Lower Duwamish Waterway River Mile 3.9-4.3 East (Slip 6)

Source Control Action Plan

September 2008

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Lower Duwamish Waterway River Mile 3.9-4.3 East (Slip 6)

Source Control Action Plan

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Executive Summary

The purpose of this Source Control Action Plan (SCAP) is to identify potential contamination sources and the actions necessary to keep sediments from being contaminated again after any cleanup occurs. This SCAP is based on a thorough review of information pertinent to sediment recontamination in the Slip 6 source control area, as presented in *Lower Duwamish Waterway, RM 3.9 – 4.4 East (Slip 6) Summary of Existing Information and Identification of Data Gaps* (E & E 2008).

The Lower Duwamish Waterway (LDW), located in Seattle, Washington, was added to the National Priorities List (Superfund) by the U.S. Environmental Protection Agency (EPA) on September 13, 2001. The Washington State Department of Ecology (Ecology) added the site to the Washington State Hazardous Sites List on February 26, 2002. Contaminants of concern (COCs) found in waterway sediments include polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), dioxin/furans, arsenic, and other metals, and phthalates. These COCs may pose threats to people, fish, and wildlife.

In December 2000, EPA and Ecology entered into an order with King County, the Port of Seattle, the city of Seattle, and The Boeing Company to perform a Remedial Investigation (RI) and Feasibility Study (FS) of sediment contamination in the waterway. EPA is the lead agency for the Remedial Investigation/Feasibility Study (RI/FS). Ecology is the lead agency for controlling current sources of pollution to the site, in cooperation with the city of Seattle, King County, the Port of Seattle, the city of Tukwila, and EPA.

Phase 1 of the RI/FS, published in July 2003 (Windward 2003a), used existing data to identify potential human health and ecological risks, information needs, and high priority areas for cleanup. Seven candidate early action areas (EAAs, or "Tier 1" source control areas) were identified (Windward 2003b). Data collected during Phase 2 of the RI were used to identify additional sites where long-term cleanup actions may be necessary. The Slip 6 source control area was identified as one of these "Tier 2" source control areas.

As part of the source control efforts in the LDW, Ecology works with their consultants to develop SCAPs for areas of sediment contamination that will or may require cleanup. The SCAP for each of these sediment areas identifies potential sources of sediment contaminants and actions needed to control them, and evaluates whether ongoing sources are present that could recontaminate sediments after cleanup. In addition, the SCAPs describe source control actions that are planned or currently underway, and sampling and monitoring activities that will be conducted to identify additional sources.

Sections 1 and 2 of this SCAP provide background information about the LDW site and the Slip 6 source control area. Metals, PAHs, PCBs, phthalates, and semi-volatile organic compounds (SVOCs) are considered to be the major COCs in Slip 6 source control area sediments. In upland media, COCs include petroleum hydrocarbons and volatile organic compounds (VOCs), in addition to the COCs found in sediments.[1] While this SCAP focuses on these COCs, other contaminants that could result in sediment recontamination will be addressed as the sources are identified.

Section 3 describes potential upland sources of contaminants that may affect sediments in the Slip 6 source control area, including stormwater and/or storm drain solids from outfalls, groundwater, soil erosion, surface runoff, and contamination that may result from spills. Section 3 also evaluates these potential sources and identifies the actions that are planned or are underway to control potential contaminant sources. Section 4 discusses monitoring activities that will be conducted to observe known sources, identify additional sources, support remedial action decisions, and assess progress. Section 5 describes how source control efforts will be tracked and reported.

Executive Summary Table 1 lists the source control actions that have been identified for the Slip 6 source control area. This table includes a brief description for each property of the potential contaminant sources, source control activities to be conducted, the priority level for each action item, the parties involved in source control actions, and milestone/target dates for completion. The milestones and targets are best-case scenarios based on consultation with the identified agencies or facilities. They reflect reasonably achievable schedules, and include the time required for planning, contracting, field work, laboratory analysis, and activities dependent on weather.

[1] Although not explicitly addressed in the SMS, VOCs in pore water may cause adverse effects on benthic invertebrates and other aquatic biota, and are therefore considered COCs for source control efforts in the LDW.

Executive Summary Table 1

Source Control Facility/Outfall	Action Item	Priority	Responsible Party	Status	Estimated Completion Date
King County Stormwater Outfall	Collect in-line water and storm drain solids samples to evaluate if COCs are migrating to Slip 6 source control area sediments via the storm drain outfall.	High	King County	Not Scheduled	
	Conduct source tracing to identify sources of COCs to the storm drain line, as necessary.	High	King County	Not Scheduled	
	Conduct source control inspections of upland sites, as needed.	Medium	King County, SPU, Ecology	Not Scheduled	
	Administer, review, and update NPDES permits, as needed.	Low	Ecology WQ	Ongoing	
Former PACCAR Site	Negotiate an Agreed Order to address upland cleanup and source control of soil and groundwater contamination at the site.	High	Ecology, PACCAR, Merrill Creek	Ongoing	2009-2010
	Re-evaluate existing soil and groundwater data and compare to site-specific screening levels (to be developed) for metals, PAHs, petroleum hydrocarbons, PCBs, SVOCs, and VOCs as COCs in the LDW, and test for dioxin/furans.	High	Ecology, PACCAR, Merrill Creek	Ongoing	2008
	Expand investigation of the southwest storage area and northwest corner of the site to determine the extent of soil and groundwater contamination.	High	Ecology, PACCAR, Merrill Creek	Ongoing	2008-2010
	Complete Phase 2 of the Sediment Evaluation Work, which includes sediment core sampling in selected locations in the LDW adjacent to the site.	High	Ecology, PACCAR	Ongoing	Fall 2008

Source Control Facility/Outfall	Action Item	Priority	Responsible Party	Status	Estimated Completion Date
Former PACCAR Site (Cont.)	Negotiate expanding the stormwater and storm drain solids monitoring to add COCs at the site. Review future monitoring results to determine if further actions are necessary.	High	Ecology, IAAI, Merrill Creek	Ongoing	2010
	Review the current SWPPP and Operations and Maintenance Plan. Make necessary changes and additions to prevent contaminants from potential upland sources (such as fuel leaks from damaged vehicles) from migrating to Slip 6 source control area sediments via the stormwater system.	Medium	Ecology, IAAI, Merrill Creek	Planned	2008-2009
Former Rhône-Poulenc Site	Address the toluene groundwater contamination in the southwest corner of the East Parcel, in accordance with the Revised East Parcel Corrective Measures Implementation Work Plan.	High	EPA, Container Properties, Rhodia, Bayer CropScience	Ongoing	2009
	Continue to monitor the effectiveness of the hydraulic interim control measure (HCIM), and investigate the presence of elevated copper concentrations in groundwater outside the barrier wall and the potential leak in the barrier wall.	High	EPA, Container Properties, Rhodia, Bay CropScience	Ongoing	
	Investigate and address shoreline bank contamination from historical site operations and releases (e.g. application of vanillin black liquor solids to the shoreline bank for weed control).	High	EPA, Container Properties, Rhodia, Bayer CropScience	Planned	2009
	Review the current SWPPP and Operations and Maintenance Plan. Make necessary changes and additions to prevent contaminants from potential upland sources (such as fuel leaks from damaged	High	Ecology, IAAI	Planned	2008

Source Control Facility/Outfall	Action Item	Priority	Responsible Party	Status	Estimated Completion Date
Former Rhône-Poulenc Site (Cont.)	vehicles) from migrating to Slip 6 source control area sediments via the stormwater system.				
	Continue monitoring stormwater in accordance with the Industrial Storm-water General Permit.	Medium	Ecology, IAAI	Ongoing	
	Oversee and inspect discharge to the King County Sanitary Sewer System from groundwater remediation at this site through the King County Industrial Waste Program (KCIWP).	Low	KCIWP	Ongoing	
King County International Airport (KCIA)	Evaluate the "Drainage Area 3" portion of the KCIA stormwater system that discharges to the LDW via the King County stormwater line to determine if storm-water and/or storm drain solids monitoring is necessary.	High	Ecology, KCIA	Not Scheduled	
	Review and modify KCIA stormwater management activities to prevent con-taminants from entering the KCIA stormwater system.	Medium	Ecology, King County, KCIA	Not Scheduled	
	Assess and modify all tenant and airport pollutant preven-tion measures within KCIA	Medium	KCIA	Ongoing	
	Determine if PCBs are present in joint caulk material within this portion of the airport and conduct a removal, if necessary.	Medium	KCIA	Not Scheduled	
Museum of Flight (MOF)	Monitor stormwater and/or storm drain solids at MOF and former BDC properties in the vicinity of USTs and associated groundwater contamination.	High	Ecology, MOF	Not Scheduled	

Source Control Facility/Outfall	Action Item	Priority	Responsible Party	Status	Estimated Completion Date
Museum of Flight (MOF) (Cont.)	Develop a plan to remove USTs and associated soil and groundwater contamination on the MOF property.	Medium	Ecology, MOF	Not Scheduled	
	Identify the source and extent of groundwater contamination on the former BDC property, and conduct remedial action, as necessary.	High	Ecology, MOF	Not Scheduled	
Boeing Developmental Center (BDC)	Conduct stormwater and/or storm drain solids monitoring for outfalls DC14 and DC15.	High	Ecology, Boeing	Not Scheduled	
	Administer, review, and update NPDES permits, as needed.	Medium	Ecology WQ	Ongoing	
	Investigate UST locations to determine whether any USTs are located within the Slip 6 drainage basin and whether any USTs present a source of contaminants to soil and/or groundwater.	Low	Boeing	Not Scheduled	
	Review the current SWPPP and make changes and additions necessary to prevent contaminants from entering the BDC stormwater system.	Medium	Ecology, Boeing	Not Scheduled	
	Oversee and inspect this site through the KCIWP.	Low	KCIWP	Ongoing	
Atmospheric Deposition	Evaluate atmospheric deposition to assess whether this pathway is a potential source of phthalates and other contaminants, such as PCBs, in stormwater runoff to the Slip 6 source control area sediments.	Low	Source Control Work Group	Not Scheduled	

Priority:
High = High priority action item – to be completed prior to sediment cleanup.
Medium = Medium priority action item – to be completed prior to or concurrent with sediment cleanup.
Low = Low priority action item – ongoing actions or actions to be completed as resources become available.

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Acronyms/Abbreviations

AS/SVE	air sparge/soil-vapor extractor
BBP	butyl benzyl phthalate
BDC	Boeing Developmental Center
BEHP	bis(2-ethylhexyl)phthalate
bgs	below ground surface
BMPs	best management practices
BTEX	benzene, toluene, ethylbenzene, and xylene
COCs	contaminants of concern
cPAH	carcinogenic polycyclic aromatic hydrocarbons
CSCSL	Confirmed and Suspected Contaminated Site List
CSL	Cleanup Screening Level
CSO	combined sewer overflow
DCE	dichloroethene
dw	dry weight
EAAs	early action areas
Ecology	Washington State Department of Ecology
EF	exceedance factor
E & E	Ecology and Environment, Inc.
EPA	U.S. Environmental Protection Agency
ESA	Environmental Site Assessment
FS	Feasibility Study
GIS	Geographic Information System
HCIM	hydraulic control interim measure
HPAH	high molecular weight PAH compound
IAAI	Insurance Auto Auctions, Inc.
KCIA	King County International Airport
KCIWP	King County Industrial Waste Program
LDW	Lower Duwamish Waterway
LDWG	Lower Duwamish Waterway Group
LUST	leaking underground storage tank
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
$\mu g/m^2/d$	micrograms per meter squared per day
MDL	method detection limit
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
NOAA	National Oceanic and Atmospheric Administration

Acronyms/Abbreviations (Cont.)

NRWQC	National Recommended Water Quality Criteria
OC	organic carbon
ORC	Oxygen Release Compound
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	perchlorethylene (tetrachloroethene)
PCP	pentachlorophenol
ppb	parts per billion
PRG	preliminary remediation goal
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RM	river mile
SCAP	Source Control Action Plan
SCWG	Source Control Work Group
SMS	Washington State Sediment Management Standards
SPU	Seattle Public Utilities
SQS	Sediment Quality Standards
SVOCs	semi-volatile organic compounds
SWPPP	Storm Water Pollution Prevention Plan
TCE	trichloroethene
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TPH-D	Diesel-range total petroleum hydrocarbon
TPH-G	Gasoline-range total petroleum hydrocarbon
TRI	Toxics Release Inventory
UST	underground storage tank
VC	vinyl chloride
VOC	volatile organic compound

1.0 Introduction

This Source Control Action Plan (SCAP) describes potential sources of contaminants that may affect sediments in the Slip 6 Source Control Area.[2] The Slip 6 source control area is located on the eastern side of the LDW Superfund Site between river mile (RM) 3.9 and 4.3 as measured from the southern end of Harbor Island. The aquatic portion of the Slip 6 source control area includes the Slip 6 inlet and the section of the LDW between RM 3.9 and 4.3 from the east shoreline out to the east edge of the dredged ship channel. The Slip 6 inlet extends approximately 800 feet to the northeast from its point of convergence with the LDW. The sediments in the source control area, both in the inlet and in the main waterway, are referred to as the "Slip 6 sediments" throughout this report. The upland properties within the Slip 6 source control area were defined by Ecology as properties that discharge stormwater to the Slip 6 sediments. The upland properties within the Slip 6 source control area are collectively referred to as the "Slip 6 drainage basin"[3] (Figures 1 and 2).

The purpose of this plan is to evaluate the significance of these sources and to determine what actions are needed to minimize the potential for recontamination of Slip 6 sediments after any proposed cleanup. In addition, this SCAP describes:

- Source control actions/programs that are planned or currently underway,
- Sampling and monitoring activities that will be conducted to identify additional sources and assess progress, and
- How these source control efforts will be tracked and reported.

The information in this document was obtained from various sources, including the following documents:

- *Lower Duwamish Waterway, RM 3.9-4.4 East (Slip 6), Summary of Existing Information and Identification of Data Gaps*, Ecology and Environment, Inc. (E & E), February 2008, located on Ecology's website:

  http://www.ecy.wa.gov/programs/tcp/sites/lower_duwamish/sites/slip6/slip6.htm
- *Lower Duwamish Waterway Source Control Strategy*, Washington State Department of Ecology, January 2004, located on Ecology's website: http://www.ecy.wa.gov/pubs/0409043.pdf

1.1 Organization of Document

Section 1 of this SCAP describes the Lower Duwamish Waterway (LDW) site, the strategy for source control, and the responsibilities of the public agencies involved in source control for the

[2] This SCAP incorporates data published through March 1, 2008. Section 6, Tracking and Reporting of the Source Control Activities, describes how newer data will be disseminated.

[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 2.

LDW. Section 2 provides background information on the Slip 6 source control area, including a description of the contaminants of concern (COCs) for sediments. Section 3 provides an overview of potential sources of contaminants that may affect Slip 6 sediments, including outfalls and properties within the Slip 6 drainage basin. Section 3 also describes actions planned or currently underway to control potential sources of contaminants, while Sections 4 and 5 describe monitoring and tracking/reporting activities, respectively. References are listed in Section 6, and figures and tables are presented at the end of the document.

As new information about the sites and potential sources discussed in this document becomes available and as source control progress is made, Ecology will update this SCAP by publishing Technical Memoranda or by including updates to the Source Control Status Reports, as appropriate.

1.2 Lower Duwamish Waterway Site

The LDW is the downstream portion of the Duwamish River, extending from the southern tip of Harbor Island to just south of Turning Basin 3 (Figure 1). It is a major shipping route for bulk and containerized cargo. Most of the upland areas adjacent to the LDW have been developed for industrial and commercial operations. These include cargo handling and storage, marine construction, boat manufacturing, marina operations, concrete manufacturing, paper and metals fabrication, food processing, and airplane parts manufacturing. In addition to industrial uses, the river is also used for fishing, recreation, and wildlife habitat. Residential areas near the waterway include the South Park and Georgetown neighborhoods. Beginning in 1913, this portion of the Duwamish River was dredged and straightened to promote navigation and industrial development, resulting in the river's current form. Shoreline features within the waterway include constructed bulkheads, piers, wharves, buildings extending over the water, and steeply sloped banks armored with riprap or other fill materials (Weston 1999). This development left intertidal habitats dispersed in relatively small patches, with the exception of Kellogg Island, which is the largest contiguous area of intertidal habitat remaining in the Duwamish River (Tanner 1991). Over the past 20 years, public agencies and volunteer organizations have worked to restore intertidal and subtidal habitat within the river. Some of the largest restoration projects are at Herring House Park/Terminal 107, Turning Basin 3, Hamm Creek, and Terminal 105.

The presence of chemical contamination in the LDW has been recognized since the 1970s (Windward 2003a). In 1988, the United States Environmental Protection Agency (EPA) investigated sediments in the LDW as part of the Elliott Bay Action Program. Contaminants identified by the EPA study included metals, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), phthalates, and other organic compounds. In 1999, EPA completed a study of approximately 6 miles of the waterway, from the southern tip of Harbor Island to just south of the turning basin near the Norfolk combined sewer overflow (CSO) outfall (Weston 1999). This study confirmed the presence of PCBs, PAHs, phthalates, mercury, and other metals, that may pose threats to people, fish, and wildlife.

In December 2000, EPA and Ecology signed an agreement with King County, the Port of Seattle, the City of Seattle, and The Boeing Company, collectively known as the Lower Duwamish

Waterway Group (LDWG). Under the agreement, the LDWG is conducting a Remedial Investigation (RI) and Feasibility Study (FS) of the LDW to assess risks to human health and the environment and to evaluate cleanup alternatives. The RI for the site is being done in two phases. Results of Phase 1 were published in July 2003 (Windward 2003a). The Phase 1 RI used existing data to provide an understanding of the nature and extent of chemical distributions in LDW sediments, develop preliminary risk estimates, and identify candidate sites for early cleanup action. The Phase 2 RI is currently underway and is designed to fill critical data gaps identified in Phase 1. Based on the results of the Phase 2 RI, additional areas for cleanup may be identified. During Phase 2, an FS is being conducted that will address cleanup options for contaminated sediments in the LDW.

On September 13, 2001, EPA added the LDW to the National Priorities List. This is EPA's list of hazardous waste sites that warrant further investigation and cleanup under Superfund. Ecology added the site to the Washington State Hazardous Sites List on February 26, 2002.

An interagency Memorandum of Understanding, signed by EPA and Ecology in April 2002 and updated in April 2004, divides responsibilities for the site (EPA and Ecology 2002; EPA and Ecology 2004). EPA is the lead for the RI/FS, while Ecology is the lead for source control issues.

In June 2003, the *Technical Memorandum: Data Analysis and Candidate Site Identification* (Windward 2003b) was issued. Seven candidate sites for early action (Early Action Areas [EAAs]) were recommended (Figure 1). The sites because Tier 1 source control areas and include:

- EAA-1: Duwamish/Diagonal CSO and storm drain
- EAA-2: West side of the waterway, just south of the First Avenue S. Bridge, approximately 2.2 miles from the south end of Harbor Island
- EAA-3: Slip 4, approximately 2.8 miles from the south end of Harbor Island
- EAA-4: South of Slip 4, on the east side of the waterway, just offshore of the Boeing Plant 2 and Jorgensen Forge properties, approximately 2.9 to 3.7 miles from the south end of Harbor Island
- EAA-5: Terminal 117 and adjacent properties, approximately 3.6 miles from the south end of Harbor Island, on the west side of the waterway
- EAA-6: East side of the waterway, approximately 3.8 miles from the south end of Harbor Island
- EAA-7: Norfolk CSO/SD, on the east side of the waterway, approximately 4.9 to 5.5 miles from the south end of Harbor Island

Of the seven recommended EAAs, five either had sponsors to begin investigations or were already under investigation by a member or group of members of the LDWG. These five sites are EAA-1, EAA-3, EAA-4, EAA-5, and EAA-7. EPA is the lead for managing cleanup at two areas, EAA-3 and EAA-5. The other three EAA cleanup projects were begun before the current LDW RI/FS was initiated. Cleanup at EAA-4, under EPA Resource Conservation and Recovery

Act (RCRA) management, is currently in the planning stage. The EAA-1 and EAA-7 cleanups are under King County management as part of the Elliott Bay-Duwamish Restoration Program. Cleanup at EAA-1 was partially completed in March 2004, and a partial sediment cleanup was conducted at EAA-7 in 1999. Early action cleanups may involve members of the LDWG or other parties as appropriate. Planning and implementation of early action cleanups is being conducted concurrently with the Phase 2 investigation.

Further information about the LDW can be found on Ecology's website: http://www.ecy.wa.gov/programs/tcp/sites/lower_duwamish/lower_duwamish_hp.html and on EPA's website: http://yosemite.epa.gov/r10/cleanup.nsf/sites/lduwamish.

1.3 Lower Duwamish Waterway Source Control Strategy

The Lower Duwamish Waterway Source Control Strategy (Ecology 2004) describes the process for identifying source control issues and implementing effective source controls for the LDW. The goal of the strategy is to minimize the potential for recontamination of sediments to levels exceeding the LDW sediment cleanup goals and the Washington State Sediment Management Standards (SMS). It is based on the principles of source control for sediment sites described in EPA's *Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites; February 12, 2002* (EPA 2002), and SMS (WAC 173-204). The source control work is identified in a series of detailed, area-specific SCAPs, which are prioritized to coordinate with sediment cleanups.

The SCAPs document what is known about each source control area, the potential sources of recontamination, past clean up actions taken to address them, and actions necessary to achieve adequate source control for an area. Because the scope of source control for each site will vary, it is necessary to adapt each plan to its respective area.

The success of this strategy depends on the coordination and cooperation of all public agencies with responsibility for source control in the LDW area, as well as prompt compliance by the businesses and property owners that must make changes necessary to control releases from their properties.

Source control priorities are divided into four tiers. Tier 1 consists of source control actions associated with the EAAs. Tier 2 consists of source control actions associated with any final, long-term sediment cleanup actions identified through the Phase 2 RI and the EPA ROD. Tier 3 consists of source identification and potential source control actions in areas of the LDW that are not identified for cleanup, but where source control may be needed to prevent future contamination. Tier 4 consists of source control work identified by post-cleanup sediment monitoring (Ecology 2004). This document is a SCAP for a Tier 2 source control area.

The Lower Duwamish Waterway Source Control Strategy can be found on Ecology's website: http://www.ecy.wa.gov/programs/TCP/sites/lower_duwamish/source_control/sc.html

Further information about Lower Duwamish Waterway source control can be found at Ecology's Lower Duwamish Source Control website:

http://www.ecy.wa.gov/programs/tcp/sites/lower_duwamish/lower_duwamish_hp.html
and at the King County/Seattle Public Utilities Joint Business Inspection website:
http://www.dnr.metrokc.gov/wlr/indwaste/duwamish.htm

1.4 Source Control Work Group

The primary public agencies responsible for source control for the LDW are Ecology, the city of Seattle, King County, the Port of Seattle, the city of Tukwila, and EPA. All of these agencies, except for the Port of Seattle, are directly involved in the source control activities for the Slip 6 source control area.

In order to coordinate among these agencies, Ecology formed the Source Control Work Group (SCWG) in January 2002. The purpose of the SCWG is to share information, discuss strategy, actively participate in developing SCAPs, jointly implement source control measures, and share progress reports on source control activities for the LDW area. The monthly SCWG meetings are chaired by Ecology. All final decisions on source control actions and completeness will be made by Ecology, in consultation with EPA, as outlined in the April 2004 Ecology/EPA Lower Duwamish Waterway Memorandum of Understanding (EPA and Ecology 2004).

Other public agencies with relevant source control responsibilities include the Washington State Department of Transportation, Puget Sound Clean Air Agency, and the Seattle/King County Department of Public Health. These agencies are invited to participate in source control with the SCWG as appropriate (Ecology 2004).

1.5 Scope of Document

This report addresses five properties within the Slip 6 drainage basin: the former PACCAR site, the former Rhône-Poulenc site, the King County International Airport (KCIA), the Museum of Flight (MOF), and the Boeing Developmental Center (BDC). All of the properties exist fully within the Slip 6 drainage basin, except the KCIA and the BDC. These properties extend outside of the Slip 6 source control area into other source control areas and are also addressed in other SCAPs. References to these SCAPs are listed in sections 3.4 KCIA and 3.6 BDC.

This report identifies potential sources of contamination within upland media that have the potential to recontaminate Slip 6 sediments. This report also summarizes the COCs that have been identified in the Slip 6 sediments. Atmospheric deposition of air pollution is a potential source of contamination to Slip 6 sediments from local or regional sources outside of the Slip 6 source control area. However, this document contains only a limited discussion of atmospheric deposition in Section 3.7. 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 action items relating to air pollution.

Data regarding existing sediment contamination in the Slip 6 source control area are summarized in Section 2 and include data published by March 1, 2008. However, source control actions in this report are focused only on upland sources that have the potential to recontaminate Slip 6 sediments in the event that sediment remediation is required. This report does not include action items that may be necessary to prevent contaminants in capped sediments from contaminating capping material if this remedial option is selected, or to prevent contaminants from upstream sources from migrating to Slip 6 sediments. It will be important to address any contaminated sediments left in place or upstream contaminants as part of the remedial option selection process for Slip 6 sediments.

2.0 Slip 6 Source Control Area

This section describes the history and current conditions of the Slip 6 source control area. Slip 6 sediments have accumulated chemical contaminants from numerous sources, both historical and potentially ongoing. These chemicals may have entered the LDW through direct discharges, spills, bank erosion, groundwater discharges, surface water runoff, atmospheric deposition, or other non-point source discharges.

Historically, the Duwamish River meandered through the mud flats of the river delta. 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, in addition to imported fill, was likely used to fill in the upland areas near the Slip 6 inlet.

The upland areas within the Slip 6 drainage basin have been industrialized since the 1920s. Historical and current commercial and industrial operations within the Slip 6 drainage basin include cargo handling and storage, auto storage lots, truck manufacturing, chemical processing, aviation operations, and aircraft manufacturing, research, and development. South Park, the nearest residential area to the Slip 6 source control area, is approximately one-half mile to the southwest on the western side of the LDW.

