Final East Parcel Corrective Measures Study

Former Rhone-Poulenc East Marginal Way Facility

Tukwila, Washington

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On behalf of the respondents, I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to evaluate the information submitted. I certify that the information contained in or accompanying this Final East Parcel Corrective Measures Study is true, accurate, and complete. As to those portions of the report for which I cannot personally verify accuracy, I certify under penalty of law that this report and all attachments were prepared in accordance with procedures designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who may manage the system, or those directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

By: _____ Date: Oct 31 2006

Mr. Gary Dupuy, Project Coordinator

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FINAL EAST PARCEL CORRECTIVE MEASURES STUDY

Former Rhone-Poulenc Facility, East Parcel
Tukwila, Washington

1.0 INTRODUCTION

The former Rhone-Poulenc facility is located along the Duwamish Waterway at 9229 East Marginal Way South, Tukwila, Washington, as shown on Figure 1. Due to previous use of the facility and historic releases to site soil and groundwater, a Resource Conservation and Recovery Act (RCRA) corrective action is being conducted at the facility under Administrative Order on Consent No. 1091-11-20-3008(h) (Order) between the Respondents (Container Properties, L.L.C. (Container Properties); Rhodia, Inc. (Rhodia); and Bayer CropScience) and the U.S. Environmental Protection Agency, Region 10 (EPA), dated March 31, 1993, as amended. Container Properties, Rhodia, and Bayer CropScience are collectively referred to as the Respondents. Container Properties is the current owner of the former Rhone-Poulenc property.

Under the terms of the Order, the Respondents have completed a RCRA Facility Investigation and have implemented two interim measures. A soil vapor extraction (SVE) system was installed and operated to remove toluene from soil beneath the former tank farm. The SVE system was operated until recovery diminished to de minimis levels and has since been removed. In 2003 a hydraulic control interim measure (HCIM) was implemented in the western portion of the site. Construction for the HCIM was completed early in 2004. The HCIM, which consists of a barrier wall enclosing the most highly affected areas and a groundwater recovery system, is currently being operated in accordance with the requirements of the Order.

Container Properties is proceeding with redevelopment of the former Rhone-Poulenc facility property. In support of this redevelopment, Container Properties is subdividing the site into two separate parcels (the West and East Parcels), as shown in Figure 2. While both parcels were part of the former Rhone-Poulenc facility and are covered under the Order, the East Parcel was not used extensively for chemical processing and, therefore, has not been substantially impacted by past operations, based on sampling results presented in the RCRA Facility Investigation Report (CH2M HILL, 1995). A potential buyer has been identified for the East Parcel. Container Properties is presently working with the potential buyer to identify and

resolve issues related to the sale of the East Parcel. This document presents the Corrective Measures Study (CMS) for the East Parcel only.

1.1 CORRECTIVE MEASURES STUDY PURPOSE AND OBJECTIVES

The corrective action provisions of the Order require that the Respondents must complete a CMS that assesses potential corrective action alternatives and recommends an appropriate final remedial measure. For this facility, the CMS is being split into separate studies, each addressing one of the parcels. Ultimately, corrective measures provisions under the Order will be addressed for both parcels. A CMS Work Plan for the East Parcel was submitted to EPA in June 2006 (Geomatrix, 2006a). The CMS Work Plan described the planned approach for completing the East Parcel CMS. The East Parcel CMS Work Plan was conditionally approved by EPA in a letter dated July 27, 2006. In accordance with the provisions of the conditional approval, a Revised East Parcel CMS Work Plan was submitted to the EPA on August 9, 2006 (Geomatrix 2006c).

This East Parcel CMS (referred to in this document as the CMS) has been prepared in accordance with the approved East Parcel CMS Work Plan, requirements specified in EPA guidance (RCRA Corrective Action Plan, OSWER, 1994), and applicable CMS provisions of the Order. The scope of this CMS includes affected soil and groundwater within the East Parcel, as shown in Figure 2. The purpose of this CMS is to identify and evaluate potential corrective action alternatives that address affected soil and groundwater within the East Parcel and to identify a final corrective measure alternative that, once implemented, would achieve cleanup standards for the East Parcel. Ultimately, successful implementation of the CMS that attains cleanup standards based on unrestricted land use would allow EPA to issue a determination of "corrective action complete without controls" for the East Parcel. If implementation does not achieve cleanup standards based on unrestricted land use, EPA may issue a determination of "corrective action complete with controls."

As noted above, the scope of this CMS is limited to the area defined in the Short Plat description included as Appendix A and as designated the East Parcel in Figure 2. This CMS does not address corrective action requirements for other portions of the former Rhone-Poulenc property not included in the East Parcel. Future plans will be prepared as appropriate to address corrective action provisions for the remaining portions of the site, including, but not limited to, the West Parcel and the Intertidal/Shoreline sediments area.

To effectively develop and focus potential corrective measure alternatives, it is necessary to establish clear objectives for corrective action within the East Parcel. Two sets of objectives have been established for this CMS, objectives necessary to meet the requirements of the Order and applicable regulations and objectives necessary to achieve requirements of the Respondents. The following corrective measures objectives have been identified for the East Parcel to address requirements under the Order, applicable regulations, and regulatory guidance:

1. Protect human health and the environment.
2. Attain interim cleanup levels as presented in this CMS report.
3. Control the source of releases to reduce or eliminate, to the extent practicable, further releases of hazardous constituents to the environment.
4. Comply with applicable federal and state laws and regulations for management of wastes.

The objectives necessary to address the site-specific requirements of the Respondents are as follows:

1. Provide for sale, redevelopment and reuse of the East Parcel.
2. Achieve a determination by EPA that corrective action is complete without controls for the East Parcel.

Corrective measures alternatives considered in the East Parcel CMS will be assessed relative to attainment of the above objectives and to appropriate evaluation criteria. The selected corrective measure alternative should be capable of meeting these objectives.

1.2 CORRECTIVE MEASURES STUDY ORGANIZATION

Following this introduction, this document is divided into the following sections:

- Section 2.0 describes the history of activities conducted on the East Parcel and summarizes the results of previous investigations;
- Section 3.0 presents the interim cleanup levels used for the East Parcel;
- Section 4.0 summarizes the results of recent site characterization field activities;
- Section 5.0 identifies and describes the corrective action alternatives considered for the East Parcel;

- Section 6.0 presents the evaluation of the corrective action alternatives;
- Section 7.0 presents the conclusions of this CMS and recommends a final corrective measure alternative that, once implemented, would achieve cleanup standards within the East Parcel; and
- Section 8.0 presents the implementation schedule for the preferred alternative.
- Section 9.0 presents the references used in this CMS.

Figures and tables follow Section 9.0.

2.0 SITE HISTORY AND SETTING

The East Parcel occupies approximately 6.5 acres within the City of Tukwila in an area known as Seattle's South End Industrial District. Summarized in the following subsections are the history of the East Parcel, the previous site investigations conducted within the East Parcel, and the hydrogeological setting.

2.1 EAST PARCEL HISTORY

Industrial use of the entire former Rhone-Poulenc property began in the 1930s when I.F. Laucks built a pilot plant to formulate glue for use in plywood manufacturing. During the latter portion of World War II the East Parcel was used as an internment camp for Italian prisoners. Improvements at that time included barracks, support buildings, recreational fields, and security fencing. In 1946, the Monsanto Chemical Company (Monsanto) purchased the site and continued the manufacture of glue and added production of paints, resins, and storage of wood preservatives. Monsanto began vanillin production in 1952, which continued through sale of the property to Rhone-Poulenc in 1986. Rhone-Poulenc ceased manufacturing at the site in 1991. The production facility was closed permanently in April 1991. Ownership was transferred to Rhodia in January 1998. Rhodia subsequently sold the property to the current owner, Container Properties, in November 1998.

All the manufacturing on the site and most of the industrial activity was located on the West Parcel. The East Parcel, for the most part, was used for non-industrial purposes, with most of the area used as parking lots. However, the East Parcel did contain several infrastructure buildings designed to support the manufacturing activities located on the West Parcel. Buildings present within the East Parcel included a laboratory building, an air compressor station, and a maintenance building. In addition, the RCRA Facility Assessment (RFA) (PRC Environmental, 1990) identified two former potential waste disposal areas; one identified as a

pilot plant waste disposal area and one identified as an area used for disposal of sulfuric acid tank solids.

2.2 PREVIOUS INVESTIGATIONS

Since all manufacturing operations ceased within the former Rhone-Poulenc property in 1991, investigations have been completed to evaluate environmental impacts to soil and groundwater. Soil and groundwater investigations have included the East Parcel. The investigations have followed the RCRA process from an initial RFA through the RCRA Facility Investigation (RFI), which was completed in 1995. Based on the results of the RFI, an extensive soil investigation was recently conducted within the East Parcel to identify any remaining affected soil. In addition, quarterly monitoring of groundwater is conducted at the former Rhone-Poulenc property under the requirements of the Order. Nearly 10 years of quarterly groundwater monitoring data have been collected; monitoring data include a limited number of wells on the East Parcel and in the West Parcel, which is located immediately downgradient of the East Parcel.

The most relevant investigations for the East Parcel are:

- 1986 — Site Screening Investigation by Dames and Moore.
- 1990 —RFA by PRC Environmental.
- 1991 — Site Assessment by Landau Associates.
- 1995 — Final RCRA Facility Investigation (RFI) by CH2M HILL.
- 1998 — Interim Measures Report-PCB Remediation and Sewer Cleaning by Rhodia.
- 2001 — Geoprobe Investigation Report, Former Rhone-Poulenc Inc., Marginal Way Facility, Tukwila, Washington by AGI.
- 2006 – East Parcel Soil Characterization by Geomatrix.

The most extensive investigation conducted in the East Parcel is the East Parcel Characterization completed in 2006. This investigation was completed in June 2006 and utilized a multi-incremental sampling approach. For the 2006 East Parcel characterization, six areas of interest were identified based on the results of these previous investigations, as shown in Figure 3. These investigation areas include the following:

- The former Maintenance Building Area.

- The former Compressor Area.
- The former Laboratory Area.
- The Sulfuric Acid Tank Waste Solids Disposal Area.
- The Pilot Plant Waste Disposal Area.
- The Background Area (consisting of two sub-areas, Background Subarea 1 and Background Subarea 2).

In preparation of the East Parcel Soil Characterization Work Plan, Geomatrix reviewed the existing soil and groundwater data for the site. Available data indicate that soil has been impacted at concentrations exceeding interim cleanup levels. Constituents of concern (COCs) in soil identified for the East Parcel include metals (arsenic, copper, and mercury), polychlorinated biphenyls (PCBs), and carcinogenic polyaromatic hydrocarbons (cPAHs); a specific subset of these COCs was identified for each of the six investigation areas, as described in the East Parcel Soil Characterization Work Plan (Geomatrix, 2006a). Recent site characterization field work was completed in accordance with the East Parcel Soil Investigation Work Plan and is summarized in Section 4.0. A data report documenting the results of the East Parcel Soil Characterization was submitted to EPA in July 2006 (Geomatrix, 2006b). Data from this investigation forms the primary basis for assessment of the contamination and the development of corrective measures for the East Parcel.

The review of analytical data collected from previous investigations (primarily the RFI) indicated that the East Parcel groundwater has not been impacted by former Rhone-Poulenc constituents at concentrations exceeding the interim cleanup levels. However, during the site characterization work and during subsequent implementation of voluntary interim measures, toluene-impacted soil was encountered in the southwest corner of the East Parcel. The impacts to soil were found to extend to the water table and groundwater is currently impacted above groundwater interim cleanup levels in a very limited area of the southwest corner of the parcel. This CMS also addresses the groundwater impacts.

2.3 HYDROGEOLOGICAL SETTING

This section summarizes the soil stratigraphy and describes current groundwater conditions in the East Parcel. As discussed in Section 2.2, previous investigations indicate that groundwater beneath the East Parcel has not been impacted by site constituents above the interim cleanup levels. The near-surface hydrostratigraphy at the East Parcel is described in detail in the RFI.

It was further confirmed during geotechnical investigations conducted by URS in June 2002 for the north and east alignments of the HCIM barrier wall installed on the West Parcel. While most investigations have been conducted in the West Parcel, available data for stratigraphy beneath the East Parcel indicates that the East Parcel stratigraphy is similar to that present in the West Parcel although the fill thickness is less.

The unsaturated zone occurs from ground surface to a depths ranging from 5 to 11 feet below ground surface (bgs). This zone consists primarily of hydraulic fill with smaller volumes of non-hydraulic construction fill. Low permeability silt and clay strata occur locally at the base of the fill, which may cause perching of infiltrating precipitation. The recent data collected during the East Parcel Characterization (Geomatrix, 2006d) indicated that the thickness of the fill is thinner in the East Parcel, generally limited to depths of 4 to 8 feet. The fill is underlain in the East Parcel by low permeability, organic-rich silt and clayey silt which extend into the water table. The uppermost water-bearing unit, referred to as the Upper Aquifer, underlies the unsaturated zone and is continuous beneath the upland former Rhone-Poulenc property. Groundwater in the Upper Aquifer generally occurs under unconfined conditions within the alluvial deposits. The Upper Aquifer is approximately 50 feet thick and is composed of sands and silty sands (AGI 2001 and URS, 2002). On the East Parcel, the uppermost portion of the Upper Aquifer may be within the finer-grained unit which overlies the sand, particularly during high tide.

The Upper Aquitard underlies the Upper Aquifer and is composed of alluvial or glaciomarine silt with scattered traces of fine sand. The Upper Aquitard ranges in thickness from approximately 15 to 50 feet and has an average thickness of approximately 20 feet.

Groundwater flow conditions in the East Parcel area have likely been affected by the installation of a subsurface barrier wall on the West Parcel, although the groundwater flow directions in the area have not been evaluated since the completion of the barrier wall in 2003. Monitoring of water levels since the completion of the barrier wall has focused on attainment of the hydraulic control performance standard, not on water levels within the East Parcel. In previous investigations, the net groundwater flow direction across the East Parcel was determined to be from east to west in the Upper Aquifer with local flow in the southern portion of the East Parcel toward Slip 6. After completion of the barrier wall, the groundwater flow is still likely from east to west, until the groundwater flow splits and flows south around the barrier wall towards Slip No. 6, north around the wall and then west toward the Duwamish Waterway. Manual water level measurements collected outside the barrier wall are greatly

influenced by tidal fluctuations so it is difficult to demonstrate this splitting of flow using the existing post-HCIM data set. It is likely that the most significant effect of the HCIM barrier wall is evident in the western end of the East Parcel.

3.0 CONSTITUENTS OF CONCERN AND CLEANUP STANDARDS

EPA is in the process of establishing final cleanup levels that will be applicable to the former Rhone-Poulenc site and several other sites at or near the Duwamish Waterway. This process relies on consultation with potentially affected parties and the concerned public, and has not been finalized; therefore, final cleanup standards have not yet been established. Since soil cleanup standards are needed to support the CMS process, EPA has worked with the Respondents to establish preliminary remediation goals (PRGs) for the constituents previously identified from investigations conducted within the East Parcel. The PRGs, as well as additional criteria that were established during implementation of the East Parcel characterization and voluntary interim measure, are considered interim cleanup levels. These interim cleanup levels rather than final cleanup levels will be used for this CMS. Final cleanup levels for the site may be different from the interim cleanup levels.

In a letter dated May 10, 2006, EPA established PRGs for constituents previously identified within contaminated East Parcel soil. The PRGs consider the Washington State Department of Ecology (Ecology) Model Toxics Control Act (MTCA) cleanup level process, the federal Toxic Substances Control Act (TSCA) rules for PCBs and area-specific concerns for the Duwamish Waterway and potentially exposed receptors. Several constituents were included in soil analyses specified in the Work Plan for which PRGs had not been established. For several analyzed constituents with no PRGs, the Respondents used the MTCA Method A cleanup levels as interim cleanup levels for this CMS. In addition, the cleanup standard for toluene was developed in general accordance with MTCA Method B cleanup level protocols to ensure that the soil cleanup criterion was protective of groundwater. In this report, the PRGs established by EPA in the May 10, 2006 letter are referred to as PRGs. The PRGs, the cleanup criteria developed in general accordance with MTCA Method B cleanup level procedures, and the MTCA Method A cleanup levels used for other constituents are referred to collectively as interim cleanup levels.

The interim cleanup levels for the East Parcel are presented in Table 1. Two sets of PRGs were established by EPA for several constituents, one for unrestricted land use and one for restricted land use. Unrestricted land use cleanup levels have been consistently used in conducting this CMS. The PRG for copper is the MTCA Method B cleanup level, which is based on the

natural background concentration established by Ecology for the Puget Sound Area. The PRG for cPAHs incorporate the total toxicity equivalent calculations specified in the MTCA rules for considering all cPAHs and expressed as benzo(a)pyrene equivalents. The PRGs must be met for soil within either the upper 15 feet of the current land surface (based on the MTCA criteria for direct exposure) or to the top of the water table, whichever comes first. For the East Parcel, the top of the water table generally is found at depths ranging from 8 to 10 feet.

