WASHINGTON STATE DEPARTMENT OF ECOLOGY

Lower Duwamish Waterway RM 3.9-4.4 East (Slip 6) Summary of Existing Information and Identification of Data Gaps Final Report

Contract No. C0700036
Work Assignment No. EANE012

February 2008

Prepared for:

WASHINGTON DEPARTMENT OF ECOLOGY
Toxics Cleanup Program
3190 160th Avenue SE
Bellevue, WA 98008-5452

This page intentionally left blank

Table of Contents

Page

This page intentionally left blank

Acronyms/Abbreviations

2LAET	second lowest apparent effects threshold
AST	above ground storage tank
AS/SVE	air sparging/soil vapor extraction
BBP	butyl benzyl phthalate
BDC	Boeing Developmental Center
BEHP	bis(2-ethylhexyl)phthalate
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylene
CDD	chlorinated dibenzo-p-dioxins
CDF	chlorinated dibenzofurans
COC	chemical of concern
cPAH	carcinogenic polycyclic aromatic hydrocarbons
CSCSL	Confirmed and Suspected Contaminated Sites List
CSL	Cleanup Screening Level
CSO	combined sewer overflow
DCE	dichloroethene
dw	dry weight
E & E	Ecology and Environment, Inc.
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ESA	Environmental Site Assessment
GIS	Geographic Information System
HCIM	hydraulic control interim measure
IAAI	Insurance Auto Auctions, Inc.
KCIA	King County International Airport
LAET	lowest apparent effects threshold
LDW	Lower Duwamish Waterway
LDWG	Lower Duwamish Waterway Group
LUST	leaking underground storage tank
MDL	method detection limit
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
$\mu g/m^2/d$	micrograms per meter squared per day
MFC	Military Flight Center
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MOF	Museum of Flight
MTCA	Model Toxics Control Act
NDPES	National Pollutant Discharge Elimination System
NRWQC	National Recommended Water Quality Criteria
OC	organic carbon
ORC	Oxygen Release Compound
PAH	polycyclic aromatic hydrocarbon

PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PCP	pentachlorophenol
PQL	practical quantitation limit
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI/FS	Remedial Investigation/Feasibility Study
RL	Reporting Limit
RM	river mile
SCAP	Source Control Action Plan
SMS	Sediment Management Standards
SPU	Seattle Public Utilities
sq. ft.	square feet
SQS	Sediment Quality Standards
SVOC	semivolatile organic compound
SWPPP	Stormwater Pollution Prevention Plan
TCE	trichloroethene
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TRI	Toxics Release Inventory
UST	underground storage tank
VC	vinyl chloride
VOC	volatile organic compound

1.0 Introduction

1.1 Background and Purpose

This Summary of Existing Information and Identification of Data Gaps Report (Data Gaps Report) pertains to Slip 6, one of several source control areas identified as part of the overall cleanup process for the Lower Duwamish Waterway (LDW) Superfund Site (Figure 1). This report summarizes readily available information regarding properties in the Slip 6 drainage basin (Figure 2). This information is necessary for the following reasons:

- to identify potential upland sources of sediment recontamination;
- to identify any potential contaminant migration pathways into the LDW;
- to identify any data gaps needing attention before effective source control can be accomplished; and
- to determine what, if any effective source control is already in place.

The LDW consists approximately of the lower 5.5 miles of the Duwamish River as it flows into Elliott Bay in Seattle, Washington. In September 2001, the U.S. Environmental Protection Agency (EPA) added this site to the National Priorities List due to chemical contaminants in sediments. The Washington State Department of Ecology (Ecology) added the site to the Washington State Hazardous Sites List on February 26, 2002.

The key parties involved in the LDW Superfund site are the Lower Duwamish Waterway Group (LDWG; comprised of the city of Seattle, King County, the Port of Seattle, and The Boeing Company), EPA, and Ecology. LDWG is conducting a Remedial Investigation/Feasibility Study (RI/FS) for the LDW Superfund site.

EPA is leading the effort to determine the most effective clean-up strategies for the LDW through a RI/FS process. Ecology was granted the authority[1] to investigate upland sources of contamination and to develop plans to reduce contaminant migration to waterway sediments (to the maximum extent practicable). The Lower Duwamish Waterway Source Control Strategy (Ecology 2004) describes the process for identifying source control issues and implementing effective controls. The basic plan is to identify and manage sources of potential recontamination in coordination with sediment cleanups.

The focus of the Source Control Strategy is to identify and control contamination that could potentially affect LDW sediments. This will be achieved by using existing administrative and legal authorities to perform inspections and require necessary source control actions (Ecology 2007a). It is based, primarily, on the principles of source control for sediment sites described in

[1] EPA and Ecology signed an interagency Memorandum of Understanding (MOU) in April 2002 and updated the MOU in April 2004. The MOU divides responsibilities for the site. EPA is the lead agency for the sediment Remedial Investigation/Feasibility Study, while Ecology is the lead agency for source control issues (EPA and Ecology 2002, 2004).

EPA's Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites (EPA 2002), and the Washington State Sediment Management Standards (SMS) (WAC 173-340-3707(7) and WAC 173-204-400).

The Source Control Strategy involves developing and implementing a series of detailed, area-specific Source Control Action Plans (SCAPs). Several areas, often defined by drainage basins, have been identified and prioritized for SCAP development as described in the LDW Source Control Status Report (Ecology 2007a). Before developing each SCAP, Ecology often prepares a Data Gaps Report for the specific area. Findings from the Data Gaps Report are reviewed by LDW stakeholders and are incorporated into the SCAP. This process helps to ensure that the action items in the SCAP will be effective, implementable, and enforceable.

Further information about the LDW can be found on the following at websites:

- Ecology's LDW website: http://www.ecy.wa.gov/programs/tcp/sites/lower_duwamish/lower_duwamish_hp.html
- EPA's LDW website: http://yosemite.epa.gov/r10/cleanup.nsf/sites/lduwamish
- The LDWG website: http://www.ldwg.org.

1.2 Organization of Document

Section 2 of this report provides a summary of background information on the properties associated with the Slip 6 Source Control Area (Figure 2). Section 3 describes potential sources of contaminants to the LDW sediments, including upland facilities of concern, groundwater, stormwater, bank erosion, and atmospheric deposition. Section 3 also summarizes data gaps that must be addressed to complete the development of a SCAP for Slip 6. Section 4 provides a list of documents cited in the report.

Information presented in this report was obtained from the following sources.

- Ecology Northwest Regional Office Central Records
- Washington State Archives
- Seattle Public Utilities (SPU) Business Inspection Reports[2]
- Ecology Underground Storage Tank (UST) and Leaking Underground Storage Tank (LUST) lists
- Ecology Facility/Site Database
- Washington Confirmed and Suspected Contaminated Sites List (CSCSL)
- EPA Enforcement and Compliance History Online
- EPA Envirofacts Warehouse
- King County Industrial Waste Program Records

[2] SPU inspection reports were requested, but were not available before this report was completed.

- King County Geographic Information System (GIS) Center Parcel Viewer and Property Tax Records
- King County GIS files
- GIS shape files provided by SPU

1.3 Scope of Document

The scope of the document research conducted for this report is limited geographically to the upland area within the Slip 6 drainage basin[3] (Figure 2) and any discharge points into the LDW along the waterfronts of the properties within this boundary. There are other potential sources of recontamination upstream up of Slip 6 that might, via the LDW, impact the sediments in Slip 6. However, they have been or will be addressed in other studies.

This report covers reviews of five properties within the Slip 6 drainage basin: former PACAAR Property, former Rhone-Poulenc Property, King County International Airport (KCIA), the Museum of Flight (MOF) and the Boeing Developmental Center (BDC). With the exception of the BDC, all of the properties exist fully within the drainage basin boundaries. In the case of the BDC, the property is located partially within the Slip 6 drainage basin and partially within a drainage basin to the South. All available BDC documentation was reviewed; however, this report focuses on the impacts to the Slip 6 drainage basin. Information on BDC related to other drainage basins may be found in the Early Action Area 7 SCAP (E & E 2007a) or in the river mile (RM) 4.4 to 4.8 East SCAP that has not been published at this time. This report does not identify or assess the possibility of migration from sources outside of the Slip 6 drainage basin.

Similarly, air pollution is a potential source of contamination to Slip 6 sediments with origins outside of the Slip 6 drainage basin. Although some limited discussion of atmospheric deposition is provided in Section 2, the scope of work for this report did not include an assessment of data gaps pertaining to air pollution effects on Slip 6 sediments. Because air pollution is a concern for the wider LDW region, Ecology will review work being conducted by the Washington State Department of Health and planned by the Puget Sound Partnership regarding atmospheric deposition. Ecology is planning to hire a contractor to develop options and recommendations for addressing data gaps relating to air pollution.

There is available data regarding existing sediment contamination near the Slip 6 source control area. However, this report focuses only on upland sources that have the potential to recontaminate Slip 6 area sediments in the event that sediment remediation is required. This does not preclude the potential for recontamination from capped sediments if this remedial option is selected. Source control with regard to any contaminated sediments left in place will be important to address as part of the remedial option selection process for Slip 6.

The scope of this report does not include quality assurance or validation of reported data. Data published in previous reports approved by EPA and/or Ecology are assumed to have been

[3] The area referred to herein as the 'Slip 6 drainage basin' is actually a sub-drainage basin of the LDW valley. The LDW valley drainage basin has been divided into the sub-drainage basins, defined tentatively by storm water collection systems and outfalls, as shown in Figure 1.

validated and are accurate. Information from reports by others that have not been approved by EPA or Ecology is included only for summary purposes.

The level of assessment conducted for the data reviewed in this report is determined by the source control objectives. The scope of this report does not include critical analysis that exceeds what is required to reasonably achieve source control, even though some parties may have an interest in a more critical analysis of data. For instance, a method detection limit (MDL) indicates the minimum concentration that a substance can be detected and reported with 99% confidence that the analyte concentration is greater than zero, but without certainty of its true concentration. The practical quantitation limit (PQL) or reporting limit (RL) is the concentration that can be reliably measured and is often three to ten times greater than the MDL. In cases where an applicable screening level falls between the MDL and the PQL/RL, it cannot be certain if the true concentration of a detected substance exceeds the screening level unless the concentration exceeds the PQL/RL. Furthermore, numerous circumstances can affect the MDL and PQL/RL levels for a given sample run resulting in variances within a single sampling event. Nevertheless, for the purposes of determining appropriate source control actions, data reports were reviewed on the basis of the interpretations and presentation of results as stated in the report. No attempt was made to determine MDLs or PQLs/RLs for any particular analytical chemistry results.

2.0 Slip 6

2.1 Site Description

2.1.1. Site Location

Slip 6 is located, approximately, at RM 3.9 to 4.4 on the east side of the LDW. In this document, the term "Slip 6" is the general name of this area and is not limited to the waterway inlet itself (Figure 2). The Slip 6 area consists of upland and adjacent portions. The upland areas are defined by the Slip 6 drainage basin map provided by Ecology (Figure 2). The adjacent areas include the Slip 6 inlet and embankment areas, both to the north and south of the inlet. The Slip 6 inlet extends approximately 800 feet to the northeast from its point of convergence with the LDW. The embankment areas are outside of the inlet and front the properties within the Slip 6 drainage basin that meet the LDW waterline. The Slip 6 drainage basin was determined by the land areas with stormwater discharge to either the Slip 6 inlet or embankment areas.

Like the LDW, the waters of Slip 6 are tidally influenced. The upland areas of Slip 6 border the waterway with various materials, including sheet pile bulkheads, riprap, fill material, and natural vegetation. In addition, several stormwater outfalls are located along the Slip 6 waterfront, as described further in Section 2.3.1.

2.1.2. Site History

General background and site description of the LDW Superfund Site is provided in the Phase I Remedial Investigation Report (Windward 2003), which describes the history of dredging/filling and industrialization of the Duwamish River and its environs, as well as the physiography, physical characteristics, hydrogeology, and hydrology of the area.

Most of the upland areas adjacent to the Slip 6 waterfront and the LDW have been heavily industrialized since the 1920s. Historical and current commercial and industrial operations in the vicinity of Slip 6 include cargo handling and storage, auto storage lots, truck manufacturing, chemical processing, aviation operations, and airplane parts manufacturing. The nearest residential area to Slip 6 is approximately one-half mile to the southwest and across the LDW.

Historically, the original Duwamish River meandered through the mud flats of the river delta. However, in the late 1800s and early 1900s, extensive modifications were made to straighten the Duwamish River to create a navigable channel. Many of the current slips are remnants of old river meanders. Dredged material was likely used to fill in the upland areas near Slip 6, in addition to imported fill. Other material may have been used as fill, but there are no available or known records to indicate the source of any such material.

2.1.3. Site Geology and Hydrogeology

Groundwater within the Duwamish Valley alluvium is typically encountered under unconfined conditions within approximately 10 feet (3 meters) of the ground surface. Groundwater in this unconfined aquifer is found within the fill material and native alluvial deposits. The direction of groundwater flow in the unconfined aquifer is generally toward the LDW, although the direction may vary locally depending on the nature of subsurface material and temporally based on its proximity to the LDW and the influence of tidal action. The area affected by tide-related flow direction reversals is generally within 300 to 500 feet (100 to 150 meters) of the LDW (Windward 2003) and varies depending upon location. For example, at RM 3.9, the Paccar property shows tidal influence to 800 feet east of LDW (Kennedy Jenks 2002a).

2.1.4. General Source Description

The Duwamish River originates at the confluence of the Black and Green Rivers, near Tukwila, Washington. From the confluence, the Duwamish River flows approximately 12 miles (19 kilometers) before splitting at the southern end of Harbor Island to form the East and West Waterways, which discharge into Elliott Bay. The LDW study area consists of the downstream portion of the Duwamish River, excluding the East and West Waterways.

The LDW is a receiving water body for different types of industrial and municipal stormwater and periodic overflow discharges from combined sewer systems during high rainfall events. There are currently no permitted discharges of industrial wastewater directly into the LDW. However, there are industrial and municipal stormwater discharges that currently enter the LDW.

Sediments in the Slip 6 portion of the LDW have been contaminated by chemicals from various human activities. Before reaching the LDW sediments the contaminants first affected upland media including surface water, groundwater, soil, and air. Ecology identified several industrial properties within the Slip 6 drainage basin as facilities of concern. Activities at these properties, both historically and currently, have led to contamination of various upland media. These properties are described in Table 2-1 below, illustrated in Figure 2, and discussed in further detail in Section 3.

Table 2-1: Slip 6 Properties				
Property Name	**Location Relative to the Slip 6 Inlet**	**Potential Pathways**	**Historical Use**	**Current Use**
Former PACCAR Site	Adjacent to Rhone-Poulenc to the North	Stormwater discharge, groundwater migration, bank erosion/leachin g	Truck building industry	Vehicle storage lot
Former Rhone-Poulenc Site	Along the northern side of the Slip 6 inlet	Groundwater migration, bank erosion/leachin g	Chemical Processing	Vehicle storage lot
King County International Airport	Across East. Marginal Way South	Stormwater discharge	Aviation Operations	Aviation Operations
Museum of Flight	Two parcels, located on the east and the west of East Marginal Way South	Groundwater migration, Stormwater discharge	To the west: steel manufacturing and airplane manufacturing. To the east: gasoline stations	Aviation Museum
Boeing Developmental Center	Along the southern side of the Slip 6 inlet	Stormwater discharge, bank erosion/leachin g	Airplane manufacturing	Aerospace Research and Development

2.2 Chemicals of Concern in LDW Sediments

Although the scope of this report does not include existing sediment conditions in the Slip 6 portion of the LDW, the results from LDW sediment studies provide guidance in assessing source control requirements for the upland areas. Several contaminants in LDW sediments within the vicinity of Slip 6 have been documented to be at levels of concern based on results of sampling conducted between 1999 and 2007. The SMS (Chapter 173-204 WAC) establish Marine Sediment Quality Standards (SQS) and Cleanup Screening Levels (CSL) for some chemicals that may be found in sediments. When chemical concentrations in surface sediments are less than the SQS, it is assumed that there will be no adverse effects on biological resources and no significant health risk to humans. CSLs represent "minor adverse effects" levels used as an upper regulatory threshold for making decisions about source control and cleanup.

For the purposes of this report, the term "Chemical of Concern" (COC) is defined as a chemical that may potentially recontaminate LDW sediments in the Slip 6 area in the event that sediment remediation is required. A chemical was identified as a COC for Slip 6 if the chemical met either of the following criteria:

A. The detected concentration in one or more Slip 6 surface sediment samples as reported in the Phase I Remedial Investigation Report exceeded the SQS or CSL value. On this basis, the following chemicals were identified as chemicals of concern for Slip 6 (Windward 2003):

    - Metals (mercury and lead)
    - Total polychlorinated biphenyls (PCBs)
    - Benzoic acid
    - Phenols
    - Butyl benzyl phthalate (BBP)
    - Bis(2-ethylbexyl) phthalate (BEHP)
    - Polycyclic aromatic hydrocarbons (PAHs)
    - Dibenzofuran

B. The chemical was detected above an applicable screening level in one or more samples of upland media (including stormwater, groundwater, soil, seeps and storm drain solids), even if not detected in Slip 6 sediment samples. The following additional chemicals are identified as chemicals of concern to the Slip 6 sediments on this basis:

    - Metals (arsenic, chromium, copper, lead, mercury, nickel, selenium, vanadium and zinc)
    - Volatile Organic Compounds (VOCs) [tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2- dichloroethene (DCE), 1,1-DCE, toluene, vinyl chloride (VC)]
    - Semivolatile Organic Compounds (SVOCs) [PCBs and PAHs]
    - Phenols
    - Phthalates
    - Petroleum hydrocarbons

Chemicals that were no longer detected above applicable screening levels in upland media following completion of remedial actions at potential upland sources are not included.

In some instances it was not feasible to determine if a chemical was a COC or not based on one or more of the following reasons:

- No applicable screening level had been established for the site for the particular chemical.
- Site specific screening levels are currently under development, but not yet available.
- Applicable screening levels could not be applied due to inadequate data.
- The reporting limit for the compound was greater than the applicable screening level in which case an exceedance may or may not be detectable.

Whenever these situations occurred a data gap was identified to indicate where further study may be required. An example of the third reason above is when storm drain solids are compared to SMS criteria, but the analytical method did not include sufficient information (see Section 2.3).

2.3 Application of Sediment Management Standards to the Identification of COCs

Under the SMS, the SQS and CSL values for some organic compounds are organic carbon (OC) normalized. As such, any detected concentrations (dry weight basis [dw]) for applicable SMS compounds in sediment samples are to be normalized to the total organic carbon (TOC) concentration in the samples, as appropriate, to allow comparison with the SQS and CSL values. For samples with TOC concentrations considered to be outside an acceptable range (i.e. <0.5% or >4.0%), it is recommended that the dw concentrations of the constituents be compared to the Puget Sound lowest apparent effects threshold (LAET) or Puget Sound second lowest apparent effects threshold (2LAET) values.

There are no established cleanup levels or standards for storm drain solids. However, SMS numerical criteria and LAET values provide a generally conservative basis to evaluate contaminant concentrations in storm drain solids samples. Any chemicals found in storm drain solids above SMS or LAET/2LAET screening levels are considered to be COCs with regard to LDW sediments. The reason for this is that if the solids were to migrate to the LDW they would become sediments. Although it is conservative to ignore mixing and dilution effects, SMS and LAET/2LAET criteria are considered to be a reasonable measure of contamination for storm drain solids. However, there were instances where the original data was presented without TOC data or it was unclear if data results had been normalized to TOC.

Recently, a screening tool was developed to help determine when a detected chemical is not a concern to LDW sediments (SAIC 2006a). The screening tool consists of screening levels derived from SMS numerical criteria for marine sediments and applicable, relevant and appropriate requirements. These screening tool levels are referred to as either “soil-to-sediment screening levels” or “groundwater-to-sediment screening levels.” Concentrations less than the screening tool levels provide an indication that SMS compounds in upland groundwater and soil are not likely to pose a risk to LDW sediments. The screening levels calculated for this tool incorporate a number of conservative assumptions, including the absence of contaminant dilution and ample time for contaminant concentrations in soil, sediment, and groundwater to achieve equilibrium. In addition, the screening levels do not address issues of contaminant mass flux from upland to sediments, nor do they address the area or volume of sediment that might be affected by upland contaminants. Because of these assumptions and uncertainties, these screening levels are most appropriately used for ruling out, but not establishing, a concern. If contaminant concentrations in upland soil or groundwater are below these screening levels, then it is unlikely that they will lead to exceedance of marine sediment SQS. The use of this tool to screen out contaminants in the presence of non-aqueous phase liquids is inappropriate. However, upland concentrations that exceed these screening levels may or may not pose a threat to marine sediments. Additional site-specific information must be considered in order to make such an assessment.

Where feasible, these screening tool levels are compared to the most recent upland groundwater and soil results for a given property or study area. Generally, if a chemical is not detected above the applicable screening tool level, given appropriate reporting limits, then the chemical is not considered to be a COC for the given location. However, in some instances site-specific criteria are more stringent than the screening tool levels. In this case if a detected chemical concentration is below a screening tool level, but above a site-specific criterion, then it cannot be ruled out as a COC. In other cases the MDL or reporting limit may be greater than a screening tool level. In these cases it cannot be determined if the concentration is below the screening tool level, so the chemical cannot be ruled out as a COC unless other factors prevail.

2.4 Potential Pathways of Contamination

To assess whether upland contaminants are a potential source of LDW sediment recontamination, it is necessary to evaluate potential pathways that may exist between the potential source and the LDW. Pathways are the means by which source contaminants in the upland area may potentially reach LDW sediments. Pathways can lead to either point or non-point discharges. Point discharges can include direct wastewater discharges, stormwater discharges, combined sewer overflows (CSOs), and spills. The only existing point discharges into the waters of Slip 6 are stormwater drainage points. Non-point discharges can include erosion or leaching from bank soils, groundwater migration and atmospheric deposition. In some cases a pathway is not known to have, historically or currently, any contamination. However, this report considers all pathways that may potentially provide a conduit for upland contaminants to reach LDW sediments. The potential contaminant migration pathways evaluated for Slip 6 are described below and are discussed in more detail in Section 3.

2.4.1. Piped Outfalls

Properties in the vicinity of Slip 6 drainage basin are served by a combination of storm drain, sanitary sewer, and combined sewer systems. Storm drains convey stormwater runoff collected from streets, parking lots, and roof drains from residential, commercial, and industrial properties near the LDW. There are both public and private storm drain systems that drain upland areas to Slip 6. Most of the waterfront properties along the LDW are served by privately-owned systems that discharge directly to the LDW. The other upland areas are served by a combination of privately-and publicly-owned systems. There are no sanitary sewer treatment system discharge points or CSO discharge points to the waters of Slip 6.

2.4.1.1. Stormwater

Stormwater discharges to Slip 6 waters via storm drains and pipes or directly from properties adjacent to the LDW. Stormwater runoff from urban areas may contain a wide variety of substances including bacteria, metals, oil, detergents, pesticides, fertilizers, and other chemicals that are washed off the land surface during rain events. These pollutants are transported in dissolved and particulate phases to the LDW by a combination of public and private storm drain systems. Storm drains can also convey materials from businesses with permitted discharges [i.e., National Pollutant Discharge Elimination System (NPDES) industrial stormwater permits], vehicle washing, runoff from landscaped areas, erosion of contaminated soil, infiltration of contaminated groundwater through breaks in conveyance lines, and materials illegally disposed of into the system. Known points of stormwater discharge to the Slip 6 waters are listed below:

- BDC Outfall 14 (DC14);
- BDC Outfall 15 (DC15);
- Storm-North, stormwater from the Former PACCAR Site;
- Storm-South, stormwater from the Former PACCAR Site; and
- Outfall #1, King County storm sewer line that discharges to Slip 6. Stormwater from this outfall is from the KCIA and former Rhone-Poulenc Site.

These discharges are described in Section 3.

2.4.1.2. National Pollution Discharge Elimination System Permits

In 2004, the City of Seattle conducted a comprehensive survey of outfall or outfall-like structures terminating in the LDW. The survey identified 227 outfalls or structures. Of these, 42 are municipally-owned outfalls, 101 were identified as privately-owned outfalls, and 84 are of unknown ownership. Discharges from many of these outfalls are permitted under NPDES. There are six types of NPDES permits covering the LDW. They are described below.

- The **Phase I Municipal Storm Water Permit** covers stormwater discharges from outfalls owned by the City of Seattle, the Port of Seattle, and King County. The Phase I Municipal Storm Water Permit requires more monitoring than the general permits do, including the monitoring of the solids portion (sediments). Monitoring requirements are detailed in Special Conditions, S8, in the Phase I permit. The Permit was issued on January 17, 2007. The analyte list is tiered, depending on how much sediment is collected in a sample. The stormwater monitoring portion of the permit does not require monitoring of all outfalls. The monitoring is limited to only three basins, or sub-basins, considered representative of residential, commercial, and industrial use. Any monitoring required under this permit is of limited value to the LDW source control effort. The Phase I Storm Water Permit is heavily dependent on best management practices of the permitee, such as street sweeping and catch basin cleaning.

Another key component of the permit is the requirement placed on the permit holders to detect, remove, and prevent illicit connections and illicit discharges, including spills into the municipal separate storm sewers (Special Condition 5.8). This condition has resulted in the City of Seattle and King County programs and ordinances governing stormwater and surface water within their jurisdictions.

- The **Phase II Municipal Storm Water Permit** includes any City of Tukwila outfall. Part of the area that drains into Slip 6 waters is located within the City of Tukwila; however, there are no City of Tukwila outfalls in the Slip 6 Area. Section S8 of the Phase II Municipal Storm Water Permit states:

  > "Permittees are not required to conduct water sampling or other testing during the effective term of this Permit, with the following exceptions:
  >
  > 1. Any water quality monitoring required for compliance with total maximum daily limits, pursuant to section S7 Compliance with Total Maximum Daily Load Requirements and Appendix 2 of this Permit, and
  > 2. Any sampling or testing required for characterizing illicit discharges pursuant to section S5.C.3. or S6.D.3. of this Permit."

- The **Industrial Stormwater General Permit** covers 112 industries within the natural drainage basin of the LDW. This permit covers the BDC, KCIA, the former PACCAR property, and the west parcel of the former Rhone-Poulenc property. Coverage under the Industrial Stormwater General Permit requires monitoring of stormwater discharge for pH, turbidity, oil and grease, copper and zinc. If stormwater is discharged to a 303(d)-listed surface water body, monitoring for total suspended solids is also required. Additional monitoring is required for timber products, air transportation, chemical, food, and metal industries.

- The **Sand and Gravel General Permit** provides coverage for discharges of process water, stormwater, and mine dewatering water associated with sand and gravel operations, rock quarries, and similar mining activities, including stockpiles of mined materials, concrete batch operations, and hot mix asphalt operations. There are five Sand and Gravel Permit holders along the LDW, but none are within the Slip 6 drainage basin.

- The **Boatyard General Permit** covers a commercial business engaged in the construction, repair, and maintenance of small vessels, 85% of which are 65 feet or less in length or revenues from which constitute more than 85% of gross receipts. The permit generally requires monitoring for copper, oils, and total suspended solids. These permits do not specifically require monitoring of the solids portion of stormwater flow. There are two permitted boatyards in the LDW, neither of which is located within the upland areas or waters of Slip 6.

- An **Individual Permit** is written for a specific discharge at a specific location. The individual permit is highly tailored to regulate the pollutants in the discharge. An individual permit may be a NPDES permit for discharges to surface waters. NPDES individual permits may be issued to an industry or to a municipality. There are four individual permits issued within the LDW. Individual permits for LaFarge Cement and Duwamish Shipyard, which are located outside the Slip 6 drainage basin, are specific to their respective industrial activities. The remaining two individual permits are for the City of Seattle and King County CSO system; however, there are no CSO outfalls to the waters of Slip 6.

2.4.2. Groundwater

Contaminated groundwater may enter the LDW directly via groundwater discharge to surface water, tidal fluctuation, seeps or infiltration into storm drains/pipes, ditches, or creeks that discharge to the LDW. Contaminants from spills and releases to soils on properties in the Slip 6 drainage basin area may migrate to groundwater and subsequently be transported to Slip 6 waters. In general, shallow groundwater in the Duwamish Valley is typically encountered within about 10 feet (3 meters) of the ground surface and exists under unconfined conditions. The general direction of shallow groundwater flow in the Duwamish Valley is toward the LDW, although the direction may vary locally depending on the nature of the subsurface material and temporally based on proximity to the LDW and the influence of tidal action. High tides can cause temporary groundwater flow reversals, generally within 300 to 500 feet (100 to 150 meters) of the LDW (SAIC 2006b). Seep studies have been conducted in the Slip 6 waters, as further described in 3.5.3.3.

2.4.3. Bank Erosion/Leaching

Waterway bank soil, contaminated fill, waste piles, landfills, and surface impoundments may release contaminants directly into Slip 6 waters through soil erosion, soil erosion to stormwater, leaching to groundwater, or leaching from banks to the LDW. Portions of the bank contain sheet piling, rip-rap, and timbered piling.

2.4.4. Atmospheric Deposition

Atmospheric deposition occurs when air pollution deposits enter the LDW directly or through stormwater. Such deposits can become a possible source of contamination to Slip 6 sediments. Air pollution is generated from air emissions that can be either from a point source or widely dispersed. Examples of point source emissions include paint overspray, sand-blasting, industrial smokestacks, and fugitive dust and particulates from loading/unloading of raw materials (e.g., sand, gravel, and concrete). Examples of widely dispersed emissions include vehicle emissions and aircraft exhaust.

None of the Slip 6 properties listed in Table 2-1 have current operations that have known point source emissions of air pollution that may contribute contaminants to Slip 6 sediments. Air traffic at KCIA may result in significant emissions, but this pertains to the entire airfield operations and lies outside of the scope of this report.

The Washington State Department of Health hired a consultant to model air emissions from multiple sources in south Seattle. The objective of the multiple source air modeling project in the Duwamish valley was to identify air pollutants, key air pollution sources affecting residential areas of south Seattle, and the geographic areas of south Seattle that are affected by air pollutants. This effort is an initial step to identify priorities for future work in the area. The purpose of this report is to summarize key findings of the modeling effort and make recommendations for future actions. Ecology understands the report will be published in 2008. A study on atmospheric deposition planned by the Puget Sound Partnership has not been funded yet and no schedule has been developed. Ecology will continue to monitor these efforts.

King County has been monitoring atmospheric deposition to assess whether atmospheric deposition is a potential source of phthalates, particularly bis(2-ethylhexyl)phthalate (BEHP), in stormwater runoff (King County and Seattle Public Utilities 2005). Passive deposition samplers (i.e., stainless steel bowls that drain into a glass bottle) were placed at four locations in the LDW area as well as in surrounding neighborhoods to collect samples of both wet and dry atmospheric deposition. Results showed that concentrations of PAHs, butylbenzylphthalate, and BEHP in the Duwamish Valley were greater than Beacon Hill during the winter sampling events than during the spring sampling events (King County and Seattle Public Utilities 2005). This finding is consistent with previous sampling results by the Puget Sound Clean Air Agency showing atmospheric particulate concentrations trending higher during fall/winter months than during spring/summer months.

King County (King County and SPU 2005) concluded that the LDW sample results compared well with studies conducted within the same airshed (i.e., Georgia Basin) and with other regions [i.e., Great Lakes and Roskilde Fjord (Denmark) studies]. PAH values observed in LDW samples [0.006 to 0.28 micrograms per square meter per day ($\mu g/m^2/d$)] were comparable to the average values reported for the Georgia Basin airshed (0.004 to 0.36 $\mu g/m^2/d$). The LDW bis(2-ethylhexyl) phthalate values (0.23 to 3.5 $\mu g/m^2/d$) were higher than the Georgia Basin average values (0.3 to 0.6 $\mu g/m^2/d$), but were comparable with the results from the Denmark study (0.068 to 2.16 $\mu g/m^2/d$). The study noted that further atmospheric deposition testing was needed to evaluate the reproducibility of results and to perform correlations with existing atmospheric measurements (e.g., particulate concentrations).

2.4.5. Spills

Spills of waste materials containing contaminants of concern may occur directly to the LDW or onto the ground within the Slip 6 drainage basin. Activities occurring in the Slip 6 upland areas at this time may result in spills if adequate containment procedures are not followed. Stormwater Pollution Prevention Plans (SWPPP) outline areas of risk of stormwater pollution and pollution prevention measures for each facility of potential concern.

3.0 Potential Sources of Sediment Recontamination

3.1 Introduction

This section summarizes available information on potential contaminant sources and pathways based on available documentation. This summary was then evaluated to identify any potential for contaminant migration and recontamination of LDW sediments. In some instances, data, or lack of data, indicate a source or pathway may be present. A data gap is identified when available data are insufficient to confirm or rule out the contamination or any significant potential for contaminant migration to LDW sediments.

Several industrial facilities within the drainage basin that discharges to Slip 6 have been identified as facilities of concern (see Table 2-1). These facilities are illustrated in Figure 2 and discussed in further detail below. The facilities were evaluated for the following means of potential recontamination of LDW sediments:

- Existing upland contamination of soil, groundwater, surface water, or storm drain solids and water;
- Migration pathways that may exist between the potential sources and the LDW; and
- Activities that could potentially lead to an accidental release of a COC.

The sections below summarize current and historical land uses and environmental investigations and cleanups at each of the facilities of interest. Current land use information was obtained from existing reports, Ecology databases, and aerial photographs. The Ecology online databases were searched for information on current NPDES permit numbers, USTs, LUST release incidents, hazardous waste facilities, and for inclusion of the property on the Confirmed and Suspected CSCSL. Property ownership information was obtained from King County tax records and from existing reports. Table 1 summarizes property information, and Table 2 summarizes the regulatory database listings.

3.2 Former PACCAR Site

3.2.1. Current Operations

The former PACCAR, Inc. site is located at 8801 East Marginal Way South in Tukwila, Washington. The site is also known as the former Kenworth Truck Tukwila site, Insurance Auto Auctions, Inc. site, and the Merrill Creek Holdings, LLC site. In this document the site will be referred to as the former PACCAR site. The site occupies approximately 25 acres on the east bank of the LDW. The site is bordered by Boeing-Thompson property to the north, East Marginal Way South to the east, the former Rhone-Poulenc property to the south, and the LDW to the west (Figure 2). Zoning for the site is heavy industrial use, and the site is located within Tukwila's Manufacturing Industrial Center/Heavy zoning district.

The property was developed in 1929 by the Fisher Body Corporation for the assembly of trucks and then by Boeing for airplane assembly during World War II. PACCAR purchased the Kenworth Truck Company and site in 1946 and used the property to manufacture trucks. In 2002, PACCAR ceased operations at the facility and sold the property to Merrill Creek Estate Holdings, LLC in October 2004. The property is currently leased to Insurance Auto Auction, Inc. (IAAI), where wrecked, stolen, or abandoned vehicles are stored, auctioned, and/or transported off site for recycling or disposal.

The site consists of approximately 25 acres of paved property. Along the western boundary of the site, a metal sheet piling bulkhead extending approximately 30 feet bgs was installed in the 1930s along the northern two-thirds of the western boundary, separating the uplands from the LDW. The remaining southern third of the western boundary is shoreline covered with large boulders as riprap.

According to the King County Tax Assessor website, the facility is located on Parcel 5422600060. This property is owned by Merrill Creek Estate Holdings, LLC and contains the following three structures (Figure 3):

- A 165,600-square feet (sq. ft.) industrial light manufacturing building (built in 1930);
- A two-story 27,520-sq. ft. office building (built in 1964); and
- A 43,200-sq. ft. industrial light manufacturing building (built in 1951; King County 2007a).

As shown on Figure 3, additional historic buildings at the site include the former plastic shop, tire shop, and shipping and receiving buildings. These buildings were not listed on the King County Tax Assessor website as they were demolished in 2004.

To the north of the site is the approximate 20-acre Boeing Thompson property (8811 East Marginal Way South, Parcel 0007400033), where jet engine research is conducted. To the south of the site is the former Rhone-Poulenc property that has been divided into two separate parcels. The West Parcel (Parcel 5422600010) is an approximately 14-acre property that is currently paved and leased to IAAI for storage of wrecked vehicles prior to auction or transport off site for recycling or disposal. The East Parcel (Parcel 5422600020) is an approximately 7-acre property which is owned by the MOF. To the east of the site is an approximately 565-acre property (6505 Perimeter Road South, Parcel 2824049007) owned by King County, which is currently the KCIA and contains an air terminal and hangars (King County 2007a).

From 1986 to present, PACCAR has conducted multiple environmental investigations and cleanup actions at the site. In October of 2000, PACCAR entered into Ecology's Voluntary Cleanup Program. On October 4, 2006, PACCAR entered into an Agreed Order (DE 3599) for implementation of the Sediment Evaluation Work Plan with Ecology (Ecology 2006). On January 24, 2008, Ecology issued a Notice of Potential Liability under the Model Toxics Control Act (MTCA) for the Release of Hazardous Substances at the former PACCAR site to PACCAR, Inc. and Merrill Creek Holdings, LLC. In addition, Ecology intends to negotiate an Agreed

Order for upland cleanup of contaminated soil and groundwater at the site, and to determine site-specific cleanup levels that are sufficient for upland cleanup and source control (Ecology 2008).

The paragraphs below summarize available site information from online Ecology and EPA databases.

The former PACCAR facility is listed as a hazardous facility on Ecology's online Hazardous Site Facility Search Database with Resource Conservation and Recovery Act (RCRA) Site Identification No. WAD009249509 (Ecology 2007b). In addition, the site is listed on Ecology's CSCSL database with Facility Site Identification No. 2072. The site is listed with suspected and/or confirmed contamination in sediments, soils, groundwater, and surface water. Potential contaminants listed in 1998 include halogenated organic compounds, EPA priority pollutant metals, petroleum products, phenolic compounds, and non-halogenated solvents. According to the database, the site was listed on March 1, 1988, and is currently awaiting a site hazard assessment (Ecology 2007c).

According to Ecology's online NPDES and State Water Discharge Permit database, there is a current NPDES Industrial Stormwater General Permit (SO3008681A), issued to IAAI on February 11, 2005, for operations at the former PACCAR site. In accordance with the permit, IAAI is required to monitor stormwater discharge for zinc, copper, lead, oil/grease, turbidity, and pH (Ecology 2007d). Previous site operations were permitted under an Industrial Stormwater General Permit (SO3-001784) from November 18, 2000 to February 20, 2003. The permit was terminated because truck manufacturing operations had ceased at the facility (Ecology 2003a). There is no NPDES Individual Wastewater Discharge permit (Ecology 2007e) or Wastewater Discharge Permit from the King County Industrial Waste Program for this site.

According to Ecology's online LUST database, the former PACCAR site is listed as having a release (ID No. 552588) for UST (No. 8218) to soil and groundwater with cleanup starting on July 15, 1999. On Ecology's online UST database, the site is listed as having eight registered USTs and 11 unregistered USTs that have been removed from the site. The eight registered USTs include the following:

- A 10,000 to 19,999 gallon tank (ID 38586) containing antifreeze;
- A tank of unknown size (ID 38651) containing diesel fuel;
- A 10,000 to 19,999 gallon tank (ID 38529) containing diesel fuel;
- A 10,000 to 19,999 gallon tank (ID 38610) containing motor oil;
- A 10,000 to 19,999 gallon tank (ID 38600) containing motor oil;
- A 10,000 to 19,999 gallon tank (ID 38675) containing motor oil;
- A tank of unknown size (ID 38548) containing hazardous substances, and;
- A tank of unknown size (ID 38634) containing hazardous substances (Ecology 2007f).

The EPA TRI database annually records toxic releases and other waste management activities. Available data include reports on releases, water transfers, and waste quantity from 1988 to 2005. The former PACCAR site is listed with TRI No. 98108KNWRT8801E, and database records indicate that total on- and off-site releases ranged from 1 to 96,000 pounds, depending on the year and the chemical. The majority of these releases were air emissions; however, some waste was transferred off-site for waste management, recycling, and energy recovery. Wastes included 1,1,1-TCE; acetone; certain glycol ethers; dichlorodifluoromethane; ethylene glycol; manganese; methanol; methyl ethyl ketone; methyl isobutyl ketone; n-butyl alcohol; styrene; toluene; and xylene (mixed isomers; EPA 2007). The former PACCAR facility is no longer manufacturing and no longer releasing air emissions.

3.2.2. Historical Use

Historical use of the site began in approximately 1929 when the Fisher Body Corporation (a subsidiary of General Motors) built the main manufacturing building, and manufactured trucks and heavy equipment. During World War II, Boeing operated the site to produce truck and airplane assemblies. In January 1946, PACCAR purchased the Kenworth Truck Company and facility. In 1965, PACCAR also purchased a portion of the neighboring property to the south, formerly owned by Monsanto, to expand their operations. PACCAR's subsidiary, Kenworth Truck Company, manufactured trucks at the site from 1946 through April 1996. In 1997, truck building resumed at the facility and off-road trucks were built for PACCAR through 2002 when PACCAR ceased operations at the site (Ecology 2006).

3.2.3. Environmental Investigations and Cleanup Activities

Since 1986, the former PACCAR site has been the subject of numerous environmental investigations and cleanup activities, which are shown in chronological order on Figure 4. Site investigations began in 1986 following report of a LUST. Environmental investigations at the site have included the UST investigations from 1986 to 2004; the Interim VOC Investigation in 1998; the Ambient Air Monitoring in 2002; the Phase I Data Gaps Investigation of soil, groundwater, stormwater, and seeps in 2002; the Phase II Data Gaps Investigation of site-wide soil, groundwater, and stormwater in 2004; the investigation of the north storm drain in 2006; the site-wide groundwater monitoring from 2006 to 2007; and the Sediment Evaluation Work from 2006 to present.

Cleanup actions at the site began with several UST closures in 1986. These closures were followed by several removal actions including: removal of USTs in 2000, 2001, and 2003; removal of contaminated soil in 1995, and 2002 to 2004; application of oxygen-releasing compounds to the subsurface soil during 2003 and 2004. Groundwater extraction was conducted from 1993 to 1995 and an air sparging and soil vapor extraction (AS/SVE) system was installed in 2004. Cleanup actions of the stormwater system include: closure of the middle outfall in 2004; cleaning of the entire stormwater system in 2004; repair of the north storm drain in 2006; and on-going stormwater quality improvements from 2007 to present.

Investigations at the site detected the following releases:

- to soils: petroleum hydrocarbons, VOCs, SVOCs, phenols, phthalates, and metals;
- to groundwater: VOCs, SVOCs, petroleum hydrocarbons, PAHs, PCBs, and metals;
- to stormwater: VOCs, PCBs, PAHs, and metals.

The principal environmental investigations and cleanup actions are summarized in the sections below. To the extent possible, earlier investigations have been briefly summarized. Analytical results from earlier investigations are not discussed in detail when a subsequent cleanup action has removed or remediated the contamination. The more recent investigations are summarized with more information and data pertaining to current site conditions. The following subsections include summaries of the following investigations: Interim VOC Investigation (1998); Ambient Indoor Air Monitoring (2002); Phase I Data Gap Investigation (2002); Phase II Data Gap Investigation (2004); and UST Removals (2003); and the current Sediment Evaluation Work (2006 to present). Due to the large amount of soil data collected during various environmental investigation of the site and because site-specific screening levels are currently being developed, soil data was not compared to the soil-to-groundwater screening tool. In order to assess potential impacts to LDW sediments, further evaluation and comparison of the data to current applicable screening levels is necessary. In general, the screening criteria protective of the LDW sediment will be more stringent, compared to historic cleanup levels or screening criteria. Industrial cleanup levels are not applicable at this property due to the proximity of the waterway and mixed land use. Investigations of stormwater and groundwater at the site are discussed under the Stormwater and Groundwater subsections.

Interim VOC Investigation 1998

Early site investigations addressed VOC contamination due to former leaking solvent USTs at the site. Historical USTs and UST removals are discussed in detail in the UST section, and the Interim VOC investigation is briefly summarized below.

To assess the distribution of VOCs in groundwater after UST removal activities, 23 monitoring wells were installed at several site locations from February 1986 to July 1987. Based of the results of groundwater monitoring, a plume of VOCs in groundwater appeared to extend from the North Fire Aisle toward the west of the site (Kennedy/Jenks 2000).

In 1990, three groundwater recovery wells were installed in the North Fire Aisle area to initiate remediation of the affected groundwater. Groundwater extraction was performed from August 1993 to April 1995. Extracted groundwater was discharged under a permit to King County sanitary sewer system without treatment (Kennedy/Jenks 2000).

In 1998, an Interim VOC Investigation characterized contamination within groundwater and surface water in the western portion of the site. The investigation concluded that VOCs were detected in groundwater and surface water at concentrations potentially exceeding the applicable cleanup levels at several locations (Kennedy/Jenks 2000).

Ambient Indoor Air Monitoring 2002

In January 2002, an ambient indoor air investigation was conducted at the site. The scope of the investigation was to monitor ambient indoor air of buildings with underlying groundwater contamination to ensure that VOCs were not impacting indoor air quality. The scope was expanded at Ecology’s request that the “ambient/indoor air investigation be conducted in all enclosed buildings at the site in order to better understand the vapor threat that VOCs pose to human health and the environment" (Kennedy/Jenks 2002b).

According to the *Ambient Air Monitoring Report* (Kennedy/Jenks 2002b), the ambient indoor air samples were analyzed for the 27 VOCs previously detected in site groundwater. The results of this investigation indicated that none of the VOCs detected in the air samples exceeded either the MTCA Method C air cleanup levels or the Occupational Health and Safety Administration /Washington Industrial Safety and Health Act standards.

Phase I Data Gap Investigation 2002

From February to May 2002, Phase I Data Gap Investigations were conducted by Kennedy/Jenks Consultants. The main tasks of this investigation included reconnaissance groundwater and soil assessments in the North Fire Aisle Area, Wash Pit Area, and Southwest Storage Area (Figure 5); groundwater monitoring well installations in the North Fire Aisle, along the northern property boundary, and along the sheet-piling bulkhead adjacent to the LDW; and site-wide groundwater, stormwater, and seep monitoring (Kennedy/Jenks 2002a).

A total of 28 soil borings were advanced at the site in three work areas. A total of 74 soil samples and 12 reconnaissance groundwater samples were collected from the soil borings. The results of this investigation are summarized in the three subsections below: North Fire Aisle, Wash Pit, Southwest Storage Area (Kennedy/Jenks 2002a).

North Fire Aisle

The North Fire Aisle work area is located at the western end of the North Fire Aisle immediately north of the Boiler/Power House and diesel fuel AST containment area and is centered on the former location of two solvent USTs. Additional soil sampling was conducted to evaluate the extent and level of residual VOC-containing soil and to assess whether this area continues to be a source of VOCs to site groundwater. Soil samples were also analyzed for petroleum hydrocarbons, SVOCs (including PAHs), PCBs, and metals (Kennedy/Jenks 2002a).

Six reconnaissance groundwater samples and 18 soil samples were collected from the North Fire Aisle Area and submitted for a range of chemical analyses. In addition, groundwater monitoring wells MW-8A and MW-8B are located in the North Fire Aisle and were analyzed for a range of potential chemicals of concern. The results of these investigations indicated the following:

- Dense non-aqueous phase liquid is not expected based on the low concentrations of solvent compounds detected and the limited vertical concentration gradients observed.
- Residual concentrations of parent solvent compounds (PCE and TCE) in the North Fire Aisle Area are low. Only one sample collected from well MW-14A contained TCE at concentrations above the National Toxics Rule NTR criterion of 81 micrograms per liter (µg/L; Kennedy Jenks 2002a).

However, recent groundwater sampling indicates elevated VOCs at the site and no cleanup action at the source. Although an AS/SVE system has been installed to reduce the migration of VOC from groundwater to the LDW, it is likely that VOCs are still reaching the LDW.

Wash Pit Area

The Wash Pit Area is located in the north-central part of the site, south of the Maintenance Building. The wash pit includes a concrete-bermed enclosure where steam cleaning was historically performed, and this enclosure was identified as a potential area of concern. Additional soil sampling was conducted to evaluate whether this area was a source of VOCs to site groundwater. Soil samples were also analyzed for petroleum hydrocarbons, SVOCs (including PAHs), PCBs, and metals (Kennedy/Jenks 2002a).

Three reconnaissance groundwater samples and 13 soil samples were collected from the Wash Pit Area and submitted for chemical analyses. In addition, groundwater monitoring wells MW-15A and MW-19B are located in the Wash Pit Area and were also analyzed for a range of potential chemicals of concern. The results of this investigation indicated that no potential chemicals of concern were detected at concentrations exceeding applicable soil or surface water standards (Kennedy/Jenks 2002a). However, the results of this investigation must be re-evaluated and compared to current applicable screening criteria for the site, which are estimated to be more stringent.

Southwest Storage Area

The Southwest Storage Area, which includes the Former Boneyard, Drum Storage, and Former Hazardous Waste Storage Area, is located in the southwestern corner of the site. These areas were identified as potential areas of concern, based on historical usage and previous investigations conducted in the Former Boneyard. The northwestern corner of the Former Boneyard was previously excavated in an area where an oil spill had occurred. The excavated soil contained elevated concentrations of metals. Additional sampling of these areas was conducted to evaluate whether metal contamination within soils remains in place and whether historical activities in the other areas have affected soil and/or groundwater in this portion of the site. Soil samples were analyzed for petroleum hydrocarbons, SVOCs (including PAHs), PCBs, and metals (Kennedy/Jenks 2002a).

Three reconnaissance groundwater samples and 43 soil samples were collected from the Southwest Storage Area and submitted for a range of chemical analyses. In addition, groundwater samples from nearby groundwater monitoring wells were analyzed for a range of potential chemicals of concern. The results of the investigations indicate the following:

- Petroleum hydrocarbons and lead concentrations in soil exceed the MTCA Method A industrial cleanup levels. While the distribution of petroleum hydrocarbons in this area appears to be indicative of surface spills, the distribution of lead was not and may be an artifact of the backfill material. Additional investigation of lead contamination in the Southwest Storage Area was recommended and undertaken in the Phase II Data Gaps Investigation in 2004.

- VC was detected in both reconnaissance and monitoring well groundwater samples above applicable surface water standards. Reconnaissance groundwater samples also indicated elevated concentrations of carcinogenic PAHs and metals. Specifically, concentrations of chrysene, benzo(a)anthracene, benzo(b)fluoranthene, arsenic, selenium, copper, lead, and mercury exceeded applicable surface water standards (Kennedy/Jenks 2002a).

However, the results of this investigation must be re-evaluated and compared to current applicable screening criteria for the site, which are estimated to be more stringent.

Phase II Data Gap Investigation 2004

During the Phase II Data Gap Investigations, a site-wide "grid sampling" of 122 locations was conducted to evaluate the potential impacts to soil and/or groundwater and provide further information in selected "focus areas" of the site where available information indicated that impacted soil and/or groundwater may be present (Figure 6). The results of the investigation are summarized below and shown on Figure 7.

- The lateral extent of lead in the Southwest Storage Area above the MTCA Method A industrial soil cleanup level of 1,000 milligrams per kilogram (mg/kg) was defined by focused soil sampling.
- Three new limited areas with soil concentrations above (or in the case of petroleum hydrocarbons potentially above) MTCA Method C industrial soil cleanup levels were identified. Near-surface soil at grid location H4 contained petroleum-range hydrocarbons above MTCA Method C industrial land use standards which were excavated as part of the investigation. Two other areas (southern portion of the Off-Highway Building and northwestern corner of the site) were tentatively identified as exceeding MTCA Method C industrial land use standards for petroleum hydrocarbons based on residual saturation.
- Except as indicated below, reconnaissance groundwater analytical data collected during the Phase 2 data gaps investigations were generally consistent with the Phase 1 data with VOCs detected in groundwater in the western portion of the site. Arsenic was detected in reconnaissance groundwater samples collected at the site above natural background.
- Gasoline-range hydrocarbons were detected in site groundwater in the northwestern corner of the site above proposed surface water standards. The source of the gasoline-range hydrocarbons is unknown and may be attributed to historical surface release in the northwestern corner of the site in proximity to focused location TSA-1.
- Petroleum-range hydrocarbons were not detected in groundwater samples collected from new South Fire Aisle wells MW-6A(R) and MW-42A installed at, and downgradient of former leaking UST E2, respectively, at concentrations above proposed surface water standards.
- No LDW compounds were detected above MTCA Method C industrial soil cleanup levels in the upland soil samples collected adjacent to the LDW.
- PCBs and dioxins/furans were detected above MTCA Method C industrial soil cleanup levels in solids samples collected from the middle storm drain outfall and associated catch basin. The middle outfall was cleaned and all solids and waste water were removed, characterized, and disposed at an authorized facility. The middle outfall was subsequently closed (plugged) in 2004 as part of the stormwater system cleaning in 2004.

- Stormwater analytical data collected during Phase 2 data gaps investigations were generally consistent with previous Phase 1 data with low concentrations of metals (arsenic, cadmium, copper, lead, and zinc) and benzo(b)fluoranthene and chrysene detected slightly above proposed surface water standards (Kennedy/Jenks 2004).

However, the results of this investigation must be re-evaluated and compared to current applicable screening criteria for the site, which are estimated to be more stringent.

As part of remedial actions conducted at the site in 2004, several areas were excavated (Figure 8). These areas included the following:

- Excavation of petroleum hydrocarbon-containing soil encountered in the eastern portion of the South Fire Aisle during the 2003 UST removal activities.
- Excavation of the petroleum hydrocarbon- and metals-containing soil encountered during installation of the SVE pipelines in the western portion of the site.
- Excavation of the petroleum hydrocarbon-containing soil encountered at grid location H4 located west of the Main Manufacturing Building, during the Phase II data gaps investigations (Kennedy/Jenks 2004).

Although results of the Phase II Data Gap Investigations confirmed petroleum hydrocarbon levels below proposed industrial cleanup standards, as a proactive approach, Oxygen Release Compound® (ORC) was injected into the subsurface in the western portion of the South Fire Aisle to address residual petroleum hydrocarbon impacts to soil and groundwater in this portion of the site (Figure 8; Kennedy/Jenks 2004).