The Slip 6 source control area shoreline consists of various materials, including sheet pile bulkheads, riprap, fill material, and natural vegetation. As described further in Section 3, five stormwater outfalls currently discharge to Slip 6 sediments: three discharge within the Slip 6 inlet and two discharge north of the inlet along the LDW bank.

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. However, the direction may vary locally depending on the nature of subsurface material and temporally due to tidal influence of the LDW. The upland area affected by tidal fluctuations is generally within 300 to 500 feet (100 to 150 meters) of the LDW (Windward 2003a) and varies depending upon location. For example, at the former Paccar site, tidal influence extends to 300 to 400 feet east of the LDW (Anchor 2008a).

2.1 Contaminants of Concern in Sediments

Several environmental investigations have included the collection of sediment in the Slip 6 source control area. These investigations include the Rhône-Poulenc RCRA Facility Investigation in 1995 (CH2M HILL 1995), the Boeing Site Characterization in 1997 (Exponent 1998), the National Oceanic and Atmospheric Administration (NOAA) sediment characterization of the Duwamish River in 1998 (NOAA 1998), the EPA Site Inspection (Weston 1999), the Rhône-Poulenc Sediment and Pore Water Investigation (EPA 2005), and the Lower Duwamish Waterway Phase 2 RI (Windward 2005a, 2005b, 2007). Analytical results from these investigations are presented in a sediment database created by the LDWG and can be accessed at www.ldwg.org. In addition, sediment samples were collected and analyzed at the former PACCAR site as part of the Sediment Evaluation Work Phase I (Anchor 2007a) and Phase II (Anchor 2008b); these investigations were conducted more recently and the results are not included in the LDWG database. The Sediment Evaluation Phase II includes sediment core sampling in selected locations in the LDW adjacent to the former PACCAR site. Draft results were submitted to Ecology in May 2008 and the final report is expected in fall 2008.[4]

Sediment investigations from 1994 to 1999 included collection of 90 surface sediment samples and one subsurface sediment sample at locations within the Slip 6 source control area. More recently, sediment sampling conducted as part of the Phase 2 LDW RI included 13 surface sediment samples collected during two rounds of sampling in 2005 and subsurface samples collected from two coring locations in 2006. During the Rhône-Poulenc Sediment Investigation and Pore Water Investigation in 2004, 11 surface samples and 12 subsurface samples were collected near the Rhône-Poulenc site and in the Slip 6 inlet. Sediment sampling locations for these investigations are shown in Figure 3. During the Sediment Evaluation Work in 2006, 26 surface sediment samples were collected from the nearshore of the former PACCAR site (Figure 4) and Phase II work is expected to include four sediment corings from 0 to 10 feet below the mudline (Anchor 2008b).

Chemical data from previous sediment investigations were compared to SMS, which include both the Sediment Quality Standards (SQS) and Cleanup Screening Levels (CSL) (WAC 173-204). Sediments that meet the SQS criteria have a low likelihood of adverse effects on benthic organisms. However, exceeding the SQS criteria does not necessarily lead to adverse effects or toxicity, and the SQS exceedance factor does not correspond to the level of sediment toxicity. The CSL is defined as the maximum chemical concentration and level of biological effects permissible at a cleanup site, to be achieved by year 10 after cleanup has been completed. The CSL is greater than or equal to the SQS and represents a higher level of risk to benthic organisms than SQS levels. The SQS and CSL values provide a basis for identifying sediments that may pose a risk to some ecological receptors. The SMS for most organic chemicals are based on total organic carbon (TOC)-normalized concentrations.

For source control at the LDW sediment site, Ecology and EPA view exceedances of the SQS in sediments as an indication that further investigation and/or control of upland sources in needed. Used this way, SQS is one of the primary pieces in the weight of evidence approach to determining sediment source control needs, described in the LDW Source Control Strategy. Analysis of sediment samples collected within the Slip 6 source control area identified COCs, defined as those chemicals that exceeded the SQS in at least one sample. The following are COCs in Slip 6 sediments:

[4] This SCAP incorporates data published through March 1, 2008. Section 6, Tracking and Reporting of the Source Control Activities, describes how newer data will be disseminated.

Contaminants of Concern (COCs)	Surface Sediment		Subsurface Sediment	
	> SQS	> CSL	> SQS	> CSL
Metals				
Lead	●	●		
Mercury	●	●		
PAHs				
Acenaphthene	● (EF 2.9)			
Benzo(g,h,i)perylene	●		●	
Dibenzo(a,h,)anthracene	●		● (EF 3.2)	●
Dibenzofuran	●			
Fluoranthene	●			
Fluorene	●			
Indeno(1,2,3-cd)pyrene	●		●	
Phenanthrene	●			
Total HPAH	●			
PCBs				
PCBs (total)	● (EF 9.6)	●	● (EF 34)	●
Phthalates				
Bis(2-ethylhexyl) phthalate	●		●	
Butyl benzyl phthalate	● (EF 3.5)			
Diethyl phthalate			● (EF 6.7)	●
Di-n-octyl phthalate			●	
Other SVOCs				
Benzoic acid	●	●	●	●
Pentachlorophenol			●	●
Phenol	● (EF 3.3)	●	● (EF 7.4)	●

Key:
Black dots indicate the COCs exceeded SQS or CSL in at least one sample.
Shaded cells indicate the COCs exceeded both SQS and CSL.
Parentheses indicate the highest Exceedance Factor (EF) of SQS.

Note:
This table includes data published through March 1, 2008.
Source: Lower Duwamish Waterway Group Website sediment database (www.ldwg.org) and *Sediment Evaluation Work Phase I* (Anchor 2007a).

Analytical results that exceed the SQS and CSL and their exceedance factors are listed in Tables 1 and 2. Analytical results for most sample locations can be found in a sediment database at www.ldwg.org.

2.1.1 Metals

Metals exceedances were detected at two surface sediment sample locations near the former PACCAR site. Mercury was detected at location AN-029 at 6.8 mg/kg dw, which exceeded the CSL by a factor of 11.5. Lead was detected at location LDW-SS121 at 533 mg/kg dw, which exceeded the SQS by a factor of 1.2 and the CSL by a factor of 1.0.

2.1.2 PAHs

Several PAHs exceeded the SQS at eight surface sediment locations and 15 subsurface sediment locations. Three surface sediment locations were near the BDC and eight locations were near the former Rhône-Poulenc site. The 15 subsurface locations were near the former Rhône-Poulenc site. The highest exceedances included dibenzo(a,h)anthracene at 0.23 mg/kg dw (38 mg/kg OC), which exceeded the SQS and CSL by factors of 3.2 and 1.2, respectively, and acenapthene at 1.2 mg/kg dw (46 mg/kg OC), which exceeded the SQS by a factor of 2.9.

2.1.3 PCBs

PCBs exceeded the SQS or CSL at eight surface sediment locations, five near the former PACCAR site and three near the former Rhône-Poulenc site. PCBs exceeded the SQS or CSL at three subsurface sediment locations near Rhône-Poulenc. Concentrations of PCBs ranged from 0.129 to 2.5 mg/kg dw (15 to 410 mg/kg OC), which exceeded SQS by factors of 1.3 to 34, respectively. The highest concentration of PCBs was from a subsurface sample, SB-4, at 2.5 mg/kg (410 mg/kg OC). This concentration exceeded CSL by a factor of 6.3.

2.1.4 Phthalates

Phthalates, including butyl benzyl phthalate (BBP) and bis(2-ethylhexyl)phthalate (BEHP), exceeded the SQS at six surface sediment locations within the Slip 6 source control area. At three locations near the former PACCAR site, concentrations of BBP ranged from 0.07 to 0.32 mg/kg dw (8.2 to 17 mg/kg OC), which exceeded the SQS by factors of 1.7 to 3.5. At three locations in the Slip 6 inlet near the former Rhône-Poulenc site and the BDC, concentrations of BEHP ranged from 1.6 to 2.1 mg/kg dw (59 to 77 mg/kg OC), which exceeded the SQS by factors of 1.3 to 1.6.

Phthalates, including BBP, BEHP, diethyl phthalate, and di-n-octyl phthalate, exceeded the SQS or CSL in subsurface sediment cores at two locations near the former Rhône-Poulenc site and five locations within the Slip 6 inlet near Rhône-Poulenc and the BDC. The concentrations of BEHP and di-n-octyl phthalate were relatively low. BBP was detected at location SB-5 at 0.365 mg/kg, which exceeded the SQS by a factor of 5.8. Diethyl phthalate was detected at location SH-02 at 2.7 mg/kg dw (410 mg/kg OC), which exceeded CSL by 3.7.

2.1.5 Other SVOCs

Exceedances of other SVOCs were detected at six surface sediment locations and 11 subsurface locations near the former Rhône-Poulenc site. Benzoic acid, pentachlorophenol, and/or phenol exceeded the CSL at each location. The highest concentration of benzoic acid was 2.0 mg/kg dw in a subsurface sample at location SB-3, exceeding the SQL and CSL by a factor of 3.1. The highest concentration of pentachlorophenol was 0.93 mg/kg dw at location SH-04, exceeding CSL by a factor of 1.3. The highest concentration of phenol was 3.1 mg/kg dw in a subsurface sample at location SB-3, exceeding the CSL by a factor of 2.6.

2.2 Contaminants of Concern in Upland Media

Several environmental investigations and cleanup activities have been conducted at properties within the Slip 6 drainage basin to address contamination of upland media (including stormwater, storm drain solids, groundwater, seeps, and soil). These investigations are summarized in Section 3.

A COC in upland media was identified when a chemical was detected above an applicable screening level in one or more samples of upland media, even if not detected in Slip 6 sediment samples. The following chemicals are identified as COCs 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, and vinyl chloride (VC)]
- semivolatile organic compounds (SVOCs) (PAHs, PCBs, phenols, and phthalates)
- petroleum hydrocarbons[5]

[5] Although no explicitly addressed in the SMS, VOCs in pore water may cause adverse effects on benthic invertebrates and other aquatic biota, and are therefore considered COCs for source control efforts in the LDW.

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3.0 Potential Sources of Sediment Recontamination

For each of the Slip 6 source control area properties, this section summarizes current and historical land uses, the results of environmental investigations and cleanup activities, and actions necessary to achieve source control. In addition, there are four active private outfalls (2076, 2073, 2081, and 2082) and one public outfall (2080) that discharge to the LDW within the Slip 6 source control area (Figure 5). There are six inactive private outfalls (2075, 2074, 2078, 2079, 2083, and 2084). Active outfalls were determined based on existing information and are discussed in Sections 3.2 through 3.6. The properties within the Slip 6 drainage basin (former PACCAR site, former Rhône-Poulenc site, KCIA, MOF, and BDC) are described in Sections 3.2 to 3.6. Atmospheric deposition is discussed in Section 3.7.

3.1 Outfalls

The LDW area is served by a combination of separated storm drain and sanitary sewer systems as well as a combined sewer system. Storm drains convey stormwater runoff collected from streets, parking lots, roof drains, and residential, commercial, and industrial properties to the waterway. In the LDW area, there are both public and private storm drain systems. Most of the waterfront properties are served by privately owned systems that discharge directly to the waterway. The other upland areas are served by a combination of private and publicly owned systems.

3.1.1 Storm Drain Outfalls

Storm drains discharging to the LDW carry precipitation runoff. A wide range of contaminants may become dissolved or suspended in runoff as rainwater flows over the land. Urban areas may accumulate particulates, dust, oil, asphalt, rust, rubber, metals, pesticides, detergents, or other materials as a result of urban activities. These can migrate into storm drains during wet weather. Storm drains can also convey materials from businesses, residences, vehicle washing, runoff from landscaped areas, erosion of contaminated soil, groundwater infiltration, and materials illegally dumped into the system or onto the ground. Stormwater can discharge directly to the LDW via outfalls from sites adjacent to the river or from publicly owned storm drain systems. These direct discharges are authorized by Ecology through various types of National Pollutant Discharge Elimination System (NPDES) permits. Stormwater from businesses, roads, and residential areas upland of the river is typically the regulatory responsibility of the public utilities agencies of Seattle, Tukwila, or King County, depending on the exact location and type of land use.

King County owns a 36-inch storm drain line that receives drainage from the KCIA stormwater system and from the former Rhône-Poulenc site before discharging to the Slip 6 inlet at the King County Outfall (Figure 5). As part of the Elliot Bay Action Program, storm drain solids were collected in 1988. However, there has been no recent stormwater or storm drain solids sampling of any of these systems. It is not known whether these systems have contributed or will contribute to recontamination in the LDW.

Private outfalls to the LDW are identified at the former PACCAR site and the BDC (Figure 5). These outfalls are described in more detail in Sections 3.2 and 3.6.

3.1.2 Sanitary Sewer System and Combined Sewer Overflow

King County's sanitary sewer system collects municipal and industrial wastewater from sources throughout the LDW area. The system then conveys wastewater to King County's West Point wastewater treatment plant, where it is treated before being discharged to Puget Sound. The local municipalities (e.g., cities of Seattle and Tukwila) and local sewer districts own and operate the smaller trunk sewer lines, which collect wastewater from individual properties. The large interceptor system that collects wastewater from the trunk lines is owned and operated by King County. A King County interceptor extends along the east side of East Marginal Way South within the Slip 6 source control area, adjacent to the KCIA.

King County Industrial Waste Program (KCIWP) permits limit the contaminants a user may contribute to the sanitary sewer system. These permits also authorize King County to conduct regular business inspections. The KCIWP permits are not the same as Ecology-issued National Pollutant Discharge Elimination System (NDPES) permits for discharges to surface waters of the state.

Some areas of the LDW are also served by combined sewer systems, which carry both stormwater and municipal/industrial wastewater in a single pipe. These systems were generally constructed before about 1970 because it was less expensive to install a single pipe rather than separate stormwater and sanitary systems. Under normal rainfall conditions, wastewater and stormwater are conveyed through this combined sewer pipe to a wastewater treatment facility. During large storm events, however, the total volume of wastewater and stormwater can sometimes exceed the conveyance and treatment capacity of the combined sewer system. When this occurs, the combined sewer system is designed to overflow through relief points, called combined sewer overflow (CSO) outfalls. The CSO outfalls prevent the combined sewer system from backing up and creating flooding problems. However, no combined sewer overflow points discharge to the Slip 6 source control area.

3.1.3 NPDES Permits

Six types of NPDES permits cover various discharges to the LDW. However, only two types of permits apply to the Slip 6 source control area, Phase I Municipal Stormwater Permits and Industrial Stormwater General Permits. Permits that do not apply to the Slip 6 source control area include boat yard, sand and gravel general, phase II municipal stormwater, and individual permits.

Phase I Municipal Stormwater Permit

Stormwater runoff into municipal separated storm sewers that discharge to surface waters must have a NPDES permit under the federal Clean Water Act. Phase I of the municipal stormwater program went into effect in 1990 and applies to municipalities with populations of more than 100,000, including the city of Seattle and King County. Within the Slip 6 source control area, this permit covers the bulk of KCIA, including taxi and runways. King County's 36-inch storm drain line that discharges within the Slip 6 source control area is covered under the Phase I municipal stormwater permit.

The original Phase I permit was issued in 1995 and was reissued on January 17, 2007. The new permit represents a significant shift in approach to stormwater monitoring. The new permit requires monitoring of in-line water and storm drain solids, during both wet and dry seasons. Contaminants to be monitored include the State's SMS list, as well as toxicity testing for effluent and receiving sediments. The permit requires all permittees to monitor one stormwater drainage/outfall representing each type of land use: residential, commercial, and industrial. Complete monitoring requirements are in Special Condition S.8 of the permit, which is available on-line at: http://www.ecy.wa.gov/programs/wq/stormwater/municipal/phase_I_permit/ph_i-permit.html.

Neither the city of Seattle nor King County have selected outfalls within the Slip 6 source control area for Phase I permit-required monitoring.

In addition to the expanded monitoring described above, the Phase I permit also contains more traditional requirements such as system maintenance, best management practices (BMPs), and business inspections. In addition, the Phase I permit contains programmatic requirements in the areas of education/outreach, illicit discharge detection and elimination, and the development of municipal stormwater regulations/code. These traditional requirements apply to KCIA.

Before this permit was reissued, the city of Seattle and King County formed a joint program to conduct the source control inspection process throughout the 20,000 acres of the LDW drainage basin. The City's source control authority comes from the City Stormwater, Grading, and Drainage Control Code (SMC 22.800), which was established in part to meet the requirements of its NPDES municipal stormwater permit. King County's source control authority, associated with the joint program, stems from its authorized pretreatment program and their attendant industrial and hazardous waste management programs. For King County storm drain outfalls, their source control authority comes from the County's Water Quality Code (Chapter 9.12 KCC).

Ongoing source control programs conducted by the city, county, and Ecology (for example, 2003-2005 city/county joint inspection program, ongoing Seattle Public Utilities (SPU) program, ongoing KCIWP, Ecology Urban Waters Initiative, and coordination with city/county) help reduce the amount of pollution entering public storm drains and sanitary/combined sewer systems that discharge to the LDW. LDW source control activities generally go beyond what is required under the NPDES program. In particular, the level of source tracing and characterization these programs conduct exceeds what is required by NPDES.

Industrial Stormwater General Permit

This permit covers 112 industries within the natural drainage basin of the LDW. Coverage under the Industrial Stormwater General Permit requires a facility to monitor its stormwater discharge for copper, zinc, oils, and total suspended solids. Within the Slip 6 source control area, the permit covers IAAI's operations on the former PACCAR site and the West Parcel of the former Rhône-Poulenc site (SO3008681A), as well as the BDC (SO3000146D).

3.1.4 Source Control Actions

Stormwater discharges from public outfalls may represent an ongoing source of COCs to the Slip 6 source control area. King County is responsible for the following source control actions for the King County storm drain outfall. Discharges from private outfalls are addressed in Sections 3.2 and 3.6. Although, stormwater for the KCIA is received by the King County storm drain line, source control actions specific to the KCIA stormwater system are discussed in Section 3.4.4. To minimize the potential for discharge of COCs from the King County storm drain outfall, the following source control actions are planned:

- King County will collect in-line water and storm drain solids samples to evaluate if COCs are migrating to Slip 6 sediments via the storm drain outfall.
- If COCs from sediments or uplands within the Slip 6 source control area are present above screening criteria in the storm drain line, King County will conduct source tracing to identify sources of contaminants.
- King County, SPU, and Ecology will conduct source control inspections of upland sites, as needed.
- Ecology's Water Quality Program will continue to administer, review, and update NPDES permits, as needed.

3.2 Former PACCAR Site

3.2.1 Facility Summary

The former PACCAR Inc. (PACCAR) site is located on the eastern shoreline of the LDW from RM 3.9 to 4.0. The site is also known as the former Kenworth Truck Tukwila, Insurance Auto Auctions, Inc., Merrill Creek Holdings, LLC site, and the 8801 East Marginal Way site. This document will refer to the site as the former PACCAR site. The site is bordered by the Boeing-Thompson property to the north, East Marginal Way South to the east, the former Rhône-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.

Industrial 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, and continued truck manufacturing from 1946 through April 1996. In 1966, PACCAR also purchased a portion of the neighboring property to the south, formerly owned by Monsanto, to expand their operations. Truck building resumed in 1997 and off-road trucks were built for PACCAR through 2002, when PACCAR ceased operations at the site (Ecology 2006a). In October 2004, PACCAR sold the property to Merrill Creek Estate Holdings, LLC. The property is currently leased to Insurance Auto Auctions, 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 (Figure 6). A metal sheet piling bulkhead extending approximately 30 feet below ground surface (bgs) was installed in the 1930s along the northern two-thirds of the shoreline and western boundary, separating the uplands from the LDW. The southern third of the shoreline is armored with riprap (i.e., large boulders).

Site information from Ecology, EPA, and King County online databases and permits is summarized in the table below. More details are presented in the *Slip 6 Summary of Existing Information and Identification of Data Gaps Report* (E & E 2008).

Facility Summary: Former PACCAR Site	
Address	8801 East Marginal Way South
Property Owner	Merrill Creek Holdings, LLC
Property Leasee	Insurance Auto Auctions, Inc.
Tax Parcel No.	5422600060
Parcel Size	24.30 acres
Facility/Site ID	2072
EPA ID No.	WAD009249509
NPDES Permit No.	SO3008681A (IAAI)
UST/LUST ID No.	8218 / 552588
Listed on CSCSL	Yes
TRI No.	98108KNWRT8801E
KCIWP	N/A

From 1986 to the present, PACCAR conducted multiple environmental investigations and cleanup actions at the site. In October 2000, PACCAR entered into Ecology's Voluntary Cleanup Program. On October 4, 2006, PACCAR entered into an Agreed Order (DE 3599) with Ecology to implement of the Sediment Evaluation Work Plan (Ecology 2006a). 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. Currently, Ecology, PACCAR, and Merrill Creek are negotiating an Agreed Order for remedial action at the upland portion of the site (Ecology 2008a).

3.2.2 Environmental Investigations and Cleanup Activities

Since 1986, the former PACCAR site has been the subject of numerous environmental investigations and cleanup activities, which are displayed in the timeline in Figure 7. Site investigations began in 1986 following report of a leaking underground storage tank (LUST). Environmental investigations at the site have included the underground storage tank (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 2008.

Investigations at the site detected the following releases to:

- Soils: petroleum hydrocarbons, VOCs, SVOCs, phenols, phthalates, and metals;
- Groundwater: VOCs, SVOCs, petroleum hydrocarbons, PAHs, PCBs, and metals;
- Stormwater: VOCs, PCBs, PAHs, and metals.

Cleanup actions at the site began with several UST closures in 1986. These closures were followed by several remedial actions, including removal of USTs in 1991, 2000, 2001, and 2003; removal of contaminated soil in 1995 and from 2002 to 2004; and 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 performed on 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 stormwater quality improvements completed in February 2008.

Site-specific screening levels are currently being developed; therefore, soil data were not compared to the SQS- and CSL-based soil-to-groundwater screening tool (SAIC 2006a). To assess potential impacts to LDW sediments, further evaluation and comparison of the data to the site-specific screening levels is necessary. It is anticipated that the site-specific screening levels, which will be protective of the LDW sediment, will be more stringent than historic cleanup levels or screening criteria from past environmental investigations. Historically, industrial cleanup levels were used, but these higher, less stringent levels are not applicable at this property due to the proximity of the waterway and the mixed use of the land.

As part of on-going environmental investigations and cleanup actions, PACCAR has submitted a Storm Drainage and Water Quality Improvements Report and Draft Sediment Evaluation Phase 2 Report, which are currently under review by Ecology. As part of the Agreed Order, PACCAR has submitted a Draft Interim Action Work Plan that includes a summary of remedial investigation results, feasibility cleanup alternatives, a work plan to address data gaps, and a work plan to implement the selected remedial action for soil and groundwater of the upland area.

This plan also re-evaluates and compares analytical results from previous environmental investigations to site-specific screening criteria.[6]

The principal environmental investigations and cleanup actions, including analytical results and figures, are described in the *RM 3.9-4.4 Summary of Existing Information and Identification of Data Gaps Report* (E & E 2008). A summary of this information is provided in the table below.

Date	Investigation/Cleanup	Description	Chemicals with Elevated Concentrations
1995	Remediation of Boneyard Hydraulic Oil Spill (GeoEngineers 1995)	80 cubic yards of petroleum hydrocarbon contaminated soil was removed from an area of the boneyard. Confirmation samples were analyzed for oil- and diesel range hydrocarbons, arsenic, cadmium, chromium, and lead. One location had concentrations of lead and chromium above MTCA Method A industrial soil cleanup levels.	**Soil:** Lead and chromium
2002	Phase I Data Gap Investigation (Kennedy/Jenks 2002)*	Investigation included reconnaissance soil and groundwater assessments in the North Fire Aisle, Wash Pit, and Southwest Storage Areas (Figure 8). 74 soil samples and 12 groundwater samples were collected from 28 soil borings and analyzed for VOCs, SVOCs, PAHs, petroleum hydrocarbons, PCBs, and metals. Site-wide groundwater, stormwater, and seep monitoring was conducted. Stormwater data is not included in this table because the entire stormwater system was cleaned in 2004, and 2006 to 2007 stormwater data is available.	**Soil:** Petroleum hydrocarbons and lead **Groundwater:** VOCs, VC, chrysene, benzo(a)anthracene, benzo(b)fluoranthene, arsenic, selenium, copper, lead, and mercury **Seep:** arsenic, copper, and lead
		Grab samples from five seeps were collected. Arsenic (7.5 µg/L) was above natural background, and copper (33.8 µg/L) and lead (16 µg/L) exceeded Ecology's Chronic Freshwater Surface Water Quality Standard.	

[6] This plan is currently under review by Ecology. This SCAP incorporates data published through March 1, 2008. Section 6, Tracking and Reporting of the Source Control Activities, describes how newer data will be disseminated.