The interim cleanup levels established for constituents other than those for which PRGs had been established are listed in Table 1. As noted, these interim cleanup levels are based on MTCA Method A cleanup levels. The residential Method A cleanup levels are listed as unrestricted land use interim cleanup levels and the industrial Method A cleanup levels are listed for restricted land use. Unrestricted land use for PRGs is essentially equivalent to residential land use for MTCA cleanup levels and restricted land use PRGs are considered equivalent to industrial MTCA cleanup levels. Based on the results of East Parcel characterization and voluntary interim measures, toluene was identified in soil and groundwater. Additionally, total petroleum hydrocarbons (TPH) was identified in soil. The TPH included gasoline range organics (GRO), diesel range organics (DRO), and residual oil range organics (RRO); as noted in Table 1, interim cleanup levels have been established for these constituents based on Method A cleanup levels. Cleanup levels based on unrestricted land use have been used consistently for this CMS.

If corrective measures achieve the interim cleanup levels for unrestricted land use, then future restrictions on land use at the East Parcel would not be required. Alternatively, if corrective measures cannot achieve the interim cleanup levels for unrestricted land use, but achieve the interim cleanup levels for restricted land use, then institutional controls to restrict future use at the East Parcel would be required. Physical controls, such as capping, may also be required if unrestricted land use interim cleanup levels are not attained. These standards support the corrective action objectives presented in Section 2.

4.0 EAST PARCEL SOIL CHARACTERIZATION AND VOLUNTARY INTERIM MEASURES

Impacted soil in the East Parcel was recently characterized in accordance with the East Parcel Soil Characterization Work Plan (Geomatrix, 2006a). This investigation applied the EPA multi-incremental sampling method that used multiple samples to characterize a given area of the East Parcel and for a given COC and soil depth. The results of the characterization indicated that soils in some of the areas exceeded the interim cleanup levels for unrestricted

land use. Therefore, Container Properties decided to implement a voluntary interim measure to remove soils exceeding unrestricted land use interim cleanup levels.

4.1 EAST PARCEL CHARACTERIZATION

The East Parcel was characterized in accordance with the Work Plan. For the multi-incremental characterization, the East Parcel was divided into six subareas that were based on the historical activities in each area and the anticipated COCs. These six areas are:

- The former Maintenance Building Area,
- The former Compressor Area,
- The former Laboratory Area,
- The Sulfuric Acid Tank Waste Solids Disposal Area,
- The Pilot Plant Waste Disposal Area, and
- The Background Area (consisting of two sub-areas, Background Subarea 1 and Background Subarea 2).

Using the multi-incremental sampling approach, the soil samples from each area are composited to characterize the six investigation areas noted above. Although VOCs were not anticipated, all samples taken were screened with a PID to identify any VOC areas. Where VOCs were indicated, discrete samples were taken to evaluate the VOC type and concentrations. Based on the results of this investigation and the interim cleanup levels for unrestricted land use, impacted soil areas and one impacted groundwater area were identified. It was decided by Container Properties to proceed with a voluntary interim measure to excavate impacted soils on the East Parcel exceeding the unrestricted land use interim cleanup levels. The results of the soil characterization are summarized below.

Soil characterization field work performed under the approved East Parcel Soil Characterization Work Plan was recently completed, and the results have been initially reported in the East Parcel Soil Characterization Data Report (Geomatrix, 2006b). This characterization used a multi-incremental sampling approach, which involved collecting multiple grab samples from specified depth intervals within each of the six areas of interest, compositing the discrete samples for each specified depth and area into a single sample, and analyzing the composited sample for the COCs identified for the specific investigation area. To facilitate representative compositing and analysis of the samples, each discrete sample was milled prior to mixing. An aliquot was taken from the composite sample for analysis. The sampling and analysis strategy

used for the East Parcel soil characterization is summarized in Table 2. The analytes listed in Table 2 are based on the approved Work Plan.

Based on field screening (e.g., photoionization detector readings and/or visual observation), soil samples with potential waste material (as defined in the East Parcel Soil Characterization Work Plan) identified during the soil investigation were not included in the composite samples. These discrete samples were instead analyzed as a discrete sample submitted to the laboratory for analysis of VOCs, cPAHs, metals, and PCBs, as appropriate depending on the specific investigation area and field observations.

Table 3 and Figure 4 present the composite sample results for each of the East Parcel investigation areas. As noted on Table 3, multi-incremental sampling results indicate that the Pilot Plant Waste Disposal Area and the two Background Areas were below unrestricted land use interim cleanup levels. Because the composite copper results from the Surface 1 depth interval in the Maintenance, Compressor, Laboratory, and Sulfuric Acid Areas exceeded the copper unrestricted interim cleanup level, each of the Surface 1 discrete archive samples from these areas were analyzed for copper. PCBs were also detected above the unrestricted cleanup level in the Compressor Area Surface 1 composite sample, so the discrete Surface 1 archive samples in this area were also analyzed for PCBs. It should be noted that all discrete samples analyzed for PCBs were analyzed outside of the hold time; although the standard hold time was exceeded, the results are considered accurate and representative because PCBs are known to be highly persistent. The hold time was exceeded due to the time required to process and analyze the composite samples.

Table 4 and Figure 5 show discrete sample results for the East Parcel. Note that Figure 4 does not depict non-archive sample locations due to space restrictions on the figure. The discrete sample analyses allowed for better delineation of the extent of soil exceeding unrestricted interim cleanup levels.

Due to the potential to encounter high levels of contamination or buried waste materials, the East Parcel Soil Characterization Work Plan defined "waste" samples as samples collected during the multi-incremental sampling program that showed visual or olfactory evidence of contamination, contained non-soil materials, or sample yielded high PID readings from headspace testing. These criteria were considered evidence that the soil may be contaminated and thus, may require management similar to waste materials. The only suspected waste samples identified in the East Parcel during characterization were collected in the Compressor

Area. Based on odors and high PID readings, these samples were analyzed for VOCs, total petroleum hydrocarbons as gasoline (TPH-G), and TPH as Diesel Extended (TPH-Dx). In the southwest portion of the Compressor Area, the interim cleanup levels for unrestricted land use were exceeded for toluene, TPH-Dx, and TPH-G at depths ranging from 2 to 8 feet, as presented in Table 4.

4.2 VOLUNTARY INTERIM MEASURE

Based on the results of the East Parcel characterization, limited areas of contaminated soil were identified. These included the areas defined by the multi-incremental samples and the soil affected by toluene and TPH near the southwest corner of the Compressor Area. In order to attain Container Properties' objective of achieving interim cleanup levels based on unrestricted land use to support sale of the East Parcel, it was decided to implement a voluntary interim measure based on removal of soil exceeding interim cleanup levels for unrestricted land use. Throughout the following discussion of the voluntary interim measures, reference to interim cleanup levels as is consistent throughout this CMS, refers to interim cleanup levels for unrestricted land use. Excavation was conducted within the former Maintenance Building Area, former Compressor Area, Sulfuric Acid Solids Disposal Area, and the Laboratory Area. The voluntary interim measure completed for the East Parcel is summarized below. Additional details are presented in the East Parcel Soil Characterization and Voluntary Interim Measure Report (Geomatrix, 2006d). All soils exceeding interim cleanup levels based on unrestricted land use were removed from the East Parcel; confirmation samples indicate that remaining soils are below the interim cleanup levels for unrestricted land use.

4.2.1 Former Maintenance Building Area

Soils exceeding interim cleanup levels for unrestricted land use were excavated from the former Maintenance Building Area. The extent of the excavation is shown in Figure 6. Based on the results from multi-incremental composite and discrete samples, surficial soils over much of the area exceeded cleanup levels for copper. The discrete sample results indicated that about 75% of the area exceeded interim cleanup levels. Initially, these soils were excavated to a depth of 2 feet below initial grade. Remaining soils were sampled using the multi-incremental approach to confirm removal of affected soil; the confirmation sampling results indicated that the interim cleanup level had not been attained. The discrete samples were analyzed to identify areas with elevated copper. Based on the results of the discrete sample analyses, a limited area, as shown in Figure 6, was excavated to a depth of 3 feet below initial grade. A multi-incremental confirmation sample was collected and the result was below the interim cleanup

level, indicating that soil affected by copper had been removed from the site. Excavated surficial soil was placed on the West Parcel, within the contained area.

During excavation of surficial soils, an area of toluene contamination was discovered in the southwest corner of the former Maintenance Building Area. Toluene-affected soil extended from a depth of about 3 feet below initial grade to the water table (about 10-12 feet below grade); the maximum depth of the excavation was approximately 12 feet. The extent of the deep excavation is shown on Figure 6. Final confirmation samples collected on the north and east walls of the excavation were below the interim cleanup level for toluene for unrestricted land use. The excavation was extended to the south until the property line was encountered. Final confirmation samples for the south wall indicated that the residual concentrations of benzene and toluene are present in a portion of the wall at concentrations exceeding interim cleanup levels; two samples were collected from the south wall; one of the two samples exceeded the interim cleanup levels for both benzene and toluene. These concentrations reflect conditions at the property line rather than within the East Parcel. The excavation extended to the west, into the West Parcel. A total of four final confirmation samples were collected from the base of the excavation; two of the samples were below interim cleanup levels and two were above. The confirmation samples from the base of the excavation were taken at the water table. Approximately 140 cubic yards of soil were excavated from the deep excavation. This soil has been stockpiled for offsite landfill disposal. The area has been backfilled with clean fill material.

As noted above, soil affected by toluene extended to the water table in the deep excavation area. Toluene-affected soil above the water table was removed for off-site disposal. Five confirmation samples were collected from soils at the base of the excavation (at or just below the water table); of the five samples, two exceeded the toluene interim cleanup level and one slightly exceeded the interim cleanup level for benzene. Groundwater collected at the base of the excavation was recovered and placed within a Baker Tank; this water was characterized and will be pretreated for discharge to the King County sanitary sewer system. The soil removal has fully remediated the source of toluene in groundwater beneath the East Parcel. Any residual toluene and/or benzene in East Parcel groundwater is expected to biologically degrade and attenuate.

During excavation within the former Maintenance Building Area, two concrete vaults were found: one approximately 4 feet in diameter and one about 3 feet in diameter. Based on site drawings, these vaults appear to be former manholes used for industrial wastewater

management. Both vaults had been filled with pea gravel and concrete rubble at the time they were abandoned. The smaller vault was removed; the larger vault was left in place. The excavation also identified two transite pipes leading to the larger vault; sampling identified them as asbestos containing material. The two transite lines ran to the vault from the former laboratory. The transite lines were excavated and removed from the vault to the location of the laboratory. No transite lines were present downstream of the vault.

An oil/water separator was also found along the south property line; this separator could not be found on site drawings. Liquid and sludge within separator were sampled and found to contain diesel range organics, residual oil range organics, and low levels of PCBs. The liquid and sludge were removed to appropriate containers for off-site disposal. The concrete separator, which was in good condition, was entirely removed for disposal at the ChemWaste Management landfill facility in Arlington, Oregon. No visible staining or discoloration was noted beneath or around the separator.

4.2.2 Former Compressor Area

Multi-incremental sampling indicated that surficial soils exceeded the interim cleanup levels for unrestricted land use for copper and PCBs. Additionally, the soil in the southwest corner of the area was found to contain elevated concentrations of TPH and toluene. Excavation was conducted over the entire area outside the concrete slab where the compressors were mounted, as shown on Figure 6. Most of the area was excavated to a depth of 4 feet; the southwest corner was excavated to about 17 feet below the original grade. Confirmation samples indicated that essentially all soil exceeding the copper and PCBs interim cleanup levels for unrestricted land use has been removed from the former Compressor Area. Excavated soils were placed in a stockpile for offsite landfill disposal.

Toluene contamination was found at elevated concentrations in soil located in the southwest corner of the former Compressor Area during the East Parcel characterization. Soil in this area was excavated to a depth of 16 to 17 feet below grade. Confirmation samples collected from the four walls (north, east, south, and west) and the base were all below the interim cleanup level. The west wall of the excavation extended into the West Parcel. One confirmation sample collected from the base of the (Sample B4) excavation was slightly above the interim cleanup level for benzene (detected concentration of 0.054 mg/kg vs. interim cleanup level of 0.03 mg/kg). The base of the excavation was just above the water table, where aerobic biological reactions are expected to be active. Benzene is known to actively degrade under

aerobic conditions. Soil excavated from the deep excavation was placed in a stockpile for off-site disposal. The area has been backfilled with clean fill material.

Several steel pipes, including the former toluene pipe running to the toluene process tanks, were exposed during excavation. The toluene pipe is the likely source of toluene found in this area. Exposed piping within the excavation was removed and scrapped. Additionally, a concrete vault, approximately 6 feet in diameter and filled with pea gravel, was encountered in the southeast corner of the deep excavation. This vault appears to have been a manhole for the industrial wastewater sewer system. Water was observed leaking from a pipe connected to the vault. The water had no odor, or sheen or other evidence of contamination, and the expected source of the water is trapped runoff that had infiltrated to the line. The vault was not removed.

4.2.3 Laboratory Area

Surficial contamination in soil within the Laboratory Area was excavated as shown in Figure 6. The excavation extended to a depth of 2 to 3 feet below grade. Confirmation samples were collected using the multi-incremental sampling approach. The confirmation samples met the interim cleanup level for copper for unrestricted land use, indicating that impacted soil has been removed from the Laboratory Area. All soil excavated from the Laboratory Area was of moderate to low copper concentration; therefore, the excavated soil was placed in the West Parcel, within the contained area, for use as backfill to attain final grades needed to complete paving of the site. The area has been backfilled with clean fill material.

4.2.4 Sulfuric Acid Tank Solids Disposal Area

Based on the analysis of the multi-incremental composite and discrete samples, two separate areas were identified that exceeded the interim cleanup level (Figure 6). The northern area was excavated to a depth of 2 feet below original grade. The southern area was excavated to a depth of 3 feet. Confirmation sampling was done using the multi-incremental sampling approach; the confirmation sampling results were below interim cleanup levels, indicating the remaining soils meet the interim cleanup levels for unrestricted land use. All soil excavated from the Laboratory Area was of moderate to low copper concentration; therefore, the excavated soil was placed in the West Parcel, within the contained area, for use as backfill to attain final grades needed to complete paving of the site. The area has been backfilled with clean fill material.

5.0 CORRECTIVE MEASURE ALTERNATIVES

In an advanced notice of proposed rulemaking regarding corrective action at RCRA facilities, EPA recognizes that at facilities with relatively straightforward remedial solutions, extensive evaluation of a range of corrective measure alternatives may not be necessary (EPA, 1996). Given the limited number of COCs present in the East Parcel and its limited use for industrial purposes, a limited set of alternatives has been evaluated in this CMS. In accordance with the approved East Parcel CMS Work Plan, the corrective action alternatives considered in the East Parcel CMS include the following:

1. No Action;
2. Source Area Excavation and Off-Site Disposal; and
3. Ex-Situ Bioremediation and Stabilization.

Under Alternative 1, no corrective action would be implemented and the East Parcel would be left under existing conditions; this alternative is typically included in feasibility studies conducted at CERCLA sites. Alternative 2 would use excavation to remove all source area soils exceeding cleanup levels for unrestricted land use. Under Alternative 3, a combination of remediation technologies would be conducted to treat affected soil for removal and/or immobilization of COCs.

A preliminary screening of these corrective action alternatives was completed in the Revised CMS Work Plan using the criteria listed in Table 5. For these criteria, precedence has been given to the screening criteria specified in the Order because they are specifically applicable to the former Rhone-Poulenc site. The criteria definitions presented in the Order have been adapted to address the criteria specified in EPA guidance and in the MTCA regulations. In accordance with the Order, the criteria have been separated in Technical, Human Health, Environmental, and Institutional categories.

Based on the results of this preliminary screening (presented in the Revised CMS Work Plan), Alternative 1: No Action has been included in the evaluation of alternatives to serve as a baseline for evaluation of the remaining alternatives incorporating active remediation. This alternative would not attain corrective action objectives. Results of the East Parcel soil characterization, as summarized in Section 4, confirmed that impacted soil exceeding unrestricted land use interim cleanup levels is present in the East Parcel. The remaining two

alternatives are developed in Section 6, along with an evaluation of the alternatives against the criteria presented in Table 5.

6.0 DEVELOPMENT AND EVALUATION OF ALTERNATIVES

As discussed in Section 5, three corrective measures alternatives passed preliminary screening and were retained for development and detailed evaluation. These alternatives will be evaluated against the criteria listed in Table 5, which include criteria cited in the Order, applicable EPA guidance for feasibility studies, and the MTCA regulations. The two alternatives developed to support evaluation are:

- Alternative 2 - Source Area Excavation and Removal; and
- Alternative 3 - Ex-Situ Bioremediation and Stabilization.

These alternatives have been developed to attain, to the extent practicable, the corrective measures objectives for the East Parcel identified in Section 1.1. The design is based on the results of previous investigations, including the recently completed East Parcel soil characterization. The alternatives are developed below in Sections 6.1 and 6.2, followed by a screening evaluation of the alternatives in Section 6.3. Finally, a preferred alternative is identified, based on the results of the evaluation, and is presented in Section 7.