UST Removals

Historically, there were 18 USTs and one oil/water separator vault identified at the site, as shown on Figure 9. All USTs were removed from the site between 1986 and 2003, and there are currently no known USTs located at the site. The various UST removals are summarized in the paragraphs below.

During the 1986 evaluation, seven USTs were identified as “essential” to plant operations, including three motor oil USTs (E4, E5, and E6); two diesel fuel USTs (E2 and E3); one antifreeze UST (E1) in the South Fire Aisle; and one acetone UST (E7) adjacent to the Plastics Shop. The remaining “nonessential” USTs (#1 through #8, and #10 through #12) and an oil/water separator vault (#14) were removed in 1986 (Kennedy/Jenks 2003).

During the removal of USTs #6 and #8 in the North Fire Aisle, strong chemical odors were observed in the soil. Products released from these former paint thinner USTs are believed to be the source of VOCs in site groundwater originating from the North Fire Aisle. Also during the 1986 evaluation, it was determined that UST E2 historically leaked. Soil adjacent to this UST in the SFA area exceeded MTCA industrial soil cleanup levels for petroleum hydrocarbons. UST E2 was subsequently closed-in-place (Kennedy/Jenks 2003).

Between 2000 and 2001, three of the South Fire Aisle USTs including E1 (antifreeze), E3 (diesel fuel), and E4 (15W-40 oil) were removed. In addition, two more USTs were closed-in-place including E5 (75W-90 oil) and E6 (50W oil; Kennedy/Jenks 2003). Confirmation soil sampling activities were performed during the removal of USTs E1, E3, and E4. Confirmation sampling was not performed when USTs E2, E5, and E6 were closed in-place, but was performed as part of the 2003 removal (Kennedy/Jenks 2003).

In February and March 2003, four previously closed in-place USTs were removed. Three of the USTs were located in the South Fire Aisle and historically contained diesel fuel (UST E2) and new motor oil (USTs E5 and E6). The fourth UST (UST 7) was located northeast of the Plastics Shop building and historically contained acetone (Figure 10). Petroleum hydrocarbon-impacted soil was removed, and confirmation sampling activities were performed in association with the removal of each UST to assess the residual concentrations of chemicals of potential concern in soil. Prior to backfilling, 1,890 pounds of ORC was placed in the UST E2 excavation area (Kennedy/Jenks 2003).

Following the completion of the UST removal, soil excavation, and confirmation sampling activities, additional site investigation activities, including further soil excavation and StrataProbe soil borings, were performed in the area east of the UST E6. A total of 735 tons of petroleum hydrocarbon-impacted soil was excavated and transported offsite for disposal (Kennedy/Jenks 2003).

Based on the findings of the investigation, it appeared that hydrocarbon-impacted soil associated with the South Fire Aisle USTs had been removed. Hydrocarbon-impacted soil located east of UST E6 appeared to be from a source other than the South Fire Aisle USTs and was removed in 2004 (Kennedy/Jenks 2003).

On July 17, 2003, Ecology issued a letter of No Further Action for soils in the area of USTs E2, E5, E6, and E7. The determination did not include soils east of the location and did not include groundwater (Ecology 2003b). However, the No Further Action letter is no longer applicable under current MTCA guidance as Ecology does not issue No Further Action for soil only or for one portion of a site.

Additional soil excavations in the eastern portion of the South Fire Aisle were performed between April and August 2004. The final excavation was approximately 300 feet long (from the end of the original 40-foot excavation). All 46 confirmation samples were analyzed for diesel- and oil-range hydrocarbons, and select soil samples were analyzed for RCRA eight metals, VOCs, PCBs, PAHs and gasoline-range hydrocarbons. Final confirmation samples were below MTCA Method A for diesel- and oil-range hydrocarbons (Kennedy/Jenks 2004). Ecology recommends that these results need to be re-evaluated and compared to current applicable screening criteria for the site, which are estimated to be more stringent.

Sediment Evaluation

PACCAR began sediment evaluation work in 2006 to investigate potential sediment quality impacts from the site under an Agreed Order with Ecology. As part of cleanup activities at the site, and at Ecology's request, PACCAR proposed a Sediment Evaluation Work Plan (Anchor 2006) to assess whether upland activities may have resulted in the migration of chemicals to the adjacent LDW and if so, whether these chemicals may have resulted in impacts to sediment quality. The work plan summarizes and evaluates potential pathways to sediments (including seeps, stormwater, and stormwater solids), summarizes existing sediment quality data, and identifies potential data gaps and summarizes activities to fill any identified data gaps.

Phase 1 of the sediment evaluation included surface sediment collection in October and December of 2006. The stormwater, stormwater solids, and seep water sample collection are described in the stormwater and groundwater subsections.

In March 2007, Anchor completed a pathways and data analysis to determine if the sediment evaluation phase 1 results indicated complete pathways from the site to the LDW. The pathway analysis included stormwater discharge, stormwater solids, and seep discharge to the LDW. The investigation did not include analysis of soils. The results of this pathway analysis are discussed in the stormwater and groundwater subsections.

The Sediment Evaluation Phase 2 Work Plan was approved by Ecology and sampling was conducted by Anchor in February 2008. The results are scheduled for May 2008.

3.2.3.1. Uplands

As identified through numerous environmental investigations conducted at the site, the following areas currently contain soil at concentrations exceeding or potentially exceeding industrial soil cleanup levels. Proposed cleanup levels will be more stringent compared to industrial levels. Areas with contamination include the Southwest Storage Area, the Former Off-Highway Building and the Northwest Corner of the site, and the North and South Fire Aisles. In addition, potential contamination may exist on the portion of the property that was previously owned and occupied by Monsanto. The following section summarizes these areas.

Southwest Storage Area

The Southwest Storage Area is located at the western part of the property purchased by PACCAR from Monsanto. The Southwest Storage Area included an area that was backfilled to straighten a “kink” in the LDW sometime between 1961 and 1970 by placing riprap and backfilling behind the riprap. The Southwest Storage Area included three separate and continuous areas: a former Boneyard area, a drum storage area, and a hazardous waste storage area (Kennedy Jenks 2003).

In 1995, a section of the boneyard was excavated to remove petroleum hydrocarbon contaminated soil and approximately 80-cubic yards of soil was disposed offsite. Confirmation samples were analyzed for oil- and diesel-range hydrocarbons and were below the cleanup level of 200 mg/kg. Analysis of arsenic, cadmium, chromium, and lead was also undertaken and only one location (S-1) had values above MTCA Method A industrial levels for lead and chromium (GeoEngineers 1995).

A focused investigation in 2004 was also conducted in the Southwest Storage Area. Soil samples were collected from between 1 and 15-feet bgs at seven locations. Soil in the Southwest Storage Area contains lead at concentrations exceeding the MTCA Method A industrial/commercial soil cleanup level of 1,000 mg/kg. Concentrations of lead exceeded cleanup levels at six locations (BY-1, BY-3, BY-4, BY-5, SWS-1, and SWS-2) with concentrations ranging from 1,030 to 9,220 mg/kg, as shown in Figure 7 (Kennedy/Jenks 2005a). Concentrations ranging from 1,335 mg/kg to 9,220 mg/kg exceeded the soil-to-groundwater screening tool.

Former Off-Highway Building and Northwestern Corner of the Site

Concentrations of petroleum hydrocarbons in soil in the southern portion of the former Off-Highway Building and northwestern corner of the site exceed MTCA Method A industrial soil cleanup levels. The MTCA Method A industrial/commercial soil cleanup for diesel/oil-range hydrocarbons is 2,000 mg/kg. The MTCA Method A industrial/commercial soil cleanup level for gasoline-range hydrocarbons is 100 mg/kg (or 30 mg/kg if benzene is present) (Kennedy/Jenks 2005a). However, the results of this investigation must be re-evaluated and compared to current applicable screening criteria for the site, which are estimated to be more stringent.

Total petroleum hydrocarbons (TPH) concentrations (diesel/oil-range) in soil in the southern portion of the former Off-Highway Building ranged from 3,127 mg/kg (FPD-4) to 11,610 mg/kg (FTD-1). The TPH concentration (diesel/oil range) in soil in the northwestern corner was 2,650 mg/kg (TSA-1), and the TPH concentration (gasoline-range) in soil in the northwestern corner was 3,456 mg/kg (A1). Locations potentially exceeding the MTCA Method C industrial soil cleanup levels for petroleum hydrocarbons are shown on Figure 7 (Kennedy/Jenks 2005a). However, the results of this investigation must be re-evaluated and compared to current applicable screening criteria for the site, which are estimated to be more stringent.

Former Monsanto Property (Southern One-third of the Site)

The former Monsanto Property represents the southern one-third of the former PACCAR site and was purchased by PACCAR from Monsanto in 1965 and annexed to the former PACCAR site.

In 1987, an Environmental Site Assessment (ESA) was conducted on the southern one-third of the site, which was previously owned by Monsanto. Reportedly, Monsanto disposed of approximately 200 tons of waste material on the property between 1952 and 1962. The waste material was reported by Monsanto to be insoluble residues, a by-product of vanillin production operations at the site. These residues included calcium sulfate, calcium carbonate, calcium oxylate, sodium oxylate, copper, and possibly phenolic compounds. The unknown waste areas were reportedly buried with fill in order to expand operations on the former PACCAR site. The site assessment collected several soil (2 to 18.5-feet bgs) and groundwater samples in suspected waste disposal areas and determined that chemical concentrations in soil and groundwater did not pose a threat to human health and the environment (GeoEngineers and Kennedy/Jenks/Chilton 1987).

During the Phase II Data Gaps investigation, soil and groundwater samples were collected from this area on a sampling location grid. Soil samples from this investigation were collected from approximately 0.5 to 7.5-foot bgs. No soil samples from this area exceeded industrial screening levels (Kennedy/Jenks 2004).

Immediately adjacent to the southern property boundary with Rhone-Poulenc, the Northwest Corner Soil Removal was conducted at the former Rhone-Poulenc site in 2006. During this removal, soil contaminated with copper, TPH, and pentachlorophenol (PCP) was excavated from the former Rhone-Poulenc site up to the northern property boundary (also the property boundary with the former PACCAR site). In addition, field observations noted that the discoloration and odor indicated that soil affected by TPH may extend to the north of the property, beyond the property line (Geomatrix 2007a). However, Ecology has recommended that the results of this investigation be re-evaluated and compared to current applicable screening criteria for the property, which are estimated to be more stringent.

North and South Fire Aisles

During removals of USTs in the North and South Fire Aisles, contaminated soils were excavated and disposed of off-site. Confirmation sampling needs to be re-evaluated and compared with current applicable screening levels for the site, which are estimated to be more stringent.

3.2.3.2. Stormwater

The former PACCAR site has three stormwater outfalls: Storm-North, Storm-South, and an inactive middle outfall, which was closed in 2004. All catch basins and roof drains connect to either the Storm-North or Storm-South, which discharge to the LDW. The stormwater system is shown on Figure 11. Stormwater discharge for PACCAR/Kenworth Truck operations at the site was permitted by an Industrial Stormwater General Permit (No. SO3-001784) from November 18, 2000 to February 20, 2003. The permit was terminated because truck manufacturing operations had ceased at the facility (Ecology 2003a). The site is currently leased by IAAI for vehicle storage and is permitted with an Industrial Stormwater General Permit (No. SO3008681A), issued on February 11, 2005. IAAI is required to monitor for zinc, copper, lead, oil/grease, turbidity, and pH. Under a permit by the City of Tukwila, IAAI completed construction of stormwater quality improvements including removal of particulate and metal substances from stormwater. These operations began in February of 2008.

Several investigations of the stormwater system have occurred at the site. These investigations include a Phase I Data Gaps Investigation (Kennedy/Jenks 2002a), Phase II Data Gaps Investigation (Kennedy/Jenks 2004), and subsequent investigations of the northern portion of the stormwater system because groundwater was infiltrating the northern storm drain. Cleanup actions of the stormwater system included a cleaning of the entire stormwater system in 2004, closure of the middle outfall in 2004, and repair of the northern storm drain line in 2006. Recent monitoring included four stormwater events and two stormwater solids events completed in 2006 and 2007 as part of the Agreed Order for sediment evaluation work.

The results of these stormwater investigations and cleanup actions are summarized in the subsections below. The results of the Phase I and Phase II Data Gaps Investigations are only briefly summarized because the entire stormwater system was cleaned following the investigations.

Phase I Data Gaps Investigation

During the Phase I Data Gaps Investigation, stormwater samples were collected from the north and south outfalls. Analytical results of this investigation were compared to EPA National Recommended Water Quality Criteria (NRWQC) Marine Chronic levels. The results indicated that PAHs (fluoranthene, total benzofuoranthenes, indeno(1,2,3-cd)pyrene) and metals (total and dissolved zinc and copper) exceeded the NRWQC Marine Chronic levels in Storm-North and Storm-South. Total and dissolved arsenic exceed screening levels in Storm-North and chrysene exceeded screening levels in Storm-South. In addition, indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, total PCBs, and total mercury had MDLs that exceeded the screening levels (Kennedy/Jenks 2002a).

Phase II Data Gaps Investigation

During the Phase II Data Gaps Investigation, stormwater samples were collected from the north and south outfalls. Analytical results of this investigation were similar to the Phase I results, and were compared to NRWQC. The results indicated that PAHs (benzo(a)anthracene, benzo(a)pyrene, dibenzo(a,h) anthracene, fluoranthene, indeno(1,2,3)pyrene), metals (total and dissolved copper and zinc), and dibenzofuran exceeded NRWQC in Storm-North and Storm-South outfalls. Total lead and total PCBs also exceeded screening levels in Storm-South. In addition, total and dissolved mercury and pesticides (heptachlor, aldrin, chlordane) had MDLs that exceeded screening levels (Kennedy/Jenks 2004).

As part of this investigation, solids accumulated in the Storm-North catch basin, inactive Middle Outfall pipe and catch basin, and the Storm-South catch basin were collected for analysis. Although not technically applicable, SMS (SQS and CSL) were compared to analytical results for illustrative purposes. The SMS dw criteria were based on LAET and 2LAET. The results of this investigation are summarized in the subsections below.

<u>North Catch Basin</u>

In the north outfall catch basin, metals (cadmium and zinc), phthalates (BEHP, dimethyl phthalate), total PCBs, and benzoic acid exceeded CSL. One PAH, 2-methylnapthalene, exceeded SQS. In addition, total chlorinated dibenzo-p-dioxins (CDDs) and chlorinated dibenzofurans (CDFs) were calculated using Toxicity Equivalency Factor at a concentration of 26.18 pg/g (Kennedy/Jenks 2004).

<u>Middle Outfall and Catch Basin</u>

Analytical results from the middle outfall indicated that concentrations of metals (cadmium, lead, and zinc) and PCB Aroclor 1254 exceeded CSL in the middle outfall. In the middle outfall catch basin, metals (cadmium, lead, zinc, mercury), PCBs, benzoic acid, and phthalates (BEHP, BBP, and di-n-butyl phthalate) exceeded CSL. Arsenic and dibenzo(a,h)anthracene exceeded

SQS. In addition, CDDs and CDFs were calculated using Toxicity Equivalency Factor at concentrations of 2,399 picograms per gram (pg/g) in the middle outfall and 27,530 pg/g in the middle outfall catch basin (Kennedy/Jenks 2004).

South Outfall Catch Basin

In the south outfall catch basin, metals (cadmium and zinc) phthalates (bis(2-ethylhexl)phthalate, BBP, dimethyl phthalate), SVOCs (benzoic acid and benzyl alcohol), and PCBs exceeded CSL. Diethyl phthalate exceeded SQS. In addition, diesel- and oil-range hydrocarbons were detected at 2,890 mg/kg and 7,780 mg/kg, and CDD and CDF were detected at 19.5 pg/g (Kennedy/Jenks 2004).

Stormwater System Cleaning

In 2004, the entire stormwater system was cleaned of all solids by pressure washing and vacuuming the storm drain lines and catch basins, removing all the solids and water. The solids and water were disposed of offsite at an authorized facility. In addition, the middle outfall and middle outfall catch basin were filled to prevent infiltration of stormwater into the middle outfall. The former catch basin was subsequently covered with a steel plate and sealed with asphalt. The site was sold to Merrill Creek Holdings, LLC in 2004 after the lines were cleaned (AMEC 2006a).

Stormwater and Stormwater Solids Monitoring

As part of the Agreed Order (No. DE 3599) for sediment evaluation work, stormwater and stormwater solids were sampled at the former PACCAR site to determine if potential contamination in the stormwater system is impacting LDW sediments adjacent to the site (Figure 12). Four stormwater events (October 2006, March 2007, May 2007, and July 2007) and two stormwater solids events (October 2006 and March 2007) were conducted as part of the Agreed Order.

Analytical results for the four stormwater sampling events were compared to Washington State Marine Chronic Water Quality Criteria and are presented in Table 3 and Figure 13. All four stormwater sampling events detected two dissolved metals (copper and zinc) exceeding screening criteria in Storm-North and/or Storm-South samples. In Event 4, PCBs were detected in Storm-South at 0.055 µg/L and slightly exceeded screening criteria. Concentrations of other detected metals were below the screening criteria in all four sampling events. The only detected organic chemicals included PCBs, BEHP, and di-n-octylphthalate, which were below screening criteria (Anchor 2008).

Analytical results for Event 1 and 2 stormwater solids sampling is presented in Table 4 and Figure 14. The following results exceeded SMS dry-weight criteria (Anchor 2007a):

- PAHs - Low molecular weight PAHs increased from 1,120 micrograms per kilogram (µg/kg) dw and 1,233 µg/kg dw from Event 1 to 3,460 µg/kg dw and 2,750 µg/kg for Event 2 from samples for Storm-North and Storm–South locations. High molecular

PAHs increased from 1,300 µg/kg dw and 7,836 µg/kg dw from Event 1 to 36,020 µg/kg dw and 26,760 µg/kg dw for Event 2 from samples for Storm-North and Storm–South locations.

- PCBs - Total PCB concentrations for the Storm-South sample was 160 µg/kg dw for Event 1. Total PCB concentrations for the Storm-North and Storm-South were 313 and 950 µg/kg dw for Event 2 samples.

- Phthalates - BEHP increased from 10,000 µg/kg dw and 4,500 µg/kg dw for Event 1 results to 62,000 µg/kg dw and 26,000 µg/kg dw for the Event 2 results from Storm-North and Storm-South, respectively.

- Metals - Metals results from Event 2 show a general increase in concentrations over the Event 1 results. In Event 2, metals that exceeded screening criteria at Storm-North were lead (764 µg/kg dw), mercury (0.9 µg/kg dw), and zinc (1,110 µg/kg dw).

Stormwater Pipe Repair 2006

Several investigations of the north stormwater system showed that the source of VC in the stormwater system was a result of shallow groundwater infiltrating the storm drain lines. In February and March of 2005, an investigation identified locations of groundwater infiltration within the northern portion of the storm drain system. Specifically, two site visits included visual inspection of selected sections of the system, collection of water samples from the stormwater system, collection of one groundwater sample, and a video survey of the selected sections of the storm line. The investigation identified several locations along the storm line where there were either cracks or evidence of groundwater infiltration. In addition, sample results detected VC in CB-74A, CB-74B, MH-68, and Lift Station-1. Recommendations were made to repair sections with minor damage with a cured-in-place method, and replace the section westbound of CB-74 (AMEC 2005).

In the October of 2006, the storm line pipe from CB-74 to the lift station was repaired in accordance with the *Draft Storm Drain Cured in Place Pipe Repair Work Plan* (AMEC 2006b). The pipe was repaired by inserting a pipe liner and using a cured in place method. Following the repair, a Public Works Final Inspection was completed by the City of Tukwila (AMEC 2007a).

Stormwater Quality Improvements

IAAI completed construction of stormwater quality improvements in February 2008 under a permit issued by the City of Tukwila as part of a Shoreline Substantial Development Permit issued in 2004. The improvements, which include a Vortech pretreatment system at the north and south outfalls, are scheduled for completion in February 2008. Stormwater monitoring in 2008 will be expanded. Monitoring parameters will include all chemicals of concern at the site in addition to the standard parameters. The results of the expanded monitoring will assist in determining whether an individual NPDES permit will be required for this site in the future.

3.2.3.3. Groundwater

The site geology and groundwater conditions are summarized in the paragraphs below.

The subsurface soils on site primarily consist of dredged sand, silt, and imported fill material, approximately 3 to 8 feet thick. At various locations on site, areas are underlain by structural fill from previous utility construction and paving. An unconfined saturated zone has been identified beneath this fill in a fine- to medium-grained sand layer that extends to approximately 40 feet bgs. Shallow groundwater has been encountered at depths ranging from approximately 4 to 7 feet bgs. The upper portion of the sand unit contains interbedded and laterally discontinuous layers of silt, sandy silt, and imported structural fill. Below this sand unit, an aquitard of silt and silty sand has been encountered between approximately 40 and 75 feet bgs. A lower aquifer occurs in sand, which is reportedly underlain by glacial till and bedrock (Kennedy Jenks 2004).

Groundwater at the site ranges from 5 to 12 feet bgs. The shallow zone horizontal groundwater gradient is generally to the west across the site, but is strongly influenced by tidally induced water level fluctuations, particularly on the western half of the site. The amount of water level fluctuation ranges from approximately 3 to 4 feet near the LDW to 0.04 foot in the eastern portion of the site. Groundwater flow is influenced by tidal fluctuations in the LDW, which cause twice-daily gradient reversals (Kennedy Jenks 2004).

The following three water-bearing zones have been identified at the site:

- Upper portion of the upper saturated zone (shallow zone or “A” zone).
- Lower portion of the upper saturated zone (intermediate zone or “B” zone).
- Upper portion of the lower saturated zone (deep zone or “C” zone; AMEC 2006c).

Currently there are 17 monitoring wells in Zone A, six monitoring wells in Zone B, and two monitoring wells in Zone C. These monitoring wells are shown on Figure 15.

Numerous groundwater investigations have been conducted at the site since 1986. Data collected during these investigations indicate that the following compounds were detected in site groundwater: VOCs, SVOCs, PAHs, PCBs, petroleum hydrocarbons, phthalates, and metals. These groundwater investigations included a site-wide groundwater monitoring event for the Phase I Data Gaps Investigation (Kennedy/Jenks 2002a) and Phase II Data Gaps Investigation (Kennedy/Jenks 2004), a Draft Wet Season Groundwater Study (AMEC 2006c), and a Draft Dry Season Groundwater Study (AMEC 2007b). In addition, an AS/SVE was installed as an interim remedial action in 2004 to intercept and treat VOCs in the shallow groundwater at the site. Monitoring of the AS/SVE system includes quarterly groundwater monitoring for VOCs at selected groundwater wells. The results of these groundwater investigations and monitoring are summarized in the subsections below. Only the most recent groundwater data from the Draft Wet and Dry Season Groundwater Studies were compared with the groundwater-to-sediment screening tool.

Phase I Data Gaps Investigation 2002

During the Phase I Data Gaps Investigation (Kennedy/Jenks 2002a), 13 new groundwater monitoring wells were installed at the site. During the site-wide groundwater monitoring event, 28 shallow zone wells, eight intermediate zone wells, and two deep wells were sampled. The results of this investigation are summarized below:

- VC, 1,1 DCE, and TCE are considered chemicals of concern in the shallow zone groundwater throughout the western portion of the site.
- Petroleum hydrocarbon compounds and chrysene were considered chemicals of concern in the shallow zone groundwater in the South Fire Aisle. However, soils in this area were excavated from 2003 to 2004.
- Arsenic and selenium were the only metals detected at concentrations above applicable surface water standards. When evaluated with respect to background levels, arsenic exceedances are limited to two areas of the site: the northwestern corner near the Boeing facility and in the southern portion of the site, formerly owned by Monsanto.

Phase II Data Gaps Investigation 2004

During the Phase II Data Gaps Investigation (Kennedy/Jenks 2004), a total of 26 reconnaissance groundwater samples were collected throughout the site. The results of this investigation are summarized below:

- Analytical data were generally consistent with the Phase I data with VOCs detected in groundwater in the western portion of the site and arsenic detected above natural background at the site.
- Gasoline-range hydrocarbons were detected above surface water standards in the northwest corner of the site.
- Petroleum hydrocarbons were not detected in new South Fire Aisle wells MW-6A(R) and MW-42A, installed near former leaking UST E2, at concentrations above surface water standards. Soil removal activities in South Fire Aisle and the use of ORC have reduced the petroleum hydrocarbon concentrations in groundwater in this portion of the site.

Wet Season Groundwater Study 2006

In March 2006, a site-wide wet season groundwater investigation (AMEC 2006c) was conducted, sampling 25 monitoring wells. Groundwater samples were analyzed for the full suite of SMS chemicals, VOCs, SVOCs, TPH, PCBs, and dissolved priority pollutant metals. The draft results of this investigation are summarized in the subsections below.

<u>Upland Monitoring Well Results</u>

Analytical results from upland groundwater sampling were compared to surface water screening criteria. The following chemicals exceeded the surface water screening criteria in the upland area and are potential chemicals of concern: PCE; TCE; cis-1,2-DCE; 1,1-DCE; VC; methylene chloride; benzo(g,h,i)perylene; BEHP; PCBs; copper; zinc; and nickel. All of the above compounds were detected in the Zone A groundwater and BEHP was also detected at one location in the Zone B groundwater. The following trends are apparent:

- VOCs – Concentrations of chlorinated solvents (PCE, TCE, cis-1,2-DCE, 1,1-DCE, and VC) exceeding surface water screening criteria are present in the northern and western areas of the site, which is consistent with the previously identified UST (removed in 1986) leak in the area to the central-northern part of the site.
- SVOCs – Concentrations of BEHP exceeding surface screening criteria were detected in seven of the inland wells across the site and one well in the south fire aisle have a concentration of benzo(g,h,i)perylene exceeding the criteria.
- PCBs – Concentrations of PCBs exceeding surface water screening criteria were detected in two of the inland wells located in the northeast and eastern areas of the site.
- Metals – Copper concentrations were found above surface water screening criteria across the site and elevated copper concentrations are present in the site's upgradient well situated along the eastern site boundary. Nickel and zinc concentrations exceeding surface water screening criteria appear to be limited to the southern property boundary.
- Pesticides, TPH, and non-aqueous phase liquids were not detected in the upland site groundwater.

Nearshore Monitoring Well Results

The analytical results for monitoring wells adjacent to the LDW (MW-26A, MW-26B, MW-26C, MW-29A, MW-29B, MW-29C, MW-30A, MW-35A, MW-35B, MW-36A, and MW-36B) were compared to surface water screening criteria. Based on the analytical results, potential chemicals of concern in the nearshore wells include VC, fluoranthene, BEHP, PCBs, chromium, and copper.

- VOCs – VC exceeded surface water screening criteria at two wells.
- SVOCs – BEHP exceeded surface water screening criteria in three shallow and one deep nearshore wells. Fluoranthene exceeded surface water screening levels in only one of the nearshore wells in the SW corner of the site.
- PCBs – PCBs were detected in only one nearshore well at a concentration above the surface water screening criteria.
- Metals – Chromium was detected in two shoreline monitoring wells, one in the shallow Zone A and one in the intermediate Zone B, in concentrations below the surface water screening criteria but exceeding the SMS screening value. Copper exceeded the surface water screening criteria in one shallow and one intermediate zone well.
- Pesticides, TPH, and non-aqueous phase liquids were not detected in nearshore well groundwater (AMEC 2006c).

Arsenic was not detected above surface water screening levels on the former PACCAR site. However, arsenic (213 µg/L) exceeded surface water screening levels in MW I-206, located on the Boeing Thompson property, north of the site boundary with the former PACCAR site (AMEC 2006c). For more information on arsenic contamination on the Boeing Thompson property and the potential migration of this contamination to the former PACCAR site, refer to the *Draft Lower Duwamish Waterway Early Action Area 6 Summary of Existing Information and Identification of Data Gaps Report* (SAIC 2008).

On the former PACCAR site, concentrations of BEHP exceeded both SQS- and CSL-based groundwater-to-sediment screening levels. Concentrations of PCBs and zinc exceeded SQS-based groundwater-to-sediment screening levels.

Dry Season Groundwater Study 2006

In August 2006, a site-wide dry season groundwater investigation (AMEC 2007b) was conducted, sampling 25 monitoring wells. Groundwater samples were analyzed for the full suite of SMS chemicals, VOCs, SVOCs, TPH, PCBs, and dissolved priority pollutant metals. The results of the *Draft Dry Season Groundwater Study Report* (AMEC 2007b) were generally consistent with the results of the Wet Season Groundwater Study. Based on the analytical results, chemicals of concern in upland wells include PCE, TCE, cis-1,2-DCE, VC, BEHP, fluoranthene, PCBs, copper, and nickel. Potential chemicals of concern in the nearshore wells include BEHP, benzyl alcohol, chromium, nickel, zinc, and copper.

Arsenic exceeded surface water screening levels in Boeing MW I-206 at a concentration of 235 μg/L. This concentration of arsenic also exceeded the SQS-based groundwater-to-sediment screening level (AMEC 2007b). On the former PACCAR site, concentrations of BEHP exceeded both SQS- and CSL-based groundwater-to-sediment screening levels.

Air Sparging/Soil Vapor Extraction (AS/SVE) System

As an interim remedial action, an AS/SVE system was installed to intercept and treat VOCs in the shallow groundwater before discharging to the LDW. The VOCs originated from the former solvent UST and paint area at the North Fire Aisle portion of the site. The system was installed in a trench cut perpendicular to the general path of groundwater flow to reduce the potential for these compounds to migrate to the LDW. The AS/SVE system includes 33 air sparging wells and six horizontal soil vapor extraction lines that provide a treatment zone of influence that extends well beyond the estimated width of the VOC plume at the site (Figure 15). Installation of the system began in March 2004 and the system startup was completed in July 2004. Groundwater monitoring wells MW-7A and MW-41A were located at the northern and southern limits of the trench. These wells are intended to measure VOC concentrations in groundwater during system operation to monitor the lateral effects of air sparging, and verify that contaminated groundwater is not moving around the edges of the treatment zone. As part of operations and maintenance, weekly monitoring of system performance and equipment, and quarterly groundwater monitoring for VOCs is conducted (Kennedy/Jenks 2005b).

The most current round of groundwater monitoring was conducted on June 29, 2007 from shallow zone monitoring wells MW-7A and MW-41A located at the northern and southern ends of the AS/SVE system and from shallow zone wells MW-26A, MW-29A, MW-30A, MW-35A, MW-36A, and MW37A located downgradient from the AS/SVE treatment area (along the bulkhead, adjacent to the LDW; Figure 15). The analytical results of this round of groundwater monitoring did not detect VOC concentrations that exceeded screening levels, which included the MTCA Method B Surface Water Cleanup Level and the NRWQC Human Health for

Consumption of Organisms Level (Kennedy/Jenks 2007). Analytical results for groundwater monitoring are summarized in Table 5.

Since the start up of the AS/SVE, the system has operated as designed and has provided a treatment zone of influence adequate to reduce VOC concentrations in groundwater. In January 2007, concentrations of VC in MW-7A (13.0 µg/L) and MW-35A (4.39 µg/L) exceeded the MTCA Method B Surface Water Cleanup Level of 3.69 µg/L. However, no VOC concentrations have exceeded the screening levels in the past two quarters (Kennedy/Jenks 2007).

Seeps

There are six seeps located on the shoreline bank adjacent to the site boundary with the LDW (Figure 12). Water from these seeps was sampled during the Phase I Data Gaps Investigation (Kennedy/Jenks 2002a) and recently during the Sediment Evaluation Phase 1 Work (Anchor 2007a). The results of these two investigations are summarized in the paragraphs below.

During the Phase I Data Gaps Investigation, grab samples were collected from Seeps 1, 2, 4, 5, and 6. All of the seeps have low flow, but Seep 3 did not have sufficient flow to sample. The results of this investigation detected total arsenic (7.5 µg/L), copper (33.8 µg/L), and lead (16 µg/L) from the Seep 2 sample at concentrations above natural background concentrations for arsenic and above Ecology's Chronic Freshwater Surface Water Quality Standard for copper and lead. Dissolved metals were not detected above applicable surface water standards (Kennedy/Jenks 2002a). Dissolved metals did not exceed the groundwater-to-sediment screening levels.

During the Sediment Evaluation Phase 1 Work, seep water samples were collected from Seeps 2, 4, 5, and 6. Seeps 1 and 3 were not sampled because they were not observed during the investigation. The results of this investigation detected concentrations of dissolved copper above the Washington State Marine Chronic Water Quality Criteria (3.1 µg/L) in three of the four seeps ranging from 3.5 to 6.3 µg/L (Anchor 2007a). The results of this investigation did not exceed the groundwater-to-sediment screening levels.

3.2.3.4. Spills

PACCAR maintained a SWPPP (PACCAR 2001) in accordance with the former Industrial Stormwater General Permit (No. SO3-001784) that was in effect from October 4, 2000 to February 20, 2003. According to the spill and leak log from the SWPPP, there have been four reported leaks and no reported spills at the facility. Spill control and cleanup prevented the leaks summarized below from discharging to the LDW:

- November 12, 1999 - Five gallons of white paint were spilled in the Receiving Building.
- December 2, 1999 - Two gallons of diesel fuel were spilled from a delivery truck near the Receiving Building.
- January 26, 2000 - 3,468 gallons of diesel fuel were spilled from a UST diesel fuel supply line in the South Fire Aisle.

- May 31, 2000 - Less than one gallon of simple green was spilled in the Maintenance Building.

Currently, the site is leased to IAAI for storage and auction of damaged vehicles. IAAI is no longer required to maintain a SWPPP. IAAI has volunteered to conduct several preventative measures, such as placing absorbent socks in stormwater catch basins, sweeping the paved areas weekly, and cleaning the storm drains before the new system was activated. It is unknown whether these measures are sufficient to prevent potential leakage from damaged vehicles stored on the site from migrating via the stormwater system and discharging to the LDW.

3.2.3.5. Bank Erosion/Leaching

The shoreline adjacent to the LDW is contained within a metal sheet pile bulkhead for northern two-thirds of the shoreline and heavily armored with riprap for the southern one-third of the shoreline. No soil sampling has been conducted on the shoreline bank.

Historically, Monsanto sprayed the shoreline banks with metal wastes, a by-product from the vanillin manufacturing process to control weeds (EPA 1993). Because the southern one-third of the property was formerly owned by Monsanto and is currently comprised of riprap, it is possible that soil contamination exists on the shoreline bank of the portion of that property.

Sediment

The following section summarizes sediment data from sampling locations adjacent to the property that were collected during several investigations. As shown on Figure 16, PCB concentrations measured in 1997 exceeded the SMS cleanup screening level (CSL; 65 mg/kg OC-normalized) at locations EIT061 (134 mg/kg OC) and EST144 (133 mg/kg OC). The 2005 LDWG results for sample LWD-SS121 (57 mg/kg OC) that is co-located with sample EIT061 was below the CSL. The SQS (12 mg/kg OC) was exceeded in 1997, 1998, and 2005 at locations EST143 (24 mg/kg OC), DR236 (15 mg/kg OC), LDW-SS120 (32 mg/kg OC), and LDW-SS121 (57 mg/kg OC). Location EST144 (133 mg/kg OC) is near the Middle Outfall; however, the LDWG 2005 result for a sample LDW-SS123 (8 mg/kg OC), which is co-located with EST144, was below the SQS. In addition, samples DR277, R34, R35, and EIT062 were collected in the immediate vicinity of EST144 and contained low concentrations of PCBs (below the SQS; Anchor 2006).

Available surface sediment data collected adjacent to the site indicates that the following chemicals exceed the chemical SQS set forth in the SMS:

- Total PCBs
- Mercury
- Lead
- Dibenz(a,h)anthracene
- Butylbenzylphthalate
- Phenanthrene
- Fluorene

Chemicals analyzed for, but which had detection limits greater than, the applicable SMS criteria include chlorinated benzenes, phenols, and benzyl alcohol (Anchor 2006).

3.2.4. Potential Pathways of Contamination

3.2.4.1. Stormwater

Although the stormwater system at the site was cleaned in 2004, chemicals of concern are still detected above screening criteria in stormwater and stormwater solids. Results of recent monitoring in 2007 indicate that copper and zinc exceeded Washington State Marine Chronic Water Quality Criteria in stormwater. Results of recent stormwater solids monitoring in 2007 indicated that cadmium, lead, zinc, flouranthene, dimethylphthalate, butylbenzylphthalate, BEHP, total benzofluoranthenes, total high molecular weight PAHs, 4-methylphenol, benzyl alcohol, and benzoic acid exceed dry-weight CSL. PCBs exceeded dry-weight CSL. In addition, PCBs and butylbenzylphthalate exceeded SQS criteria in some of the sediments adjacent to the site.

In the *Pathways and Data Analysis Memorandum* (Anchor 2007b), Anchor determined that although copper and zinc exceeded Washington State Marine Chronic Water Quality Criteria in stormwater, neither of these chemicals were found in surface sediments adjacent to the site at levels exceeding the SQS. Sediment coring results will be available in May 2008. In addition, Anchor determined that none of these chemicals in surface sediments adjacent to the site were elevated when compared to concentrations measured by the LDWG in the rest of the LDW.

Recent monitoring indicates that chemicals of concern are detected above screening criteria in stormwater and stormwater solids. Although some of these chemicals were not detected in surface sediments adjacent to the site, no sediment core sampling has been conducted to evaluate the potential historic contamination. The Sediment Evaluation Phase 2 Work sediment coring results will be available in May 2008 for selected locations in the LDW adjacent to the property. IAAI is planning to conduct a further investigation of stormwater and stormwater solids in 2008 in order to evaluate stormwater discharge as a potential pathway of concern to LDW sediments.

3.2.4.2. Groundwater

The results of the most recent groundwater investigations in 2006 indicate that PCE, TCE, cis-1,2-DCE, 1,1-DCE, VC, methylene chloride, benzo(g,h,i)perylene, fluoranthene, BEHP, PCBs, benzyl alcohol, copper, chromium, zinc, and nickel are contaminants of concern in upland groundwater because they exceed surface water screening criteria (AMEC 2006c; AMEC 2007b). In addition, BEHP, PCBs, and zinc exceeded the groundwater-to-sediment screening tool.

In the *Pathway and Data Analysis Memorandum* (Anchor 2007b), Anchor determined that although BEHP was detected in nearshore groundwater above SMS screening criteria, these concentrations did not exceed SMS criteria in sediments adjacent to the site. In addition, Anchor estimated that because BEHP was not detected in seep water, the groundwater pathway is incomplete. Ecology recommends further investigation of the BEHP pathway(s).

Although BEHP was not detected in seep water, the hydrogeologic conditions at the site are complex and tidally influenced. The lack of BEHP in seep water does not exclude the possibility that groundwater from the site could be migrating to the LDW through hydrologic connections other than seep water. Further investigation is needed to better characterize groundwater as a pathway of potential concern.

3.2.4.3. Spills

IAAI has an Operations and Maintenance Plan that requires immediate attention to any spills and leaks, weekly sweeping of the entire site, and use and inspection of absorbent socks in each of the catch basins. IAAI is monitoring the catch basins for accumulation of solids and conducting quarterly monitoring of the pretreatment systems before discharge to the LDW.

It remains a concern that potential leakage from damaged vehicles could migrate via stormwater and discharge into the LDW.

3.2.4.4. Bank Erosion/Leaching

The shoreline bank of the site is armored with a metal sheet pile bulkhead at the northern two-thirds of the shoreline and with riprap at the southern one-third of the shoreline. Because the upper shoreline soils are not exposed and the shoreline bank is armored, there is a low potential for soil erosion into the LDW, except through seep and groundwater flow. However, because the shoreline armoring is not impermeable and the shoreline is inundated by twice daily tides, a potential pathway is present for migration of contaminants and bank leaching to occur and potentially impact the LDW.

The southern one-third of the site, including the riprap shoreline bank, was previously owned and operated by Monsanto. Historically, Monsanto sprayed the shoreline banks with metal wastes, by-products from the vanillin manufacturing process, to control weeds (EPA 1993). It is possible that soil contamination exists on this part of the shoreline bank. If contamination exists within the shoreline bank, bank leaching could present a source of contamination to the LDW.

3.2.5. Data Gaps

3.2.5.1. Uplands and Groundwater

Ecology is currently addressing soil and groundwater contamination in the uplands portion of the site, and issued a Determination of Potential Liability to PACCAR, Inc. and Merrill Creek Holdings, LLC. In addition, Ecology intends to negotiate an Agreed Order to address upland cleanup and source control of soil and groundwater contamination at the site.

At present, there are several data gaps for soil and groundwater at various locations throughout the site. Ecology is currently negotiating site specific tasks for investigation, feasible alternative cleanup actions, and cleanup levels that are applicable for upland cleanup and source control. In general, these data gaps identify areas of the site that need further investigation or re-evaluation of previously collected data compared with site specific cleanup levels, which are to be determined. These data gaps include:

- Additional investigation of soil and groundwater for petroleum hydrocarbons, PAHs, VC, PCBs, and metals in the Southwest Storage Area and southern portion of the site (approximately grid locations C6 through P6, as shown on Figure 6).
- Additional investigation of soil and groundwater for VOCs (PCE, TCE, DCEs, and VC) at source areas near former UST locations in the North Fire Aisle and paint area including MW-8A, MW-28A, MW-14, and MW-24A.
- Additional investigation of soil and groundwater for VOCs below the four drains and vault locations of the former paint room.
- Confirmation and re-evaluation of soil and groundwater compliance sampling for petroleum hydrocarbons, PAHs, and metals at the former Wash Pit Area, south of the Maintenance Building.
- Confirmation and re-evaluation of soil and groundwater compliance sampling for petroleum hydrocarbons, PAHs, and metals at grid location H4, south of the Off-Highway Building, and northwest corner of the site.
- Confirmation and re-evaluation of soil and groundwater compliance sampling for petroleum hydrocarbons, PAHs, and metals in the excavation area east of the South Fire Aisle USTs.
- Confirmation and re-evaluation of soil and groundwater compliance sampling for petroleum hydrocarbons, PAHs, and metals surrounding the former USTs north of the Administration Building (approximately grid locations Q2 and Q3 through P2 and P3, as shown on Figure 6).
- Confirmation and re-evaluation of soil and groundwater compliance sampling for petroleum hydrocarbons, PAHs, and metals at the northwest corner including in the area of grid location A1 and the oil/water separator.
- Additional investigation of stormwater solids in the middle outfall, including associated storm drain lines and catch basins, for PCBs and dioxins/furans. Additional investigation of soil and groundwater adjacent and beneath the middle outfall and storm drain lines to determine potential lateral and vertical extent of PCBs and dioxins/furans.
- Additional investigation of soil and groundwater surrounding MW-26A and MW-42A to determine potential lateral and vertical extent of PCBs and dioxins/furans.
- Additional investigation of soils and groundwater surrounding MW-26A, MW-28A, MW-39A, MW-11A, and MW-30A for BEHP.
- Additional investigation of soils and groundwater surrounding MW-30A for fluoranthene.
- Additional investigation of soils and groundwater surrounding MW-25A, MW-7A, MW-40A, MW-14A, MW-27A, MW-39A, MW-37A, MW-30A, MW-41A, MW-9A, MW-42A, and MW-1A.

3.2.5.2. Stormwater

Results of recent stormwater sampling detected dissolved copper and zinc exceeding Washington State Marine Water Quality Criteria (Anchor 2008). Recent stormwater solids sampling detected several contaminants at concentrations exceeding dry-weight SMS criteria (Anchor 2007b).

Stormwater quality improvements are currently under construction and scheduled for completion in 2008. Monitoring of stormwater and stormwater solids will be required following completion of construction and will assist in determining if an NPDES permit will be required. Results of future monitoring of stormwater and stormwater solids are necessary to determine the extent to which stormwater and stormwater solids may be an on-going source of contamination to the LDW.

3.2.5.3. Spills

Possible leakage or spills from damaged vehicles stored on the property remains a potential concern for contaminants migrating via the stormwater system and discharging to the LDW.

3.2.5.4. Bank Erosion/Leaching

Because the upper shoreline soils are not exposed and the shoreline bank is armored, there is a low potential for soil erosion into the LDW, except through seep and groundwater flow. However, because the shoreline armoring is not impermeable and the shoreline is inundated by twice daily tides, it is possible that bank leaching occurs. Further investigation is necessary to determine the extent to which erosion and leaching may occur.

It is possible that soil contamination exists within the shoreline bank of the southern one-third of the site, due to information that Monsanto historically sprayed the shoreline banks with vanillin black liquor wastes to control weeds. It is currently unknown whether soil contamination is present and is a data gap.

3.3 Former Rhone-Poulenc Site

3.3.1. Current Operations

The former Rhone-Poulenc, Inc. facility is located at 9229 East Marginal Way South in Tukwila, Washington. The site is approximately 21.5 acres, 19.5 of which are uplands and 2.0 of which are intertidal mudflats in the LDW. The site is bordered by the former PACCAR site to the north, East Marginal Way South to the east, the BDC and the Slip 6 inlet to the south, and the LDW to the west (Figure 2). The site and surrounding area are zoned for heavy industrial use.

Since the facility's closure in 1991, there have been no manufacturing activities ongoing at the facility. The process equipment, most tanks, and several buildings were dismantled or removed during the closure. Container Properties, LLC (Container Properties), the current owner, has subdivided and redeveloped the property into two separate parcels (the West Parcel and East Parcel; Figure 17). Container Properties has recently issued a 15-year lease for the west parcel to IAAI who also leases the former PACCAR property to the north.

According to the King County Tax Assessor website, the West Parcel (Parcel No. 5422600010) is an approximate 14-acre property that is currently paved and leased to IAAI for storage of wrecked cars prior to auction or offsite recycling. The East Parcel (Parcel No. 5422600020) is an approximate 7-acre property that is now owned by the MOF (King County 2007a).

To the north of the site is the approximately 25-acre former PACCAR, Inc. property (8801 East Marginal Way South, Parcel 5422600060), owned by Merrill Creek Estate Holdings, LLC. The property is currently a commercial property that is leased to IAAI for storage of wrecked cars prior to being auctioned or transported offsite for recycling. South of the site is the Slip 6 inlet and the BDC, which is comprised of three properties (Parcel No. 5624201032 – 25.78 acres, Parcel No. 5624201038 – 3.78 acres, and Parcel No. 5624201036 – 1.63 acres). The BDC property is currently used for aircraft and aerospace research and development. To the east of the site is an approximately 565-acre property (6505 Perimeter Rd South, Parcel No. 2824049007) owned by King County, which is currently the KCIA and contains an air terminal and hangars (King County 2007a).

Investigation and cleanup is being conducted at the former Rhone-Poulenc site under RCRA Administrative Order on Consent (No. 1091-11-20-3008(h), dated March 31, 1993, as amended) by the current owner, Container Properties, and former property owners Rhodia Inc and Bayer CropScience. The site is being cleaned up because toxic wastes from the site are migrating within the groundwater to the LDW. Site contaminants include toluene and metals, mainly copper. Since the former Rhone-Poulenc site has been divided into the East and West Parcels, the East Parcel has been significantly remediated and redeveloped. EPA issued a remedy selection and a partial determination of "Corrective Action Complete Without Controls" for the East Parcel on December 20, 2006 (EPA 2006a).

The paragraphs below summarize available site information from Ecology and EPA online databases.

The former Rhone-Poulenc facility is listed as a hazardous facility on Ecology's online Hazardous Site Facility Search Database with RCRA Site Identification No. WAD009282302 (Ecology 2007b). In addition, Rhone-Poulenc is listed on Ecology's CSCSL database with Facility Site ID 2150. The site is listed with suspected and/or confirmed contamination in soils and groundwater. Potential contaminants include EPA priority pollutant metals, corrosive wastes, and inorganic conventional contaminants. According to the database (Ecology 2007c), the site was listed as a hazardous site on March 1, 1988, and is currently awaiting a site hazard assessment.

According to Ecology's online NPDES and State Water Discharge Permit database, there is no NPDES Individual Wastewater Discharge permit or NPDES Industrial Stormwater General Permit listed for the former Rhone-Poulenc site (Ecology 2007d, 2007e). However, the IAAI operations on the West Parcel are covered under the Industrial Stormwater General Permit

(SO3008681A), the same permit for IAAI operations on the former PACCAR site. There is currently a Revised Wastewater Discharge Permit (No. 7789-01) for Container Properties to discharge treated wastewater from a groundwater extraction and treatment system to the King County sanitary sewer system. The permit was issued on May 19, 2004, and has been revised to extend the expiration date to May 19, 2009 (King County 2006).

Rhone-Poulenc is not listed in Ecology's online LUST and UST databases (Ecology 2007f).

The EPA TRI database annually records toxic releases and other waste management activities. Available data include reports on releases, water transfers, and waste quantity from 1988 to 2005. The former Rhone-Poulenc site is listed with TRI No. 98108RHNPL9229E, and database records indicate that total on- and off-site releases ranged from 0 to 636,166 pounds, depending on the year and the chemical. The majority of these releases were air emissions; however, some waste was transferred offsite for waste management. Wastes included copper compounds, phthalates, sodium hydroxide, sulfuric acid, and toluene (EPA 2007).

3.3.2. Historical Use

Industrial use of the site began in the 1930s when I. F. Laucks built a pilot plant to formulate glue for use in plywood manufacturing. In the mid-1940s, the site was used as a prisoner-of-war camp. In 1946, the site was purchased by Monsanto Chemical Company, which continued manufacturing glue, paints, and resins, and handling of wood preservatives. In 1952, Monsanto began producing vanillin, which continued through the sale of the property to Rhone-Poulenc in 1986. Rhone-Poulenc continued operations until 1991 when the manufacturing ceased. The title was transferred to Rhodia in January 1998. Rhodia then sold the property to Container Properties, the current owner, in November 1998 (Geomatrix 2006a).

Limited information is publicly available about historical site operations and the vanillin manufacturing process due to lack of historical documentation and proprietary information that is protected under Confidential Business Information.

3.3.3. Environmental Investigations and Cleanup Activities

Since the site closure in 1991, investigations have been conducted to evaluate environmental impacts to soil and groundwater from the former vanillin plant. Historical releases of hazardous substances occurred at the site. Released constituents include caustic soda, toluene, mineral oil, PCBs, and copper. The investigations have followed the RCRA process from an initial RCRA Facility Assessment (RFA) through the RCRA Facility Investigation (RFI). Studies completed subsequent to the RFI include geoprobe and geotechnical investigations conducted in support of the interim measure design and focused investigations to assess subsurface structures, previously identified hotspots, and specific waste materials. Interim remedial measures have been conducted at the site, including the hydraulic control interim measure (HCIM), several removal actions, and redevelopment actions. Quarterly monitoring of groundwater is currently conducted on site. These environmental investigations and cleanup activities are depicted chronologically in Figure 18.

The COCs for the site are toluene, an industrial solvent used in the vanillin process, copper resulting from the use of metal sludge and burial of autoclave solids, and groundwater affected by elevated pH due to caustic releases. Toluene-affected groundwater is limited primarily to the southwest portion of the site. Copper-affected groundwater and elevated groundwater pH due to the caustic release are limited to the western side and southwestern corner of the site, based on historical data. Other metals are present to a limited extent in the groundwater. Other potential chemicals of concern for the site include PAHs, methylene chloride, benzene, arsenic, chromium, lead, mercury, nickel, and vanadium. In addition, SVOCs have been documented at the site (Geomatrix 2007b).

Elevated concentrations of PCBs have also been detected in an area affected by past releases from a former PCB-containing compressor. PCB-contaminated soils around the compressor pad and a decommissioned underground drain line were removed during two separate interim measures. Sources of metals contamination (such as the use of metals sludge for weed control or the burial of autoclave solids) and other contaminants are present at the site (Geomatrix 2007b).

Summarized below is a history of sampling events and several interim measures that have been implemented in the course of conducting corrective actions at the site. This information is summarized from EPA's *Statement of Basis* (EPA 2006b).

In 1986, Dames and Moore preformed a site screening investigation for Rhone-Poulenc. Rhone-Poulenc, in acquiring the property from Monsanto, wanted a thorough understanding of any potential soil or groundwater contamination at the site. The report documented that wastes and waste materials had been spilled and disposed on site, and concluded that the potential for contamination of groundwater at the site existed. The Dames and Moore investigation included installation of eleven groundwater monitoring wells, including three dual completion (shallow/deep) wells. These wells were sampled for a range of hazardous constituents. Hazardous constituents, including toluene, were detected in groundwater (EPA 2006b).

In 1990, EPA performed a RFA of the entire Rhone-Poulenc site. The RFA determined that hazardous wastes and/or hazardous constituents had been released to the environment from various activities over the course of operations at the site. These activities included but were not limited to pipeline and tank leaks of toluene and caustic, disposal of autoclave scale and other waste materials, and use of waste vanillin black liquor solids for weed control. The RFA concluded that releases to soil and groundwater had occurred as a result of past practices at the facility (EPA 2006b).

In 1991, an independent site assessment was conducted by Landau Associates for Boeing Environmental Affairs. The site assessment was conducted because Boeing was considering purchasing the property. This site assessment evaluated soil and groundwater quality on the upland portion of the property and sediment and seep quality on the marine portion of the property. Constituents of concern were detected at numerous areas onsite. The assessment concluded that at least two areas of the facility would likely require remediation. The cost to remediate these areas was estimated to range from 5.6 to 12.3 million dollars (EPA 2006b).

In May 1993, Rhone-Poulenc and EPA entered into an Administrative Order on Consent using EPA's corrective action authority in Section 3008(h) of RCRA to address releases of contaminants at the facility. The Order sets forth the process by which an investigation and cleanup of the facility is to be conducted, and requires the Respondent to perform a RFI, Interim Measures if needed, and a Corrective Measures Study, as well as the option to conduct the final corrective measure selected by EPA. Additional entities are now subject to the Order. Specifically, Rhone-Poulenc transferred the facility to Rhodia in January 1998, and Container Properties purchased the facility in November 1998. Rhone-Poulenc has gone through various corporate transitions, and Bayer CropScience is the current corporate successor. Rhodia, Bayer CropScience, and Container Properties are the Respondents of the Order, and are responsible for carrying out all actions required by the Order (EPA 2006b).