Date	Investigation/Cleanup	Description	Chemicals with Elevated Concentrations
1986 to 2003	UST Removals (Kennedy/Jenks 2003)*	Historically, there were 19 USTs and one oil/water separator at the site (Figure 11). All USTs were removed from 1986 to 2003. Confirmation sampling was conducted in 2000 and 2001 with the removal of USTs E1, E3, and E4, and in 2003 with the removal of USTs E2, E5, E6, and E7. 735 tons of petroleum hydrocarbon-contaminated soil was removed from an area east of E6. 1,890 pounds of ORC was place in the UST E2 excavation area. Final confirmation samples were below MTCA Method A industrial soil cleanup levels for petroleum hydrocarbons.	
2004	Phase II Data Gaps Investigation (Kennedy/Jenks 2004)*	Soil and groundwater samples were collected from 122 locations of the site-wide “grid sampling” (Figure 9). Site-wide stormwater and storm drain solids sampling was conducted. Several soil removals were conducted. Lead above the MTCA Method A industrial cleanup level was found in soil in the Southwest Storage Area. Petroleum hydrocarbons exceeded MTCA Method C cleanup levels at H4, the southern portion of the Off-Highway Building, and the northwest corner. Groundwater data was consistent with data from the Phase I Data Gaps Investigation with exceedances of VOCs and arsenic. Gasoline-range hydrocarbons exceeded surface water criteria in the northwest corner. PCBs and dioxins/furans exceeded MTCA Method C industrial soil cleanup levels in storm drain solids from the middle outfall.	**Soil:** Lead and petroleum hydrocarbons **Groundwater:** VOCs, arsenic, gasoline-range hydrocarbons **Storm Drain Solids:** PCBs and dioxin/furans

Date	Investigation/Cleanup	Description	Chemicals with Elevated Concentrations
2004 (Cont.)	Phase II Data Gaps Investigation (Kennedy/Jenks 2004)* (Cont.)	Stormwater data was consistent with data from the Phase I Data Gaps Investigation. Phase II stormwater data is not included in this table because the entire stormwater system was cleaned in 2004, and 2006 to 2007 stormwater data is available. Petroleum hydrocarbon-containing soil was from H4. Additional soil was removed in the eastern portion of the South Fire Aisle. Confirmation samples were analyzed for diesel-, oil-, and gasoline-range hydrocarbons, metals, VOCs, PCBs, and PAHs. Final confirmation samples were below MTCA Method A cleanup levels.	
2004	Stormwater System Cleaning (AMEC 2006a)	Entire stormwater system was cleaned. The middle outfall and middle outfall catch basin were closed.	
2004	AS/SVE System (Kennedy/Jenks 2005)	An AS/SVE system was installed as an interim remedial action to intercept and treat VOCs in the shallow groundwater before reaching the LDW. Groundwater is monitored quarterly. Petroleum hydrocarbon-contaminated soil was removed as part of the installation of the SVE pipelines.	
2005 to 2006	Investigation and Repair of North Storm Drain Line (AMEC 2007a)	Investigation identified locations of groundwater infiltrations in north storm drain line. The storm drain line was repaired using a cured-in-place method.	

Date	Investigation/Cleanup	Description	Chemicals with Elevated Concentrations
2006	Draft Wet Season Groundwater Study (AMEC 2006b) and Draft Dry Season Groundwater Study (AMEC 2007b)*	25 upland and nearshore monitoring wells were sampled during two site-wide groundwater investigations, in March and August 2006 (Figure 12). Samples were analyzed for SMS chemicals, VOCs, SVOCs, TPH, PCBs, and dissolved priority pollutant metals and compared to surface water screening criteria.	**Wet Season:** PCE, TCE, cis-1,2-DCE, 1,1-DCE, VC, methylene chloride, benzo(g,h,i)perylene, fluoranthene, BEHP, PCBs, chromium, copper, nickel, and zinc. **Dry Season:** PCE, TCE, cis-1,2-DCE, VC, BEHP, fluoranthene, benzyl alcohol, PCBs, chromium, copper, nickel, and zinc.
2006 to 2007	Sediment Evaluation Work Phase 1 (Anchor 2006, Anchor 2008c)	As part of an Agreed Order with Ecology, this investigation assesses whether upland activities have resulted in the migration of chemicals to adjacent sediments in the LDW. This investigation included collection of sediment, stormwater, storm drain solids, and seep samples. Four stormwater sampling events and two storm drain solids were conducted. In stormwater, dissolved copper and zinc exceeded Washington State Marine Chronic Water Quality Criteria.	**Stormwater:** dissolved copper and zinc, PCBs **Storm drain solids:** total PCBs, phenanthrene, and benzo(a)pyrene exceeded the SQS; cadmium, lead, mercury, zinc, fluoranthene, pyrene, benzo(a)anthracene, chrysene, indeno(1,2,3-cd)pyrene, dimethylphthalate, BBP, BEHP, total benzofluoranthenes, total HPAH, 4-methylphenol, benzyl alcohol exceeded the SQS and CSL. **Seep:** Copper
		In storm drain solids, PCBs, PAHs, metals, and SVOCs exceeded SQS or CSL. 4 seep samples were collected. In three seep samples, dissolved copper (3.5 to 6.7 µg/L) exceeded Washington State Marine Chronic Water Quality Criteria.	

Date	Investigation/Cleanup	Description	Chemicals with Elevated Concentrations
2007	AS/SVE Quarterly Groundwater Monitoring (Kennedy/Jenks 2007)	8 shallow zone monitoring wells were sampled. Results were compared to MTCA Method B Surface Water Cleanup Levels and the NRWQC Human Health for Consumption of Organisms Level. No concentrations of VOCs exceeded the surface water criteria in the past two quarters.	
2008	Stormwater quality improvements	Operation of stormwater pretreatment system at north and south outfalls.	

Notes: * The results of this investigation need to be re-evaluated and compared with site-specific screening criteria (to be developed), which are estimated to be more stringent than historical cleanup levels or screening criteria from past environmental investigations.

3.2.2.1 Stormwater

The former PACCAR site has three stormwater outfalls that have discharged to the LDW: Storm-North, Storm-South, and an inactive middle outfall, which was closed in 2004 (Figure 5). All catch basins and roof drains now connect to either the Storm-North or Storm-South outfalls. Current site operations by IAAI for vehicle storage are permitted with an Industrial Stormwater General Permit (No. SO3008681A), issued on February 11, 2005. IAAI is required to monitor for oil/grease, pH, turbidity, copper, lead, and zinc. On February 14, 2008, IAAI completed construction of stormwater quality improvements and began stormwater pretreatment operation of a Vortech pretreatment system at the north and south outfalls. Ecology and IAAI are currently negotiating to expand the monitoring parameters to include additional COCs at the site. The results of the expanded monitoring would assist in determining evaluating the effectiveness of the stormwater quality improvements for source control and in determining whether an individual NPDES permit would be required for this site in the future.

3.2.2.2 Groundwater

The subsurface soils onsite consist primarily 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 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 tidal 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. Tidal fluctuations in the LDW 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 2006b)

There are 17 monitoring wells in Zone A, six in Zone B, and two in Zone C. These monitoring wells are shown in Figure 12.

3.2.2.3 Bank Erosion/Leaching

The shoreline adjacent to the LDW is contained within a metal sheet pile bulkhead for the northern two-thirds of the shoreline and heavily armored with riprap for the southern third. 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 third of the property was formerly owned by Monsanto and is currently armored with riprap, soil contamination may exist on the shoreline bank of that portion of the property.

3.2.3 Potential for Future Release

Historical contamination at the site could recontaminate Slip 6 sediments via stormwater, groundwater, and bank erosion and leaching. Potential contaminant sources include:

- **Stormwater Contamination:** Although the stormwater system at the site was cleaned in 2004, results of stormwater monitoring from 2006 to 2007 indicated that copper and zinc exceeded Washington State Marine Chronic Water Quality Criteria in stormwater. Results of storm drain solids monitoring from 2006 to 2007 indicated that total PCBs and PAHs (phenanthrene and benzo(a)pyrene) exceeded the SQS. Metals (cadmium, lead, mercury, zinc), PAHs (flouranthene, pyrene, benzo(a)anthracene, chrysene, indeno(1,2,3-c,d)pyrene, total benzofluoranthenes, total high molecular weight PAHs), phthalates (dimethylphthalate, BEHP, BBP), SVOCs (4-methylphenol, benzyl alcohol, and benzoic acid) exceeded CSL.

  A new stormwater treatment system was constructed and began operation on February 14, 2008. Ecology is negotiating with IAAI to expand stormwater and storm solids monitoring to evaluate the effectiveness of the improvements. Current monitoring for six parameters (oil and grease, pH, turbidity, copper, lead, and zinc) achieves current NPDES industrial general permit requirements, yet results need to be compared to sediment and surface water criteria. Monitoring results were not yet available at the time this report was written; therefore, it is unknown whether these improvements are sufficient to prevent migration of contaminants via the stormwater system.

- **IAAI Operations:** IAAI now has a Storm Water Pollution Prevention Plan (SWPPP) and is in compliance with its stormwater general permit. 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 is unknown if this plan and monitoring are sufficient to prevent contaminants from upland sources (such as potential fuel leaks from damaged vehicles) from migrating to Slip 6 sediments via the stormwater system.

- **Soil Contamination:** In previous soil investigations, data were compared to MTCA Industrial Soil Cleanup Levels. Ecology has determined that these industrial soil cleanup levels are not applicable to the site, due to the proximity to the LDW. PACCAR has submitted a Draft Interim Action Work Plan that re-evaluates and compares analytical results from previous environmental investigations to site-specific screening criteria. In addition, the remedial investigation also presents fate and transport evaluation to determine COCs and areas of potential concern. The feasibility study evaluates remedial actions and controls to address COCs and areas of potential concern. The corrective action plan proposes actions and controls to mitigate impacts of uplands media to levels protective of human health and the environment. This document is currently under review by Ecology.
- **Groundwater Contamination:** The results of the most recent groundwater investigations from 2006 to 2007 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. In addition, BEHP, PCBs, and zinc exceeded the SQS- and CSL-based groundwater-to-sediment screening levels.
- **Historical Contamination (shoreline bank):** The southern third of the site, including the riprap shoreline bank, was previously owned and operated by Monsanto. Historically, Monsanto applied waste vanillin black liquor solids and metal wastes to the shoreline banks for weed control. Therefore, the shoreline bank may be contaminated, and could present a source of contamination to the LDW sediments.

3.2.4 Source Control Actions

The following source control actions will be conducted:

- Ecology, PACCAR, and Merrill Creek are currently negotiating an Agreed Order to address upland cleanup and source control of soil and groundwater contamination at the upland portion of the site.
- PACCAR has submitted a draft Interim Action Plan that re-evaluates existing soil and groundwater data from previous environmental investigations and compares to site-specific screening criteria for metals, PAHs, petroleum hydrocarbons, PCBs, SVOCs, VOCs, and/or dioxins/furans in several locations across the site. This document is currently under review by Ecology.

- Ecology, PACCAR, and Merrill Creek will expand investigation of the former Southwest Storage Area and northwest corner of the site to determine if contaminants are present in soil and groundwater.
- PACCAR has completed Phase 2 of the Sediment Evaluation Work Plan, which includes sediment core sampling in selected locations in the LDW adjacent to the site. The final report is expected in fall 2008.
- Ecology and IAAI are currently negotiating expanding the monitoring parameters of stormwater and storm drain solids to include additional upland COCs at the site. Ecology will review future monitoring results to determine if further actions will be necessary.
- Ecology and IAAI will review the current SWPPP and Operations and Maintenance Plan to prevent contaminants from upland sources (such as potential fuel leaks from damaged vehicles) from migrating to Slip 6 sediments via the stormwater system.

3.3 Former Rhône-Poulenc Site

3.3.1 Facility Summary

The former Rhône-Poulenc, Inc. site is located on the east side of the LDW from RM 4.0 to 4.2. 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.

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 manufactured glue, paints, and resins and handled wood preservatives. In 1952, Monsanto began producing vanillin. Production continued when the property was sold to Rhône-Poulenc in 1986 and ceased in 1991. The title was transferred to Rhodia, Inc. (Rhodia) in January 1998. Rhodia sold the property to Container Properties LLC (Container Properties), the current owner, in November 1998 (Geomatrix 2006a).

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

Since the facility's closure in 1991, there have been no manufacturing activities at the facility. The process equipment, most tanks, and several buildings were dismantled or removed during the closure. In May 1993, Rhône-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. Additional entities are now subject to the Order. Specifically, Rhône-Poulenc transferred the facility to Rhodia in January 1998, and Container Properties purchased the facility in November 1998. Rhône-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 2006a).

In 2006, Container Properties redeveloped the former Rhône-Poulenc site, subdividing the property into two separate parcels (West Parcel and East Parcel; Figure 13). Container Properties owns the West Parcel and has recently issued a 15-year lease to IAAI. IAAI uses the West Parcel as an extension of its operations on the former PACCAR site for storage of wrecked vehicles prior to auction or offsite recycling. The East Parcel was sold to the Museum of Flight on February 28, 2007.

After subdivision of the former Rhône-Poulenc site into the East and West parcels, substantial soil characterizations and removals were conducted at the East Parcel. EPA issued a remedy selection and a partial determination of "Corrective Action Complete Without Controls" for the East Parcel on December 20, 2006 (EPA 2006b).

Site information from Ecology, EPA, and King County online databases and permits is summarized in the table below. This site information is described in the *Slip 6 Summary of Existing Information and Identification of Data Gaps Report* (E & E 2008).

Facility Summary: Former Rhône-Poulenc Site	
Address	9229 East Marginal Way South
Property Owner	Container Properties (West Parcel) Museum of Flight (East Parcel)
Property Leasee	IAAI (West Parcel)
Tax Parcel No.	5422600010 (West Parcel) 5422600020 (East Parcel)
Parcel Size	13.15 acres (West Parcel) 6.47 acres (East Parcel)
Facility/Site ID	2150
EPA ID No.	WAD009282302
NPDES Permit No.	SO3008681A (West Parcel)
UST/LUST ID No.	Not Listed
Listed on CSCSL	Yes
TRI No.	98108RHNPL9229E
KCIWP	7789-01 (West Parcel)

3.3.2 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 including caustic soda, toluene, mineral oil, PCBs, and copper occurred at the site. The investigations have followed the RCRA process from an initial RCRA Facility Assessment (RFA) through the RCRA Facility Investigation (RFI).

Studies completed after 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 14.

Soil and groundwater sample results were not compared to the SQS- and CSL-based soil-to-sediment and groundwater-to sediment screening tool (SAIC 2006a), because site-specific cleanup levels have been developed by EPA as part of the RCRA corrective action. The COCs for the site were determined by EPA through several environmental investigations at the site. The COCs for the site are toluene, from use as a solvent in the vanillin process, copper from metal sludge and autoclave solids, and elevated pH in groundwater due to caustic releases. Toluene-affected groundwater is limited primarily to the southwest portion of the site. Copper-affected groundwater and elevated groundwater pH are limited to the west side and southwest corner of the site, based on historical data. Other potential COCs include PAHs, methylene chloride, benzene, arsenic, chromium, lead, mercury, nickel, vanadium, and SVOCs (Geomatrix 2007b).

Several environmental investigations and cleanup activities were conducted at the former Rhône-Poulenc site before the subdivision. These investigations, including analytical results and figures, are described in the *Slip 6 Summary of Existing Information and Identification of Data Gaps Report* (E & E 2008) and summarized below.

In 1990, EPA performed an RFA that determined that hazardous wastes and/or hazardous constituents had been released to the soil and groundwater from various activities during operations at the site. These activities included but were not limited to pipeline and tank leaks of toluene and caustics, disposal of autoclave scale and other waste materials, and use of waste vanillin black liquor solids for weed control on the shoreline banks (EPA 2006a).

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

Based on these investigations, an HCIM was required by EPA in 2000 to stop ongoing releases of hazardous constituents to the LDW. Construction of this interim measure, including 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 2006a).

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) and two separate PCB removal actions (1995, 2006; EPA 2006a).

The sections below describe the environmental investigation and redevelopment activities that have occurred on the East and West parcels.

3.3.3 East Parcel

In 2006, substantial soil characterization and removal was conducted on the East Parcel in preparation for redevelopment. These investigations and cleanup activities achieved interim soil cleanup levels in the eastern portion of the site (Figure 15). The site was subsequently sold to the Museum of Flight. Although both parcels were part of the former Rhône-Poulenc facility under the order, the East Parcel was not extensively used for chemical processing and 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 2006a).

Extensive investigation and removals were conducted for the East Parcel. Investigations included the *East Parcel Soil Characterization and Voluntary Interim Measure Report* (Geomatrix 2006a), the *East Parcel Corrective Measures Study* (Geomatrix 2006b), and the *Revised East Parcel Corrective Measures Implementation Work Plan* (Geomatrix 2008). These investigations, including analytical results and figures, are described in the *Slip 6 Summary of Existing Information and Identification of Data Gaps* (E & E 2008) and summarized below.

Results of the soil characterization in 2006 indicated a limited extent of soil that had elevated concentrations of copper, carcinogenic polycyclic aromatic hydrocarbons (cPAHs), PCBs, and toluene. Following the soil characterization, the corrective measures study recommended that source area excavation and removal be selected as a final remedy. The Respondents conducted the source removal voluntarily to expedite sale and redevelopment. Removal of the contaminated soil and the post-excavation confirmation sampling demonstrated 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 (Figure 13) (EPA 2006a).

EPA evaluated the effectiveness of the source removal and determined that this action was sufficient. EPA selected source removal as the final remedy and simultaneously issued a partial determination that corrective action is complete without controls on the East Parcel (EPA 2006a).

The Statement of Basis documents EPA's rationale for proposing source area excavation and removal as the final remedy for the East Parcel (EPA 2006a). 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.

Groundwater

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 2006a). 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 concentrations above the cleanup level (1.0 mg/L). To remediate the remaining toluene-affected groundwater, the Revised East Parcel Corrective Measures Implementation Work Plan includes installation of biosparge wells, an air injection compressor, vent wells, a vacuum pump, and monitoring wells. It is anticipated that this enhanced bioremediation program will attain the final groundwater cleanup standard for toluene within three to six months (Geomatrix 2008).

3.3.4 West Parcel

The West Parcel 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. Preparing the property for lease and redevelopment required extensive work.

Specifically, investigations included the *West Parcel Redevelopment Report* (Geomatrix 2007c), the *Waste Removal Report* (Geomatrix 2007d), the *Northwest Corner Soil Removal Report* (Geomatrix 2007a), and the *Voluntary Interim Measure Report, Hazardous Waste Storage Area and Transformer A Area Cleanup* (Geomatrix 2006c). These investigations, including analytical results and figures, are described in the *Slip 6 Summary of Existing Information and Identification of Data Gaps Report* (E & E 2008) and summarized below.

In 2006, 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 (Figure 15) (Geomatrix 2007c).

During redevelopment, all structures on the East and West parcels were demolished except the new pretreatment system building. Known hazardous building components and waste materials were removed prior to demolition of each structure. Bearing walls were removed to the foundation. Railroad tracks and ties, including buried track, were removed to 2 feet below grade on the West Parcel. In addition, waste material and waste-containing structures were discovered during redevelopment activities and were removed (Geomatrix 2007c).

During demolition for the redevelopment of the site in 2006, an oil spill in the Transformer A Area and suspected waste materials near the former Hazardous Waste Storage Area were discovered. At the Transformer A Area, TPH-D was detected in soil at concentrations exceeding the preliminary remediation goal (PRG). The transformer was drained and soil was removed for off-site disposal. A final confirmation soil sample indicated that TPH-D was detected at 1,200 mg/kg, which is below the PRG for TPH-D and that TPH-O was not detected (Geomatrix 2006c).

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 were collected. Detected PCBs did not exceed the PRG in any of the samples. Total petroleum hydrocarbons (TPH), SVOCs, and metals were detected in all three samples. The contaminated liquid in the catch basin was vacuumed out and soil from around the top of the concrete catch basin was removed. All waste materials were disposed of at an authorized offsite facility, and the sump was backfilled with clean soil inside the barrier wall (Geomatrix 2006c).

In 2006, the Northwest Corner Soil Removal was conducted because soil sampling data from the RFI identified an area with elevated copper concentrations that could release the contaminant to the sensitive habitat along the LDW. Soil outside of the interim measure barrier wall was removed at the northwest corner of the site (Geomatrix 2007a).

The objective of the Northwest Corner Soil Removal was to further define the area of contamination and remove the surface 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, 42 soil samples were collected using a multi-incremental sampling approach within an area 55 feet long by 20 feet wide. Samples were collected at depths of 0.5 to 1.0 feet (Surface 1), 2.0 to 3.0 feet (Surface 2), and 5.0 to 6.0 feet (Surface 3) 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 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 PCP concentration of 550 μg/kg was detected above the MTCA Method C industrial cleanup level of 270.2 μg/kg (Geomatrix 2007a).

Based on the sampling results, soil to a depth of 5 feet was identified for removal. Soil to a depth of 2 feet was excavated and disposed of at an off-site landfill. Soil from 2 feet to 5 feet was excavated and used as fill within areas of the West Parcel with known contamination that is enclosed by the subsurface barrier wall. 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 onto the former PACCAR site. 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).

Following redevelopment, 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 was completed, monitoring wells were raised to the finish grade and repaired as necessary (Geomatrix 2007c).

Stormwater

The stormwater drainage system comprises catch basins, storm drain lines, and a stormwater treatment vault with a Stormfilter unit containing individual cartridge-type units with a range of filtering abilities. The system was designed to meet requirements of the stormwater general permit. 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 16 (Geomatrix 2007d).

As part of the stormwater general permit, IAAI maintains a SWPPP. In addition, 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. It is unknown whether these measures are sufficient to prevent leakage from damaged vehicles stored on the site from migrating via the stormwater system and discharging to the LDW.

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). Groundwater is extracted from within the barrier wall, pretreated, and then discharged to a private sewer line that connects to the King County sanitary sewer system (Figure 17). 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. Depending on rainfall and LDW levels, from 0 to 30,000 gallons of water are pumped through the system each day. The annual average groundwater flow rate was 8.8 gallons per minute in 2005 (Geomatrix 2007b).

Monthly sampling of the pretreatment system is conducted at the inlet before the filters, between the carbon units, and at the last carbon unit before the effluent discharges to the King County sanitary sewer system. The groundwater pretreatment system was designed to eliminate the potential for spills or slug discharges to the King County sanitary sewer system (Geomatrix 2006d).

The last field inspection was conducted by the KCIWP on May 10, 2007. The system was operating properly and appeared to be well maintained. According to the inspection report (King County 2007a), all effluent samples have been under the method detection limits (MDL). To date, only seven influent samples have indicated toluene concentrations above the MDL. Self-monitoring requirements of the permit include monthly monitoring for benzene, toluene, ethylbenzene, fats, oils, grease, pH, and daily discharge volume. According to the most recent Self-Monitoring Report, dated September 2007, benzene, toluene, ethylbenzene, fats, oils, and grease were under the MDLs and pH was within the parameters of the KCIWP permit (Geomatrix 2007e).

Groundwater

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

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

The HCIM, consisting of a low-permeability barrier wall, groundwater recovery system, and performance monitoring well network, was installed at the site in early 2003. Shown in Figure 17, the HCIM is contained within the West Parcel. The purpose 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 is monitored quarterly. The Round 34 groundwater monitoring report, conducted in December 2006, was the most recent report available for review (Geomatrix 2007f).

The performance monitoring system for the HCIM includes sampling of 16 monitoring wells and one extraction well for the chemical analyses of groundwater. Along the LDW and the Slip 6 inlet, 10 of the monitoring wells are located outside of and downgradient from the barrier wall, and 7 wells are located either inside or upgradient from the containment area (Figure 17). 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).

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 34^{th} 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 the exterior downgradient well DM-8 have decreased from past concentrations of up to 3,900 µg/L in groundwater samples collected before the installation of the HCIM to below the detection limit (0.25 µg/L) 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 East Parcel's Final Media Cleanup Standard for toluene of 1,000 µg/L. This standard was used as a screening level for the West Parcel. A final cleanup level for toluene has not been selected for the West Parcel. The remaining 8 exterior wells were below the detection limit (0.25µg/L).

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 National Recommended Water Quality Criteria (NRWQC), which is 150 µg/L for chronic exposure to arsenic in fresh water.

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.
- 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 NRWQC 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).

Groundwater monitoring has detected vertical downward-directed gradients in the southwest interior monitoring well cluster (MW-51/MW-52). These gradients are not fully explained, and could be due to either 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 leak. However, if there is a leak in the barrier wall, the leakage would be directed inward toward the extraction wells (Geomatrix 2007b).

Bank Erosion/Leaching

Historically, waste vanillin black liquor solids and metal wastes were applied to the shoreline banks for weed control (EPA 1993). As a result, soil and groundwater in the shoreline banks are contaminated.

3.3.5 Potential for Future Release

Historical releases of hazardous substances, including caustic soda, toluene, mineral oil, PCBs, and copper, have resulted in soil and groundwater contamination at the site.

The East and West parcels have been significantly redeveloped through the corrective action and are currently paved. The East Parcel has been issued a partial determination of "Corrective Action Complete Without Controls," excluding the present toluene contamination in the southwest corner of the East Parcel. Soil and groundwater contamination on the West Parcel has been contained within the HCIM as an interim measure, which is effectively reducing the concentrations of contaminants migrating to the LDW.

Historical contamination at the site has the potential to recontaminate Slip 6 sediments via stormwater, groundwater, and bank erosion and leaching. Potential contaminant sources include:

- **IAAI Operations:** IAAI now has a SWPPP and is in compliance with its stormwater general permit. 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 is unknown if this plan and monitoring are sufficient to prevent contamination from upland sources (such as potential fuel leaks from damaged vehicles) from migrating to Slip 6 sediments via the stormwater system.
- **Groundwater Contamination (East Parcel):** Elevated concentrations of toluene are present in groundwater in the southwest corner of the East Parcel. This groundwater contamination is located outside the HCIM of the West Parcel and adjacent to the shoreline of the Slip 6 inlet and therefore presents an on-going source of contamination to the LDW.
- **Groundwater Contamination (West Parcel):** Copper contamination is present above cleanup levels in groundwater outside the barrier wall. It is most likely due to contamination before the barrier wall was installed, but it may also be due to a potential leak in the barrier wall. This copper contamination presents an on-going source of contamination to the LDW.
- **Historical Contamination (shoreline bank):** Historically, waste vanillin black liquor solids and metal wastes were applied to the shoreline banks for weed control, resulting in soil and groundwater contamination. Because the shoreline banks are unarmored and frequently inundated by tidal and seasonal fluctuations of the LDW water level, erosion

and leaching of the shoreline banks presents an on-going source of contamination to the LDW.

3.3.6 Source Control Actions

Various contaminants have been detected in soil and groundwater and in the sediments adjacent to the site as a result of historical operations of the former vanillin plant and releases of contaminants.

