# EXHIBIT B
# CLEANUP ACTION PLAN (CAP)

# EQUILON SEATTLE SALES TERMINAL

# HARBOR ISLAND SITE

# SEATTLE, WASHINGTON

**ISSUED BY**

**WASHINGTON STATE DEPARTMENT OF ECOLOGY**

**NORTHWEST REGIONAL OFFICE, BELLEVUE**

**SEPTEMBER 28, 1998**

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## 1.0 INTRODUCTION

This Cleanup Action Plan (CAP) is provided to describe the proposed remediation at the Equilon Enterprises LLC and Texaco Refining and Marketing Inc. (TRMI) Seattle Sales Terminal site (Equilon), on Harbor Island in Seattle, Washington. It has been prepared to satisfy the requirements of the Model Toxics Control Act (MTCA) Agreed Order No. DE 92 TC-N160, cooperatively entered into between Texaco Refining and Marketing Inc. (TRMI) and the Washington State Department of Ecology (Ecology).

The purposes of this CAP are to: 1) describe the site, including a summary of its history and extent of contamination; 2) identify the site-specific cleanup standards, 3) summarize the remedial cleanup action alternatives presented in the Focused Feasibility Studies (FFS), 4) identify and describe selected remedial action alternative for the site and 5) a discussion of the implementation schedule. Detailed information regarding site history, characterization, and the evaluation of alternative cleanup actions is contained in the final RI and final FFS reports [EMCON 1994, Lovely Consulting, Inc. (LCI) and EMCON, 1997].

The remedial actions selected for the site are to occur under the legal framework of a Consent Decree between Equilon and Ecology.

## 2.0 SUMMARY OF SITE CONDITIONS AND INTERIM REMEDIATION SYSTEM

This section provides a summary of site conditions, including the nature and extent of impacts and a description of the interim remediation system. In addition, the exposure pathways identified for the site are briefly described.

## 2.1 SITE

The Equilon Seattle Sales Terminal consists of the main terminal and main tank farm, located inland in the north-central part of Harbor Island; the north tank farm, located north of the main terminal; and the Shoreline Manifold Area and Dock, located adjacent to Elliott Bay at the north end of Harbor Island (Figure 1). Groundwater flows in a radial pattern outward from the center of Harbor Island and enters the marine surface water at the island's edge. The site is zoned industrial and meets the industrial criteria established under WAC 173-340-745. In addition, the site will likely remain an industrial facility in the foreseeable future because of the site zoning, and, perhaps more importantly, because of the substantial industrial improvements to Harbor Island (e.g., construction of cargo handling facilities and construction of major petroleum distribution pipelines for the island). Ecology and EPA have determined that there is no current or planned future use of groundwater beneath Harbor Island for drinking water purposes. The cleanup objective is to protect the surface water and associated ecosystem.

### 2.1.1 Nature and Extent

The following section summarizes the nature and extent of contamination at the site based on the results of the RI, Interim Actions and FFS. A general discussion of the contaminants detected at the site is presented first. A summary of the floating product plume beneath the Shoreline Manifold Area is presented next since this is the primary area of concern at the site. Sections on TPH, BTEX and cPAHs; and arsenic, copper, and lead follow.

The results of the site characterization activities conducted during the RI indicate that contaminants present in soil and groundwater at the inland portions of the site are primarily weathered total petroleum hydrocarbons as diesel (TPH-D) with lesser amounts of weathered gasoline (TPH-G) and heavier oil (TPH-O), and a few inorganic metals (arsenic, copper and lead). Arsenic and lead in the surface soil are the result of airborne releases from the former smelter located adjacent to but not owned or operated by the Equilon terminal. Copper, only found in groundwater, is attributed to natural background on Harbor Island. The inorganic metals are present at low concentrations at a few locations in groundwater. In the north tank farm, there is a small amount of measurable floating product at one location, in the vicinity of MW-204. Since completion of the RI, approximately 700 gallons of unleaded gasoline was released in 1996 from a 'pinhole' leak in a section of a pipe at the Shoreline Manifold Area. At the Shoreline Manifold area, in addition to weathered TPH-D in soil, there is localized contained floating product on the water table. At the main terminal and main tank farm, lead is present at higher concentrations in surface soil than subsurface soil due to airborne transport of lead particulate in stack emissions from historic lead smelter activities adjacent to the Equilon Terminal.

**Floating Product.** Data collected during the FFS show that the impacted area of primary concern at the site is a small product plume located beneath the Shoreline Manifold Area adjacent to Elliott Bay. A small lens of floating product is trapped behind the foundation of the island bulkhead that forms a partial barrier to groundwater flow to the Bay. The bulkhead structure acts as a "hanging wall" which allows groundwater and some dissolved petroleum hydrocarbons to flow beneath the foundation while trapping the floating product. The water table elevations fluctuate seasonally due to rainfall and in response to tidal influence from the Bay; however, the

water table elevation does not drop below the base of the bulkhead. Due to the dampening effect of the bulkhead structure, water table fluctuations in response to tidal influence and seasonal fluctuations are 1 to 2 feet near Elliott Bay. The resulting "smear" zone of product in soil beneath the product plume is more than 2 feet thick.

An interim product recovery system has been in operation under the Shoreline Manifold Area since the release was discovered in 1996 (Figure 2). This system has been effective in removing product on top of the groundwater table, preventing migration of product sheen into Elliott Bay, and ensuring protection of receptors in Elliott Bay. Based on the amount of product and vapor recovered (about 500 gallons), and dissolved constituents in water recovered to date, the interim system has recovered nearly all of the released product. Accessible TPH soil hot spots at this location that act as potential ongoing sources to groundwater contamination will be excavated to the extent practicable.