The RFI was completed in 1995, and documented the presence of hazardous constituents in the soil and groundwater. Most of the contamination was shown to be located on the western portion of the facility, in the area of the former processing plant and storage areas. Additional investigations have been completed as needed, including an investigation of the storm and process sewers in 1998, and a geoprobe investigation focused on delineating the extent of the main plumes of contamination in 2001. Quarterly groundwater monitoring has been conducted for the past 10 years (EPA 2006b).

Based on these investigations, a HCIM was required by EPA in 2000 to stop ongoing releases of hazardous constituents to the LDW. Construction of this interim measure, a subsurface barrier wall and associated groundwater extraction and treatment system, was completed in 2003. This system, which is located in the west parcel, is currently in operation (EPA 2006b).

Several other voluntary interim measures have been conducted at the site, including installation and operation of a soil vapor extraction system to remove toluene from beneath the former tank farm (2000 to 2002), two separate PCB removal actions (1995, 2006), and soil removals on the East Parcel and copper disposal area in the West Parcel (2006; EPA 2006b).

The sections below described the redevelopment activities that have occurred on the East and West Parcels.

3.3.3.1. East Parcel

In the spring of 2006, Container Properties informed EPA that they wished to proceed with redevelopment of the East Parcel. Data from previous investigations indicated that although soils in the East Parcel did contain some contaminants, groundwater had not been impacted. EPA and the Respondents agreed to separate the East and West parcels for purposes of completing corrective action (EPA 2006b).

In this case, the Respondents conducted source removals on the East Parcel after evaluating the corrective measures alternatives and prior to EPA's selection of a final remedy. This action was conducted voluntarily in an expedited fashion to provide for the sale and redevelopment of the East Parcel. Upon evaluation of the effectiveness of the source removal, EPA has determined that this action was sufficient. EPA selected source removal as the final remedy for the East

Parcel, and simultaneously issued a partial determination that corrective action is complete on the East Parcel (EPA 2006b).

The subsections below summarize the soil characterization investigation and voluntary interim measure conducted on the East Parcel.

Soil Characterization Investigation

As part of the redevelopment actions, a soil characterization investigation was completed on the East Parcel in June 2006. A review of historical chemical data from the RFI conducted in 1995 indicated that groundwater beneath the East Parcel had not been impacted by historical operations on the facility. As a result of this information, the East Parcel investigation in June 2006 focused on soils. The RFI data indicated that contaminants were present in soils in some areas at concentrations exceeding the Preliminary Remediation Goals (PRGs). The East Parcel was divided into seven areas of interest for further investigation. Each area was characterized using a method known as multi-incremental sampling. This method divides each area of interest into specific depth zones and uses composites from about 35 locations at each depth zone, within each area of interest, to obtain each sample. The samples are carefully processed prior to analysis. The 2006 investigation confirmed that contaminants were present in soils of some areas of the East Parcel. Contaminants detected included metals (arsenic, copper, and mercury), PCBs, carcinogenic polycylclic aromatic hydrocarbons (cPAHs), and toluene (EPA 2006b).

The seven areas of interest were identified based on the results of the previous investigations, as shown on Figure 19. These investigation areas include the following:

1. The former Maintenance Building Area
2. The former Compressor Area
3. The former Laboratory Area
4. The former Sulfuric Acid Tank Waste Solids Disposal Area
5. The former Pilot Plant Waste Disposal Area
6. Background Area 1
7. Background Area 2 (Railroad)

The results of this investigation are documented in the *East Parcel Soil Characterization Data Report* (August 2006) and the *East Parcel Soil Characterization and Voluntary Interim Measure Report* (September 2006). The results for each investigation area are summarized below.

Former Maintenance Building Area

The former maintenance building was presumed to have contained lubricating oils and solvents based on its use. The RFA reported that waste oils and solvents were disposed of on the ground surface around the maintenance building from 1952 to 1980. Historical sample results showed that metals were detected above their respective soil cleanup levels in shallow soils, and one sample from 7.5 feet below ground surface (bgs) exceeded the soil cleanup level for cPAHs (EPA 2006b).

Two multi-increment samples were analyzed from the Maintenance Building Area during the 2006 East Parcel Investigation. The Surface 1 multi-increment sample (0.5 to 1.5 ft) was analyzed for arsenic, copper, and mercury, and the Surface 2 multi-increment sample (7.0 to 8.0 ft) was analyzed for cPAHs. Arsenic, mercury, and cPAHs were detected below their respective soil cleanup levels. Because Surface 1 copper results (110 mg/kg) exceeded the soil cleanup level (36.4 mg/kg), the discrete archived samples from this area were also analyzed for copper. The discrete sample results showed that the majority of the Former Maintenance Building Area surface soil samples contained copper concentrations exceeding the soil cleanup level (EPA 2006b).

During subsequent excavation activities, an area of toluene contamination was discovered in the southwest corner of the Former Maintenance Building Area. Because the toluene contamination appeared to be at a depth near the water table (approximately 10 to 15 feet bgs), 12 direct push borings were installed around the perimeter of the excavation, and soil and grab groundwater samples were collected from the borings. The boring locations are shown on Figure 20. The analytical results show that toluene-affected soil and groundwater were of limited extent, covering the corner area approximately 35 feet east from the East/West Parcel boundary and 75 feet north of the southern property line. The majority of the soil contamination was shown to be just above the water table. Toluene was present at concentrations up to 23,000 mg/kg in the soil, and up to 90 milligrams per liter (mg/L) in the groundwater. Historical site drawings show a toluene pipeline on the West Parcel running north-south along the East/West Parcel boundary. During the East Parcel Soil Characterization Investigation, it was determined that the toluene-affected soil was a result of a leak of that pipeline (EPA 2006b).

After subsequent groundwater monitoring, the Revised East Parcel Corrective Measures Implementation Work Plan indicates that toluene is still present in groundwater above cleanup levels in the southwest corner of the East Parcel. The source of toluene has not been positively identified; however, the toluene transfer line is the most likely source of the toluene contamination identified in soils and groundwater within this area. The work plan will address remediation of the residual toluene contamination (Geomatrix 2008).

Former Compressor Area

The Former Compressor Area includes the location of the former autoclave compressor. Leaks of compressor fluids were noted during the RFA inspection. The compressor fluid used was reported to be Pydraul A, a mineral oil carrier with PCBs formerly manufactured by Monsanto. Rhodia performed a cleanup of the compressor pad in 1995. The compressor pad and surrounding soil were excavated to a depth of 8 feet from an area measuring approximately 16 by 19 feet. However, confirmation sampling results from that cleanup were compared to a restricted use soil cleanup level (10 mg/kg) that is higher than the unrestricted use soil cleanup level (1 mg/kg) for PCBs. Copper was also detected above the unrestricted use soil cleanup level in three historical sampling locations (EPA 2006b).

During the 2006 East Parcel investigation, two multi-incremental samples were analyzed from the Former Compressor Area. The Surface 1 multi-increment sample (1.5-2.5 ft) was analyzed for PCBs, arsenic, copper, and mercury. Arsenic and mercury were detected below their respective soil cleanup levels in the Surface 1 sample. The Surface 2 multi-increment sample (7.0 to 8.0 ft) was analyzed for PCBs. PCBs were not detected in the Surface 2 sample (EPA 2006b).

Because the Surface 1 multi-increment sample copper results exceeded the soil cleanup level at a relatively high concentration (257 mg/kg), the discrete archived samples were not analyzed because it was assumed that copper-affected soils were widespread in this area. PCBs were also detected (7.4 mg/kg) above the soil cleanup level in the Surface 1 multi-increment sample, so the Surface 1 archived samples were analyzed for PCBs. Discrete sample results showed that PCBs were present in only one of 11 upper level archived samples at a concentration that exceeded the soil cleanup level for PCBs. This sample was located in the southwest corner of the Former Compressor Area (EPA 2006b).

Photoionization detection readings, odors, and sheens noted in some of the borings led to analyses to evaluate potential chemicals of concern. Discrete samples were obtained and analyzed for VOCs and TPH. These samples indicated that toluene was present in these soils. Due to an error in establishing the probable location of the East/West boundary, the affected borings were later determined to be located primarily on the West Parcel, rather than the East Parcel (EPA 2006b).

Former Laboratory Area

The area immediately west of the former laboratory building was reportedly used for one-time disposal of vanillin black liquor solids in 1979. Previous sampling investigations detected copper above the soil cleanup level in a surface soil sample, and cPAHs above the soil cleanup level at 2.5 feet bgs (EPA 2006b).

Two multi-increment samples were analyzed from the Former Laboratory Area during the 2006 East Parcel Investigation. The Surface 1 multi-increment sample (0.5 to 1.5 ft) was analyzed for arsenic, copper, and mercury, and the Surface 2 multi-increment sample (2.5 to 3.5 ft) was analyzed for cPAHs. Arsenic and mercury were detected below their respective soil cleanup levels in the Surface 1 sample. cPAHs were not detected in the Surface 2 sample. Because the Surface 1 copper results (40.3 mg/kg) exceeded the soil cleanup level (36.4 mg/kg), the discrete archived samples from this area were analyzed for copper. Discrete results showed copper exceedances in two clusters within the Former Laboratory Area, one small cluster at the north of the area, and one larger cluster at the south (EPA 2006b).

Former Sulfuric Acid Tank Solids Disposal Area

This area is adjacent to the Former Compressor Area, approximately 70 feet north of the former compressor pad. Sulfuric acid tank solids were reportedly buried in this area once in 1969. None of the historical soil samples collected in this area exceeded the soil cleanup level, except for one surface soil exceedance for copper (EPA 2006b).

During the 2006 East Parcel investigation, no evidence of contamination was observed in this area. One multi-increment sample (0.5 to 1.5 ft) was analyzed for pH, arsenic, barium, cadmium, chromium, copper, lead, mercury, selenium, and silver. Because the sample copper results (41.5 mg/kg) exceeded the soil cleanup level, the discrete archived samples were analyzed for copper. The discrete analytical results showed copper exceedances of the unrestricted soil cleanup level in two clusters, one located at the north end of the area, and one at the south end (EPA 2006b).

Former Pilot Plant Waste Disposal Area

Dames and Moore identified this area as having been used for disposal of pilot plant wastes. I.F. Laucks Company once operated a pilot plant at the site that was used to make glue for plywood manufacturing. This area was used as an asphalt parking lot for the Rhone-Poulenc facility from the 1950s through closure of the plant. None of the previous samples collected in this area exceeded the unrestricted soil cleanup levels, with the exception of cPAHs in soils samples from two locations (EPA 2006b).

During the East Parcel fieldwork, no evidence of contamination was observed in this area. Two multi-increment samples were analyzed. Both upper (1.0 to 2.0) and lower (7.0 to 8.0) surface samples were analyzed for cPAHs. Both surfaces in this area had concentrations of cPAHs that were well below the soil cleanup level (EPA 2006b).

Background Areas

The Background Areas of the East Parcel were not identified as areas of concern in previous investigations. These areas were occupied by a prisoner-of-war camp during the mid-1940s. During operation of the Rhone-Poulenc facility, these areas were used primarily for parking vehicles. From 1998 through 2004, the Background Areas were used for temporary storage of trailer-mounted cargo containers. Copper was previously detected just above the soil cleanup level in two soil samples collected at depths of 5.0 and 7.5 feet (EPA 2006b).

Background Area 2 is a 40-foot wide corridor located along the path of the former railroad spur that crossed this part of the property. The areas to the north and south of the former railroad are defined as Background Area 1. During the 2006 East Parcel Investigation, no evidence of contamination was observed in either of the Background Areas. One multi-increment sample (1.0 to 2.0 ft) was analyzed from each of these areas. The multi-increment samples were analyzed for copper and cPAHs. All samples from these areas had concentrations of these analytes that were well below the soil cleanup levels (EPA 2006b).

Voluntary Interim Measure

As discussed above, some soil samples collected during the 2006 East Parcel Investigation contained copper, cPAHs, PCBs, and toluene at concentrations that exceeded the cleanup levels. Due to the limited extent and volume of affected soils, and in order to expedite redevelopment of the East Parcel, Container Properties decided to proceed with soil removal as a voluntary interim measure (EPA 2006b).

Excavation of contaminated soils was completed between August 1 and September 23, 2006. As shown on Figure 21, areas were excavated to 2 feet bgs, 3 feet bgs, or up to 17 feet bgs for two areas. Excavations extended up to 10 feet into the West Parcel in order to prevent recontamination. Approximately 3,500 cubic yards of soil were removed from the shallow excavations in the East Parcel and placed within the perimeter of the barrier wall on the West Parcel. Approximately 500 cubic yards of soil was excavated from the deep Former Compressor Area excavation and stockpiled on the East Parcel for off-site disposal. The excavation in the toluene source area (the southwest Former Maintenance Building Area) extended to the south parcel line, at least 10 feet into the West Parcel, and to at least six inches to a foot below the water table. Approximately 1,700 cubic yards of soil were excavated from this area for offsite disposal (EPA 2006b).

Upon completion of the deep excavation in the Former Maintenance Building Area, the groundwater in the excavation had a slight sheen of toluene. The excavation was repeatedly dewatered and left to recharge over several successive days. A total of 14,000 gallons of contaminated groundwater was pumped into a Baker Tank, treated on-site via the approved West Parcel groundwater pretreatment system, and discharged to the sanitary sewer system (EPA 2006b).

After excavation was complete, samples were collected from the sidewalls and bottom of each excavation to confirm that all affected soils were removed. Several rounds of confirmation sampling, additional excavation, and repeat confirmation sampling were conducted in some areas. To ensure the removal of all affected soil had been achieved, multi-increment confirmation samples were collected for each of the four investigation area requiring excavation. Thirty-five soil samples were used to prepare each single multi-increment confirmation sample (EPA 2006b).

The results of the 2006 East Parcel Investigation and the post-excavation confirmation sampling demonstrate that soils exceeding cleanup levels in the East Parcel have been removed. Except for one location in the southwest corner of the Former Maintenance Building Area, soil remaining on the East Parcel meets the unrestricted use soil cleanup levels (EPA 2006b).

Groundwater in the southwest corner of the Former Maintenance Building Area contained toluene at concentrations up to 90 mg/L prior to the soil and groundwater removal actions (EPA 2006b). Although the suspected toluene source was removed, subsequent soil and groundwater sampling conducted in May 2007 indicated that toluene was still present in the groundwater at levels above the cleanup level (1.3 mg/L). The Revised East Parcel Corrective Measures Implementation Work Plan will address remediation of the residual toluene contamination Geomatrix 2008).

The Respondents completed a Corrective Measures Study in 2006 for the East Parcel. The East Parcel Corrective Measures Study recommended that source area excavation and removal be selected as a final remedy (EPA 2006b).

The Statement of Basis documents EPA's rationale for proposing to select source area excavation and removal as the final remedy for the East Parcel (EPA 2006b). EPA has required a contingent remedy to address residual toluene in groundwater. On January 28, 2008, EPA approved the Revised East Parcel Corrective Measures Implementation Work Plan to address the toluene plume.

3.3.3.2. West Parcel

The West Parcel has been redeveloped and encompasses the area addressed by the HCIM, which includes a subsurface barrier wall and a groundwater recovery and pretreatment system. Container Properties has recently issued a 15-year lease for the West Parcel to IAAI. In order to prepare the property for lease, the redevelopment required extensive work.

Preparatory work included relocation of the groundwater recovery and pretreatment system being operated as part of the HCIM, installation of new electrical service, demolition of existing structures, removal of waste, grading, paving, installation of a new stormwater system, installation of a new fence along the parcel boundaries, well abandonment, and well restoration (Geomatrix 2007c).

During redevelopment, all structures on the East and West Parcels were demolished, except for the new pretreatment system building. Bearing walls were removed to the foundation. In addition, railroad tracks and ties, including buried track, were removed to 2 feet below grade on the West Parcel (Geomatrix 2007c).

Known hazardous building components and waste materials were removed prior to demolition of each structure. Hazardous building components removed included asbestos siding, asbestos tiles, asbestos-insulated piping, Freon refrigeration equipment, mercury vapor lamps, and electrical equipment containing PCBs (Geomatrix 2007c). The following waste material and waste-containing structures were discovered or generated during demolition and redevelopment activities:

- The 1-190 sump;
- The Hazardous Waste Storage Area Sump;
- Asbestos-containing materials (piping, wallboard, flooring, etc);
- Material contaminated with PCBs (light ballasts, transformer contents, etc.);
- Drums containing waste or unused oil and used personal protective equipment;
- Soil cuttings from well abandonment and replacement;
- Soil cuttings from additional soil investigations;
- Waste generated during treatment of sump liquids; and
- Waste generated due to stormwater regulations (Geomatrix 2007d).

Following the installation of the new stormwater system, the West Parcel was filled, graded, and paved. This pavement is not intended to serve as an engineered cap or an interim measure, but to support use of the West Parcel by IAAI. After paving of the site was completed, monitoring wells were raised to the finish grade and repaired as necessary (Geomatrix 2007c).

Northwest Corner Soil Removal

Soil and groundwater at the site have been characterized in several investigations. Soil sampling data presented in the RFI identified an area with elevated copper concentrations in the Northwest Corner of the site. A soil sample collected at location A01-04 at a depth of 6 inches was found to have a copper concentration of 6,850 mg/kg. Soil affected with this concentration of copper could release the contaminant to the sensitive habitat along the LDW. The approximate location of A01-04 is shown on Figure 22, and is located outside the interim measure barrier wall (Geomatrix 2007a).

The objective of the Northwest Corner Soil Removal was to further define the area of contamination and remove the surficial soil substantially exceeding the interim copper cleanup level of 36.4 mg/kg, based on Puget Sound background copper concentrations. To delineate the area of contamination, a total of 42 soil samples were collected using a multi-incremental sampling approach within an area measuring 55 feet long by 20 feet wide. Samples were collected at depths of 0.5 to 1.0 feet, 2.0 to 3.0 feet, and 5.0 to 6.0 feet within this area using direct-push drilling methods (Geomatrix 2007a).

Selected waste samples were collected from 11 borings and analyzed for SVOCs, TPH-hydrocarbon identification, TPH-extended diesel range, TPH-gasoline range, and/or metals. Selection of suspected waste samples to be analyzed was based on field observations of parameters such as color, sheen, and photoionization detection readings (Geomatrix 2007a).

During soil characterization fieldwork, evidence of contamination, including green coloration, viscoelastic soil behavior, odor, and sheen was noted in some borings. Green soil was mostly noted in the upper 2 feet. Analytical results of discrete samples indicated that copper exceeded the interim cleanup level in all Surface 1 archive samples that were analyzed and in 19 of the 32 Surface 2 archive samples (Geomatrix 2007a).

Analytical results are shown on Figures 23, 24, and 25. Results indicated that gasoline-range organics were detected above the MTCA Method A cleanup level of 100 mg/kg in six of the seven suspected waste samples, with a maximum concentration of 13,000 mg/kg in NWC-2-6W. Diesel-range organics were detected slightly above the interim cleanup level of 2,000 mg/kg in one of the six samples, with a maximum concentration of 2,100 mg/kg. Copper was found at concentrations exceeding the interim cleanup level of 36.4 mg/kg in all four suspected waste samples analyzed for metals, with a maximum concentration of 18,200 mg/kg in NWC-2-39W. PCP was the only SVOC detected at a concentration that exceeded interim cleanup levels. At NWC-1-22W, a concentration of 550 µg/kg was detected above the MTCA Method C interim cleanup level for PCP of 270.2 µg/kg (Geomatrix 2007a).

Based on the results of the sampling, soil to a depth of 5 feet was identified for removal. The soil to a depth of 2 feet was excavated and disposed of at an off-site landfill. The soil from 2 feet to 5 feet in depth was excavated and used as fill within areas of the West Parcel with known contamination and that are enclosed by the subsurface barrier wall (Figure 26). Field observations during the excavation (discoloration and odor) indicated that soil affected by TPH may extend to the north of the excavation, beyond the property line. A total of 172 cubic yards of soil was excavated from the Northwest Corner. Of this volume, about 54 cubic yards were placed within the West Parcel, with the remainder (about 118 cubic yards) transported offsite for disposal. The excavation area was backfilled with clean soil fill and graded (Geomatrix 2007a).

Transformer A and Hazardous Waste Storage Area Removal

During demolition for the redevelopment of the site, an oil spill in the Transformer A Area and suspected waste materials near the former Hazardous Waste Storage Area were discovered. The Transformer A Area is located on the East Parcel. The former Hazardous Waste Storage Area is located near the northwest corner of the West Parcel, as shown on Figure 27. Transformer A and the slab were removed. Transformer A was drained and contained approximately 75% of its oil capacity (263 gallons), indicating as much as 66 gallons may have spilled. Approximately 38 tons of Transformer A Area soil was removed for off-site disposal with concentrations of TPH-D that exceeded the PRG for soil. A final confirmation soil sample indicated that a detected concentration of TPH-D (1,200 mg/kg) was detected, but below the PRG for TPH-D, and TPH-O was not detected (Geomatrix 2006b).

In the former Hazardous Waste Storage Area, a sump with approximately 8 inches of dark liquid with an oily sheen was uncovered during demolition. Water, sediment, and soil samples waer collected. No PCBs were detected above the PRG in any of the samples. TPH, SVOCs, and metals were detected in all three samples. TPH-D was detected at a concentration of 1,100 mg/L in the water and up to 9,300 mg/kg in the soil and sediment samples. During cleanup, 2 tons of darkly stained soil was removed from around the top of the concrete catch basin. A total of 150 gallons of liquid and sediment was vacuumed out of the catch basin until it was empty. All wastes materials were disposed of at an authorized offsite facility, and the sump was backfilled with clean soil inside the barrier wall (Geomatrix 2006b).

3.3.3.3. Uplands

Both the East and West Parcels have been significantly redeveloped and are currently paved. There are no manufacturing operations conducted on either parcel, and there are no longer any existing facility structures.

EPA has issued a partial determination of “Corrective Action Complete Without Controls” for the East Parcel. The West Parcel currently has a HCIM in place around the perimeter of the upland area to reduce the concentrations of contaminants within the upland portion of the site from migrating to the LDW.

3.3.3.4. Stormwater

Prior to redevelopment, stormwater runoff from the West Parcel was directed to the LDW through the existing Outfall 7, located near the northwestern corner of the site. The existing stormwater drainage system was abandoned in place and replaced by a new stormwater collection and treatment system. This system is comprised of catch basins, storm drain piping, and a stormwater treatment vault with a Stormfilter unit containing individual cartridge-type filtration units with a range of filtering abilities. The system was designed to meet the requirements of the City of Tukwila. Stormwater is piped to the stormwater treatment vault where it is filtered before connecting to the existing 36-inch King County storm drain line that crosses the property and discharges to the eastern portion of the Slip 6 inlet, as shown in Figure 17 (Geomatrix 2007c).

The abandonment of the former stormwater collection and discharge system included the following actions:

- In the existing catch basins, the metals grates were removed, the concrete was broken up, and the depressions were filled.
- The storm drain piping was disconnected and abandoned in place.
- The oil-water separator in the northwest corner was broken up and filled. The oil separator pipes were blocked and grouted.
- The outfall was bricked and grouted at the manhole and outlet, and filled with controlled density fill (Geomatrix 2007c).

Wastewater

Currently, wastewater from the groundwater pretreatment system is discharged to the King County sanitary sewer system under a Wastewater Discharge Permit (No. 7789-01) for further treatment at the publicly owned treatment works. The only connection from the facility to the King County sanitary sewer is a force sewer that can only be accessed by going through the pretreatment system. Groundwater is extracted from within the barrier wall, pretreated, and then discharged to the King County sanitary sewer system (Figure 28). This pretreatment system includes filtration and carbon adsorption. The system is fully automated and activates pumps in the groundwater extraction wells as necessary, 24 hours a day, seven days a week, in order to keep groundwater levels lower inside the barrier wall than outside the barrier wall. Depending on rainfall and LDW levels, a typical day could range from 0 to 30,000 gallons of water being pumped through the system. The annual average groundwater flow rate was 8.8 gallons per minute in 2005 (Geomatrix 2007b).

Monthly sampling is conducted at three points: the inlet before the filters; between the carbon units; and the effluent stream after the last carbon unit. The system has been designed to eliminate the potential for discharge of spills or slug discharges to the King County sanitary sewer system. Non-routine batch discharges have occurred at the site due to redevelopment activities rather than the operation of the groundwater recovery and pretreatment system. In these instances, a variance request was submitted to King County, and the discharge water was sampled and pretreated prior to discharge. This procedure will be followed for all future non-routine batch discharges (Geomatrix 2006c).

The last field inspection was conducted by the King County Industrial Waste Program on May 10, 2007. The system was operating properly and appeared to be well maintained. According to the inspection report (King County 2007b), all effluent samples have been under the MDLs. To date, only seven influent samples have indicated toluene concentrations above the MDLs. The results of monitoring from May 2003 through December 2006 are summarized in Table 6. Self-monitoring requirements of the permit include monthly monitoring for benzene, toluene, ethylbenzene, fats, oils, and grease, pH, and daily discharge volume. According to the most recent Self-Monitoring Report, dated September 2007, samples of benzene, toluene, ethylbenzene, fats, oils, and grease were under the MDLs and pH was within the permitted parameters (Geomatrix 2007e).

3.3.3.5. Groundwater

Substrate beneath the facility is made up of hydraulic fill from sediments dredged from the LDW and forms the upper 5 to 15 feet. Alluvial silt and sand up to 50 feet thick underlies the fill. The upper aquifer occurs within these alluvial sediments.

Tidal fluctuation of the adjacent LDW has a diurnal effect on the groundwater elevations of the upper aquifer. Under mean flow conditions, the upper aquifer groundwater flows east to west toward the LDW with a mean horizontal gradient of 0.003.

The following sections describe groundwater in the East and West Parcels.

East Parcel

Despite the implementation of the voluntary interim measure and removal of the source, toluene is still present above cleanup levels in groundwater at the southwest corner of the East Parcel. The Respondents are currently working with EPA to develop a Groundwater Bio-Sparging Work Plan to address this area of contamination. The area with toluene-impacted groundwater is located outside the HCIM and adjacent to the shoreline of the Slip 6 inlet, and currently presents an on-going source of contamination to the Slip 6 inlet and the LDW.

West Parcel

The HCIM, consisting of a low-permeability barrier wall, groundwater recovery system, and a performance monitoring well network, was installed at the site in early 2003. The HCIM encompasses the West Parcel and is shown on Figure 28. The primary goal of the HCIM is to contain contaminated groundwater, by maintaining an inwardly directed horizontal hydraulic gradient, and to prevent affected groundwater from the area within the barrier wall from reaching the LDW. In accordance with the performance monitoring plan for the site, groundwater monitoring is completed quarterly. The most recent groundwater monitoring was Round 34, conducted in December 2006 (Geomatrix 2007f).

The performance monitoring system for the HCIM includes sampling of 16 monitoring wells and 1 extraction well for the chemical analyses of groundwater. Along the LDW and the Slip 6 inlet, 10 of the monitoring wells are located outside and downgradient from the barrier wall, and 7 wells are located either inside or upgradient from the containment area (Figure 29). In accordance with the performance monitoring plan, the 11 exterior wells (including exterior upgradient monitoring well B1A) are sampled every quarter and 6 interior wells (including extraction well EX-3) are sampled semiannually (Geomatrix 2007f). Groundwater performance monitoring data for 2002-2006 are summarized in Tables 7, 8, 9, 10, and 11.

In December 2006, 11 exterior wells were sampled and analyzed for general field parameters (temperature, pH, dissolved oxygen, oxidation/reduction potential, and turbidity), aromatic hydrocarbons (benzene, toluene, ethylbenzene, and xylenes), and total metals (aluminum, arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, thallium, vanadium, and zinc; Geomatrix 2007f).

The following paragraphs summarize the results of the 34th round of groundwater sampling. During this round, only the exterior monitoring wells were sampled. The data from the sampling event are generally consistent with past sampling results obtained from the site:

Toluene

- Toluene concentrations in samples from the exterior downgradient well DM-8 have decreased from past concentrations up to 3,900 µg/L in groundwater samples collected before the installation of the HCIM, to below the detection limit in all groundwater samples collected since installation of the barrier wall. In Round 34, the highest concentration was 170 µg/L from MW-44. Toluene was also detected in MW-41 (42 µg/L) and MW-43 (28 µg/L). All results were below the Final Media Cleanup Standard for toluene of 1,000 µg/L. The remaining 8 exterior wells were below the detection limit.

Arsenic

- There are no clearly identifiable trends in total arsenic concentrations since the completion of the barrier wall, with the exception of samples from DM-8, which have generally decreased in arsenic concentrations. The highest concentration of total arsenic was 9 µg/L from MW-44. All arsenic concentrations are below the NRWQC for chronic exposure to arsenic in fresh water which is 150 µg/L.

Copper

- Changes in total copper concentrations in samples from the northwest (MW-39), and west (DM-8/MW-42) exterior well clusters suggest convergence of copper concentrations, which may reflect a decreased chemical gradient for copper in the downgradient side of the wall next to the LDW.
- Changes over time in total copper concentrations in the south exterior well cluster show that water samples from the shallow well (MW-44) have increased in total copper concentrations since completion of the barrier wall, while water samples from the deeper well (MW-43) have decreased in total copper concentrations since completion of the barrier wall.
- Total copper concentrations were highest in groundwater samples from MW-41 (46 µg/L) and MW-44 (173 µg/L). While some copper concentrations from this round exceed potential copper screening levels, Final Media Cleanup Standards for copper in groundwater have not been established for this site (Geomatrix 2007f). Potential screening levels include: EPA National Ambient Water Quality Criteria Criterion Continuous Concentration for both freshwater (12.23 µg/L) and saltwater (3.1 µg/L), which have been calculated based on site specific hardness; and State of Washington Chronic Toxicity Criteria for both freshwater (15.11 µg/L) and saltwater (3.1 µg/L; Geomatrix 2007b).

The groundwater monitoring has detected vertical downward-directed gradients in the southwest interior monitoring well cluster (MW-51/MW-52). These downward-directed gradients are not fully explained, and could be either due to the complex geology of the site or a leak in the barrier wall at that location. During the installation of the barrier wall, an obstruction was encountered near the southwest corner. Later excavation removed large logs from this area, and the wall was repaired. This area of repaired wall may be the location of a potential leak. However, it should be noted that if there is a leak in the barrier wall, the leakage would be directed inwards toward the extraction wells (Geomatrix 2007b).

3.3.3.6. Spills

Historical releases and spills at the site have resulted in contaminated soil and groundwater from constituents including caustic soda, toluene, mineral oil, PCBs, and copper. Recently, there have been no documented spills, and there are currently no manufacturing operations conducted at the site.

As part of the 15-year lease of the West Parcel, IAAI is required to maintain the stormwater system. It is currently unknown whether IAAI must maintain a SWPPP to prevent potential leakage from damaged vehicles stored on the site from migrating via the stormwater system and discharging to the Slip 6 inlet.

3.3.3.7. Bank Erosion/Leaching

Historically, waste vanillin black liquor solids and metal wastes were applied to the shoreline banks for weed control. As a result of past site activities, soil and groundwater contamination is present in the shoreline banks.

3.3.4. Potential Pathways of Contamination

The East and West Parcels have been significantly redeveloped and are currently paved. Because there are no manufacturing operations conducted on either parcel, and there are no longer any existing facility structures, current operations of the site do not present a source of potential contamination of the LDW.

EPA has issued a partial determination of "Corrective Action Complete Without Controls" for the East Parcel. As a result of extensive remediation and the cleanup determination, the uplands of the East Parcel do not present a source of potential contamination to the LDW.

Although the West Parcel has soil and groundwater contamination on site, the HCIM is in place around the perimeter of the upland area to reduce the concentrations of contaminants within the upland portion of the site from migrating to the LDW. Further, the upland area is paved, and although it is not intended to serve as an engineered cap or interim measure, soils are prevented from erosion. For this reason, the upland area of the West Parcel is not currently a source of potential contamination to the LDW.

3.3.4.1. Stormwater

As part of the West Parcel lease, IAAI is required to maintain the stormwater system. Stormwater from the site is collected and filtered prior to discharge to the Slip 6 inlet via the King County storm drain line. It is currently unknown whether a permit and/or stormwater monitoring are required to discharge stormwater into the King County storm drain line. For this reason, it is unknown whether potential leakage from damaged vehicles could migrate via the stormwater system and discharge to Slip 6.

Because wastewater from the groundwater extraction system is pretreated before discharging to the King County sanitary sewer system, and then routed for further treatment at a publicly owned treatment works, it is not a potential source of contamination to the LDW or Slip 6.

3.3.4.2. Groundwater

East Parcel

Toluene-impacted groundwater is present in the southwest corner of the East Parcel. The groundwater contamination is present outside the barrier wall of the West Parcel and adjacent to the shoreline of the Slip 6 inlet. For this reason, the groundwater contamination presents an on-going source of contamination to the LDW.

West Parcel

Copper contamination is present above cleanup levels in groundwater outside the barrier wall. This contamination is most likely due to historical contamination before the installation of the barrier wall, and presents an on-going source of contamination to the LDW.

3.3.4.3. Spills

There have been no recent documented spills at the site, and manufacturing operations have ceased at the site. The site is currently used for vehicle storage by IAAI, and it is unknown whether a SWPPP is required for the site to prevent potential leakage from damaged vehicles stored on the site from migrating via the stormwater system and discharging to the LDW and Slip 6 inlet.

3.3.4.4. Bank Erosion/Leaching

Historically, waste vanillin black liquor solids and metal wastes were applied to the shoreline banks for weed control. As a result of past site activities, soil and groundwater contamination is present in the shoreline banks. Because the shoreline banks are unarmored and frequently inundated due to tidal and seasonal fluctuations of the LDW, erosion and leaching of the shoreline banks present an on-going pathway of contamination to the LDW.

3.3.5. Data Gaps

3.3.5.1. Stormwater

The stormwater system is currently undergoing filtration before discharging to the LDW via the King County storm drain line. It is unknown whether a permit and/or stormwater monitoring are required to discharge stormwater from the site to the King County storm drain line.

3.3.5.2. Groundwater

East Parcel

Groundwater with elevated concentrations of toluene is located within the southwest corner of the East Parcel. The Respondents are currently working with EPA to develop a Groundwater Bio-Sparging Work Plan to address this area of contamination. Subsequent groundwater sampling data and work to be performed will be addressed in the Revised East Parcel Corrective Measures Implementation Work Plan, which was approved by EPA on January 28, 2008.

West Parcel

The HCIM is effectively working to reduce the contaminants in groundwater from reaching the LDW. Currently copper exceeds screening criteria outside the barrier wall and data from some monitoring wells show that these concentrations are increasing. The Respondents and EPA are currently working to identify why copper concentrations are increasing; however the result is still unknown and is a data gap.

In addition, groundwater monitoring data suggest there may be a leak in the barrier wall in the southwest corner. To address this data gap, installation of additional monitoring wells was proposed to gather additional monitoring data. The result of this proposed action is still unknown and is a data gap.

3.3.5.3. Spills

It is unknown whether IAAI is required to maintain a SWPPP to prevent potential leakage from damaged vehicles stored on the site from migrating via the stormwater system and discharging to the LDW and the Slip 6 inlet.

3.3.5.4. Bank Erosion/Leaching

Historically, waste vanillin black liquor solids were applied to the shoreline banks for weed control. The concentration and extent, the potential to impact the LDW, and the potential pathways of migration of this contamination on the shoreline banks has not been investigated and is a data gap.

3.4 King County International Airport

3.4.1. Current Operations

KCIA, also known as Boeing Field, is located at 7277 Perimeter Road South, Seattle. This facility is also listed under the address of the airport maintenance building, at 6518 Ellis Avenue, Seattle. The KCIA is a general aviation airport, owned and operated by King County as a public utility. The site covers approximately 615 acres, 435 of which are an impervious surface covered by buildings and paved areas. The remaining 180 acres consists of grass and landscaped area. Approximately 80 acres of the KCIA is located in the Slip 6 area and drains to the LDW (Figure 30).

The KCIA averages more than 300,000 operations (takeoffs and landings) each year, and serves small commercial passenger airlines, cargo carriers, private aircraft owners, helicopters, corporate jets, military, and other aircraft. The airport is also home to the Boeing Company's 737 aircraft flight-test program along with other Boeing operations (KCIA 2007a).

According to the King County Tax Assessor website, the portion of KCIA located within the Slip 6 drainage area is part of Parcel 2824049007, with a listed address of 6505 Perimeter Road South. This parcel consists of 564.77 acres and 101 buildings that have various uses including office buildings, storage hangers, industrial light manufacturing, material storage sheds and warehouses, and service repair garages (King County 2007a). A map of the KCIA indicates the only buildings within the Slip 6 drainage area are the airport office center, general aviation buildings, and general aviation hangers (Figure 30; KCIA 2007a).

KCIA has a NPDES Industrial Stormwater General Permit (No. SO3000343D) for the airport maintenance shop, located northeast of Slip 6. The parameters for this permit include pH (6.5 to 8.5 standard pH units), oil/grease (15 mg/L), turbidity (25 nephelometric turbidity unit [ntu]), copper (63.3 ug/L), lead (81.6 ug/L), zinc (117 ug/L), biological oxygen demand (BOD; 30 mg/L), total ammonia (19 mg/L), nitrate/nitrite as N (0.68 mg/L). This permit expires on May 31, 2008 (Ecology 2007d). According to Ecology's online NPDES and State Waste Discharge Permit database, this site does not have a NPDES Individual Wastewater Discharge Permit (Ecology, 2007f). KCIA has a SWPPP addressing the airport maintenance facilities, the paved areas (runways and taxiways), and activities such as de-icing (KCIA 2006).

The KCIA has been issued Wastewater Discharge Authorization No. 4109-01 (EPA ID No. WAD 980986848) from the King County Wastewater Treatment Division. This authorization allows the site to discharge limited amounts of industrial wastewater into King County's sewer system in accordance with effluent limitations and other requirements and conditions listed in the document. According to the permit, the sewer system discharges to the West Point Wastewater Treatment Plant. The system effluent consists of wastewater generated by transportation facility operations and undergoes a pre-treatment process of best management practices, gravity separation, and carbon absorption as needed. The permit is effective from October 30, 2006 through October 29, 2011. The transportation facility operations are located outside of Slip 6.

3.4.2. Historic Use

The airport is the homestead site of some of the original settlers who arrived in King County. In the early 1900s, the natural course of the Duwamish River, which meandered through much of the airport property, was straightened and filled.

Construction of the airport began in 1928. The airport served as the community's aviation center until December 6, 1941, when the U.S. Army took over the airport for strategic and production reasons. The airport remained under military jurisdiction through the end of World War II. In the late 1940s, the airport was re-opened for passenger and other commercial traffic. After Seattle Tacoma International Airport opened in 1947, KCIA usage evolved to general aviation, serving industrial, business, and recreational purposes (SAIC 2006b).

3.4.3. Environmental Investigations and Cleanup Activities

There have been no environmental investigations or cleanup activities within the area of the KCIA that could potentially impact Slip 6. The paragraphs below briefly summarize available information about KCIA from online Ecology and EPA databases and environmental investigations.

On Ecology's online LUST database, KCIA is listed as having groundwater and soil cleanups reported at 6518 Ellis Avenue South, which is the address of the airport maintenance building. This building is located north of the portion of KCIA that could potentially impact Slip 6. On Ecology's online UST database, the site is listed as having five USTs removed from the airport maintenance building, located at 6518 Ellis Avenue South. Information for the KCIA, which was updated on March 1999, lists 28 USTs and 31 above ground storage tanks (ASTs) located at the airport (Ecology 2007f). All USTs and ASTs are located outside of the portion of KCIA that could potentially impact Slip 6.

The facility is not listed on Ecology's online CSCSL database (Ecology 2007c). There have been two cleanups noted for KCIA: one at American Avionics, located at 7023 Perimeter Road South; and one at the KCIA maintenance building, located at the north of the airport at 6518 Ellis Avenue South (SAIC 2006b). Both of these areas are outside of the Slip 6 drainage basin; therefore, they are not considered a potential contributor to sediment recontamination of Slip 6.

In 2001 and 2005, KCIA sampled stormwater catch basin sediments and pavement joint caulk in the Early Action Area-4 drainage area for potential PCB contamination. The scope and results of this investigation are summarized in the Lower Duwamish Waterway Early Action Area 4, Summary of Existing Information and Data Gaps Report (E & E 2007b). This investigation was conducted outside of the Slip 6 drainage area.

Boeing has been working to remove PCB-contaminated joint caulk material from the paved areas at North Boeing Field, outside and to the north of the area that could impact Slip 6 from stormwater discharge. As of 2005, approximately 80,000 linear feet of joint caulk had been removed. An additional 1,400 linear feet of joint caulk is scheduled to be removed in 2007 from North Boeing Field (SAIC 2006b).

On August 3, 2004, the Joint Inspection Program conducted an inspection at the Hangar and office section of the KCIA (listed as 8600 Perimeter Road South). The inspections of commercial and industrial properties are conducted as part of a King County and SPU joint program to assist businesses in reducing the amount of pollutants discharged to the LDW via storm drains and CSOs. The inspection determined that the following corrective actions were required:

- Development of a spill prevention and cleanup plan, including educating employees about the plan, for areas where mobile fueling is conducted.

- Obtain a drain cover to be used in case of spills near the catch basin on the west side of the building.

Compliance was achieved on September 30, 2004.

The airport has been cleaning out accumulated solids from each stormwater catch basin on the airport semi-annually. Each oil/water separator is cleaned annually, or more frequently if there are any accumulations noted during weekly inspections (SAIC 2006b). No information was found on stormwater or stormwater solids monitoring for this area of the KCIA. It is currently unknown whether or not stormwater from this portion of the KCIA is potentially a source of contamination to the Slip 6 inlet.

3.4.4. Potential Pathways of Contamination

3.4.4.1. Stormwater

There are approximately 15 miles of drainage pipe in the KCIA stormwater drainage system. There are five outfalls or discharge points (Figure 31). There are two pumping stations, lifting water and pumping it out at two outfalls (outfalls 1 and 2). There are three gravity lines, feeding two outfalls (outfalls 3 and 4), that drain the south end of the airport. There are several off-site stormwater sources (Associated Grocers, Railroad Right-of-Way, City of Seattle, and others) that discharge into the KCIA stormwater drainage system. Some north-end KCIA facilities are connected to a stormwater system owned by the Washington State Department of Transportation, which serves the Interstate 5 freeway. Other non-KCIA-owned properties (Boeing Company, MOF, and City of Seattle) contribute stormwater at Outfalls 3 and 4. Some KCIA properties along East Marginal Way South go into a combination of Boeing Company and City of Tukwila stormwater drainage systems (KCIA 2007b).

CAD files provided by KCIA show that the portion of KCIA that is located within the Slip 6 drainage basin is referred to as “Drainage Area 3,” as depicted in Figure 31. Drainage Area 3 discharges stormwater from the KCIA stormwater system at “Outfall 3,” a discharge point to the King County storm drain that crosses the former PACCAR site and former Rhone-Poulenc site before discharging into the Slip 6 inlet at Outfall #1 (KCIA 2007b).

The KCIA stormwater system is complex and includes stormwater from non-KCIA-owned facilities including Boeing and MOF. In addition, there appears to be a 24 inch storm drain that contributes stormwater from an unknown area outside the KCIA to the KCIA stormwater system. It is currently unknown what area this storm drain collects stormwater from, and how much water this storm drain discharges to the KCIA stormwater system. For this reason, it is currently unknown how large of an area is contributing to the KCIA stormwater system and what the potential impact might be from stormwater discharged from the KCIA stormwater system to the LDW at the Slip 6 inlet.

There was no information found about stormwater or stormwater solids investigations or monitoring within this portion of the KCIA; therefore it is unknown whether stormwater is a potential pathway of contamination to the LDW.

3.4.4.2. Groundwater

No information was found on groundwater investigations or monitoring for the portion of KCIA that could potentially impact Slip 6. Groundwater flow likely flows toward the southwest, toward the LDW, and discharges to the LDW in the vicinity of the Slip 6 inlet.

There is no known groundwater contamination on this portion of the facility. Based on the information reviewed, it is unlikely that groundwater from this portion of the site contributes to ongoing recontamination of the LDW.

3.4.4.3. Spills

There have been no documented spills on this portion of the KCIA. The KCIA maintains a SWPPP (KCIA 2006) to address the airport maintenance facilities, the paved areas (runways and taxiways), and activities such as de-icing.

It is unknown if the SWPPP is sufficient to prevent spills in this portion of KCIA from migrating via the stormwater system and discharging to the LDW. It is also unknown if non-KCIA-properties that contribute stormwater to the KCIA stormwater system have sufficient SWPPPs in place. Therefore, it is unknown if spills are a potential pathway of contamination to the LDW.

3.4.4.4. Bank Erosion

This site is not located along the shoreline bank of the LDW or the Slip 6 inlet; therefore, bank erosion is not a potential source of recontamination to LDW sediments.

3.4.5. Data Gaps

3.4.5.1. Uplands

There have been no upland investigations for this portion of the airport. However, a significant portion of the KCIA lies within the Slip 6 drainage basin. Other studies have indicated that joint caulk material has contributed to PCB contamination of stormwater sediments in portions of the KCIA outside of the Slip 6 drainage basin. Further investigation of joint caulk material may be necessary to determine if similar PCB contamination is present within this portion of the KCIA and potentially migrating via the stormwater system to the Slip 6 inlet.

3.4.5.2. Stormwater

The total area that is drained by the KCIA stormwater system within the Slip 6 drainage basin, including non-KCIA-owned properties and stormwater connections from outside the KCIA, is currently unknown and a data gap.

There have been no stormwater or stormwater solids investigations or monitoring for this portion of the airport; therefore it is unknown whether potential contamination is migrating from the KCIA to the LDW via stormwater.

The KCIA stormwater system within the Slip 6 drainage area discharges to the LDW at Outfall #1 through a King County storm drain line. There is no stormwater or in-line sediment sampling conducted on this King County storm drain line; therefore, it is currently unknown whether this storm drain line is contributing to the recontamination of the LDW and Slip 6.

3.4.5.3. Groundwater

There have been no groundwater investigations or monitoring for this portion of the airport. Because this portion of KCIA has no history of groundwater contamination, it is unlikely that groundwater is contributing to the recontamination of the LDW.

3.4.5.4. Spills

It is unknown if the SWPPP is sufficient to prevent spills in this portion of KCIA from migrating via the stormwater system and discharging to the LDW. It is also unknown if non-KCIA-properties that contribute stormwater to the KCIA stormwater system have sufficient SWPPPs in place.

3.4.5.5. Bank Erosion/Leaching

KCIA is not located on or near the shoreline bank of the LDW or the Slip 6 inlet. Because of the large distance between this area and the LDW, potential contaminants from this area have not contributed to the LDW via bank erosion and leaching. No data gaps have been identified for bank erosion for this area of KCIA.

3.5 Museum of Flight

3.5.1. Current Operations

The MOF is essentially divided into two properties, with East Marginal Way South running between them as illustrated in Figures 32 and 33. On the western side of East Marginal Way South is the former BDC property (referred to as Gate J-28 in Boeing documents) and on the eastern side of East Marginal Way South is the location of the museum (9404 East Marginal Way South, Tukwila, Washington). Both properties are owned by the MOF. Boeing is conducting the monitoring activities for the property located west of East Marginal Way South; although the MOF owns this property. According to the King County tax assessor website (King County 2007a), the MOF museum address corresponds to parcel 3324049019, which is located to the east of East Marginal Way South. This 11.44-acre parcel contains the following five structures: a 141,643-sq. ft. museum built in 1987, an 11,625-sq. ft. office building built in 1982, a 27,140-sq. ft. industrial heavy manufacturing building built in 1920, a 17,430-sq. ft. restaurant built in 1994, and an 87,076-sq. ft. museum built in 2003.

Parcel 5624201034, located to the west of East Marginal Way South, is also part of the MOF facility and was formerly owned by the Boeing Company. This 5.48-acre parcel is zoned for commercial/heavy industrial use and contains two structures: a 32,340-sq. ft. storage warehouse (built in 1991) and a 798-sq. ft. office building built in 2005. A third parcel, No. 5422600020, is located to the north of parcel 5624201034, and is planned to be purchased in the future by The Museum of Flight Foundation. Parcel 5422600020, the former Rhone-Poulenc property, is discussed in Section 3.3.

KCIA is located east of Parcel 332404901. KCIA is discussed in Section 3.4.

3.5.2. Historical Use

3.5.2.1. Museum of Flight (Parcel 3324049019)

Parcel 3324049019 was first developed with a service station, located immediately north of the intersection of Purcell Avenue and East Marginal Way South, around 1925 (GeoEngineers 2001a). Until the early 1980s, multiple generations of service stations, a tire store, and a café operated on the property. Two USTs, associated with the service stations, were reportedly removed from the area immediately north of the former Purcell Avenue during construction of the Great Gallery (depicted in Figure 34). No physical evidence of petroleum contamination was reported during this historical UST removal and no soil samples were collected for chemical analysis (GeoEngineers 2001a).

3.5.2.2. Former Boeing Property (Parcel 5624201034)

Parcel 5624201034 was historically divided into three lots (lots 66, 67, and 68), as depicted in Figure 35. Prior to 1918, the property was used for agricultural purposes. N.C. Jannsen Drilling

Company owned Lot 66 from around 1926 to approximately 1953. The Purox Company occupied Lot 67 as of 1928. Three separate steel manufacturing companies occupied lot 67 until at least 1966. The Standard Lumber Company owned and/or leased the northern portion of the former Boeing property from approximately 1920 to at least 1960. In 1986, Lots 66, 67, and 68 were sold to the Boeing Company by the Port of Seattle. Boeing constructed building 9-04 in 1991 for hazardous material and waste storage (GeoEngineers 2000).

3.5.3. Environmental Investigations and Cleanup Activities

According to Ecology's online LUST database, the MOF property (Facility Site ID No. 98798343/Parcel 3324049019), located at 9404 East Marginal Way South, has soil and groundwater contamination awaiting cleanup (Ecology 2007f). The former Boeing property is not listed in the LUST database. Ecology's online UST database indicates that two USTs have been removed at the MOF. However, investigations conducted by the MOF have determined that there are at least ten USTs located at the property. The MOF property and the former Boeing property are not listed in Ecology's online CSCSL database, Ecology's online Hazardous Waste Facility search database, Ecology's online Industrial Storm Water General Permit databases, or EPA's TRI inventory database.

3.5.3.1. Stormwater

Museum of Flight (Parcel 3324049019)

On October 14, 2004, the Joint Inspection Program conducted an inspection at the MOF. The inspection of commercial and industrial properties was conducted as part of a King County and SPU joint program to assist businesses in reducing the amount of pollutants discharged to the LDW via storm drains and CSOs. The inspection found that no industrial wastewater was being discharged to the storm drain, and that the catch basins are cleaned twice a year. The inspection determined that the facility was observed to be in compliance, and no further action was required by the MOF.

No additional data regarding stormwater lines was available during the review of Ecology files. It is unknown if the locations of known groundwater and soil contamination could be a potential pathway of contamination to Slip 6.

Former Boeing Property (Parcel 5624201034)

Groundwater containing petroleum hydrocarbon contamination is located at the east edge of Building 9-04 on the former Boeing property. It is not clear on Boeing's drainage plans where the stormwater from this area drains to. Stormwater at the 9-04 building does not drain to either of the Boeing outfalls (DC14 nor DC15) located at the Slip 6 inlet (Figure 36; Boeing 2003a). It is unclear if the groundwater contamination and potential residual soil contamination could migrate to the Slip 6 inlet and present a potential pathway of contamination to Slip 6.

3.5.3.2. Groundwater

Museum of Flight (Parcel 3324049019)

Results of a Phase I/II ESA conducted in 2001 indicated the presence of USTs and also located areas of soil and groundwater contamination (GeoEngineers 2001a). Approximately ten USTs are located at this parcel where the museum is located. Thirteen soil borings (B-1 through B-13) were advanced to depths of 12 to 20 feet bgs at locations depicted in Figure 37 and 38. Groundwater was encountered in the borings at depths ranging between 10 and 16 feet bgs. Soil samples were submitted for chemical analysis of benzene, toluene, ethylbenzene, and xylene (BTEX) and gasoline-, diesel-, and heavy oil-range-hydrocarbons. Groundwater samples were analyzed for BTEX and petroleum hydrocarbons (GeoEngineers 2001a).

One or more BTEX compound and/or gasoline-range petroleum hydrocarbons were detected in soil samples from borings B-2, B-3, B-4 and B-6 at concentrations that exceed MTCA Method A cleanup levels for industrial properties. Soil chemical analysis results are presented in Figures 37 and 38 and in Table 12. Borings B-1, B-3, B-4, and B-6 had BTEX compounds and/or gasoline-range petroleum hydrocarbons detected at concentrations that exceed MTCA Method A cleanup levels for soil. Groundwater chemical analysis results are presented in Figure 37 and Table 13. Borings B-3 and B-6 had BTEX compounds and/or gasoline-range petroleum hydrocarbons that were detected at concentrations that exceed MTCA Method A cleanup levels (GeoEngineers 2001a).

The Phase I/II ESA concluded that gasoline-related soil contamination at concentrations that exceed MTCA Method A cleanup levels appeared to be present at depths ranging between 8 and 15 feet bgs. At the time, the MOF had planned to expand its facility to the north and the west. It was recommended that a plan for UST removal and contaminated soil disposal be developed and that the USTs and petroleum-contaminated soils and groundwater be properly disposed of during the excavation phase of the redevelopment. (GeoEngineers 2001a)

To date, the planned redevelopment has not occurred. No work has been done to address groundwater contamination or to remove the USTs or remediate contaminated soil or groundwater.

Former Boeing Property (Parcel 5624201034)

This area was formally identified as Gate J-28 when Boeing owned this parcel. Boeing is no longer the owner of the parcel. Boeing has been conducting groundwater monitoring at the parcel, with the latest event occurring in April 2004.

