    EPA Response: EPA will continue to communicate with and involve DRCC in its planning and decision-making in the T-117 early action removal. EPA encourages DRCC to maintain its active involvement in all aspects of cleanup in this community and has communicated DRCC's request for active involvement in the Ecology dioxin/furan study to Ecology. As part of EPA's ongoing community involvement efforts, the identification of South Park and Georgetown communities as environmental justice areas of concern, and DRCC's public participation agreement with Ecology, the agencies will continue to strive for meaningful participation.

23. Begin testing for dioxins in South Park, but do not hold up the T-117 cleanup. (RC-1-2, RC-2-2, DC-3, PC-6)

    EPA Response: EPA is preparing to proceed with the T-117 Early Action Area cleanup. Further testing for dioxin/furans is moving forward through the independent study led by Ecology.

24. I applaud the new commitment for expanded sampling and analysis for dioxins/furans. As an atmospheric chemist, I hypothesize that the source signature will differ from the PCBs, we'll find that the dioxins are not entirely due to the T-117 site that caused the PCBs to be there, consequently, I do not support delaying T-117 cleanup to wait for further dioxin results. (DC-3, PC-6)

    EPA Response: Thank you for your informed support.

25. Representing People for Puget Sound, one area of concern is the issue of sampling in the neighborhood. It is great that Ecology is going to fund $100,000 for dioxin/furans sampling to study South Park, T-117, and the various contamination pathways. We need to have a quality sampling effort for this particular part of the Duwamish valley. Ecology, EPA, and the City need to focus that work to really answer the key questions about the connection to T-117 and if we have dioxin in these yards in this area. (PC-4)

    EPA Response: EPA will share this comment with Ecology. As part of EPA's ongoing community involvement efforts, the identification of South Park and Georgetown communities as environmental justice areas of concern, and DRCC's public participation agreement with Ecology, the agencies will continue to strive for meaningful participation.

26. The dioxin/furans sampling should include the 24 T-117 neighbors that live right next to that site so that they know what contaminants are in their yards and what is going to be done about it. The archived samples should be analyzed for dioxin/furans. (PC-3, PC-4)

    EPA Response: The existing archived samples, with the exception of one residence, are being analyzed by the City and results should be available around the time the Action Memorandum is issued. Ecology's dioxin/furans sampling study in the South Park and regional Duwamish area should prove helpful for any further response actions.

27. South Park citizens should be included as participants in Ecology's dioxin/furans sampling study, as we expect to be and have been to date, in the processes of the dioxin sampling and analysis, and then the analysis of what the data tell us about. (PC-3, PC-4, DC-4, PC-6)

    EPA Response: EPA will share this comment with Ecology. EPA and Ecology have received DRCC's letter requesting participation in the South Park dioxin sampling study. As part of EPA's ongoing community involvement efforts, the identification of South Park and Georgetown communities as environmental justice areas of concern, and DRCC's public participation agreement with Ecology, the agencies will continue to strive for meaningful participation.

28. Habitat restoration, South Park dioxin/furans soil testing, and cumulative impact risk assessment should be initiated as Phase 2 so as not to delay cleanup alternative 2. If more cleanup is needed, it can proceed as a separate project. (DC-2, DC-3, RC-2-2)

    EPA Response: This NTCRA is intended to be the final cleanup of the sediments within the early action area, but this determination will not be made until after the Lower Duwamish Waterway Superfund Site has identified cleanup standards for the waterway in a Record of Decision. The goal of the T-117 Early Action Area (EAA) cleanup is to reduce current and future exposures of people and wildlife to the contaminants within the EAA. EPA selected cleanup levels for T-117 based on health risk calculations and based on the more stringent of federal and state laws for unrestricted land use, as mandated by CERCLA. Section 4.1 of the EE/CA describes the scope, goals and objectives of the cleanup.