**TPH, BTEX, and cPAHs.** RI data also indicate that elevated concentrations of TPH are present in subsurface soil within localized inland areas of the main terminal, main tank farm, north tank farm; and Shoreline Manifold Area. Concentrations of TPH-G and TPH-D have been detected in groundwater above cleanup levels within or in close proximity to areas where the historical spills or one recent (1996) spill occurred. Groundwater monitoring results indicated concentrations of TPH-G exceeded the cleanup level in 25 percent of the samples, exceeded the cleanup level of TPH-D in 2 percent of the samples, and did not exceed the cleanup level for TPH-O in any samples. Benzene and carcinogenic polynuclear aromatic hydrocarbons (cPAHs) have also been detected in groundwater above cleanup levels. Concentrations of benzene exceeded the cleanup level in approximately 35 percent of the groundwater samples. Concentrations of cPAHs exceeded the cleanup level in 1 percent of the samples collected and only in one well (MW-208). In addition to collecting groundwater quality data, groundwater contaminant modeling was conducted during the RI and FFS. The ground water quality and modeling results indicate that dissolved-phase hydrocarbons are not migrating off site at concentrations that pose a threat to surface water at the shorelines of Harbor Island, but slightly exceeds criteria at the property boundaries.

**Arsenic, Copper, and Lead.** Arsenic was found in surface soil within portions of the main tank farm above Harbor Island action levels set in the EPA ROD for the surface soils but below MTCA cleanup levels. Lead was identified in surface soil in portions of the main tank farm and adjacent to the oil/water separator above the levels designated in the EPA ROD for the surface soils. EPA conducted surface soil investigations for the island including the Texaco site. Ecology and EPA in a memorandum of agreement (MOA), agreed not to duplicate investigation efforts on the island except where data gaps exist. Ecology concurred with the EPA ROD on Harbor Island. The occurrence of lead and arsenic are most likely associated with stack emissions from the former lead smelter located adjacent to the terminal but was never owned nor operated by Equilon. Dissolved copper and lead are the only metals detected in groundwater above cleanup levels during the RI monitoring. Concentrations of dissolved copper and lead exceeded the cleanup level in approximately 44 percent and 1 percent of the samples collected, respectively. Dissolved copper and lead were also detected across much of the northern portion of Harbor Island during the USEPA RI, indicating elevated background concentrations. Copper and lead were not detected in subsurface soils above the cleanup level. These inorganic metals are

associated with the former lead smelter and marine paints used at shipbuilding and repair facilities adjacent to the Equilon Terminal (Tetra Tech 1988).

**Marine Sediments.** Based on the results of marine sediment sampling conducted by EPA adjacent to the site, sediments have not been impacted by adjacent shoreline activities (e.g., Equilon operations) above levels that would cause adverse effects to aquatic life. No further action is proposed by EPA for the marine sediments adjacent to Equilon property.

### 2.1.2 Exposure Pathways

The following pathways were evaluated at the site as part of the FFS (LCI and EMCON 1997):

- Product to Groundwater and Surface Water
- Soil to Groundwater
- In land Groundwater to Surface Water
- Soil Particulate to Air
- Soil Direct Contact
- Groundwater to Marine Sediments

As described in the following sections, the primary exposure pathways identified for the site are associated with the Shoreline Manifold Area and associated TPH contaminated soil hot spot and dissolved petroleum hydrocarbons in groundwater (Section 1.1.2.1, 1.1.2.2 & 1.1.2.3), and lead and arsenic particulate in surface soil (Section 1.1.2.4.). Secondary exposure pathways identified for the site are associated with the dissolved petroleum hydrocarbon plume in the inland portions of the site in Main and North Tank areas (Section. 1.1.2.3)

#### 2.1.2.1 Product to Groundwater and Surface Water

The two potential transport pathways associated with product release and plume beneath the Shoreline include (1) occasional product migration into the Elliott Bay through discontinuities in the subsurface barriers, and (2) partitioning of hydrocarbons from the product or adjacent soil to the groundwater, and then subsequent transport in dissolved phase to the surface water through groundwater discharges. These pathways associated with the product release and plume by the Shoreline area are the primary pathways of concern at the site because they pose a potential threat to the surface water and its ecosystem. The proposed cleanup action will interrupt these pathways by continuing the use of the existing bulkhead and remedial actions which will focus on removal of the product, and associated dissolved petroleum hydrocarbons, if present, as discussed in Section 4. These actions will be effective in meeting cleanup levels in groundwater at the point of compliance, providing protection to day workers, and preventing migration of product sheen and potential dissolved petroleum hydrocarbon plumes into the surface water adjacent to the Equilon site.

#### 2.1.2.2 Soil to Groundwater Pathway

The results of groundwater monitoring data and groundwater modeling conducted during the RI and FFS indicate that the soil to groundwater pathway for the inland sources appears to be complete and are stabilizing. The last recorded spill to inland soils took place over five years ago. Groundwater monitoring data indicate that the dissolved plumes associated with these sources appear to be stabilizing and are generally decreasing. Soil to groundwater pathway from the inland portion of the Equilon site (portions of the main terminal, main terminal tank farm and the north tank farm) does not pose a threat to the surface water at the shorelines based on the results of the fate and transport modeling and groundwater monitoring for the site. Therefore, offsite migration to adjacent properties is considered a secondary concern. Accessible TPH soil hot spots that act as potential ongoing sources to groundwater contamination will be excavated to the extent practicable so that the dissolved petroleum hydrocarbon in groundwater does not adversely impact off-site properties, to improve groundwater general conditions at the source and to enhance the timely restoration of the impacted area through natural degradation. Monitoring wells will be sampled along the property boundaries as part of the Groundwater Compliance Monitoring Program to provide early warning of any pending off property migration. A detailed contingency plan is outlined in the compliance groundwater monitoring program for the site as a 'backup' remediation technology in case the Preferred Corrective Option proves ineffective.