The following source control actions will be conducted:

- The Respondents and EPA are currently addressing the toluene groundwater contamination in the southwest corner of the East Parcel, in accordance with the Revised East Parcel Corrective Measures Implementation Work Plan.
- The Respondents and EPA will continue to monitor the effectiveness of the HCIM and investigate the presence of elevated copper concentrations in groundwater outside the barrier wall and the potential leak in the barrier wall.
- The Respondents and EPA will investigate and address contamination in the shoreline banks from historical site operations and releases (e.g., application of vanillin black liquor solids to the shoreline bank for weed control).
- Ecology and IAAI will review the current SWPPP and Operations and Maintenance Plan to prevent contamination from upland sources (such as potential fuel leaks from damaged vehicles) from migrating to Slip 6 sediments via the stormwater system.
- IAAI will continue monitoring stormwater in accordance with the Industrial Stormwater General Permit.
- King County will continue to oversee and conduct pretreatment inspections of this site through the Industrial Waste Program.

3.4 King County International Airport

3.4.1 Facility Summary

The KCIA is a general aviation airport, owned and operated by King County as a public utility. The facility is approximately 615 acres, 435 of which are impervious surfaces covered by buildings and paved areas. The remaining 180 acres consists of grass and landscaped areas. The KCIA is located approximately one-quarter mile from the eastern shoreline of the LDW.

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

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).

Approximately 80 acres of the KCIA are within the Slip 6 drainage basin and discharge stormwater to the LDW. This area is part of Parcel 2824049007, with a listed address of 6505 Perimeter Road South. A map of KCIA indicates the only buildings within the Slip 6 drainage basin are the airport office center, general aviation buildings, and general aviation hangers (Figure 18; KCIA 2007a). This report focuses on the portion of the KCIA within the Slip 6 drainage basin. Information on the KCIA related to other source control areas may be found in the *Lower Duwamish Waterway, Early Action Area 7 Source Control Action Plan* (Ecology 2007a), *Lower Duwamish Waterway Early Action Area 4 Source Control Action Plan* (Ecology 2007b), *Lower Duwamish Waterway Early Action Area 3 Source Control Action Plan* (Ecology 2006b), and *Lower Duwamish Waterway Early Action Area 6 Source Control Action Plan* that is planned for publication at a later time.

Site information from Ecology, EPA, and King County online databases and permits is summarized in the table below. This site information is described in the *Slip 6 Summary of Existing Information and Identification of Data Gaps Report* (E & E 2008).

Facility Summary: King County International Airport	
Address	6505 Perimeter Road South
Property Owner	King County
Tax Parcel No.	2824049007
Parcel Size	564.77 acres
Facility/Site ID	2387398 (KCIA)
EPA ID No.	WAH000031371 (inactive)
NPDES Permit Nos.	WAR04-4501 (Municipal Phase I Permit) SO3000343D (Industrial Stormwater General Permit for maintenance, equipment cleaning, and de-icing Operations areas only)
UST/LUST ID No.	Not Listed
Listed on CSCSL	Not Listed
TRI No.	Not Listed
KCIWP No.	N/A

Stormwater

There are approximately 15 miles of drainage pipe in the KCIA stormwater drainage system and five drainage basins (Figure 19). There are several off-site stormwater sources that connect with 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 to drainage basins 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).

The portion of KCIA that is within the Slip 6 drainage basin is referred to as "Drainage Area 3" as shown on CAD files provided by KCIA (Figure 19). Drainage Area 3 contributes stormwater from the KCIA stormwater system at a connection point to the King County storm drain that crosses the former PACCAR site and former Rhône-Poulenc site before discharging into the Slip 6 inlet at the King County Outfall (Figure 5 and Figure 19) (KCIA 2007b).

The KCIA stormwater system is complex and includes stormwater from non-KCIA-owned facilities, including the MOF. In addition, a 24-inch storm drain contributes stormwater from an unknown area outside the KCIA to the KCIA stormwater system. The area of the stormwater collection and the amount of stormwater this storm drain line collects and contributes to the KCIA stormwater system are currently unknown. For this reason, the potential impact from the KCIA stormwater system discharge to Slip 6 sediments is unknown.

Within the Slip 6 source control area, the KCIA implements stormwater management requirements in accordance with King County's Phase I Municipal Stormwater Permit, King County Stormwater Management Plan, and the Airport Work Plan. Relevant requirements include source control inspections of KCIA tenants, system mapping, stormwater infrastructure inspections and maintenance, and implementing procedures and policies to reduce stormwater pollutants from lands owned or maintained by KCIA. Semi-annually, the airport has been cleaning out accumulated solids from each stormwater catch basin at the airport. Each oil/water separator is cleaned annually, or more frequently, if there are any accumulations noted during weekly inspections (SAIC 2006b).

The KCIA Industrial Stormwater General Permit addresses the airport maintenance facilities and industrial activities such as de-icing and wash pad facilities. The SE Airpark Wash Pad/De-Icing Station is located in drainage basin 3; however, it does not discharge to the stormwater system. Instead, it is plumbed to the sanitary sewer and authorized under a King County Industrial Waste discharge authorization (DA 550-02).

During storm events, this portion of the KCIA stormwater system could discharge an unknown quantity of stormwater to another source control area, outside of the Slip 6 source control area, via the Michigan Street CSO system. Source control actions for this CSO system will be discussed in the *Lower Duwamish Waterway, RM 1.7 to 2.0 East, Source Control Action Plan*, which was not published at the time this SCAP was written.

3.4.2 Environmental Investigations and Cleanup Activities

There have been no environmental investigations or cleanup activities for the area of KCIA within the Slip 6 source control area. The portion of the KCIA with USTs and above ground storage tanks is outside of the Slip 6 source control area. Areas of KCIA with cleanups for soil and groundwater contamination are also outside of the Slip 6 source control area (SAIC 2006b).

In 2001 and 2005, KCIA sampled storm drain solids in catch basins and pavement joint caulk material in the KCIA area for potential PCB contamination. This investigation was conducted within the EAA-4 source control area, outside of the Slip 6 source control area, but the findings may be relevant to areas within the Slip 6 source control area. One joint caulk sample had concentrations of PCBs that exceeded the MTCA Method A cleanup level of 1 mg/kg. Details of this investigation are summarized in the *Lower Duwamish Waterway Early Action Area 4 Source Control Action Plan* (E & E 2007b).

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

To date, there have been no joint caulk samples collected and analyzed for PCBs from the portion of KCIA within the Slip 6 source control area.

3.4.3 Potential for Future Releases

Activities at the KCIA have the potential to release contaminants to Slip 6 sediments via stormwater. There is no known soil or groundwater contamination within this area of KCIA. Potential contaminant sources include the following:

- **Stormwater:**
  The KCIA stormwater system is complex and not well understood. The KCIA stormwater system collects stormwater from KCIA, KCIA-leased properties, non-KCIA-owned facilities such as the MOF, and unknown areas outside the KCIA. For this reason, the size and location of the drainage area and identity of facilities within the drainage area that currently contributes to the KCIA stormwater system are unknown. No stormwater or storm drain solids investigations or monitoring have been conducted for this portion of KCIA. Because of these uncertainties, the KCIA stormwater system has the potential to release contaminants to Slip 6 sediments.
- **PCB-Containing Joint Caulk Material:**
  PCB-containing joint caulk material has been found in other parts of the KCIA, including North Boeing Field and the portion of KCIA within EAA-4. Further investigation of joint caulk material is necessary to determine if similar PCB contamination is present within this portion of the KCIA and potentially migrating to Slip 6 sediments via the stormwater system.
- **Airport Operations:**
  Airport activities, including de-icing aircraft, fueling operations, and maintenance of aircraft and vehicles, could present a source of contamination to Slip 6 sediments via the stormwater pathway. Because representative stormwater discharge data has not been

collected from the KCIA, it is not known whether existing airport operations present a recontamination threat to Slip 6 sediments.

3.4.4 Source Control Actions

The following source control actions will be conducted:

- Ecology and KCIA will evaluate the "Drainage Area 3" stormwater system infrastructure of the KCIA stormwater system that discharges to the LDW via the King County stormwater line to determine if stormwater and/or storm drain solids monitoring is necessary.
- Ecology, King County, and KCIA will review and modify, as necessary, the stormwater management activities performed in accordance with applicable NPDES permits to prevent contaminants from entering the KCIA stormwater system.
- KCIA will continue to assess and, as necessary, modify all tenant and airport pollutant prevention measures located within Drainage Basin #3 and within the rest of the KCIA.
- KCIA will determine if PCBs are present in joint caulk material within this portion of the airport and conduct a removal if necessary.

3.5 Museum of Flight

3.5.1 Facility Summary

The MOF includes two properties, located to the east and west, respectively, of East Marginal Way (Figures 2 and 20). Both properties are owned by the MOF; however, the property to the west of East Marginal Way was formerly owned by Boeing. For the purpose of this report, the two properties will be referred to as the MOF property (Parcel 3324049019) and the former BDC property (Parcel 5624201034).

The MOF property was first developed around 1925 as a service station, located immediately north of the intersection of Purcell Avenue and East Marginal Way South (GeoEngineers 2001a). Until the early 1980s, multiple generations of service stations, a tire store, and a café operated on the property. In 1983, the museum opened to the public (MOF 2008).

The former BDC property (also known as Gate J-28 in the Boeing documents) was historically divided into three lots (lots 66, 67, and 68). Prior to 1918, the property was used for agricultural purposes. N.C. Jannsen Drilling Company owned Lot 66 from approximately 1926 to 1953. The Purox Company occupied Lot 67 around 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). The property was sold to the MOF in 2002 (King County 2007b).

Site information from Ecology, EPA, and King County online databases and permits is summarized in the table below. This site information is described in the *Slip 6 Summary of Existing Information and Identification of Data Gaps Report* (E & E 2008).

Facility Summary: Museum of Flight	
Address	9404 East Marginal Way South (MOF) Not Listed (Former BDC Property)
Property Owner	Museum of Flight
Tax Parcel No./size	3324049019/11.44 acres (MOF) 5624201034/5.48 acres (Former BDC Property)
Facility/Site ID	98798343 (MOF)
EPA ID No.	N/A
NPDES Permit No.	N/A
UST/LUST ID No.	583716 (MOF)
Listed on CSCSL	Not Listed
TRI No.	N/A
KCIWP	N/A

Stormwater

According to maps of the KCIA stormwater drainage system, it appears that stormwater from the MOF property discharges to the KCIA system (Figure 19). Stormwater is collected by a conventional stormwater system with catch basins and associated storm drain lines. King County will address stormwater discharges from MOF into the KCIA stormwater system, as necessary under their Phase I Municipal Stormwater Permit. No other stormwater maps or SWPPP were found for the MOF property during file review. The KCIA stormwater drainage system is discussed in Section 3.4.1.

The stormwater drainage system of the former BDC property is part of the original stormwater system of the entire BDC property. Stormwater is collected by a conventional stormwater system with catch basins and associated storm drain lines. The stormwater drains from this property and discharges to the Slip 6 inlet at outfall DC15, located on the current BDC property (Figure 21). This outfall has an in-line oil/water separator installed in the storm drain line.

3.5.2 Environmental Investigations and Cleanup Activities

There have been few environmental investigations conducted at the MOF property and the former BDC property. These investigations, including analytical results and figures, are described in the *Slip 6 Summary of Existing Information and Identification of Data Gaps Report* (E & E 2008) and summarized in the subsections below.

3.5.2.1 Museum of Flight (Parcel 3324049019)

In 2001, a Phase I/II Environmental Site Assessment (ESA) indicated the presence of approximately 10 USTs and also located areas of soil and groundwater contamination. This investigation reported that two USTs associated with the service stations were previously removed from the area immediately north of the former Purcell Avenue during construction of the museum's Great Gallery (depicted in Figure 22). Reportedly, there was no physical evidence of petroleum contamination during this historical UST removal; however, no soil samples were collected for chemical analysis (GeoEngineers 2001a).

The Phase I/II ESA conducted soil borings at 13 locations, ranging between 12 to 20 feet bgs (Geomatrix 2001a). The results of this investigation were analyzed in 2001, but have been compared to current MTCA Method A industrial cleanup levels for soil and groundwater. Results indicated that one or more benzene, toluene, ethylbenzene, and xylene (BTEX) compounds and/or gasoline-range petroleum hydrocarbons were detected in soil samples from three boring locations at concentrations that exceeded MTCA Method A industrial cleanup levels. Groundwater samples collected at two locations had BTEX compounds and gasoline-range petroleum hydrocarbons that were detected at concentrations that exceed MTCA Method A cleanup levels (Figures 22 and 23) (GeoEngineers 2001a).

At the time, the MOF had planned to expand its facility to the north and the west. GeoEngineers recommended that the USTs and contaminated soil be removed and 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 remove the USTs or to address soil or groundwater contamination.

On October 14, 2004, SPU conducted an inspection at the MOF through the Joint Inspection Program. 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 in compliance, and SPU did not require further action at the MOF.

No additional data regarding stormwater lines were found in the reviewed files. It is unknown if the stormwater lines are located within the areas of known groundwater and soil contamination.

3.5.2.2 Former BDC Property (Parcel 5624201034)

In 2001, a Phase II ESA was completed on the former BDC property prior to transferring the property to MOF. During this investigation, soil and groundwater samples were analyzed for petroleum hydrocarbons, VOCs, PAHs, and RCRA metals. Oil-range petroleum hydrocarbons were detected in one soil sample at a concentration that exceeded the MTCA Method A cleanup level in effect at the time of the Phase II ESA. However, this concentration (490 mg/kg) does not exceed the current MTCA Method A cleanup level of 2,000 mg/kg. One groundwater sample, in the southeastern corner of the property (B-10), exceeded the current MTCA Method A cleanup level of 500 μg/L for diesel-range petroleum hydrocarbons (GeoEngineers 2001b).

Results of this investigation indicated that the potential for subsurface contamination from hazardous substances at the facility was low, with the exception of the diesel-range petroleum hydrocarbon concentration in the groundwater sample collected from soil boring B-10, located in the southeastern corner of the property. Further groundwater monitoring was recommended (GeoEngineers 2001b).

A subsequent groundwater investigation was initiated in 2001, including installation of wells DC-MW-7 and DC-MW-8.

In 2001, Ecology determined that 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 the 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.

Diesel-range and gasoline-range petroleum hydrocarbons were detected in the groundwater from the upgradient well, DC-MW-9, during each of two semiannual monitoring events conducted in 2003 and 2004 (Figure 20). The monitoring report states that water samples from DC-MW-9 contained gasoline-range and diesel-range petroleum hydrocarbon concentrations that exceeded the current MTCA Method A groundwater cleanup levels of 0.8 mg/L and 0.5 mg/L, respectively. Groundwater results from the downgradient well, DC-MW-7, and the cross-gradient well, DC-MW-8, 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 11 monitoring events suggested that the petroleum hydrocarbon concentrations at DC-MW-9 were stable and would not likely decrease until the source was removed. Boeing recommended discontinuing further groundwater monitoring until the off-site source of petroleum hydrocarbons could be identified and remediated. Groundwater flow during the most recent monitoring event was to the west-southwest (Landau 2004). The Slip 6 inlet is located to the northwest of DC-MW-9 (Figure 20).

There is known groundwater and soil contamination present on the MOF property, which is located adjacent to and upgradient from the former BDC property. This contamination could be the source of groundwater contamination on the former BDC property.

3.5.3 Potential for Future Release

Soil and groundwater contamination is present on the MOF property and groundwater contamination is present on the former BDC property. This contamination may have the potential to impact Slip 6 sediments via infiltration to the stormwater drainage system. Potential contaminant sources include the following:

- **Soil and Groundwater Contamination (MOF Parcel 3324049019):** Soil and groundwater contamination associated with USTs is present at concentrations exceeding MTCA Method A industrial cleanup levels. It is unknown if this contamination is migrating via the groundwater to adjacent properties or if stormwater lines are located within areas of soil and groundwater contamination.

- **Groundwater Contamination (former BDC Parcel 5624201034):** Groundwater contamination, consisting of diesel-range and gasoline-range petroleum hydrocarbons, is present. However, it is currently unknown if this groundwater contamination is migrating and could impact Slip 6 sediments. The extent and source of the groundwater plume is unknown. It is also unknown whether stormwater lines are located within the areas of groundwater contamination.

3.5.4 Recommended Source Control Actions

The following source control actions will be conducted:

- Ecology and MOF will monitor stormwater and/or storm drain solids at the MOF property (Parcel 3324049019) and the former BDC property (Parcel 5624201034) in the vicinity of the USTs and associated groundwater contamination.
- Ecology and MOF will develop a plan to remove USTs and associated soil and groundwater contamination located on the MOF property.
- Ecology and MOF will identify the source and extent of groundwater contamination on the former BDC property, and conduct remedial actions, as necessary.

3.6 Boeing Developmental Center

3.6.1 Facility Summary

The BDC is located on the eastern shoreline of the LDW from approximately RM 4.2 to 5.0 and lies within three separate source control areas. The portion of the BDC within the Slip 6 drainage basin is located from RM 4.2 to 4.3 with the Slip 6 inlet to the north (Figures 2 and 24). Although information for the entire BDC was reviewed, only information for the portion of the BDC within the Slip 6 drainage basin is discussed in this report. Information on the BDC related to other source control areas may be found in the *Early Action Area 7 Source Control Action Plan* (Ecology 2007a), and in the *RM 4.3 to 4.8 East Source Control Action Plan* that has not yet been published.

Currently, 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).

The earliest known use of 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 well documented. The Monsanto Fund purchased the northern 38 acres of the BDC at an unknown time and leased portions of the property. The area included warehouse and office buildings, winery buildings, the granary, Dallas-Mavis (a trucking company), and the Slip 6 inlet. 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 the Slip 6 inlet and intended to develop the slip as a marina. However, those plans never materialized and the Port of Seattle sold the property to Boeing in 1985 (SAIC 1994).

Boeing has operated on portions of this property continuously since 1956. Prior to 1980, the Military Airplane Company Division (which later became known as the Military Flight Center (MFC)) 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).

Site information from Ecology, EPA, and King County online databases and permits is summarized in the table below. This site information is described in the *Slip 6 Summary of Existing Information and Identification of Data Gaps Report* (E & E 2008).

Facility Summary: Boeing Development Center	
Address	9725 East Marginal Way South
Property Owner	The Boeing Company
Tax Parcel No. (Parcel Size)	5624201032 (25.78 acres) 5624201038 (3.78 acres) 5624201036 (1.63 acres)
Facility/Site ID	2101
EPA ID No.	WAD093639946
NPDES Permit No.	SO3000146D
UST/LUST ID No.	10408
Listed on CSCSL	Yes
TRI No.	98108BNGDV9725E
KCIWP	526-04

Stormwater

Stormwater from the BDC flows into catch basins within the property and discharges 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 21. Both outfalls have in-line oil/water separators. These outfalls are described in the *Slip 6, Summary of Existing Information and Identification of Data Gaps Report* (E & E 2008). Information on the other 16 outfalls at the BDC may be found in the *Early Action*

Area 7 Source Control Action Plan (Ecology 2007a), and in the *RM 4.3 to 4.8 East Source Control Action Plan* that has not yet been published.

The stormwater system at the BDC is operated under Industrial Stormwater General Permit No. SO3000146D. The permit was recently renewed and expires in June 2013. Parameters for this permit include pH (minimum of 6.0 and maximum of 9.0 standard pH units), oil/grease (15 mg/L), turbidity (25 ntu), copper (63.3 µg/L), lead (81.6 µg/L), and zinc (117 µg/L) (Ecology 2007b). Boeing maintains a SWPPP for the BDC.

The facility has been issued 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 the 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.

3.6.2 Environmental Investigations and Cleanup Activities

There has been one environmental investigation at the BDC for stormwater. There was no information found that indicated a concern for groundwater contamination or soil contamination in the shoreline bank area that could pose a threat to Slip 6 sediments.

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 outfalls located within Slip 6 (DC14 and DC15). Two of the 11 sediment/sludge samples had concentrations of detected total PCBs; however, both sampling locations were located outside of the Slip 6 source control area. The source of these PCBs is unknown (Boeing 2003a).

USTs

According to Ecology's online UST database, the BDC had 11 USTs at the facility. Four of these USTs are listed as removed, one as closed in-place, three as exempt, and three as operational and containing diesel fuel or unleaded gasoline. According to the SWPPP (Boeing 2003b), two tanks (which contain 550 gallons of diesel fuel and 1,100 gallons of unleaded gas, respectively) are located near building 9-52, which is outside of the Slip 6 drainage basin. It is unknown if the other USTs are located on the portion of the BDC within the Slip 6 source control area.

3.6.3 Potential for Future Release

No contamination has been documented on the portion of the BDC within the Slip 6 source control area. However, potential sources or migration of contaminants via stormwater and/or groundwater from this portion of the BDC to Slip 6 sediments cannot presently be ruled out. Potential contaminant sources include the following:

- **Stormwater Discharge:** The two outfalls to the LDW within the Slip 6 source control area (DC14 and DC15) were not sampled. It is currently unknown whether stormwater and storm drain solids may present a potential source of contamination to Slip 6 sediments.
- **Potential Soil and Groundwater Contamination:** It is unknown whether any USTs are located within the Slip 6 source control area and if these USTs may present a potential source of contamination to soil and/or groundwater.

3.6.4 Source Control Actions

The following source control actions will be conducted:

- Boeing and Ecology will conduct stormwater and/or storm drain solids monitoring for outfalls DC14 and DC15.
- Ecology's Water Quality Program will continue to administer, review, and update NPDES permits as needed.
- Boeing will investigate UST locations to determine whether any USTs are located within the Slip 6 source control area and whether any USTs represent a source of contamination to soil and/or groundwater.
- Boeing and Ecology will review the current SWPPP and make changes and additions necessary to prevent contaminants from entering the BDC stormwater system.
- King County will continue to oversee and conduct pretreatment inspections of this site through the Industrial Waste Program.

3.7 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 properties within the Slip 6 source control area have current operations with known point source emissions of air pollution that may contribute contaminants to Slip 6 source control area sediments. Air traffic at KCIA may result in significant emissions, but this pertains to the entire airfield operations and lies outside 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 recommend 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 (Ecology 2008b).

Out of concern for phthalate recontamination at sediment cleanup sites in the larger Puget Sound region, the Sediment Phthalates Work Group was formed in 2006. One accomplishment of this work group was reviewing existing information to explore the potential for phthalate recontamination via atmospheric pathways. The group concluded that phthalates reach sediments via a complex pathway involving off-gassing to air followed by attachment to particulates, deposition to the ground, and transport to sediments through stormwater (Sediment Phthalates Work Group 2007).

King County conducted atmospheric deposition sampling in the LDW area to assess whether atmospheric deposition is a potential source of phthalates and selected PAHs and PCBs (KCDNRP 2008).

Based on comparison to results from other atmospheric deposition networks that employed high-volume air sampling techniques to collect gaseous and particulate phase air samples, the total deposition results from this study are likely to be biased low for the lighter phthalates, low- to mid-range PAH compounds, and low- to mid-range PCB congeners. Because side-by-side comparison sampling of the passive atmospheric deposition samplers with high-volume air samplers was not conducted, it is not possible to assess the degree of bias (KCDNRP 2008).

The sampling stations were located at Beacon Hill, Duwamish Valley, Georgetown, KCIA, and South Park Community Center. The following range of atmospheric deposition flux values was observed (KCDNRP 2008):

Analyte	Range of Air Deposition Flux (μg/m^2/day)	Location of Highest Values
Butyl benzyl phthalate	0.163 to 7.007	South Park
Bis(2-ethylhexyl)phthalate	0.261 to 12.240	Duwamish Valley
Benzo(a)pyrene	0.008 to 2.225	KCIA
Pyrene	0.035 to 4.652	KCIA
Aroclor 1254	<0.011 to 0.044	Georgetown
Aroclor 1260	<0.011 to 0.034	Georgetown

Detailed results are provided in King County's *Monitoring Report – October 2005 to April 2007* (KCDNRP 2008).

3.7.1 Source Control Actions

Atmospheric deposition should be further evaluated to assess whether it is a potential source of phthalates (particularly BEHP) and other contaminants, such as PCBs, in stormwater discharge. However, at this time, there are no available resources to address this issue.

Because air pollution is a concern for the greater Puget Sound region, Ecology is planning to review atmospheric deposition work being conducted by and/or planned by the Phthalate Work Group, the Washington State Department of Health, and the Puget Sound Partnership. Based on their actions or recommendations, the LDW source control team will develop options for addressing air pollution.

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4.0 Monitoring

Monitoring efforts by SPU, Ecology, KCIWP, and Puget Sound Clean Air Agency will continue to assist in identifying and tracing ongoing sources of COCs present in LDW sediments or in upland media. This information will be used to focus source control efforts on specific problem areas within the Slip 6 source control area and to track the progress of the source control program. The following types of samples will continue to be collected:

- in-line storm drain solids trap samples from storm drain systems,
- on-site catch basin solids samples, and
- soil and groundwater samples as necessary.

If monitoring data indicate that additional sources of sediment recontamination are present, then Ecology will identify additional source control activities as appropriate.

Because source control is an iterative process, monitoring is necessary to identify trends in concentrations of COCs. Monitoring is anticipated to continue for some years. Any decisions to discontinue monitoring will be made jointly by Ecology and EPA, based on the evidence. At this time, Ecology plans to review the progress and data associated with the source control action items for each SCAP annually, and this information will be updated in the Source Control Status Report, which is scheduled for publication twice a year. In addition, Ecology may prepare Technical Memoranda to update the SCAPs, as needed.

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5.0 Tracking and Reporting of Source Control Activities

Ecology is the lead for tracking, documenting, and reporting the status of source control to EPA and the public. Each agency performing source control work will document its source control activities and provide regular updates to Ecology. Ecology will update information in the SCAPs in the Source Control Status Reports that are published twice a year.