29. When sampling throughout South Park was attempted earlier, there was a problem with indemnifying. If contaminants are found on private property, people could be sued or fined to clean up the property. Organizations should work together to protect small businesses or property owners who allow a test on their property. (PC-9)

    EPA Response: When EPA believes it is necessary to gather data about potential contamination in an area based on historical information or data, EPA requests permission from property owners for access to soils, water, and indoor air. If permission is denied, EPA can compel access for sampling from any uncooperative property owner. Sampling in yards for this cleanup was done with property owners' permission. The City, as required by the Administrative Order issued by EPA, sent written requests for

access to property owners for written consent to take samples. The access request described some of the risks of sampling, including having to disclose discovered contamination to future owners. If a property owner released hazardous substances that were later cleaned up by an EPA removal action, the property owner could be held liable for the hazardous releases. Every person or entity may be liable for their hazardous releases. When concentrations of contaminants of concern are present, EPA works with property owners to identify what the data mean and how to protect the residents before any cleanup decisions are made. It is only fair that liability be apportioned according to fault. Consenting to testing does not and should not mean someone who releases of hazardous substances does not have to be responsible for the release.

Community Involvement/Environmental Justice

30. South Park is considered an environmental justice community. The EE/CA should recognize and account for exposure to multiple chemicals in South Park's historical legacy of industrial contamination (i.e., air pollution), and multiple social and economic stressors such as stress, unemployment, and crime that increases susceptibility to chemical exposure. Therefore, a risk assessment that does not address these cumulative exposures does not meet the community concerns. (PC-7, DRCC2)

    EPA Response: This cleanup is a Non-Time Critical Removal Action (NTCRA). For NTCRAs, EPA generally does not conduct a full risk assessment, but rather performs a risk evaluation to identify what current or potential exposures should be prevented. The risk evaluation uses sampling data from the site to identify the chemicals of concern, provides an estimate of how and what extent people might be exposed to these chemicals, and assesses of the health effects associated with these chemicals. A streamlined risk evaluation estimates the potential risk of health problems if no cleanup action is taken at a site. Therefore, the results of the streamlined risk evaluation help EPA decide whether to take a cleanup action at the site, what exposures need to be addressed by the action, and in some cases define appropriate cleanup levels.

    There are a number of other cleanup and health protective activities also occurring in this area that area part of the Lower Duwamish Waterway Superfund site, such as source control activities conducted by Ecology in coordination with EPA's evaluation of contamination in the Lower Duwamish Waterway. As part of this effort, a variety of offices at EPA and Ecology, such as air, water, RCRA, are coordinating to garner the maximum health and ecological benefits possible from all of these programs. In addition, local and state health departments, as well as non-profit groups (e.g. Environmental Coalition of South Seattle) are also undertaking programs to identify potential problems and then recommend possible solutions. The EPA Superfund program is not authorized or funded to undertake all of the issues identified by the commenter, but we are working closely with many of our local, state and federal partners to leverage as much attention and resources to this area as is possible.

EPA has selected the cleanup alternative (Alternative 2) that will maximize the amount of contaminant removal at this site in this community. Although the waterway sediments will continue to be monitored, the cleanup levels EPA selected for upland soils on the T-117 property, streets and yards, are protective of human health and reduce upland soil concentrations to ensure the protection of sediments.

Implementation of Environmental Justice and cumulative assessment of risks faced by EJ communities is an ongoing and complicated endeavor that must occur in coordination with other agencies that have a mandate to address public health issues.