Soil to groundwater pathway at the Equilon site located at the shoreline is a primary concern because of its potential direct threat to the surface water and associated ecosystem. The soil to groundwater pathway at the shoreline was not considered in the fate and transport modeling for the site. Equilon has implemented interim actions at the Shoreline Manifold Area which includes excavation of TPH-impacted soil, active product recovery, vapor extraction, treatment of recovered groundwater with BTEX constituents, product sparging, and passive product recovery. These actions have been effective at recovering almost all the product in well points at along the bulkhead.

Accessible TPH soil hot spots that reflect the most recent spill of 1996 will be excavated to the extent practicable. The completeness of these actions to interrupt vapor and soil to groundwater pathways, and protect human health and the Bay will be verified further through the compliance groundwater monitoring program for the site. If groundwater quality, or other performance and cleanup standards are confirmed above state and federal standards, the contingency plan outlined in this cap will be implemented.

The selected remedy for groundwater cleanup at the shoreline manifold area combines several remedial elements to meet the remedial action objectives of removing petroleum vapors, product and the dissolved petroleum hydrocarbons during product recovery. These elements include the following technologies: extraction monitoring well points system to remove product from the water table and the associated dissolved petroleum hydrocarbons, treatment of the extracted groundwater prior to discharge at a disposal facility, and monitoring/institutional controls. These technologies will enhance and expedite the natural biodegradation of the residual TPH along the shoreline.

#### 2.1.2.3 Inland Soil to Groundwater to Surface Water Pathway

The results of groundwater analytical modeling conducted during the RI and FFS indicate that the dissolved-phase hydrocarbon plumes originating at some locations inland within the main terminal, and the main tank farm will not reach Elliott Bay or the Duwamish River at concentrations above surface water cleanup levels. Accessible TPH soil hot spots will be excavated to the extent practicable to improve groundwater general conditions at these locations that act as potential ongoing sources to groundwater contamination. Continued groundwater monitoring will be conducted as part of the cleanup action to verify protection of Elliott Bay and to ensure that contaminated groundwater is contained within property boundaries.

Accessible areas of the site that contain TPH soil hot spots of primary and secondary concerns at the site are located at the Shoreline Manifold area next to the Bay (primary concern), and other secondary areas of concern are located north of the Main tank area, and east of the warehouse.

Accessible TPH soil hot spots at the Manifold, primary area of concern next to Elliott Bay shall be excavated to the extent practicable using the action levels of 10,000 mg/kg set by U.S. EPA ROD for the rest of the Island.

Accessible TPH soil hot spots at the inland locations, secondary areas of concern at the middle of the island shall be excavated to the extent practicable using the action levels of 20,000 mg/kg. This action level is the EPA (A Guide to Corrective Action, EPA, May 1995) recommended lower threshold criteria to enable natural attenuation to successfully reduce total petroleum hydrocarbons concentrations in soils to acceptable levels within a reasonable restoration time period of few years (5).

The technologies proposed for the accessible inland TPH soil hot spots and the associated dissolved petroleum hydrocarbon in the groundwater will include soil excavation on/off site treatment/disposal. Also, if needed, other remedial technologies identified in the contingency plan will be implemented to prevent adverse off property groundwater impacts. These technologies will improve groundwater quality at the site, enhance timely restoration of the impacted areas and expedite natural biodegradation of the residual TPH left in place.

The completeness of these actions to interrupt groundwater to surface water pathway, and protect human health and the Bay will be verified further through the groundwater compliance monitoring program for the site. If groundwater quality, or other performance and cleanup standards are confirmed above appropriate state and federal standards, the contingency plan outlined in this CAP will be implemented.

#### 2.1.2.4 Soil Particulate to Air Pathway

This pathway is not of concern for TPH because TPH-impacted soil is not located at ground surface and are mostly weathered. The majority of the main terminal is paved with asphalt or concrete. Small areas of the main terminal and all of the main tank farm are covered with gravel. The tanks and tank farm walls also offer some protection from the wind. In addition, the hydrocarbons in soil at the inland portion of the site are very weathered and mostly comprised of diesel and oil, not the volatile and more mobile compounds present in gasoline, except the

Shoreline Manifold Area where a recent gasoline spill occurred in 1996. The surface areas of impact in this location are limited in extent.

EPA ROD for surface soils on Harbor Island requires 3 inches of asphalt cap to the extent practicable on areas of Harbor Island that exceed 32.6 mg/kg, arsenic and 1000.0 mg/kg, lead based on a risk assessment RI study and MTCA, respectively. EPA conducted surface soil investigations for the island including the Equilon site.

The results of the EPA RI surface soil lead and arsenic analyses for the Equilon site indicate that this pathway is not of concern for the portions of the main terminal paved with asphalt, but of primary concern for portions of the main terminal (adjacent to the oil/water separator) and the main tank farm area covered with gravel where lead and arsenic levels exceed Harbor Island surface soil action levels. Ecology concurs with EPA that this is a concern because the gravel cover does not provide adequate protection from primarily direct contact, and secondarily from groundwater infiltration, leaching, and surface runoff discharges to storm drains where these suspended metals are transported directly to the bay and sediments at the island edges.

The proposed cleanup actions to excavate or cap areas of the surface soil lead next to the oil/water separator, and portions of the main terminal tank farms that exceed lead and arsenic EPA Harbor Island surface soil action levels will effectively eliminate the soil to air pathway as discussed in Section 4. The final configuration and details, type of cap, areas to excavate, and justifications will be presented in the Remedial Design Phase of the site.