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Tables

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Table 1
Chemicals Above Screening Levels in Surface Sediment
Slip 6 Source Control Area

Sampling Event	Sample Location	River Mile	Year	Chemical	Concentration (mg/kg DW)		TOC (% DW)	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
Metals													
LDW RI - Round1	LDW-SS121	3.9	2005	Lead	533		1.86		450	530	mg/kg dw	1.2	1
PAHs													
EPA SI	DR176	4.2	1998	Acenaphthene	1.2		2.62	46	16	57	mg/kg OC	2.9	0.81
Boeing SiteChar	R44	4.2	1997	Acenaphthene	0.59		2.4	25	16	57	mg/kg OC	1.6	0.44
RhônePoulenc2004	SB-1	4.2	2004	Benzo(g,h,i)perylene	1.1		2.72	40	31	78	mg/kg OC	1.3	0.51
RhônePoulenc2004	SB-1	4.2	2004	Dibenzo(a,h)anthracene	0.7	J	2.72	26	12	33	mg/kg OC	2.2	0.79
RhônePoulenc2004	SB-12	4.1	2004	Dibenzo(a,h)anthracene	0.42	J	1.61	26	12	33	mg/kg OC	2.2	0.79
RhônePoulenc2004	SB-3	4.2	2004	Dibenzo(a,h)anthracene	0.63	J	2.72	23	12	33	mg/kg OC	1.9	0.7
RhônePoulenc2004	SB-4	4.2	2004	Dibenzo(a,h)anthracene	0.46	J	3.17	15	12	33	mg/kg OC	1.3	0.45
RhônePoulenc2004	SB-5	4.2	2004	Dibenzo(a,h)anthracene	0.46	J			230	540	ug/kg dw	2	0.85
RhônePoulenc2004	SB-8	4.2	2004	Dibenzo(a,h)anthracene	0.44	J	2.87	15	12	33	mg/kg OC	1.3	0.45
EPA SI	DR176	4.2	1998	Dibenzofuran	0.68		2.62	26	15	58	mg/kg OC	1.7	0.45
RhônePoulenc2004	SB-1	4.2	2004	Fluoranthene	4.8		2.72	180	160	1200	mg/kg OC	1.1	0.15
RhônePoulenc2004	SB-12	4.1	2004	Fluoranthene	5.3		1.61	330	160	1200	mg/kg OC	2.1	0.28
EPA SI	DR176	4.2	1998	Fluorene	1		2.62	38	23	79	mg/kg OC	1.7	0.48
RhônePoulenc2004	SB-1	4.2	2004	Indeno(1,2,3-cd)pyrene	1.2		2.72	44	34	88	mg/kg OC	1.3	0.5
RhônePoulenc2004	SB-3	4.2	2004	Indeno(1,2,3-cd)pyrene	0.95		2.72	35	34	88	mg/kg OC	1	0.4
EPA SI	DR176	4.2	1998	Phenanthrene	3.9		2.62	150	100	480	mg/kg OC	1.5	0.31
RhônePoulenc2004	SB-12	4.1	2004	Total HPAH (calc'd)	16.1	J	1.61	1000	960	5300	mg/kg OC	1	0.19
PCBs													
EPA SI	DR236	3.9	1998	PCBs (total calc'd)	0.129		0.85	15	12	65	mg/kg OC	1.3	0.23
NOAA SiteChar	EST143	3.9	1997	PCBs (total calc'd)	0.39		1.38	28	12	65	mg/kg OC	2.3	0.43
NOAA SiteChar	EST145	4	1997	PCBs (total calc'd)	0.17		1.32	13	12	65	mg/kg OC	1.1	0.2
LDW RI - Round1	LDW-SS120	3.9	2005	PCBs (total calc'd)	0.63	J	1.94	32	12	65	mg/kg OC	2.7	0.49
LDW RI - Round1	LDW-SS121	3.9	2005	PCBs (total calc'd)	1.06	J	1.86	57	12	65	mg/kg OC	4.8	0.88
RhônePoulenc2004	SB-5	4.2	2004	PCBs (total calc'd)	0.15				130	1000	ug/kg dw	1.2	0.15
RhônePoulenc2004	SH-05	4.1	2004	PCBs (total calc'd)	1.25		0.279		130	1000	ug/kg dw	9.6	1.3
RhônePoulenc2004	SH-06	4.1	2004	PCBs (total calc'd)	0.094		0.502	19	12	65	mg/kg OC	1.6	0.29
Phthalates													
RhônePoulenc2004	SB-1	4.2	2004	Bis(2-ethylhexyl)phthalate	1.6		2.72	59	47	78	mg/kg OC	1.3	0.76
RhônePoulenc2004	SB-3	4.2	2004	Bis(2-ethylhexyl)phthalate	2.1		2.72	77	47	78	mg/kg OC	1.6	0.99
RhônePoulenc2004	SB-4	4.2	2004	Bis(2-ethylhexyl)phthalate	1.9		3.17	60	47	78	mg/kg OC	1.3	0.77
EPA SI	DR236	3.9	1998	Butyl benzyl phthalate	0.07		0.85	8.2	4.9	64	mg/kg OC	1.7	0.13
LDW RI - Round1	LDW-SS120	3.9	2005	Butyl benzyl phthalate	0.23		1.94	12	4.9	64	mg/kg OC	2.4	0.19
LDW RI - Round1	LDW-SS121	3.9	2005	Butyl benzyl phthalate	0.32		1.86	17	4.9	64	mg/kg OC	3.5	0.27

Table 1
Chemicals Above Screening Levels in Surface Sediment
Slip 6 Source Control Area

Sampling Event	Sample Location	River Mile	Year	Chemical	Concentration (mg/kg DW)		TOC (% DW)	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
Other SVOCs													
RhônePoulenc2004	SB-12	4.1	2004	Benzoic acid	1.3	J	1.61		650	650	ug/kg dw	2	2
RhônePoulenc2004	SB-4	4.2	2004	Benzoic acid	1.9	J	3.17		650	650	ug/kg dw	2.9	2.9
RhônePoulenc2004	SB-8	4.2	2004	Benzoic acid	1.7	J	2.87		650	650	ug/kg dw	2.6	2.6
RhônePoulenc2004	SH-03	4.1	2004	Benzoic acid	0.94	J	0.373		650	650	ug/kg dw	1.4	1.4
RhônePoulenc2004	SH-06	4.1	2004	Benzoic acid	0.84	J	0.502		650	650	ug/kg dw	1.3	1.3
RhônePoulenc2004	SB-3	4.2	2004	Phenol	1.4	J	2.72		420	1200	ug/kg dw	3.3	1.2
RhônePoulenc2004	SB-4	4.2	2004	Phenol	1.4		3.17		420	1200	ug/kg dw	3.3	1.2

Key:
DW - Dry weight
CSL - Cleanup Screening Level
PAH - Polycyclic aromatic hydrocarbon
PCB - Polychlorinated biphenyl
OC - Organic carbon
TOC - Total organic carbon
SQS - Sediment Quality Standard
SVOC - Semivolatile organic compound

Notes:
1. SQS and CSL values are substituted with AET values for dry weight comparison where organic compounds are not OC-normalized (when TOC is outside the range of 0.5-4.0% DW).
2. Exceedance factors are the ratio of the detected concentration to the CSL or SQS (or to AET values where applicable). Exceedance factors are shown only if the SQS exceedance factor is greater than 1.

Source:
Lower Duwamish Waterway Group, 2007. Online Lower Duwamish Waterway Group Draft Remedial Investigation Report (November 2007) Database. http://www.ldwg.org.

Table 2
Chemicals Above Screening Levels in Subsurface Sediment
Slip 6 Source Control Area

Sampling Event	Sample Location	River Mile	Depth Interval (feet)	Sample Year	Chemical	Concentration (mg/kg DW)		TOC (% DW)	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
PAHs														
RhônePoulenc2004	SB-1	4.2	0 to 1	2004	Benzo(g,h,i)perylene	0.86		2.5	34	31	78	mg/kg OC	1.1	0.44
RhônePoulenc2004	SB-1	4.2	0 to 1	2004	Dibenzo(a,h)anthracene	0.63	J	2.5	25	12	33	mg/kg OC	2.1	0.76
RhônePoulenc2004	SB-11	4.2	0 to 1	2004	Dibenzo(a,h)anthracene	0.32	J	2.26	14	12	33	mg/kg OC	1.2	0.42
RhônePoulenc2004	SB-12	4.1	0 to 1	2004	Dibenzo(a,h)anthracene	0.38	J	1.79	21	12	33	mg/kg OC	1.8	0.64
RhônePoulenc2004	SB-13	4	0 to 1	2004	Dibenzo(a,h)anthracene	0.3	J	1.5	20	12	33	mg/kg OC	1.7	0.61
RhônePoulenc2004	SB-2	4.2	0 to 1	2004	Dibenzo(a,h)anthracene	0.38	J	2.32	16	12	33	mg/kg OC	1.3	0.48
RhônePoulenc2004	SB-2	4.2	0 to 1	2004	Dibenzo(a,h)anthracene	0.41	J	2.29	18	12	33	mg/kg OC	1.5	0.55
RhônePoulenc2004	SB-3	4.2	0 to 1	2004	Dibenzo(a,h)anthracene	0.54	J	2.94	18	12	33	mg/kg OC	1.5	0.55
RhônePoulenc2004	SB-4	4.2	0 to 1	2004	Dibenzo(a,h)anthracene	0.49	J	3.44	14	12	33	mg/kg OC	1.2	0.42
RhônePoulenc2004	SB-5	4.2	0 to 1	2004	Dibenzo(a,h)anthracene	0.42	J	2.9	14	12	33	mg/kg OC	1.2	0.42
RhônePoulenc2004	SB-6	4.2	0 to 1	2004	Dibenzo(a,h)anthracene	0.42	J	2.98	14	12	33	mg/kg OC	1.2	0.42
RhônePoulenc2004	SB-7	4.2	0 to 1	2004	Dibenzo(a,h)anthracene	0.41	J	2.92	14	12	33	mg/kg OC	1.2	0.42
RhônePoulenc2004	SB-8	4.2	0 to 1	2004	Dibenzo(a,h)anthracene	0.41	J	2.48	17	12	33	mg/kg OC	1.4	0.52
RhônePoulenc2004	SH-01	4	0 to 1	2004	Dibenzo(a,h)anthracene	0.21	J	0.66	32	12	33	mg/kg OC	2.7	0.97
RhônePoulenc2004	SH-02	4	0 to 1	2004	Dibenzo(a,h)anthracene	0.38	J	1.45	26	12	33	mg/kg OC	2.2	0.79
RhônePoulenc2004	SH-04	4.1	0 to 1	2004	Dibenzo(a,h)anthracene	0.23	J	0.61	38	12	33	mg/kg OC	3.2	1.2
RhônePoulenc2004	SH-08	4.2	0 to 1	2004	Dibenzo(a,h)anthracene	0.31	J	1.1	28	12	33	mg/kg OC	2.3	0.85
RhônePoulenc2004	SB-1	4.2	0 to 1	2004	Indeno(1,2,3-cd)pyrene	0.97		2.5	39	34	88	mg/kg OC	1.1	0.44
PCBs														
RhônePoulenc2004	SH-01	4	0 to 1	2004	PCBs (total calc'd)	0.13		0.66	20	12	65	mg/kg OC	1.7	0.31
RhônePoulenc2004	SH-02	4	0 to 1	2004	PCBs (total calc'd)	0.3		1.45	21	12	65	mg/kg OC	1.8	0.32
RhônePoulenc2004	SH-04	4.1	0 to 1	2004	PCBs (total calc'd)	2.5		0.61	410	12	65	mg/kg OC	34	6.3
Phthalates														
RhônePoulenc2004	SB-1	4.2	0 to 1	2004	Bis(2-ethylhexyl)phthalate	1.6		2.5	64	47	78	mg/kg OC	1.4	0.82
RhônePoulenc2004	SB-3	4.2	0 to 1	2004	Bis(2-ethylhexyl)phthalate	2.1		2.94	71	47	78	mg/kg OC	1.5	0.91
RhônePoulenc2004	SB-4	4.2	0 to 1	2004	Bis(2-ethylhexyl)phthalate	1.7		3.44	49	47	78	mg/kg OC	1	0.63
RhônePoulenc2004	SB-5	4.2	0 to 1	2004	Bis(2-ethylhexyl)phthalate	1.6		2.9	55	47	78	mg/kg OC	1.2	0.71
RhônePoulenc2004	SB-7	4.2	0 to 1	2004	Bis(2-ethylhexyl)phthalate	1.4		2.92	48	47	78	mg/kg OC	1	0.62
RhônePoulenc2004	SH-01	4	0 to 1	2004	Diethyl phthalate	2.7		0.66	25	61	110	mg/kg OC	6.7	3.7
RhônePoulenc2004	SH-02	4	0 to 1	2004	Di-n-octyl phthalate	2		1.45	14	58	4500	mg/kg OC	2.4	0.031

Table 2
Chemicals Above Screening Levels in Subsurface Sediment
Slip 6 Source Control Area

Sampling Event	Sample Location	River Mile	Depth Interval (feet)	Sample Year	Chemical	Concentration (mg/kg DW)		TOC (% DW)	Concentration (mg/kg OC)	SQS[1]	CSL[1]	SQS/CSL Units	SQS Exceedance Factor[2]	CSL Exceedance Factor[2]
Other SVOCs														
RhônePoulenc2004	SB-11	4.2	0 to 1	2004	Benzoic acid	1.2	J	2.26		650	650	ug/kg dw	1.8	1.8
RhônePoulenc2004	SB-12	4.1	0 to 1	2004	Benzoic acid	1.3	J	1.79		650	650	ug/kg dw	2	2
RhônePoulenc2004	SB-3	4.2	0 to 1	2004	Benzoic acid	2	J	2.94		650	650	ug/kg dw	3.1	3.1
RhônePoulenc2004	SB-4	4.2	0 to 1	2004	Benzoic acid	1.7	J	3.44		650	650	ug/kg dw	2.6	2.6
RhônePoulenc2004	SB-5	4.2	0 to 1	2004	Benzoic acid	1.8	J	2.9		650	650	ug/kg dw	2.8	2.8
RhônePoulenc2004	SB-6	4.2	0 to 1	2004	Benzoic acid	1.8	J	2.98		650	650	ug/kg dw	2.8	2.8
RhônePoulenc2004	SB-7	4.2	0 to 1	2004	Benzoic acid	1.7	J	2.92		650	650	ug/kg dw	2.6	2.6
RhônePoulenc2004	SB-8	4.2	0 to 1	2004	Benzoic acid	1.5	J	2.48		650	650	ug/kg dw	2.3	2.3
RhônePoulenc2004	SH-07	4.2	0 to 1	2004	Benzoic acid	0.93	J	0.473		650	650	ug/kg dw	1.4	1.4
RhônePoulenc2004	SH-01	4	0 to 1	2004	Pentachlorophenol	0.84	J	0.66		360	690	ug/kg dw	2.3	1.2
RhônePoulenc2004	SH-04	4.1	0 to 1	2004	Pentachlorophenol	0.93	J	0.61		360	690	ug/kg dw	2.6	1.3
RhônePoulenc2004	SB-3	4.2	0 to 1	2004	Phenol	3.1		2.94		420	1200	ug/kg dw	7.4	2.6

Key:

DW - Dry weight
CSL - Cleanup Screening Level
PAH - Polycyclic aromatic hydrocarbon
PCB - Polychlorinated biphenyl
OC - Organic carbon
TOC - Total organic carbon
SQS - Sediment Quality Standard
SVOC - Semivolatile organic compound

Notes:

1. SQS and CSL values are substituted with AET values for dry weight comparison where organic compounds are not OC-normalized (when TOC is outside the range of 0.5-4.0% DW).
2. Exceedance factors are the ratio of the detected concentration to the CSL or SQS (or to AET values where applicable). Exceedance factors are shown only if the SQS exceedance factor is greater than 1.

Source:

Lower Duwamish Waterway Group, 2007. Online Lower Duwamish Waterway Group Draft Remedial Investigation Report (November 2007) Database. http://www.ldwg.org.

Figures

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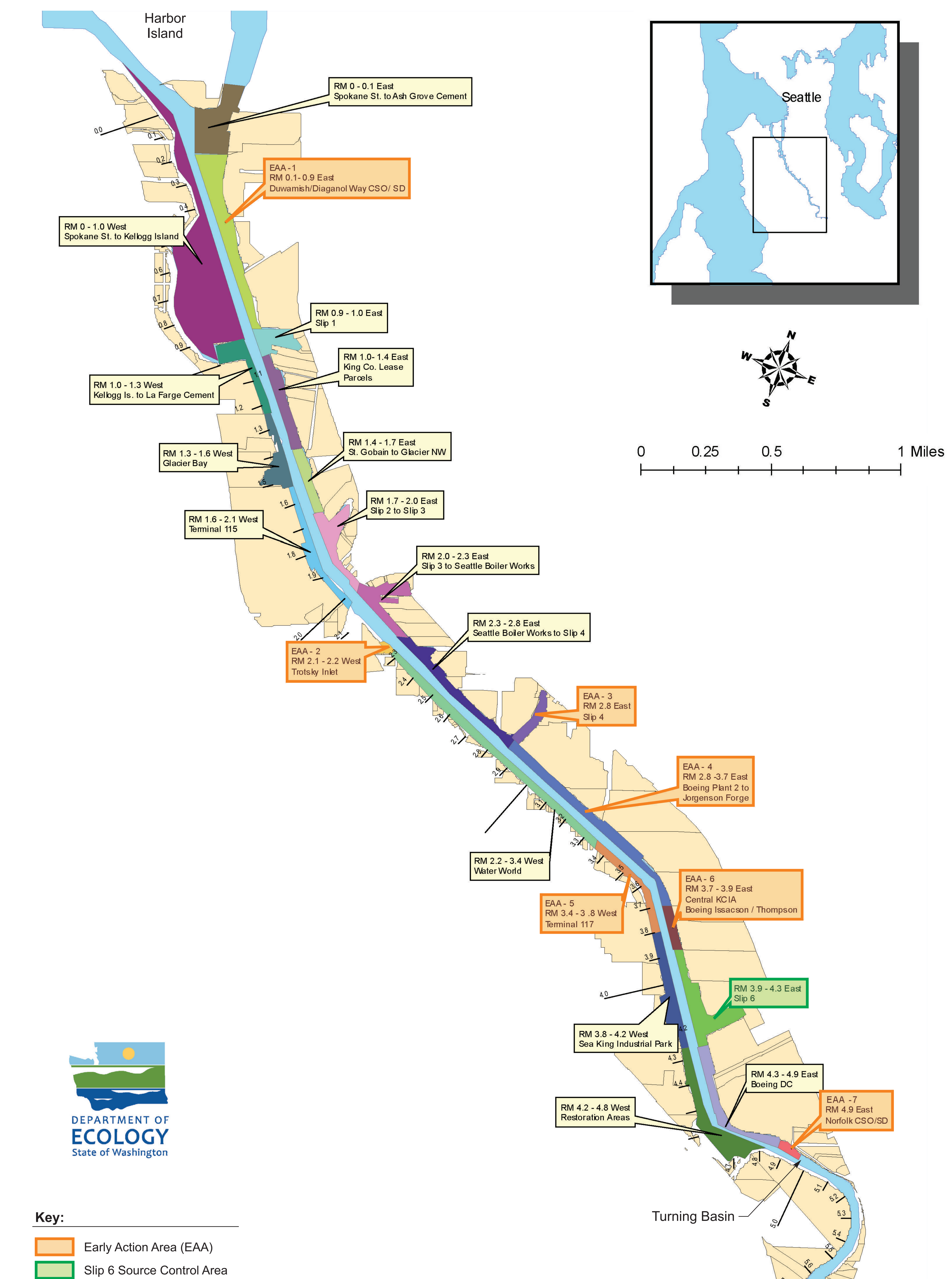

Note: The SCAP area boundaries are an approximation. Final boundaries will be determined jointly by the EPA and Ecology. Drainage basins leading to these areas will be defined in the future.

Base Map Reference: Department of Ecology, 2008.

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY RM 3.9-4.3 EAST (SLIP 6) Tukwila, Washington	Figure 1 DESIGNATED SOURCE CONTROL AREAS (DRAFT)		
		Date: 7/17/08	Drawn by: AES	10:002330WD1402\fig 1

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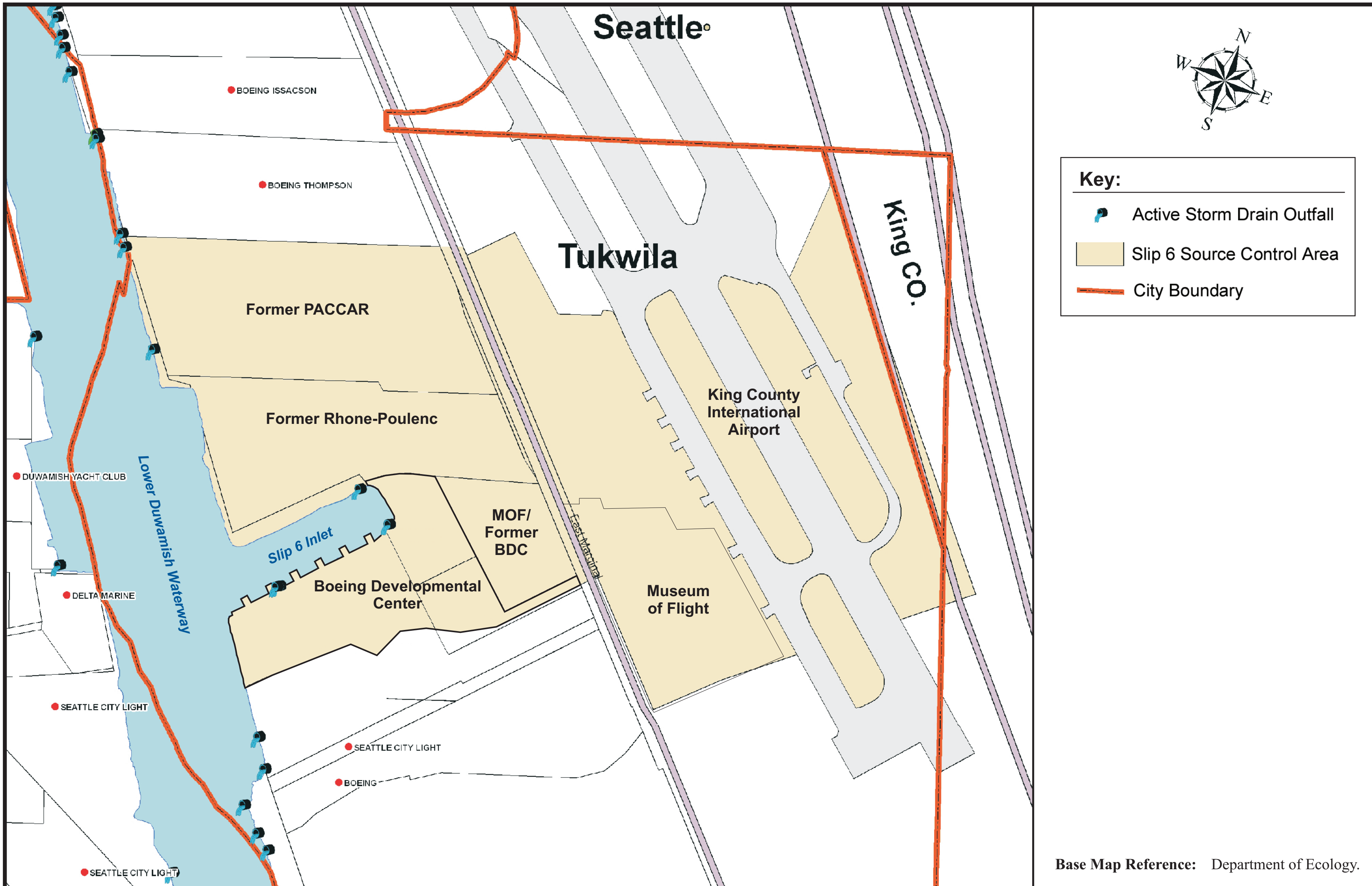

Base Map Reference: Department of Ecology.