31. The dioxin/furans exposures are evaluated as incremental risks to the residents in the T-117 area, with the assumption that the community is "average" with regard to health status and risk. In fact, the entire South Park community and the T-117 area residents in particular, have faced a combination of environmental conditions and exposures that increase basic risk status and increase their vulnerability. The residents face cumulative risks from past exposures, industrial chemical releases, proximity to this PCB contamination site and the psycho-social stress of living in a contaminated area. (DRCC2)

    EPA Response: It is one of EPA's priorities to conduct cleanups in communities considered Environmental Justice areas of concern. The tool we currently have to work with are Superfund risk assessments and risk assessment evaluations. These other factors, such as cumulative risks, exposures to other industrial chemical releases, and the stress of living near a contaminated area in underserved communities do not fit well into these evaluations. EPA is working to develop new guidance to help evaluate environmental justice considerations at key points in the rulemaking process to protect the health and safety of the historically underrepresented in environmental decision-making (see http://www.epa.gov/environmentaljustice/resources/policy/ej-rulemaking.html). If new programs or resources become available, EPA will coordinate this information with the community and DRCC.

Jobs

32. Hire locals to do the work and keep the jobs and money here in South Park. A Community Benefits Agreement that could be overseen by EPA would mean that people who are unemployed in our neighborhood would be trained to do the cleanup. EPA should utilize its own Super JTI job readiness program that provides training and employment opportunities for underserved citizens living in communities affected by Superfund sites to provide information, services and employment education and jobs to the residents of South Park. EPA should emphasize to the City and the Port that jobs and contracts should be given to local residents as priority and training provided for residents so that they can actually get those jobs. (PC-1, NR-2, PC-7, DRCC2, KT-3)

    EPA Response: EPA will be working with the Port of Seattle and the City of Seattle who will be doing the contracting work for firms to conduct this cleanup. It is important to all

these public agencies that we understand and implement these programs to the extent practicable. In addition, EPA will coordinate with our Brownfields program to learn about monies and/or other resources available to assist the community during this cleanup.

The SuperJTI program (http://www.epa.gov/superfund/community/sfjti/index.htm) combines classroom instruction with hands-on work experience. SuperJTI graduates can get technical skills to work at Superfund sites, construction projects, or hazardous waste processing companies. SuperJTI tailors training opportunities to meet the needs and priorities of each community. If communities want to establish their own training program, SuperJTI can help the community participate in current or emerging job training and employment programs.

EPA offers SuperJTI training through its Technical Assistance Services for Communities (TASC) contract. This national contract provides job training to communities affected by hazardous waste sites regulated under Superfund (CERCLA), the Resource Conservation and Recovery Act (RCRA), or federal facility and tribal removal sites. EPA's Office of Superfund Remediation and Technology Innovation (OSRTI) manages the contract. EPA also uses its community outreach mechanisms to create partnerships with local businesses and community organizations and other federal agencies to develop and support job training.

To find out more about the SuperJTI initiative, contact:

Karen L. Martin
U.S. EPA Headquarters
Telephone: (703) 603-9925
Email: martin.karenl@epa.gov

Health Concerns

33. Washington State Department of Health should do studies to determine if there is any specific evidence about the health degradation of people who live in the Duwamish corridor. In the health study, we should try to address the cumulative effect of all these various problems in South Park. (PC-9, RC-2-2, PC-13)

    EPA Response: EPA agrees that health studies may be appropriate and that public health agencies should consider addressing this issue. It should be recognized that evaluating the origin of health related concerns can be difficult due to the fact that many conditions (e.g. cancer) have many causes, long lag times between exposure and effect, and require large numbers of study subjects in order to discern effects.

34. The yard at 1410 South Cloverdale Street is slated to be cleaned up after the major cleanup of the area so that it doesn't get recontaminated. But the owner of that house has small children and there are certain ages where a child's development can be affected

severely by dioxins. Please try to clean that yard up now; and if it gets recontaminated then we can readdress it in three to five years, when the cleanup is done. (PC-10, KT-5)

EPA Response: EPA and the City are discussing the possibility of cleaning up this residence before 2013 when the rest of the contamination in the residential yards and the adjacent streets will be removed.

35. It is possible that there is a cancer cluster in our neighborhood that has not been well-documented or well-studied. Someone should devote resources to assess the actual risks to our children, ourselves, and pets. (PC-12)

    EPA Response: EPA has forwarded this concern to the Washington and King County Health Departments and will assist them as they evaluate how to address this issue.