In 2000, Boeing conducted a Phase I ESA of this property. A previous investigation identified diesel-range petroleum hydrocarbons in the soil near the southeast corner of the property. The impacted soil impacted soil was reportedly within the adjacent railroad right-of-way. The Phase I ESA concluded that, based on the historical review, there was a significant potential for soil and groundwater contamination by hazardous substances at the property and that additional soil and groundwater testing may be warranted. GeoEngineers recommended conducting a Phase II ESA to provide a better understanding of the subsurface contamination (GeoEngineers 2000).

In 2001, soil and groundwater samples were collected as part of a Phase II ESA (GeoEngineers 2001b) that was completed before Boeing transferred the property to the MOF. Ten soil borings were advanced with a direct-push rig to approximately 12 to 16 feet bgs. Soil and groundwater samples were analyzed for petroleum hydrocarbons, VOCs, PAHs, and RCRA metals. Oil-range petroleum hydrocarbons were detected in a soil sample collected from 12 feet bgs in boring B-9 at a concentration exceeding the MTCA Method A cleanup level in effect at the time of the Phase II ESA. The concentration detected (490 mg/kg) does not exceed the current MTCA Method A cleanup level of 2,000 mg/kg. VOCs, PAHs, and metals were either not detected in soil or were detected at concentrations less than MTCA Method A cleanup levels available at the time the Phase II ESA was conducted. Cadmium was not detected in ten of the soil samples and had a detection limit of less than 0.3 mg/kg. Mercury was not detected in two soil samples and had a detection limit of less than .02 mg/kg. One groundwater sample exceeded the MTCA Method A cleanup level of 1000 µg/L for diesel-range petroleum hydrocarbons, and one groundwater sample exceeded the MTCA Method A cleanup level of .005 mg/L for lead. All other VOCs, PAHs, and metals were detected at concentrations less than the MTCA Method A cleanup levels. No SMS chemical concentrations in soil or groundwater exceeded the applicable screening tool level (GeoEngineers 2001b).

The results of the March 2001 Phase II ESA indicated that the potential for subsurface contamination from hazardous substances at the facility was low, with one exception. Diesel-range petroleum hydrocarbons were detected in a groundwater sample in the southeastern corner of the former Boeing property (referred to as Gate J-28 in Boeing documents) at the soil boring location B-10. Further groundwater monitoring was recommended (GeoEngineers 2001b).

A groundwater quality investigation was conducted in 1991, which included installation of two groundwater monitoring wells DC-MW-7 (downgradient of boring B-10) and DC-MW-8 (upgradient of boring B-10). Results for groundwater samples at these wells indicated diesel-range petroleum hydrocarbons at a concentration above the MTCA Method A cleanup level at well DC-MW-8.

In 2001, Ecology determined TPH in the soil no longer posed a threat to human health or the environment and declared no further action for soil was necessary under MTCA. However, Ecology determined groundwater monitoring was required to ensure that TPH-contaminated groundwater did not migrate away from the location and pose a threat to human health or environment (Maeng 2001). Groundwater monitoring was continued at wells DC-MW-7 and DC-MW-8, and a third well, DC-MW-9, was installed at the location of former boring B-10. Samples were also collected from this well for laboratory analysis.

Diesel-range and gasoline-range petroleum hydrocarbons were detected in the groundwater from the upgradient well, MW-9, during each of two semiannual monitoring events conducted in 2003 and 2004. Well MW-9 is upgradient of MW-7. The well locations are depicted in Figure 39. Gasoline-range petroleum hydrocarbons were detected at concentrations of 2.2 mg/L and 2.0 mg/L in samples from MW-9 during the 2003 and 2004 sampling events, respectively. Diesel-range petroleum hydrocarbons were detected at concentrations of 1.6 mg/L and 2.2 mg/L in samples from MW-9 during the 2003 and 2004 sampling events. The monitoring report states that these gasoline-range and diesel-range petroleum hydrocarbon concentrations exceed the

MTCA Method A groundwater cleanup levels of 0.8 mg/L and 0.5 mg/L, respectively. Groundwater results from the downgradient well, MW-7, did not exceed MTCA Method A cleanup levels (Landau 2004).

The 2004 Annual Groundwater Monitoring Report (Landau 2004) concluded that the source of contaminants detected in groundwater appeared to be located off-property and upgradient of the groundwater contamination. Additionally, the petroleum hydrocarbon concentrations observed over the past eleven monitoring events suggested that the petroleum hydrocarbon concentration at DC-MW-9 were stable and the petroleum hydrocarbon concentrations at well DC-MW-9 would not likely decrease until the source was removed. Boeing recommended further groundwater monitoring be discontinued until the off-site source of petroleum hydrocarbons could be identified and remediated (Landau 2004). Groundwater flow during this annual monitoring event was reported to be to the west-southwest (Landau 2004). Slip 6, as depicted in Figure 39, is located to the northwest of DC-MW-9.

3.5.3.3. Spills

There have been no documented spills at either MOF area. There is inadequate information available to assess the potential for future spills to migrate to Slip 6 drainage basin. There is no information that indicates that a SWPPP has been developed for this property, which would minimize the potential for spills to impact the drainage system.

3.5.3.4. Bank Erosion

This property is not located along the shoreline bank of the LDW or the Slip 6 inlet.

3.5.4. Potential Pathways of Contamination

3.5.4.1. Stormwater

Museum of Flight (Parcel 3324049019)

No information regarding stormwater from this portion of the property was identified during the file review. It is unclear is stormwater from this area is a potential pathway of contamination.

Former Boeing Property (Parcel 5624201034)

According to the SWPPP, and as depicted in Figure 36, this area does not drain to either of the Boeing outfalls (DC14 or DC15) located within the Slip 6 inlet. However, it appears that catch basins located in this area lead to outlet DC15. It is unclear where the stormwater drains to. No information regarding stormwater from this portion of the property was identified during the file review. It is unclear if stormwater from this area is a potential pathway of contamination.

3.5.4.2. Groundwater

Museum of Flight (Parcel 3324049019)

Parcel 3324049019 is located upgradient of parcel 5624201034. As stated in Section 3.5.3.2, a Phase I/II ESA (GeoEngineers 2001a) concluded that gasoline-related soil contamination at concentrations that exceed MTCA Method A cleanup levels appeared to be present at depths ranging between 8 and 15 feet bgs. BTEX compounds and/or gasoline-range petroleum hydrocarbons were detected in groundwater samples at concentrations that exceed MTCA Method A cleanup levels.

No work has been done to address groundwater contamination or to remove the USTs and contaminated soil. There is not enough information to assess if groundwater is a potential pathway of contamination to Slip 6.

Former Boeing Property (Parcel 5624201034)

As stated in Section 3.5.3.2, groundwater contamination is present in parcel 5624201034. This area was formally identified as Gate J-28 when Boeing owned this parcel. Boeing has been conducting the groundwater monitoring, with the latest event occurring in April 2004. The 2004 Annual Groundwater Monitoring Report concluded that the source of contaminants detected in groundwater was located off-property at the upgradient edge of the property. Additionally, the petroleum hydrocarbon concentrations observed over the past 11 monitoring events suggest the concentrations are stable and that the petroleum hydrocarbon concentrations would likely not decrease until the source is removed. Boeing recommended that further groundwater monitoring be discontinued until the off-site source of petroleum hydrocarbons could be identified and remediated (Landau 2004). Groundwater flow during this annual monitoring event was reported to be to the west (Landau 2004). Groundwater sampling has not been sampled since April 2004, and the source of the groundwater contamination has not been addressed. In 2004 it appeared that groundwater contamination was not migrating to the LDW or to the Slip 6 inlet. The current conditions are unknown and the source has not been identified or remediated. The current groundwater contaminant plume is not understood clearly enough to determine if groundwater from this property has the potential to be a potential pathway of contamination to Slip 6. However, based on the groundwater flow direction at the property and the lack of petroleum hydrocarbons immediately downgradient of the location where petroleum hydrocarbons were detected in groundwater, it is unlikely that groundwater migration is a potential pathway of contamination to Slip 6.

3.5.4.3. Spills

There have been no documented spills at either of the MOF parcels. There is no information that indicates that a SWPPP has been developed for either the former Boeing property (parcel 5624201034) or the MOF (parcel 3324049019), which would minimize the potential for spills to impact the drainage system. Therefore, there is inadequate information available to assess if there is the potential for future spills to migrate to the Slip 6 drainage basin.

3.5.4.4. Bank Erosion

This property is not located along the shoreline bank of the LDW or the Slip 6 inlet; therefore, bank erosion is not a potential source of recontamination to LDW sediments.

3.5.5. Data Gaps

3.5.5.1. Stormwater

Museum of Flight (Parcel 3324049019)

No information regarding stormwater sampling was identified during the file review. There was no information in the reviewed files that indicated that contamination is present in the stormwater or that the stormwater has been sampled from this area. It is unclear where the surface water drains to.

Former Boeing Property (Parcel 5624201034)

It is unclear where the surface water drains to. The SWPPP indicates that the area does not drain to one of the two Boeing outfalls (DC14 and DC15) located in the Slip 6 inlet; however, it appears that the catch basins lead to DC15. No information regarding stormwater sampling was identified during the file review. There was no information in the reviewed files that indicated that contamination is present in the stormwater or that the stormwater has been sampled from this area.

3.5.5.2. Groundwater

Museum of Flight (Parcel 3324049019)

Groundwater and soil contamination identified on the MOF property located to the east side of East Marginal Way South has not been remediated. There is not enough information to determine if groundwater contamination is a potential pathway to Slip 6.

Former Boeing Property (Parcel 5624201034)

Groundwater monitoring was conducted until 2004 when it was suggested by Boeing's consultants that the off-site source of petroleum hydrocarbons be identified and remediated. The groundwater at this property has not been sampled since 2004. The source of the continued groundwater contamination has not been addressed. Data collected during previous monitoring events suggests that groundwater migration is an unlikely potential pathway for contamination to Slip 6.

3.5.5.3. Spills

No spills have been documented as occurring within either area of the MOF. There is not adequate information available to assess the potential for future spills to migrate to the Slip 6 drainage basin.

3.5.5.4. Bank Erosion

Museum of Flight (Parcel 3324049019)

This portion of the property is not located along the banks of Slip 6. No data gaps have been identified.

Former Boeing Property (Parcel 5624201034)

This portion of the property is not located along the banks of Slip 6. No data gaps have been identified.

3.6 Boeing Developmental Center

3.6.1. Current Operations

The portion of the BDC that is located within the Slip 6 drainage area is identified in King County's tax assessor website as being located at 9725 East Marginal Way South in Tukwila, Washington (King County 2007a). Boeing has operated on portions of this property continuously since 1956. The Slip 6 inlet is within the northern portion of the BDC property, as depicted in Figures 2 and 40. Information regarding the southern portion of the BDC is detailed in Early Action Area 7, Summary of Existing Information and Identification of Data Gaps Report (E & E 2007a) and the Source Control Action Plan for Early Action Area 7 (E & E 2007b). The BDC is primarily an aircraft and aerospace research and development complex. Operations include manufacturing airplanes and missiles, which involves machining metal, electroplating, chemical milling, conversion coating, painting, parts cleaning, and assembly (Landau 2002).

To the east is the Boeing Military Flight Center (MFC) and further east is the southernmost portion of the KCIA. The LDW lies along the southwestern property boundary. To the north, Slip 6 separates the BDC from the former Rhone-Poulenc chemical manufacturing facility (Landau 2002).

The portion of the BDC that is located within the Slip 6 drainage area includes the following three parcels that are owned by Boeing (King County 2007a):

- Parcel 5624201032 – 25.78 acres, zoned for commercial/industrial use, containing four structures: a 244,121- sq. ft. office building (built in 1990), a 76,744-sq. ft. service repair garage (built in 1986), a 70,964-sq. ft. industrial engineering building (built in 1986), and a 9,022-sq. ft. cafeteria (built in 1991). (Approximately half of this parcel is located within the Slip 6 drainage basin.)

- Parcel 5624201038 – 3.78 acres, zoned for commercial/industrial use.
- Parcel 5624201036 – 1.63 acres, zoned for commercial/industrial use. (Approximately half of this parcel is located within the Slip 6 drainage basin.)

The following surrounding land-use information was also obtained from the King County tax assessor website (King County 2007a):

- To the north of the BDC is the former Rhone-Poulenc facility (9229 East Marginal Way South, parcel 5422600010). This property has been redeveloped and subdivided into two separate parcels (the West Parcel and East Parcel). The West Parcel (Parcel No. 5422600010) is an approximately 14-acre property that is currently paved and leased to IAAI for storage of wrecked cars prior to auction or offsite recycling. The East Parcel (Parcel No. 5422600020) is an approximate 7-acre property which is now owned by the MOF.
- To the northeast of the BDC is a 5.48-acre property that was formally owned by Boeing and is part of the MOF (no listed address, parcel 5624201034). This parcel is owned by the MOF and contains two buildings used as a storage warehouse and an office building. This area is further discussed in Section 3.5.
- To the east of the BDC is the MOF (9404 East Marginal Way South, parcel 3324049019). This 11.44-acre parcel is owned by the Museum of Flight Foundation and contains five buildings, two of which are used as a museum, one as a restaurant, one as an office building, and one for industrial heavy manufacturing.
- To the southeast of the BDC is the MFC property; this facility is discussed in detail in the Early Action Area 7 reports (E & E 2007a and b).
- To the south of the parcels that are located within the Slip 6 drainage basin are the remaining parcels that comprise the BDC. These areas do not lie within the drainage area of Slip 6.

Ecology issued the BDC an Industrial Storm water General Permit No. SO3000146D by Ecology. The permit expires on May 31, 2008. Based on Ecology's online database, the benchmarks for this permit are for pH with a minimum of 6.0 and a maximum of 9.0 standard pH units. There are also benchmarks for Oil/Grease, 15 mg/l, Turbidity, 25 ntu, Copper, 63.3 μg/l, Lead, 81.6, Zinc, 117 μg/l) (Ecology 2007d).

The BDC is listed as a hazardous facility on Ecology's online Hazardous Site Facility Search database and has a RCRA ID No. WAD093639946 (Boeing A&M Developmental Center; Ecology 2007b). According to the BDC Storm Water Pollution Prevention Plan (SWPPP; Boeing 2003a), solid and liquid hazardous wastes are accumulated at collection stations inside buildings where hazardous wastes are generated. These wastes are managed per the Hazardous Waste Management Plan, with liquid wastes held in areas with secondary containment. Most waste is generated in the 9-101 building, which is located outside the Slip 6 drainage basin. No documents were found indicating that Boeing is out of compliance.

The facility has been issued a Wastewater Discharge Authorization No. 526-04 from the King County Industrial Waste Program to discharge wastewater to the King County sanitary sewer. This wastewater is generated from the vactor decant station operations, composite parts wash operations, photo processing, water jet cutting operations, and groundwater remediation activities. In a vactor decant station, liquid and solid wastes are separated and the water is sent through a series of oil/water separators. This authorization is effective November 17, 2005, through November 16, 2010.

According to Ecology's online NPDES and State Waste Discharge Permit database, this property does not have an Individual Wastewater Discharge permit (Ecology 2007e).

EPA's online Toxics Release Inventory (TRI) database (http://www.epa.gov/triexplorer/) was searched for information on the BDC. In general, the database contains information on toxic chemical releases and other waste management activities reported annually by certain industry groups as well as federal facilities. Release Reports, Waste Transfer Reports, and Waste Quantity Reports were searched in this database. In general, the databases for Release Reports and Waste Transfer Reports contain data for the years 1988 through 2004, and the database for Waste Quantity Reports contains data for the years 1991 through 2004. Data for the BDC are provided in the Release Reports and Waste Transfer Reports for the years 1988 through 1994 and in the Waste Quantity Reports for the years 1991 through 1994 (EPA 2007).

Quantities of the releases are summarized by report type in Appendix A. In the Release Reports and Waste Transfer Reports for the years 1988 and 1989, 1,1,1-trichloroethane, acetone; Freon 113; methyl ethyl ketone; and toluene were listed for the BDC. For 1990, Freon 113, methyl ethyl ketone, and toluene were listed. For the years 1991-1994, the only chemical listed is 1,1,1-trichloroethane. In the Waste Quantity Reports for the years 1991 through 1994, 1,1,1-trichloroethane is the only chemical listed (EPA 2007).

3.6.2. Historical Use

The BDC area was farmland until 1918, when the U.S. Army Corps of Engineers channelized the LDW. The earliest known commercial operations at the property began in 1927. Information on land use between 1927 and 1956 is not available. Boeing has operated on portions of this property continuously since 1956 (SAIC 1994).

Monsanto Fund purchased the northern 38 acres of the BDC at an unknown time. The area included warehouse and office buildings, winery buildings, the granary, Dallas-Mavis, and Slip 6. During the time that Monsanto owned the 38 acres, they leased out the property. The Port of Seattle purchased the property and took over the leases in 1976. The Port of Seattle leased the northeastern five acres in two, 2.5-acre parcels to Kenworth Truck Company and Transport Pool Granary for storage. Terminal 128 Corporation leased Slip 6 and intended to develop the slip as a marina. However, those plans never materialized and the Port of Seattle sold Boeing the property in 1985 (SAIC 1994).

Boeing has operated on portions of this property continuously since 1956. Prior to 1980, the Military Airplane Company Division of Boeing operated this facility. The BDC began operations in October 1980. In November 1987, the operation was transferred to the Boeing Advanced Systems Company Division. In 1990, as part of reorganization, Boeing separated the BDC from the MFC (SAIC 1994).

Historical activities conducted by Boeing at the property include manufacturing of airplanes and missiles, which involves machining metal, electroplating, chemical milling, conversion coating, painting, parts cleaning, and assembly. Past projects at the BDC include research on supersonic transportation and development of military aircraft (SAIC 1994).

3.6.3. Environmental Investigations and Cleanup Activities

The BDC is listed on several databases, including Ecology's online CSCSL database, Ecology's online Hazardous Waste Facility search database, and Ecology's online Industrial Storm Water General Permit databases.

On Ecology's CSCSL database, the BDC (Facility ID No. 4581384) is listed as having soil contamination below the MTCA cleanup level for PCBs (Ecology 2007c). The BDC (listed as the Boeing A&M Developmental Center, Facility Site ID No. 2101) is also listed as having confirmed groundwater and soil contamination and suspected surface water, air, and sediment contamination. The contaminants are listed as base/neutral/acid organics, priority pollutant metals, petroleum products, and non-halogenated solvents.

The BDC (identified as the Developmental Center on Ecology's online UST database) is reported to have had eleven USTs at the facility. It is unknown which, if any, of the USTs are located in the portion of the BDC that is located in the Slip 6 drainage basin. Four of these USTs are listed as having been removed, one as closed in place, three as exempt, and three as operational and containing diesel fuel or unleaded gasoline. According to the December 2003 SWPPP (Boeing 2003a), two tanks (which contain 550 gallons of diesel fuel and 1,100 gallons of unleaded gas) are located by building 9-52, but outside the Slip 6 drainage basin. The property is not listed on Ecology's online LUST database (Ecology 2007f).

3.6.3.1. Stormwater

Stormwater from the BDC is collected by a conventional stormwater drainage system. Catch basins within the property collect stormwater and discharge it to the LDW at a total of 18 outfalls, two of which discharge to the Slip 6 inlet (DC14 and DC15), as depicted in Figure 36. Some of the remaining outfalls drain to the Norfolk Drainage Basin. This is addressed in the Early Action Area 7 SCAP and associated Data Gaps Report. The remaining outfalls drain to a third sub-drainage basin. Information on the two outfalls that drain to the Slip 6 source control area is summarized below. Both of these storm drain lines have in-line oil/water separators installed in the system immediately upstream of the outfalls in Slip 6 (Boeing 2003a).

Outfall DC14

This outfall drains the roof area of the northern half of the 9-08 (office) building and large paved areas (extensive parking and drive areas) around the building. It also drains landscaped areas around the building and in a greenbelt corridor on the western boundary next to the LDW. Runoff is collected into a drain line system, which discharges, via an oil/water separator, into the LDW. This is considered to be a medium volume outfall (Boeing 2003a).

Outfall DC15

This outfall drains the roof of most of the 9-77 building, all of the 9-05 and 9-07 buildings, and a large water storage tank. It also drains extensive parking and storage areas around these buildings. Runoff is collected into a drain line system, which discharges, via an oil/water separator, into the LDW. This is considered to be a medium volume outfall (Boeing 2003a).

Stormwater Pollution Prevention Plan

The 2003 revision of Boeing's SWPPP (Boeing 2003a) for the BDC (for Ecology Permit # S03-000146) includes a potential pollutant source inventory. This property-wide source inventory identifies activities or practices that may be a source of stormwater pollution. The assessment was conducted by Environmental Engineering and included extensive site inspections and research of current and past practices and activities. The potential sources identified by Boeing for the BDC are listed below (Boeing 2003a).

- Roof contaminants are considered to be a minor stormwater risk at this property.
- Drums are considered to be a risk to stormwater.
- ASTs that contain oil and gas tanks are considered to be a moderate risk to stormwater. Fourteen diesel tanks are located at the site. Seven of these are located outdoors, and each one has secondary containment to hold at least the volume of the tank contents. Outside fuel tanks are located within the Slip 6 drainage area.
- Material handling activities are considered to be a minimal risk to stormwater. The 9-52 and 9-60 buildings are where the majority of loading/unloading activities take place and stormwater from this area now drains to a newly installed oil-water separator prior to discharge to the LDW. Most buildings have large roll-up doors that permit a great deal of loading and unloading to be done indoors.
- Non-stormwater discharges are considered to be a minor risk to stormwater pollution. These discharges include, on occasion: dewatering for construction projects: infrequent flushing of municipal water from fire sprinkler systems, discharges of groundwater or stormwater that accumulates in utility vaults, and discharges of condensate from air handling units to the storm drainage system.

PCB Sampling at Oil/water Separators

Sampling for PCBs was conducted at oil/water separators located throughout the BDC during August and September of 2002. However, this sampling did not include the two discharge points that are located within the Slip 6 drainage basin (DC14 and DC15) (Boeing 2003b).

3.6.3.2. Groundwater

There have been no areas with documented contaminated groundwater in the portion of the BDC located within the Slip 6 drainage area.

3.6.3.3. Spills

There have been no documented spills in the portion of the BDC located within the Slip 6 drainage basin.

3.6.3.4. Bank Erosion

A portion of the BDC property is located along the embankment of the LDW, adjacent to the Slip 6 inlet. Available information was reviewed to evaluate the potential for bank erosion or leaching of near-bank soils to recontaminate LDW sediments. Available information did not indicate the potential for sediment recontamination as a result of bank erosion or leaching of near bank soils.

3.6.4. Potential Pathways of Contamination

3.6.4.1. Stormwater

The Slip 6 drainage basin contains two outfalls that are located on the BDC property; DC14 and DC15. The outfalls are described in Section 3.6.3.

Sampling for PCBs was conducted at oil/water separators located throughout the BDC during August and September of 2002. There were four sampling events during the project for the collection of aqueous and sediment/sludge samples. Neither DC14 nor DC15 have been sampled.

3.6.4.2. Groundwater

There have been no documented areas of contaminated groundwater in the portion of the BDC that is located within the Slip 6 drainage basin.

3.6.4.3. Spills

There have been no documented spills in the portion of the BDC located within the Slip 6 area. However, a SWPPP contains a potential pollutant source inventory that identifies materials that, if spilled or released, could result in stormwater pollution. These materials include storage, waste handling, manufacturing, building processes, and transportation. Spills at the BDC could enter the storm drain system and be discharged to the Slip 6 inlet. However, Boeing has developed a SWPPP to minimize the potential for spills to impact the drainage system.

3.6.4.4. Bank Erosion

The portion of BDC by Slip 6 is located along the bank of the LDW. No information was available regarding possible contaminants located within soils along the bank.

3.6.5. Data Gaps

3.6.5.1. Stormwater

Runoff from impervious surfaces, both paved areas and rooftops, is treated with oil/water separators prior to discharge to the LDW. However, it is not apparent whether dissolved aqueous contaminants or contaminated solids could be migrating through the oil/water separators.

Available data from monitoring of solids in the storm drains is insufficient to assess the potential for sediment recontamination from any ongoing sources.

3.6.5.2. Groundwater

There are five former, three operational, and three exempt USTs listed in the Ecology UST database. It is not clear which of these, if any, are located within the Slip 6 drainage basin and if any are located within an area that could potentially contaminate groundwater that would migrate into the Slip 6 drainage basin.

3.6.5.3. Spills

There is no information to indicate that spills have occurred on this portion of the BDC. Boeing has developed a SWPPP to minimize the potential for spills to impact the drainage system.

3.6.5.4. Bank Erosion

No information was available regarding possible contaminants that may be located within soils along this bank. There is insufficient data to assess the potential for sediment recontamination from bank erosion.

This page intentionally left blank

4.0 References

AMEC Earth & Environmental, Inc. (AMEC). 2007a. Letter of Correspondence from Vicki Acker and Meg Strong, AMEC, to Alex Buccilli, PACCAR, Inc. RE: Storm Drain System Repair (CB74 to Lift Station). February 16, 2007.

______. 2007b. Draft Dry Season Groundwater Study Report. 8801 East Marginal Way South Property. Prepared for PACCAR, Inc. February 23, 2007.

______. 2006a. Historical Storm Line System Sampling and Cleaning Activities Report. Prepared for PACCAR, Inc. June 1, 2006.

______. 2006b. Draft Storm Drain Cured in Place Pipe Repair Work Plan. 8801 East Marginal Way South, Tukwila, WA. March 28, 2006.

______. 2006c. Draft Wet Season Groundwater Study Report. 8801 East Marginal Way South Property. Prepared for PACCAR, Inc. June 3, 2006.

______. 2005. Investigation of Groundwater Infiltration to the North Part of the Storm Drain System. 8801 East Marginal Way South Property. Prepared for PACCAR, Inc. May 9, 2005.

Anchor Environmental LLC, (Anchor). 2008. Memorandum: May and June 2007 Stormwater Results. Prepared for PACCAR, Inc. January 14, 2008.

______. 2007a. Memorandum: March 2007 Storm Water and Storm Water Solids Results. Prepared for PACCAR, Inc. June 29, 2007.

______. 2007b. Pathway and Data Analysis Memorandum. 8801 East Marginal Way South Property. Prepared for PACCAR, Inc. March 23, 2007.

______. 2006. Sediment Evaluation Work Plan. 8801 East Marginal Way South Property. Prepared for PACCAR, Inc. July 2006.

Boeing. 2003a. Storm Water Pollution Prevention Plan, Boeing Developmental Center, Washington Department of Ecology Permit # SO3-000146. Prepared by The Boeing Company. Washington Department of Ecology. December 2003.

______. 2003b. Summary of Data from PCB Sampling Associated with Oil/Water Separators at the Developmental Center. Prepared by Project Performance Corporation for The Boeing Company. January 23, 2003.

Ecology and Environment, Inc (E & E). 2007a. Lower Duwamish Waterway Early Action Area 7, Summary of Existing Information and Data Gaps Report – Final. Prepared for Washington State Department of Ecology by E & E, Seattle, Washington. June 2007.

______. 2007b. Lower Duwamish Waterway Early Action Area 4, Summary of Existing Information and Data Gaps Report – Final. Prepared for Washington State Department of Ecology by E & E, Seattle, Washington. April 2007.

GeoEngineers. 2001a. *Phase I/Phase II Environmental Site Assessment. Museum of Flight Property 9404 East Marginal Way South*. Prepared for the Washington Department of Ecology on behalf of Boeing. June 29, 2001.

______. 2001b. Phase II Environmental Site Assessment Report, 9725 East Marginal Way South, Seattle, Washington. Prepared by GeoEngineers, Seattle, WA. March 12, 2001.

______. 2000. *Phase I Environmental Site Assessment, 9725 East Marginal Way South, for Museum of Flight.* Prepared for the Boeing Company. May 22, 2000.

______. 1995. Remediation Monitoring Boneyard Hydraulic Oil Spill Report. Prepared for Kenworth Truck Company. September 21, 1995.

GeoEngineers and Kennedy/Jenks/Chilton. 1987. Environmental Site Assessment Former Monsanto Waste Disposal Area. Kenworth Truck Facility, King County, WA. January 14, 1987.

Geomatrix. 2008. Revised East Parcel Corrective Measures Implementation Work Plan. Former Rhone-Poulenc Site, Tukwila, WA. Prepared for Container Properties, LLC. January 28, 2008.

______. 2007a. Northwest Corner Affected Soil Removal Report. Former Rhone-Poulenc Site, Tukwila, WA. Prepared for Container Properties, LLC. January 2007.

______. 2007b. Revised Operations and Maintenance Report, 2003-2006. Former Rhone-Poulenc Site, Tukwila, WA. Prepared for Container Properties, LLC. April 2007.

______. 2007c. West Parcel Redevelopment Report. Former Rhone-Poulenc Site, Tukwila, WA. Prepared for Container Properties, LLC. January 2007.

______. 2007d. Waste Removal Report. Former Rhone-Poulenc Site, Tukwila, WA. Prepared for Container Properties, LLC. January 2007.

______. 2007e. Self Monitoring Repot, Discharge Permit (No. 7789-01), Former Rhone-Poulenc Site. October 12, 2007.

_______. 2007f. Revised Performance Monitoring Report, Round 34, December 2006. Former Rhone-Poulenc Site, Tukwila, WA. Prepared for Container Properties, LLC. February 2007.

_______. 2006a. East Parcel Soil Characterization and Voluntary Interim Measure Report. Former Rhone-Poulenc Site, Tukwila, WA. Prepared for Container Properties, LLC. September 29, 2006.

_______. 2006b. Voluntary Interim Measure Report Hazardous Waste Storage Area and Transformer A Area Cleanup. Former Rhone-Poulenc Site, Tukwila, WA. Prepared for Container Properties, LLC. August 2006.

_______. 2006c. Slug Discharge Control Plan. Former Rhone-Poulenc Site, Tukwila, WA. Prepared for Container Properties LLC. October 2006.

Kennedy/Jenks. 2007. Air Sparging and Soil Vapor Extraction System 2nd Quarter 2007 Operations Report. 8801 East Marginal Way South Property. Prepared for PACCAR, Inc. December 2007.

_______. 2005a. Draft Cleanup Action Plan. 8801 East Marginal Way South Property. Prepared for PACCAR, Inc. March 31, 2005.

_______. 2005b. Air Sparging and Soil Vapor Extraction System Installation, Startup, and Quarterly Operations Report. 8801 East Marginal Way South Property. Prepared for PACCAR, Inc. February 7, 2005.

_______. 2004. Phase II Data Gaps Investigations Summary Report, 8801 East Marginal Way South Property. Prepared for PACCAR, Inc. November 2004.

_______. 2003. Underground Storage Tank Closure Report. Prepared for PACCAR, Inc. June 4, 2003.

_______. 2002a. Phase I Data Gaps Investigations Summary Report. Prepared for PACCAR, Inc. December 2002.

_______. 2002b. Ambient Air Monitoring Report. PACCAR Inc – Seattle Facility. Prepared for PACCAR Inc. March 25, 2002.

_______. 2000. Risk Assessment. PACCAR Inc, Seattle Facility. Prepared for PACCAR Inc. October 2000.

King County. 2007a. King County online GIS Center Parcel Viewer. http://www.metrokc.gov/GIS/mapportal/PViewer_main.htm. King County, Seattle, WA. Accessed October 2007.

_______. 2007b. Field Inspection Report. 9229 East Marginal Way South. May 10, 2007.

_______. 2006. Issuance of Revised Wastewater Discharge Permit No. 7789-01 to Container Properties, LLC. March 29, 2006.

King County and Seattle Public Utilities (SPU). 2005. Source Control Program for the Lower Duwamish Waterway. June 2005 Progress Report.

King County Industrial Airport (KCIA). 2007a. King County International Airport Online. Accessed online at http://www.metrokc.gov/airport/. February 13, 2007.

______. 2007b. AutoCAD Files: "20 Storm.dwg" and "03 BuildingLeaseLine.dwg." January 29, 2007.

______. 2006. Storm Water Pollution Prevention Plan. Washington State Department of Ecology Permit No. SO3-000343. Prepared for Washington State Department of Ecology.

Landau Associates (Landau). 2004. 2004 Annual Groundwater Monitoring Report, Gate J-28/Museum of Flight. Prepared by Landau Associates, Edmonds, WA, for The Boeing Company, Seattle, WA. July 30, 2004.

______. 2002. Summary Report, Corrective Action, Boeing Developmental Center. Prepared by Landau Associates, Edmonds, WA, for The Boeing Company, Seattle, WA. February 27, 2002.

Maeng, B. 2001. No Further Action Determination for Soils at Gate J-28 Area Boeing Developmental Center (WAD 093 639 946). June 28, 2001.

PACCAR. 2001. Storm Water Pollution Prevention Plan. PACCAR Facility, Tukwila, WA. August 2001.

Science Application International Corporation (SAIC). 2008. Draft Lower Duwamish Waterway Early Action Area 6 Summary of Existing Information and Identification of Data Gaps Report. Prepared for Washington State Department of Ecology by SAIC, Bothell, WA. February 2008.

______. 2006a. Soil and Groundwater Screening Criteria, Source Control Action Plan, Slip 4, Lower Duwamish Waterway. Prepared for Washington State Department of Ecology by SAIC, Bothell, WA. July 2006.

______. 2006b. Lower Duwamish Waterway Source Control Action Plan for Slip 4 Early Action Area. Prepared for Washington State Department of Ecology by Science Applications International Corporation. Publication No. 06-09-046. July 2006.

______. 1994. RCRA Facility Assessment Report for Boeing Developmental Center Tukwila Washington, EPA ID No WAD 09363 9946 and Boeing Military Flight Center Seattle, WA, EPA ID No WAD 98847 5943. Prepared for the U.S. Environmental Protection Agency, Seattle, WA. September 1994.

United States Environmental Protection Agency (EPA). 2007. Toxic Release Inventory Database. Accessed online at http://www.epa.gov/triexplorer/ on October 15, 2007.

______. 2006a. Final Decision and Response to Comments. Rhone-Poulenc East Facility. December 20, 2006.

______. 2006b. Statement of Basis for Remedy Selection and Corrective Action Complete Without Controls Determination. Rhone-Poulenc, Inc. East Parcel, Tukwila, WA. U.S.E.P.A. Region 10, Seattle, WA. November 2006.

______. 2002. Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites. OSWER Directive 9285.6-08. U.S. Environmental Protection Agency. February 12, 2002.

______. 1993. EPA RCRA Administrative Order on Consent (No. 1091-11-20-3008(h) with Container Properties, LLC, Rhodia, Inc., and Bayer CropScience, Inc. March 31, 1993 (as amended).

Washington State Department of Ecology (Ecology). 2008. Letter of Correspondence from Robert Warren, Washington State Department of Ecology, to Richard Bangert, PACCAR, Inc. Re: Determination of Potentially Liable Person Status for the Release of Hazardous Substances under the Model Toxics Control Act. January 24, 2008.

______. 2007a. Lower Duwamish Waterway Source Control Status Report 2003 to June 2007. Publication No. 07-09-064. July 2007.

______. 2007b. Washington Hazardous Waste Facility Search. https://fortress.wa.gov/ecy/hwfacilitysearch/Default.aspx. Washington Department of Ecology, Olympia, WA. Accessed October 2007.

______. 2007c. Online Confirmed and Suspected Contaminated Sites List database. http://www.ecy.wa.gov/programs/tcp/cscs/20061228%20CSCSL.pdf. Washington Department of Ecology, Olympia, WA. Accessed October 2007.

______. 2007d. Online Industrial Storm Water General Permits. http://www.ecy.wa.gov/programs/wq/stormwater/industrial/permit_rewrite/appendix4.pdf Washington Department of Ecology, Olympia, WA. Accessed October 2007.

______. 2007e. Online NPDES and State Waste Discharge Permit Database. http://www.ecy.wa.gov/programs/wq/permits/northwest_permits.html. Washington Department of Ecology, Olympia, WA. Accessed October 2007.

______. 2007f. Online Underground Storage Tank and Leaking Underground Storage Tank databases. http://www.ecy.wa.gov/programs/tcp/ust-lust/ust-lst2.html. Washington Department of Ecology, Olympia, WA. Accessed October 2007.

______. 2006. Agreed Order (No. DE 3599) with PACCAR Inc., 8801 East Marginal Way South property. October 4, 2006.

______. 2004. Lower Duwamish Source Control Strategy. Publication No. 04-09-043. January 2004.

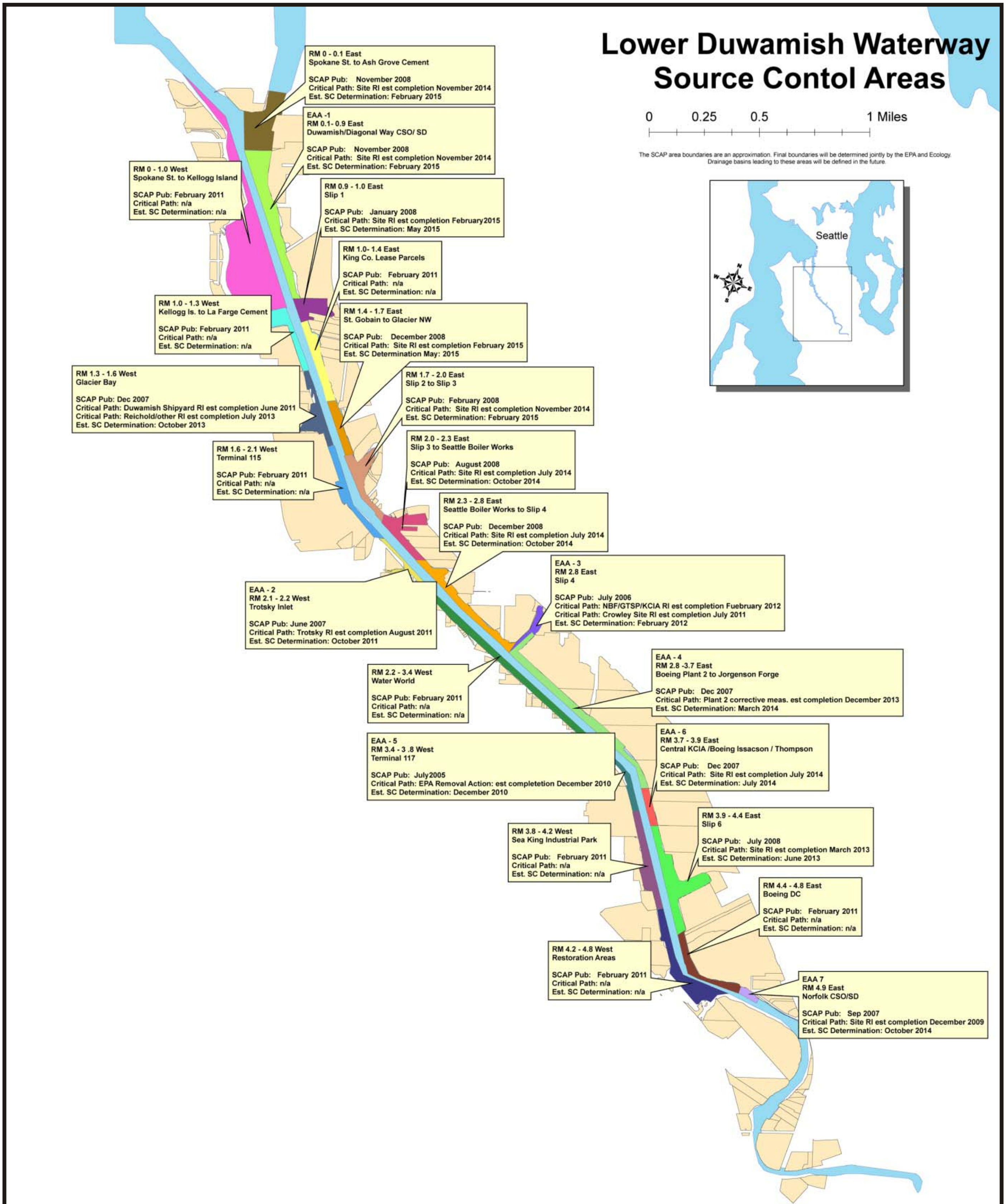
______. 2003a. Letter of Correspondence from Melodie Selby, Washington State Department of Ecology to Lisa Montoya, Kenworth – Seattle. Re: Notice of Termination of Coverage under the Industrial Storm Water Baseline General Permit. May 30, 2003.

______. 2003b. Letter of Correspondence from Maura O'Brien, Washington State Department of Ecology, to Carole Robbins, PACCAR Inc. Re: No Further Action for Soils at USTs E2, E5, E6, and E7 Area. July 17, 2003.

Windward Environmental LLC, 2003. Phase I Remedial Investigation Report, Final, prepared for Lower Duwamish Waterway Group. July 2003.

5.0 Figures

This page intentionally left blank



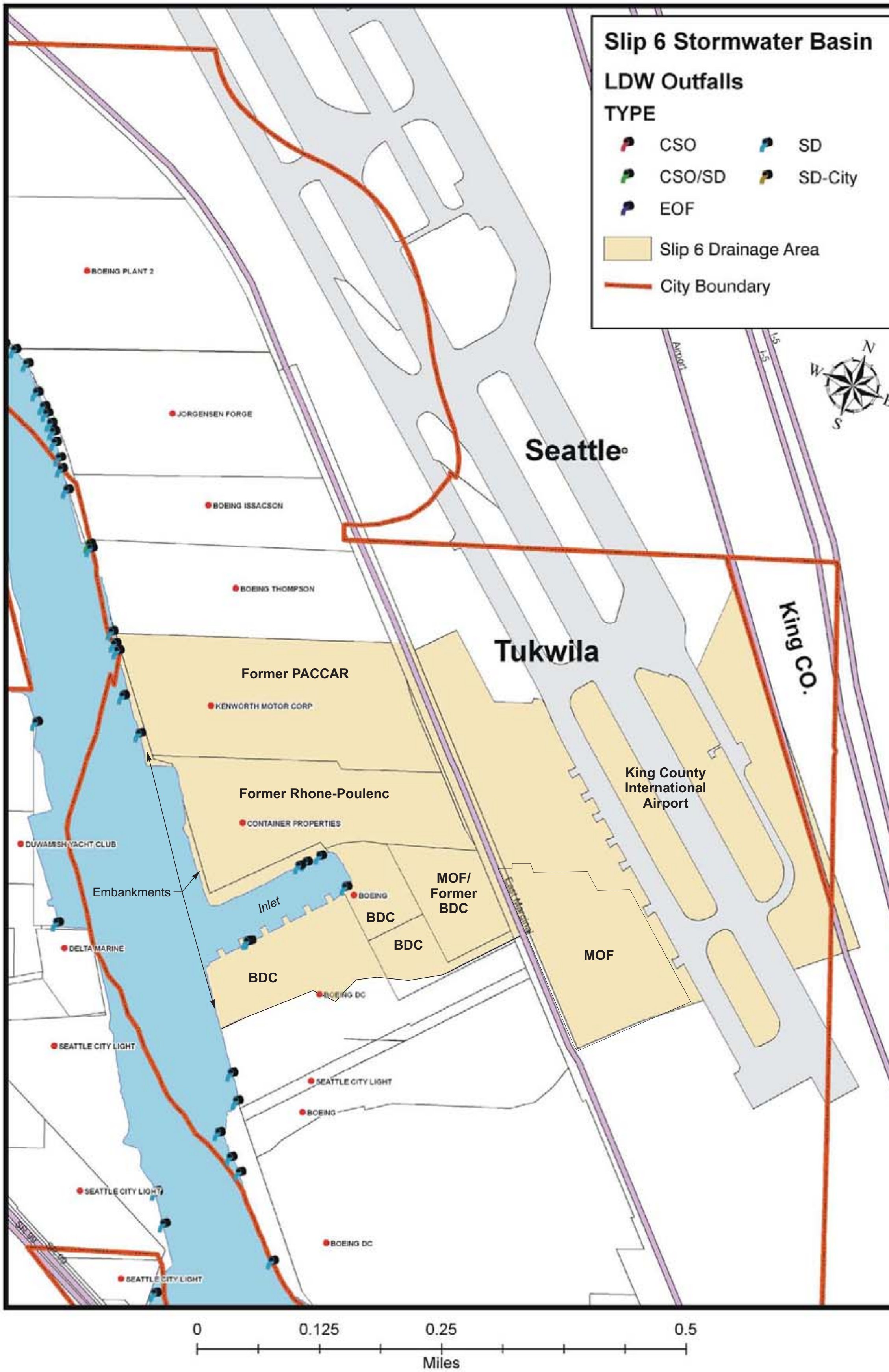
ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

LOWER DUWAMISH WATERWAY
RM 3.9-4.4 EAST (SLIP 6)
Tukwila, Washington

Figure 1
DESIGNATED SOURCE CONTROL AREAS
(DRAFT)

Base Map Reference:
Department of Ecology, 2008.

Date: 3-3-08 | Drawn by: AES | 10:002330WD1402\fig 1



Base Map Reference: Department of Ecology.

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY RM 3.9-4.4 EAST (SLIP 6) Tukwila, Washington	Figure 2 SLIP 6 DRAINAGE AREA Date: 2/13/08 — Drawn by: AES — 10:002330WD1402\fig 2

ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

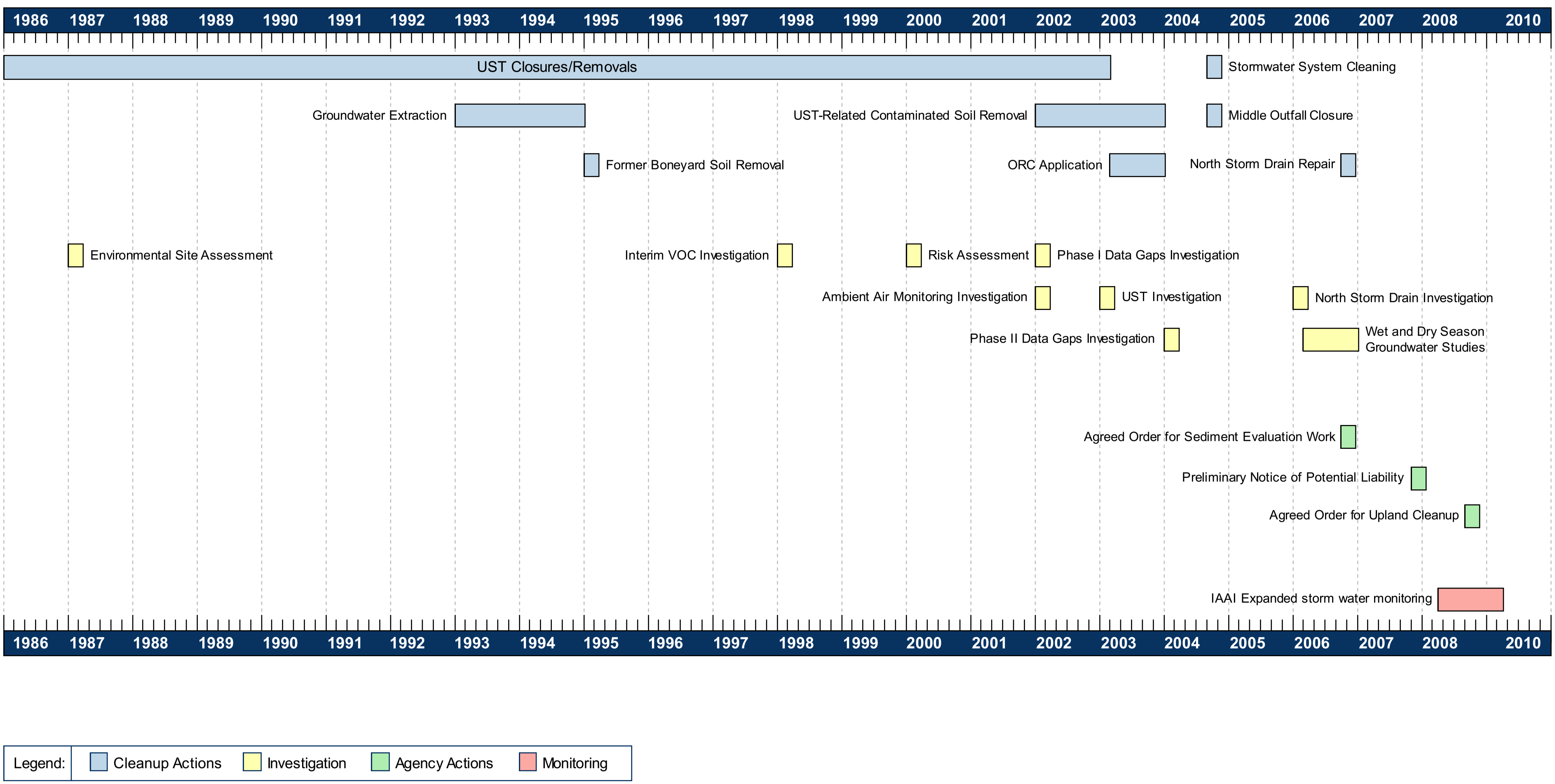
0 150 300
Approximate Scale in Feet

Source: Anchor Environmental, L.L.C. 2006.

LOWER DUWAMISH WATERWAY
RM 3.9-4.4 EAST (SLIP 6)
Tukwila, Washington

Figure 3
SITE MAP

Date:	Drawn by:	
2/13/08	AES	10:002330WD1402\fig 3



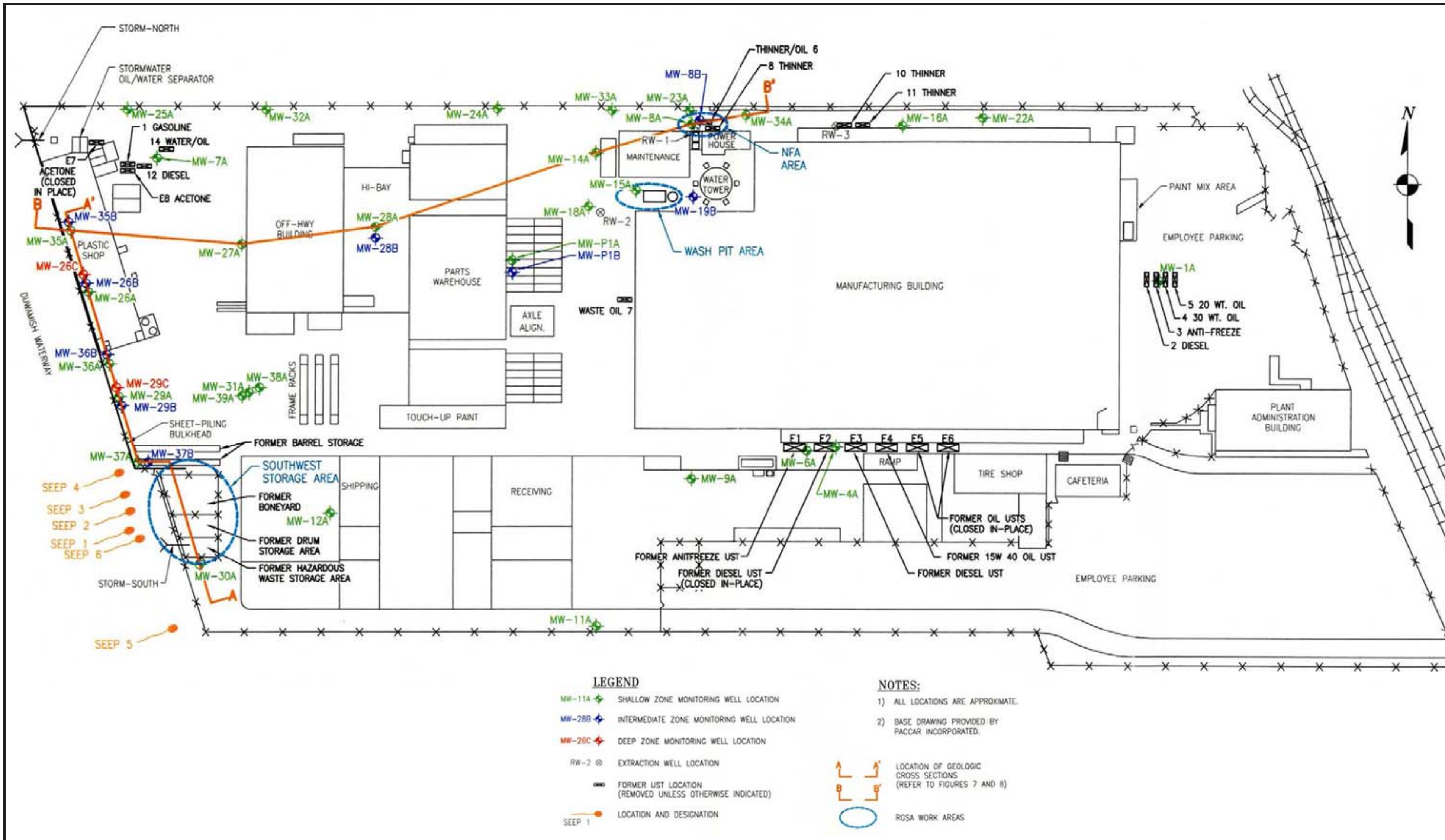
ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

LOWER DUWAMISH WATERWAY
RM 3.9-4.4 EAST (SLIP 6)
Tukwila, Washington

Figure 4

ENVIRONMENTAL INVESTIGATIONS AND CLEANUP ACTIONS TIMELINE
FORMER PACCAR SITE

Date:	Drawn by:	
2/22/08	AES	10:002330WD1402\fig 4



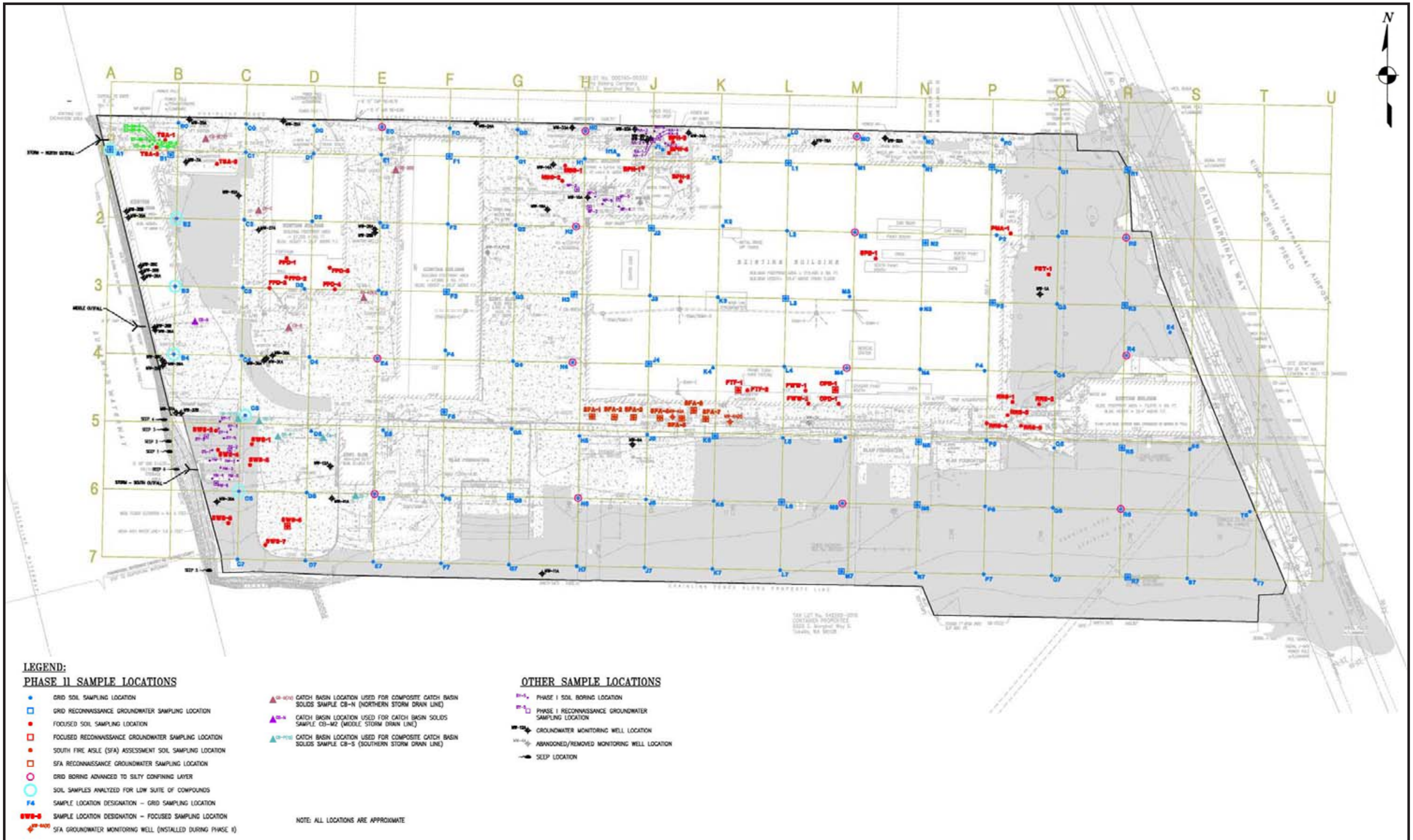
ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

Source: Kennedy/Jenks Consultants 2002.