#### 2.1.2.5 Soil Direct Contact Pathway

This pathway is of limited concern for TPH because all elevated TPH concentrations in soils at the site are below the ground surface and are considered low risks, however, concerns relating to metals, arsenic and lead will be permanently addressed either through capping or excavation. Additional protection will be provided through the restrictive and deed covenant on the property and institutional controls.

#### 2.1.2.6 Groundwater to Marine Sediments

This pathway is not of concern at this time since the results of EPA marine sediment sampling in Elliott Bay (adjacent to the site) did not indicate that impacts due to Equilon operations exceeded the Marine Sediment Cleanup Standards to require active remediation. However, due to the location of the petroleum hydrocarbons plume at the Shoreline Manifold Area next to Elliott Bay of the Equilon site, sediments, biota, and the surface water will be evaluated if groundwater quality is confirmed above state and federal standards at the points of compliance. The details and specifics for implementation of surface water, sediment and biota sampling are described in the Groundwater Compliance Monitoring Program for the site. This is to ensure continued protection of human health and the Bay by the preferred remedial action alternative proposed in this CAP.

## 2.2 INTERIM REMEDIATION SYSTEM

Interim Actions implemented at the Shoreline Manifold Area and North tank Farm included soil excavation of TPH-impacted soil, passive and active product removal, vapor extraction, and treatment of recovered groundwater with dissolved BTEX constituents. These interim actions were implemented in response to two releases in the Shoreline Manifold Area (a small volume, 200 gallons of diesel release in 1991, a small volume, 700-900 gallons of gasoline release in 1996) and one release in the North Tank Farm (3000 gallons of diesel released). Implementation of these interim actions has provided removal of sources (contaminated soil) in the release areas and significant reduction of the product plume behind the bulkhead.

Since these interim actions were completed without Ecology's direct oversight, the completeness of these interim actions to interrupt vapor, soil to groundwater, and groundwater to surface water pathways, and protect human health and the environment will be verified further through the compliance groundwater monitoring program for the site. After implementing the Preferred Options, if groundwater quality, or other performance and cleanup standards are confirmed above state and federal standards at the points of compliance, the Contingency Plan outlined in this CAP will be implemented.

These interim actions have helped improve the overall groundwater quality at the Shoreline Manifold Area. A description of the interim actions taken is presented below.

**January 1991 Interim Action**

Approximately 200 gallons of No. 2 diesel was released onto soil on January 11, 1991 from a pinhole leak in a product line at the Shoreline Manifold Area. Nine hundred gallons of diesel and water was recovered from the excavation at the manifolds using a vacuum truck. About 10 cubic yards of petroleum impacted soil was excavated from the area and stockpiled for appropriate disposal/treatment.

**August 1991 Interim Action**

Approximately 3,000 gallons of diesel was released at the north tank farm on August 31, 1991 during product transfer operations. A vacuum truck was used to recover 3,052 gallons of product. In addition, TPH-impacted soil was excavated and disposed off-site.

**August 1996 Interim Action**

Interim actions were implemented at the Shoreline Manifold Area upon discovery of a small product release in August 1996. Immediate actions taken after discovery included identification of the product type, pressure testing of the pipelines in the vicinity, and isolation of the release source. A pinhole (approximately 1/16-inch in diameter) was discovered in the pipe. Based on the area of impact and the nature of the leak, it is estimated that approximately 700 to 900 gallons (17 to 21 barrels) of unleaded gasoline were released. Follow-up activities included repair of the pipe, excavation of impacted soil (25 tons) in the vicinity of the release, and manual product recovery from vicinity wells (MW-212 and WP-2).

The interim actions included installation of six additional well points (WP-3 through WP-8) along the bulkhead, installation of a total fluids pump for continuous product recovery, performance of a vapor extraction pilot test, and installation of a vapor extraction/treatment system (blower and catalytic oxidizer). The location of the well points and the treatment system are shown on Figure 2. The current radius of influence of the vapor recovery wells covers the entire area impacted by the spill. Of the estimated 700 to 900 gallons released, approximately 390 to 400 gallons, with an additional 100 gallons in the vapor phase have been recovered to date. The interim action has been effective at removing almost all of the visible product along the bulkhead, thereby significantly reducing the product plume in size and volume. The interim action is in progress and the groundwater analytical results of the newly installed conditional compliance groundwater monitoring wells by the shoreline show that the adjacent surface water (Elliott Bay) is adequately protected.

## 3.0 SUMMARY OF CLEANUP STANDARDS

The Model Toxics Control Act (MTCA) cleanup regulations provide that a cleanup action must comply with cleanup levels for selected hazardous substances, points of compliance (POCs), and applicable or relevant and appropriate state and federal laws (ARARs) [Washington Administrative Code (WAC) 173-340-710]. The final indicator hazardous substances identified for the site, the associated cleanup levels, and ARARs are briefly summarized in the following sections. POCs will be established within the product plume area and at downgradient edge of the site or property boundary. POCs are outlined in the Groundwater Compliance Monitoring Plan.

### 3.1 INDICATOR HAZARDOUS SUBSTANCES

Indicator hazardous substances (IHSs) were identified for the Texaco Harbor Island Terminal site as part of the FFS using the criteria outlined in WAC 173-340-708(2). The final list of IHSs for groundwater and soil are a subset of the contaminants detected at the site. The final soil IHSs are arsenic and lead for surface soil; and benzene, toluene, xylenes, TPH-G, TPH-D, and TPH-O for subsurface soil. The final groundwater IHSs are benzene, toluene, ethylbenzene, cPAHs, TPH-G, TPH-D, TPH-O, copper, lead, and free product.