36. In the 1970s we witnessed the contamination here in South Park. The Malarkey site was unpaved, dirt, gravel, and mud puddles. Kids would ride their bikes through the site and and played alongside the river and in the river. We saw unknown barrels leaking, oil trucks spraying oil along the roads, on Malarkey and in the neighborhood. We have health concerns: asthma, thyroid problems, bone cancer. One of the potential causes is dioxin. When we get this cleaned up, we should do some sort of health testing for current and past residents. (PC-2)

    EPA Response: EPA has forwarded this concern to the Washington and King County Health Departments and will assist them as they evaluate how to address this issue.

Restoration

37. DRCC supports seamless habitat restoration and public access with walking trails at T-117 to be constructed immediately following sediment removal. We hope that extensive backfilling will not be required so that the installation of habitat features can smoothly occur as soon as the area is cleaned up. This will minimize the impact on the neighborhood of truck traffic and will save costs for the Port and the City. Consider providing public access to this site and the river once the site is cleaned up. (DRCC2, PF-1, PC-3, PC-4, PC-8, PC-11, KT-2)

    EPA Response: A principal goal of the removal action is to complete the upland and sediment removals in a manner that leaves them suitable for a range of final site uses and redevelopment options. An evaluation of final site redevelopment options is currently being performed by the Port and may be ready for implementation concurrent with the completion of the removal or after the removal has been completed. These final site uses include future commercial uses that could be accomplished through limited additional backfilling, or the creation of intertidal habitat that could be accomplished through minimal backfill removal and contouring. If the Port is able to identify a site redevelopment option in conjunction with community involvement prior to or during the

design phase of the removal, the design of the removal completion would be coordinated with the final site use design.

EPA has no jurisdiction over habitat restoration projects. The Port may conduct such a project with federal, state and tribal Natural Resource Trustees, or on its own. EPA continues to encourage all such projects, and would coordinate to the extent practicable with the Port and appropriate trustees.

Other comments

38. We have had a problem with the cement factories down the road in that they have continually worked on trying to find a way to burn tires and to make the concrete process work more inexpensively. But in doing that, we are concerned that the fine particulates come in the air and create another level of pollution. And we hope that you will take that into consideration under the issue of recontaminating the area. (PC-13)

    EPA Response: The Department of Ecology is looking at this pathway of contamination into the waterway as part of the Lower Duwamish Waterway Superfund cleanup. Indirect atmospheric deposition of contaminants occurs when contaminants deposited on upland areas are conveyed to water bodies via storm water flow. Although not the only potential source of contaminants in storm water conveyances, contributions from atmospheric deposition can be detected through the sampling of storm solids and mitigated through the cleaning of conveyance systems and the application of other storm water BMPs. Based on available atmospheric deposition data and the hypothetical deposition contribution from direct atmospheric deposition, it appears that other pathways, including surface and storm water runoff, are more important for source control. The potential for recontamination through indirect atmospheric deposition is more uncertain; periodic sampling of storm solids within the T-117 conveyance systems will be conducted to assess the importance of this pathway.

    The Puget Sound Clean Air Agency is the regional authority for air quality regulation, and is responsible for issuing and enforcing air operating permits for the cement manufacturers and other facilities located along the Duwamish River. Information about air operating permits for those facilities can be found at: http://www.pscleanair.org/announce/permits/titlev.aspx

39. The Port trucking over the years has created fine particulates from the diesel burning. We don't know the real extent of that pollution, but I hope that would be something that we can look at very carefully, to see if that's something that we can address in our environment so that we don't have to live with that contaminated air. (PC-13)

    EPA Response: Although, air quality concerns about Port trucking are outside the scope of this removal action, at the national level, EPA continues to enforce emission standards and implement pollution reduction programs to reduce particulates and other hazardous air pollutants. More information about EPA's rules and programs to reduce truck

emissions, including the National Clean Diesel Campaign, can be found at: http://www.epa.gov/otaq/.