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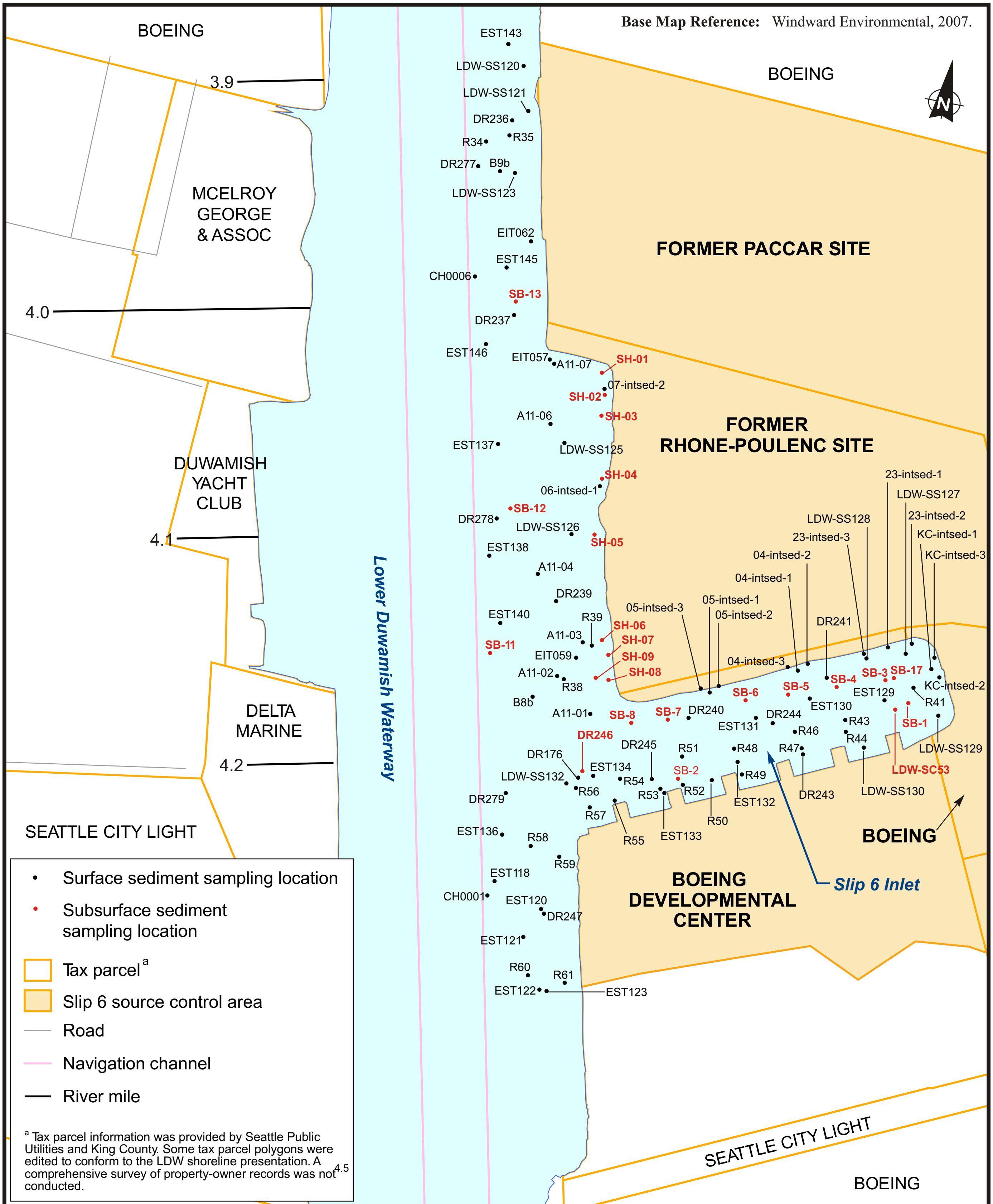
LOWER DUWAMISH WATERWAY
RM 3.9-4.3 EAST (SLIP 6)
Tukwila, Washington

0 0.125 0.25
Approximate Scale in Miles

Figure 2
SLIP 6 SOURCE CONTROL AREA

Date:	Drawn by:	
8/20/08	AES	10:002330WD1402\fig 2



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LOWER DUWAMISH WATERWAY
RM 3.9-4.3 EAST (SLIP 6)
Tukwila, Washington

0 200 400
Approximate Scale in Feet

Figure 3

SLIP 6 SOURCE CONTROL AREA
SEDIMENT SAMPLING LOCATIONS

Date:	Drawn by:	
8-20-08	AES	10:002330WD1402\fig 3

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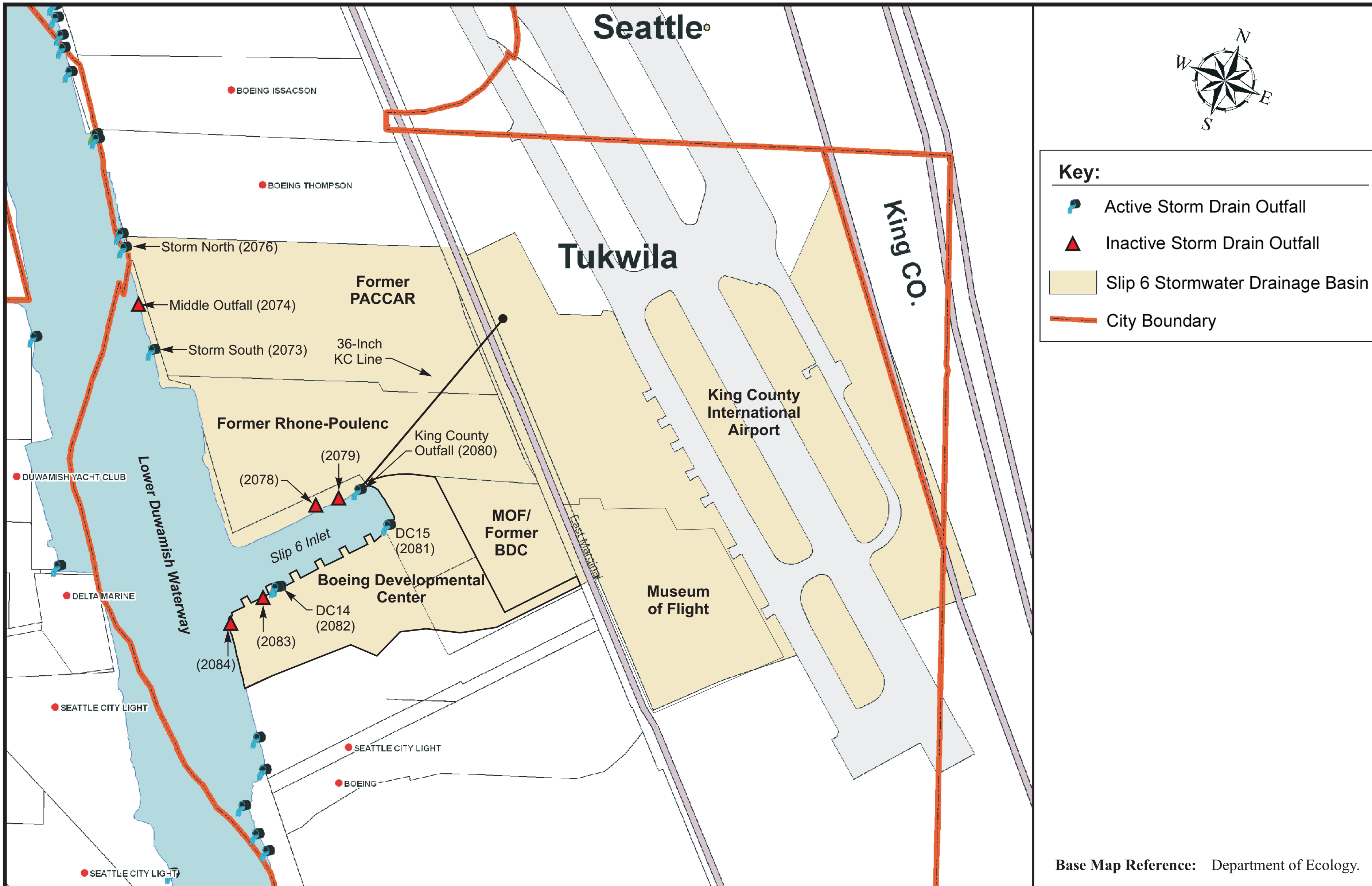
LOWER DUWAMISH WATERWAY
RM 3.9-4.3 EAST (SLIP 6)
Tukwila, Washington

0 80 160
Approximate Scale in Feet

Figure 4
2006 SEDIMENT EVALUATION WORK
SAMPLING LOCATIONS
FORMER PACCAR SITE

Date: 8-20-08
Drawn by: AES
10:002330WD1402\fig 4



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LOWER DUWAMISH WATERWAY
RM 3.9-4.3 EAST (SLIP 6)
Tukwila, Washington

0 0.125 0.25
Approximate Scale in Miles

Figure 5
SLIP 6 STORMWATER DRAINAGE AREA

Date:	Drawn by:	
8/20/08	AES	10:002330WD1402\fig 5

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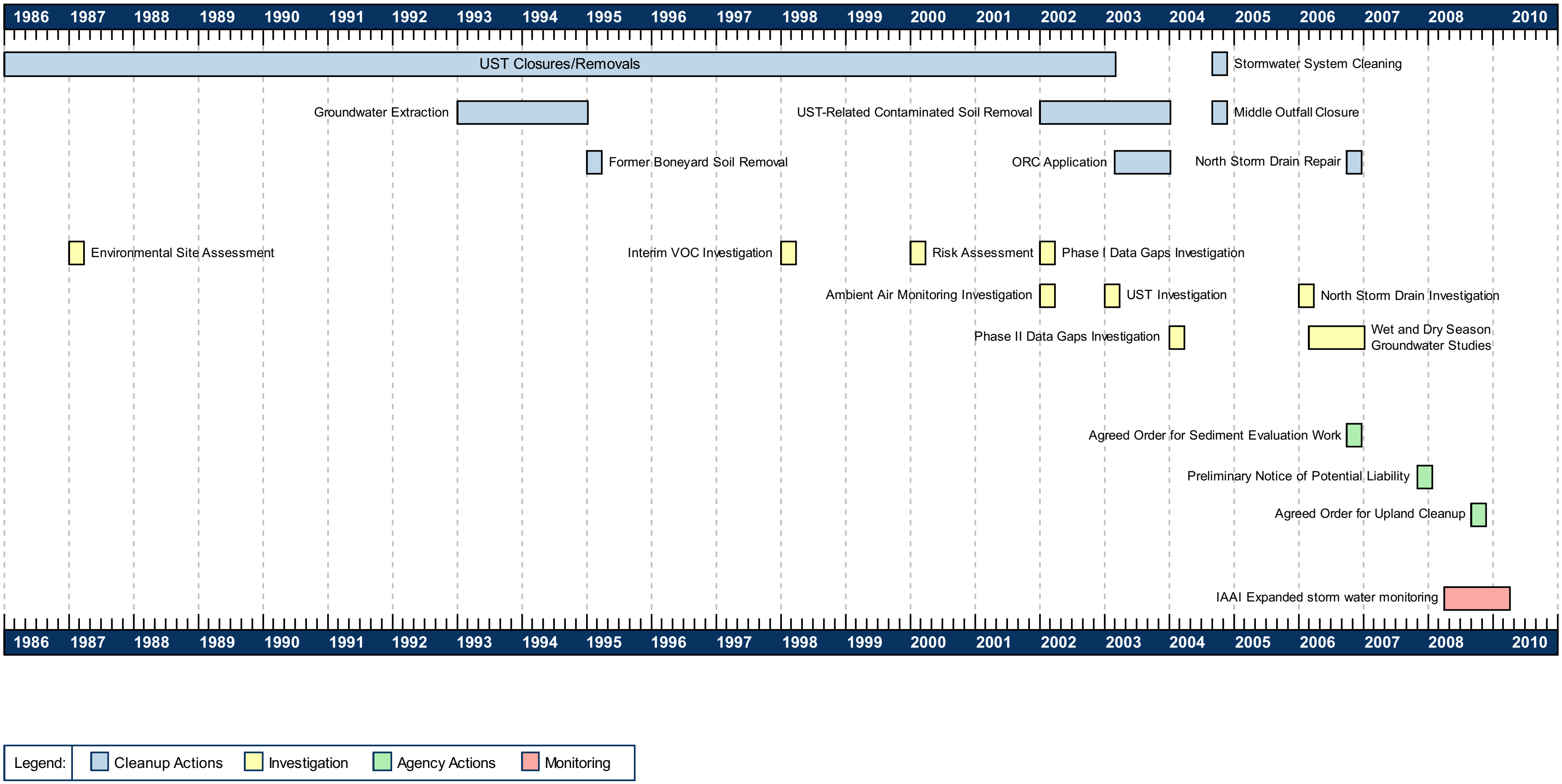
RM 3.9-4.3 EAST (SLIP 6)
Tukwila, Washington

0 150 300
Approximate Scale in Feet

Figure 6
FORMER PACCAR SITE MAP

Date:	Drawn by:	
7/17/08	AES	10:002330WD1402\fig 6



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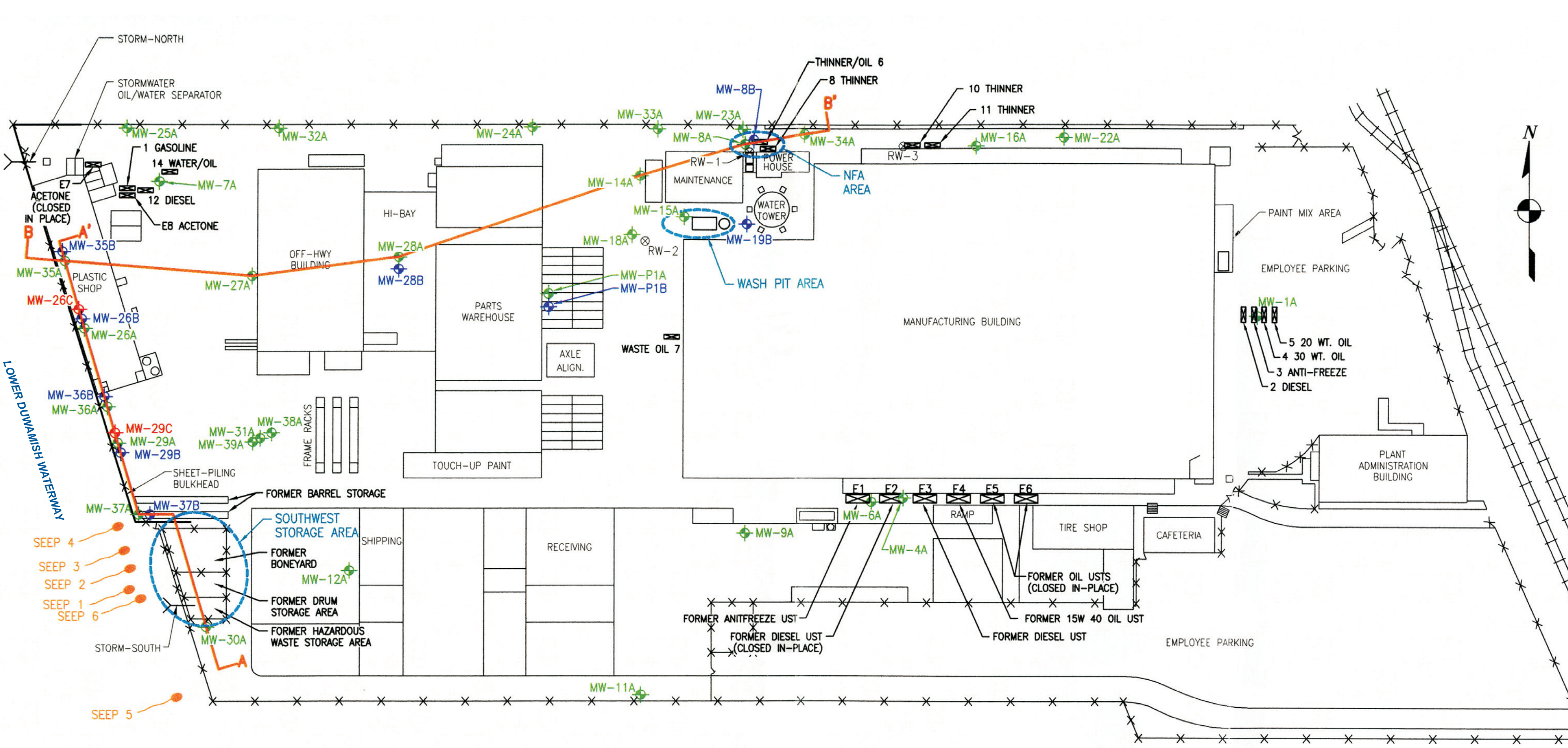
LOWER DUWAMISH WATERWAY
RM 3.9-4.3 EAST (SLIP 6)
Tukwila, Washington

Figure 7
ENVIRONMENTAL INVESTIGATIONS AND CLEANUP ACTIONS TIMELINE
FORMER PACCAR SITE

Date:	Drawn by:	
7/17/08	AES	10:002330WD1402\fig 7

Source: Kennedy/Jenks Consultants 2002.



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY RM 3.9-4.3 EAST (SLIP 6) Tukwila, Washington	Figure 8 PHASE I RECONNAISSANCE GROUNDWATER AND SOIL ASSESSMENTS WORK AREAS FORMER PACCAR SITE
	0 240 480 Approximate Scale in Feet	Date: 7/17/08 · Drawn by: AES · 10:002330WD1402\fig 8

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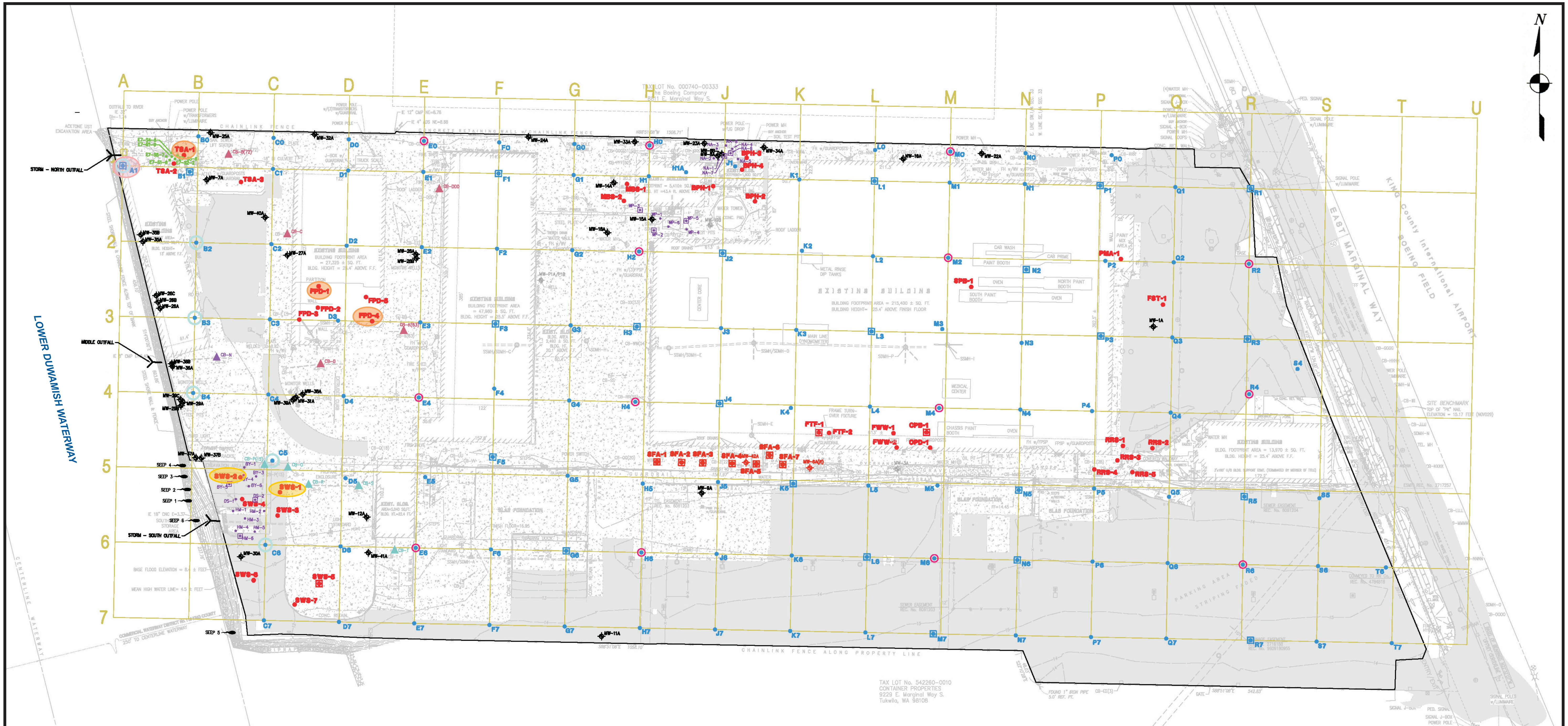

LEGEND:

PHASE II SAMPLE LOCATIONS

- GRID SOIL SAMPLING LOCATION
- GRID RECONNAISSANCE GROUNDWATER SAMPLING LOCATION
- FOCUSED SOIL SAMPLING LOCATION
- FOCUSED RECONNAISSANCE GROUNDWATER SAMPLING LOCATION
- SOUTH FIRE AISLE (SFA) ASSESSMENT SOIL SAMPLING LOCATION
- SFA RECONNAISSANCE GROUNDWATER SAMPLING LOCATION
- GRID BORING ADVANCED TO SILTY CONFINING LAYER
- SOIL SAMPLES ANALYZED FOR LOW SUITE OF COMPOUNDS
- F4 SAMPLE LOCATION DESIGNATION – GRID SAMPLING LOCATION
- SWS-5 SAMPLE LOCATION DESIGNATION – FOCUSED SAMPLING LOCATION
- MW-6A(R) SFA GROUNDWATER MONITORING WELL (INSTALLED DURING PHASE II)

- CB–N(72) CATCH BASIN LOCATION USED FOR COMPOSITE CATCH BASIN SOLIDS SAMPLE CB–N (NORTHERN STORM DRAIN LINE)
- CB–N CATCH BASIN LOCATION USED FOR CATCH BASIN SOLIDS SAMPLE CB–M2 (MIDDLE STORM DRAIN LINE)
- CB–P(15) CATCH BASIN LOCATION USED FOR COMPOSITE CATCH BASIN SOLIDS SAMPLE CB–S (SOUTHERN STORM DRAIN LINE)

NOTE: ALL LOCATIONS ARE APPROXIMATE

OTHER SAMPLE LOCATIONS

- BY–5 PHASE I SOIL BORING LOCATION
- BY–5 PHASE I RECONNAISSANCE GROUNDWATER SAMPLING LOCATION
- MW–12A GROUNDWATER MONITORING WELL LOCATION
- MW–4A ABANDONED/REMOVED MONITORING WELL LOCATION
- SEEP LOCATION

- BORING LOCATION EXCEEDING MTCA METHOD A INDUSTRIAL LAND USE CLEANUP LEVEL FOR LEAD
- BORING LOCATION EXCEEDING (OR POTENTIALLY EXCEEDING) MTCA METHOD C INDUSTRIAL LAND USE STANDARDS FOR DIESEL–AND OIL–RANGE HYDROCARBONS
- BORING LOCATION EXCEEDING (OR POTENTIALLY EXCEEDING) MTCA METHOD C INDUSTRIAL LAND USE STANDARDS FOR GASOLINE–RANGE HYDROCARBONS

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0 120 240
Approximate Scale in Feet

Source: Kennedy/Jenks Consultants.

LOWER DUWAMISH WATERWAY
RM 3.9-4.3 EAST (SLIP 6)
Tukwila, Washington

Figure 9

PHASE II DATA GAPS INVESTIGATION SAMPLING LOCATIONS
FORMER PACCAR SITE

Date:	Drawn by:	
7/17/08	AES	10:002330WD1402\fig 9

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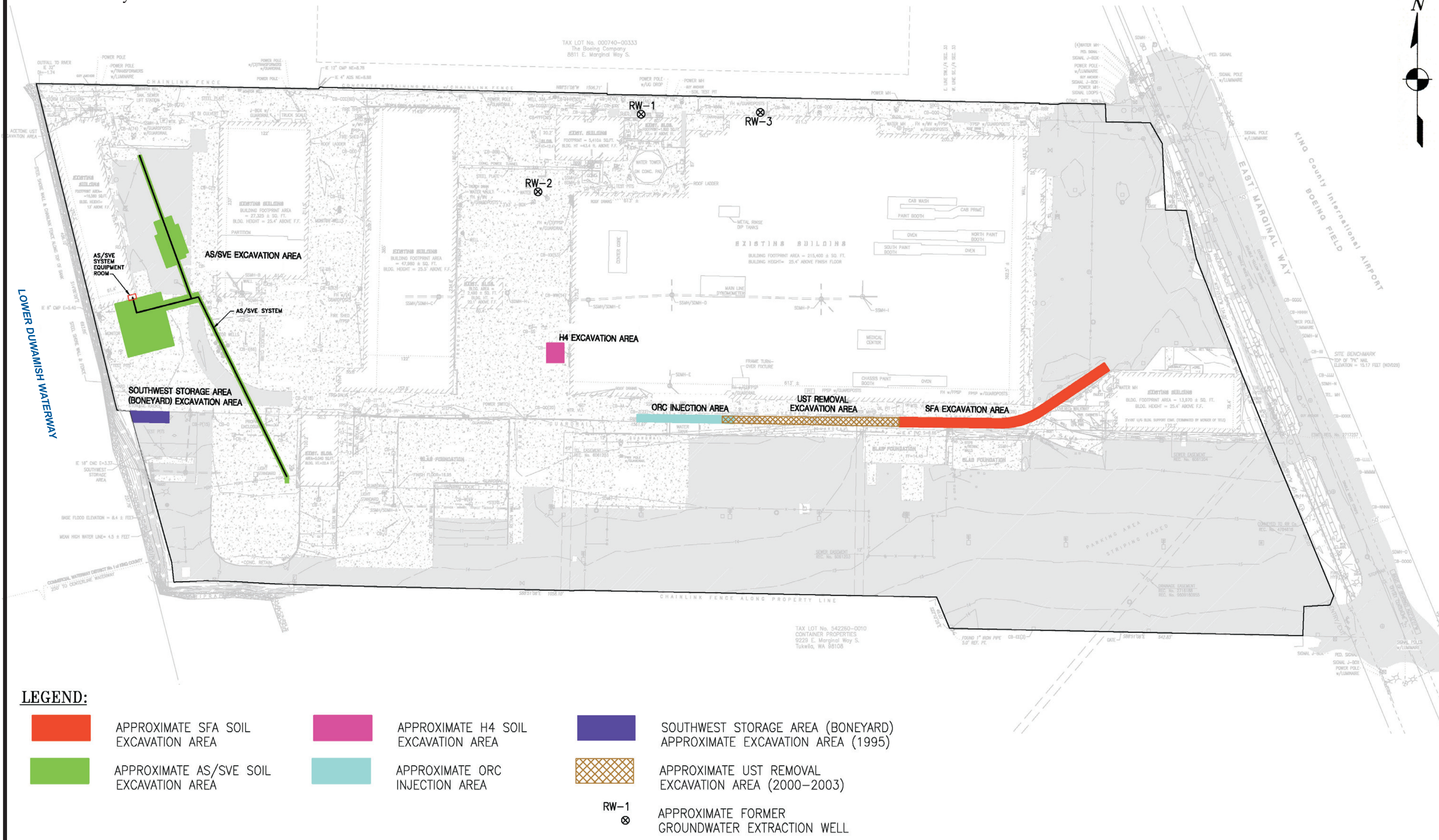
Source: Kennedy/Jenks Consultants 2004.