6.1 ALTERNATIVE 2: SOURCE AREA EXCAVATION AND REMOVAL

This alternative consists of the excavation and removal of soil affected with constituents above unrestricted land use interim cleanup levels within the East Parcel. Excavated soil with low-level contamination of metals only would be relocated to the West Parcel and placed within the area enclosed by the barrier wall. Excavated soil containing other constituents or levels of metals that would suggest the soil was a waste (as defined in the East Parcel Soil Characterization Work Plan) would be disposed of in a permitted off-site disposal facility.

This alternative was recently implemented as a voluntary interim measure as part of completion of the soil characterization work. Based on the recent soil characterization, copper was the only widespread COC present above interim cleanup levels for unrestricted land use in East Parcel soil. Copper has been detected at elevated concentrations in the former Compressor Area, former Maintenance Building Area, Laboratory Area, and the Sulfuric Acid Tank Solids Area. Based on the results of the discrete, archived samples, the areas impacted by copper were delineated, as shown on Figure 6. The depths of copper impacts in these areas are as shown on Figure 6. In addition, toluene, PCBs, diesel range organics (DRO), and gasoline

range organics (GRO) were identified at concentrations exceeding interim cleanup levels in a small area immediately south of the former compressor pad (see Figure 6). Soil impacted by these COCs was estimated to extend to a depth of 17 feet bgs in this area. Finally, a small area of toluene-impacted soil was encountered in the extreme southwestern corner of the East Parcel with impacts extending to the water table at about 12 feet bgs.

In order to complete the excavation in the former Maintenance Building Area, the existing railroad tracks and ties were removed and properly disposed. Soil with copper contamination only was then excavated within the areas and depths shown on Figure 6, followed by confirmation sampling to ensure attainment of unrestricted use interim cleanup levels. Given the presence of impacted soils within the contained area of the West Parcel, plans for paving the entire West Parcel with a temporary cover comprised of asphalt, and the generally low concentrations of copper identified in the East Parcel soils, the excavated copper-impacted soil were placed on the West Parcel to achieve the planned final grade and elevation in the area contained by the barrier wall. An estimated 4,040 cubic yards (approximately 6,870 tons) of copper-impacted soil were removed and placed on the West Parcel.

The limited area of soil impacted with toluene, TPH, and PCBs within the former Compressor Area were excavated for off-site disposal. It is estimated that about 300 cubic yards (approximately 510 tons) of soil were excavated for off-site disposal. Based on the results of the East Parcel soil characterization samples and an assessment of historical operations that caused the releases, the soil was not classified as a dangerous waste under Washington dangerous waste regulations (WAC 173-303). Detected PCB concentrations were below the threshold requiring management under the TSCA regulations. Therefore, the excavated soil impacted by toluene, TPH, and PCBs was disposed of in a Subtitle D landfill. The excavated soil was temporarily staged on plastic-lined stockpiles and transported to the Roosevelt Regional Landfill in Klickitat County, Washington, for disposal as non-hazardous waste.

The area of toluene in the extreme southwestern corner of the parcel was also disposed of off site at the Roosevelt Regional Subtitle D Landfill. Volumes of this soil requiring disposal were estimated at approximately 350 cubic yards.

Following completion of the excavations, soil confirmation samples were collected beneath all excavated areas to confirm that soil exceeding interim cleanup levels has been removed. For the large, shallow excavations addressing copper-impacted soils, a multi-incremental sampling approach was used for confirmation sampling and analysis. Separate multi-incremental

composite samples were collected from excavations within each of the investigation areas defined for the East Parcel soil characterization. A total of 35 grab samples were collected within each investigation area and composited into a single confirmation sample. Individual grab samples were archived for potential analysis if the multi-incremental sample exceeded the interim cleanup levels and it became necessary to more carefully delineate impacted soil. For the two limited areas excavated to remove toluene contamination (former Maintenance Building Area), and toluene, TPH, and PCB contamination (former Compressor Areas), because of the VOCs present, confirmation grab samples were collected from the sidewalls and base of the excavation area and analyzed for the appropriate COCs.

Fugitive dust emissions during excavation, loading, and grading activities were controlled using water as a dust suppressant. After confirmation sample results confirmed removal of affected soil exceeding interim cleanup levels for unrestricted land use, the East Parcel was backfilled with clean fill and graded as necessary to restore site drainage.

As noted previously, toluene has been detected in groundwater near the southwestern corner of the East Parcel. The voluntary interim measure successfully removed the entire source area for this toluene, and toluene is no longer in use at the site. The excavation included removal of affected soils from the portion of the West Parcel that borders the East Parcel. During the RFI and other site investigations conducted in this area, toluene was not found in groundwater. Thus, available information indicates that this area is small. The southwest corner of the East Parcel is immediately upgradient from the HCIM barrier wall in the West Parcel. Since the regional groundwater flow direction is toward the west, it is highly unlikely that residual toluene contamination within the West Parcel would migrate to the east, toward the East Parcel. Due to the alteration of groundwater flow patterns created by the HCIM barrier wall, the southwest corner of the East Parcel has a flow direction with relatively high groundwater flow, toward Slip 6.

Implementation of this alternative as a voluntary interim measure has entirely removed the source of toluene, and as a result further actions are not required to address the limited remaining impacts to groundwater. Natural processes are expected to rapidly address the limited area with toluene-impacted groundwater. Toluene has been shown in numerous studies to biodegrade in groundwater readily under aerobic conditions. Literature values for toluene degradation rates indicate half lives on the order of 12 days under aerobic groundwater conditions (Wiedemeier, 1999). This half-life degradation rate for toluene is a mean value calculated based on various field in situ measurements. The impacts to groundwater in the East

Parcel cover a minimal (less than 2,500 sq. ft.) area with the upper groundwater zone having relatively high flow rates. Groundwater data for toluene collected prior to the completion of the source removal varied from two to 40 times the interim cleanup level within the excavation area. Groundwater immediately upgradient of the impacted area was non-detect for toluene. Since the toluene is near the water table, oxygen needed to support aerobic biodegradation should be readily available. It is anticipated that toluene concentrations in groundwater will meet interim cleanup levels for unrestricted land use within about three to six months.

Implementation of this alternative has resulted in the removal of soil with COC concentrations above unrestricted land use interim cleanup levels. With complete source removal implemented, groundwater will meet unrestricted interim cleanup levels within six months. Therefore, no restrictions would be necessary for future development and land use under this alternative. Long-term institutional controls would not be required and redevelopment would be unrestricted following the successful completion of remediation activities.

6.2 ALTERNATIVE 3 – EX-SITU BIOREMEDIATION AND EX-SITU STABILIZATION

This alternative includes ex-situ bioremediation and ex-situ stabilization to address East Parcel soil COCs. Impacted soil would be excavated for on-site treatment. In the CMS Work Plan, the preliminary version of this alternative included SVE. Based on the results of the East Parcel soil characterization, a limited area of soil was identified as affected by toluene. The toluene is predominantly within a fine-grained soil, an organic rich silt and clay. Therefore, it was considered more appropriate to address the toluene simultaneously with TPH via ex-situ bioremediation. For this reason, SVE was deleted from Alternative 3 for this CMS.

Ex-situ bioremediation would be used to reduce toluene and TPH concentrations to acceptable levels. Toluene and TPH-impacted soil would be excavated from the affected area immediately south of the former compressor pad (Figure 6) and placed staged in a bermed area on a 40-mil plastic liner. Following excavation, samples would be collected to determine the appropriate mix of nutrients and other amendments to support active biodegradation. Based on the test results, necessary amendments (assumed to be limited to nutrients and water) would then be added to the soil to create optimal conditions for aerobic biodegradation of the toluene and TPH. Soil amendments would be mixed into the soil using standard earth-moving equipment (e.g., front-end loader).

The moisture content of the piles would be monitored to ensure optimal moisture content is maintained and to prevent the addition of excess water and the generation of leachate. The soil

piles would be periodically turned using earth-moving equipment to aerate and mix the soil. The piles would be covered with plastic sheeting when not being turned to maintain the moisture content and temperature of the piles, to reduce wind erosion, and to limit infiltration of precipitation. Once test samples indicate that the organic COC concentrations had been reduced below the interim cleanup levels, active bioremediation would be discontinued. Soils impacted with PCBs would be chemically stabilized to immobilize the PCBs; this technology has been effective for PCBs, but is not usually effective for lighter organics. After removal of the bioremediation soil from the treatment area, soil samples would be collected from the upper 6 inches of soil below the footprint of the treatment cell to confirm that bioremediation activities did not impact underlying soils.

For estimating the ex-situ bioremediation costs, the following assumptions were made:

- Approximately 300 cubic yards of impacted soil would be excavated and treated. The average depth of soil in the treatment zone would be 5 feet.
- An indigenous microbial population is present that is capable of degrading the organic COCs in the soil; bioaugmentation was assumed to not be necessary.
- The bioremediation soil in the treatment area would be turned bi-monthly.
- Organic COCs are toluene and TPH. The concentrations for these constituents would be reduced below interim cleanup levels in about three months.

Following the completion of bioremediation activities, ex-situ stabilization using Portland cement as a fixation agent would be used to immobilize soil impacted with metals and/or PCBs in the other areas designated for excavation shown on Figure 6. Bench-scale tests would be conducted to determine the amount of Portland cement that would be needed to immobilize copper and PCBs present in East Parcel soil. Portland cement was included in the alternative because it has been proven for fixation of metals and PCBs in soil. Soil containing copper concentrations above the PRG would be excavated from the locations and depths shown on Figure 6 and mixed with Portland cement using a pug mill. The bioremediated soil containing PCBs and/or metals would also be stabilized using the pug mill. Following mixing in the pug mill, the stabilized soil would be placed onto a plastic-lined pad to allow the material to set up and to confirm that stabilization performance criteria are attained. After confirming attainment of performance criteria, the stabilized soil would be replaced into the excavation, compacted, and graded to restore site drainage. The stabilized soil would be covered by a layer of clean soil at least 1 foot in thickness. An estimated 20 to 35 percent increase in the soil volume (EPA, 1989) would occur due to the addition of Portland cement; this would result in an

increase in the surface elevation within the area where the stabilized soil is placed. Institutional controls would be included in this alternative to identify the location where stabilized material is placed and to control potential future risks that may result from excavation and construction.

For bioremediated soil that do not contain either metals or PCBs above interim cleanup levels, the bioremediated soil will be placed back in the excavation, compacted and graded to promote drainage. Institutional controls would not be required of these soils, since they meet the interim cleanup levels.

The following assumptions were made for the purpose of estimating the ex-situ stabilization costs:

- The existing railroad tracks and ties present on the East Parcel would be removed from the former Maintenance Area and properly disposed.
- Approximately 4,040 cubic yards of copper impacted soil would be excavated and stabilized.
- Approximately 300 cubic yards of bioremediated soil containing PCB and copper would be stabilized using pozzolanic materials.
- Approximately 5,500 cubic yards of stabilized soil would be generated for backfilling the excavations.
- The excavation would be enlarged as necessary to accommodate the stabilized soil and to provide site soils to provide a foot of clean soil cover.
- All soil would be replaced and compacted on site. No off-site disposal would be required.
- Excavation, stabilization, and fill activities would take approximately two months to complete.

This corrective measures alternative would result in the reduction of toluene and TPH in soil through ex-situ aerobic biodegradation. PCB and copper concentrations in soil would not be reduced through the stabilization process, but their mobility and resultant potential risks would be significantly reduced through chemical fixation. Copper and PCB interim cleanup levels would not be obtained by this alternative. Therefore, institutional controls would be required to protect workers and ensure that any soil removed from the East Parcel in the future is properly characterized and managed. Soils that do not contain PCBs or metals that are bioremediated to reduce toluene and TPH concentrations to below interim cleanup levels can be placed on site

without the need for institutional controls as the soils meet all the interim cleanup levels for the site.

6.3 SCREENING OF ALTERNATIVES

The potential corrective measure alternatives described in Sections 6.1, 6.2 and 6.3 were screened against the criteria presented in Table 5 to support the selection of the preferred corrective measure for the East Parcel. The screening evaluation for all criteria is summarized in Table 6 and discussed below. The alternatives were ranked on a relative scale of 1 (low ranking) to 3 (high ranking) for each of the criteria. It should be noted that for all criteria, a rank of low means least favorable among the alternatives and a high rank means most favorable. Although Alternative 1: No Action, is not discussed extensively below, it has been included in Table 6 to provide a benchmark for evaluation of Alternatives 2 and 3.

6.3.1 Technical Screening Criteria

Table 5 summarizes the technical screening criteria: performance, reliability, and implementability. Performance criteria include subcategories for effectiveness and useful life. Reliability criteria include subcategories addressing active operation, maintenance, and demonstrated reliability. Implementability criteria include subcategories for constructability, implementation time, and beneficial results timeframe. Descriptions of the technical criteria and ranking of the corrective measure alternatives are discussed below.

6.3.1.1 Effectiveness

Effectiveness is the capability of the alternative to perform the intended functions, such as contaminant destruction or immobilization, and to achieve corrective measure objectives. Site-specific characteristics that influence the effectiveness of the alternative must be considered in ranking the alternative for this criterion. The two alternatives were evaluated for effectiveness as follows:

- Alternative 2: Source Excavation and Removal. This alternative was given a high ranking because all of the affected soils would be removed from the East Parcel. Natural processes under this alternative are expected to meet groundwater interim cleanup levels within about six months of completion of the soil removal.

- Alternative 3: Ex-Situ Bioremediation and Stabilization. Although this alternative would immobilize PCBs and metals in East Parcel soils and achieve risk management objectives, interim cleanup levels would not be attained for these constituents. Toluene and TPH be destroyed via bioremediation to attain interim

cleanup levels. Since this alternative would not achieve interim cleanup levels within the East Parcel, it was given a moderate ranking.

6.3.1.2 Useful Life

Useful life is the length of time that the alternative can maintain its effectiveness. The potential availability of future resources as well as the appropriateness of the technology must be considered to assess the useful life. The alternatives were evaluated against this criterion as follows:

- Alternative 2: Source Excavation and Removal. This alternative was given a high ranking because it would permanently remove COCs from the East Parcel. No controls would be needed to provide long-term protection of human health and the environment at the East Parcel. The engineered containment barriers within the landfill and the West Parcel would provide long-term containment for the excavated soil.

- Alternative 3: Ex-situ Bioremediation and Stabilization. This alternative was also given a high ranking because toluene and TPH would be removed or destroyed by ex-situ bioremediation. PCBs and copper would be immobilized with Portland cement, which has a long, effective life.

6.3.1.3 Toxicity, Mobility, and Volume Reduction

This criterion assesses the degree to which the alternative reduces the potential for COCs to impact the environment through treatment to reduce the toxicity or mobility of the COCs or through treatment to reduce the volume of affected media. The alternatives were evaluated for this criterion as follows:

- Alternative 2: Source Excavation and Removal. This alternative was given a high ranking for this criterion relative to the other alternatives. Under this alternative, essentially all soil exceeding interim cleanup levels would be removed from the site and placed within an engineered, secure landfill. This would remove hazardous constituents from the site and limits their mobility over the long-term. Natural attenuation would eliminate toxicity for any constituents remaining in groundwater. Thus, this alternative would substantially reduce the toxicity and mobility of hazardous constituents within the East Parcel.

- Alternative 3: Ex-situ Bioremediation and Stabilization. Alternative 3 was given a moderate ranking for this criterion because it would be slightly less effective than Alternative 2 for reducing the toxicity, mobility, or volume of impacted media. Ex-situ bioremediation would substantially reduce the toxicity and volume of impacted soil. Stabilization would reduce the mobility of PCBs and metals, but both constituents would remain at the site. There is some potential for these two

persistent constituents to become mobile at some time in the future. For this reason, Alternative 3 was not ranked as high as Alternative 2.

6.3.1.4 Long-Term Operation and Maintenance

The long-term operation and maintenance requirements of the alternatives were considered for evaluation against this criterion as follows:

- Alternative 2: Source Excavation and Removal. This alternative was ranked high because no significant operation and maintenance is required with this alternative after the completion of excavation activities. In addition, this alternative does not rely on institutional controls to provide long-term protection of human health and the environment.

- Alternative 3: Ex-situ Bioremediation and Stabilization. This alternative, assuming the soil contains PCBs and metals above interim cleanup levels, was given a moderate ranking because long-term institutional controls would be required at the East Parcel to protect workers and ensure that any soil removed from the East Parcel in the future is properly characterized and managed. In addition, operation and maintenance activities would be significant during ex-situ bioremediation and stabilization, a period of about three to eight months. It also may be necessary to conduct groundwater monitoring for some time after backfilling with the stabilized soil.