In January 2007, the Port of Seattle adopted the Northwest Ports Clean Air Strategy establishing emission reduction standards for seaport activity including port "drayage" trucks. Of the diesel particulate matter captured as part of a 2005 Puget Sound Maritime Air Emissions Inventory, 3% comes from heavy-duty vehicles (trucks and cruise terminal buses). By the end of 2010, all trucks that serve Seattle's cargo terminals must have an engine year of 1994 emissions standards or newer. By 2015, 80% of port drayage trucks must meet 2007 emission standards, as defined by EPA; progressing to 100% by 2017. By early March, 2010, about 110 old, polluting trucks have been taken off the road and scrapped. More information on efforts to reduce port air emissions can be found at: http://www.portseattle.org/community/environmentair/seaport/index.shtml

Also, the Puget Sound Clean Air Agency's Diesel Solutions program is reducing diesel emissions by retrofitting vehicles with pollution control equipment, using cleaner fuels including ultra-low sulfur diesel and biodiesel, and promoting reduced idling (http://www.pscleanair.org/programs/dieselsolutions/default.aspx).

Attachment C

ARARs

Engineering Evaluation/Cost Analysis
T-117 Early Action Area
Lower Duwamish Waterway Superfund Site, Seattle, WA

Table C-1 - ARARs for the Lower Duwamish Waterway FS

Topic	Standard or Requirement	Regulatory Citation		Comment
		Federal	State	
Sediment Quality	Sediment quality standards; cleanup screening levels		Sediment Management Standards(WAC 173-204)	The SMS is a statutory requirement under MTCA and an ARAR under CERCLA. Numerical standards for the protection of benthic marine invertebrates.
Fish Tissue Quality	Concentrations of chemicals in fish tissues	Food and Drug Administration Maximum Concentrations of Contaminants in Fish Tissue (49 CFR 10372-10442)		The Washington State Department of Health assesses the need for fish consumption advisories.
Surface Water Quality	Surface Water Quality Standards	Ambient Water Quality Criteria established under Section 304(a) of the Clean Water Act (33 USC 1251 et seq) http://www.epa.gov/ost/criteria/wqctable/	Surface Water Quality Standards (RCW 90-48; WAC 173-201A)	State surface water quality standards apply where the State has adopted, and EPA has approved, Water Quality Standards Federal recommended Water Quality Criteria established under Section 304(a) of the Clean Water Act that are more stringent than State criteria and that are relevant and appropriate also apply. Both chronic and acute standards, and marine and freshwater are used as appropriate.
Land Disposal of Waste	Disposal of materials containing PCBs	Toxic Substances Control Act (15 USC 2605; 40 CFR Part 761)		
	Hazardous waste	Resource Conservation and Recovery Act Land Disposal Restrictions (42 USC 7401-7642; 40 CFR 268)	Dangerous Waste Regulations Land Disposal Restrictions (RCW 70.105; WAC 173-303, -140, -141)	
Waste Treatment Storage and Disposal		Resource Conservation and Recovery Act (42 USC 7401-7642;40 CFR 264 and 265)	Dangerous Waste Regulations (RCW 70.105; WAC 173-303)	