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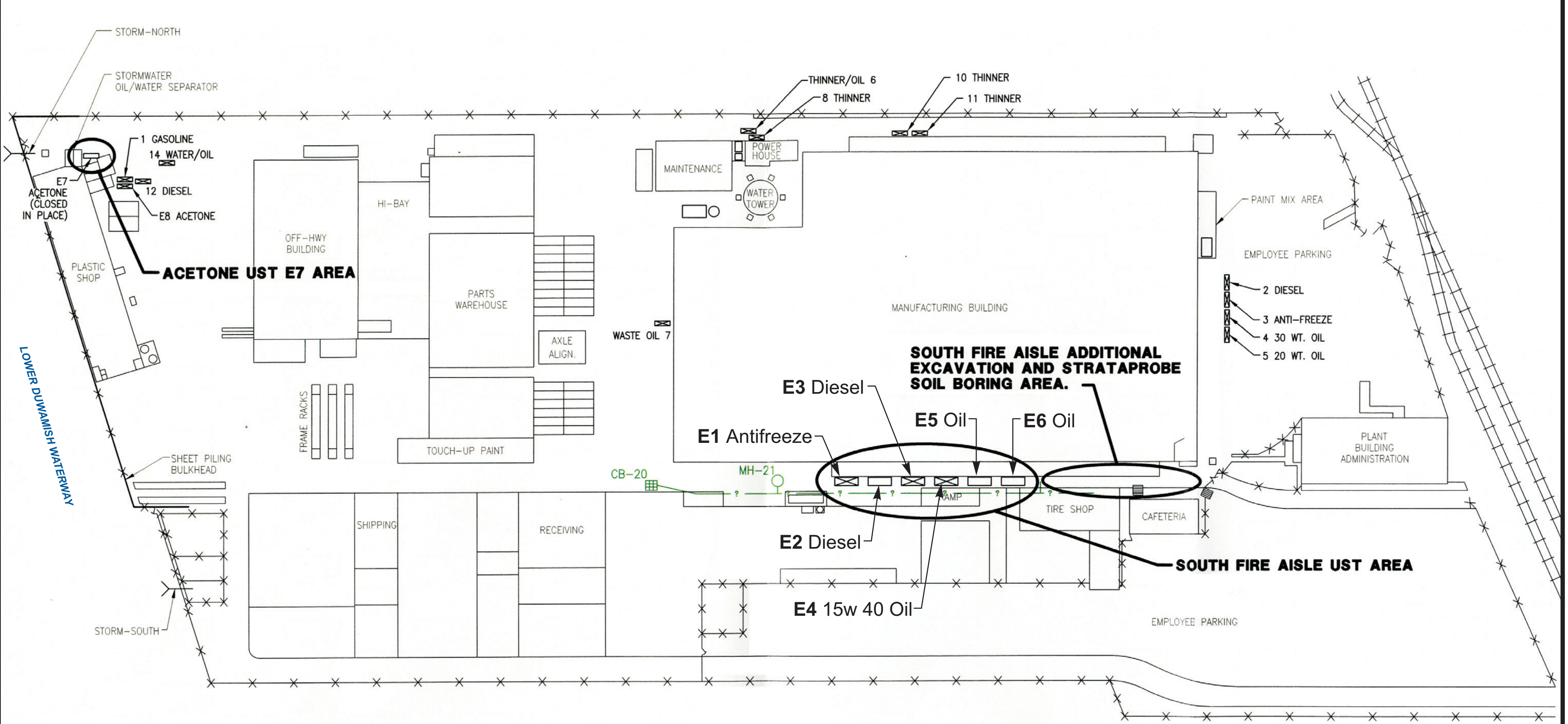
RM 3.9-4.3 EAST (SLIP 6)
Tukwila, Washington

0 240 480
Approximate Scale in Feet

Figure 10
APPROXIMATE SOIL EXCAVATION AREAS AND ORC INJECTION AREA FORMER PACCAR SITE

Date:	Drawn by:	
7/17/08	AES	10:002330WD1402\fig 10

Source: Kennedy/Jenks Consultants 2003.



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.

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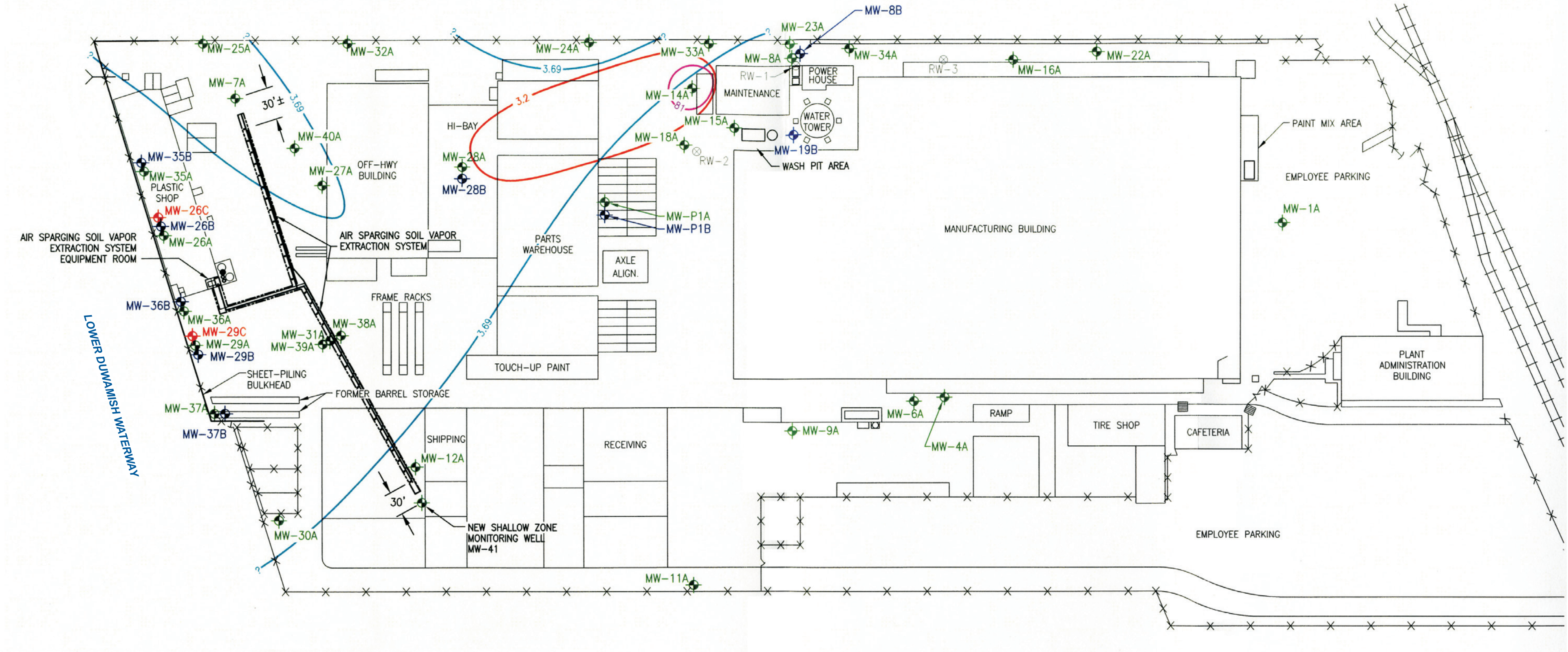
LOWER DUWAMISH WATERWAY
RM 3.9-4.3 EAST (SLIP 6)
Tukwila, Washington

0 240 480
Approximate Scale in Feet

Figure 11
FORMER UST LOCATIONS
FORMER PACCAR SITE

Date:	Drawn by:	
7/17/08	AES	10:002330WD1402\fig 11

Source: Kennedy/Jenks Consultants 2005.



LEGEND

- MW-11A — SHALLOW ZONE MONITORING WELL LOCATION
- MW-28B — INTERMEDIATE ZONE MONITORING WELL LOCATION
- MW-26C — DEEP ZONE MONITORING WELL LOCATION
- ?-81-? — NATIONAL TOXIC RULE/NATIONAL AMBIENT WATER QUALITY CRITERIA CONCENTRATION CONTOUR FOR TRICHLOROETHENE (μg/l)
- ?-3.2-? — NATIONAL TOXIC RULE/NATIONAL AMBIENT WATER QUALITY CRITERIA CONCENTRATION CONTOUR FOR 1,1-DICHLOROETHENE (μg/l)
- ?-3.69-? — MTCA METHOD B SURFACE WATER CLEANUP LEVEL CONCENTRATION CONTOUR FOR VINYL CHLORIDE (μg/l)

NOTES:

1) ALL LOCATIONS ARE APPROXIMATE.
2) BASE DRAWING PROVIDED BY PACCAR INCORPORATED.
3) ANALYTICAL RESULTS ARE FOR GROUNDWATER SAMPLES COLLECTED 26 MARCH TO 2 APRIL 2002.

N

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LOWER DUWAMISH WATERWAY
RM 3.9-4.3 EAST (SLIP 6)
Tukwila, Washington

0 240 480
Approximate Scale in Feet

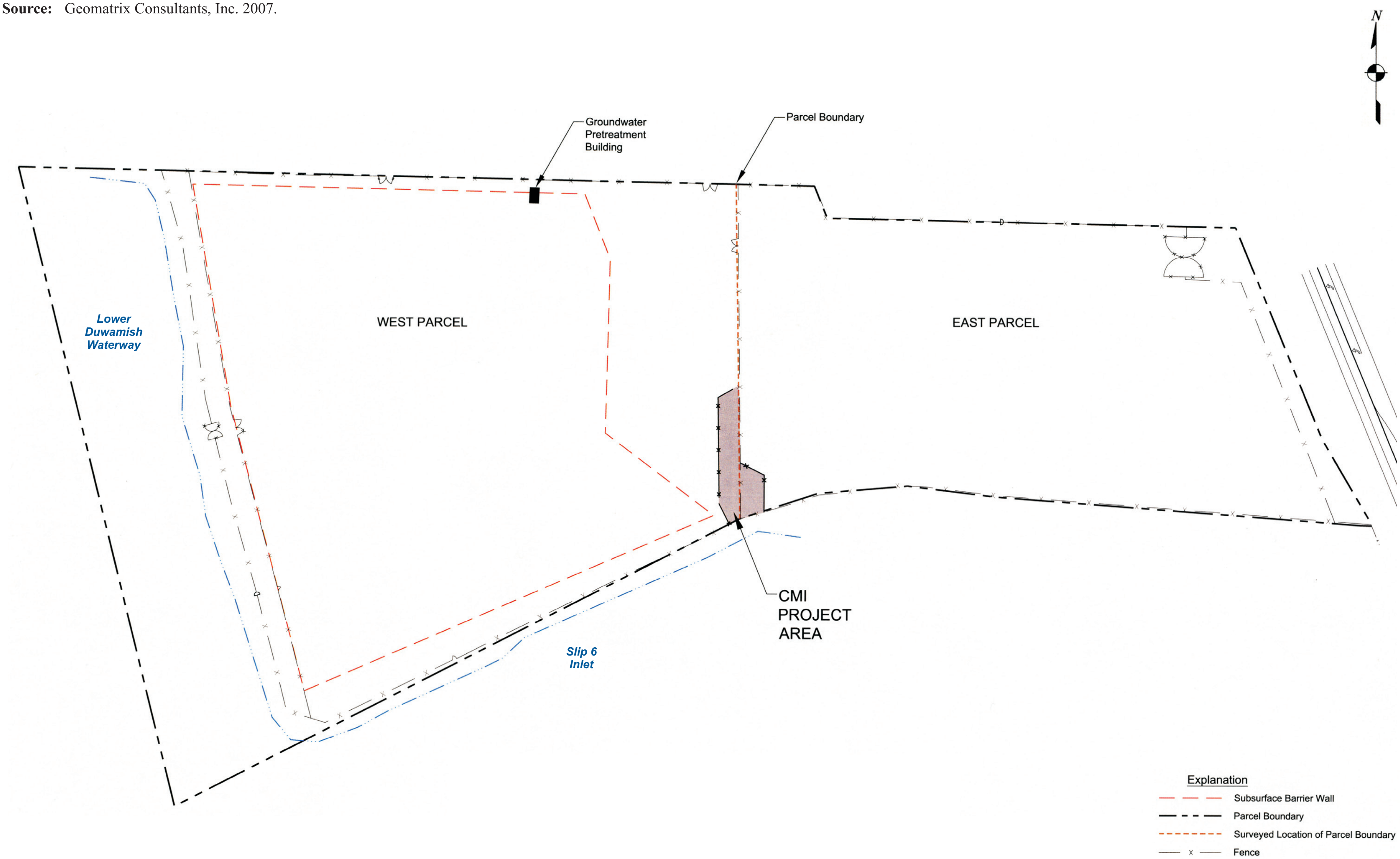
Figure 12
GROUNDWATER MONITORING
FORMER PACCAR SITE

Date: 7/17/08

Drawn by: AES

10:002330WD1402\fig 12

Source: Geomatrix Consultants, Inc. 2007.



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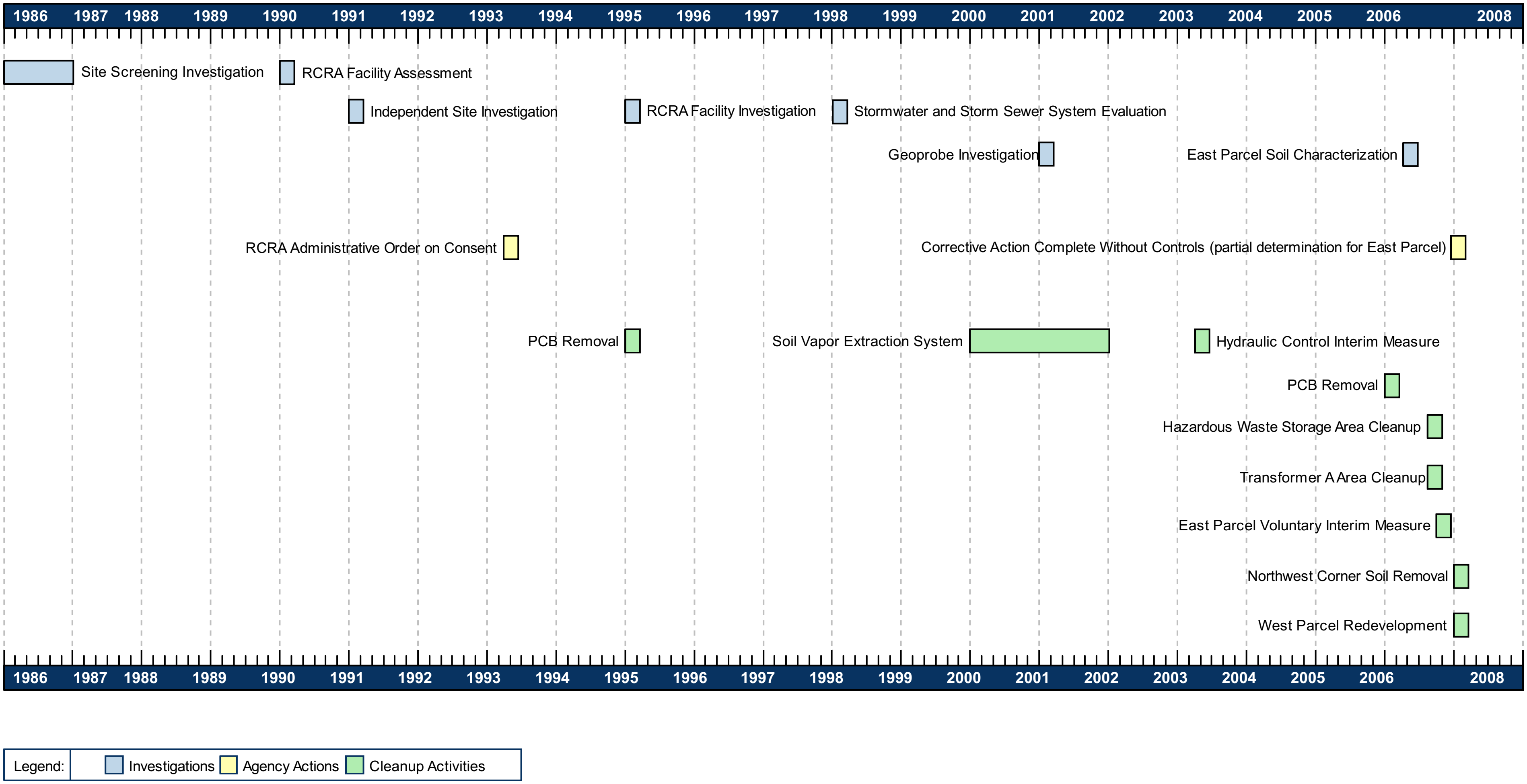
LOWER DUWAMISH WATERWAY
RM 3.9-4.3 EAST (SLIP 6)
Tukwila, Washington

0 120 240
Approximate Scale in Feet

Figure 13
WEST AND EAST PARCELS SITE MAP
FORMER RHONE-POULENC SITE

Date:	Drawn by:	
7/17/08	AES	10:002330WD1402\fig 13



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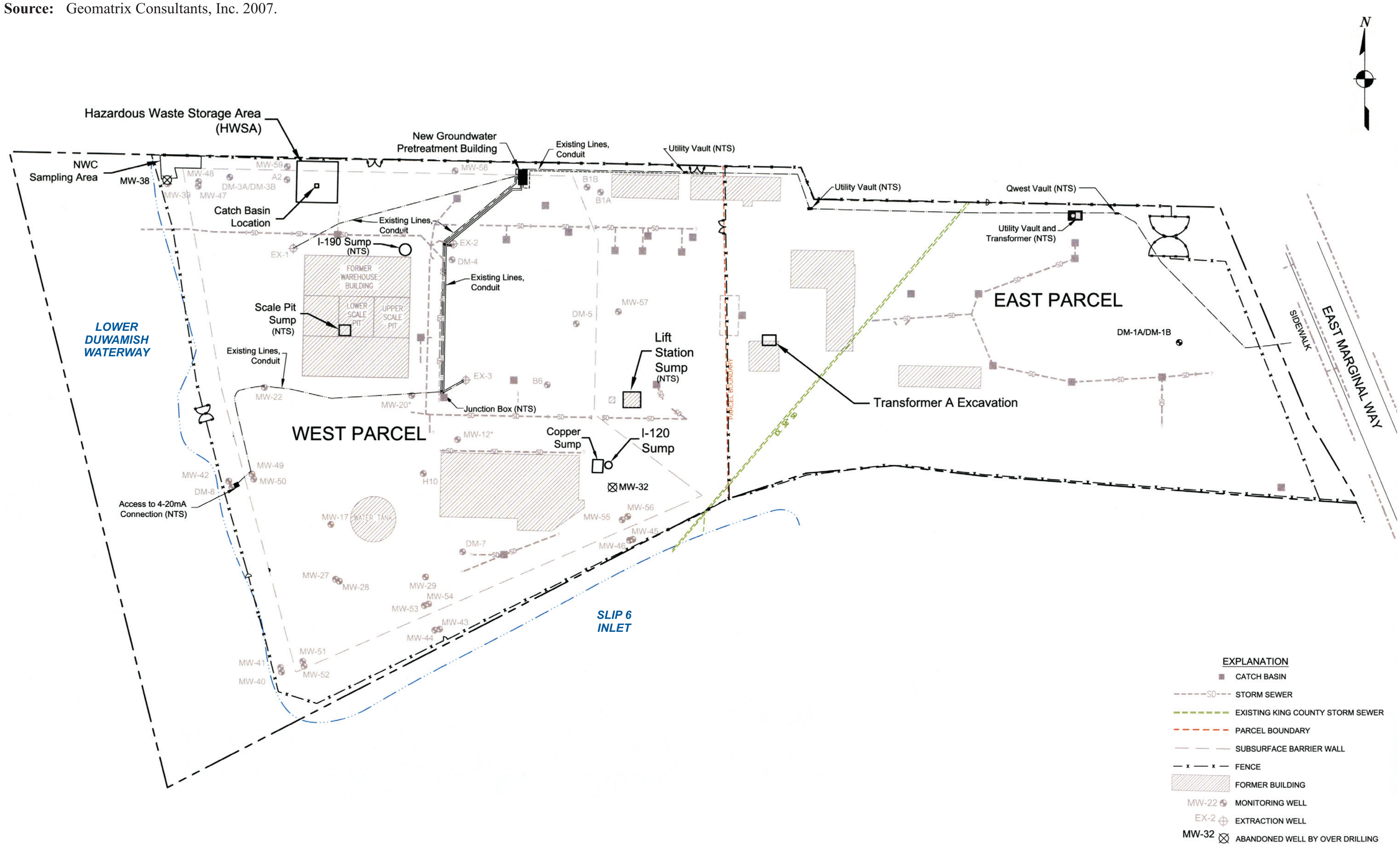
LOWER DUWAMISH WATERWAY
RM 3.9-4.3 EAST (SLIP 6)
Tukwila, Washington

Figure 14
ENVIRONMENTAL INVESTIGATIONS AND CLEANUP ACTIONS TIMELINE
FORMER RHONE-POULENC SITE

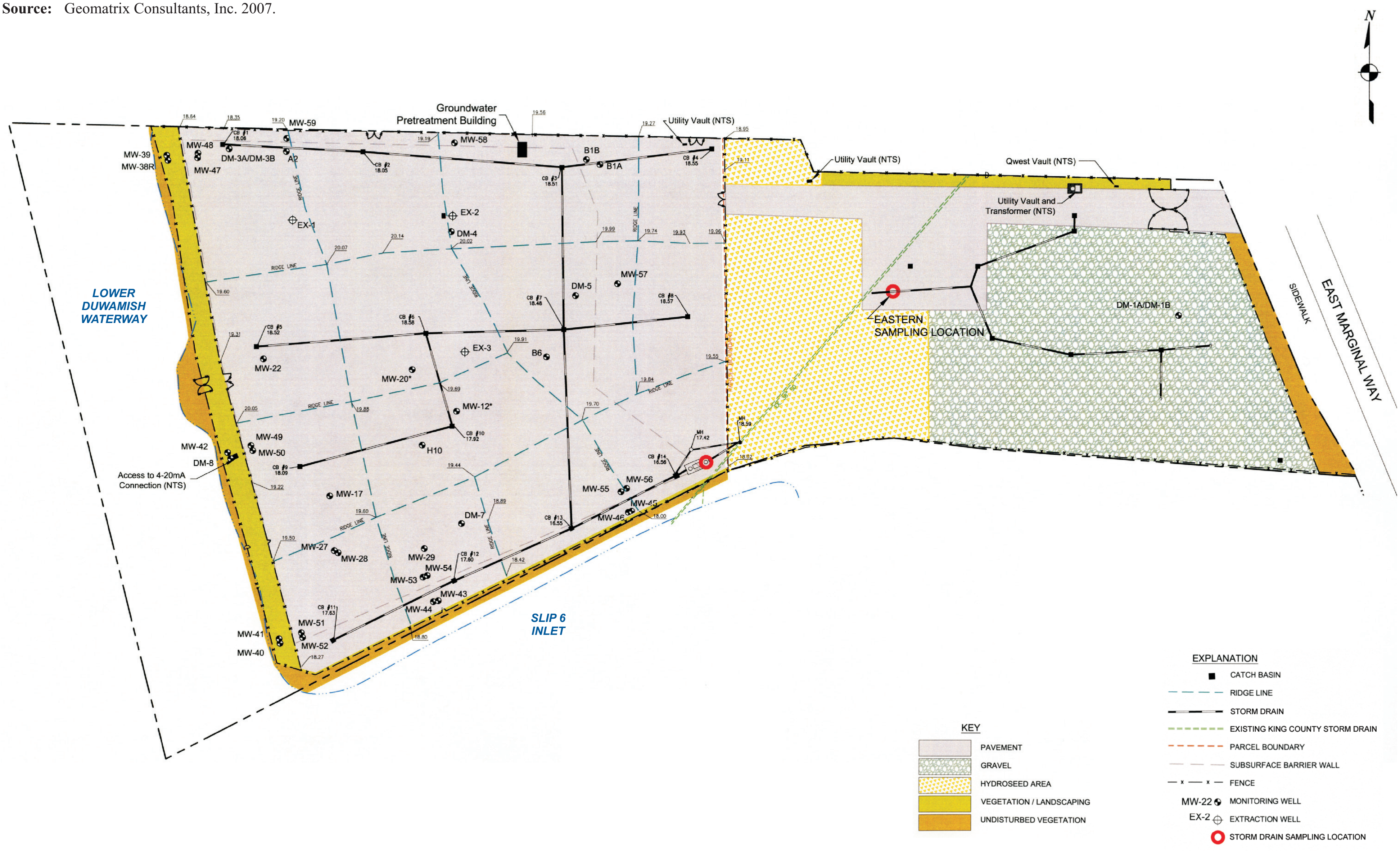
Date:	Drawn by:	
7/17/08	AES	10:002330WD1402\fig 14

Source: Geomatrix Consultants, Inc. 2007.



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY RM 3.9-4.3 EAST (SLIP 6) Tukwila, Washington	Figure 15 WASTE REMOVAL AREAS FORMER RHONE-POULENC SITE
	0 240 480 Approximate Scale in Feet	Date: 7/17/08 — Drawn by: AES — 10:002330WD1402\fig 15

Source: Geomatrix Consultants, Inc. 2007.