### 3.2 CLEANUP LEVELS

Soil and groundwater cleanup levels for the final IHSs were developed based on the industrial zoning of the site and the determination by Ecology that there is no current or planned future use of the groundwater for drinking water purposes. The beneficial use of the site groundwater is the protection of the adjacent surface waters and ecosystems and to prevent dissolved petroleum hydrocarbon plume in the groundwater from migrating off site which could impact adjacent properties.

Surface soil cleanup levels were determined based on EPA ROD for Harbor Island. Ecology concurred with EPA's ROD in 1994.

| | |
|---|---|
| Arsenic | 32.6 mg/kg |
| Lead | 1,000 mg/kg |

Surface soil (0-6 inches) cleanup levels for BTEX and TPH were not developed because surface soil concentrations did not exceed screening levels. The subsurface soil action level for TPH at the primary areas of concern by the is set to meet the remedial objective of protecting surface water at the property boundaries and shorelines and is:

| | |
|---|---|
| Total TPH | 10,000 mg/kg |

This TPH cleanup is also protective for other chemical constituents in petroleum product (i.e., BTEX).

The subsurface soil action level for TPH at the secondary areas of concerns, inland of the site is set to meet the remedial objective of protecting surface water at the property boundaries by improving groundwater general conditions at the source, enhancing timely restoration of the impacted area through natural biodegradation and to prevent off property migrations and is:

| | |
|---|---|
| Total TPH | 20,000 mg/kg |

Groundwater cleanup levels were determined by Ecology to be surface water standards that are protective of aquatic organisms in Elliott Bay. These surface water standards are the adopted ambient water quality criteria (WAC 173-201A and Section 304 of the federal Clean Water Act). The category of ambient water quality standards selected as relevant and appropriate for the site are the chronic criteria for protection of aquatic organisms (WAC 173-201A-040). Surface water standards are not established for TPH; therefore, the groundwater cleanup levels for TPH-G, TPH-D, and TPH-O were selected as protective cleanup goals at this time.

| | |
|---|---|
| Product | No Sheen |
| Benzene | 0.071 mg/L |
| cPAHs | 0.000031 mg/L |
| Copper | 0.0029 mg/L |
| Ethylbenzene | 29.0 mg/L |
| Lead | 0.0058 mg/L |
| Toluene | 200.0 mg/L |
| TPH-G | 1.0 mg/L |
| TPH-D | 10 mg/L |
| TPH-O | 10 mg/L |

Copper and lead are from off-site sources and are found throughout the groundwater beneath Harbor Island.

## 3.3 ARARS

The selected cleanup action will comply with federal, state and local ARARs. Applicable requirements are federal and state laws or regulations that legally apply to a hazardous substance, cleanup action, location, or other circumstance at the site. Relevant and appropriate requirements are those federal and state regulations that do not legally apply but address situations sufficiently similar that they may warrant application to the cleanup action. Potential ARARs pertinent to remediation alternatives include substantive requirements of chapters 70.94, 70.95, 70.105, 75.20, 90.48, and 90.58 RCW. Others are identified and defined in the FFS (LCI and EMCON 1997) and they include the Model Toxics Control Act (WAC 173-340), the Washington State Dangerous Waste Regulations (WAC 173-303, Washington State Water Quality Standards for Surface Water (WAC 173-201A), and laws requiring or authorizing local government permits or approvals for the remedial action implementation.

## 4. SUMMARY OF SELECTED CLEANUP ACTION

Site-specific cleanup action alternatives were developed and analyzed for soil and groundwater in the final FFS (LCI and EMCON, 1997) to ensure the protection of human health and the environment at the site. Based on this initial screening and evaluation of supplemental data collected during the FFS, the following three alternatives were selected for further evaluation.

- **Alternative 1A - No Further Action.** This alternative includes cleanup actions performed at the Terminal to date, groundwater monitoring as part of the island-wide operable unit, passive product recovery, ongoing interim actions, and continued use of the existing bulkhead at the Shoreline Manifold area.

- **Alternative 3A - Product Recovery and Associated Dissolved Petroleum Hydrocarbons and Reuse, Treatment of Groundwater Prior to Proper Disposal, Source Identification and Removal at the Property Boundaries, Surface Soil Excavation or Cap, Excavation of Accessible TPH Subsurface Soil Hot Spots to the Extent Practicable, Groundwater and Product Monitoring, Institutional Controls, Deed Restrictions and Contingency Plans.** This alternative includes continued product recovery with enhanced vapor extraction and passive product recovery at the Shoreline Manifold Area; product monitoring; aggressive passive product recovery at the North Tank Farm; excavation or capping of lead impacted surface soil near the oil/water separator excavation or capping of surface soil impacted with lead and arsenic in the main tank farm; source identification and removal to contain migrating contaminated groundwater within property boundaries, excavation of accessible TPH subsurface soil hot spots to the extent practicable; groundwater monitoring in point of compliance and property wells; natural biodegradation of residual TPH in subsurface soils; and institutional controls including a deed restriction and contingency plans 'backup technology'.

- **Alternative 4A - Product Recovery and Reuse, On-Site Soil Stabilization, and Institutional Controls.** This alternative includes all actions in Alternative 3A except the gravel cover and contingent soil excavation or 3 inches of asphalt cap, stabilization of lead-impacted soil in the main tank farm, and an upgraded storm water collection system.