Table C-1 - ARARs for the Lower Duwamish Waterway FS

Topic	Standard or Requirement	Regulatory Citation		Comment
		Federal	State	
Noise	Maximum noise levels		Noise Control Act of 1974 (RCW 80.107; WAC 173-60)	
Groundwater		Safe Drinking Water Act MCLs and non-zero MCLGs (40 CFR 141)	RCW 43.20A.165 and WAC 173-290-310	For on-site potable water, if any.
Dredge/Fill and Other In-water Construction Work	Discharge of dredged/fill material into navigable waters or wetlands	Clean Water Act (33 USC 401 et seq; 33 USC 141; 33 USC 1251-1316; 40 CFR 230, 231, 404; 33 CFR 320-330)Rivers and Harbors Act (33 USC 401 et seq	Hydraulic Code Rules (RCW 75.20; WAC 220-110)	For in-water dredging, filling or other construction.
	Open-water disposal of dredged sediments	Marine Protection, Research and Sanctuaries Act (33 USC 1401-1445) 40 CFR 227	DMMP (RCW 79.90; WAC 332-30-166)	
Solid Waste Disposal	Requirements for solid waste handling management and disposal	Solid Waste Disposal Act (42 USC 215103259-6901-6991; 40 CFR 257, -258)	Solid Waste Handling Standards (RCW 70.95; WAC 173-350)	
Discharge to Surface Water	Point source standards for new discharges to surface water	National Pollutant Discharge Elimination System (40 CFR 122, 125)	Discharge Permit Program (RCW 90.48; WAC 173-216, -222)	
Shoreline	Construction and development		Shoreline Management Act (RCW 90.58; WAC 173-16); King County and City of Seattle Shoreline Master Plans (KCC Title 25; SMC 23.60)	For construction within 200 feet of the shoreline.
Floodplain Protection	Avoid adverse impacts, minimize potential harm,	Executive Order 11988, Protection of flood plains (40 CFR 6, Appendix A) ; FEMA National Flood Insurance Program Regulations (44 CFR 60.3Ld)(3)).		For in-water construction activities, including any dredge or fill operations. Includes local ordinances: KCC Title 9 and SMC 25.09.

Table C-1 - ARARs for the Lower Duwamish Waterway FS

Topic	Standard or Requirement	Regulatory Citation		Comment
		Federal	State	
Critical (or Sensitive) Area ARAR			Growth Management Act (RCW 37.70a); King County Critical Area Ordinance (KCC Title 21A.24); City of Seattle (SMC 25.09)	
Habitat for Fish, Plants, or Birds ARAR	Evaluate and mitigate habitat impacts	Clean Water Act (Section 404 (b)(1)); U.S. Fish and Wildlife Mitigation Policy (44 FR 7644); U.S. Fish and Wildlife Coordination Act (16 USC 661 et seq); Migratory Bird Treaty Act (16 USC 703-712)		
Pretreatment Standards	National Pretreatment Standards		40 CFR Part 403; Metro District Wastewater Discharge Ordinance (KCC) To be considered (as is local requirement)	
Environmental Impact Review	SEPA		State Environmental Policy Act RCW 43.21C; WAC 197-11-790)	Applicable to MTCA cleanups.

Table C-2 Other Legal Requirements for the Lower Duwamish Waterway

Topic	Standard or Requirement	Regulatory Citation		Comment
		Federal	State	
Native American Graves and Sacred Sites		Native American Graves Protection and Repatriation Act (25 U.S.C. 3001 et seq.; 43 CFR Pt. 10) and American Indian Religious Freedom Act (42 U.S.C. 1996 et seq.)		
Critical Habitat for Endangered Species	Conserve endangered or threatened species, consult with species listing agencies	Endangered Species Act of 1973 (16 USC 1531 et seq; 50 CFR 200, -402); Magnuson-Stevens Fishery Conservation and Management Act (16 USC 1801-1884)	Endangered, threatened, and sensitive wildlife species classification (**WAC 232-12-297)**	Consult, and obtain Biological Opinions.
Historic Sites or Structures	Requirement to avoid, minimize, or mitigate impacts to historic sites or structures	National Historic Preservation Act (16 USC 470f; 36 CFR Parts 60, 63 and 800)		Considered if implementation of the selected remedy involves removal of historic sites or structures.
Occupational Health and Safety	Requirements to provide for worker health and safety	Occupational Safety and Health Act (29 USC; 29 CFR)	Washington Industrial Safety and Health Act (RCW 49.17; WAC 296)	