6.3.1.5 Demonstrated and Expected Reliability

The reliability of the alternatives were evaluated for this criterion, including the success of the technology demonstrated in previous, similar applications and the flexibility of the alternative to deal with changes that may be necessary based on unknown conditions. The alternatives were evaluated for reliability as follows:

- Alternative 2: Source Excavation and Removal. This alternative was ranked high because all impacted soil would be removed from the East Parcel. Groundwater is expected to meet interim cleanup levels within six months of implementation. There would be no long-term environmental concerns remaining within the East Parcel. The engineered controls utilized for off-site management of the excavated soil have proven reliability.

- Alternative 3: Ex-situ Bioremediation and Stabilization. This alternative was also given a high ranking because the reliability of ex-situ bioremediation and ex-situ stabilization have been well demonstrated at similar sites for these COCs.

6.3.1.6 Constructability

The corrective measure alternatives were evaluated to assess their relative ease of implementation, taking into account both site-specific and external factors that may affect

constructability. Factors specific to the East Parcel include heterogeneity, presence of utilities or buildings, adjacent properties, and natural conditions. External factors considered include the availability of qualified contractors, requirement for specialty equipment, permitting requirements, etc. The constructability evaluation is as follows:

- Alternative 2: Source Excavation and Removal. This alternative was ranked high because the excavations are relatively shallow and will not require shoring or permitting to complete. There are also limited site-specific factors that would limit excavation and qualified contractors, and landfills are readily available.

- Alternative 3: Ex-situ Bioremediation and Stabilization. This alternative was given a moderate ranking because of more complex permitting requirements associated with ex-situ bioremediation and ex-site stabilization and due to the need to provide routine operation and maintenance operations over a period as long as eight months. In addition, this alternative was ranked lower because ex-situ bioremediation and ex-situ stabilization are more specialized technologies than excavation and off-site disposal and fewer experienced contractors are available.

6.3.1.7 Implementation Time & Beneficial Results Timeframe

Implementation time is the time needed to fully complete the remedial actions associated with each alternative. The beneficial results timeframe is a measure of how long an alternative will take to achieve its full effectiveness. Both alternatives were ranked high for these categories because it is anticipated that these alternatives could be implemented and completed in less than a year. However, Alternative 3 would require more time to achieve beneficial results than Alternative 2.

6.3.1.8 Safety

Safety includes risks to workers implementing the corrective measure as well as to nearby businesses and communities. Factors assessed include the potential for causing fires, explosions, traffic accidents, noise, exposure to East Parcel constituents, and potential for injuries associated with implementation. The two alternatives are evaluated relative to this criterion as follows:

- Alternative 2: Source Excavation and Removal. This alternative was given a moderate ranking due to potential worker exposure issues associated with the excavation and handling of impacted East Parcel soils. The generation of dust and/or vapors during excavation and loading activities has the potential to impact workers and off-site receptors. In addition, there is an increased risk of traffic accidents associated with the transport of soil to an off-site disposal facility, which is located more than 150 miles from the East Parcel.

- Alternative 3: Ex-situ Bioremediation and Stabilization. This alternative was given a low ranking due to the extensive handling required to excavate, treat, and stabilize impacted soils, as well as the increased potential for dust generation relative to Alternatives 2A and 2B. The period of operation, which may be eight months long, increases the probability of encountering safety issues.

6.3.2 Human Health Screening Criteria

Human health considerations include the extent to which alternatives mitigate both short- and long-term exposure to East Parcel constituents, including protection of workers and the public during implementation of the alternative. Potential exposure to East Parcel constituents or materials used in implementation, the nature and extent of East Parcel contaminants, and the locations of potentially exposed populations were assessed for this criterion. Within the East Parcel, the only significant human health risks are short-term risks associated with construction and operation, although Alternative 3 does have potential for future exposure to stabilized soils. This criterion was evaluated as follows for the alternatives:

- Alternative 2: Source Excavation and Removal. Soil with COC concentrations above interim cleanup levels would be permanently removed from the East Parcel under this alternative and groundwater is expected to meet acceptable concentrations within months of implementation. However, there are short-term exposure risks to construction workers during the excavation and loading of impacted soil. Because of the offsetting effects of short- and long-term exposure risks, this alternative was given a moderate ranking.

- Alternative 3: Ex-situ Bioremediation and Stabilization. Although copper and PCBs would be immobilized under this alternative, these constituents would remain on site at concentrations above the interim cleanup levels, requiring use of institutional controls for risk management. In addition, there would be significant short-term exposure risks associated with the extensive handling of impacted soils that would be required to implement this alternative. Since this alternative requires more handling and leaves constituents on site, this alternative was given a low ranking.

6.3.3 Environmental Screening Criteria

Environmental considerations used for evaluating the corrective measures alternatives include the short- and long-term beneficial and adverse effects associated with the alternative, taking into account East Parcel conditions, migration/exposure pathways, and measures included in the alternative to mitigate short- and long-term effects. The two alternatives were given a moderate ranking due to the significant short-term risks associated with the excavation and handling of impacted soils, including the potential for impacted material to reach the adjacent Duwamish Waterway through dust generation, wind erosion, and runoff. The short-term

effects are considered more significant than long-term effects, which are minimal for all alternatives.

6.3.4 Institutional Screening Criteria

Institutional considerations used for this CMS include compliance with applicable state and federal environmental, safety, and public health standards, as well as regulations on the design, operation, and implementation time for the alternative. The screening against institutional criteria is as follows:

- Alternative 2: Source Excavation and Removal. This alternative was ranked high due to the relative ease of implementation and minimal permitting requirements associated with the shallow soil excavations and the natural degradation of the groundwater. Based on the expected excavation depths, no existing structures (other than the railroad tracks, which can be removed) would interfere with implementation of this alternative.

- Alternative 3: Ex-situ Bioremediation and Stabilization. This alternative was given a moderate ranking due to more extensive permitting issues associated with these technologies, as well as the extensive material handling required and operations that must be conducted in close proximity to the Duwamish Waterway/Slip 6.

6.3.5 Cost Screening

The relative cost evaluation of the alternatives was based on estimated costs using the conceptual designs presented in Sections 6.1, 6.2 and 6.3. It is anticipated that each alternative could be implemented and completed in less than one year. Therefore, long-term operation and maintenance costs would not be incurred under any of the alternatives. It is estimated that Alternative 2 would cost approximately $421,200, and Alternative 3 would cost approximately $693,800 to fully implement. Detailed cost estimates for each alternative are presented in Appendix B.

7.0 CONCLUSION AND PREFERRED ALTERNATIVE

As discussed in Section 6, three corrective measure alternatives were evaluated in detail using the evaluation criteria listed in Table 5. Based on the results of the screening evaluation (Table 6), Alternative 2 is the preferred corrective measure alternative for the East Parcel and has already been successfully implemented as a voluntary interim measure. This corrective measure received a score of 36, while Alternatives 1 and 3 received lower scores (23 and 28, respectively).

Alternative 2 includes the following elements:

- Removal of existing railroad tracks and ties for proper off-site disposal.
- Excavation of approximately 4,200 cubic yards of copper-impacted soil and placement of the soil on the West Parcel within the area enclosed by the barrier wall.
- Excavation of approximately 600 cubic yards of soil impacted with organic COCs and PCBs for disposal at an off-site, permitted landfill.
- Confirmation soil sampling of all excavated areas.
- Grading of the East Parcel with existing, on-site material to promote drainage to the south.
- Natural attenuation of the remaining toluene-impacted groundwater.

This alternative would result in the removal of all soil having concentrations of COCs above interim cleanup levels. Groundwater is expected to achieve interim cleanup levels in three to six months of implementation of this remedy. No long-term institutional controls would be required to provide long-term protection of human health and the environment, and East Parcel redevelopment would be unrestricted following successful completion of remedial activities. Therefore, this alternative would provide greater long-term protection of human health and the environment than Alternative 3. In addition, the costs to implement Alternative 2 are lower than the costs for Alternative 3.

7.1 VOLUNTARY INTERIM CORRECTIVE MEASURES

In an effort to expedite cleanup and redevelopment of the East Parcel, Container Properties has implemented the elements of Alternative 2 for the East Parcel as a voluntary interim corrective measure. Excavation and removal of affected soil from the East Parcel was completed in early September 2006. A report describing this voluntary interim measure, including confirmation sample results that indicate affected soil has been removed from the East Parcel, was submitted to EPA on September 29, 2006 (Geomatrix, 2006d). Groundwater is currently impacted with toluene for a very small area of the East Parcel in the extreme southwestern corner of the parcel. Based upon the total removal of the source soils achieved by this voluntary interim action, no further corrective action is necessary to achieve interim cleanup levels in the East Parcel.

8.0 SCHEDULE

As outlined above the preferred alternative, Alternative 2, has been implemented voluntarily. As noted in Section 4.2, almost all key components included in Alternative 2 have been completed. Affected soil exceeding interim cleanup levels has been excavated. Confirmation samples have been collected that demonstrate attainment of interim cleanup levels. Only backfilling and off-site disposal of excavated soil remain to be completed.

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TABLES

Geomatrix

TABLE 1

INTERIM CLEANUP LEVELS

East Parcel CMS
Former Rhone-Poulenc East Marginal Way Facility
Tukwila, Washington

Constituent	Interim Soil Cleanup Level (mg/kg)	
	Unrestricted Land Use	Restricted Land Use
Arsenic[1]	20	20
cPAHs[1]	0.1	2
Benzene[2]	0.03	--
Cadmium[2]	2	--
Chromium, Hexavalent[2]	19	--
Chromium, Trivalent[2]	2,000	--
Copper[1]	36.4	36.4
Lead[2]	250	--
Mercury (inorganic)[1]	2	2
Naphthalene[2]	5	--
PCB Mixtures[1,3]	1	10
Toluene[4]	0.83	--
TPH - DRO[2]	2,000	2,000
TPH - RRO[2]	2,000	2,000
TPH - GRO[2]	100/30	100/30

Notes:

1. Interim cleanup level based on PRGs established for the East Parcel by EPA, Region 10, in a letter dated May 10, 2006. The PRG for cPAHs applies to total carcinogenic PAHs in benzo(a) pyrene equivalents, calculated in accordance with the MTCA regulations, WAC 173-340 708(8).
2. Interim cleanup levels based on MTCA Method A cleanup levels for residential properties. For TPH-GRO, the Method A cleanup level is 100 mg/kg if no benzene is present and 30 mg/kg if benzene is present.
3. For use of the restricted land use PRG, a cap meeting TSCA requirements [40 CFR 761.61(a)(7) and (8)] is required.
4. Interim cleanup levels established in general accordance with MTCA B cleanup level procedures to be protective of groundwater.
5. cPAHs = carcinogenic polycyclic aromatic hydrocarbons
6. PCBs = polychlorinated biphenyls
7. TPH = total petroleum hydrocarbons
8. DRO = diesel range organics
9. RRO = residual range organics
10. GRO = gasoline range organics

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TABLE 2

EAST PARCEL SAMPLING AND ANALYSIS STRATEGY

East Parcel CMS
Former Rhone-Poulenc East Marginal Way Facility
Tukwila, Washington

Area of Interest	Surface 1			Surface 2		
	Depth	Sample ID	Analytes	Depth	Sample ID	Analytes
Former Maintenance Area	0.5 to 1.5	MAINT-1-	As, Cu, Hg	7.0 to 8.0	MAINT-2-	cPAHs
Laboratory Area	0.5 to 1.5	LAB-1-	As, Cu, Hg	2.5 to 3.5	LAB-2-	cPAHs
Former Compressor Area	1.5 to 2.5	COMP-1-	PCBs, As, Cu, Hg	7.0 to 8.0	COMP-2-	PCBs
Former Sulfuric Acid Tanks Solid Disposal Area	0.5 to 1.5	SULF-1-	pH, Ag, As, Ba, Cd, Cr, Cu, Hg, Pb, Se	--	--	--
Former Pilot Plant Waste Disposal Area	1.0 to 2.0	PILOT-1-	cPAHs	7.0 to 8.0	PILOT-2-	cPAHs
Background 1	1.0 to 2.0	BACK1-1-	cPAHs, Cu	--	--	--
Background 2 (RR)	1.0 to 2.0	BACK2-1-	cPAHs, Cu	--	--	--

Notes:
Depths are in feet below ground surface.
Metals other than mercury analyzed by EPA Method 6000/7000; mercury analyzed by EPA Method 7010.
pH analyzed using EPA Method 9045B.
cPAHs = carcinogenic polyaromatic hydrocarbons analyzed using EPA Method 8270C.
PCBs = polychlorinated biphenyls analyzed using EPA Method 8082.
RR = railroad

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TABLE 3

EAST PARCEL CHARACTERIZATION, COMPOSITE SAMPLE ANALYSES

Former Rhone-Poulenc East Parcel CMS
East Marginal Way Facility
Tukwila, Washington

Area of Investigation	Sample ID	Depth (feet)	cPAHs (mg/kg)[2]	Total PCBs (mg/kg)	pH	Metals (mg/kg)								
						Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Selenium	Silver
Background 1	BACK1-1	1.0 to 2.0	0.02549 J							15.7				
	BACK1-1 (dup)	1.0 to 2.0	0.02839 J											
Background 2 (RR)	BACK2-1	1.0 to 2.0	0.0983 J							24.8 J				
Former Compressor Area	COMP-1	1.5 to 2.5		**7.4**		2.82				**257**		0.415		
	COMP-1 (dup)	1.5 to 2.5		**6.9**										
	COMP-2	7.0 to 8.0		<0.17 U										
Former Maintenance Area	MAINT-1	0.5 to 1.5				4.76				**110**		0.450		
	MAINT-1 (dup)	0.5 to 1.5				4.56				**106**		0.427		
	MAINT-2	7.0 to 8.0	0.001761 J											
Former Pilot Plant Waste Disposal Area	PILOT-1	1.0 to 2.0	0.005782 J											
	PILOT-2	7.0 to 8.0	0.001865 J											
Former Sulfuric Acid Tanks Solids Disposal Area	SULF-1	0.5 to 1.5			7.74 J	2.53	33.5	0.08	10.7	**41.5**	6.52	0.055	0.3 J	0.123 J
Laboratory Area	LAB-1	0.5 to 1.5				4.9				**40.3**		0.043		
	LAB-2	2.5 to 3.5	0.0155 J											
	Interim Cleanup Level		0.1	1	--	20	--	2	19/2,000[3]	36.4	250	2	--	--

Notes:

1. Interim cleanup levels are listed in Table 1, and are based on either PRGs established by EPA Region 10 or MTCA Method A residential cleanup levels.
2. cPAHs = carcinogenic polycyclic aromatic hydrocarbons, expressed as benzo(a)pyrene equivalent.
3. The MTCA Method A Chromium VI cleanup level is 19 mg/kg; the MTCA Method A Chromium III cleanup level is 2,000 mg/kg. It is expected that chromium present in Site soils is Chromium III.