The proposed cleanup action for the site was selected based on a comparison of each cleanup action alternative with the following criteria (WAC 173-340-360(2) and (3)) and consideration of the MTCA remedy selection requirements:

- Overall Protection of Human Health and the Environment
- Compliance with Cleanup Standards
- Use of Permanent Solutions to the Maximum Extent Practicable
- Compliance with ARARs
- Provision for Compliance Monitoring
- Provision for Reasonable Restoration Time Frame

**THE SELECTED REMEDIAL ALTERNATIVE (3A).** Alternative No. 3A, the selected alternative in this CAP, includes active and passive product recovery and associated dissolved petroleum hydrocarbons by the shoreline, source identification and removal at property boundaries to contain dissolved petroleum hydrocarbons within property limits, reuse of recovered product, treatment of groundwater with dissolved petroleum hydrocarbons (before disposal), capping or excavating surface soil impacted with lead and arsenic, excavating accessible TPH soil hot spots in the subsurface to the extent practicable, groundwater monitoring at compliance and performance wells, natural attenuation for the TPH residuals in the subsurface below action levels, access restrictions, contingency plans and deed restrictions. The major features of Alternative 3A are presented on Figure 3. A conceptual description of each element of this alternative and how it will be implemented at the site is presented below. Detailed descriptions with engineering drawings, specifications and justifications will be presented in the Remedial Design phase for the site:

**Active Product Recovery.** Current estimated volume of free product adhered to soil present at the Shoreline Manifold area based on the recovered volume is less than 200 gallons. Measurable product has been reduced to a sheen. Active product recovery has been initiated at the Shoreline Manifold area as part of an interim action. The system includes a network of six well points in the vicinity of MW-212 and a vapor extraction/treatment system (blower and catalytic oxidizer). It is anticipated that the duration of the active product recovery is nearly complete based on the product recovered to date. This will be confirmed through compliance and performance standards evaluations. Detail of this evaluation is contained in the Groundwater Compliance Monitoring Program for the site. Throughout the site, including the inland areas, free product shall be recovered from the water table when ever present.

**Passive Product Recovery.** Passive product recovery, using peristaltic pumps, product recovery canisters, and absorbent materials (filter “socks”) will be performed in the vicinity of MW-204 and MW-212 until there is no evidence of measurable petroleum hydrocarbon sheen (Figure 3). The details of this system will be presented in the Remedial Design phase. For the wells at the Shoreline Manifold Area, passive product recovery is intended to supplement the active product recovery system as needed. The performance standards (no sheen) of this Passive product recovery will be evaluated periodically. The frequency of this reevaluation will be presented in the Groundwater Compliance Monitoring Plan for the site. Throughout the site, including the inland areas, free product shall be recovered from the water table when ever present.

**Reuse of Recovered Product.** Recovered product will continue to be recycled into new product.

**Groundwater Treatment.** During active product recovery, associated petroleum hydrocarbons dissolved in the groundwater may be recovered during the process. The recovered petroleum hydrocarbons in the groundwater will be separated from the product through gravity separation and the water discharged to the King County sewer system under a King County discharge permit or disposed of at an approved facility. Additional treatment (carbon adsorption) will only be used if needed to meet discharge limits.

**Location of Accessible Impacted Soils and Volumes.**

Accessible areas of the site that contain elevated TPH impacted subsurface soil hot spots that are of primary and secondary concerns at the site are located at the Manifold area next to the Bay (primary concern), and other secondary areas of concern are north of the Main tank area, and east of the warehouse. Accessible TPH soil hot spots at these locations could pose potential threats to Elliot Bay and adjacent properties respectively and will require excavation to the extent practicable.

Elevated lead impacted surface soil (about 13,000 mg/kg) will be capped or excavated adjacent to the oil/water separator. This area is shown on Figure 3. This elevated lead concentration next to the oil/water separator averages 4 inches in thickness, and covers an area approximately 2,785 square feet (sf) in the vicinity of TX-26, SB-129a, and SB-131. The soil volume is approximately 35 cubic yards, comprised of 80 percent gravel and 20 percent sand/silt.

The surface soil impacted areas above the EPA action levels of 32.6 mg/kg and 1000 mg/kg for arsenic and lead respectively that are subject to capping or excavation are shown in Figure 3. The estimated volume of lead and arsenic impacted soil is about 3,500 cubic yards.

The volume of the accessible TPH subsurface soil hot spots subject to excavation to the extent practicable at the shoreline is about 382 cubic yards, while the volume at the inland locations are as follows; Main Tank farm area is about 117 cubic yards, and the Main Terminal Warehouse area is about 50 cubic yards.

**Soil Excavation and Off-Site Disposal or Capping**

Lead impacted soil adjacent to the oil/water separator would be excavated and transported to an approved hazardous waste disposal facility. Lead and arsenic above EPA action levels will be excavated and transported/treated before disposal at an approved disposal facility. These areas would be backfilled with clean imported material. Excavated TPH subsurface soil hot spots will be treated on/off site, and/or disposed at an approved disposal facility.

Back filling of surface soils, and subsurface soils will comprise of clean fill material or treated material which will be tested before reuse on the site to ensure that it meets minimum requirements under the regulation for metals and TPH respectively. Excavation, disposal and back filling would be accomplished through the legal framework of the Consent Decree.

Excavation or capping of the surface soils above action levels will prevent surface runoff directly to the storm drains and sediments and protect day workers from direct contact of contaminated arsenic and lead surface soils. Excavation of the accessible TPH subsurface soil hot spots that act as ongoing source to groundwater contamination will improve general groundwater conditions at the source, enhance restoration time for the impacted areas and enhance biodegradation of the residual TPH in the subsurface. In addition, groundwater monitoring program will be implemented to monitor the ongoing intrinsic degradation/natural attenuation of the residual TPH in soils as part of the selected cleanup action. A deed restriction will also be implemented to prevent inappropriate future use of the site.