LOWER DUWAMISH WATERWAY
RM 3.9-4.4 EAST (SLIP 6)
Tukwila, Washington

Figure 5
PHASE I RECONNAISSANCE GROUNDWATER AND SOIL ASSESSMENTS WORK AREAS

Date:	Drawn by:	
2/13/08	AES	10:002330WD1402\fig 5



ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

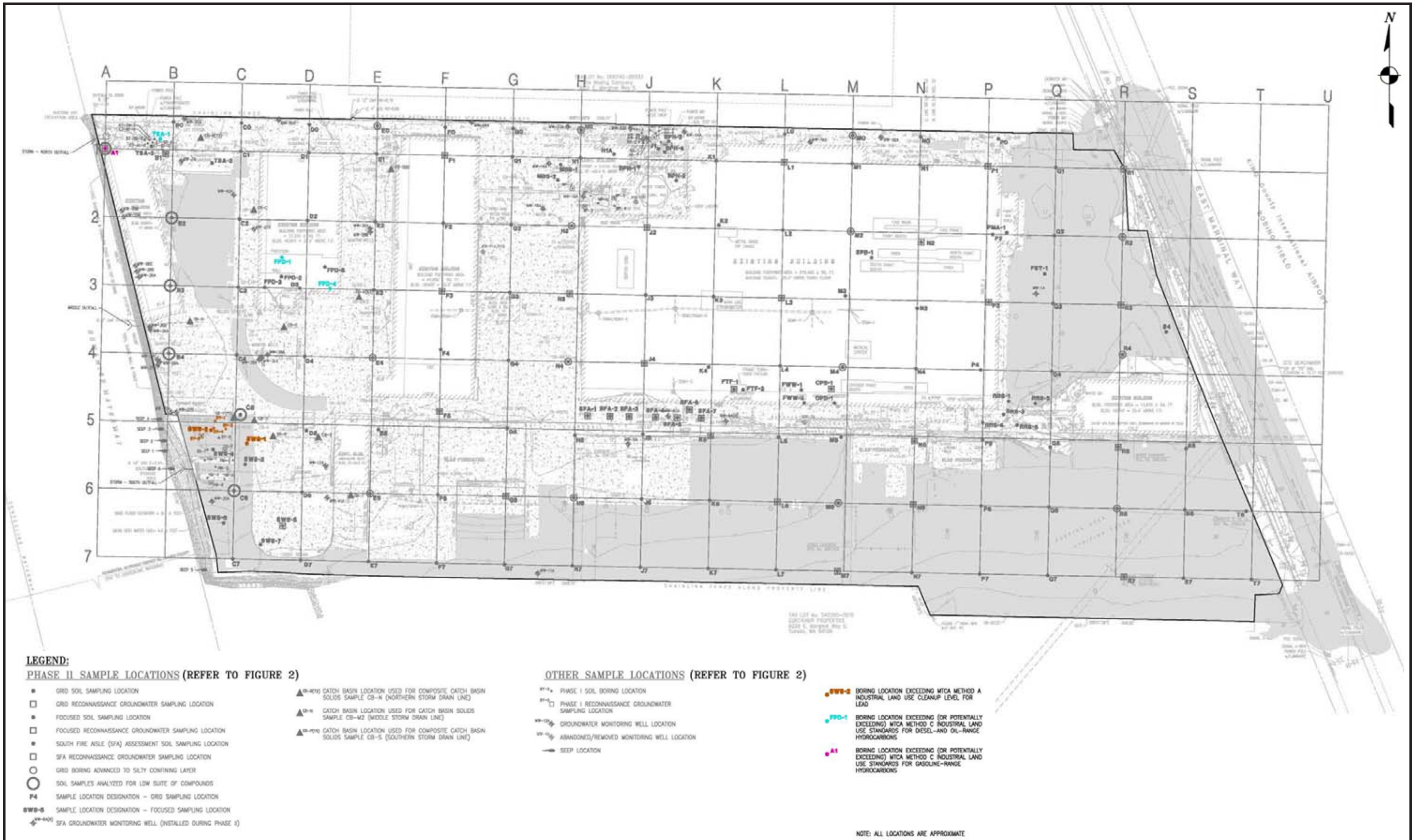
Source: Kennedy/Jenks Consultants.

LOWER DUWAMISH WATERWAY
RM 3.9-4.4 EAST (SLIP 6)
Tukwila, Washington

Figure 6

PHASE II DATA GAPS INVESTIGATION SAMPLING LOCATIONS

Date:	Drawn by:	
2/13/08	AES	10:002330WD1402\fig 6



ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

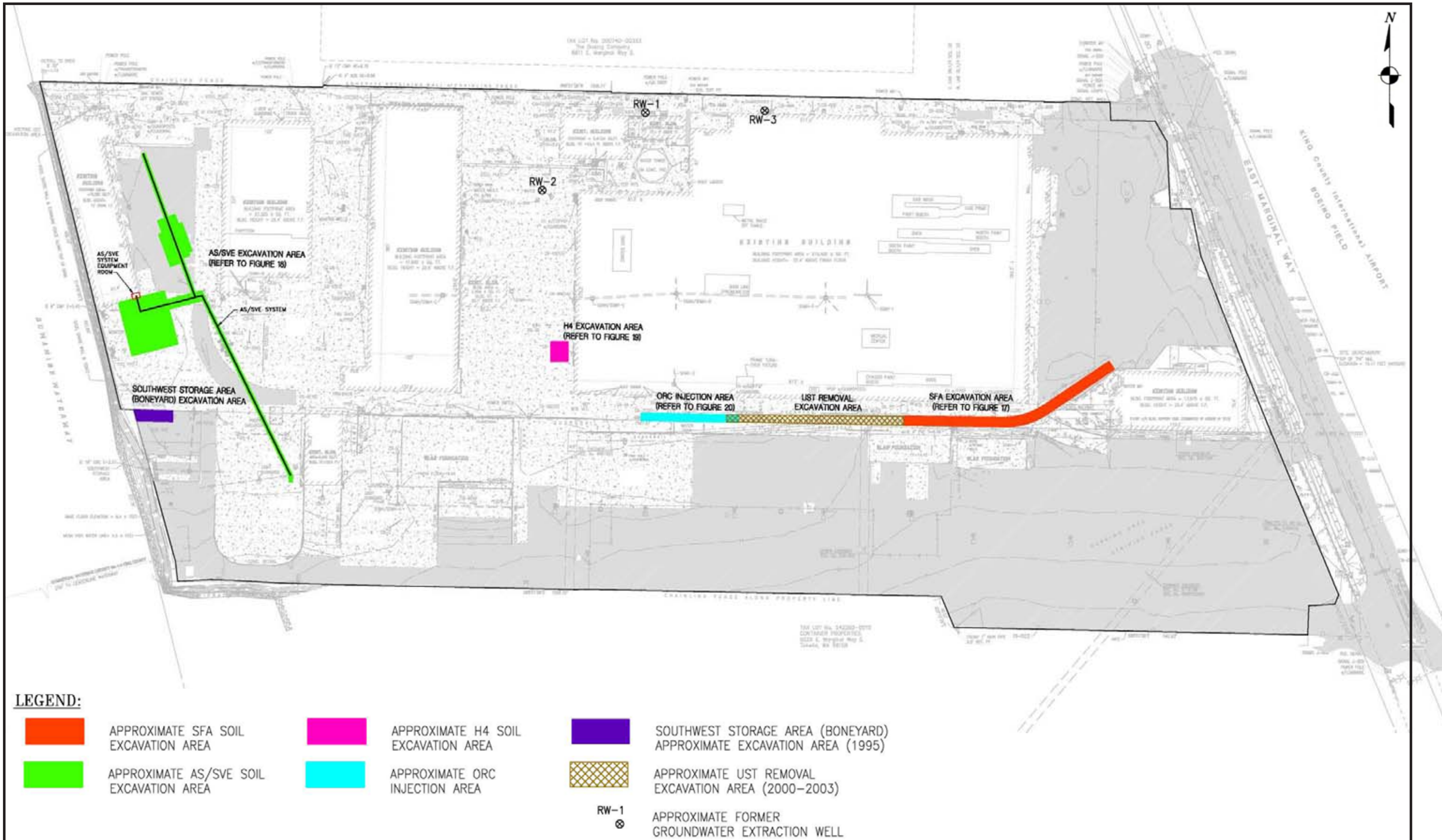
0 120 240
Approximate Scale in Feet

Source: Kennedy/Jenks Consultants.

LOWER DUWAMISH WATERWAY
RM 3.9-4.4 EAST (SLIP 6)
Tukwila, Washington

Figure 7
BORING LOCATIONS EXCEEDING
MTCA INDUSTRIAL SOIL CLEANUP LEVELS

Date:	Drawn by:	
2/13/08	AES	10:002330WD1402\fig 7



ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

0 120 240
Approximate Scale in Feet

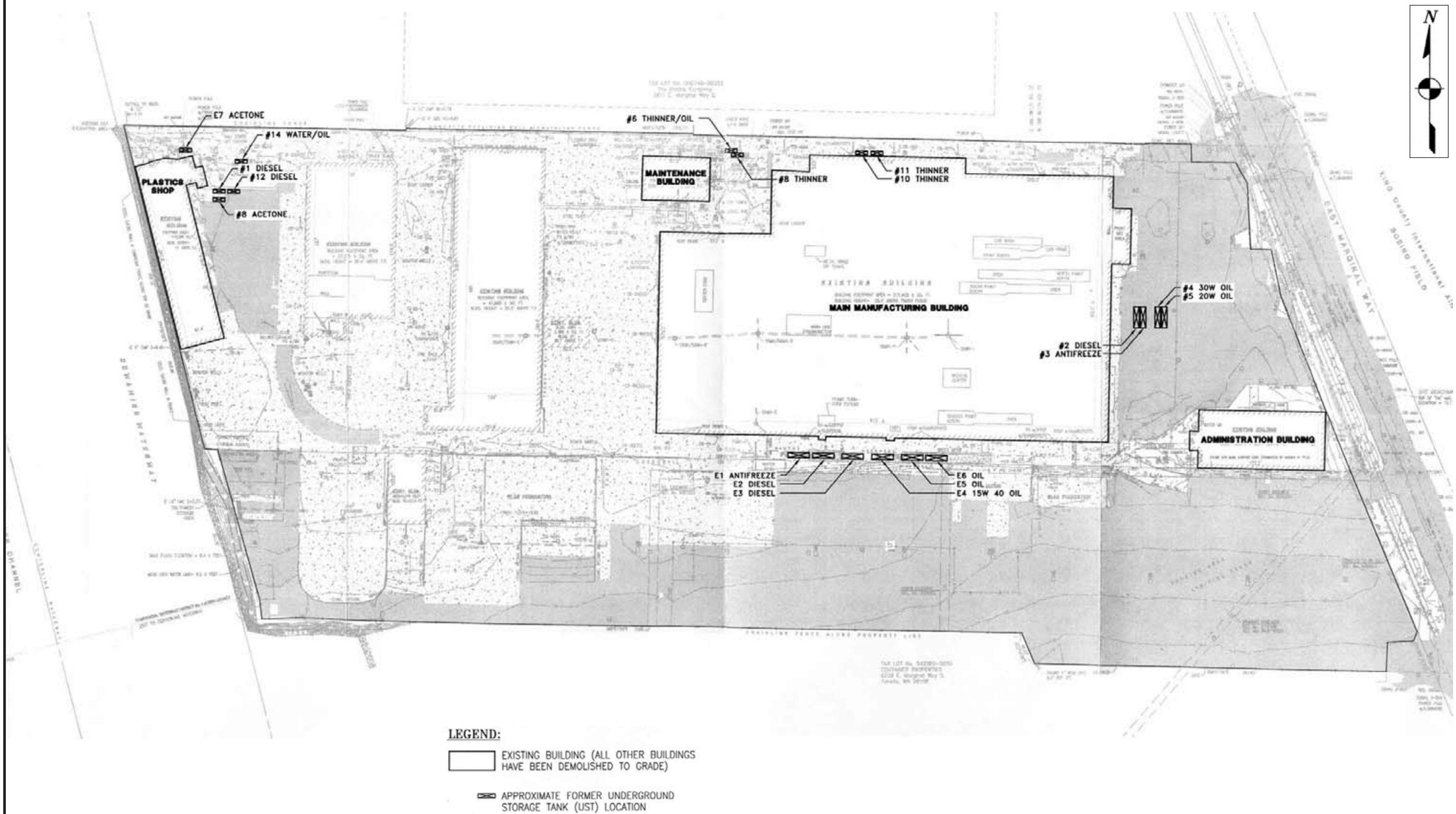
Source: Kennedy/Jenks Consultants 2004.

LOWER DUWAMISH WATERWAY
RM 3.9-4.4 EAST (SLIP 6)
Tukwila, Washington

Figure 8

APPROXIMATE SOIL EXCAVATION AREAS AND ORC INJECTION AREA

Date:	Drawn by:	
2/13/08	AES	10:002330WD1402\fig 8



ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

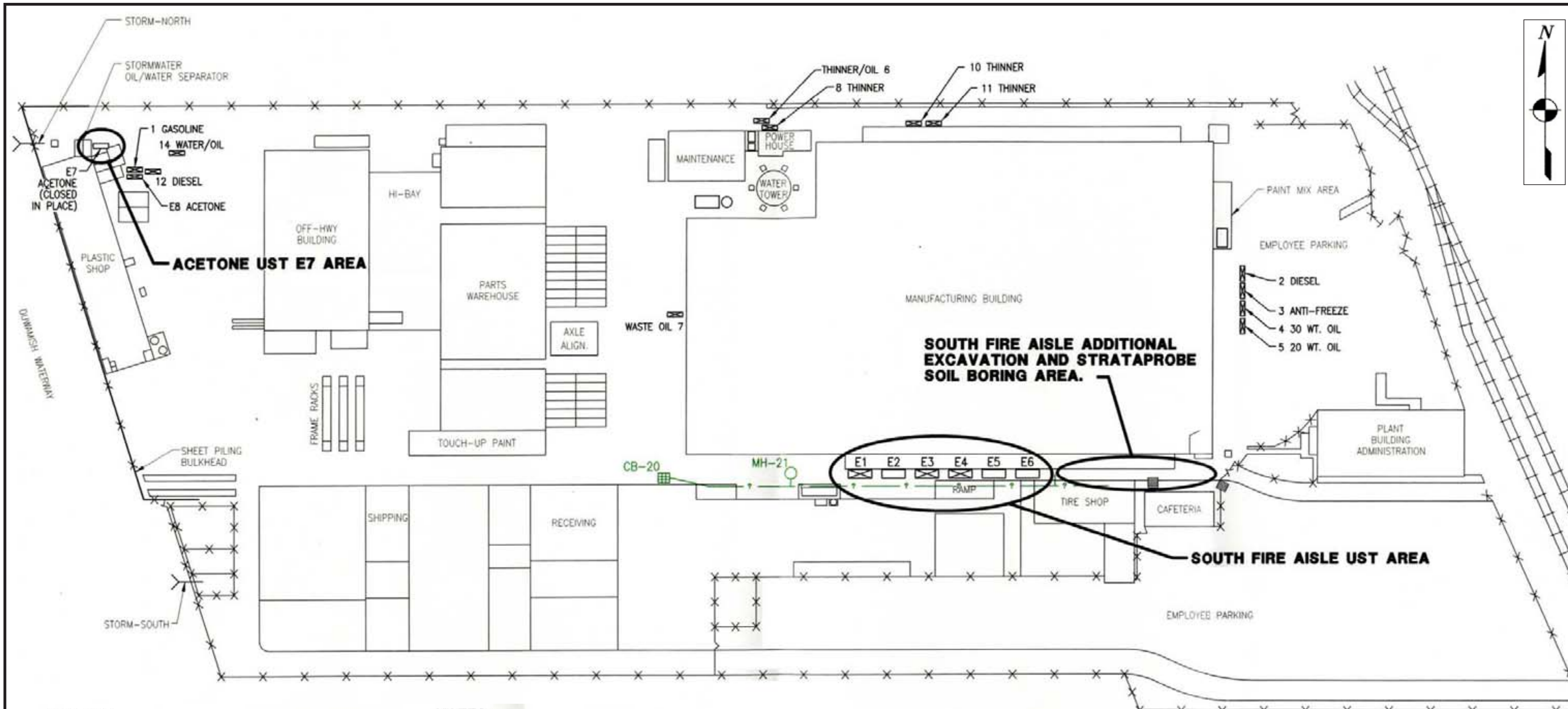
0 120 240
Approximate Scale in Feet

Source: Kennedy/Jenks Consultants 200 .

LOWER DUWAMISH WATERWAY
RM 3.9-4.4 EAST (SLIP 6)
Tukwila, Washington

Figure 9
FORMER UST LOCATIONS

Date:	Drawn by:	
2/13/08	AES	10:002330WD1402\fig 9



LEGEND

- FORMER UNDERGROUND STORAGE TANK (UST) LOCATION
- USTs REMOVED FEBRUARY/MARCH 2003
- APPROXIMATE LOCATIONS OF CATCHBASINS (CB) AND MANHOLES (MH), BASED ON PACCARS SEWER AND DRAINAGE MAP DATED JANUARY 1999, WHERE PIPE TRACING WAS PERFORMED BY APS.
- SOLID LINES REPRESENT PIPES THAT WERE TRACED BY APS.
- DASHED LINES REPRESENT THE POTENTIAL LOCATION OF THE STORM DRAIN PIPE (ACTUAL PIPE LOCATION HAS NOT BEEN CONFIRMED).

NOTES:

1) ALL LOCATIONS ARE APPROXIMATE.

2) BASE DRAWING PROVIDED BY PACCAR INCORPORATED.

ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

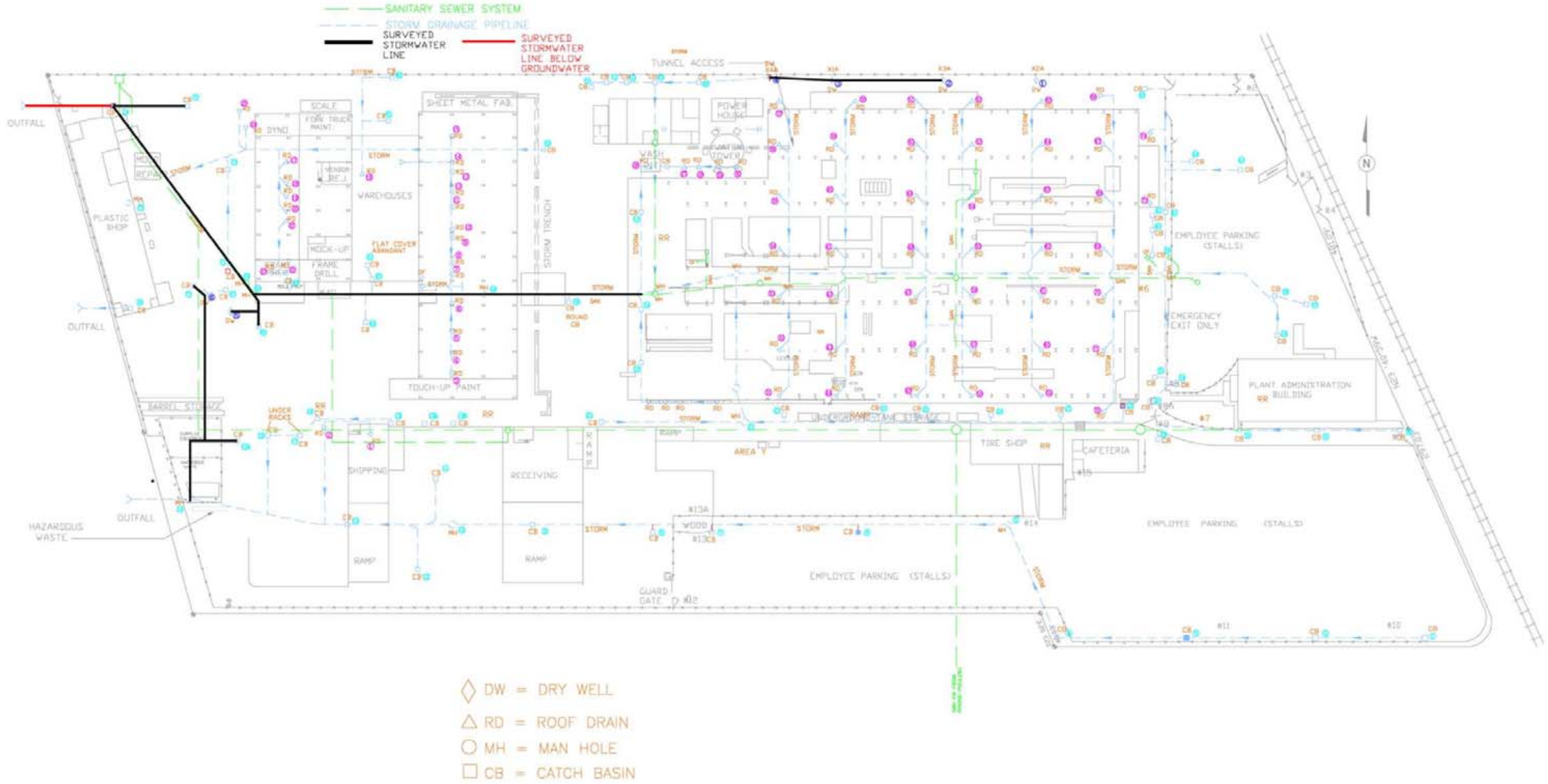
0 120 240
Approximate Scale in Feet

Source: Kennedy/Jenks Consultants 2003.

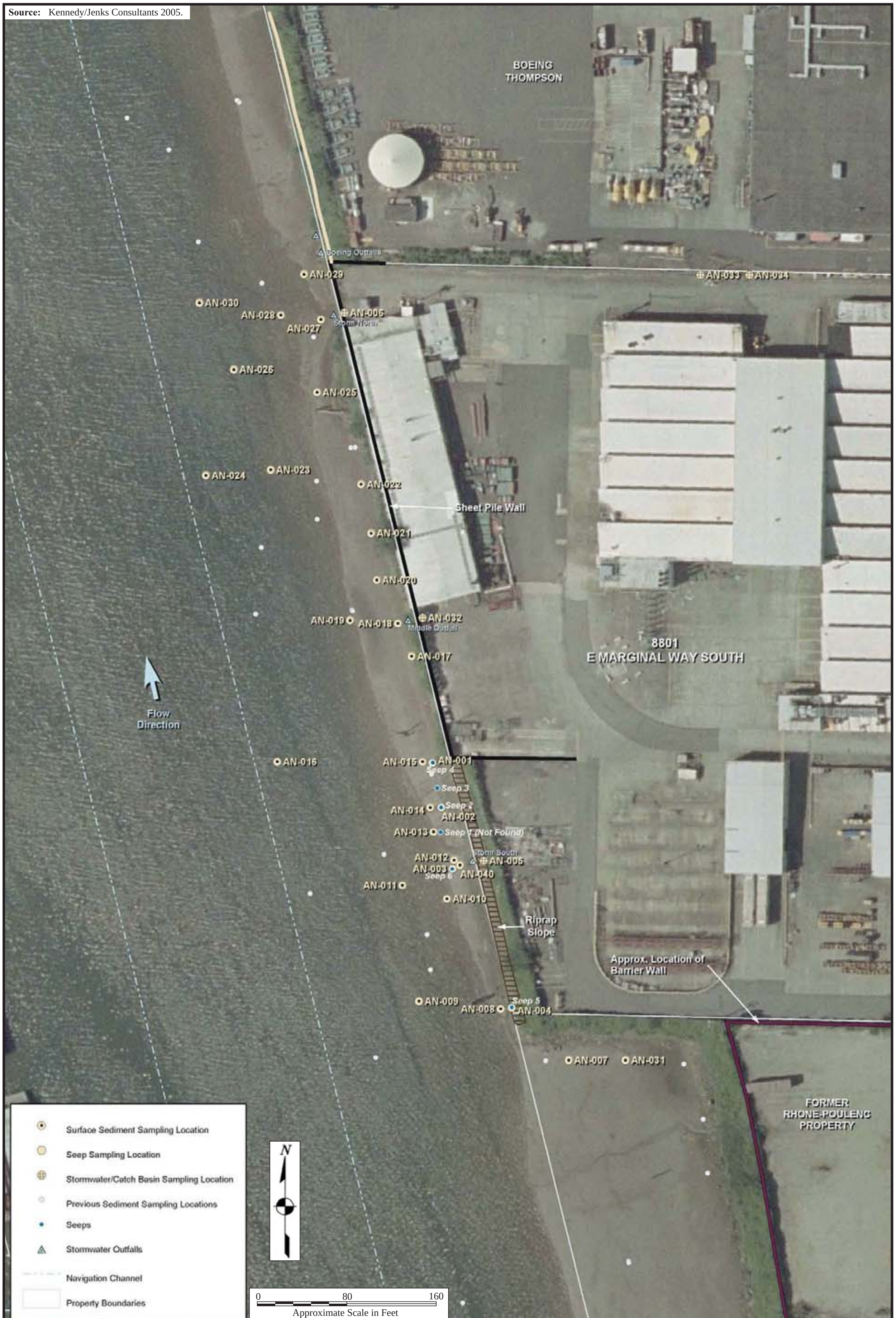
LOWER DUWAMISH WATERWAY
RM 3.9-4.4 EAST (SLIP 6)
Tukwila, Washington

Figure 10
UST REMOVAL 2003

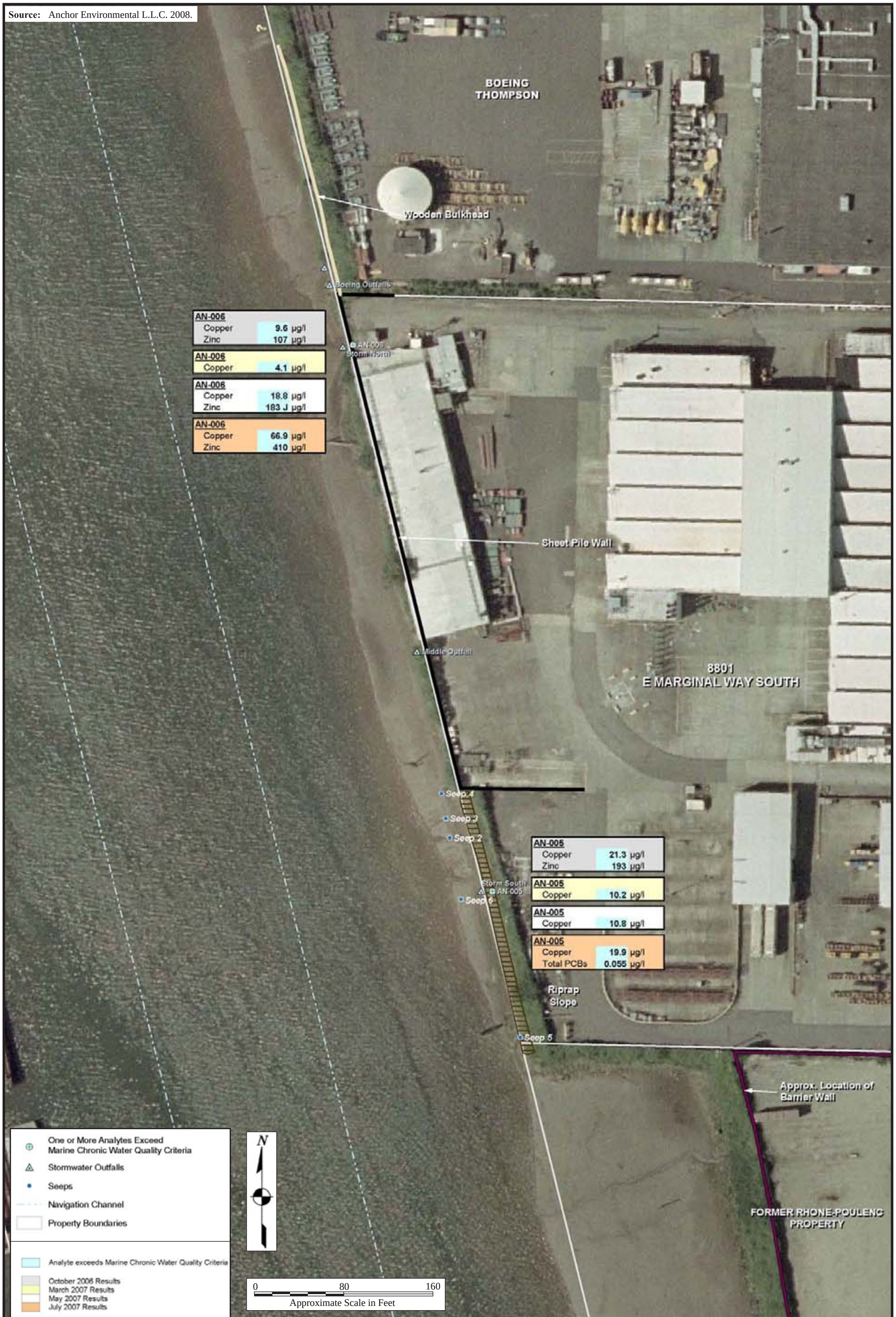
Date:	Drawn by:	
2/13/08	AES	10:002330WD1402\fig 10



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	Not to Scale **Source:** Anchor En ironmental, L.L.C. 2006.	LOWER DUWAMISH WATERWAY RM 3.9-4.4 EAST (SLIP 6) Tukwila, Washington	Figure 11 STORMWATER SYSTEM Date: 2/13/08 · Drawn by: AES · 10:002330WD1402\fig 11



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY RM 3.9-4.4 EAST (SLIP 6) Tukwila, Washington	Figure 12 SAMPLING LOCATIONS		
		Date: 2/13/08	Drawn by: AES	10:002330WD1402\fig 12



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY RM 3.9-4.4 EAST (SLIP 6) Tukwila, Washington	Figure 13 EVENTS 1, 2, 3, AND 4 STORMWATER DATA
		Date: 2/13/08 Drawn by: AES 10:002330WD1402\fig 13

AN-006

Cadmium	7.1	mg/kg dw
Zinc	720 J	mg/kg dw
Butylbenzylphthalate	1,100	µg/kg dw
bis(2-Ethylhexyl)phthalate	10,000	µg/kg dw
Benzyl alcohol	920	µg/kg dw

AN-006

Cadmium	6.8	mg/kg dw
Lead	764	mg/kg dw
Mercury	0.9 J	mg/kg dw
Zinc	1,110	mg/kg dw
Total PCBs (SMS)	950	µg/kg dw
Phenanthrene	3,000	µg/kg dw
Fluoranthene	9,500	µg/kg dw
Pyrene	5,000 J	µg/kg dw
Benzo(a)anthracene	2,200 J	µg/kg dw
Chrysene	4,600 J	µg/kg dw
Benzo(a)pyrene	2,500 J	µg/kg dw
Indeno(1,2,3-cd)pyrene	1,500 J	µg/kg dw
Dibenzo(a,h)anthracene	320 J	µg/kg dw
Benzo(g,h,i)perylene	2,100 J	µg/kg dw
Dimethylphthalate	630	µg/kg dw
Butylbenzylphthalate	1,300 J	µg/kg dw
bis(2-Ethylhexyl)phthalate	62,000	µg/kg dw
Total benzofluoranthenes (SMS)	8,300	µg/kg dw
Total HPAH (SMS)	36,020	µg/kg dw
4-Methylphenol	14,000	µg/kg dw
Benzoic acid	3,700 J	µg/kg dw

AN-033

Cadmium	15	mg/kg dw
Lead	504	mg/kg dw
Zinc	6,710 J	mg/kg dw
Dimethylphthalate	180	µg/kg dw
bis(2-Ethylhexyl)phthalate	3,600	µg/kg dw

AN-005

Total PCBs (SMS)	160	µg/kg dw
Dimethylphthalate	210	µg/kg dw
Butylbenzylphthalate	280	µg/kg dw
bis(2-Ethylhexyl)phthalate	4,500	µg/kg dw

AN-005

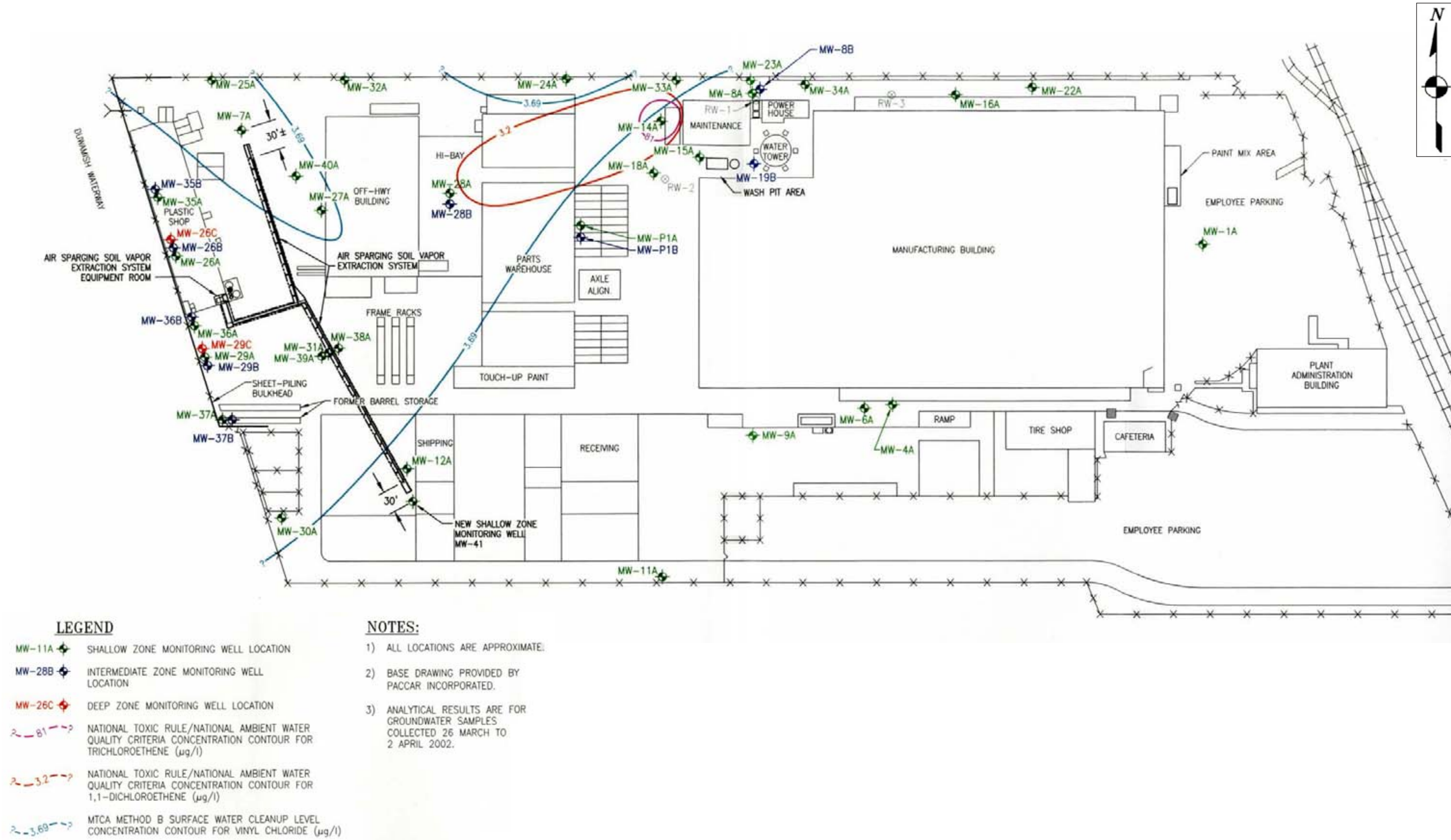
Lead	660	mg/kg dw
Zinc	860	mg/kg dw
Total PCBs (SMS)	313	µg/kg dw
Phenanthrene	2,300	µg/kg dw
Fluoranthene	7,100	µg/kg dw
Pyrene	2,900 J	µg/kg dw
Benzo(a)anthracene	1,800 J	µg/kg dw
Chrysene	4,600 J	µg/kg dw
Benzo(a)pyrene	2,200 J	µg/kg dw
Indeno(1,2,3-cd)pyrene	750 J	µg/kg dw
Benzo(g,h,i)perylene	910 J	µg/kg dw
Dimethylphthalate	290 J	µg/kg dw
Butylbenzylphthalate	5,100 J	µg/kg dw
bis(2-Ethylhexyl)phthalate	26,000 J	µg/kg dw
Total benzofluoranthenes (SMS)	6,500	µg/kg dw
Total HPAH (SMS)	26,760	µg/kg dw
4-Methylphenol	7,100	µg/kg dw
Benzyl alcohol	940	µg/kg dw
Benzoic acid	4,200	µg/kg dw

ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

LOWER DUWAMISH WATERWAY
RM 3.9-4.4 EAST (SLIP 6)
Tukwila, Washington

Figure 14
MARCH 200 AND OCTO ER 2006
STORMWATER OUTFALL SOLIDS DATA
8801 EAST MAR INAL WAY SOUTH PROPERTY

Date:	Drawn by:	
2/13/08	AES	10:002330WD1402\fig 14



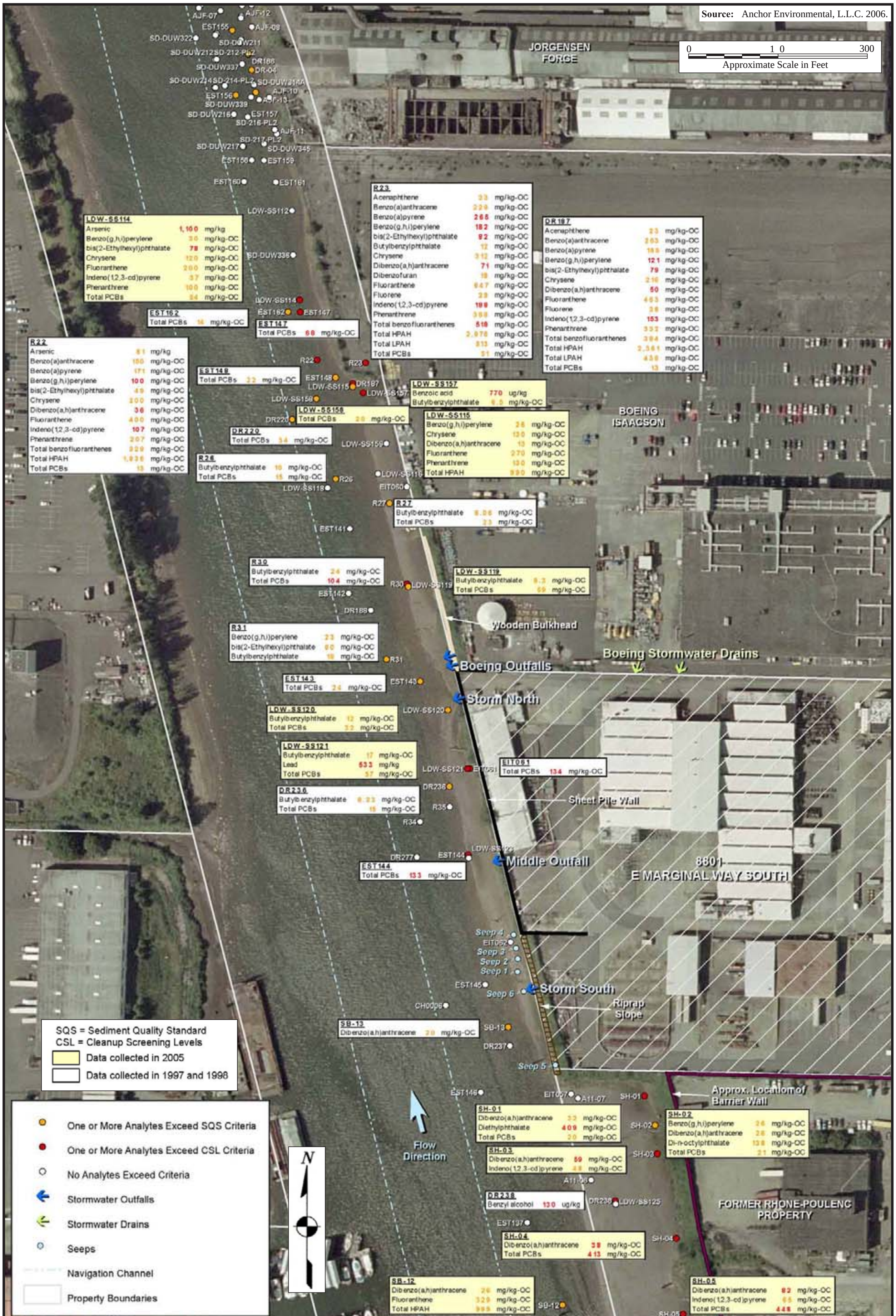
ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

Source: enne y/ enks Consultants 200 .

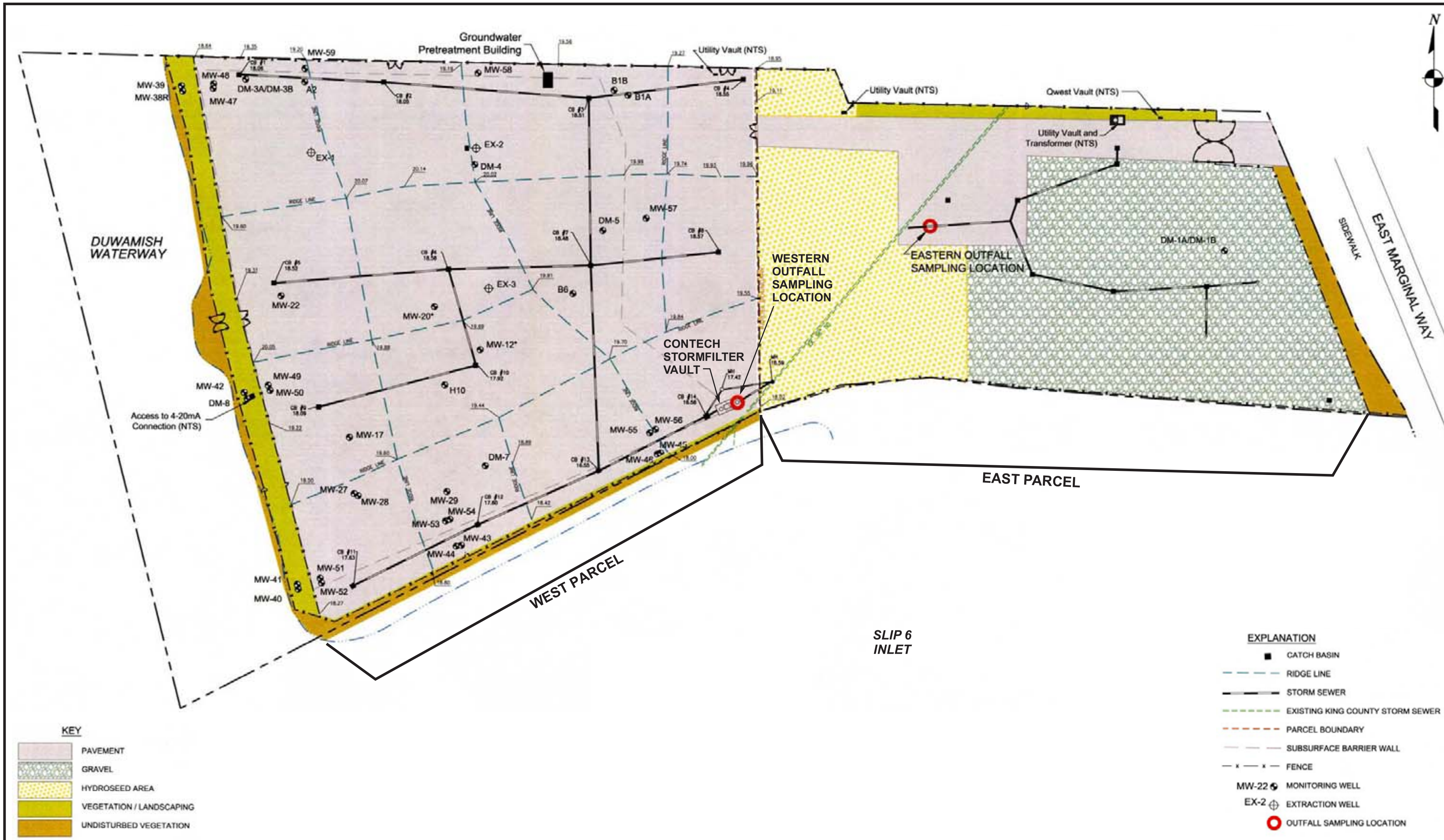
LOWER DUWAMISH WATERWAY
RM 3.9-4.4 EAST (SLIP 6)
Tukwila, Washington

Figure 1
ROUNDWATER MONITORIN

Date:	Drawn by:	
2/13/08	AES	10:002330WD1402\fig 1



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY RM 3.9-4.4 EAST (SLIP 6) Tukwila, Washington	Figure 16 SUMMARY OF E ISTIN SEDIMENT UALITY DATA 8801 EAST MAR INAL WAY SOUTH PROPERTY Date: 2/13/08 · Drawn by: AES · 10:002330WD1402\fig 16



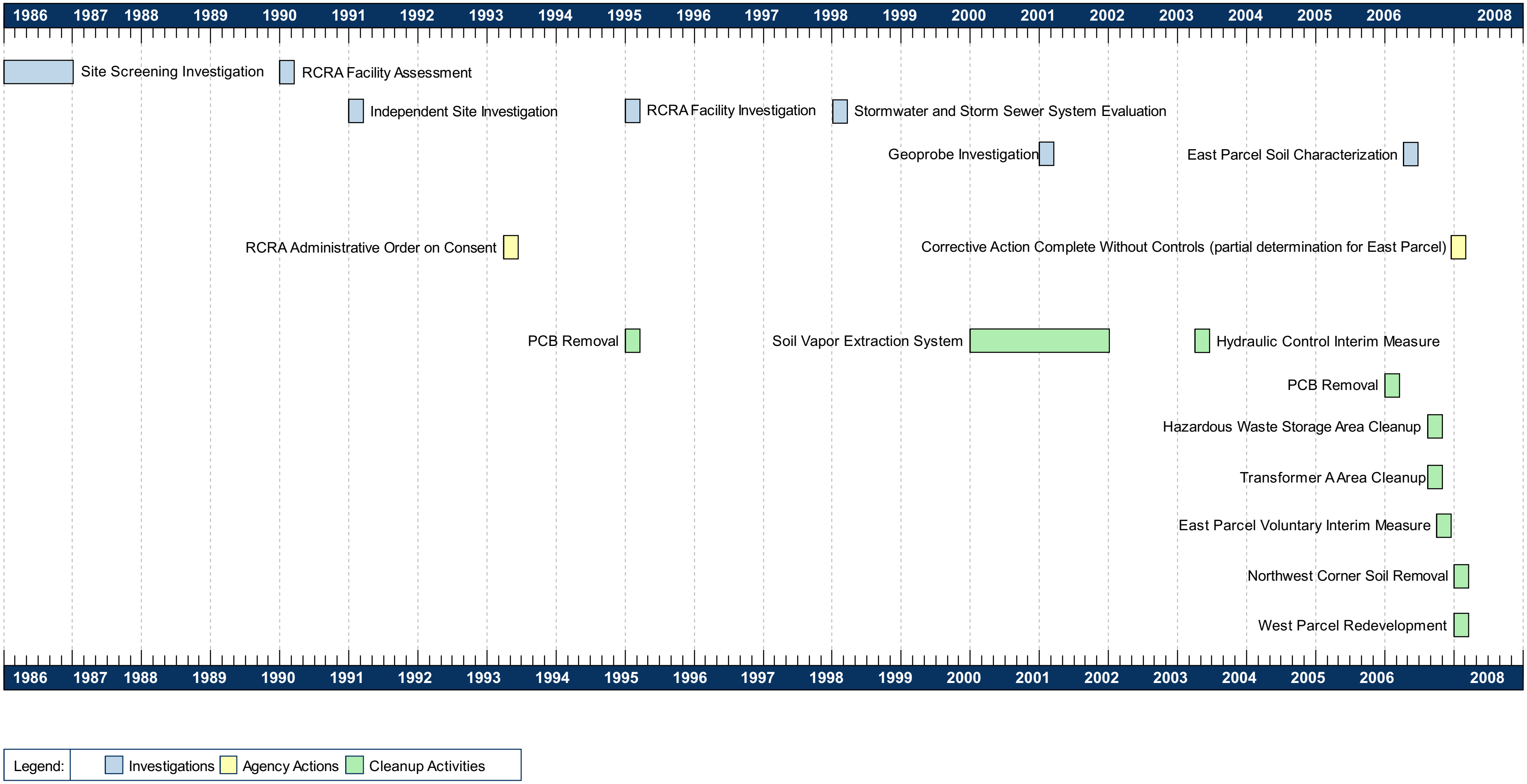
ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

Source: eomatrix Consultants, Inc. 200 .