BACK1-1 B(a)P = (17*1.0)+ (12*.1)+(22*.1)+(18*.1)+(25*.01)+(3.1*.4)+(18*.1)= 25.49
BACK1-1 DUP B(a)P = (19*1.0)+ (14*.1)+(24*.1)+(19*.1)+(29*.01)+(3.5*.4)+(20*.1)= 28.39
BACK2-1 B(a)P = (65*1.0)+ (51*.1)+(87*.1)+(74*.1)+(120*.01)+(12*.4)+(61*.1)= 98.3
MAINT-2 B(a)P = (1.2*1.0)+ (0.83*.1)+(1.3*.1)+(0.97*.1)+(1.7*.01)+(0.26*.4)+(1.3*.1)= 1.761
PILOT-1 B(a)P = (3.9*1.0)+ (3.6*.1)+(4.4*.1)+(3.5*.1)+(6.6*.01)+(0.74*.4)+(3.7*.1)= 5.782
PILOT-2 B(a)P = (1.2*1.0)+ (0.85*.1)+(1.6*.1)+(1.1*.1)+(2.4*.01)+(0.34*.4)+(1.5*.1)= 1.865
LAB-2 B(a)P = (11*1.0)+ (8.4*.1)+(11*.1)+(8.6*.1)+(15*.01)+(1.5*.4)+(9.5*.1)= 15.5

Bold results exceed PRG or interim cleanup level.
PCBs = polychlorinated biphenyls
U = The compound was analyzed for, but was not detected ("non-detect") at or above the MRL/MDL.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

TABLE 4

EAST PARCEL CHARACTERIZATION, DISCRETE SAMPLE RESULTS
East Parcel CMS
Former Rhone-Poulenc East Marginal Way Facility
Tukwila, Washington

Area of Investigation	Sample ID	Depth (feet)	GRO - NWTPH (mg/kg)	DRO - NWTPH (mg/kg)	RRO - NWTPH (mg/kg)	PCBs (mg/kg)	VOCs (mg/kg)								Metals (mg/kg)								
							Isopropyl-benzene	Naph-thalene	n-Butyl-benzene	n-Propyl-benzene	sec-Butyl-benzene	Styrene	tert-Butyl-benzene	Toluene	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Selenium	Silver
Interim Cleanup Level [1]			100/30	2,000	2,000	1	--	5	--	--	--	--	--	0.83	--	--	2	19/2,000 [2]	36.4	250	2	--	--
Former Compressor Area	COMP-1-31W	2.0 to 3.0	**280** [3]	**6,300** [4]	420 [5]		0.072 J	0.25	1.4	0.18 J	0.72	0.016 J	0.033 J	0.047 J									
	COMP-2-21W	7.0 to 8.0					<150 U	<150 U	<150 U	<150 U	<150 U	8.5 J	<150 U	**14,000**									
	COMP-1-28M	2.0 to 3.0													<10 U	19.9	<0.5 U	23	**134**	9	0.07	<10 U	<0.8 U
	COMP-1-3A	1.5 to 2.5				0.2 J																	
	COMP -1-7A	1.5 to 2.5				<0.054 UJ																	
	COMP -1-10A	1.5 to 2.5				0.0075 J																	
	COMP -1-15A	1.5 to 2.5				<0.059 UJ																	
	COMP -1-18A	1.5 to 2.5				0.84 J																	
	COMP -1-21A	1.5 to 2.5				**1.6 J**																	
	COMP -1-24A	1.5 to 2.5				<0.060 UJ																	
	COMP -1-26A	1.5 to 2.5				<0.057 UJ																	
	COMP -1-27A	1.5 to 2.5				0.044 J																	
	COMP -1-29A	1.5 to 2.5				0.46 J																	
	COMP -1-33A	1.5 to 2.5				0.12 J																	
Former Maintenance Area	MAINT-1-3A	0.5 to 1.5																	**296 J**				
	MAINT-1-14A	0.5 to 1.5																	**194 J**				
	MAINT-1-16A	0.5 to 1.5																	**122 J**				
	MAINT-1-25A	0.5 to 1.5																	16.7 J				
	MAINT-1-29A	0.5 to 1.5																	**116 J**				
	MAINT-1-10A	0.5 to 1.5																	**484**				
	MAINT-1-20A	0.5 to 1.5																	**64.9**				
	MAINT-1-22A	0.5 to 1.5																	**226**				
	MAINT-1-33A	0.5 to 1.5																	21.4				
	MAINT-1-34A	0.5 to 1.5																	**111**				
	MAINT-1-7A	0.5 to 1.5																	**114**				
Former Sulfuric Acid Tanks Solids Disposal Area	SULF-1-3A	0.5 to 1.5																	**55.7 J**				
	SULF-1-7A	0.5 to 1.5																	**50.5 J**				
	SULF-1-10A	0.5 to 1.5																	23.8 J				
	SULF-1-15A	0.5 to 1.5																	19.1 J				
	SULF-1-18A	0.5 to 1.5																	15.2 J				
	SULF-1-19A	0.5 to 1.5																	10.4 J				
	SULF-1-22A	0.5 to 1.5																	27.5 J				
	SULF-1-24A	0.5 to 1.5																	**106 J**				
	SULF-1-26A	0.5 to 1.5																	9.88 J				
	SULF-1-29A	0.5 to 1.5																	12.4 J				
	SULF-1-33A	0.5 to 1.5																	**411 J**				

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TABLE 4

EAST PARCEL CHARACTERIZATION, DISCRETE SAMPLE RESULTS

East Parcel CMS
Former Rhone-Poulenc East Marginal Way Facility
Tukwila, Washington

Area of Investigation	Sample ID	Depth (feet)	GRO - NWTPH (mg/kg)	DRO - NWTPH (mg/kg)	RRO - NWTPH (mg/kg)	PCBs (mg/kg)	VOCs (mg/kg)								Metals (mg/kg)								
							Isopropyl-benzene	Naph-thalene	n-Butyl-benzene	n-Propyl-benzene	sec-Butyl-benzene	Styrene	tert-Butyl-benzene	Toluene	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Selenium	Silver
Interim Cleanup Level [1]			100/30	2,000	2,000	1	--	5	--	--	--	--	--	0.83	--	--	2	19/2,000 [2]	36.4	250	2	--	--
Laboratory Area	LAB-1-10A	0.5 to 1.5																	26.9				
	LAB-1-12A	0.5 to 1.5																	27.4				
	LAB-1-15A	0.5 to 1.5																	34.6				
	LAB-1-18A	0.5 to 1.5																	27.9				
	LAB-1-21A	0.5 to 1.5																	**397**				
	LAB-1-24A	0.5 to 1.5																	**74.8**				
	LAB-1-26A	0.5 to 1.5																	18.9				
	LAB-1-29A	0.5 to 1.5																	**114**				
	LAB-1-33A	0.5 to 1.5																	11.5				
	LAB-1-3A	0.5 to 1.5																	47.1				
	LAB-1-7A	0.5 to 1.5																	15.4				

Notes:
1. Interim cleanup levels taken from Table 1.
2. Chromium VI cleanup level is 19 mg/kg; Chromium III cleanup level is 2,000 mg/kg. It is expected that chromium is present in Site soils as Chromium III.
3. The gasoline result has a chromatographic fingerprint that resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
4. The diesel result chromatographic fingerprint resembles a petroleum product but the elution pattern does not match the calibration standard.
5. The residual range result resembles an oil, but does not match the calibration standard.

Bold results exceed interim cleanup level.
GRO - NWTPH = gasoline range organics, northwest total petroleum hydrocarbons method
DRO - NWTPH = diesel range organics, northwest total petroleum hydrocarbons method
RRO - NWTPH = residual range organics, northwest total petroleum hydrocarbons method
PCBs = polychlorinated biphenyls
VOCs = volatile organic compounds (only detected VOCs are shown on this table)
U = The compound was analyzed for, but was not detected ("non-detect") at or above the MRL/MDL.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
UJ = The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
All PCB results were analyzed outside of hold time and are qualified as estimated (J).
mg/kg = milligrams per kilogram

TABLE 5

CORRECTIVE MEASURES SCREENING CRITERIA

East Parcel CMS
Former Rhone-Poulenc Site
Tukwila, Washington

Screening Criteria	Definition
Technical Criteria	
Performance	
Effectiveness	Capability for the alternative to perform the intended functions, such as containment or constituent destruction. This criterion must be evaluated through design specification or performance evaluation. Site-specific characteristics that affect the effectiveness of the alternative must be considered.
Useful Life	Useful life is the length of time that the alternative can achieve its effectiveness. Specific components of an alternative may require replacement at the end of its useful life in order to continue to achieve the desired objective. The availability of resources in the future as well as the appropriateness of the technology must be considered to assess the useful life.
Toxicity, Mobility, and Volume Reduction	Reduction in toxicity, mobility, and volume assesses the capability of the alternative to address COCs to remove the constituents from interaction with the environment through treatment. The reductions can be achieved by treatment to destroy COCs, treatment to immobilize the COCs, or treatment to reduce the volume of affected media.
Reliability	
Long-Term Operation & Maintenance Requirements	The frequency and complexity of operations and maintenance procedures and availability of qualified labor. Alternatives requiring frequent or complex procedures would be less reliable than those requiring less frequent or simpler procedures.
Demonstrated and Expected Reliability	This is an assessment of the risk and effects due to failure of the alternative. Factors to assess include success of the technology in previous similar applications, demonstrated compatibility of multiple technologies, effects of failure of one component on other components, and the flexibility of the alternative to deal with uncontrollable changes.

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TABLE 5

CORRECTIVE MEASURES SCREENING CRITERIA

East Parcel CMS
Former Rhone-Poulenc Site
Tukwila, Washington

Screening Criteria	Definition
Implementability	
Constructability	Constructability is the relative ease of implementation for the alternative, considering factors specific to the site and external factors. Site factors could include heterogeneity, utilities or buildings, adjacent properties, natural conditions, etc. External factors could include availability of qualified contractors, permitting requirements, etc.
Implementation Time	Implementation time is the time needed to implement the alternative. Alternatives that can be implemented in a short time would be preferred over those that require longer implementation times.
Beneficial Results Timeframe	Some corrective measures may require more time to achieve their full effectiveness than others. Alternatives that achieve beneficial results in a shorter time would be preferred over alternatives requiring more time.
Safety	
Risk of Fire, Explosion, or Exposure to Hazardous Substances	Safety includes risks posed to workers implementing the corrective measure as well as to nearby businesses and communities. Factors to be assessed for safety include fire, explosion, traffic accidents, potential for exposure to site constituents, and injuries associated with implementation.
Human Health	
Minimization of Short- and Long-Term Exposure	The extent to which the alternative mitigates both short-term and long-term exposure to site constituents, including protection of workers and the public during implementation of the alternative. Potential exposure routes, the nature and location of site constituents, and the locations of potentially exposed populations are assessed.
Environmental	
Short- and Long-Term Beneficial Versus Adverse Effects	The short- and long-term beneficial and adverse effects associated with the alternative owing to site conditions and pathways, including measures taken to mitigate these effects. In addition, the beneficial or adverse effects on environmentally sensitive areas that could be affected by the corrective measure alternative are considered.

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TABLE 5

CORRECTIVE MEASURES SCREENING CRITERIA

East Parcel CMS
Former Rhone-Poulenc Site
Tukwila, Washington

Screening Criteria	Definition
Institutional	
Relative Ease of Addressing Institutional Issues	Compliance with applicable federal, state, and local environmental, safety, or public health standards, guidance, or regulations on the design, operation, or implementation time for the alternative. Community issues that may affect the design, operation, or implementation time of the alternative.
Cost	
Relative Cost	The estimated costs for construction and for operation and maintenance of the alternative, including associated monitoring and inspection costs. Total costs in current dollars will be estimated for a project life up to 30 years.

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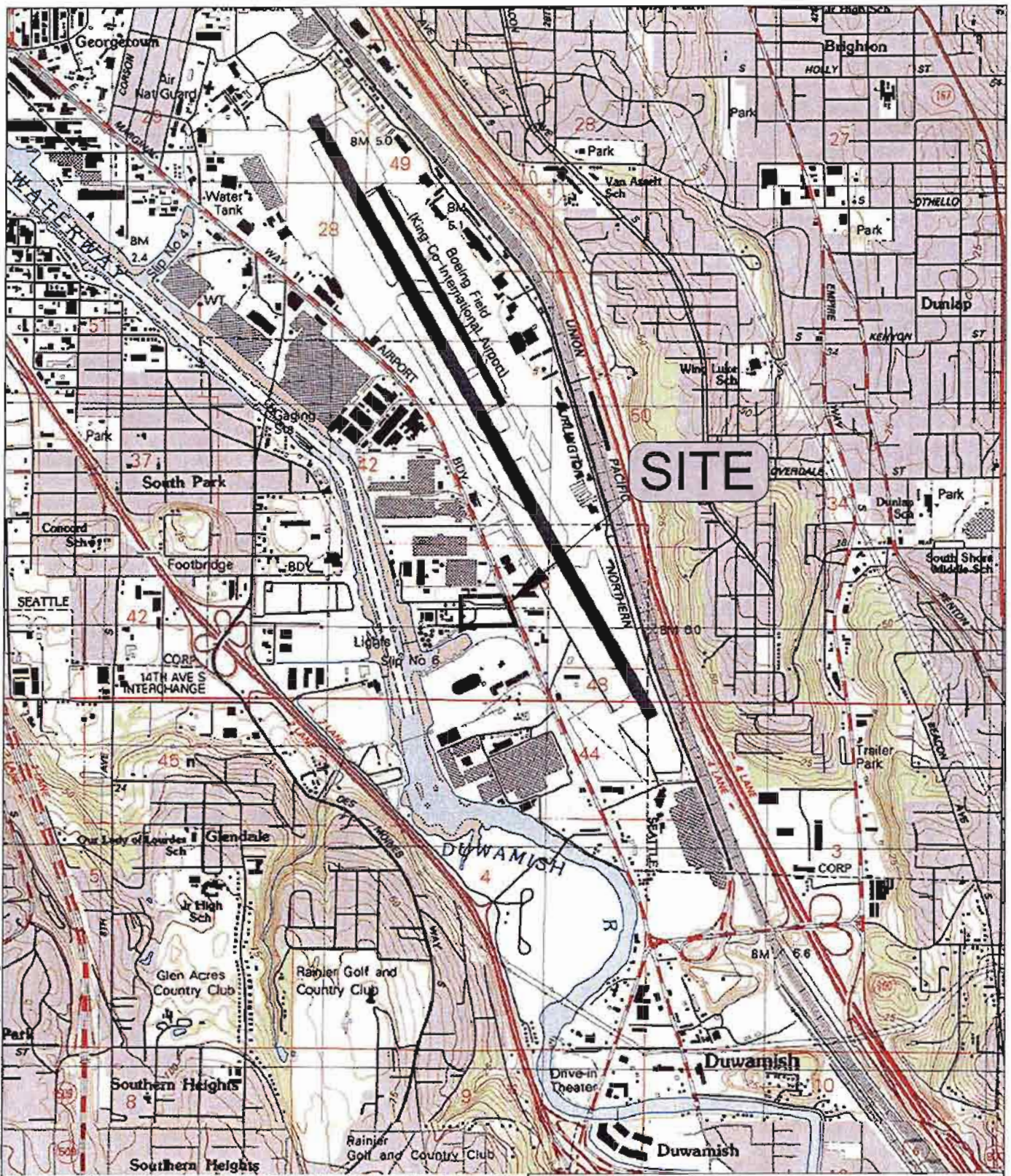
TABLE 6

POTENTIAL REMEDIAL ALTERNATIVES SCREENING

East Parcel CMS
East Parcel, Former Rhone-Poulenc East Marginal Way Facility
Tukwila, Washington

Alternative	Technical									Human Health	Environmental	Institutional	Cost	Total Score
	Performance			Reliability		Implementability			Safety					
	Effectiveness	Useful Life	Toxicity, Mobility, and Volume Reduction	Long-term Operation and Maintenance	Demonstrated and Expected Reliability	Constructability	Implementation Time	Beneficial Results Timeframe	Risk of Fire, Explosion, or Exposure to Hazardous Substances	Minimization of Short- and Long-Term Exposure	Short- and Long-Term Beneficial vs. Adverse Effects	Relative Ease of Addressing Institutional Issues	Relative Cost	
1 - No Action	1	1	1	3	1	3	3	1	1	1	1	3	3	23
2 - Source Excavation and Removal	3	3	3	3	3	3	3	3	2	2	2	3	3	36
3 - Ex-situ Bioremediation and Stabilization	2	3	2	2	3	2	3	3	1	1	2	2	2	28

FIGURES



Reference: USGS Topographic Quadrangle Map, South Seattle, Washington, Photo Revised 1968

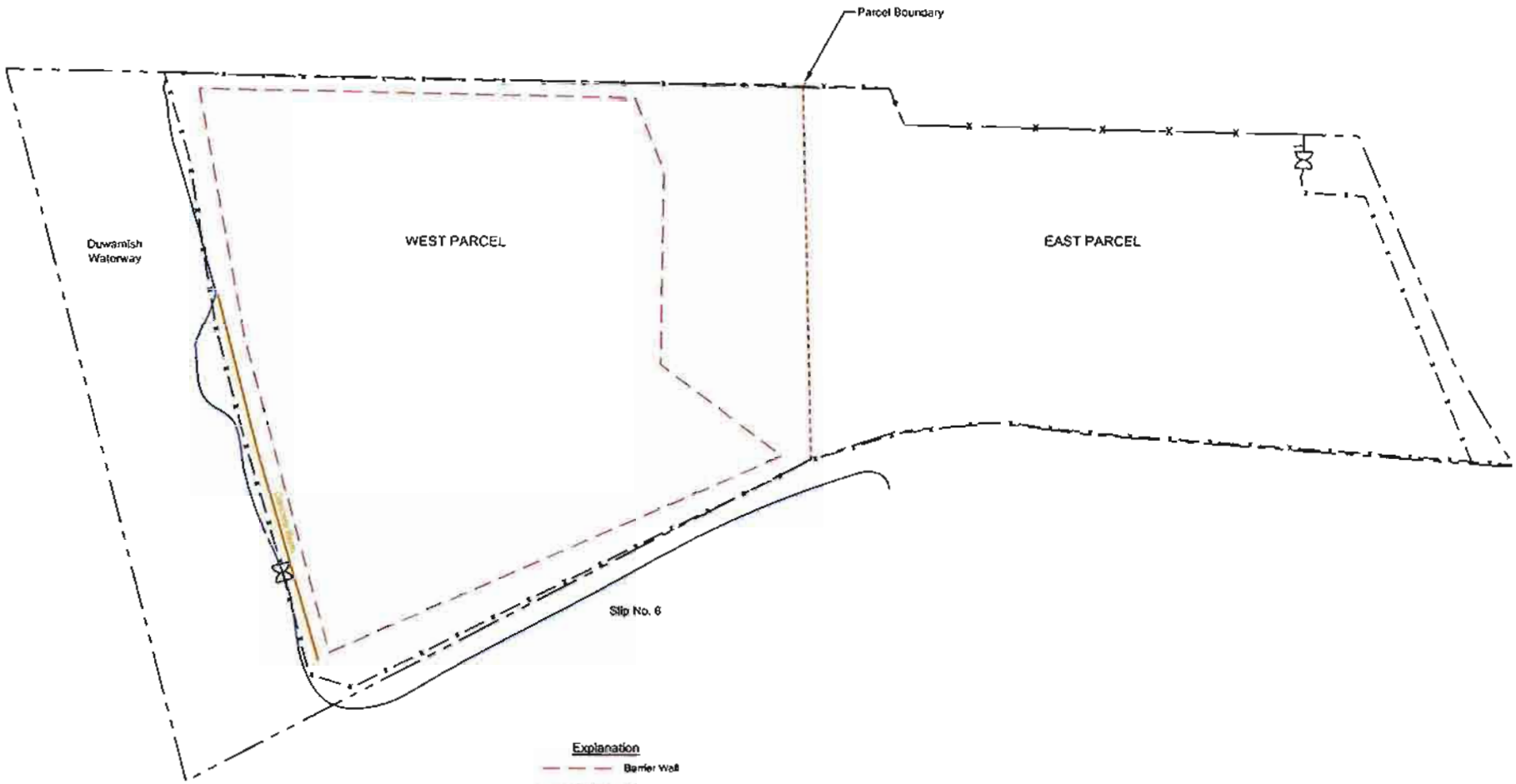
0 2000

SCALE (FEET)