**Contingency Plans.** A contingency plan is a cleanup technology that serves as a "backup" remediation technology in the event that the Preferred Option fails or proves in effective in a timely manner (5 years). A Contingency plan that contains engineering plan and design will be triggered and implemented within 30 days of meeting any of the following criteria;

- If the results of the groundwater monitoring program after implementing the Preferred Corrective Options indicate elevated contaminant concentration over the specified restoration time frame of 5 years,
- or contaminants are identified in point of compliance wells located outside of the original plume boundary, indicating renewed contaminant migration,
- or contaminant migration are not decreasing at a sufficient rate to ensure that the primary and secondary concerns identified for the site are being met.

**Inland Groundwater Contingency Plan for Property Boundary Shall Include:**

- Source identification and removal (and supplemented by treatment) if needed, to prevent adverse impacts to offsite properties.

**Shoreline Contingency Plan Shall Include:**

- Expand hydraulic control to ensure removal of free product from the water table

- When relocation of the above ground construction of the petroleum delivery pipelines that are currently underground are completed, complete excavation to the extent practicable, TPH soil hot spots.

- Sediment and bioassay sampling as determined necessary through the groundwater compliance monitoring program.

This contingency plan is outlined in detail in the attached Groundwater Monitoring Plan, Exhibit F, developed for the site.

**Product Monitoring.** Throughout the site, including the inland areas, free product shall be removed from the water table when ever present. Product occurrence or, if appropriate, product thickness, will be monitored at the inland and shoreline locations of the site in the following

proposed monitoring wells, MW-06, MW-204, MW-208, MW-210, MW-211, and MW-212. Use of source identification and removal shall be used as needed to ensure that dissolved petroleum hydrocarbons associated with the free product to prevent adverse impacts to offsite properties. Well points are proposed in the Groundwater Compliance Monitoring Plan for the Site in the vicinity of MW-212 to assess the effectiveness of product recovery and to monitor potential changes in the nature and extent of product at localized areas. The duration of the product monitoring will be based on the performance and cleanup standards outlined in the attached Groundwater Compliance Monitoring Plan, Exhibit F, for the site.

**Groundwater Compliance Monitoring.** The attached groundwater compliance monitoring plan, Exhibit F, is consistent with WAC 173-340-410 and includes protection monitoring, performance and confirmation monitoring. The three types of compliance monitoring to be conducted include the following:

- **Protection Monitoring** to confirm that human health and the environment are adequately protected during construction and the operation and maintenance period of the cleanup action.
- **Performance Monitoring** to confirm that the cleanup action has attained cleanup standards and other performance standards.
- **Confirmation Monitoring** to confirm the long-term effectiveness of the cleanup action once cleanup actions and other performance standards have been attained.

**Points of Compliance: Soil.** The determination of adequate soil treatment will be based on the remedial actions ability to comply with the groundwater cleanup standards for the site, to meet performance standards designed to minimize human health or environmental exposure to soils above cleanup levels, and to provide practicable treatment of contaminated soils. Performance standards designed to minimize human and environmental exposure to soils above the cleanup levels set for the site shall include: Performance monitoring is outlined in the Groundwater Monitoring Program for the site and a covenant on the property which limits the site to industrial use only and prohibits any activity which may interfere with the protectiveness of the remedial action.

**Groundwater**. The achievement of cleanup levels in groundwater shall be measured at points of compliance located within the product plume area and at the downgradient edge of the site. These points of compliance shall consist of monitoring wells located in the product plume area and on the downgradient property boundary. Exact location of these wells are identified in the Groundwater Compliance Monitoring Program for the site.

**Access Restrictions.** The site is an operating facility and has restricted access (fences, signs, work permit requirements) as part of standard operations. These restrictions are in place 24 hours/day and 7 days/week. The Access and Operating Procedures for the Equilon Site is contained in Exhibit C, of the Consent Decree.

**Deed Restrictions.** Institutional controls are measures undertaken to limit or prohibit activities that may interfere with the integrity of a cleanup action or result in exposure to hazardous substances at the site. Such measures are required to assure continued protection of human health and the environment when a cleanup action results in residual concentrations of IHS that exceed

MTCA Methods A or B cleanup levels and where conditional points of compliance are established. The site is currently an "industrial" site and is anticipated to be zoned and used as an industrial site in the foreseeable future. Equilon will add a restrictive covenant to the property deed that will restrict the property use to industrial uses or interfering with remedial action implementation proposed in this document. A copy of the proposed Restrictive Covenant for the Equilon Site is contained in Exhibit D, of the Consent Decree.

**Work Construction**. Schedule to begin work under this proposed CAP are contained in Exhibit E, of the Consent Decree. Work construction at the Equilon site will be conducted under a Safety and Health Plan prepared under WAC 173-340-810.

## 5. JUSTIFICATION FOR THE SELECTED REMEDIAL ACTION

The cleanup action, as proposed, is designed to accomplish the following requirements: protect human health and the environment, comply with cleanup standards per WAC 173-340-700, comply with applicable state and federal laws per WAC 173-340-710, provide compliance monitoring per WAC 173-340-410, use permanent solutions to the maximum extent practicable per WAC 173-340-360 (2), (3), (4), (5), (7), and (8), provide a reasonable time restoration per WAC 173-340-360 (6) and consider public concerns per WAC 173-340-600. The following sections discusses how the proposed cleanup action will meet these requirements.

**Protection of Human Health and the Environment**.

Removal of accessible TPH-impacted soil hot spots in the subsurface, removal or capping of lead and arsenic impacted surface soils, product recovery and associated vapor and dissolved petroleum hydrocarbons and extraction well points will prevent free-phase and associated dissolved petroleum hydrocarbon migration into the Bay and beyond property boundaries, enhance timely restoration of site by removing TPH soil hot spots that act as ongoing sources to groundwater, air and sediment contamination.