LOWER DUWAMISH WATERWAY
RM 3.9-4.4 EAST (SLIP 6)
Tukwila, Washington

Figure 1
WEST PARCEL AND EAST PARCEL SITE MAP

Date:	Drawn by:	
2/13/08	AES	10:002330WD1402\fig 1



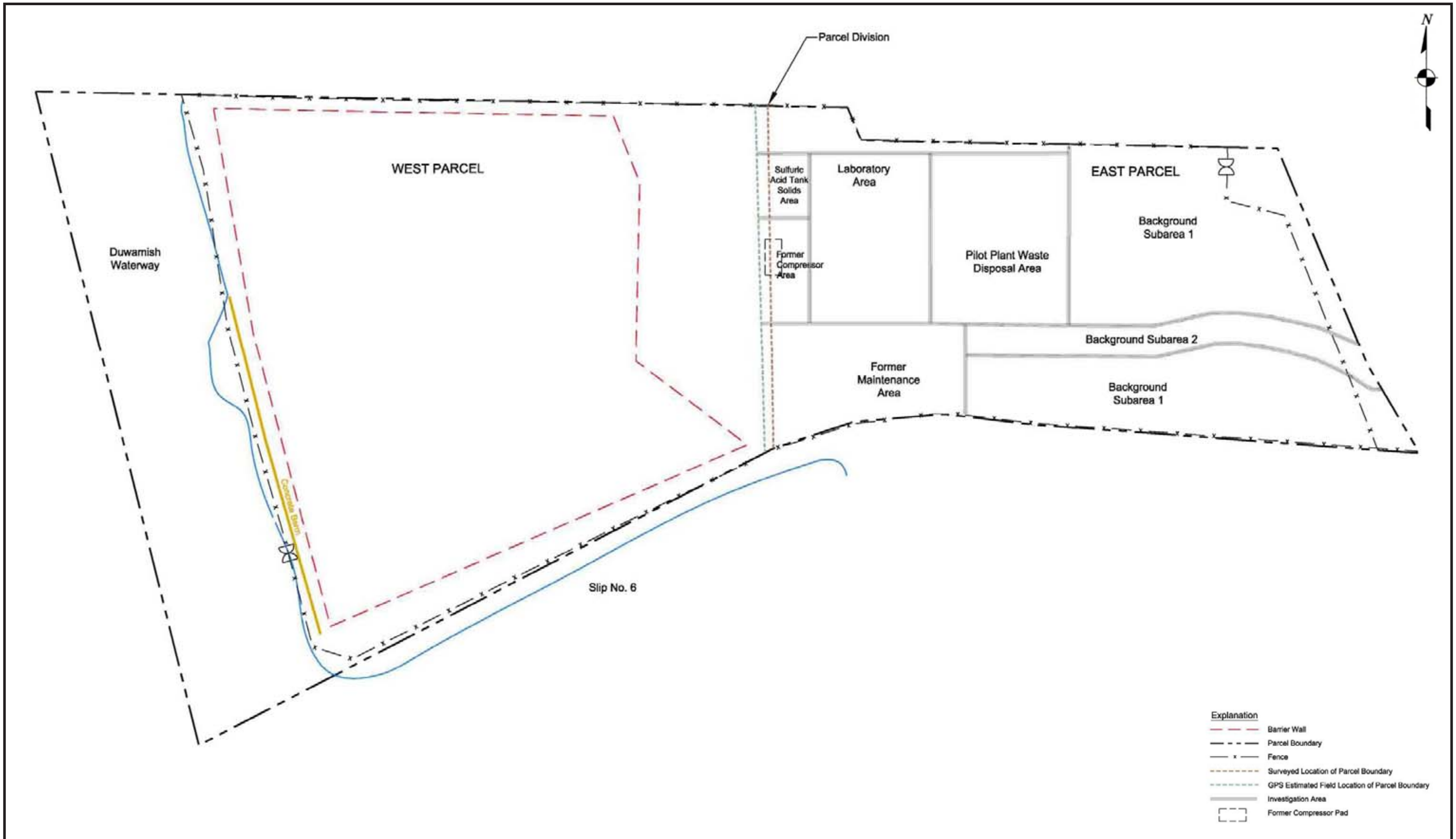
ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

LOWER DUWAMISH WATERWAY
RM 3.9-4.4 EAST (SLIP 6)
Tukwila, Washington

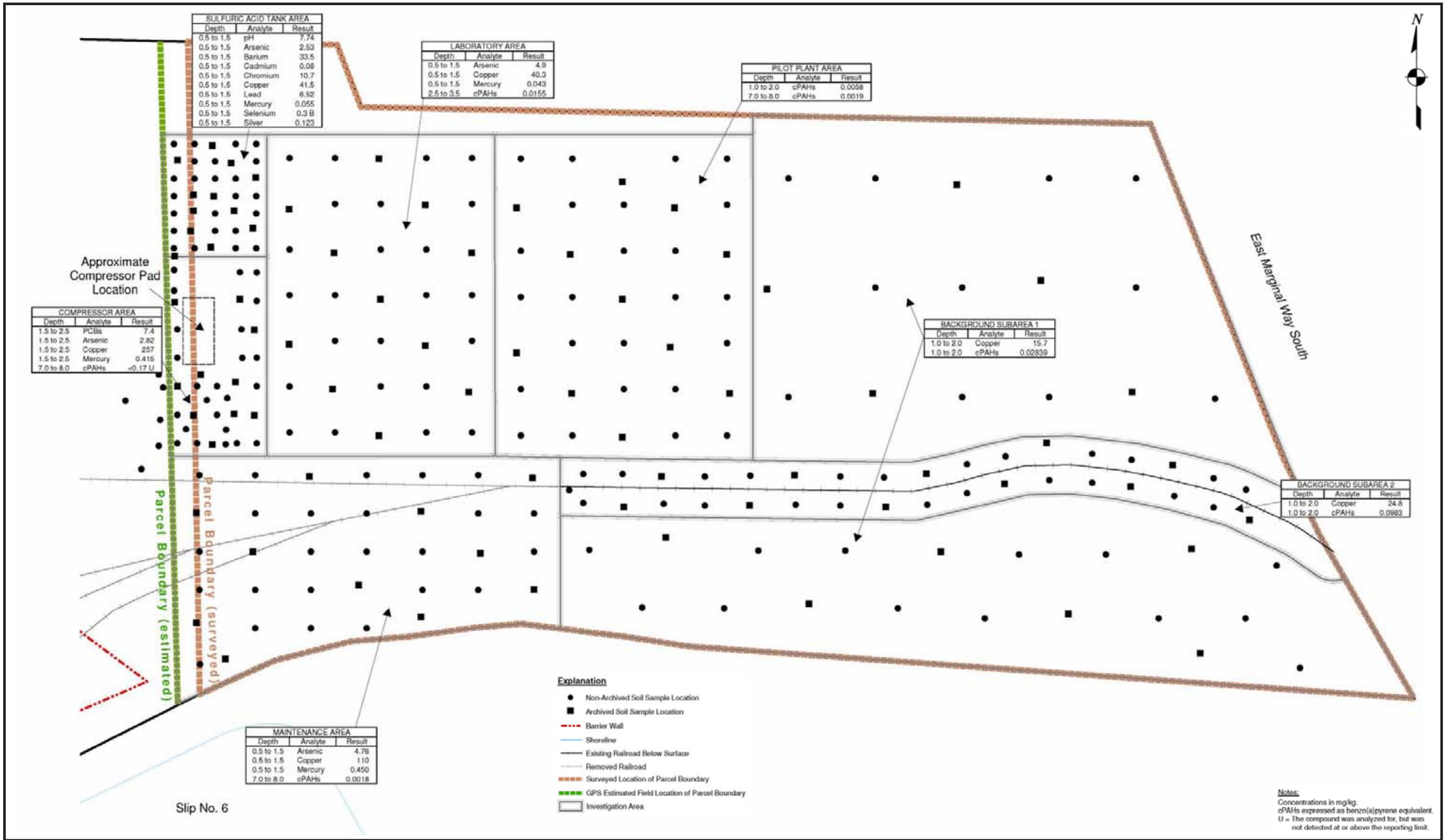
Figure 18

ENVIRONMENTAL INVESTIGATIONS AND CLEANUP ACTIONS TIMELINE
FORMER RHONE-POULENC SITE

Date:	Drawn by:	
2/22/08	AES	10:002330WD1402\fig 18



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	0 120 240 Approximate Scale in Feet **Source:** Geomatrix Consultants, Inc. 2006.	LOWER DUWAMISH WATERWAY RM 3.9-4.4 EAST (SLIP 6) Tukwila, Washington	Figure 19 EAST PARCEL SOIL CHARACTERIZATION AND VOLUNTARY INTERIM MEASURE Date: 2/13/08 — Drawn by: AES — 10:002330WD1402\fig 19



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	0.0058
7.0 to 8.0	cPAHs	0.0019

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	<0.17 U

BACKGROUND SUBAREA 1

Depth	Analyte	Result
1.0 to 2.0	Copper	15.7
1.0 to 2.0	cPAHs	0.02839

BACKGROUND SUBAREA 2

Depth	Analyte	Result
1.0 to 2.0	Copper	24.8
1.0 to 2.0	cPAHs	0.0983

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

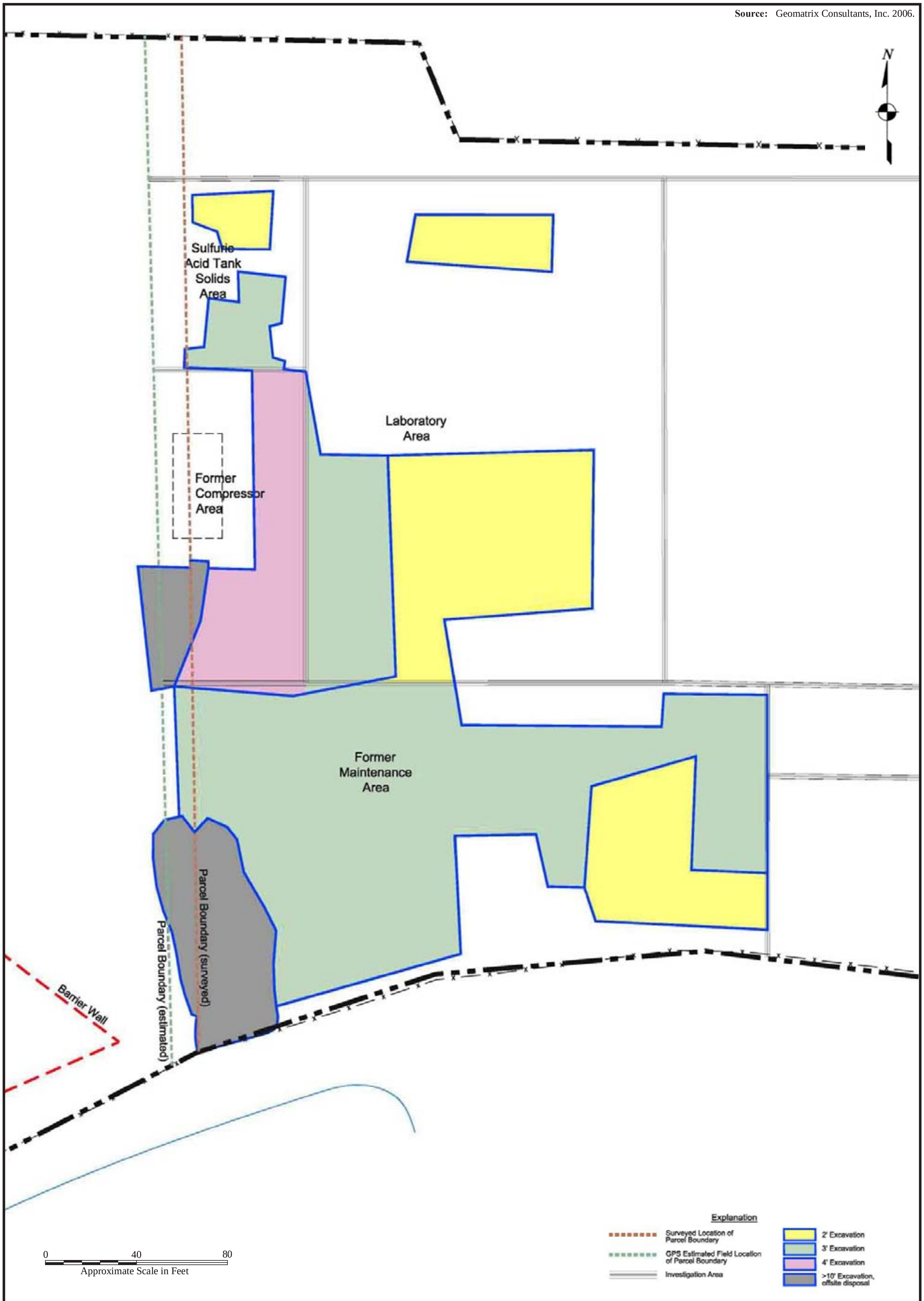
ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

Source: Geomatrix Consultants, Inc. 2006.

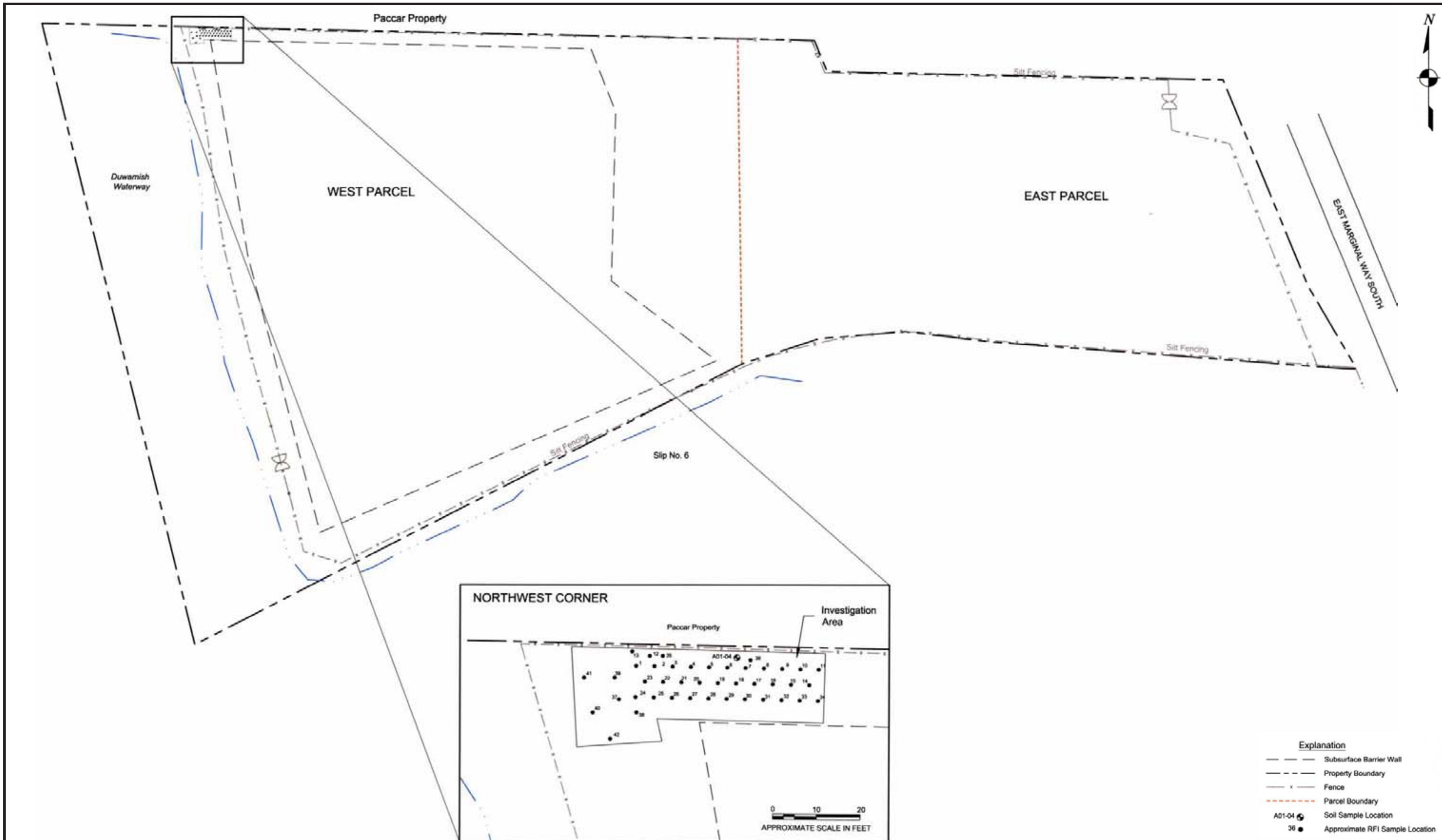
LOWER DUWAMISH WATERWAY
RM 3.9-4.4 EAST (SLIP 6)
Tukwila, Washington

Figure 20
CHARACTERIZATION COMPOSITE SAMPLE RESULTS

Date: 2/13/08
Drawn by: AES
10:002330WD1402\fig 20

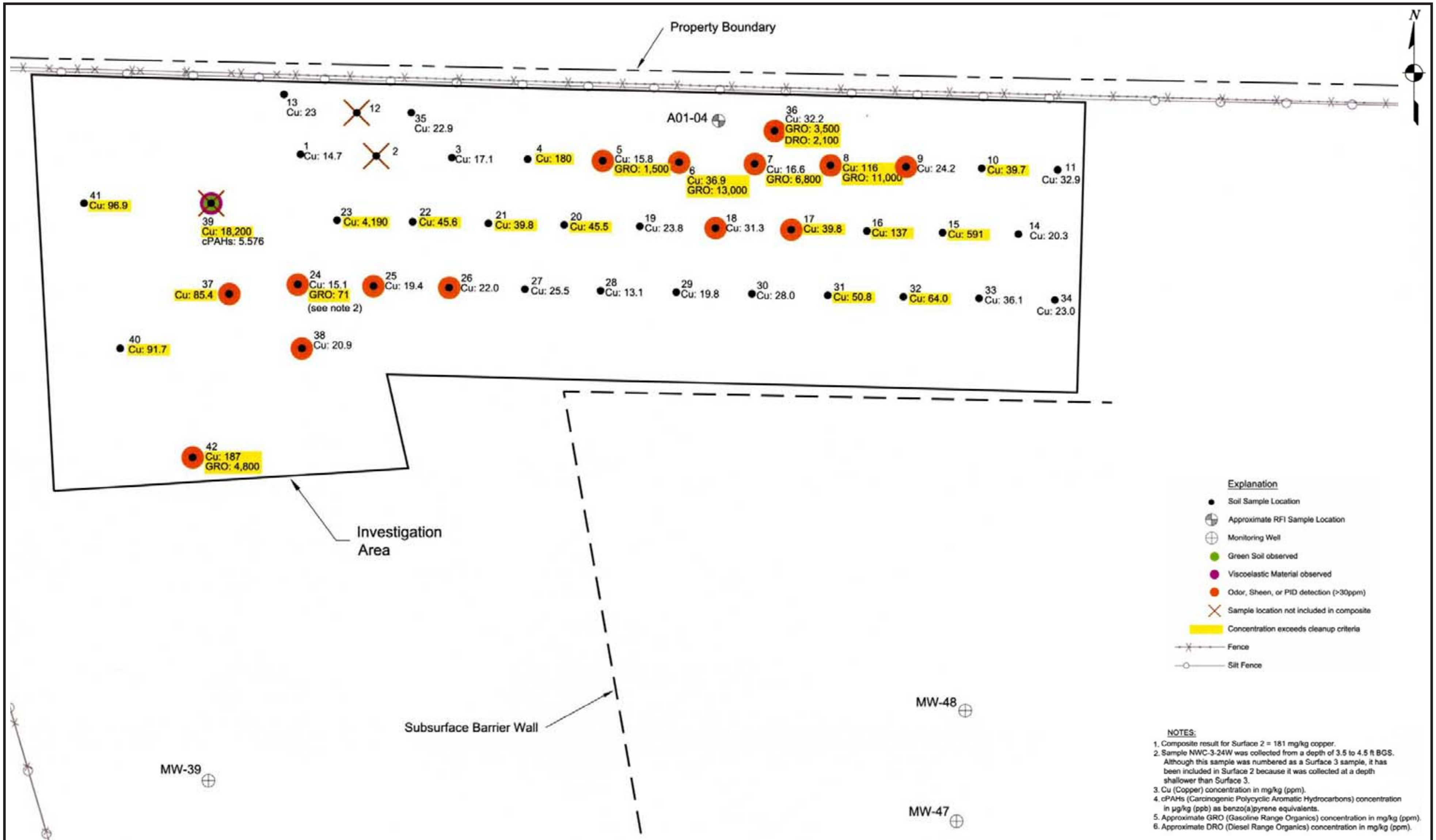


ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY RM 3.9-4.4 EAST (SLIP 6) Tukwila, Washington	Figure 21 E CA ATION AREAS	
		Date: 2/13/08	Drawn by: AES	10:002330WD1402\fig 21



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	0 120 240 Approximate Scale in Feet	LOWER DUWAMISH WATERWAY RM 3.9-4.4 EAST (SLIP 6) Tukwila, Washington	Figure 22 NORTHWEST CORNER SOIL REMO AL
	Source: Geomatrix Consultants, Inc. 200 .		Date: 2/13/08 · Drawn by: AES · 10:002330WD1402\fig 22

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	0 — 10 Approximate Scale in Feet **Source:** Geomatrix Consultants, Inc. 200 .	LOWER DUWAMISH WATERWAY RM 3.9-4.4 EAST (SLIP 6) Tukwila, Washington	Figure 23 SURFACE 1 (0. TO 1.0 ft. bgs) NORTHWEST CORNER DISCRETE SAMPLE RESULTS Date: 2/13/08 · Drawn by: AES · 10:002330WD1402\fig 23



ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

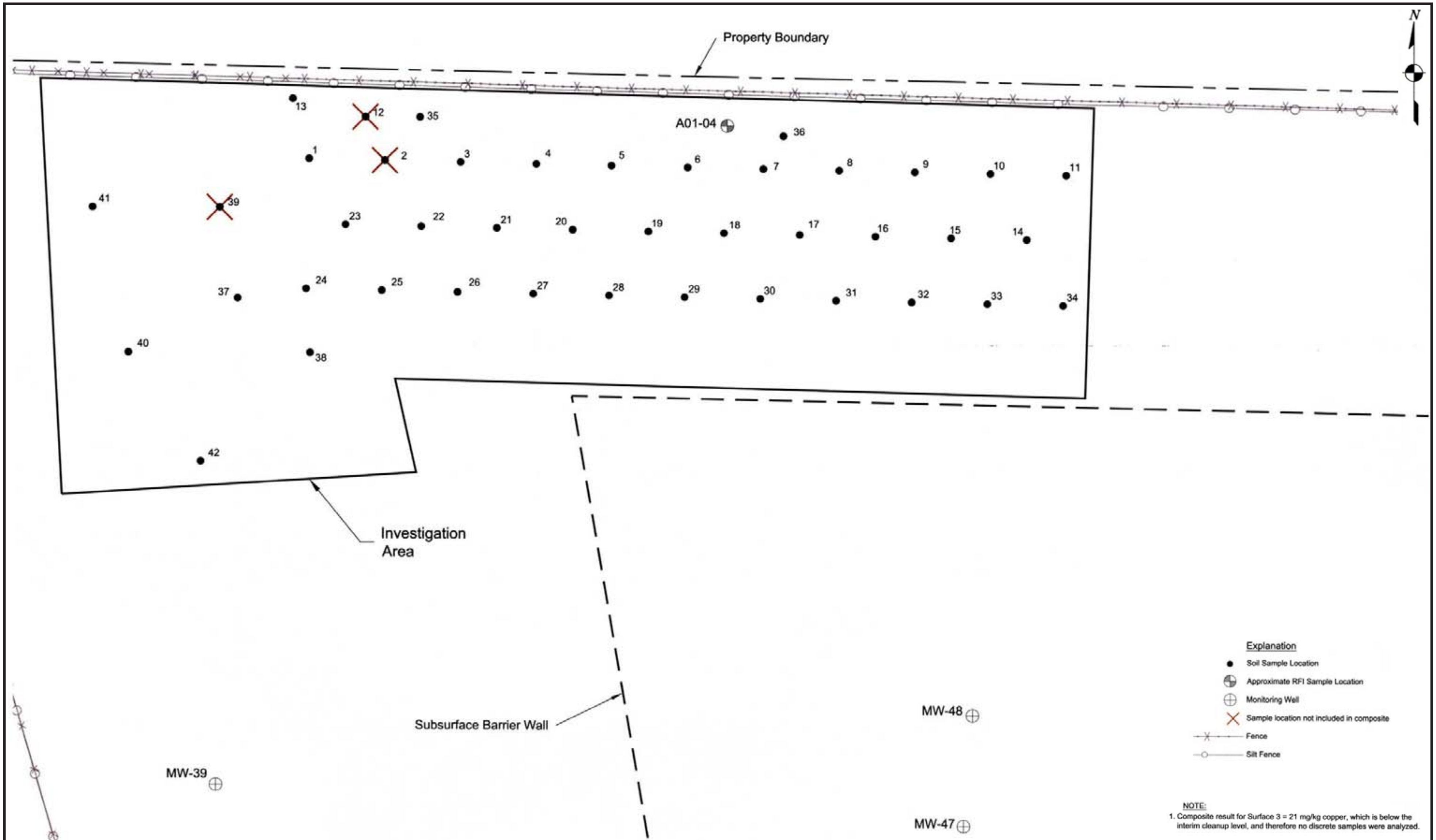
0 — 10
Approximate Scale in Feet

Source: Geomatrix Consultants, Inc. 200 .

LOWER DUWAMISH WATERWAY
RM 3.9-4.4 EAST (SLIP 6)
Tukwila, Washington

Figure 24
SURFACE 2 (2.0 TO 3.0 ft. bgs) NORTHWEST CORNER
DISCRETE SAMPLE RESULTS

Date:	Drawn by:	
2/13/08	AES	10:002330WD1402\fig 24



ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

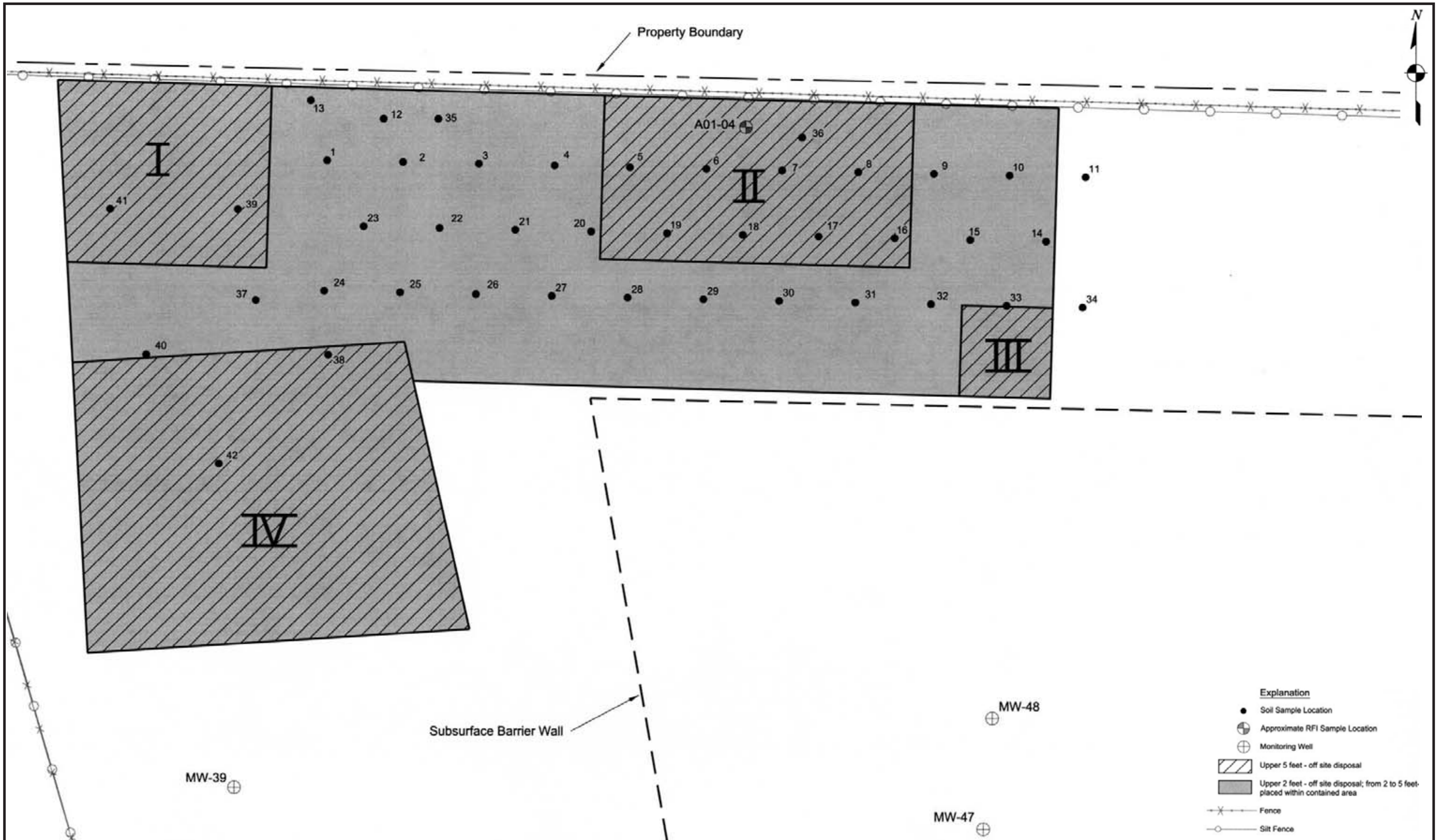
0 5 10
Approximate Scale in Feet

Source: Geomatrix Consultants, Inc. 2007.

LOWER DUWAMISH WATERWAY
RM 3.9-4.4 EAST (SLIP 6)
Tukwila, Washington

Figure 25
SURFACE 3 (5.0 TO 6.0 ft. bgs)
NORTHWEST CORNER SAMPLE LOCATIONS

Date:	Drawn by:	
2/13/08	AES	10:002330WD1402\fig 25



ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

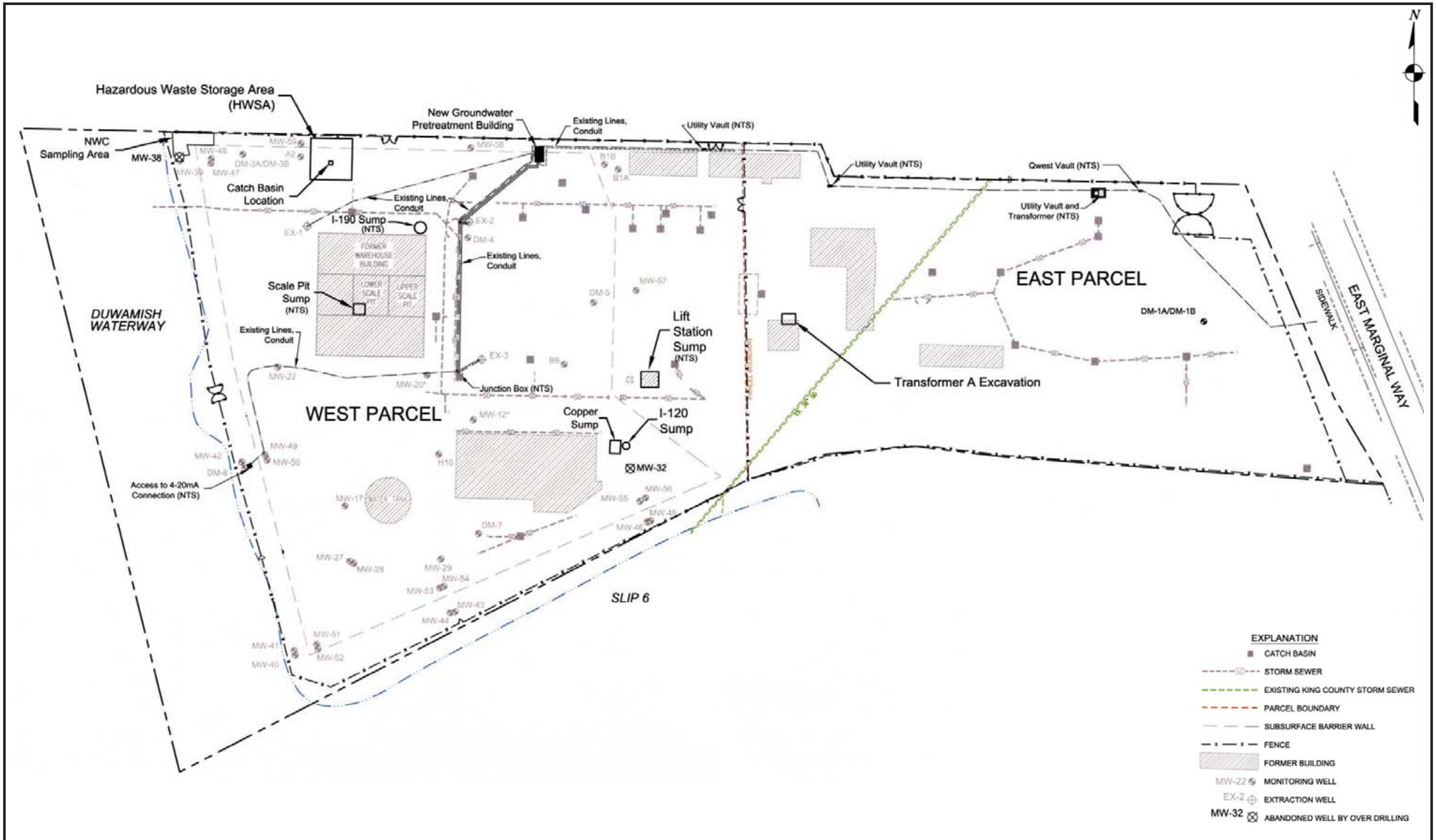
0 5 10
Approximate Scale in Feet

Source: Geomatrix Consultants, Inc. 2007.

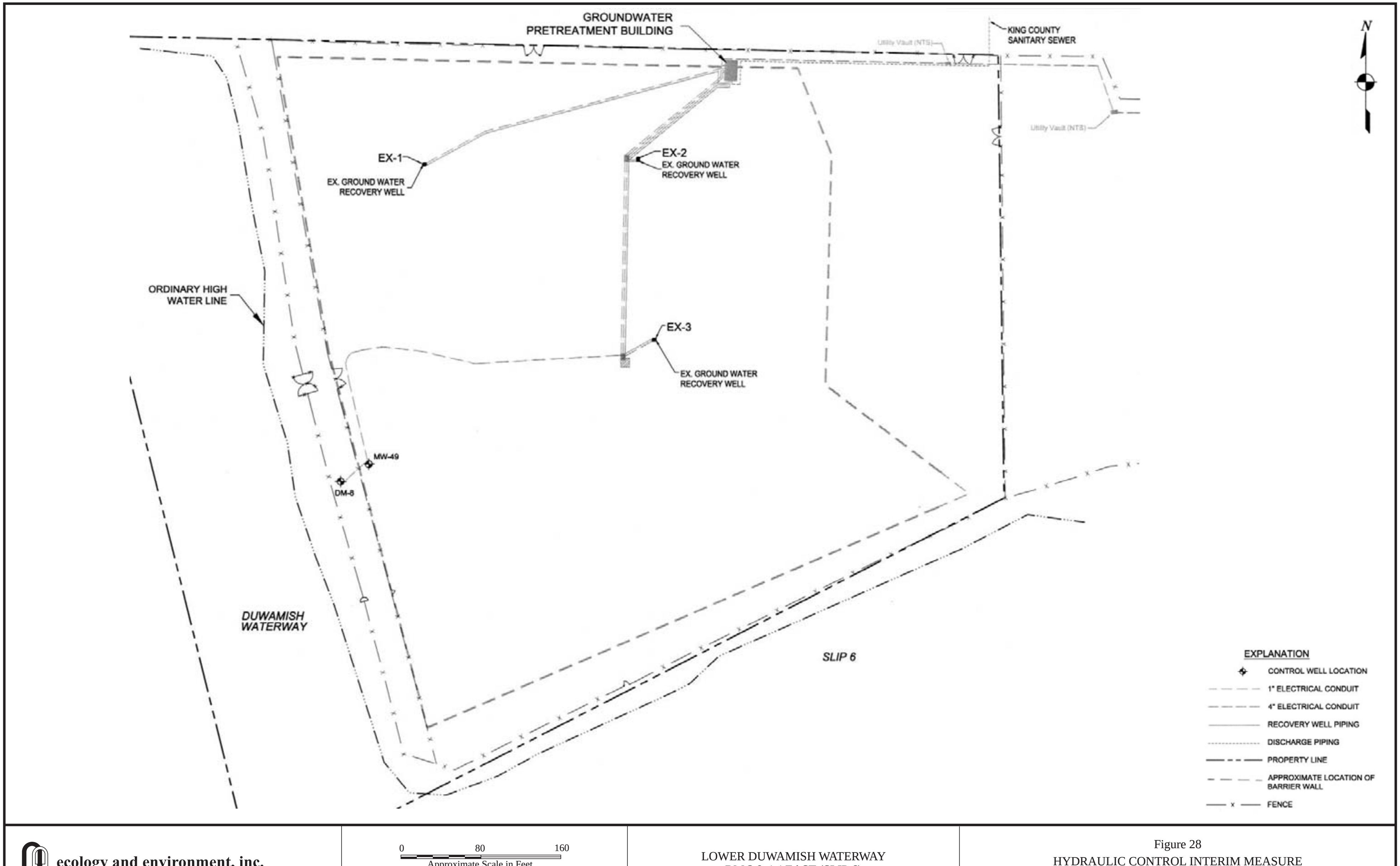
LOWER DUWAMISH WATERWAY
RM 3.9-4.4 EAST (SLIP 6)
Tukwila, Washington

Figure 26
NORTHWEST CORNER EXCAVATION

Date:	Drawn by:	
2/13/08	AES	10:002330WD1402\fig 26



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	0 120 240 Approximate Scale in Feet **Source:** Geomatrix Consultants, Inc. 2007.	LOWER DUWAMISH WATERWAY RM 3.9-4.4 EAST (SLIP 6) Tukwila, Washington	Figure 27 WASTE REMOVAL AREAS	
			Date: 2/13/08	Drawn by: AES
			10:002330WD1402\fig 27	



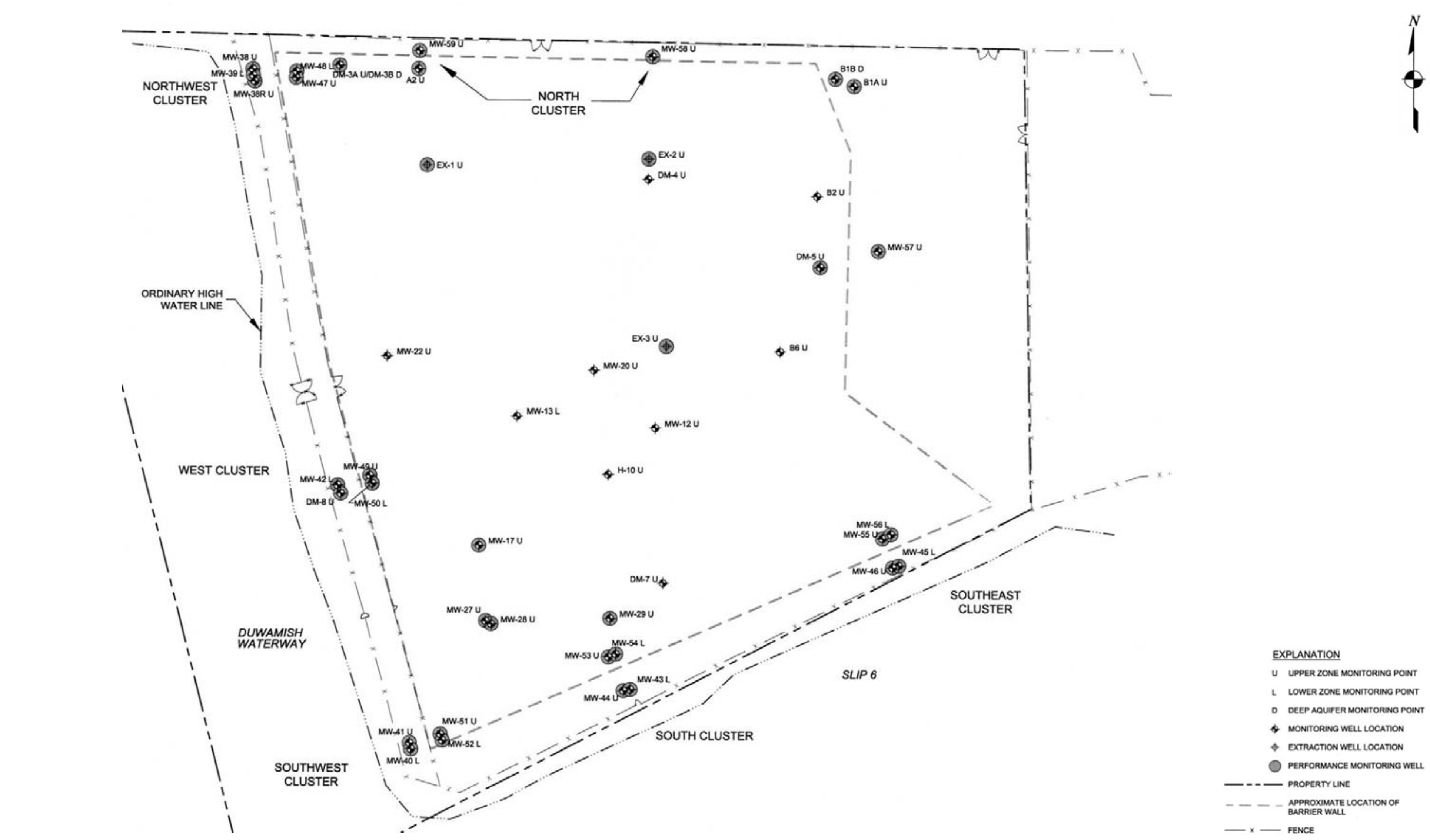
ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

Source: Geomatrix Consultants, Inc. 2007.

LOWER DUWAMISH WATERWAY
RM 3.9-4.4 EAST (SLIP 6)
Tukwila, Washington

Figure 28
HYDRAULIC CONTROL INTERIM MEASURE

Date:	Drawn by:	
2/13/08	AES	10:002330WD1402\fig 28



ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

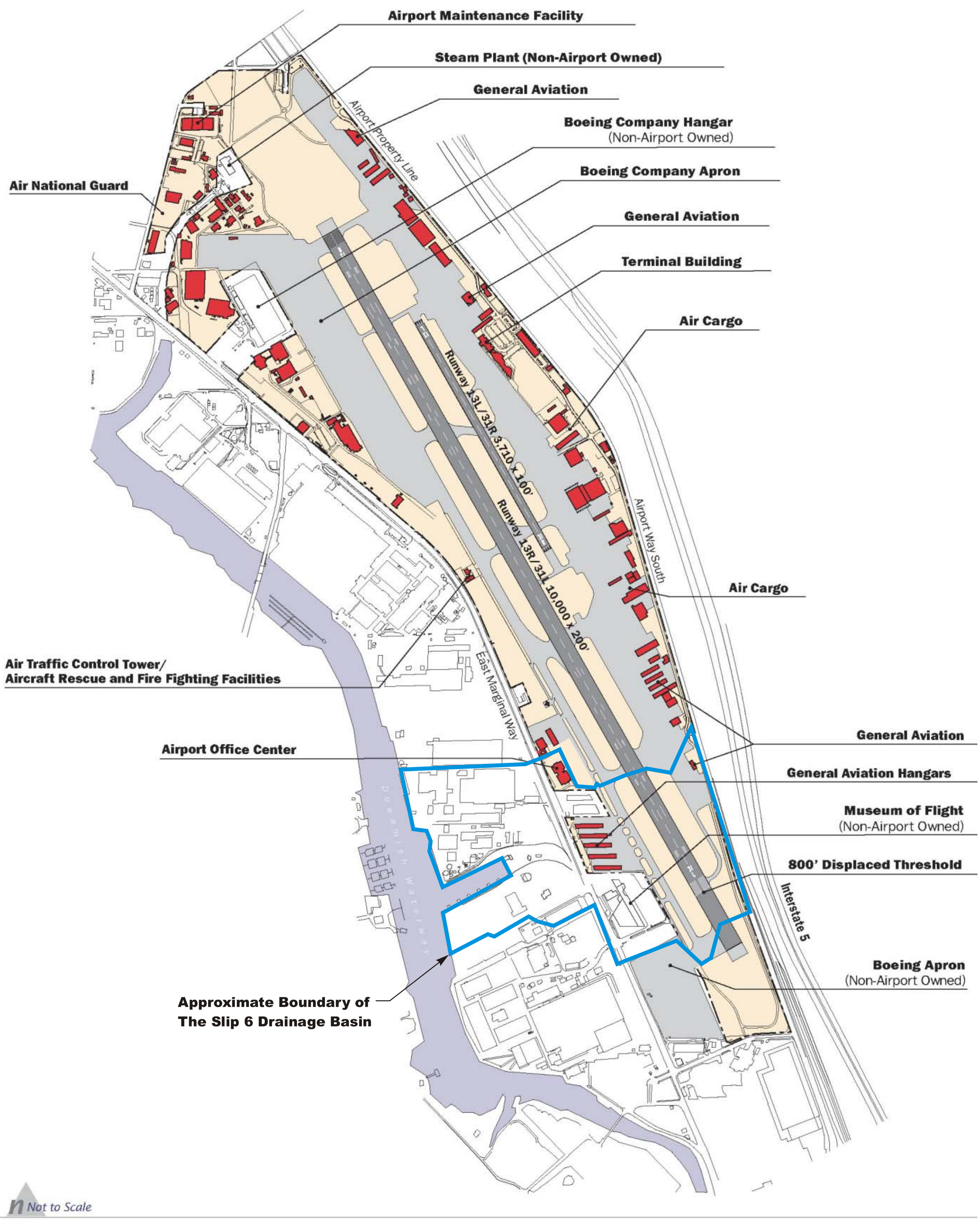
0 80 160
Approximate Scale in Feet

Source: Geomatrix Consultants, Inc. 2007.

LOWER DUWAMISH WATERWAY
RM 3.9-4.4 EAST (SLIP 6)
Tukwila, Washington

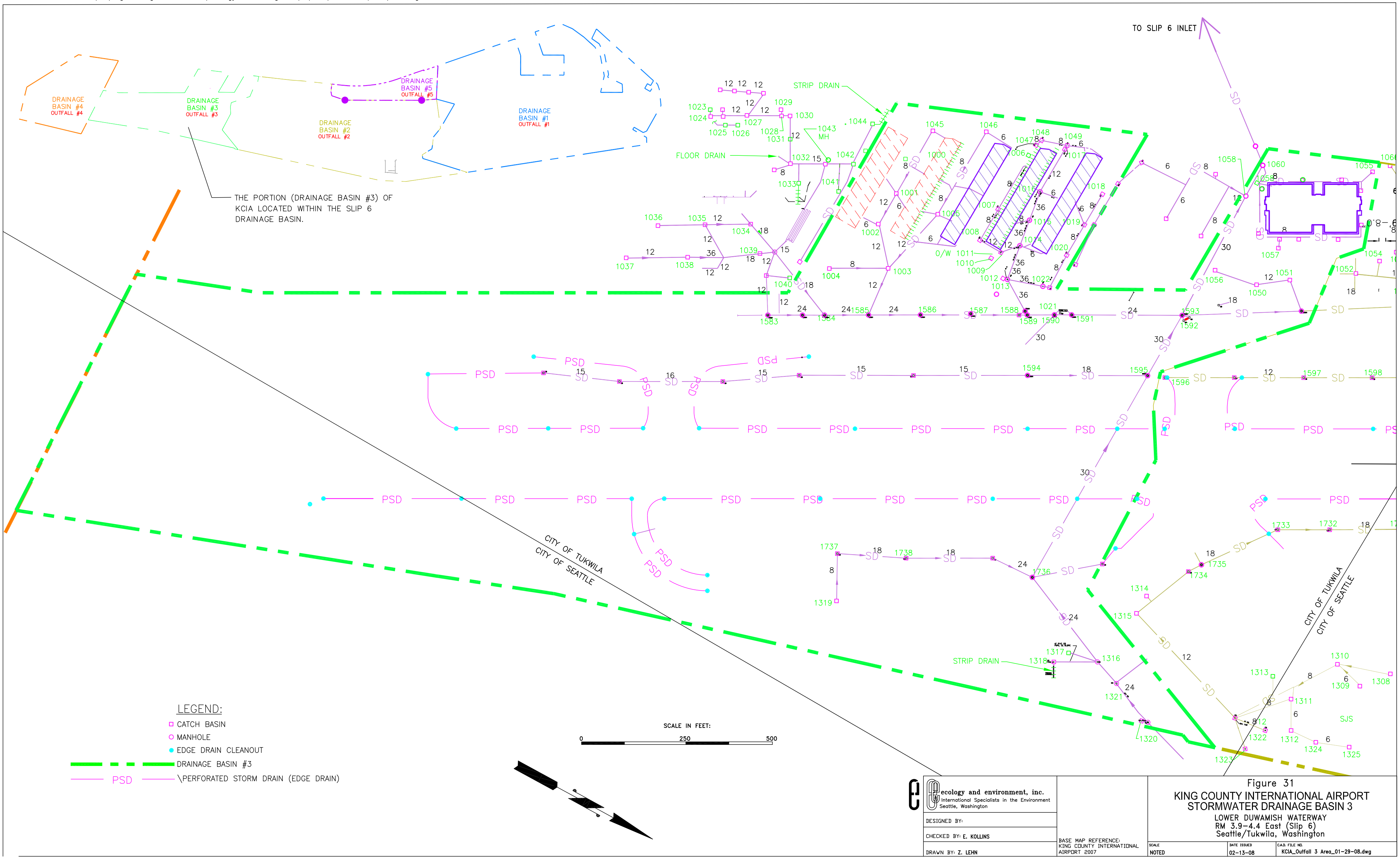
Figure 29
GROUNDWATER MONITORING WELL LOCATIONS

Date:	Drawn by:	
2/13/08	AES	10:002330WD1402\fig 29



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY RM 3.9-4.4 EAST (SLIP 6) Tukwila, Washington	Figure 30 KING COUNTY INTERNATIONAL AIRPORT SITE MAP		
	Base Map Reference: Barnard Dunkelberg & Company, 2001.	Date: 2-13-08	Drawn by: AES	10:002330WD1402\fig 30

CAD ON 'SEANAS'\D:\Engineering Documents\Ecology TCP Program\Slip 6\SEIIDG Report\CAD Figures



ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

DESIGNED BY:

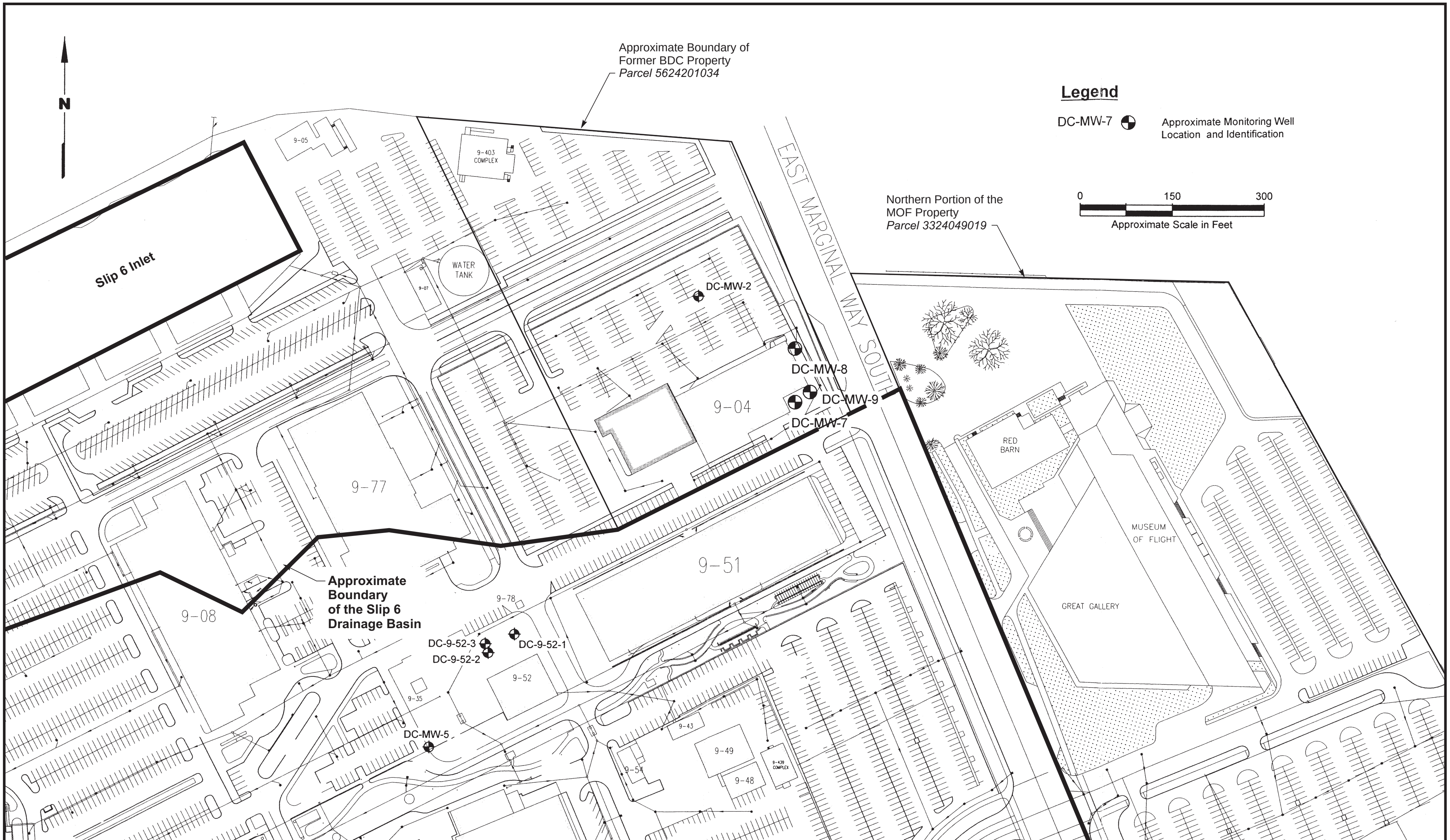
CHECKED BY: E. KOLLINS

DRAWN BY: Z. LEHN

BASE MAP REFERENCE: KING COUNTY INTERNATIONAL AIRPORT 2007

Figure 31
KING COUNTY INTERNATIONAL AIRPORT
STORMWATER DRAINAGE BASIN 3
LOWER DUWAMISH WATERWAY
RM 3.9–4.4 East (Slip 6)
Seattle/Tukwila, Washington

SCALE: NOTED | DATE ISSUED: 02-13-08 | C.A.D. FILE NO.: KCIA_Outfall 3 Area_01-29-08.dwg



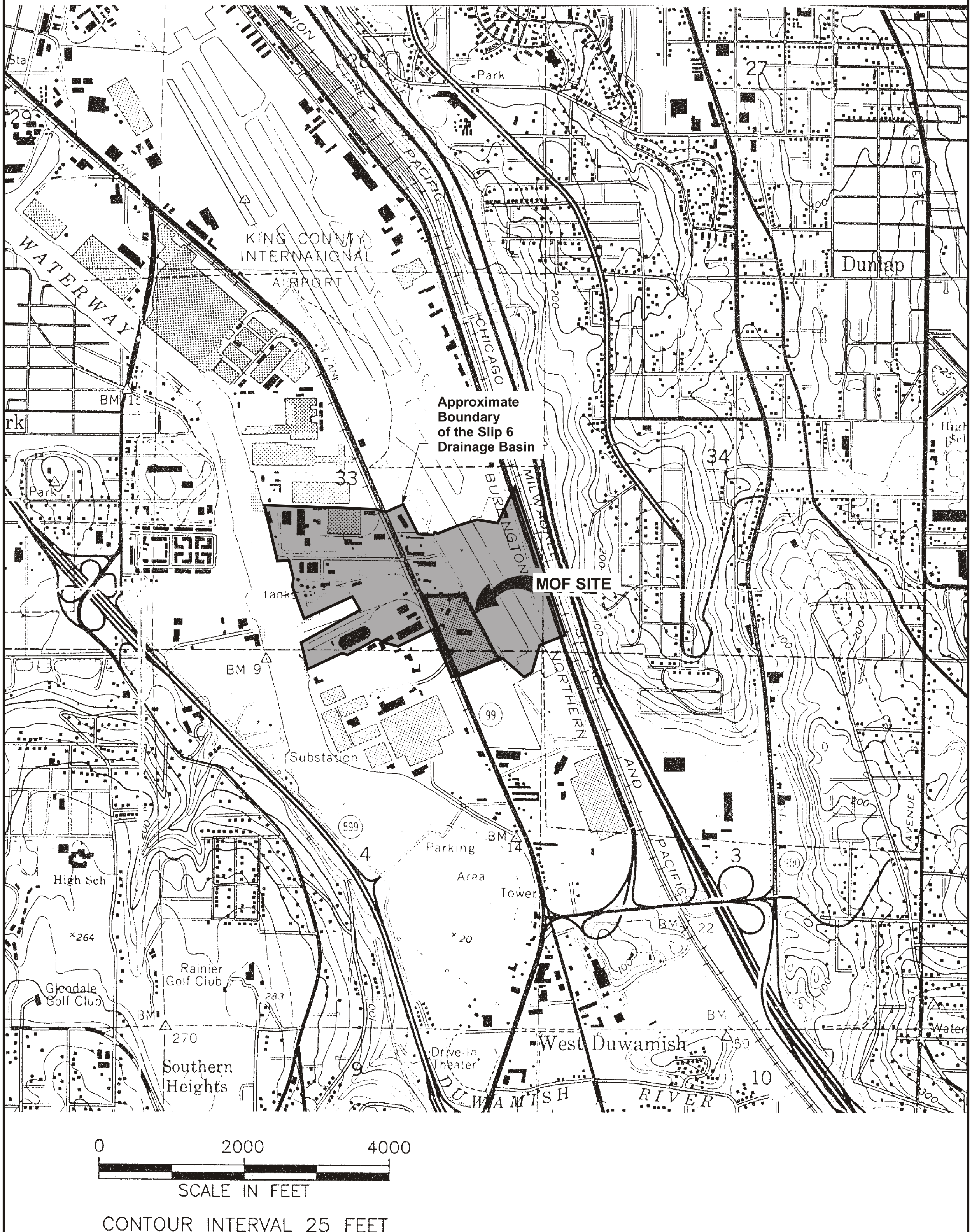
ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

Source: Landau Associates 2007.