SITE VICINITY MAP
East Parcel CMS
Former Rhone-Poulenc Site, East Parcel
Tukwila, Washington

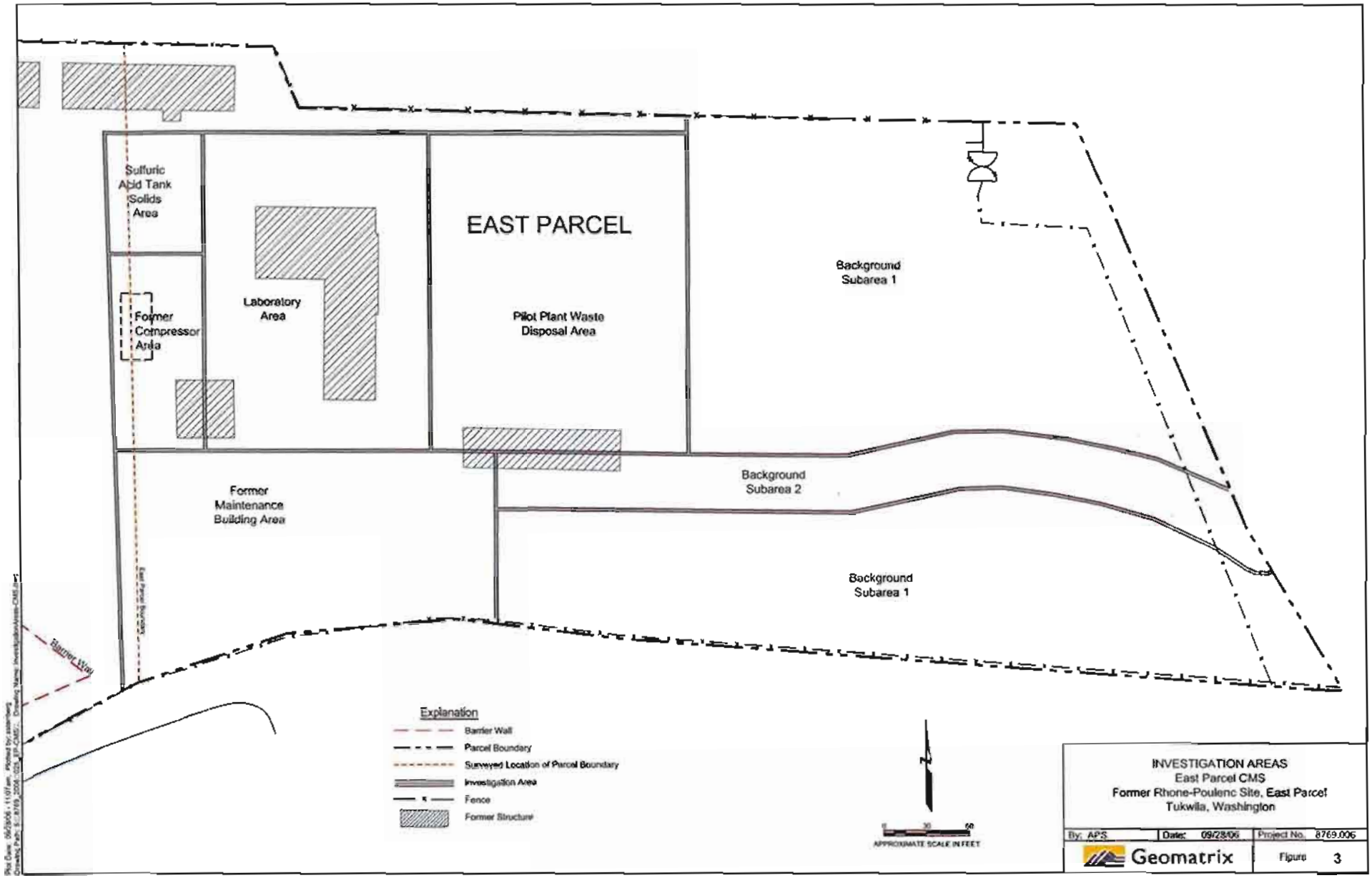
By: APS	Date: 10/25/06	Project No. 8769.006
Geomatrix		Figure 1

Plot Date: 10/25/06 - 10:09am, Plotted by: astenberg
Drawing Path: S:\8769_20061025_EP-CMS_Drawing Name: SiteVicinity-CMS.dwg



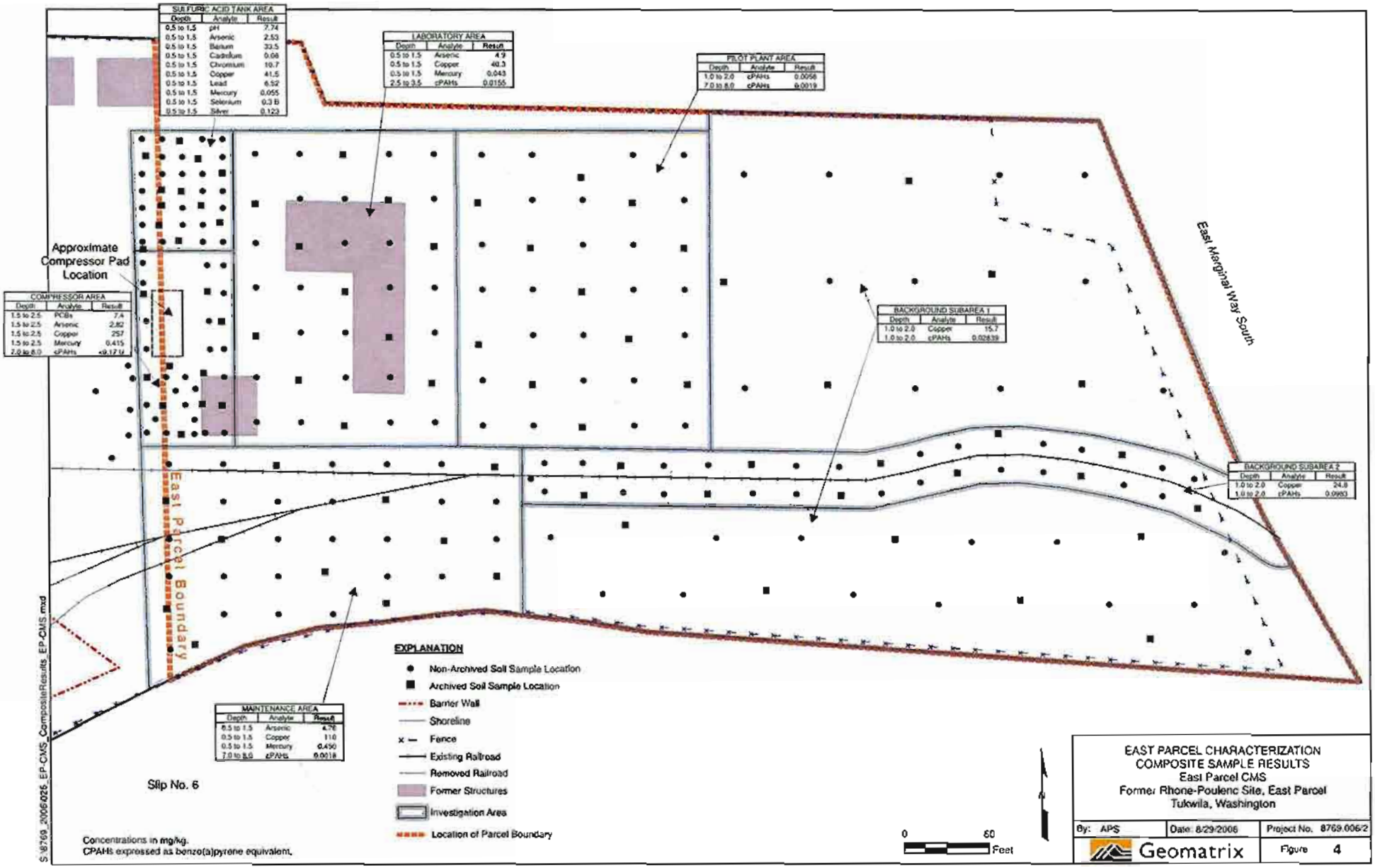
SITE MAP
East Parcel CMS
Former Rhone-Poulenc Site, East Parcel
Tukwila, Washington

By: APS	Date: 09/28/06	Project No. 8769.006
Geomatrix		Figure 2



INVESTIGATION AREAS
East Parcel CMS
Former Rhone-Poulenc Site, East Parcel
Tukwila, Washington

By: APS	Date: 09/28/06	Project No. 8769.006
Geomatrix		Figure 3


SULFURIC ACID TANK AREA
Depth | Analyte | Result
0.5 to 1.5 | pH | 7.74
0.5 to 1.5 | Arsenic | 2.53
0.5 to 1.5 | Barium | 33.5
0.5 to 1.5 | Cadmium | 0.08
0.5 to 1.5 | Chromium | 10.7
0.5 to 1.5 | Copper | 41.5
0.5 to 1.5 | Lead | 6.52
0.5 to 1.5 | Mercury | 0.055
0.5 to 1.5 | Selenium | 0.3 B
0.5 to 1.5 | Silver | 0.123
LABORATORY AREA
Depth | Analyte | Result
0.5 to 1.5 | Arsenic | 4.9
0.5 to 1.5 | Copper | 40.3
0.5 to 1.5 | Mercury | 0.043
2.5 to 3.5 | cPAHs | 0.0155
PILOT PLANT AREA
Depth | Analyte | Result
1.0 to 2.0 | cPAHs | 0.0056
7.0 to 8.0 | cPAHs | 0.0019
Approximate Compressor Pad Location
COMPRESSOR AREA
Depth | Analyte | Result
1.5 to 2.5 | PCBs | 7.4
1.5 to 2.5 | Arsenic | 2.82
1.5 to 2.5 | Copper | 257
1.5 to 2.5 | Mercury | 0.415
7.0 to 8.0 | cPAHs | <0.127 U
BACKGROUND SUBAREA 1
Depth | Analyte | Result
1.0 to 2.0 | Copper | 15.7
1.0 to 2.0 | cPAHs | 0.02639
East Marginal Way South
BACKGROUND SUBAREA 2
Depth | Analyte | Result
1.0 to 2.0 | Copper | 24.8
1.0 to 2.0 | cPAHs | 0.0983
East Parcel Boundary
MAINTENANCE AREA
Depth | Analyte | Result
0.5 to 1.5 | Arsenic | 4.76
0.5 to 1.5 | Copper | 110
0.5 to 1.5 | Mercury | 0.450
7.0 to 8.0 | cPAHs | 0.0018
Slip No. 6
EXPLANATION
Non-Archived Soil Sample Location
Archived Soil Sample Location
Barrier Wall
Shoreline
Fence
Existing Railroad
Removed Railroad
Former Structures
Investigation Area
Location of Parcel Boundary
Concentrations in mg/kg.
cPAHs expressed as benzo(a)pyrene equivalent.
0
60
Feet
EAST PARCEL CHARACTERIZATION
COMPOSITE SAMPLE RESULTS
East Parcel CMS
Former Rhone-Poulenc Site, East Parcel
Tukwila, Washington
By: APS
Date: 8/29/2006
Project No. 8769.006/2
Geomatrix
Figure 4
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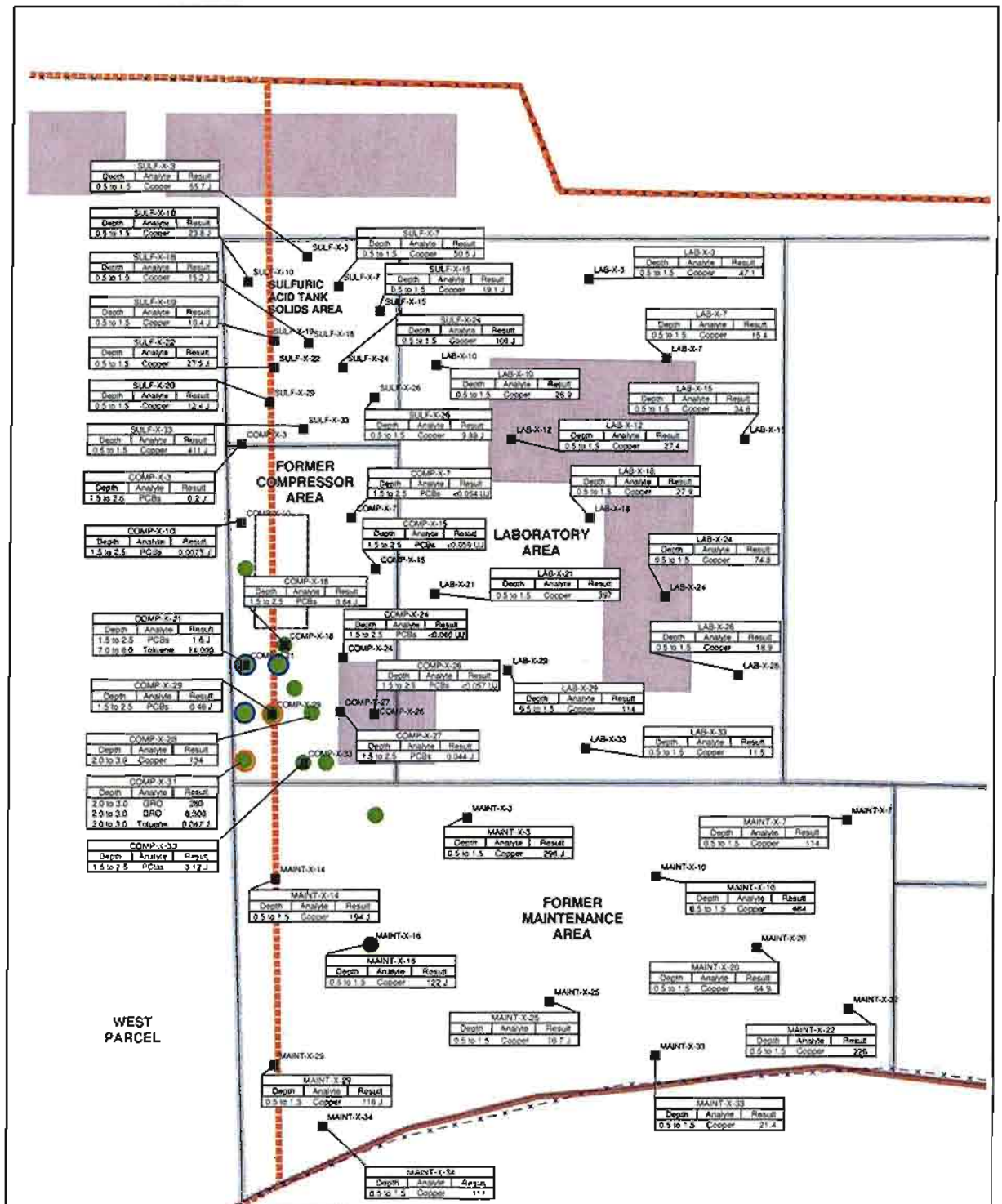
S:\8769_2006\GIS_EP-CMS_DiscreteResults_EP-CMS.mxd



Concentrations in mg/kg. Depth in feet below grade.
Non-archived soil sample locations not shown on this figure.
PCBs = Polychlorinated Biphenyls

EAST PARCEL CHARACTERIZATION
DISCRETE SAMPLE RESULTS
East Parcel CMS
Former Rhone-Poulenc Site, East Parcel
Tukwila, Washington

By: APS	Date: 8/29/06	Project No. 8769.006/2
Geomatrix		Figure 5

EXCAVATION AREAS
East Parcel CMS
Former Rhone-Poulenc Site, East Parcel
Tukwila, Washington

By: APS	Date: 09/28/06	Project No. 8769.006
Geomatrix		Figure 6

Plot Date: 09/28/06 - 11:23am, Plotted by: asteinberg
Drawing Path: S:\8769_2006\025_EP-CMS\... Drawing Name: ExcavArea_CMS.dwg