Completion of the active and passive product recovery at the shoreline will capture and prevent the spread of potential dissolved petroleum hydrocarbons from migration into the Bay and improve overall groundwater quality. Capping or excavation of lead and arsenic surface soils in the main terminal tank farm will effectively eliminate the soil to air particulate pathway, soil to groundwater pathway through infiltration and leaching, hereby effectively protecting day workers through the direct contact and surface water runoffs pathways. Soil excavation of areas with elevated lead concentrations and accessible TPH soil hot spots would remove the source of the surface lead and TPH contamination near the oil/water separator and other accessible areas of the site. Source identification and removal will prevent dissolved petroleum hydrocarbons from migrating off site and impacting adjacent properties. Monitoring wells by the shoreline and the property boundaries will provide additional protection by triggering implementation of Contingency Plans for the site.

**Comply with Cleanup Standards per WAC 173-340-700 through 760.**

The overall goal of cleaning up groundwater for the protection of surface water quality and containing contaminated groundwater within property limits will be met.

The goal of soil cleanup standards and action levels for petroleum hydrocarbons and metals are to protect the beneficial use of groundwater (surface water quality and associated ecosystem) and to contain residual contamination within property boundaries. The selected remedy that includes completion of the product recovery and associated vapor and dissolved petroleum hydrocarbon, excavation of accessible TPH soil hot spots and capping or excavation of surface soil contaminated metals will result in substantive compliance with the soil cleanup standards by reducing concentrations of contaminants in soils to levels that will support and maintain the attainment of groundwater quality standards in a timely manner.

**Compliance with Applicable State and Federal Laws per WAC 173-340-710**.

The preferred alternative meets all state and federal laws. All activities carried out to implement the preferred alternative will meet any laws requiring or authorizing local government permits or approval for the remedial action on the site.

**Provide Compliance Monitoring per WAC 173-340-410.**

The preferred alternative provides for long-term monitoring to ensure that groundwater continues to meet cleanup standards after remedial actions have been completed. During the remedial actions, performance monitoring will be conducted to confirm that cleanup actions have attained cleanup standards and treatment goals. After remedial actions, confirmation monitoring will be conducted to confirm and ensure that cleanup actions have attained cleanup standards and performance standards. Protection monitoring will be used to ensure that human health and the environment are being adequately protected during construction and operation of the cleanup actions. The specifics and details of these monitoring activities, locations, number and type of analytes, frequency, duration, and contingency plans are described in the Compliance Groundwater Monitoring Plan in Exhibit F, for the site. Schedule for this activity is contained in Exhibit E, of the Consent Decree.

**Use of Permanent Solutions to the Maximum Extent Practicable per WAC 173-340-360 (4), (5), (7), and (8)**.

Excavation of accessible TPH soil hot spots to the extent practicable, capping or excavation of lead and arsenic impacted surface soils, product recovery, groundwater treatment and reuse are permanent treatment technologies that will effectively improve groundwater quality permanently and in a timely manner.

**Provide for a Reasonable Restoration Time Frame per WAC 173-340-360 (6).**

Natural attenuation with active excavation of accessible subsurface TPH hot spots (e.g., source control), lead and arsenic in the surface soils will provide for a reasonable restoration time frame of 5 years for the site groundwater that is protective of the surface water and its ecosystem (primary concern) and adjacent properties (secondary concern).

In view of subsurface TPH soil hot spots that generate dissolved petroleum hydrocarbons in the groundwater above cleanup standards, Ecology believes that natural attenuation alone will not be sufficient to provide a reasonable restoration time frame for this site.

The projected 5 years restoration time frame is reasonable, and will allow for a meaningful statistical evaluation of compliance monitoring data and constitutes that time after the active Preferred Options have been implemented. For the Shoreline Manifold Area, restoration time begins after free product is removed from the water table, excavation of accessible TPH soil hot spots, followed by Groundwater Monitoring Program, and Contingency Plan review and implementation, if necessary. If Contingency implementation for the Shoreline Manifold is needed for the TPH in the subsurface soil based on the results of the gorundwater compliance monitoring or other performance standards, Contingency Plan shall begin after the successful relocation to above ground of the current under ground petroleum pipelines. Restoration time begins immediately after contingency implementation activity.

Where contingency plan implementation is not necessary, restoration time for the site is 5 years and the restoration clock begins 30 days after implementation of the Preferred Corrective Option for the site. This is the time required to reduce residual TPH in the subsurface to reasonable levels and groundwater quality below state standards and to collect meaningful statistical data to evaluate groundwater compliance monitoring data. Other specific time lines are outlined in Exhibit E, Schedule, and are detailed in the attached Compliance Groundwater Monitoring Program, Exhibit F, for the Equilon Site.

**Consider Public Concerns per WAC 173-340-600.**

The public is given the opportunity to comment during a 30-day public comment period upon completion of remedial milestones in the cleanup process. Some of these milestones include: The RI/FS, CAP, Agreed Order/Consent Decree, and Remedial Design (RD). Ecology will consider all comments received. At the end of the comment period, Ecology will prepare a responsiveness summary listing each comment received and Ecology's response to the comment.

## 6.0 IMPLEMENTATION SCHEDULE

Exhibit E, of the Consent Decree contains outline of the schedule for the remedial design and implementation activities. The Consent Decree will be entered in court, and will become effective once signed by all parties involved. As outlined in the schedule, specifics on detailed analysis may be needed to complete the remedial design. Ecology has review and approval authority for these documents and the public have an opportunity to participate in each milestone through the 30-day public comment period.

## 7. REFERENCES

EPA Record Of Decision (ROD), 1994, Soil and Groundwater for Harbor Island

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# FIGURES