LOWER DUWAMISH WATERWAY
RM 3.9-4.4 EAST (SLIP 6)
Tukwila, Washington

Figure 32
FORMER BOEING PROPERTY MONITORING WELL LOCATIONS

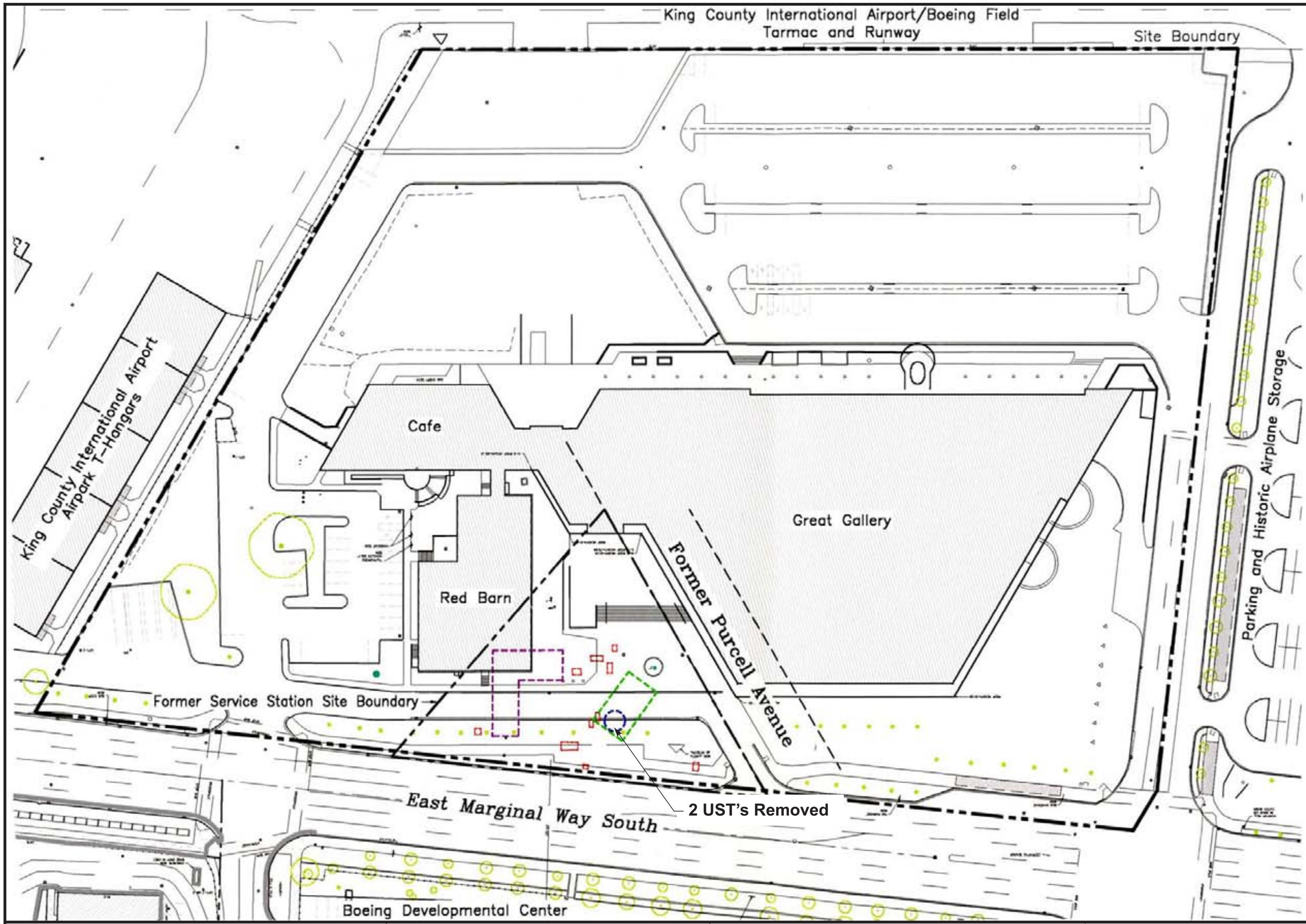
Date:	Drawn by:	
3/3/08	AES	10:002330WD1402\fig 32



Reference: USGS 7.5' topographic quadrangle map "Seattle South, Wash." photorevised 1973.

Source: Geo Engineers 2001.

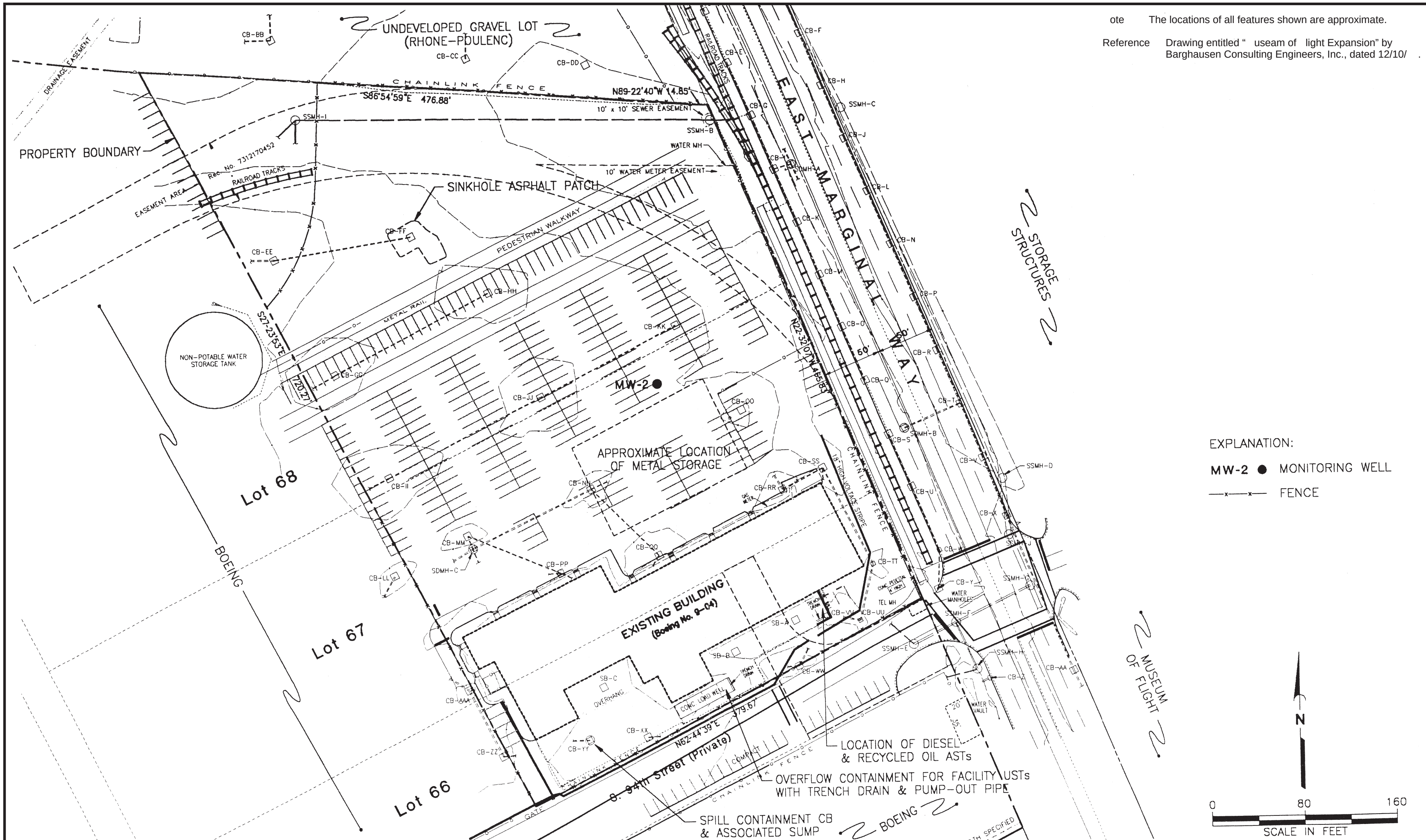
ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY RM 3.9-4.4 EAST (SLIP 6) Tukwila, Washington	Figure 33 MOF VICINITY MAP Date: 2/13/08 · Drawn by: AES · 10:002330WD1402\fig 33



Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Reference: CAD file "2001047-01" provided 05/15/01 by Bush, Roed & Hitchings.

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	**Source:** Geo Engineers 2001.	LOWER DUWAMISH WATERWAY RM 3.9-4.4 EAST (SLIP 6) Tukwila, Washington	Figure 34 MOF SITE MAP
			Date: 2/13/08 — Drawn by: AES — 10:002330WD1402\fig 34



ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

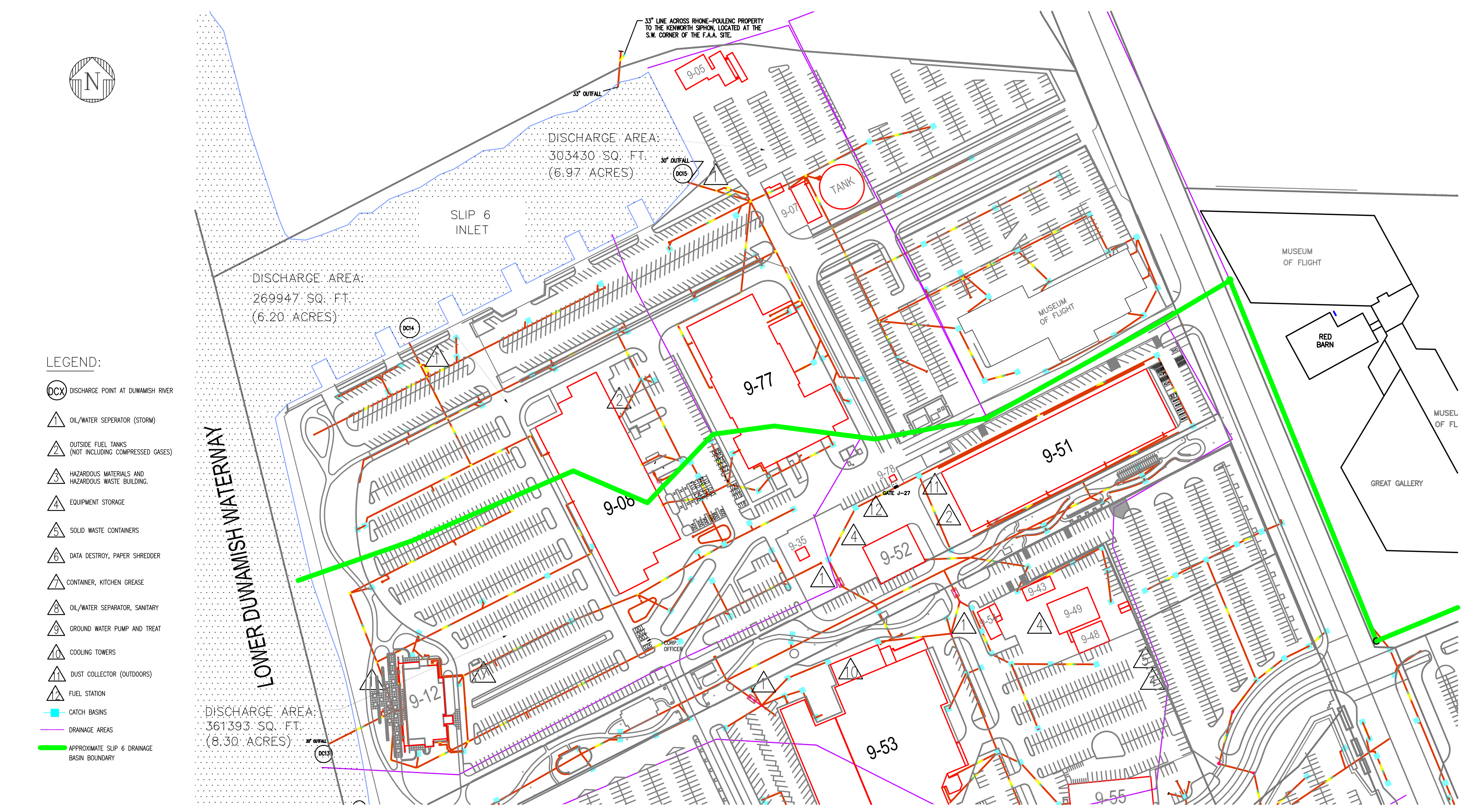
Source: Geo Engineers 2000.

LOWER DUWAMISH WATERWAY
RM 3.9-4.4 EAST (SLIP 6)
Tukwila, Washington

Figure 3
MOF HISTORI FA ILITY MAP
(FORMER D PROPERTY)

Date:	Drawn by:	
2/13/08	AES	10:002330WD1402\fig 3

CAD ON 'SEANAS'\D:\Engineering Documents\Ecology TCP Program\Slip 6\SEIIDG Report\CAD Figures



ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

DESIGNED BY:
CHECKED BY:
DRAWN BY: Z. LEHN

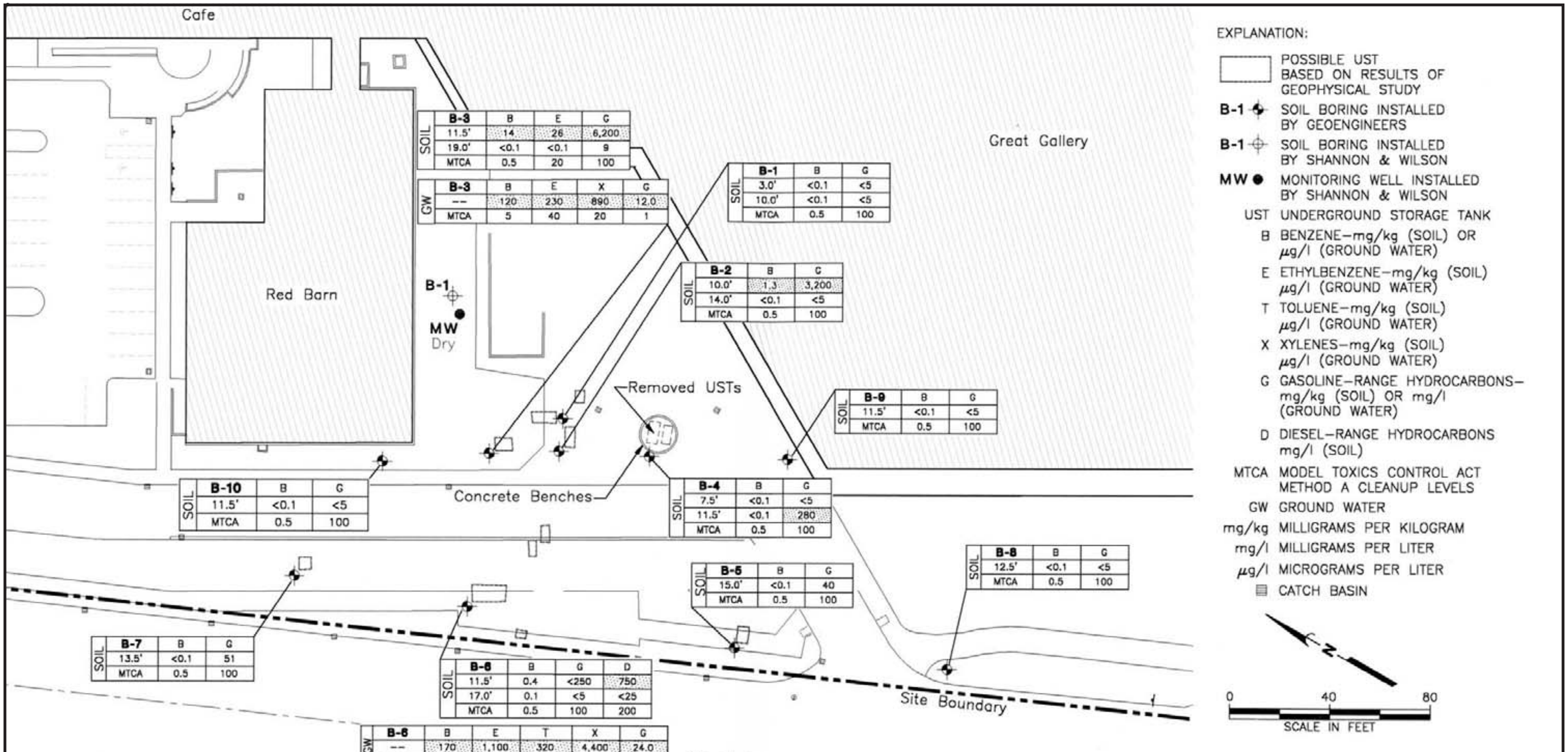
NO.	DATE	SVN	APP'D	DESCRIPTION
				REVISIONS

BASE MAP REFERENCE: THE BOEING COMPANY 2003

Figure 36
BOEING DEVELOPMENTAL CENTER
STORM WATER DRAINAGE SYSTEM

LOWER DUWAMISH WATERWAY
RM 3.9-4.4 East (Slip 6)
Tukwila, Washington

SCALE	DATE ISSUED	C.A.D. FILE NO.
NOTED	02-13-08	BDC_Slip 6 Area_FIGURE3.dwg



Notes:
1. The locations of all features shown are approximate.
2. Diesel- and heavy oil-range hydrocarbons were not detected in the soil or ground water samples with the exception of soil sample B-6-11.5. See Table 1 for details.
3. Shaded concentrations exceed MTCA Method A cleanup levels.
4. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Reference: CAD file “2001047-01” provided 05/15/01 by Bush, Roed & Hitchings.

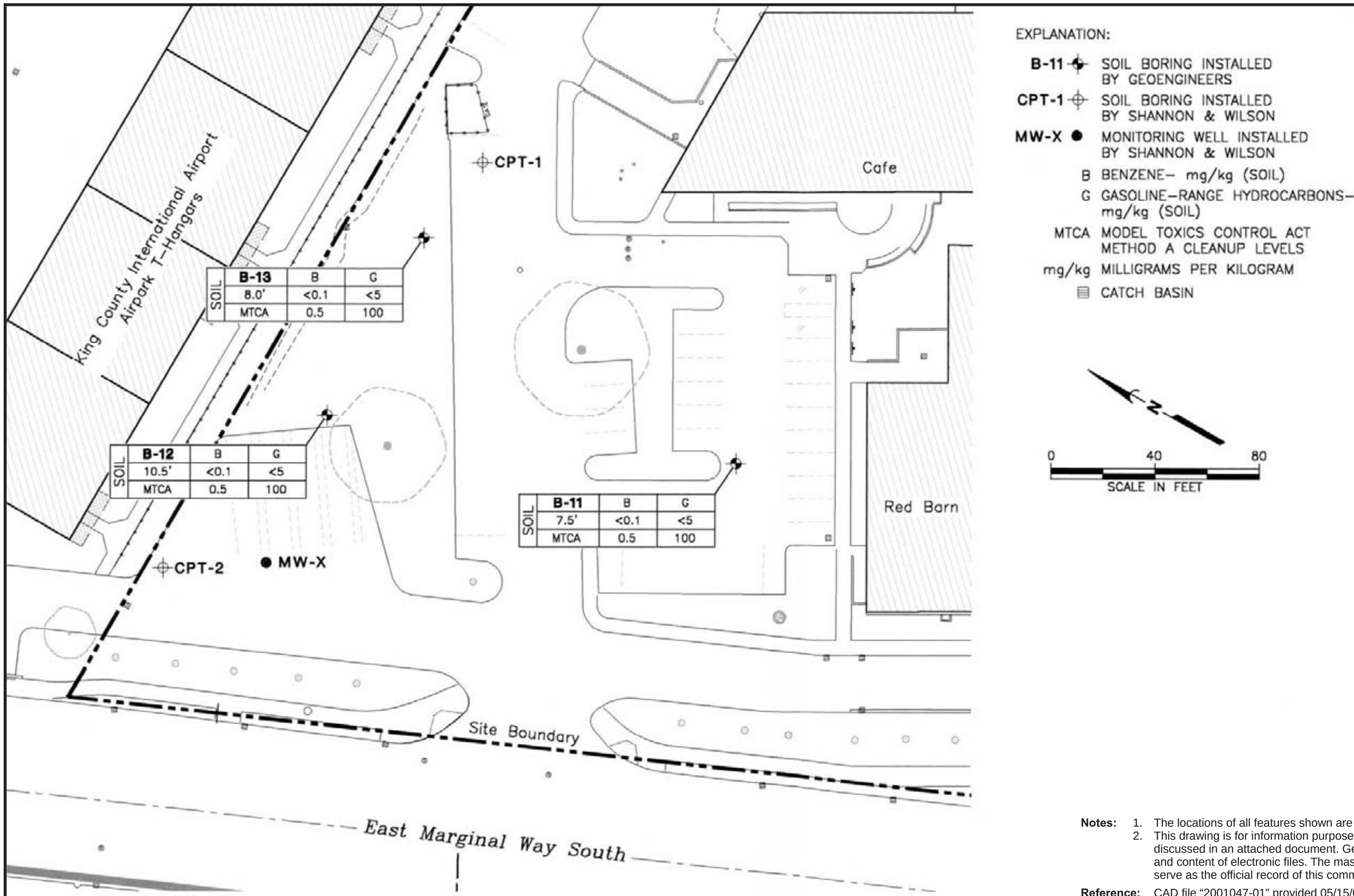
ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

Source: Geo Engineers 2001.

LOWER DUWAMISH WATERWAY
RM 3.9-4.4 EAST (SLIP 6)
Tukwila, Washington

Figure 37
MOF CHEMICAL ANALYTICAL DATA
SOUTH SOIL BORINGS

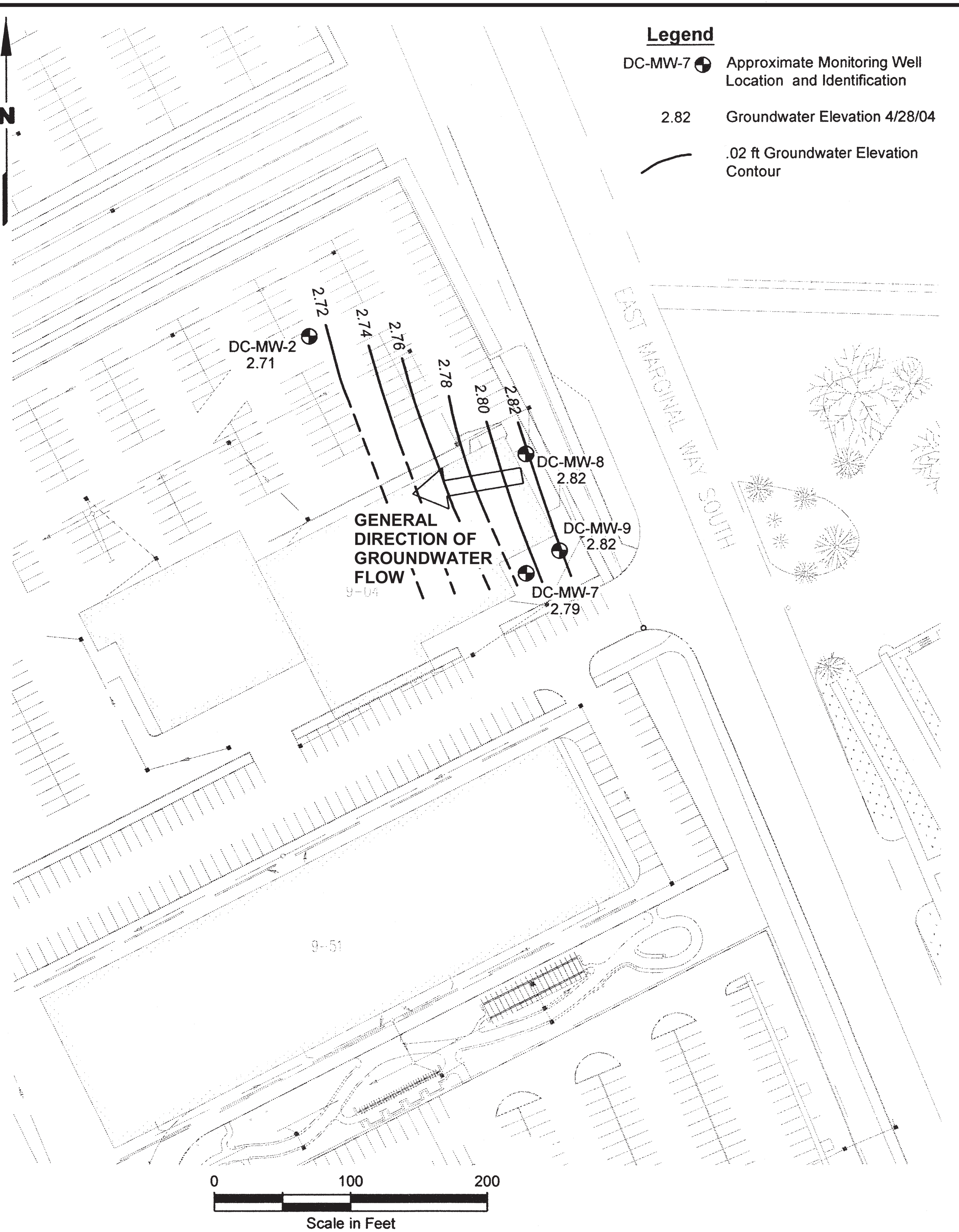
Date:	Drawn by:	
2/13/08	AES	10:002330WD1402\fig 37



Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Reference: CAD file "2001047-01" provided 05/15/01 by Bush, Roed & Hitchings.

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	**Source:** Geo Engineers 2001.	LOWER DUWAMISH WATERWAY RM 3.9-4.4 EAST (SLIP 6) Tukwila, Washington	Figure 38 MOF CHEMICAL ANALYTICAL DATA NORTH SOIL BORINGS		
			Date: 2/13/08	Drawn by: AES	10:002330WD1402\fig 38



ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

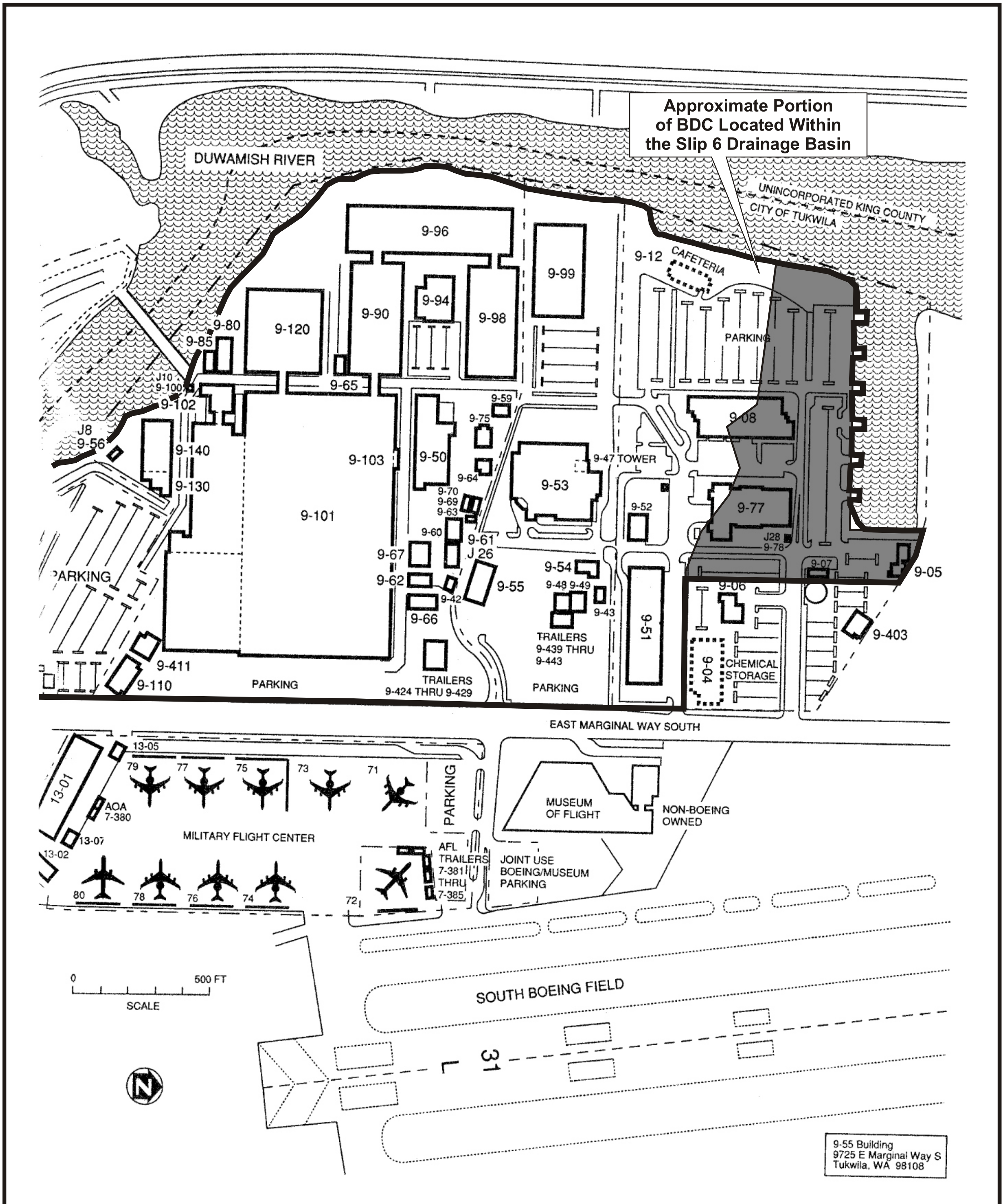
LOWER DUWAMISH WATERWAY
RM 3.9-4.4 EAST (SLIP 6)
Tukwila, Washington

Figure 39

FORMER BOEING PROPERTY
GROUNDWATER ELE ATION CONTOUR MAP

Source: Lan au Asso iates 200 .

Date:	Drawn by:	
2-13-08	AES	10:002330WD1402\fig 39



ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

LOWER DUWAMISH WATERWAY
RM 3.9-4.4 EAST (SLIP 6)
Tukwila, Washington

Figure 40
1991 BOEING DEVELOPMENTAL CENTER FACILITY MAP

Base Map Reference:
Boeing Defense & Space Group, July 1991

Date: 2-13-08

Drawn by: AES

10:002330WD1402\fig 40

6.0 Tables

This page intentionally left blank

Table 1: Identified Facilities of Potential Concern

Facility Name	Facility Physical Address	Facility Mailing Address	Facility Phone Number	Facility Owner	Facility Operator	Property Owner	Property Leasee
Boeing Developmental Center	9725 East Marginal Way South, Tukwila	Same		Boeing	Boeing	Boeing	N/A
Museum of Flight	9404 East Marginal Way South, Seattle	Same		Museum of Flight	Museum of Flight	Museum of Flight	N/A
King County International Airport	7277 Perimeter Road South, Seattle	P.O. Box 80245 7277 Perimeter Road South Seattle, WA 98108-0245	206-296-7380	King County	King County	King County	N/A
Former PACCAR Site	8801 East Marginal Way South, Tukwila	N/A	N/A	N/A	N/A	Washington Real Estate Holdings LLC and Merrill Creek Holdings LLC 600 University Street, Suite 2820, Seattle, WA 98101	Insurance Auto Auctions, Inc. Two Westbrook Corporate Center, Suite 500 Westchester, IL 60154
Former Rhone-Poulenc Site	9229 East Marginal Way South	N/A	N/A	N/A	N/A	Container Properties LLC	Insurance Auto Auctions, Inc. Two Westbrook Corporate Center, Suite 500 Westchester, IL 60154

Table 2: Regulatory Database Listings for Identified Facilities of Potential Concern

Facility Name	Facility Physical Address	NPDES Industrial Stormwater General Permit	UST List (#UST/Status)	LUST List (#Reported Release/Status)	Hazardous Waste Facility (RCRA SITE ID)	CSCSL	NPDES and State Waste Discharge Permit	KC Industrial Waste Discharge Permit
Boeing Developmental Center	9725 East Marginal Way South, Tukwila	#SO3000146D	removed; 1 closed-in-place; 3 exempt; 3	Not Listed	#WAD093639946	#4581384	Not Listed	#526-04
Museum of Flight	9404 East Marginal Way South, Seattle	Not Listed	2 removed	#98798343 / awaiting cleanup	Not Listed	Not Listed	Not Listed	
King County International Airport	7277 Perimeter Road South, Seattle	#SO3000343D	28 / 5 removed	2 cleaned up	#WAD980986848	Not Listed	Not Listed	#4109-01
Former PACCAR Site	8801 East Marginal Way South, Tukwila	#SO3008681A	#8218 / 8 removed	#552588 / awaiting cleanup	#WAD009249509	#2072	Not Listed	Not Listed
Former Rhone-Poulenc Site	9229 East Marginal Way South	Not Listed	Not Listed	Not Listed	#WAD009282302	#2150	Not Listed	#7789-01

Table 3
Events 1, 2, 3, and 4 Stormwater Data
Former PACCAR Site

Location Sample ID Sample Date Sample Matrix Sample Type	Marine Chronic Water Quality Criteria	Storm-South AN005-ST-061015 10/15/2006 W N	Storm-South AN005-ST-070322 3/22/2007 W N	Storm-South AN005-ST-070521 5/21/2007 W N	Storm-South AN005-ST-070718 7/18/2007 W N	Storm-North AN006-ST-061015 10/15/2006 W N	Storm-North AN006-ST-070322 3/22/2007 W N	Storm-North AN006-ST-070521 5/21/2007 W N	Storm-North AN006-ST-070718 7/18/2007 W N
Conventionals (mg/L)									
Total suspended solids		8.3	3.4	2.1 U	51.4	36	10.4	5.5	17.6
Cyanide		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Ammonia		0.320	0.033	0.037	0.368	5.20	1.28	1.27	4.84
Metals-dissolved (µg/L)									
Arsenic	36	1.0	0.7	0.5	0.9	4.0	1.9	0.9	1.4
Cadmium	9.3	0.5	0.2	0.2	0.3	0.2 U	0.2 U	0.2 U	0.4
Chromium*	50*	1.2	1.5	0.8	1.2	1.0	0.8	1.2	3.4
Copper	3.1	21.3	10.2	10.8	19.9	9.6	4.1	18.8	66.9
Lead	8.1	8	4	1	6	1 U	1 U	2	6
Mercury	0.025	0.02 U	0.02 U	0.020 U	0.02 U	0.02 U	0.02 U	0.020 U	0.0241
Silver		0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Zinc	81	193	39	49 J	57	107	39	183 J	410
Metals-total (µg/L)									
Chromium VI	50	R	0.011 U	0.011 U	0.011 U	R	0.011 U	0.011 U	0.011 U
Arsenic		1.2	0.6	0.5	2	6.7	2.4	1.0	1.6
Cadmium		0.7	0.2 U	0.2	1.1	0.2 U	0.2	0.3	0.5
Chromium		2.4	1.2	0.9	7.1	1.3	1.0	1.9	4.3
Copper		27.3	8.8	11.2	46	11.2	7	24.0	78.9
Lead		26	1 U	3	96	1	2	5	21
Mercury		0.02 U	0.02 U	0.020 U	0.0512	0.02 U	0.02 U	0.020 U	0.0566
Silver		0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Zinc		227	35	50 J	225	83	46	201 J	460
PCBs (µg/L)									
Aroclor 1016	--	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
Aroclor 1221	--	0.010 U	0.010 U	0.010 U	0.030 U	0.010 U	0.010 U	0.010 U	0.015 U
Aroclor 1232	--	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
Aroclor 1242	--	0.010 UJ	0.010 U	0.010 U	0.010 U	0.010 UJ	0.010 U	0.010 U	0.010 U
Aroclor 1248	--	0.010 UJ	0.010 U	0.010 U	0.010 U	0.010 UJ	0.010 U	0.010 U	0.010 U
Aroclor 1254	--	0.011 J	0.010 U	0.010 U	0.036	0.010 U	0.010 U	0.018	0.012
Aroclor 1260	--	0.028 U	0.010 U	0.010 U	0.019	0.010 UJ	0.010 U	0.010 U	0.010 U
Aroclor 1262	--	0.019 UJ	0.010 U	0.010 U	0.010 U	0.010 UJ	0.010 U	0.010 U	0.010 U
Aroclor 1268	--	0.010 UJ	0.010 U	0.010 U	0.010 U	0.010 UJ	0.010 U	0.010 U	0.010 U
Total PCBs (SMS)	0.03	0.011 J	0.01 U	0.01 U	0.055	0.010 U	0.01 U	0.018	0.012
SVOCs (µg/L)									
1,2,4-Trichlorobenzene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,2'-oxybis (1-chloropropane)		1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U
2,4,5-Trichlorophenol		5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
2,4,6-Trichlorophenol		5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
2,4-Dichlorophenol		5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
2,4-Dimethylphenol		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,4-Dinitrophenol		10 UJ	10 U	10 UJ	10 UJ	10 UJ	10 U	10 UJ	10 UJ
2,4-Dinitrotoluene		5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
2,6-Dinitrotoluene		5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U

Table 3
Events 1, 2, 3, and 4 Stormwater Data
Former PACCAR Site

Location	Marine	Storm-South	Storm-South	Storm-South	Storm-South	Storm-North	Storm-North	Storm-North	Storm-North
Sample ID	Chronic	AN005-ST-061015	AN005-ST-070322	AN005-ST-070521	AN005-ST-070718	AN006-ST-061015	AN006-ST-070322	AN006-ST-070521	AN006-ST-070718
Sample Date	Water	10/15/2006	3/22/2007	5/21/2007	7/18/2007	10/15/2006	3/22/2007	5/21/2007	7/18/2007
Sample Matrix	Quality	W	W	W	W	W	W	W	W
Sample Type	Criteria	N	N	N	N	N	N	N	N
2-Chloronaphthalene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Chlorophenol		1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 UJ
2-Methylnaphthalene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Methylphenol		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Nitroaniline		5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
2-Nitrophenol		5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
3,3'-Dichlorobenzidine		5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
3-Nitroaniline		5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
4,6-Dinitro-2-methylphenol		10 U	10 U	10 UJ	10 U	10 U	10 U	10 UJ	10 U
4-Bromophenyl-phenylether		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
4-Chloro-3-methylphenol		5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
4-Chloroaniline		5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
4-Chlorophenyl-phenylether		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
4-Methylphenol		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
4-Nitroaniline		5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
4-Nitrophenol		5.0 U	5.0 U	5.0 U	5.0 UJ	5.0 U	5.0 U	5.0 U	5.0 UJ
Acenaphthene		1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 UJ
Acenaphthylene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Anthracene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Benzo(a)anthracene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Benzo(a)pyrene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Benzo(b)fluoranthene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Benzo(g,h,i)perylene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Benzo(k)fluoranthene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Benzoic acid		10 U	10 UJ	10 U	10 U	10 U	10 UJ	10 U	10 U
Benzyl alcohol		5.0 U	5.0 UJ	5.0 U	5.0 U	5.0 U	5.0 UJ	5.0 U	5.0 U
bis(2-Chloroethoxy)methane		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
bis(2-Chloroethyl)ether		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
bis(2-Ethylhexyl)phthalate		**3.2**	1.0 U	1.0 U	**14**	1.0 U	1.0 U	1.0 U	1.0 U
Butylbenzylphthalate		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbazole		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chrysene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibenzo(a,h)anthracene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibenzofuran		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Diethylphthalate		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dimethylphthalate		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Di-n-butylphthalate		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Di-n-octylphthalate		1.0 U	1.0 U	1.0 U	**1.2**	1.0 U	1.0 U	1.0 U	1.0 U
Fluoranthene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Fluorene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Hexachlorobenzene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Hexachlorobutadiene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Hexachlorocyclopentadiene		5.0 U	5.0 U	5.0 U	5.0 UJ	5.0 U	5.0 U	5.0 U	5.0 UJ
Hexachloroethane		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Indeno(1,2,3-cd)pyrene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Isophorone		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Naphthalene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

Table 3
Events 1, 2, 3, and 4 Stormwater Data
Former PACCAR Site

Location Sample ID Sample Date Sample Matrix Sample Type	Marine Chronic Water Quality Criteria	Storm-South AN005-ST-061015 10/15/2006 W N	Storm-South AN005-ST-070322 3/22/2007 W N	Storm-South AN005-ST-070521 5/21/2007 W N	Storm-South AN005-ST-070718 7/18/2007 W N	Storm-North AN006-ST-061015 10/15/2006 W N	Storm-North AN006-ST-070322 3/22/2007 W N	Storm-North AN006-ST-070521 5/21/2007 W N	Storm-North AN006-ST-070718 7/18/2007 W N
Nitrobenzene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
n-Nitroso-di-n-propylamine		5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
n-Nitroso-di-phenylamine		1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U
Pentachlorophenol	7.9	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Phenanthrene		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Phenol		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Pyrene		1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 UJ
Total benzofluoranthenes (SMS)		1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Total LPAH (SMS)		1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Total HPAH (SMS)		1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U

Notes:
Analyte exceeds Marine Chronic Water Quality Criteria
* Chromium criteria is for Cr(VI)
Bold = detected result
mg/L = milligrams per liter
µg/L = micrograms perliter
J = estimated value
U = compound was analyzed but not detected
UJ = estimated detection limit
R = rejected
(SMS) = calculated per Sediment Management Standards

Table 4

March 2007 and October 2006 Stormwater Outfall Solids Data
Former PACCAR Site

Location Sample ID Sample Date Depth Interval	Sediment Management Standards (SMS) SQS*	CSL*	Storm-South AN005-CB-061016 10/16/2006 N/AP	Storm-South AN005-070319 3/19/2007 N/AP	Storm-North AN006-CB-061016 10/16/2006 N/AP	Storm-North AN006-070319 3/19/2007 N/AP	Boeing Drain AN033-CB-061016 10/16/2006 N/AP
Conventionals (%)							
%Moisture	--	--	--		--		--
Total solids	--	--	**63.60**	**8.35**	**57.50**	**8.42**	**90.40**
Total Organic Carbon	--	--	**2.64**	**48.20**	**10.8**	**26.90**	**3.08**
Grain Size (%)							
Gravel	--	--	**1.9**	**2.6**	**74.8**	**0.9**	--
Sand	--	--	**85.3**	**78.8**	**20.4**	**27.4**	--
Sand, Very Coarse	--	--	**2.2**	**6.2**	**5.4**	**1.6**	--
Sand, Coarse	--	--	**5.5**	**19.2**	**5.4**	**3.3**	--
Sand, Medium	--	--	**26.0**	**27.2**	**5.2**	**5.5**	--
Sand, Fine	--	--	**35.7**	**16.8**	**2.8**	**7.3**	--
Sand, Very Fine	--	--	**15.9**	**9.4**	**1.6**	**9.7**	--
Silt	--	--	**11.5**	**17.5**	**4.4**	**65.2**	--
Silt, Coarse	--	--	**6.0**	**10.5**	**2.1**	**29.0**	--
Silt, Medium	--	--	**3.2**	**3.7**	**1.4**	**18.7**	--
Silt, Fine	--	--	**1.5**	**2.1**	**0.6**	**11.7**	--
Silt, Very Fine	--	--	**0.8**	**1.2**	**0.3**	**5.8**	--
Fines	--	--	**12.7**	**18.6**	**4.8**	**71.6**	--
Metals (mg/kg dw)							
Arsenic	57	93	**13.0 J**	**5.1**	**7.2 J**	**32.4**	**10.3 J**
Cadmium	5.1	6.7	**2.5**	**4.1**	**7.1**	**6.8**	**15**
Chromium	260	270	**67.3 J**	**77.4**	**80.8 J**	**125**	**114 J**
Copper	390	530	**134 J**	**318**	**111 J**	**264**	**112 J**
Lead	450	530	**128**	**660**	**175**	**764**	**504**
Mercury	0.41	0.59	**0.30**	**0.09 J**	**0.08**	**0.9 J**	**0.12**
Silver	6.1	6.1	**1.4**	**0.3**	0.3 U	**1.6**	**0.3**
Zinc	410	960	**385 J**	**860**	**720 J**	**1110**	**6710 J**
PCBs (µg/kg dw)							
Aroclor 1016	--	--	99 U	59 U	49 U	200 U	670 U
Aroclor 1221	--	--	99 U	59 U	49 U	200 U	670 U
Aroclor 1232	--	--	99 U	59 U	49 U	200 U	670 U
Aroclor 1242	--	--	99 U	59 U	49 U	200 U	670 U
Aroclor 1248	--	--	99 U	59 U	49 U	200 U	670 U
Aroclor 1254	--	--	**160**	**250**	49 U	**700**	670 U
Aroclor 1260	--	--	99 U	**63 J**	49 U	**250**	670 U
Aroclor 1262	--	--	99 U	59 U	49 U	200 U	670 U
Aroclor 1268	--	--	99 U	59 U	49 U	200 U	670 U

Table 4

March 2007 and October 2006 Stormwater Outfall Solids Data
Former PACCAR Site

Location Sample ID Sample Date Depth Interval	Sediment Management Standards (SMS) SQS*	 CSL*	Storm-South AN005-CB-061016 10/16/2006 N/AP	Storm-South AN005-070319 3/19/2007 N/AP	Storm-North AN006-CB-061016 10/16/2006 N/AP	Storm-North AN006-070319 3/19/2007 N/AP	Boeing Drain AN033-CB-061016 10/16/2006 N/AP
Total PCBs (SMS)	130	1000	**160**	**313**	49 U	**950**	670 U
SVOCs (µg/kg dw)							
Naphthalene	2100	2400	60 U	350 U	200 U	620 U	60 U
Acenaphthylene	1300	1300	60 U	350 U	200 U	620 U	60 U
Acenaphthene	500	730	**160**	350 U	**120 J**	620 U	**110**
Fluorene	540	1000	**93**	350 U	**220**	620 U	**78**
Phenanthrene	1500	5400	**810**	**2300**	**780**	**3000**	**470**
Anthracene	960	4400	**170**	**450**	200 U	**460 J**	**63**
2-Methylnaphthalene	670	1400	60 U	350 U	**460**	620 U	60 U
Fluoranthene	1700	2500	**1600**	**7100**	**380**	**9500**	**1100**
Pyrene	2600	3300	**1600**	**2900 J**	**230**	**5000 J**	**980**
Benzo(a)anthracene	1300	1600	**330**	**1800 J**	200 U	**2200 J**	**250**
Chrysene	1400	2800	**1000**	**4600 J**	**370**	**4600 J**	**700**
Benzo(b)fluoranthene	--	--	**930**	**3200 J**	**170 J**	**4300 J**	**750 J**
Benzo(k)fluoranthene	--	--	**1000**	**3300 J**	**150 J**	**4000 J**	**750**
Benzo(a)pyrene	1600	3000	**680**	**2200 J**	200 U	**2500 J**	**600 J**
Indeno(1,2,3-cd)pyrene	600	690	**280**	**750 J**	200 U	**1500 J**	**170 J**
Dibenzo(a,h)anthracene	230	540	**160**	350 U	**84**	**320 J**	**56**
Benzo(g,h,i)perylene	670	720	**320**	**910 J**	200 U	**2100 J**	**170 J**
1,3-Dichlorobenzene	--	--	60 U	350 U	200 U	620 U	60 U
1,4-Dichlorobenzene	110	120	**18**	350 U	6.2 U	620 U	6.0 U
1,2-Dichlorobenzene	35	50	6.1 U	350 U	6.2 U	620 U	6.0 U
1,2,4-Trichlorobenzene	31	51	6.1 U	350 U	6.2 U	620 U	13 UY
Hexachlorobenzene	22	70	6.1 U	350 U	6.2 U	620 U	6.0 U
Dimethylphthalate	71	160	**210**	**290 J**	200 U	**630**	**180**
Diethylphthalate	200	1200	60 U	350 U	200 U	620 U	60 U
Di-n-butylphthalate	1400	5100	**120**	350 U	200 U	**870**	**74**
Butylbenzylphthalate	63	900	**280**	**5100 J**	**1100**	**1300 J**	**40**
bis(2-Ethylhexyl)phthalate	1300	1900	**4500**	**26000 J**	**10000**	**62000**	**3600**
Di-n-octylphthalate	6200	--	**280**	**1800 J**	**3100**	**3100 J**	**700**
Dibenzofuran	540	700	60 U	350 U	200 U	620 U	60 U
Hexachloroethane	--	--	60 U	350 U	200 U	620 U	60 U
Hexachlorobutadiene	11	120	6.1 U	350 U	6.2 U	620 U	6.0 U
n-Nitrosodiphenylamine	28	40	40 UY	350 U	62 UY	620 U	210 UY
Total benzofluoranthenes (SMS)	3200	3600	**1930**	**6500**	**320**	**8300**	**1500**
Total LPAH (SMS)	5200	13000	**1233**	**2750**	**1120**	**3460**	**721**
Total HPAH (SMS)	12000	17000	**7836**	**26760**	**1300**	**36020**	**5500**

Table 4

March 2007 and October 2006 Stormwater Outfall Solids Data
Former PACCAR Site

Location Sample ID Sample Date	Sediment Management Standards (SMS)		Storm-South AN005-CB-061016 10/16/2006	Storm-South AN005-070319 3/19/2007	Storm-North AN006-CB-061016 10/16/2006	Storm-North AN006-070319 3/19/2007	Boeing Drain AN033-CB-061016 10/16/2006
Depth Interval	SQS*	CSL*	N/AP	N/AP	N/AP	N/AP	N/AP
Phenols (µg/kg dw)							
Phenol	420	1200	60 U	480 U	200 U	620 U	60 U
2-Methylphenol	63	72	**7.9**	350 U	6.2 U	620 U	6.0 U
4-Methylphenol	670	800	**43 J**	**7100**	200 U	**14000**	**38 J**
2,4-Dimethylphenol	29	72	6.1 U	350 U	6.2 U	620 U	10 UY
Pentachlorophenol	360	690	30 U	1800 U	31 U	3100 U	30 U
Misc Extractables (µg/kg dw)							
Benzyl alcohol	57	73	30 U	**940**	**920**	620 U	30 U
Benzoic acid	650	650	600 U	**4200**	2000 U	**3700 J**	600 UJ

Notes:

Analyte exceeds SQS

Analyte exceeds CSL

Analyte Detection Limit exceeds SQS or CSL

SQS = Sediment Quality Standards

CSL = Cleanup Screening Levels

* Dry weight criteria (LAET / 2LAET) critiera from SMS were applied for PCBs and SVOCs

Bold = detected result

mg/kg dw = milligrams per kilogram dry weight

µg/kg dw = micrograms per kilogram dry weight

J = estimated value

U = compound was analyzed but not detected

UJ = estimated detection limit

UY = raised reporting limit due to background interference. Compound not detected.