APPENDIX A

Short Plat Application

Project: 10265 Fri August 26 14:53:57 2

Parcel Map Check

Parcel name: LOT 1

North: 193162.4743 East : 1637311.4710

Line	Course: S 71-49-21 W	Length: 1.77	
	North: 193161.9221	East : 1637309.7894	
Line	Course: S 62-42-32 W	Length: 842.28	
	North: 192775.7269	East : 1636561.2649	
Line	Course: N 14-00-00 W	Length: 877.15	
	North: 193626.8218	East : 1636349.0631	
Line	Course: S 88-51-08 E	Length: 956.07	
	North: 193607.6706	East : 1637304.9413	
Line	Course: S 00-50-26 E	Length: 445.25	
	North: 193162.4685	East : 1637311.4731	

Perimeter: 3122.52 Area: 572,881 sq. ft. 13.152 acres

Mapcheck Closure - (Uses listed courses, radii, and deltas)

Error Closure: 0.0061 Course: S 19-34-09 E

Error North: -0.00578 East : 0.00205

Precision 1: 511,888.52

Project: 10265 Fri August 26 14:54:01 2

Parcel Map Check

Parcel name: LOT 2

North: 193156.0766 East : 1638149.7731

Line	Course: N 88-18-58 W	Length: 14.95
	North: 193156.5159	East : 1638134.8296
Line	Course: N 85-46-07 W	Length: 486.97
	North: 193192.4468	East : 1637649.1869
Line	Course: N 83-08-12 W	Length: 117.00
	North: 193206.4285	East : 1637533.0254
Line	Course: S 85-06-48 W	Length: 119.00
	North: 193196.2915	East : 1637414.4579
Line	Course: S 71-49-21 W	Length: 108.40
	North: 193162.4748	East : 1637311.4676
Line	Course: N 00-50-26 W	Length: 445.25
	North: 193607.6769	East : 1637304.9359
Line	Course: S 88-51-08 E	Length: 102.03
	North: 193605.6331	East : 1637406.9454
Line	Course: S 22-10-28 E	Length: 46.03
	North: 193563.0075	East : 1637424.3184
Line	Course: S 88-51-08 E	Length: 542.82
	North: 193552.1342	East : 1637967.0295
Line	Course: S 22-32-07 E	Length: 305.16
	North: 193270.2751	East : 1638083.9827
Line	Course: S 30-33-07 E	Length: 121.90
	North: 193165.2986	East : 1638145.9468
Line	Course: S 22-32-07 E	Length: 9.98
	North: 193156.0807	East : 1638149.7717

Perimeter: 2419.48 Area: 281,732 sq. ft. 6.468 acres

Mapcheck Closure - (Uses listed courses, radii, and deltas)
Error Closure: 0.0043 Course: N 19-12-20 W
Error North: 0.00403 East : -0.00140
Precision 1: 562,672.09

City of Tukwila
Department of Community Development
6300 Southcenter Boulevard, Tukwila, WA 98188
Telephone (206) 431-3670 FAX (206) 431-3665
E-mail: bshplan@ci.tukwila.wa.us

SHORT PLAT NO. _____

VOLUME PAGE

DECLARATION

KNOW ALL MEN BY THESE PRESENTS THAT WE, THE UNDERSIGNED, OWNER(S) IN FEE SIMPLE OF THE LAND HEREIN DESCRIBED DO HEREBY MAKE A SHORT SUBDIVISION HEREOF PURSUANT TO RCW 58.17.060 AND ACKNOWLEDGE THAT SAID SUBDIVISION SHALL NOT BE FURTHER DIVIDED IN ANY MANNER WITHIN A PERIOD OF FIVE YEARS, FROM THE DATE OF RECORD, WITHOUT THE FILING OF A FINAL PLAT. THE UNDERSIGNED FURTHER DECLARE THIS SHORT PLAT TO BE THE GRAPHIC REPRESENTATION OF SAID SHORT SUBDIVISION AND THE SAME IS MADE WITH THE FREE CONSENT AND IN ACCORDANCE WITH THE DESIRE OF THE OWNER(S).

IN WITNESS WHEREOF WE HAVE SET OUR HANDS AND SEALS

BY: _____ _____
TITLE

PRINTED NAME: _____

ACKNOWLEDGMENT

STATE OF WASHINGTON } SS
COUNTY OF KING }

On this day personally appeared before me _____ to me known to be the individual who executed the foregoing instrument and acknowledged that he/she signed the same as his/her voluntary act and said deed for the uses and purposes mentioned therein.

GIVEN UNDER MY HAND AND OFFICIAL SEAL THIS _____ DAY OF _____ 20__.

Notary Seal

SIGNATURE OF NOTARY PUBLIC

NAME OF NOTARY PUBLIC

TITLE

MY APPOINTMENT EXPIRES

APPROVALS

TUKWILA SHORT SUBDIVISION COMMITTEE APPROVAL

Reviewed and approved by the Short Subdivision Committee and hereby certified for filing this _____ day of _____ 200__.

_____
Chairperson, Short Subdivision Committee

KING COUNTY FINANCE DIVISION

I certify that all property taxes are paid and that a deposit has been made in sufficient amount to pay the taxes for the following year, that there are no delinquent special assessments certified to this office for collection, and that all special assessments as of the property herein dedicated as streets, alleys, or for other public use are not paid in full.

This _____ day of _____, 200__.

_____
Deputy King County Assessor

_____
King County Assessor

KING COUNTY ASSESSOR'S APPROVAL

Examined and approved this _____ day of _____ 2005

_____
Deputy King County Assessor

_____
King County Assessor

_____
Tax Account Numbers

RECORDER'S CERTIFICATE

FILED FOR RECORD THIS _____ DAY OF _____, 20____
AT _____ M IN BOOK _____ OF _____ AT PAGE _____
AT THE REQUEST OF WILLIAM R. WORKMAN

_____ _____
MANAGER SUPT. OF RECORDS

LEGAL DESCRIPTION (OLD)

THAT PORTION OF TRACTS 1 AND 2 OF THE MEADOWS, ACCORDING TO THE PARTITION MAP OF PART OF THE FRANCIS MCNATT DONATION LAND CLAIM NO. 38 FILED IN KING COUNTY SUPERIOR COURT CAUSE NUMBER 120271, AND OF THE ABANDONED BED OF THE DUWAMISH RIVER, ALL LOCATED IN SECTION 33, TOWNSHIP 24 NORTH, RANGE 4 EAST, WILLAMETTE MERIDIAN, IN KING COUNTY, WASHINGTON, AND ALL LYING WESTERLY OF THE WESTERLY MARGIN OF EAST MARGINAL WAY SOUTH AND ALSO WESTERLY OF THE PARCEL OF LAND ADJOINING EAST MARGINAL WAY WHICH WAS CONVEYED TO GREAT NORTHERN RAILWAY COMPANY BY DEED RECORDED UNDER RECORDING NUMBER 4784818, LYING EASTERLY OF THE EASTERLY MARGIN OF THE RIGHT OF WAY OF COMMERCIAL WATERWAY DISTRICT NO. 1 (DUWAMISH WATERWAY), LYING SOUTHERLY OF THE HEREINAFTER DESCRIBED "LINE A" AND LYING NORTHERLY OF THE HEREINAFTER DESCRIBED "LINE B":

LINE A:

BEGINNING ON THE WESTERLY MARGIN OF EAST MARGINAL WAY SOUTH, WHICH POINT BEARS NORTH 89° 15' 54" WEST A DISTANCE OF 2490.01 FEET ALONG THE DONATION CLAIM LINE AND SOUTH 23° 40' 58" EAST A DISTANCE OF 848.73 FEET ALONG THE WESTERLY MARGIN OF EAST MARGINAL WAY SOUTH FROM THE INTERSECTION OF THE LINE BETWEEN THE DONATION CLAIM OF FRANCIS MCNATT AND HENRY VAN ASSELT WITH THE EAST LINE OF SECTION 33, TOWNSHIP 24 NORTH, RANGE 4 EAST, WILLAMETTE MERIDIAN IN KING COUNTY, WASHINGTON, RUNNING THENCE WEST A DISTANCE OF 1574.72 FEET TO THE EAST LINE OF COMMERCIAL WATERWAY DISTRICT NO. 1;
THENCE SOUTH 12° 00' 00" EAST ALONG SAID EASTERLY LINE A DISTANCE OF 237.76 FEET TO THE TRUE POINT OF BEGINNING OF SAID "LINE A";
THENCE EAST A DISTANCE OF 1853.16 FEET;
THENCE SOUTH 23° 02' 00" EAST A DISTANCE OF 48.83 FEET;
THENCE EAST A DISTANCE OF 361.26 FEET TO THE WESTERLY MARGIN OF EAST MARGINAL WAY SOUTH AND THE TERMINUS OF SAID "LINE A".

LINE B:

BEGINNING ON THE WESTERLY MARGIN OF EAST MARGINAL WAY SOUTH AT A POINT WHICH BEARS NORTH 89° 15' 54" WEST A DISTANCE OF 2490.01 FEET ALONG THE DONATION CLAIM LINE AND SOUTH 23° 40' 58" EAST A DISTANCE OF 1234.17 FEET ALONG THE WESTERLY MARGIN OF EAST MARGINAL WAY SOUTH FROM THE INTERSECTION OF THE LINE BETWEEN THE DONATION CLAIMS OF FRANCIS MCNATT AND HENRY VAN ASSELT WITH THE EAST LINE OF SECTION 33, TOWNSHIP 24 NORTH, RANGE 4 EAST, WILLAMETTE MERIDIAN IN KING COUNTY, WASHINGTON, SAID POINT BEING AT THE INTERSECTION OF THE WESTERLY MARGIN OF EAST MARGINAL WAY SOUTH WITH THE NORTH LINE OF VAN DE VANTER STOCK FARM TRACT AND THE TRUE POINT OF BEGINNING OF SAID "LINE B";
THENCE NORTH 69° 27' 50" WEST A DISTANCE OF 14.94 FEET;
THENCE NORTH 84° 54' 28" WEST A DISTANCE OF 486.97 FEET;
THENCE NORTH 84° 17' 04" WEST A DISTANCE OF 117.00 FEET;
THENCE SOUTH 82° 52' 54" WEST A DISTANCE OF 119.00 FEET;
THENCE SOUTH 78° 46' 25" WEST A DISTANCE OF 110.173 FEET;
THENCE SOUTH 61° 33' 46" WEST A DISTANCE OF 840.02 FEET, TO THE EASTERLY LINE OF THE RIGHT OF WAY OF COMMERCIAL WATERWAY DISTRICT NO. 1 AND THE TERMINUS OF SAID "LINE B".
TOGETHER WITH THE RIGHT TO CROSS THE PARCEL CONVEYED TO GREAT NORTHERN RAILWAY COMPANY AS RESERVED IN DEED RECORDED UNDER RECORDING NUMBER 4784818.
SITUATE IN THE CITY OF TUKWILA, COUNTY OF KING, STATE OF WASHINGTON

LEGAL DESCRIPTION (NEW) (BEARINGS ROTATED TO CURRENT BASIS OF BEARINGS)

THAT PORTIONS OF TRACTS 1 AND 2 OF THE MEADOWS, ACCORDING TO THE PARTITION MAP OF PART OF THE FRANCIS MCNATT DONATION LAND CLAIM NO. 38 FILED IN KING COUNTY SUPERIOR COURT CAUSE NUMBER 120271, AND OF THE ABANDONED BED OF THE DUWAMISH RIVER, ALL LOCATED IN SECTION 33, TOWNSHIP 24 NORTH, RANGE 4 EAST, WILLAMETTE MERIDIAN, IN KING COUNTY, WASHINGTON, AND ALL LYING WESTERLY OF THE WESTERLY MARGIN OF EAST MARGINAL WAY SOUTH AND ALSO WESTERLY OF THE PARCEL OF LAND ADJOINING EAST MARGINAL WAY WHICH WAS CONVEYED TO GREAT NORTHERN RAILWAY COMPANY BY DEED RECORDED UNDER RECORDING NUMBER 4784818, LYING EASTERLY OF THE EASTERLY MARGIN OF THE RIGHT OF WAY OF COMMERCIAL WATERWAY DISTRICT NO. 1 (DUWAMISH WATERWAY), LYING SOUTHERLY OF THE HEREINAFTER DESCRIBED "LINE A" AND LYING NORTHERLY OF THE HEREINAFTER DESCRIBED "LINE B":

LINE A:

COMMENCING ON THE WESTERLY MARGIN OF EAST MARGINAL WAY SOUTH, WHICH POINT BEARS NORTH 84°07'02" WEST, A DISTANCE OF 2490.01 FEET ALONG THE DONATION CLAIM LINE AND SOUTH 22°32'07" EAST, A DISTANCE OF 848.77 FEET ALONG THE WESTERLY MARGIN OF EAST MARGINAL WAY SOUTH FROM THE INTERSECTION OF THE LINE BETWEEN THE DONATION CLAIMS OF FRANCIS MCNATT AND HENRY VAN ASSELT WITH THE EAST LINE OF SECTION 33, TOWNSHIP 24 NORTH, RANGE 4 EAST, WILLAMETTE MERIDIAN IN KING COUNTY, WASHINGTON;
RUNNING THENCE SOUTH 88°31'00" WEST, A DISTANCE OF 1574.72 FEET TO THE EAST LINE OF COMMERCIAL WATERWAY DISTRICT NO. 1;
THENCE SOUTH 14°00'00" EAST, ALONG SAID EASTERLY LINE A DISTANCE OF 237.76 FEET TO THE POINT OF BEGINNING OF SAID "LINE A";
THENCE SOUTH 88°31'00" EAST, A DISTANCE OF 1056.10 FEET;
THENCE SOUTH 22°10'28" EAST, A DISTANCE OF 48.63 FEET;
THENCE SOUTH 88°31'00" EAST, A DISTANCE OF 542.82 FEET TO THE WESTERLY MARGIN OF EAST MARGINAL WAY SOUTH AND THE TERMINUS OF SAID "LINE A".

LINE B:

COMMENCING ON THE WESTERLY MARGIN OF EAST MARGINAL WAY SOUTH AT A POINT WHICH BEARS NORTH 84°07'02" WEST, 2490.01 FEET ALONG THE DONATION CLAIM LINE AND SOUTH 22°32'07" EAST, 1234.13 FEET ALONG THE WESTERLY MARGIN OF EAST MARGINAL WAY SOUTH FROM THE INTERSECTION OF THE LINE BETWEEN THE DONATION CLAIMS OF FRANCIS MCNATT AND HENRY VAN ASSELT WITH THE EAST LINE OF SECTION 33, TOWNSHIP 24 NORTH, RANGE 4 EAST, WILLAMETTE MERIDIAN IN KING COUNTY, WASHINGTON, SAID POINT BEING AT THE INTERSECTION OF THE WESTERLY MARGIN OF EAST MARGINAL WAY SOUTH WITH THE NORTH LINE OF VAN DE VANTER STOCK FARM TRACT AND THE POINT OF BEGINNING OF SAID "LINE B";
THENCE NORTH 68°18'54" WEST, A DISTANCE OF 14.95 FEET;
THENCE NORTH 83°40'07" WEST, A DISTANCE OF 486.97 FEET;
THENCE NORTH 83°05'12" WEST, A DISTANCE OF 117.00 FEET;
THENCE SOUTH 82°06'58" WEST, A DISTANCE OF 119.00 FEET;
THENCE SOUTH 77°49'31" WEST, A DISTANCE OF 110.17 FEET;
THENCE SOUTH 61°42'32" WEST, A DISTANCE OF 842.28 FEET, TO THE EASTERLY LINE OF THE RIGHT OF WAY OF COMMERCIAL WATERWAY DISTRICT NO. 1 AND THE TERMINUS OF SAID "LINE B".
TOGETHER WITH THE RIGHT TO CROSS THE PARCEL CONVEYED TO GREAT NORTHERN RAILWAY COMPANY AS RESERVED IN DEED RECORDED UNDER RECORDING NUMBER 4784818.
SITUATE IN THE CITY OF TUKWILA, COUNTY OF KING, STATE OF WASHINGTON

LOT 1

THAT PORTION OF THE ABOVE LYING WEST OF THE FOLLOWING "LINE C":
COMMENCING AT THE AFORESAID POINT OF BEGINNING OF SAID "LINE A";
THENCE SOUTH 88°31'00" EAST, A DISTANCE OF 772.68 FEET TO THE POINT OF BEGINNING;
THENCE SOUTH 00°56'26" EAST, 145.25 FEET TO ABOVE-MENTIONED "LINE B" AND THE POINT OF TERMINUS

LOT 2

THAT PORTION OF THE ABOVE LYING EAST OF THE FOLLOWING "LINE C":
COMMENCING AT THE AFORESAID POINT OF BEGINNING OF SAID "LINE A";
THENCE SOUTH 88°31'00" EAST, A DISTANCE OF 772.68 FEET TO THE POINT OF BEGINNING;
THENCE SOUTH 00°56'26" EAST, 145.25 FEET TO ABOVE-MENTIONED "LINE B" AND THE POINT OF TERMINUS

VICINITY MAP

LAND SURVEYOR'S CERTIFICATE:

I, William R. Workman, registered as a land surveyor in the State of Washington, certify that this plat is based on an actual survey of the land described hereon, conducted by me or under my supervision; that the distances, courses and angles are shown thereon correctly; and that the monuments other than those monuments approved for setting at a later date, have been set and lot corners staked on the ground as depicted on the plat.