(SMS) = calculated per Sediment Management Standards

N/AP = not applicable

Table 5

AS/SVE System

Summary of Groundwater Analytical Results for VOCs (µg/L)[a]

Former PACCAR Site

Monitoring Well Designation	Date Sampled	Analyte										
		Vinyl Chloride	**Chloro-ethane**	**Methylene Chloride**	**Acetone**	**1,1-DCE**	**1,1-DCA**	**trans-1,2-DCE**	**cis-1,2-DCE**	**Chloroform**	**TCE**	**Benzene**
LATERAL WELLS												
MW-7A (north segment)	Apr-97	0.53	<2.0[b]	<1.0	120	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Nov-97	<0.2	1.1	<0.2	<1.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	Mar-99	<1.0	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Nov-99	< 1.0	< 1.0	< 1.0	5.1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Mar-00	< 1.0	< 1.0	< 1.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Mar-02	0.5	<0.2	<0.3	2.3	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	Feb-04	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Oct-04	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Jan-05	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Apr-05	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Jul-05	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Sep-05	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Dec-05	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Apr-06	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Jun-06	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Oct-06	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Jan-07	***13.0***	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	4.04	<1.00	<1.00	<1.00
	Apr-07	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Jun-07	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
MW-41A (south segment)	Feb-04	1.94	<1.00	<5.00	<20.0	<1.00	1.12	<1.00	<1.00	<1.00	<1.00	<1.00
	Oct-04	<1.00 / <1.00[c]	<1.00 / <1.00	<5.00 / <5.00	<20.0 / <20.0	<1.00 / <1.00	<1.00 / <1.00	<1.00 / <1.00	<1.00 / <1.00	<1.00 / <1.00	<1.00 / <1.00	<1.00 / <1.00
	Jan-05	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Apr-05	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Jul-05	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Sep-05	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Dec-05	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Apr-06	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Jun-06	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Oct-06	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Jan-07	1.02	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Apr-07	<1.00	<1.00	<5.00	<20.0	<1.00	1.83	<1.00	<1.00	<1.00	<1.00	<1.00
	Jun-07	<1.00	<1.00	<5.00	<20.0	<1.00	1.77	<1.00	<1.00	<1.00	<1.00	<1.00

Table 5

AS/SVE System

Summary of Groundwater Analytical Results for VOCs (µg/L)[(a)]

Former PACCAR Site

Monitoring Well Designation	Date Sampled	Analyte: Vinyl Chloride	Chloro-ethane	Methylene Chloride	Acetone	1,1-DCE	1,1-DCA	trans-1,2-DCE	cis-1,2-DCE	Chloroform	TCE	Benzene
DOWNGRADIENT CONDITIONAL POINT OF COMPLIANCE WELLS												
MW-26A	Apr-97	***21***	<2.0	<1.0	<5.0	<1.0	8.7	3	120	<1.0	17	<1.0
	Nov-97	***50***	<0.2	<0.2	<1.0	1.4	15	3.9	150	<0.2	7.5	0.3
	Mar-99	***17***	< 1.0	< 1.0	< 5.0	< 1.0	9.1	3	92	< 1.0	1.9	< 1.0
	Nov-99	***26***	< 1.0	< 1.0	< 5.0	< 1.0	12	3.5	100	< 1.0	< 1.0	< 1.0
	Mar-00	***120***	< 1.0	< 1.0	< 5.0	< 1.0	4.5	2.3	49	< 1.0	< 1.0	< 1.0
	Mar-02	***48***	<0.2	4.1	<1.0	0.4	11	2.9	41	<0.2	5.3	0.4
	Oct-04	<1.00	37.2	<5.00	<20.0	<1.00	11.7	<1.00	18.3	<1.00	3.37	<1.00
	Jan-05	***24***	80.2	<5.00	<20.0	<1.00	56.2	<1.00	13.6	<1.00	2.09	<1.00
	Apr-05	3.13	9.5	<5.00	<20.0	<1.00	29.8	<1.00	13.4	<1.00	4.87	<1.00
	Jul-05	3.12 / 3.11[(c)]	1.91 / 1.87	<5.00 / <5.00	<20.0 / <20.0	<1.00 / <1.00	9.34 / 9.32	2.10 / 2.04	19.9 / 19.5	<1.00 /<1.00	4.60 / 4.64	<1.00 / <1.00
	Sep-05	1.68 / 1.76	1.91 / 1.87	<5.00 / <5.00	<20.0 / <20.0	<1.00 / <1.00	5.39 / 4.91	1.77 / 1.52	16.9 / 15.1	<1.00 /<1.00	3.08 / 2.83	<1.00 / <1.00
	Dec-05	<1.00 / <1.00	<1.00 / <1.00	<5.00 / <5.00	<20.0 / <20.0	<1.00 / <1.00	4.35 / 4.67	<1.00 / <1.00	11.7 / 8.94	<1.00 /<1.00	4.47 / 2.51	<1.00 / <1.00
	Apr-06	<1.00 / <1.00	<1.00 / <1.00	<5.00 / <5.00	<20.0 / <20.0	<1.00 / <1.00	2.21 / 2.13	<1.00 / <1.00	5.69 / 5.48	<1.00 /<1.00	5.59 / 5.31	<1.00 / <1.00
	Jun-06	<1.00 / <1.00	<1.00 / <1.00	<5.00 / <5.00	<20.0 / <20.0	<1.00 / <1.00	1.78 / 1.65	<1.00 / 1.06	11.6 / 11.9	<1.00 /<1.00	3.50 / 3.41	<1.00 / <1.00
	Oct-06	<1.00 / <1.00	<1.00 / <1.00	<5.00 / <5.00	<20.0 / <20.0	<1.00 / <1.00	<1.00 /<1.00	1.26 / 1.24	9.06 / 8.76	<1.00 /<1.00	2.20 / 2.23	<1.00 /<1.00
	Jan-07	<1.00 / <1.00	<1.00 / <1.00	<5.00 / <5.00	<20.0 / <20.0	<1.00 / <1.00	<1.00 /<1.00	<1.00 / <1.00	2.09 / 2.03	<1.00 /<1.00	1.61 / 1.67	<1.00 /<1.00
	Apr-07	<1.00 / <1.00	<1.00 / <1.00	<5.00 / <5.00	<20.0 / <20.0	<1.00 / <1.00	<1.00 /<1.00	<1.00 / 1.00	6.24/ 6.32	<1.00 /<1.00	3.31 / 3.35	<1.00 /<1.00
	Jun-07	<1.00 / <1.00	<1.00 / <1.00	<5.00 / <5.00	<20.0 / <20.0	<1.00 / <1.00	<1.00 /<1.00	<1.00 / 1.00	6.61/ 5.85	<1.00 /<1.00	2.05 / 1.73	<1.00 /<1.00
MW-29A	Apr-97	***9.8***	<2.0	<1.0	8.7	<1.0	9.3	1.4	75	<1.0	***52***	<1.0
	Nov-97	***23***	<0.2	<0.2	1.7	0.8	13	1.8	88	<0.2	17	0.3
	Mar-99	***8.5***	< 1.0	< 1.0	< 5.0	< 1.0	8.7	1.5	90	< 1.0	19	< 1.0
	Nov-99	***11***	< 1.0	< 1.0	< 5.0	< 1.0	7.1	1.1	57	< 1.0	2.9	< 1.0
	Mar-00	***5.8***	< 1.0	< 1.0	< 5.0	< 1.0	5.9	1.8	66	< 1.0	18	< 1.0
	Mar-02	***38***	<0.2	<0.3	<1.0	0.6	8.0	2.0	57	<0.2	8.9	0.3
	Oct-04	**9.63**	<1.00	<5.00	<20.0	<1.00	15.1	1.34	53.2	<1.00	3.02	<1.00
	Jan-05	**11.4**	<1.00	<5.00	<20.0	<1.00	16.4	1.26	46	<1.00	2.19	<1.00
	Apr-05	**8.25**	<1.00	<5.00	<20.0	<1.00	23.2	1.18	45.3	<1.00	1.93	<1.00
	Jul-05	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Sep-05	2.96	<1.00	<5.00	<20.0	<1.00	20.8	<1.00	33.8	<1.00	1.29	<1.00
	Dec-05	**8.57**	<1.00	<5.00	<20.0	<1.00	15.5	<1.00	28	<1.00	<1.00	<1.00
	Apr-06	1.48	<1.00	<5.00	<20.0	<1.00	7.8	<1.00	20.7	<1.00	4.3	<1.00
	Jun-06	<1.00	<1.00	<5.00	<20.0	<1.00	7.87	<1.00	19.5	<1.00	4.17	<1.00
	Oct-06	<1.00	<1.00	<5.00	<20.0	<1.00	3.96	<1.00	11	<1.00	7.77	<1.00
	Jan-07	<1.00	<1.00	<5.00	<20.0	<1.00	2.81	<1.00	6.3	<1.00	12.5	<1.00
	Apr-07	<1.00	<1.00	<5.00	<20.0	<1.00	3.13	<1.00	6.3	<1.00	3.16	<1.00
	Jun-07	<1.00	<1.00	<5.00	<20.0	<1.00	2.05	<1.00	5.46	<1.00	3.47	<1.00

Table 5

AS/SVE System

Summary of Groundwater Analytical Results for VOCs (µg/L)[(a)]

Former PACCAR Site

Monitoring Well Designation	Date Sampled	Analyte										
		Vinyl Chloride	Chloro-ethane	Methylene Chloride	Acetone	1,1-DCE	1,1-DCA	trans-1,2-DCE	cis-1,2-DCE	Chloroform	TCE	Benzene
MW-30A	Apr-97	*3.6*	<2.0	<1.0	85	<1.0	5	<1.0	2.3	<1.0	<1.0	<1.0
	Nov-97	*3.2*	<0.2	<0.2	1	0.9	4.6	<0.2	2.1	<0.2	<0.2	0.2
	Mar-99	1.6	< 1.0	< 1.0	< 5.0	< 1.0	2.7	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Nov-99	*3.5*	< 1.0	< 1.0	< 5.0	< 1.0	3.5	< 1.0	1.1	< 1.0	< 1.0	< 1.0
	Mar-00	2.7	< 1.0	< 1.0	< 5.0	< 1.0	2.5	< 1.0	1.0	< 1.0	< 1.0	< 1.0
	Mar-02	***3.9***	<0.2	<0.3	<1.0	0.5	2.4	<0.2	2.2	<0.2	<0.2	<0.2
	Oct-04	1.06	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Jan-05	1.27	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Apr-05	1.08	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Jul-05	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Sep-05	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Dec-05	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Apr-06	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Jun-06	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Oct-06	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Jan-07	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Apr-07	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Jun-07	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
MW-35A	Mar-02	***51***	<0.2	3.6	<1.0	<0.2	9.4	3.6	21	<0.2	0.4	0.3
	Oct-04	***15.5***	<1.00	<5.00	<20.0	<1.00	5.58	2.39	7.67	<1.00	<1.00	<1.00
	Jan-05	***31.7***	<1.00	<5.00	<20.0	<1.00	9.5	1.54	1.92	<1.00	<1.00	<1.00
	Apr-05	***9.7***	<1.00	<5.00	<20.0	<1.00	4.28	1.07	2.08	<1.00	<1.00	<1.00
	Jul-05	***8.04***	<1.00	<5.00	<20.0	<1.00	2.97	1.97	5.82	<1.00	<1.00	<1.00
	Sep-05	***17.9***	<1.00	<5.00	<20.0	<1.00	4.11	2.39	6.94	<1.00	<1.00	<1.00
	Dec-05	***19.2***	<1.00	<5.00	<20.0	<1.00	3.08	1.93	5.37	<1.00	<1.00	<1.00
	Apr-06	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Jun-06	<1.00	1	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Oct-06	***6.14***	<1.00	<5.00	<20.0	<1.00	<1.00	1.21	3.19	<1.00	<1.00	<1.00
	Jan-07	***4.39***	<1.00	<5.00	<20.0	<1.00	<1.00	2.18	4.83	<1.00	<1.00	<1.00
	Apr-07	3.59	<1.00	<5.00	<20.0	<1.00	<1.00	1.33	3.53	<1.00	<1.00	<1.00
	Jun-07	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	1.57	<1.00	<1.00	<1.00
MW-36A	Mar-02	***4.9***	<0.2	<0.3	<1.0	0.3	2.4	0.6	36	0.3	***47***	<0.2
	Oct-04	1.37	<1.00	<5.00	<20.0	<1.00	8.69	<1.00	47	<1.00	***41.3***	<1.00
	Jan-05	1.15	<1.00	<5.00	<20.0	1.03	9.24	<1.00	33.3	<1.00	***31.3***	<1.00
	Apr-05	<1.00	<1.00	<5.00	<20.0	<1.00	7.95	<1.00	29.8	<1.00	***34.2***	<1.00
	Jul-05	<1.00	<1.00	<5.00	<20.0	<1.00	4.35	<1.00	14.7	<1.00	27.7	<1.00
	Sep-05	<1.00	<1.00	<5.00	<20.0	<1.00	2.27	<1.00	8.69	<1.00	26.7	<1.00
	Dec-05	<1.00	<1.00	<5.00	<20.0	<1.00	3.47	<1.00	9.2	<1.00	24.1	<1.00
	Apr-06	<1.00	<1.00	<5.00	<20.0	1.26	2.55	<1.00	11.4	<1.00	23	<1.00
	Jun-06	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	4.2	<1.00	20.6	<1.00
	Oct-06	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	9.08	<1.00	26.3	<1.00
	Jan-07	<1.00	<1.00	<5.01	<20.1	<1.00	<1.00	<1.00	6.37	<1.00	26.0	<1.00
	Apr-07	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	10.7	<1.00	23.4	<1.00
	Jun-07	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	4.63	<1.00	21.3	<1.00

Table 5

AS/SVE System

Summary of Groundwater Analytical Results for VOCs (µg/L)[(a)]

Former PACCAR Site

Monitoring Well Designation	Date Sampled	Analyte										
		Vinyl Chloride	Chloro-ethane	Methylene Chloride	Acetone	1,1-DCE	1,1-DCA	trans-1,2-DCE	cis-1,2-DCE	Chloroform	TCE	Benzene
MW-37A	Mar-02	0.6	<0.2	<0.3	<1.0	<0.2	0.4	<0.2	0.3	<0.2	1.4	<0.2
	Oct-04	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	2.76	<1.00
	Jan-05	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Apr-05	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Jul-05	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Sep-05	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Dec-05	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	2.24	<1.00
	Apr-06	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Jun-06	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Oct-06	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	1.27	<1.00
	Jan-07	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Apr-07	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
	Jun-07	<1.00	<1.00	<5.00	<20.0	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
MTCA Method B Surface Water Cleanup Level[(d)]		*3.69*	na[(e)]	960	na	1.93	na	32,800	na	283	55.6	22.7
NRWQC Human Health for Consumption of Organisms[(f)]		530	na	*590*	na	*3.2*	na	*140,000*	na	*470*	*30*	*51*
NRWQC Aquatic Chronic Freshwater[(g)]		na	na	na	na	na	na	na	na	na	na	na
NTR Human Health for Comsumption of Organisms[(h)]		525	na	1,600	na	3.2	na	na	na	470	81	71
NTR Aquatic Chronic Freshwater[(i)]		na	na	na	na	na	na	na	na	na	na	na

Notes:

(a) Samples were analyzed for volatile organic compounds (VOCs) using EPA Method 8260b.

(b) "<" denotes analyte not detected at the indicated laboratory reporting limit.

(c) Results for duplicate sample also shown.

(d) Model Toxics Control Act (MTCA) Method B surface water cleanup level based on CLARC v3.1, dated November 2001 (Ecology 2001b).

(e) "na" denotes no cleanup level established.

(f) National Recommended Water Quality Criteria (NRWQC) for consumption of organisms only (EPA 2002) pursuant to Section 304(a)(1) of the Clean Water Act and in accordance with WAC 173-201A at a risk level of $1x10^{-6}$.

(g) NRWQC chronic freshwater criterion (EPA 2002) pursuant to Section 304(a)(1) of the Clean Water Act and in accordance with WAC 173-201A at a risk level of $1x10^{-6}$.

(h) National Toxic Rule (NTR) for consumption of organisms only based on 40 CFR 131.36 at a risk level of $1x10^{-6}$.

(i) NTR chronic freshwater criterion based on 40 CFR 131.36 at a risk level of $1x10^{-6}$.

µg/L = micrograms per liter

*Well MW-40 was located north of the anticipated northern segment of the AS/SVE system, but the northern segment location was changed and MW-7A replaced MW-40A.

Proposed surface water cleanup levels are shown in italics (Kenndey/Jenks Consultants 2004). Proposed surface water levels are the most restrictive ARAR (adjusted upward to natural background and/or PQL), provided the ARAR is sufficiently protective under MTCA at a risk level of $1x10^{-5}$.

Bold and Italic value denotes that the potentially applicable cleanup level or comparison standard was exceeded.

Only the results of detected analytes are summarized in this table. Refer to the Analytical Reports for complete results.

Table 6

Monthly Pretreatment System Analytical Summary[1]
Former Rhone-Poulenc Site
Tukwila, Washington

Month-Year	Sample Day	Sample Type[2]	24 Hour flow (gallons)	Effluent Sample pH (pH units)	Effluent Sample Benzene (µg/l)[3]	Effluent Sample Toluene (µg/l)	Effluent Sample Ethylbenzene (µg/l)	Effluent Sample HEM O&G[4] (mg/l)	Between GAC Units Sample pH (pH units)	Between GAC Units Sample Benzene (µg/l)	Between GAC Units Sample Toluene (µg/l)	Between GAC Units Sample Ethylbenzene (µg/l)	Between GAC Units Sample HEM O&G (mg/l)	Influent Sample pH (pH units)	Influent Sample Benzene (µg/l)	Influent Sample Toluene (µg/l)	Influent Sample Ethylbenzene (µg/l)	Influent Sample HEM O&G (mg/l)	Which Extraction Well Pumping?
May-03	-	-	No discharge	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Jun-03	-	-	No discharge	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Jul-03	-	-	No discharge	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aug-03	8	G	No record[5]	**6.60**	10	10	10	4,700	**6.61**	10	10	10	4,700	**6.52**	10	10	10	4,700	No record
Aug-03	15	G	No record	**6.58**	10	10	10	4,700	**6.57**	10	10	10	4,700	**6.59**	10	10	10	4,700	No record
Aug-03	22	G	No record	**6.65**	10	10	10	5,000	**6.67**	10	10	10	5,000	**6.70**	10	10	10	5,000	No record
Aug-03	29	G	3,442	**6.70**	1.0	1.0	1.0	4,700	**6.70**	1.0	1.0	1.0	4,700	**6.66**	1.0	1.0	1.0	4,800	No record
Sep-03	12	G	No record	**6.74**	1.0	1.0	1.0	5,000	**6.72**	1.0	1.0	1.0	5,000	**6.69**	1.0	1.0	1.0	5,000	No record
Sep-03	26	G	17,280	**6.67**	1.0	1.0	1.0	4,700	**6.67**	1.0	1.0	1.0	4,700	**6.69**	1.0	1.0	1.0	4,700	No record
Oct-03[6]	NA[7]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nov-03	18	G	16,272	**8.45**	1.0	1.0	1.0	5,300	**7.81**	1.0	1.0	1.0	5,300	**6.62**	1.0	1.0	1.0	5,300	No record
Dec-03	3	G	19,152	**6.66**	1.0	1.0	1.0	5,300	**6.67**	1.0	1.0	1.0	5,300	**6.63**	1.0	1.0	1.0	5,300	No record
Jan-04	5	G	20,448	**6.79**	1.0	1.0	1.0	4,700	**6.75**	1.0	1.0	1.0	9,900	**6.72**	1.0	1.0	1.0	4,700	No record
Feb-04	4	G	20,160	**6.65**	1.0	1.0	1.0	5,200	**6.65**	1.0	1.0	1.0	5,200	**6.45**	1.0	1.0	1.0	5,200	No record
Feb-04	27	G	9,504[8]	**6.54**	1.0	1.0	1.0	5,300	**6.55**	1.0	1.0	1.0	5,300	**6.57**	1.0	1.0	1.0	5,300	No record
Mar-04	31	G	13,430	**6.46**	1.0	1.0	1.0	5,200	Not indicated[9]	1.0	1.0	1.0	Not indicated	**6.40**	1.0	1.0	1.0	5,200	No record
Apr-04	28	G	9,280	**6.67**	1.0	1.0	1.0	5,300	**6.69**	1.0	1.0	1.0	5,300	**6.64**	1.0	1.0	1.0	5,300	EX-1
May-04	26	G	27,224	**6.59**	1.0	1.0	1.0	5,300	**6.58**	1.0	1.0	1.0	5,300	**6.51**	1.0	1.0	1.0	5,300	EX-1 &EX-2
Jun-04	30	G	40,965	**6.53**	1.0	1.0	1.0	4,800	**6.47**	1.0	1.0	1.0	5,800	**6.48**	1.0	1.0	1.0	4,600	Not indicated
Jul-04	29	G	48,393	**6.57**	1.0	1.0	1.0	5,900	**6.59**	1.0	1.0	1.0	5,300	**6.80**	1.0	1.0	1.0	5,200	Not indicated
Aug-04	30	G	16,283	**6.34**	1.0	1.0	1.0	5,600	**6.41**	1.0	1.0	1.0	5,400	**6.48**	1.0	1.0	1.0	5,800	Not indicated
Sep-04	29	G	11,871	**6.55**	1.0	1.0	1.0	5,600	**6.52**	1.0	1.0	1.0	5,600	**6.48**	1.0	1.0	1.0	5,600	EX-2
Oct-04	27	G	1,046	**6.66**	1.0	1.0	1.0	5,800	**6.68**	1.0	1.0	1.0	5,700	**6.59**	**1.1**	1.0	1.0	5,700	No record
Nov-04	29	G	23,082	**6.65**	1.0	1.0	1.0	6,000	**6.70**	1.0	1.0	1.0	6,100	**6.74**	1.0	1.0	1.0	6,100	No record
Jan-05	3	G	0[8]	**6.73**	1.0	1.0	1.0	6,300	**6.68**	1.0	1.0	1.0	6,400	**6.45**	1.0	1.0	1.0	6,400	Not indicated
Jan-05	25	G	367	**6.64**	1.0	1.0	1.0	5,200	**6.66**	1.0	1.0	1.0	5,700	**6.33**	1.0	1.0	1.0	5,800	EX-1
Feb-05	23	G	42,800[8]	**6.60**	1.0	1.0	1.0	6,200	**6.63**	1.0	1.0	1.0	6,000	**6.62**	1.0	1.0	1.0	6,200	all three
Mar-05	15	G	20,700[8]	**6.61**	1.0	1.0	1.0	5,000	**6.63**	1.0	1.0	1.0	5,000	**6.62**	1.0	1.0	1.0	5,000	Not indicated
Mar-05[11]	17	C	900[8]	**8.40**	1.0	1.0	1.0	5,800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Apr-05	21	G	No record	**6.77**	1.0	1.0	1.0	6,000	**6.68**	1.0	1.0	1.0	6,200	**6.70**	1.0	1.0	1.0	6,000	EX-2
May-05	27	G	9,145	**6.58**	1.0	1.0	1.0	4,900	**6.57**	1.0	1.0	1.0	4,900	**6.46**	1.0	1.0	1.0	5,100	EX-2
Jun-05	30	G	9,717	**6.77**	1.0	1.0	1.0	6,500	**6.74**	1.0	1.0	1.0	6,000	**6.76**	1.0	1.0	1.0	6,200	EX-2
Jul-05	14	G	9,893	**6.73**	1.0	1.0	1.0	5,800	**6.70**	1.0	1.0	1.0	5,600	**6.68**	1.0	1.0	1.0	5,300	EX-2
Aug-05	22	G	10,238	**6.61**	1.0	1.0	1.0	6000.0	**6.58**	1.0	1.0	1.0	5,700	**6.59**	1.0	1.0	1.0	5,900	EX-2
Sep-05	21	G	9,370	**6.68**	1.0	1.0	1.0	6,200	**6.69**	1.0	1.0	1.0	5,700	**6.71**	1.0	1.0	1.0	5,700	EX-2
Oct-05	19	G	21,180[8]	**6.71**	1.0	1.0	1.0	5,700	**6.65**	1.0	1.0	1.0	5,700	**6.63**	1.0	1.0	1.0	5,900	all three
Nov-05	16	G	22,038	**6.76**	1.0	1.0	1.0	5,800	**6.68**	1.0	1.0	1.0	5,700	**6.75**	1.0	1.0	1.0	6,000	all three
Dec-05	22	G	12,641	**6.78**	1.0	1.0	1.0	5,700	**6.71**	1.0	1.0	1.0	5,700	**6.71**	1.0	1.0	1.0	5,700	all three
Jan-06	30	G	19,724	**6.67**	1.0	1.0	1.0	5,000	**6.65**	1.0	1.0	1.0	5,000	**6.59**	1.0	1.0	1.0	5,000	EX-1
Feb-06	16	G	52,104	**6.63**	1.0	1.0	1.0	5,600	**6.65**	1.0	1.0	1.0	5,600	**6.62**	1.0	1.0	1.0	5,600	all three
Mar-06	21	G	16,000	**6.62**	1.0	1.0	1.0	5,600	**6.61**	1.0	1.0	1.0	5,000	**6.56**	1.0	**4.4**	1.0	5,600	EX-3
Apr-06	12	G	19,100	**6.63**	1.0	1.0	1.0	5,200	**6.63**	1.0	1.0	1.0	5,200	**6.63**	1.0	**15**	1.0	5,200	EX-3
May-06	16	G	11,500	**6.72**	1.0	1.0	1.0	4,700	**6.70**	1.0	1.0	1.0	4,700	**6.68**	1.0	1.0	1.0	4,700	EX-1
May-06[11]	16	C	14,000	NA	1.0	1.0	1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Jun-06	22	G	17,800	**6.64**	1.0	1.0	1.0	4,700	**6.66**	1.0	1.0	1.0	4,700	**6.70**	1.0	**9.0**	1.0	4,700	all three
Jul-06	14	G	1,400	**6.65**	1.0	1.0	1.0	4,700	**6.64**	1.0	1.0	1.0	4,700	**6.69**	1.0	**1.6**	1.0	4,700	all three
Aug-06	11	G	1,800	**6.46**	1.0	1.0	1.0	4,900	**6.44**	1.0	1.0	1.0	5,000	**6.53**	1.0	**8.5**	1.0	5,000	all three
Sep-06[11]	1	C	9,200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**8.47**	1.0	**2.1**	1.0	5,900	NA
Sep-06	18	G	1,000	**6.64**	1.0	1.0	1.0	4,700	**6.65**	1.0	1.0	1.0	5,000	**6.71**	1.0	1.0	1.0	5,200	EX-2
Oct-06[11]	9	C	5,900	**6.83**	1.0	1.0	1.0	5,700	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Oct-06	17	G	1,400	**6.82**	1.0	1.0	1.0	4,900	**6.73**	1.0	1.0	1.0	4,600	**6.61**	1.0	1.0	1.0	4,900	all three
Nov-06	21	G	1,100	**6.59**	1.0	1.0	1.0	4,700	**6.66**	1.0	1.0	1.0	4,900	**6.53**	1.0	1.0	1.0	4,800	all three
Dec-06	12	G	900	**6.58**	1.0	1.0	1.0	4,700	**6.58**	1.0	1.0	1.0	4,700	**6.59**	1.0	1.0	1.0	4,700	all three
KCDNRP Discharge Limits[10]			**65,000**	**5.0-12.0**	**130**	**1500**	**1400**	**100,000**											

Notes:
1. Bold numbers are results above the reporting limits, gray results are non-detects.
2. Sample types : G = grab; C = composite.
3. µg/L = micrograms per liter.
4. HEM O&G = n-Hexane-extractable material, oil and grease.
5. No records = No records available.
6. System Failure resulted in no sample being taken in October 2003.
7. NA = Not applicable.
8. Estimated value from data recorder records
9. Not indicated = Not indicated on the records available.
10. Current KCDNRP discharge limits, historic limits have varied as discussed in the text Section 2.0.
11. Batch discharge sampling event.

Table 7

Field pH Readings During
Groundwater Performance Monitoring, 2002–2006[1]
Former Rhone-Poulenc Site
Tukwila, Washington

Sample Location	Inside/Outside Barrier Wall	Aquifer or Zone	Field pH Round 17 Sep-2002	Round 18 Dec-2002	Round 21 Sep-2003	Round 22 Dec-2003	Round 23 Mar-2004	Round 24 Jun-2004	Round 25 Sep-2004	Round 26 Dec-2004	Round 27 Mar-2005	Round 28 Jun-2005	Round 29 Sep-2005	Round 30 Dec-2005	Round 31 Mar-2006	Round 32 Jun-2006	Round 33 Oct-2006	Round 34 Dec-2006
B1A	Outside	Upper Zone	6.57	6.49	6.46	6.27	6.22	n/s	6.55	6.36	6.43	5.61	6.48	6.54	6.45	5.86	4.82[3]	5.78
DM-5	Inside	Upper Zone	7.39	7.06	7.02	9.86	6.7	8.52	6.27	7.32	7.28	6.13	7.52	7.28	7.51	n/s	6.55	n/s
DM-8	Outside	Upper Zone	6.81	6.74	6.89	6.8	6.33	8.98	7.06	6.9[4]	6.88[4]	6.47	7.14	7.07	7.07	6.73	6.63	6.75
EX-3	Inside	Upper Zone	n/a[5]	n/a	7.02[6]	6.54	n/s	n/s	n/s	6.67	6.68	6.01	6.85	6.8	6.95	n/s	6.44	n/s
MW-17	Inside	Upper Zone	6.79	6.57	6.46	9.89	6.47	9.02	5.83	7.36	7.09	6.34	7	7.06	6.79	n/s	6.53	n/s
MW-27	Inside	Upper Zone	10.07	9.69	8.77	8.36	9.04	11.34	10.71	10.66	10.56	8.8	10.04	9.58	7.9	n/s	8.69	n/s
MW-28	Inside	Upper Zone	10.11	9.73	10.03	10.05	9.56	10.99	10.17	10.46	10.44	9.57	10.57	10.82	11.32	n/s	10.79	n/s
MW-29	Inside	Upper Zone	6.48	n/s	6.54	n/s	6.21	8.44	6.66	6.49	6.67	6.05	6.62	6.78	6.85	n/s	5.66	n/s
MW-38	Outside	Upper Zone	6.41	6.68	6.78	6.8	6.33	7.77	7.01	6.95[4]	6.84[4]	6.03	6.68	6.73	7.03	n/s	n/s	6.33
MW-39	Outside	Lower Zone	7.48	7.34	7.43	7.47	6.91	8.96	7.96	7.48[4]	7.45[4]	6.77	7.63	7.48	7.66	7.31	6.65	7.43
MW-40	Outside	Lower Zone	7.8	7.49	7.55	7.55	6.97	9.72	6.37	7.65[4]	7.71[4]	7.11	7.65	7.67	8.01	7.83	8.08	8.32
MW-41	Outside	Upper Zone	10.44	9.65	10.2	9.95	9.03	10.52	8.8	9.6[4]	9.68[4]	9.53	10.41	9.82	10.61	10.47	10.19	9.83
MW-42	Outside	Lower Zone	7.91	7.56	7.61	7.58	7.01	9.73	8.17	7.66[4]	7.77[4]	7.16	7.88	7.76	7.92	7.68	7.59	7.75
MW-43	Outside	Lower Zone	10.8	9.75	9.09	10.02	9.18	10.35	9.97	10.46[4]	10.41[4]	9.96	10.49	10.59	10.92	10.94	10.3	10.84
MW-44	Outside	Upper Zone	9.89	9.57	10.2	10.35	9.8	11.27	11.02	10.93[4]	10.91[4]	10.78	11.07	11	11.88	11.82	10.88	11.43
MW-45	Outside	Lower Zone	7.6	7.31	7.42	7.65	7.12	8.66	7.99	7.44[4]	7.54[4]	6.66	7.48	7.54	7.99	7.42	7.39	7.33
MW-46	Outside	Upper Zone	6.65	6.3	6.38	6.37	5.99	7.56	6.84	6.46[4]	6.43[4]	5.54	6.25	6.5	6.73	6.49	6.31	6.5

Notes:
1. This table lists field pH readings; despite the use of calibrated field instruments, these readings are more variable than laboratory pH readings.
2. n/s = Not sampled during these events. EX-3 was not sampled during Rounds 23-25 because the pump system was not in operation. B1-A was not sampled during Round 24 due to a pump malfunction. MW-29 was not sampled during Rounds 18 and 22 due to ponding atop the well.
3. pH meter was recalibrated after sample collection due to lower-than-expected pH reading.
4. Laboratory reading used due to field instrument malfunction.
5. n/a = EX-3 not installed until April 2003
6. pH Value for nearby well DM5 used because pH was not measured at EX-3.

Table 8

Groundwater Analytical Results for Toluene
Groundwater Performance Monitoring, 2002–2006[1]
Former Rhone-Poulenc Site
Tukwila, Washington

units in micrograms per liter (µg/L) or parts per billion (ppb)

Sample Location	Inside/ Outside Barrier Wall	Aquifer or Zone	Toluene (µg/L) Round 17 Sep-2002	Round 18 Dec-2002	Round 21 Sep-2003	Round 22 Dec-2003	Round 23 Mar-2004	Round 24 Jun-2004	Round 25 Sep-2004	Round 26 Dec-2004	Round 27 Mar-2005	Round 28 Jun-2005	Round 29 Sep-2005	Round 30 Dec-2005	Round 31 Mar-2006	Round 32 Jun-2006	Round 33 Oct-2006	Round 34 Dec-2006
B1A	Outside	Upper Zone	0.5 U[2]	0.5 U	0.5 U	0.5 U	0.5 U	n/s[3]	0.6 U	0.5 U	2.0	0.50 U	0.50 U	43	0.25 U	0.25 U	0.25 U	1.0 U
DM-5	Inside	Upper Zone	2.5 U	2.2	0.5 U	2.5 U	3.7	0.5 U	0.5 U	0.5 U	0.5 U	0.50 U	0.50 U	0.25 U	0.25 U	--[4]	0.25 U	--
DM-8	Outside	Upper Zone	99	0.5 U	0.5 U	0.5 U	0.5 UJ[5]	0.5 U	0.5 U	0.5 U	0.5 U	0.50 U	0.50 U	0.38 J[6]	0.25 U	0.25 U	0.25 U	1.0 U
DM-8 dup[7]	Outside	Upper Zone	91	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EX-3	Inside	Upper Zone	n/a[8]	n/a	0.5 U	0.5 U	n/s	n/s	n/s	0.5 U	0.7	0.50 U	0.50 U	0.27 J	5	--	1.5	--
MW-17	Inside	Upper Zone	**340,000**	**300,000**	**45,000**	**120,000**	**110,000 J**	**200,000**	**100,000**	**150,000**	**170,000**	**350,000**	**260,000**	**240,000**	**320,000**	--	**280,000**	--
MW-27	Inside	Upper Zone	0.5 U	71	0.5 U	2.5 U	1.7	7.7	0.5 U	43	39	2.4	2.4	1.30 J	2.10	--	0.25 U	--
MW-28	Inside	Upper Zone	**62,000**	**43,000**	14,000	13,000	6,100 J	7,700	6,200	5,300	4,800	4,200	2,800	2,400 J	2,600	--	750	--
MW-28 dup	Inside	Upper Zone	--	--	14,000	13,000	5,900 J	7,600	6,900	5,400	4,800	4,400	3,100	2,300	2,600	--	760	--
MW-29	Inside	Upper Zone	**36,000**	n/s	0.5 U	n/s	0.6	0.5 U	0.5 U	0.5 U	0.5 U	0.50 U	0.50 U	0.40 J	0.25 U	--	0.25 U	--
MW-38	Outside	Upper Zone	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	0.5 U	0.5 U	0.50 U	0.50 U	0.25 U	0.25 U	n/a	n/a	1.0 U
MW-38 dup	Outside	Upper Zone	--	0.5	--	--	--	--	--	--	--	--	--	--	--	--	--	1.0 U
MW-39	Outside	Lower Zone	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.59	0.50 U	0.25 U	0.25 U	0.25 U	0.25 U	1.0 U
MW-40	Outside	Lower Zone	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	0.5 U	0.5 U	0.50 U	0.50 U	0.25 U	0.25 U	0.25 U	0.25 U	1.0 UJ
MW-41	Outside	Upper Zone	82	2.3	260	190	7.4	4.8	88 U	16	5.5	190	160	23	150 J	190	57	42 J
MW-41 dup	Outside	Upper Zone	--	1.8	250	190	7.7	4.5	88 U	16	4.3	190	170	25	110 J	190	56	--
MW-42	Outside	Lower Zone	0.9	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	0.5 U	0.5 U	0.50 U	0.50 U	1.80	0.25 U	0.25 U	0.25 U	1.0 UJ
MW-43	Outside	Lower Zone	62	11	1.8	14	8.2	24	21 U	28	28	26	29	31	22	22	12	28 J
MW-44	Outside	Upper Zone	160	29	120	94	140	180	220	200	240	240	220	170	250	250	170	170 J
MW-45	Outside	Lower Zone	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.50 U	0.50 U	0.25 U	0.25 U	0.25 U	0.25 U	1.0 UJ
MW-46	Outside	Upper Zone	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.50 U	0.50 U	0.25 U	0.25 U	0.25 U	0.25 U	1.0 U
MW-46 dup	Outside	Upper Zone	0.5 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.0 U

Notes:

1. The National Recommended Water Quality Criteria for toluene in water is 15,000 µg/L based on human health consumption of organism only. Concentrations that exceed this value are in **bold.**
2. U = Not detected; value to left is the detection limit.
3. n/s = Not sampled during these events. EX-3 was not sampled during Rounds 23-25 because the pump system was not in operation. B1-A was not sampled during Round 24 due to a pump malfunction. MW-29 was not sampled during Rounds 18 and 22 due to ponding atop the well.
4. -- = Well not included in performance monitoring plan for that sampling round.
5. UJ = The analyte was not detected; the associated detection limit is an estimated value.
6. J = Indicated value is estimated concentration.
7. dup = field duplicate sample.
8. n/a = Well not yet installed during indicated sampling period.

Table 9

Groundwater Analytical Results for Arsenic
Groundwater Performance Monitoring, 2002–2006
Former Rhone-Poulenc Site
Tukwila, Washington

units are in micrograms per liter (µg/L) or parts per billion (ppb)

Sample Location	Inside/ Outside Barrier Wall	Aquifer or Zone	Total Arsenic (µg/L)															
			Round 17 Sep-2002	Round 18 Dec-2002	Round 21 Sep-2003	Round 22 Dec-2003	Round 23 Mar-2004	Round 24 Jun-2004	Round 25 Sep-2004	Round 26 Dec-2004	Round 27 Mar-2005	Round 28 Jun-2005	Round 29 Sep-2005	Round 30 Dec-2005	Round 31 Mar-2006	Round 32 Jun-2006	Round 33 Oct-2006	Round 34 Dec-2006
B1A	Outside	Upper Zone	1 U[1]	1 U	1 U	1 U	1 U	n/s [2]	1 U	2 U	1 U	1 U	1 U	1	1 U	1	1 U	1 U
DM-5	Inside	Upper Zone	40	30	27	32	10	15	17	21	18	20	25	23	29	-- [3]	28	n/s
DM-8	Outside	Upper Zone	10	20	15	14	14	14	9	4	4	3	3	6	5	4	3	4
DM-8 dup[4]	Outside	Upper Zone	10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EX-3	Inside	Upper Zone	n/a [5]	n/a	3	4	n/s	n/s	n/s	3	4 J-[6]	1 U	1	3	2	--	2	--
MW-17	Inside	Upper Zone	10	7	10	5	13	15	18	18	14 J-	13	17	14	54	--	23	--
MW-27	Inside	Upper Zone	24	22	6	30	52	18	40	1 U	21 J-	10	6	23	6	--	7	--
MW-28	Inside	Upper Zone	2	2	5	6	3	1	4	1	4 J-	4	5	9 J[7]	9	--	7 J	--
MW-28 dup	Inside	Upper Zone	--	--	6	2	3	4	4	2	5 J-	3	3	6 J	7	--	13 J	--
MW-29	Inside	Upper Zone	17	n/s	15	n/s	13	9	12	11	12	12	10	12	12	--	7	--
MW-38/-38R	Outside	Upper Zone	3	4	8	8	8	10	7	8	4	4	6	4	6	n/a	n/a	4
MW-38/-38R dup	Outside	Upper Zone	--	4	--	--	--	--	--	--	--	--	--	--	--	--	--	5
MW-39	Outside	Lower Zone	4	2	2	2	2	2	1	1	1	2	2	1	2	3 U	1	1
MW-40	Outside	Lower Zone	2	2 U	4	1 U	1	1 U	2	1 U	5 U	1 U	2	2 U	2	3	1 U	1
MW-41	Outside	Upper Zone	10	5	13	3	5	4	8	6	6	5 U	11	6	8	9	12	6
MW-41 dup	Outside	Upper Zone	--	6	13	5	6	5	9	6	5	6	12	5	9	7	10	
MW-42	Outside	Lower Zone	10	2	7	2	2	1	2	2	1	2	2	4	3	4	2 U	3
MW-43	Outside	Lower Zone	12	12	3	5 U	10	6	8	8	7	3	8	6	10	15	10	7 J-
MW-44	Outside	Upper Zone	5	2	5	1 U	5	6	2 U	20	4	6	10	9	16	17	29	9 J-
MW-45	Outside	Lower Zone	1	1 U	2	1	4	2 U	3	4	2 J-	2	2 U	1	2	3	2	2
MW-46	Outside	Upper Zone	1 U	1 U	1	1 U	1 U	1 U	1 U	1 U	1 J-	1 U	1	1 U	1 U	1	1 U	1
MW-46 dup	Outside	Upper Zone	1 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1 U

Notes:

1. U = Not detected; value to left is the detection limit.
2. n/s = Not sampled during these events. EX-3 was not sampled during Rounds 23-25 because the pump system was not in operation. B1-A was not sampled during Round 24 due to a pump malfunction. MW-29 was not sampled during Rounds 18 and 22 due to ponding atop the well.
3. -- = well not included in performance monitoring plan for that sampling round.
4. dup = field duplicate sample
5. n/a = Well not yet installed during indicated sampling round.
6. J- = Value is estimated as biased low.
7. J = Indicated value is estimated concentration.

Table 10

Groundwater Analytical Results for Mercury
Groundwater Performance Monitoring, 2002–2006
Former Rhone-Poulenc Site
Tukwila, Washington

units are in micrograms per liter (µg/L) or parts per billion (ppb)

Sample Location	Inside/ Outside Barrier Wall	Aquifer or Zone	Total Mercury (µg/L)															
			Round 17 Sep-2002	Round 18 Dec-2002	Round 21 Sep-2003	Round 22 Dec-2003	Round 23 Mar-2004	Round 24 Jun-2004	Round 25 Sep-2004	Round 26 Dec-2004	Round 27 Mar-2005	Round 28 Jun-2005	Round 29 Sep-2005	Round 30 Dec-2005	Round 31 Mar-2006	Round 32 Jun-2006	Round 33 Oct-2006	Round 34 Dec-2006
B1A	Outside	Upper Zone	0.1 U[1]	0.1 U	0.1 U	0.1 U	0.1 U	n/s [2]	1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
DM-5	Inside	Upper Zone	0.1	0.1	4 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1	0.1 U	0.1 U	0.1	--	0.1 U	--
DM-8	Outside	Upper Zone	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
DM-8 dup[3]	Outside	Upper Zone	0.1 U	-- [4]	--	--	--	--	--	--	--	--	--		--	--	--	--
EX-3	Inside	Upper Zone	n/a [5]	n/a	0.1 U	0.1 U	n/s	n/s	n/s	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	--	0.1 U	--
MW-17	Inside	Upper Zone	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1	0.1 U	0.1 U	0.1 U	--	0.1 U	--
MW-27	Inside	Upper Zone	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	--	0.1 U	--
MW-28	Inside	Upper Zone	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	--	0.1 U	--
MW-28 dup	Inside	Upper Zone	--	--	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	--	0.1 U	--
MW-29	Inside	Upper Zone	0.1 U	n/s	0.2 U	n/s	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	--	0.1 U	--
MW-38/-38R	Outside	Upper Zone	0.1 U	0.1 U	0.1 U	0.5	0.1 U	0.2	0.1 U	0.2	0.1 U	0.1 U	0.1 U	0.1 U	0.1	n/a	n/a	0.1 U
MW-38/-38R dup	Outside	Upper Zone	--	0.1 U	--	--	--	--	--	--	--	--	--	--	--	--	--	0.1 U
MW-39	Outside	Lower Zone	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
MW-40	Outside	Lower Zone	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
MW-41	Outside	Upper Zone	0.1	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
MW-41 dup	Outside	Upper Zone	--	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	--
MW-42	Outside	Lower Zone	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
MW-43	Outside	Lower Zone	0.2	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 UR[6]
MW-44	Outside	Upper Zone	0.1 U	0.1 U	0.1	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1	0.1 U	0.1 UR
MW-45	Outside	Lower Zone	0.1 U	0.1 U	0.2	0.1	0.1 U	0.1 U	0.1 U	0.3	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
MW-46	Outside	Upper Zone	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
MW-46 dup	Outside	Upper Zone	0.1 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.1 U

Notes:

1. U = Not detected; value to left is the detection limit.
2. n/s = Not sampled during these events. EX-3 was not sampled during Rounds 23-25 because the pump system was not in operation. B1-A was not sampled during Round 24 due to a pump malfunction. MW-29 was not sampled during Rounds 18 and 22 due to ponding atop the well.
3. dup = field duplicate sample.
4. -- = Well not indicated in performance monitoring plan for that sampling round.
5. n/a = Well not yet installed during indicated sampling round.
6. UR = The analyte was not detected; however, this result is flagged as rejected based on quality control criteria.

Table 11

Groundwater Analytical Results for Copper
Groundwater Performance Monitoring, 2002–2006
Former Rhone-Poulenc Site
Tukwila, Washington

units are in micrograms per liter (μg/L) or parts per billion (ppb)

Sample Location	Inside/ Outside Barrier Wall	Aquifer or Zone	Total Copper (μg/L)															
			Round 17 Sep-2002	Round 18 Dec-2002	Round 21 Sep-2003	Round 22 Dec-2003	Round 23 Mar-2004	Round 24 Jun-2004	Round 25 Sep-2004	Round 26 Dec-2004	Round 27 Mar-2005	Round 28 Jun-2005	Round 29 Sep-2005	Round 30 Dec-2005	Round 31 Mar-2006	Round 32 Jun-2006	Round 33 Oct-2006	Round 34 Dec-2006
B1A	Outside	Upper Zone	3	6	2	4	3	n/s [1]	5	9	2 U[2]	2 U	3	17	3 J[3]	2 U	2 U	2
DM-5	Inside	Upper Zone	29	29	41	44	37	22	24	23	25	26	28	24	28 J	--	32	n/s
DM-8	Outside	Upper Zone	25	9	24	20	11	10	10	13	15	13	21	17	12 J	16	17	29
DM-8 dup[4]	Outside	Upper Zone	24	-- [5]	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EX-3	Inside	Upper Zone	n/a [6]	n/a	5	2 U	n/s	n/s	n/s	5	5	3	4	4	7 J	--	5	--
MW-17	Inside	Upper Zone	23	22	2	7	17	19	32	31	30	24	27	21	3 J	--	6	--
MW-27	Inside	Upper Zone	15	16	31	48	75	94	56	48	58	84	44	200	59 J	--	90	--
MW-28	Inside	Upper Zone	35	69	28	33	72	75	71	75	90	69	80	83	119 J	--	72	--
MW-28 dup	Inside	Upper Zone	--	--	29	39	69	79	75	76	95	72	82	84	123 J	--	85	--
MW-29	Inside	Upper Zone	2	n/s	2 U	n/s	3	2 U	2 U	2 U	2 U	3	2 U	2 U	2 J	--	2	--
MW-38/-38R	Outside	Upper Zone	2	4	15	18	16	20	9	14	12	6	11	6	11 J	n/a	n/a	13
MW-38/-38R dup	Outside	Upper Zone	--	5	--	--	--	--	--	--	--	--	--	--	--	--	--	13
MW-39	Outside	Lower Zone	43	30	16	16	12	22	12	14	13	11	12	11	17 J	10	12	16
MW-40	Outside	Lower Zone	9	8	58	43	26	23	14	22	66	16	10	6	6 J	17	15	10
MW-41	Outside	Upper Zone	120	86	169	88	50	29	102	32	51	132	143	44	94 J	114	149	46
MW-41 dup	Outside	Upper Zone	--	93	180	70	46	34	84	38	54	139	151	45	112 J	98	143	--
MW-42	Outside	Lower Zone	112	51	38	20	17	14	17	16	15	22	19	31	19 J	14	16	12
MW-43	Outside	Lower Zone	224	101	26	29	31	37	36	46	43	44	50	47	46 J	38	31	26
MW-44	Outside	Upper Zone	75	32	121	108	158	148	147	17	124	131	189	185	192 J	164	207	173
MW-45	Outside	Lower Zone	60	19	41	38	33	22	23	145	24	19	16	14	18 J	13	17 U	24
MW-46	Outside	Upper Zone	3	3	2	15	2 U	2	2 U	2 U	4	2 U	2 U	2	2 UJ[7]	2 U	2	3
MW-46 dup	Outside	Upper Zone	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	9 J-

Notes:

1. n/s = Not sampled during these events. EX-3 was not sampled during Rounds 23-25 because the pump system was not in operation. B1A was not sampled during Round 24 due to a pump malfunction. MW-29 was not sampled during Rounds 18 and 22 due to ponding atop the well.
2. U = Not detected at detection limit indicated.
3. J = Value on left is the estimated concentration.
4. dup = field duplicate sample.
5. -- = Well not included in performance monitoring plan for that sampling round.
6. n/a = Indicated well not yet installed during indicated sampling rounds.
7. UJ = The analyte was not detected; the associated detection limit is an estimated value.

Table 12

Soil Chemical Analytical Data[1]

Museum of Flight
9404 East Marginal Way South
Seattle, Washington

Sample Number[2]	Sample Depth (feet)	Field Screening Results[3]		Volatile Organic Compounds[4] (mg/kg)				Total Petroleum Hydrocarbons[5] (mg/kg)		
		Sheen	Headspace Vapors	B	E	T	X	Gasoline-Range	Diesel-Range	Heavy Oil-Range
B-1-3.0	3.0	SS	<100	<0.1	<0.1	<0.1	<0.3	<5	<25	<50
B-1-10.0	10.0	SS	<100	<0.1	<0.1	<0.1	<0.3	<5	<25	<50
B-2-10.0	10.0	HS	2,000	1.3	13	7.5	9.1	3,200	<25	<50
B-2-14.0	14.0	NS	<100	<0.1	<0.1	<0.1	<0.3	<5	<25	<50
B-3-11.5[6]	11.5	HS	1,000	14	26	9.7	33	6,200	<25	<50
B-3-19.0	19.0	SS	100	<0.1	<0.1	<0.1	<0.3	9	<25	<50
B-4-7.5	7.5	SS	<100	<0.1	<0.1	<0.1	<0.3	<5	<25	<50
B-4-11.5	11.5	MS	<100	<0.1	1.6	<0.1	9.0	280	<25	<50
B-5-15.0	15.0	MS	400	<0.1	<0.1	<0.1	0.4	40	<25	<50
B-6-11.5	11.5	HS	1,200	<0.4	<0.4	<0.4	<1.2	<250	750[7]	<50
B-6-17.0	17.0	NS	<100	<0.1	<0.1	<0.1	<0.3	<5	<25	<50
B-7-13.5	13.5	MS	<100	<0.1	<0.1	<0.1	<0.3	51	<25	<50
B-8-12.5	12.5	SS	<100	<0.1	<0.1	<0.1	<0.3	<5	<25	<50
B-9-11.5	11.5	SS	<100	<0.1	<0.1	<0.1	<0.3	<5	<25	<50
B-10-11.5	11.5	SS	<100	<0.1	<0.1	<0.1	<0.3	<5	<25	<50
B-11-7.5	7.5	NS	<100	<0.1	<0.1	<0.1	<0.3	<5	<25	<50
B-12-10.5	10.5	NS	<100	<0.1	<0.1	<0.1	<0.3	<5	<25	<50
B-13-8.0	8.0	NS	<100	<0.1	<0.1	<0.1	<0.3	<5	<25	<50
MTCA Method A Cleanup Level				0.5	20	40	20	100	200	200

Notes:
[1]Soil samples were collected on April 26, 2001. Analyses conducted by CCI Analytical Laboratories of Everett, Washington.
[2]Approximate exploration locations are shown in Figures 3 and 4.
[3]See Appendix E for a description of field screening methods. NS=no sheen, SS=slight sheen, MS=moderate sheen, HS=heavy sheen.
[4]Analyzed by EPA Method 8021. B=benzene, E=ethylbenzene, T=toluene, X=xylenes.
[5]Analyzed by Ecology Methods NWTPH-G extended or NWTPH-D extended.
[6]This sample also was analyzed for halogenated volatile organic compounds (HVOCs) by EPA Method 8260A and lead by EPA Method 6010. HVOCs and lead were not detected. See Appendix F for a complete listing of the analytes tested.
[7]The laboratory report indicates that this sample contains product which is likely diesel 1 range product or extremely weathered gasoline.
mg/kg = milligrams per kilogram
Shaded concentrations exceed MTCA Method A cleanup levels.
MTCA = Model Toxics Control Act

Source: Geo Engineers 2001.

Table 13

Ground Water Chemical Analytical Data[1]

Museum of Flight
9404 East Marginal Way South
Seattle, Washington

Sample Number[2]	Volatile Organic Compounds[3] (µg/l)				Total Petroleum Hydrocarbons[4] (mg/l)		
	B	E	T	X	Gasoline-Range	Diesel-Range	Heavy Oil-Range
B-3[5]	120	230	<50	890	12.0	<0.250	<0.500
B-6	170	1,100	320	4,400	24.0	<0.250	<0.500
MW-X	<1	<1	<1	<3	<0.050	<0.250	<0.500
MTCA Method A Cleanup Level	5	30	40	20	1[6]		

Notes:

[1]Ground water samples were collected on April 26, 2001. Analyses conducted by CCI Analytical Laboratories of Everett, Washington.

[2]Approximate exploration locations are shown in Figures 3 and 4.

[3]Analyzed by EPA Method 8021. B=benzene, E=ethylbenzene, T=toluene, X=xylenes.

[4]Analyzed by Ecology Methods NWTPH-G extended or NWTPH-D extended.

[5]This sample also was analyzed for halogenated volatile organic compounds (HVOCs) by EPA Method 8260A. HVOCs were not detected. See Appendix F for a complete listing of the analytes tested.

[6]The MTCA Method A cleanup level applies to the sum of all ranges of petroleum hydrocarbons.

µg/l = micrograms per liter

mg/l = milligrams per liter

Shading indicates concentrations exceed MTCA Method A cleanup levels.

MTCA = Model Toxics Control Act

Source: Geo Engineers 2001.