_____ _____
WILLIAM R. WORKMAN Date
Professional Land Surveyor
Washington Registration No. 11298

WILLIAM R. WORKMAN — 11298 — REGISTERED PROFESSIONAL LAND SURVEYOR — STATE OF WASHINGTON
EXPIRES 08-19-2007

BARGHAUSEN CONSULTING ENGINEERS, INC.
18215 72ND AVENUE SOUTH
KENT, WA 98032
(425)251-6222
(425)251-8782 FAX
CIVIL ENGINEERING AND PLANNING
SURVEYING, TRANSPORTATION, EXPERTISE

DRAWN BY	SRH
DATE	5/26/05
SCALE	AS SHOWN
CHECKED BY	WRW
JOB NO.	10286

URBAN SHORELINE STANDARDS*

1. BUILDING SETBACK – 50 FEET
2. OUTSIDE STORAGE SETBACK – 20 FEET
3. PARKING – BEHIND OR LANDWARD OF THE USE IT SERVES (VARIANCE REQUIRED)
4. VEGETATION BUFFER – NONE
5. LANDSCAPING SCREEN/BUFFER FOR PARKING – 5 FEET
6. MAXIMUM BUILDING HEIGHT – 35 FEET

*ALL SETBACKS TO BE MEASURED FROM THE ORDINARY HIGH WATER MARK OF THE DUWAMISH WATERWAY

SITE DATA

1. TAX PARCEL NO.: 0422059-0010
2. SITE ADDRESS: 9229 EAST MARGINAL WAY
3. ZONING: MIC/H (MANUFACTURING INDUSTRIAL CENTER/HEAVY INDUSTRIAL)
4. COMPREHENSIVE PLAN: MIC/H
5. EXISTING USE: ENVIRONMENTAL REMEDIATION / UNUSED DEVELOPED SITE
6. PROPOSED USE: OUTDOOR STORAGE AND WAREHOUSE
7. BUILDING SETBACK FRONT=10 FEET, SIDE=0 FEET, REAR=0 FEET

HORIZONTAL DATUM - BASIS OF BEARINGS

NORTH AMERICAN DATUM OF 1927 NAD-27
WASHINGTON STATE PLANE COORDINATE SYSTEM – NORTH ZONE
THE MONUMENTED OFFSET CENTERLINE OF EAST MARGINAL WAY TAKEN AS North 22°32'07" West PER Book 72, of Surveys, Page 222, KING COUNTY RECORDS

VERTICAL DATUM - BASIS OF ELEVATIONS

NATIONAL GEODETIC VERTICAL DATUM OF 1929 NGVD-29

ORIGINAL PROJECT BENCHMARK FROM 1988 SURVEY BY BARGHAUSEN CONSULTING ENGINEERS
2" BRASS DISK SURFACE MONUMENT ON EAST SIDE OF 102nd St. BRIDGE (DESTROYED)

SITE BENCHMARK
TOP OF MAGNAIL SET ON WEST SIDE OF EAST MARGINAL WAY
(SEE DRAWING) ELEVATION = 17.91 FEET

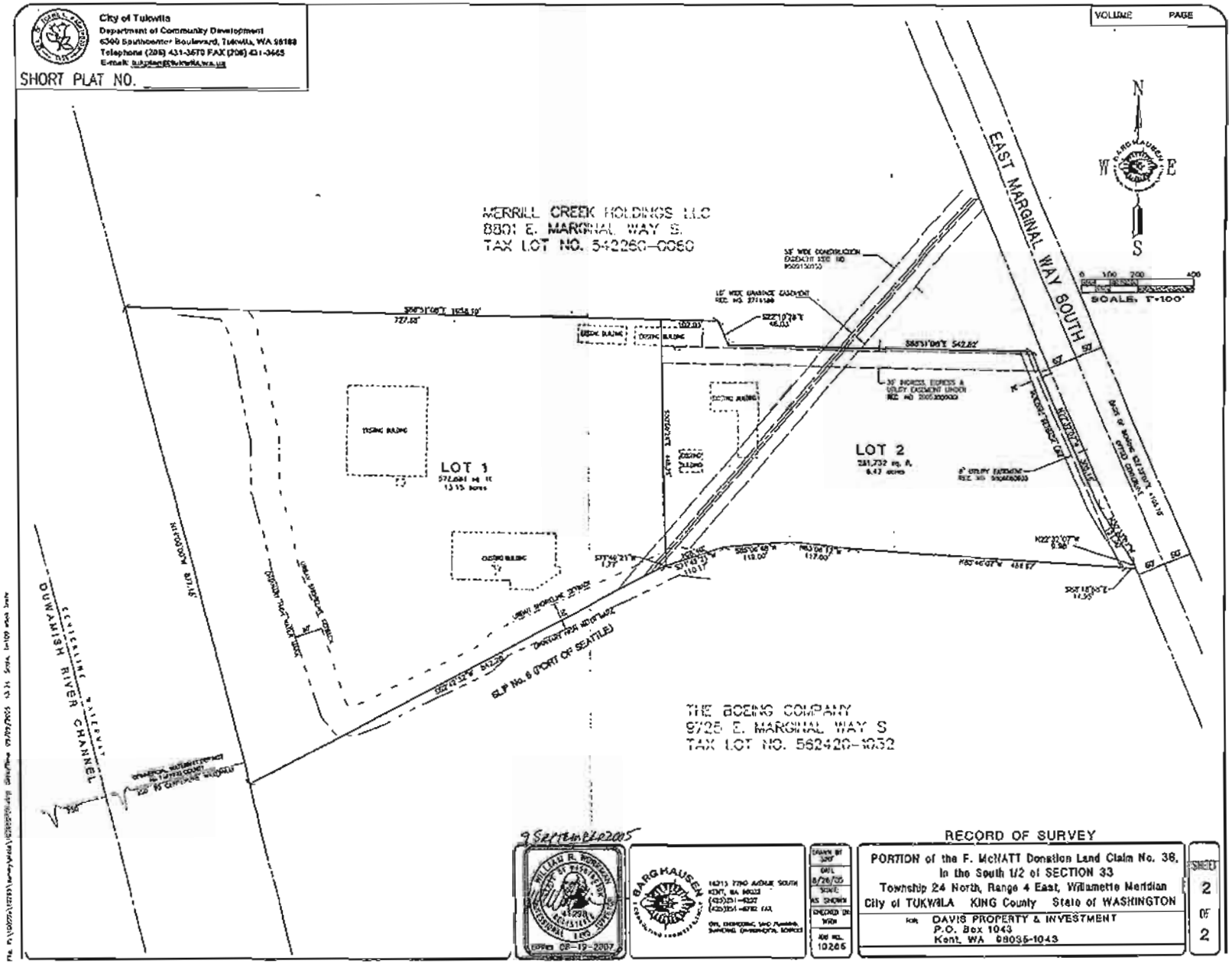
RECORD OF SURVEY

PORTION of the F. McNATT Donation Land Claim No. 38,
In the South 1/2 of SECTION 33
Township 24 North, Range 4 East, Willamette Meridian
City of TUKWILA KING County State of WASHINGTON

for: DAVIS PROPERTY & INVESTMENT
P.O. Box 1043
Kent, WA 98035-1043

SHEET 1 OF 2

File: P:\10000's\10286\survey\plat\10286SP.dwg Date/Time: 05/31/2005 8:34 Scale: 1=100 when 11x17.


City of Tukwila
Department of Community Development
6300 Southcenter Boulevard, Tukwila, WA 98188
Telephone (206) 431-3670 FAX (206) 431-3665
E-mail: subplat@TukwilaWA.gov
SHORT PLAT NO.
VOLUME
PAGE
MERRILL CREEK HOLDINGS LLC
8801 E. MARGINAL WAY S.
TAX LOT NO. 542260-0060
EAST MARGINAL WAY SOUTH
SCALE: 1"=100'
LOT 1
LOT 2
THE BOEING COMPANY
9725 E. MARGINAL WAY S
TAX LOT NO. 562420-1032
DUWAMISH RIVER CHANNEL
EXISTING WATERWAY
ELP No. 6 (PORT OF SEATTLE)
9 September 2005
BARGHAUSEN
RECORD OF SURVEY
PORTION of the F. McNATT Donation Land Claim No. 38,
In the South 1/2 of SECTION 33
Township 24 North, Range 4 East, Willamette Meridian
City of TUKWILA KING County State of WASHINGTON
for DAVIS PROPERTY & INVESTMENT
P.O. Box 1043
Kent, WA 98035-1043
SHEET 2 OF 2

APPENDIX B

Corrective Measures Cost Evaluation

APPENDIX B
CORRECTIVE MEASURE ALTERNATIVES
EAST PARCEL CMS
COST ESTIMATION SUMMARY

The general approach for cost estimation is based on the U.S. Environmental Protection Agency's (EPA) *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study,* 2000. Cost estimates were prepared for two corrective measures alternatives based in the conceptual designs presented in Section 6 of the CMS report.

The quantities included in each cost estimate were estimated based on the anticipated scope of each conceptual design using available characterization data and drawings for the East Parcel. Reasonable assumptions based on professional judgment were made as appropriate to complete the cost estimates. The costs are, therefore, preliminary estimates prepared solely to support the alternatives analysis and are not intended for use as final design or budgeting costs.

The unit prices used for the cost estimates were obtained from *RS Means, Site Work and Landscape Cost Data, 2006; RS Means, Environmental Remediation: Assemblies Cost Book, 2005;* bids from qualified contractors; and engineering judgment and experience. In developing the cost estimates, the following general assumptions were made:

- Prices are in 2006 dollars.
- Production rates and prices are based on a standard 40-hour work week, no overtime or shift work is included.
- Personal protective equipment for all work is HAZWOPER Level D.
- Waste generated will be non-hazardous.
- Costs for water and power have not been estimated.
- No security guards or additional security fencing will be required.
- No prevailing wage or union standby labor costs have been included.
- The estimates are accurate to +50% and -30%.
- Sales tax is not included.

Geomatrix

Preliminary Estimate
East Parcel CMS
Former Rhone-Poulenc Site
Tukwila, Washington

Alternative 2: Source Excavation and Removal

Item	Description	Unit	Unit Price	Quantity	Total
A	**Excavation & Backfilling**	**Total**			**$ 208,100**
	Mobilization/Demobilization	L.S.	$ 1,800	1	$ 1,800
	Create stockpile area	L.S.	$ 3,300	1	$ 3,300
	Rail road track removal/disposal	L.S.	$ 15,000	1	$ 15,000
	Excavate and stockpile VOC/TPH impacted soil	bank cy	$ 12.25	700	$ 8,575
	Excavate/transport/place metals impacted soil to W. Parc.	bank cy	$ 8.30	5,000	$ 41,500
	Backfill with clean fill	cy	$ 21.33	4,000	$ 85,320
	Grading	L.S.	$ 8,000	1	$ 8,000
	Survey	day	$ 1,500	2	$ 3,000
	25% Contingency	const. cost	$ 41,620	1	$ 41,620
B	**Hauling & Disposal**	**Total**			**$ 81,800**
	Load trucks from stockpiles	ton	$ 5.00	1,190	$ 5,950
	Transportation and disposal, non-hazardous waste	ton	$ 50.00	1,190	$ 59,500
	25% Contingency	const. cost	$ 16,360.00	1	$ 16,360
C	**Confirmation Soil Sampling**	**Total**			**$ 10,600**
	Labor	hr	$ 75	40	$ 3,000
	Analytical - copper composite samples	ea	$ 145	5	$ 725
	Laboratory archive fee	ea	$ 10	175	$ 1,750
	Analytical - TPH-G, TPH-D, BTEX, PCBs	ea	$ 300	12	$ 3,600
	Field supplies, includes field truck	L.S.	$ 500	2	$ 1,000
	GPS rental	ea	$ 250	2	$ 500
D	**Design, Oversight, and Reporting**	**Total**			**$ 120,700**
	Engineering design - 20% of construction costs	L.S.	$ 57,980	1	$ 57,980
	Permitting	L.S.	$ 5,000	1	$ 5,000
	Construction management - 8% of construction costs	L.S.	$ 23,190	1	$ 23,190
	Project management - 5% of construction costs	L.S.	$ 14,500	1	$ 14,500
	Completion and Monitoring Reports	L.S.	$ 20,000	1	$ 20,000
				Project Total	**$ 421,200**

Preliminary Estimate
East Parcel, CMS
Former Rhone-Poulenc Site
Tukwila, Washington

Alternative 3: Ex-situ Bioremediation & Stabilization

Item	Description	Unit	Unit Price	Quantity	Total
A	**Excavation and Stockpiling**	Total			$ 97,300
	Mobilization	L.S.	$ 1,800	1	$ 1,800
	Create stockpile area	L.S.	$ 8,000	1	$ 8,000
	Rail road track removal/disposal	L.S.	$ 15,000	1	$ 15,000
	Excavate and stockpile VOC/TPH impacted soil	bank cy	$ 12.25	700	$ 8,575
	Excavate, transport, and place metals impacted soil	bank cy	$ 8.30	5000	$ 41,500
	Survey	day	$ 1,500	2	$ 3,000
	25% Contingency	const. cost	$ 19,470	1	$ 19,470
B	**Bioremediation**	Total			$ 23,600
	Lab Analysis	L.S.	$ 2,500	1	$ 2,500
	Nutrients	L.S.	$ 5,000	1	$ 5,000
	Front End Loader, 2 C.Y.	hr.	$ 78.55	96	$ 7,540
	Mobilzization	ea	$ 220	8	$ 1,760
	Cover pile with sheeting between turnings	L.S.	$ 3,000	1	$ 3,000
	25% Contingency	const. cost	$ 3,760	1	$ 3,760
C	**Ex-Situ Stabilization**	Total			$ 336,600
	Bench-scale treatability test	ea	$ 3,000	1	$ 3,000
	Mobilization/demobilization	ea	$ 2,038	1	$ 2,038
	Create stockpile area	ea	$ 8,000	1	$ 8,000
	Excavator, 3 C.Y.	bank cy	$ 2.47	5640	$ 13,931
	Front End Loader, 2 C.Y.	hr	$ 78.55	320	$ 25,136
	Bobcat	month	$ 2,443	2	$ 4,886
	Pug Mill, 10 CY	month	$ 5,513	2	$ 11,026
	Pug Mill maintenance	month	$ 551	2	$ 1,102
	Grading	L.S.	$ 15,000	1	$ 15,000
	Portland Cement	ton	$ 116	1438	$ 166,831
	Labor	hr	$ 42.40	320	$ 13,568
	Vibratory roller	ex. cy	$ 0.36	9,800	$ 3,528
	Stabilization QA/QC samples	ea	$ 150	10	$ 1,500
	25% Contingency	const. cost	$ 67,010	1	$ 67,010
C	**Confirmation Soil Sampling**	Total			$ 8,800
	Labor	hr	$ 75	40	$ 3,000
	Analytical - copper composite samples	ea	$ 145	5	$ 725
	Laboratory archive fee	ea	$ 10	46	$ 460
	Analytical - TPH-G, TPH-D, BTEX, PCBs	ea	$ 300	12	$ 3,600
	Field supplies, includes field truck	L.S.	$ 500	1	$ 500
	GPS rental	ea	$ 250	2	$ 500
D	**Groundwater Monitoring**	Total			$ 31,500
	Labor (5 yr. quarterly sampling)	hr	$ 75	40	$ 3,000
	Well Contractor (Install two 2" wells to 25 ft depth)	each	$ 3,000	2	$ 6,000
	Laboratory (BTEX, Method 8021, trip blank)	each	$ 60	60	$ 3,600
	Reporting (quarterly)	L.S.	$ 4,000	4	$ 16,000
	10% Contingency	const. cost	$ 2,860	1	$ 2,860
E	**Design, Oversight, and Reporting**	Total			$ 196,000
	Engineering design - 20% of construction costs	L.S.	$ 91,500	1	$ 91,500
	Permitting	L.S.	$ 20,000	1	$ 20,000
	Construction management - 8% of construction costs	L.S.	$ 36,600	1	$ 36,600
	Project management - 5% of construction costs	L.S.	$ 22,880	1	$ 22,880
	Completion and monitoring Reports	L.S.	$ 25,000	1	$ 25,000
				Project Total	$ 693,800

Assumptions and notes

1. No off-site disposal of stabilized soil will be required.
2. Ex-situ bioremediation will take 6 months to complete. Soil stockpiles will be turned once per month. Turning will take 2 days/mo with a front end loader.
3. Stabilization of bioremediated and copper-impacted soil will take 8 weeks to complete.
4. Stabilized soil will be replaced on site and compacted in 6 in. lifts with a vibratory roller.