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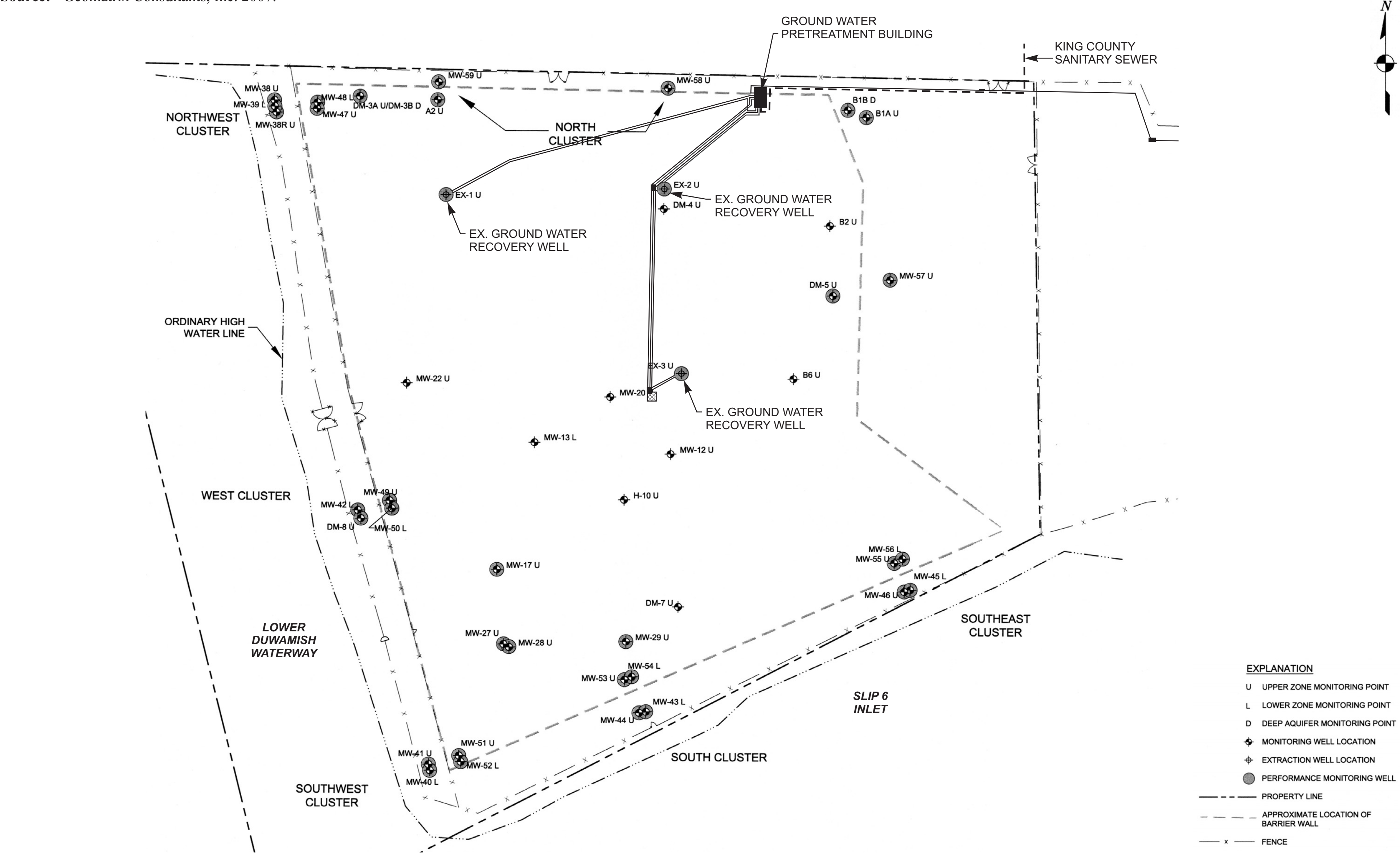
LOWER DUWAMISH WATERWAY
RM 3.9-4.3 EAST (SLIP 6)
Tukwila, Washington

0 240 480
Approximate Scale in Feet

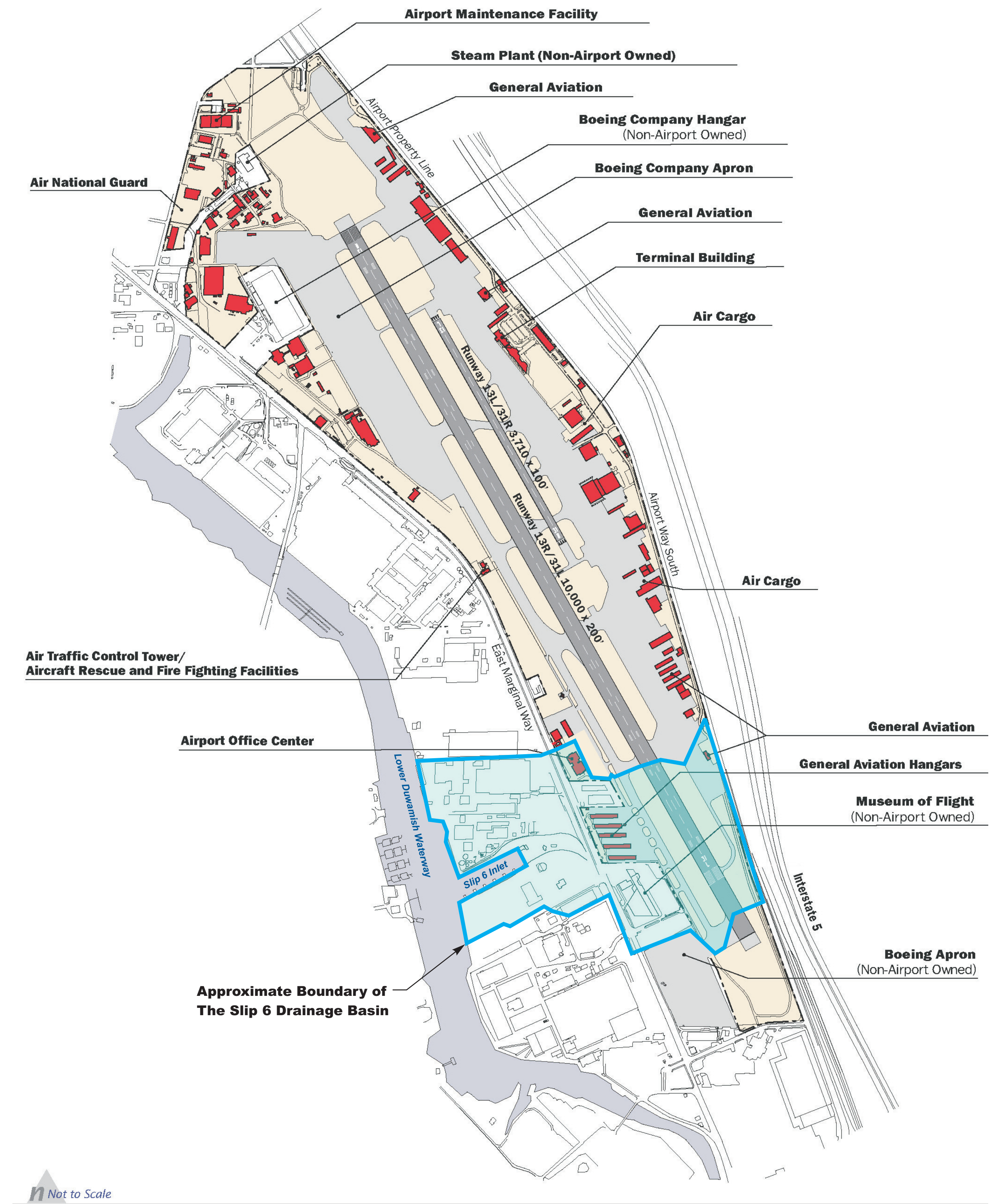
Figure 16
STORMWATER SYSTEM
FORMER RHONE-POULENC SITE

Date:	Drawn by:	
8/27/08	AES	10:002330WD1402\fig 16

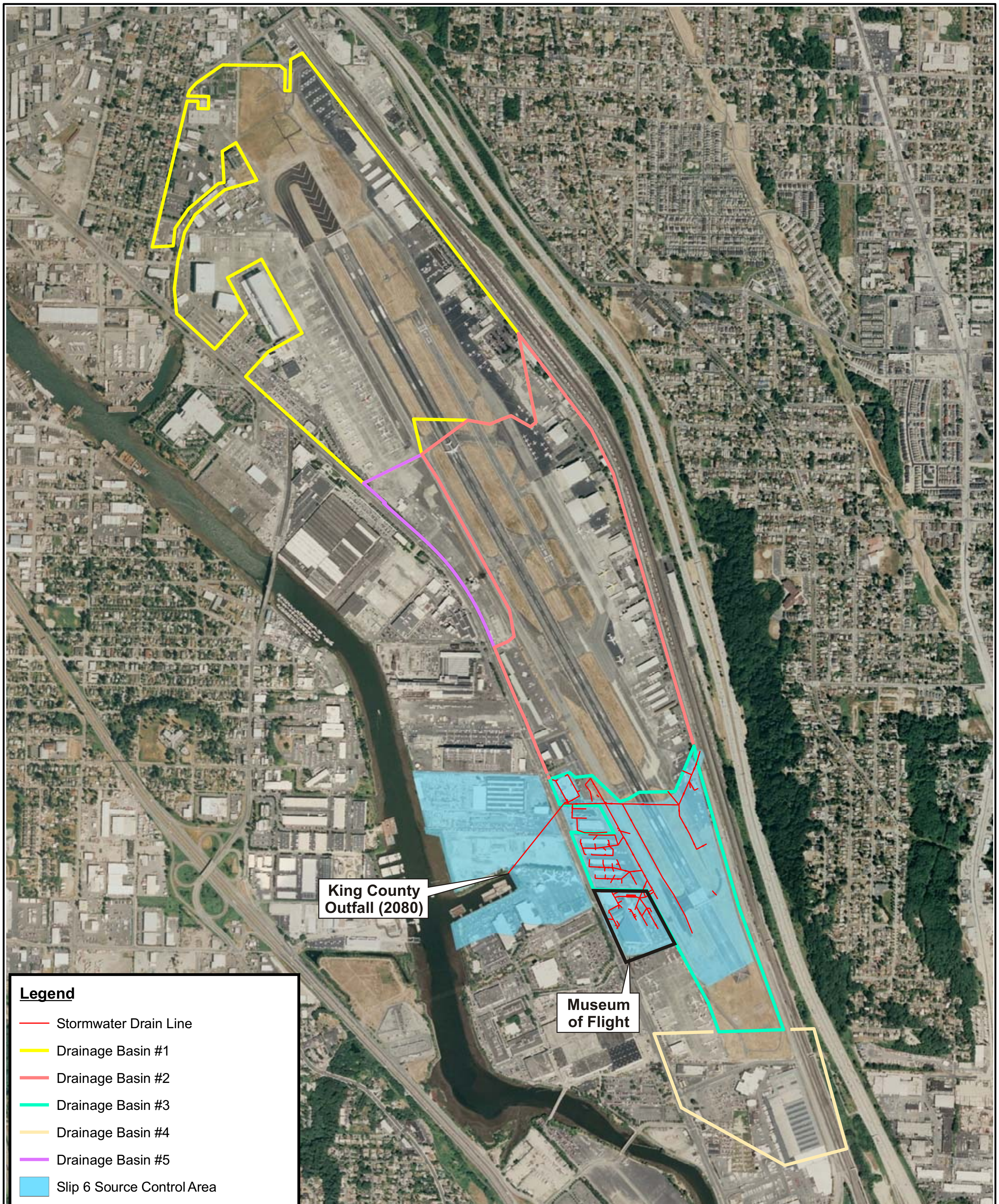
Source: Geomatrix Consultants, Inc. 2007.



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY RM 3.9-4.3 EAST (SLIP 6) Tukwila, Washington	Figure 17 HYDRAULIC CONTROL INTERIM MEASURE FORMER RHONE-POULENC SITE
	0 160 320 Approximate Scale in Feet	Date: 8/27/08 · Drawn by: AES · 10:002330WD1402\fig 17



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY RM 3.9-4.3 EAST (SLIP 6) Tukwila, Washington	Figure 18 KING COUNTY INTERNATIONAL AIRPORT SITE MAP		
	Base Map Reference: Barnard Dunkelberg & Company, 2001.	Date: 7-17-08	Drawn by: AES	10:002330WD1402\fig 18



Scale 1:20,000

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LOWER DUWAMISH WATERWAY
RM 3.9 - 4.3 EAST (SLIP 6)

Tukwila, Washington

Figure 19
King County International Airport
Stormwater Drainage Basin #3

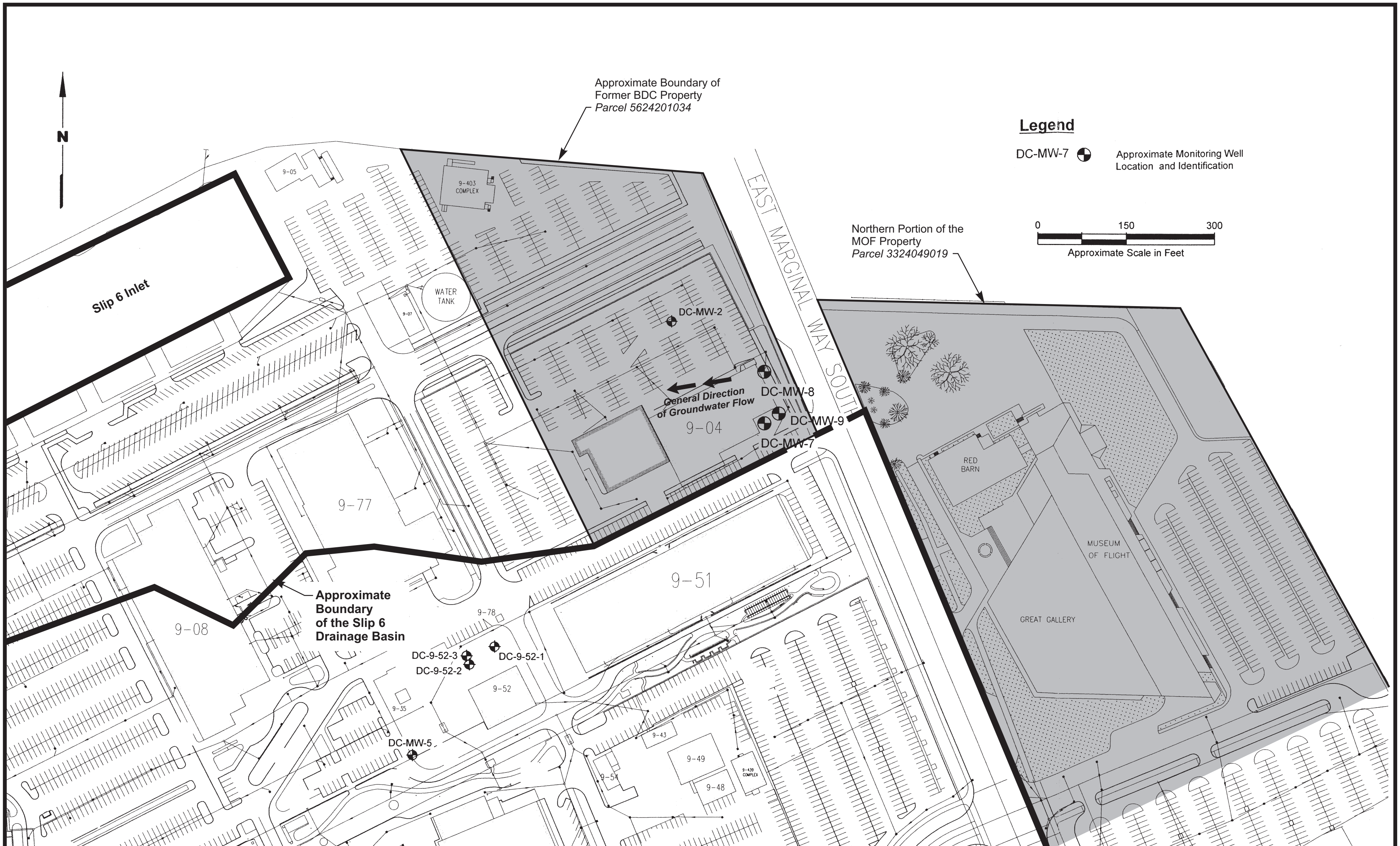
Job Id:

Date: 8/22/2008

GIS Analyst: avh

Map Source Information: 2006 NAIP Image

\edms-projects\lower_duwamish_waterway\kcia outfall 3 area.mxd



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LOWER DUWAMISH WATERWAY
RM 3.9-4.3 EAST (SLIP 6)
Tukwila, Washington

Figure 20
FORMER BOEING PROPERTY
MONITORING WELL LOCATIONS

Source: Landau Associates 2007.

Date:	Drawn by:	
7/17/08	AES	10:002330WD1402\fig 20

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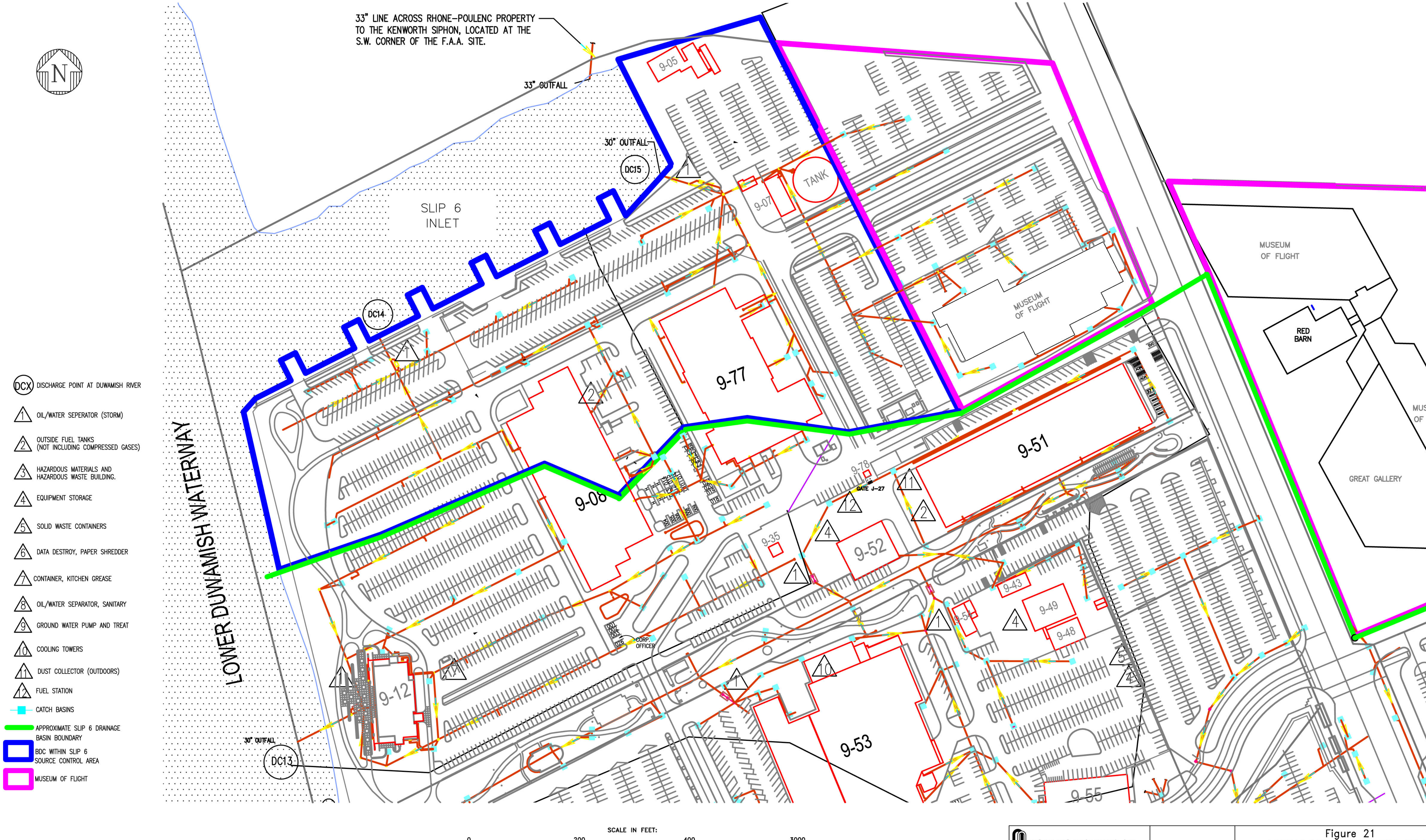

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DESIGNED BY:
CHECKED BY:
DRAWN BY: Z. LEHN

BASE MAP REFERENCE: THE BOEING COMPANY 2003

Figure 21
BOEING DEVELOPMENTAL CENTER
STORM WATER DRAINAGE SYSTEM

LOWER DUWAMISH WATERWAY
RM 3.9-4.3 East (Slip 6)
Tukwila, Washington

SCALE	DATE ISSUED	C.A.D. FILE NO.
NOTED	07/22/08	BDC_Slip 6 Area_FIGURE3.dwg

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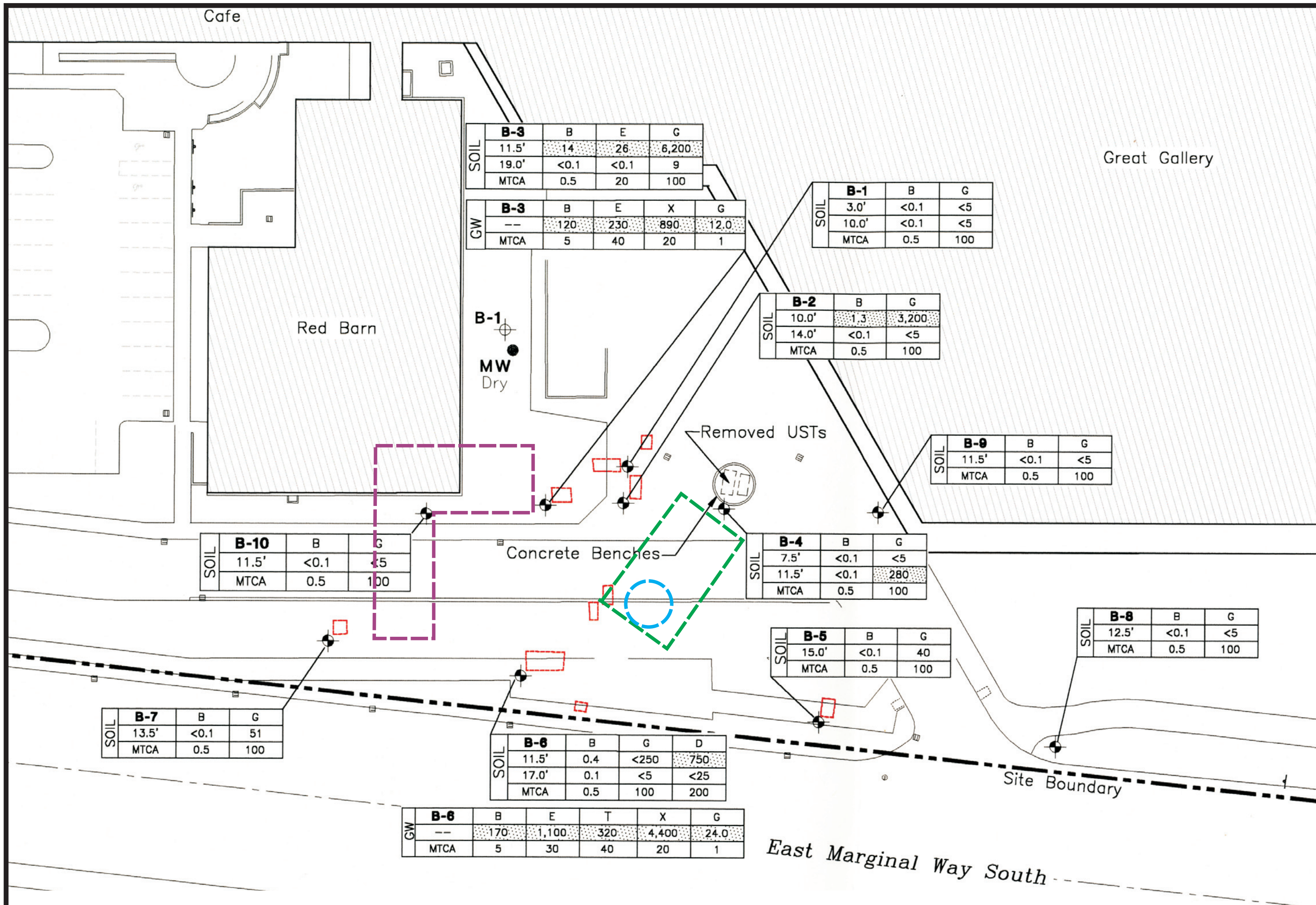
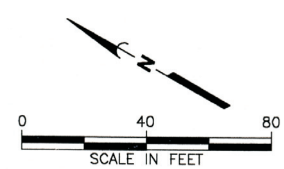


EXPLANATION:

- POSSIBLE UST BASED ON RESULTS OF GEOPHYSICAL STUDY
- B-1 SOIL BORING INSTALLED BY GEOENGINEERS
- B-1 SOIL BORING INSTALLED BY SHANNON & WILSON
- MW MONITORING WELL INSTALLED BY SHANNON & WILSON
- UST UNDERGROUND STORAGE TANK
- B BENZENE–mg/kg (SOIL) OR µg/l (GROUND WATER)
- E ETHYLBENZENE–mg/kg (SOIL) µg/l (GROUND WATER)
- T TOLUENE–mg/kg (SOIL) µg/l (GROUND WATER)
- X XYLENES–mg/kg (SOIL) µg/l (GROUND WATER)
- G GASOLINE–RANGE HYDROCARBONS–mg/kg (SOIL) OR mg/l (GROUND WATER)
- D DIESEL–RANGE HYDROCARBONS mg/l (SOIL)
- MTCA MODEL TOXICS CONTROL ACT METHOD A CLEANUP LEVELS
- GW GROUND WATER
- mg/kg MILLIGRAMS PER KILOGRAM
- mg/l MILLIGRAMS PER LITER
- µg/l MICROGRAMS PER LITER
- CATCH BASIN
- SERVICE STATION BUILT IN 1925
- SERVICE STATION BUILT IN 1948
- SERVICE STATION BUILT IN 1967



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.

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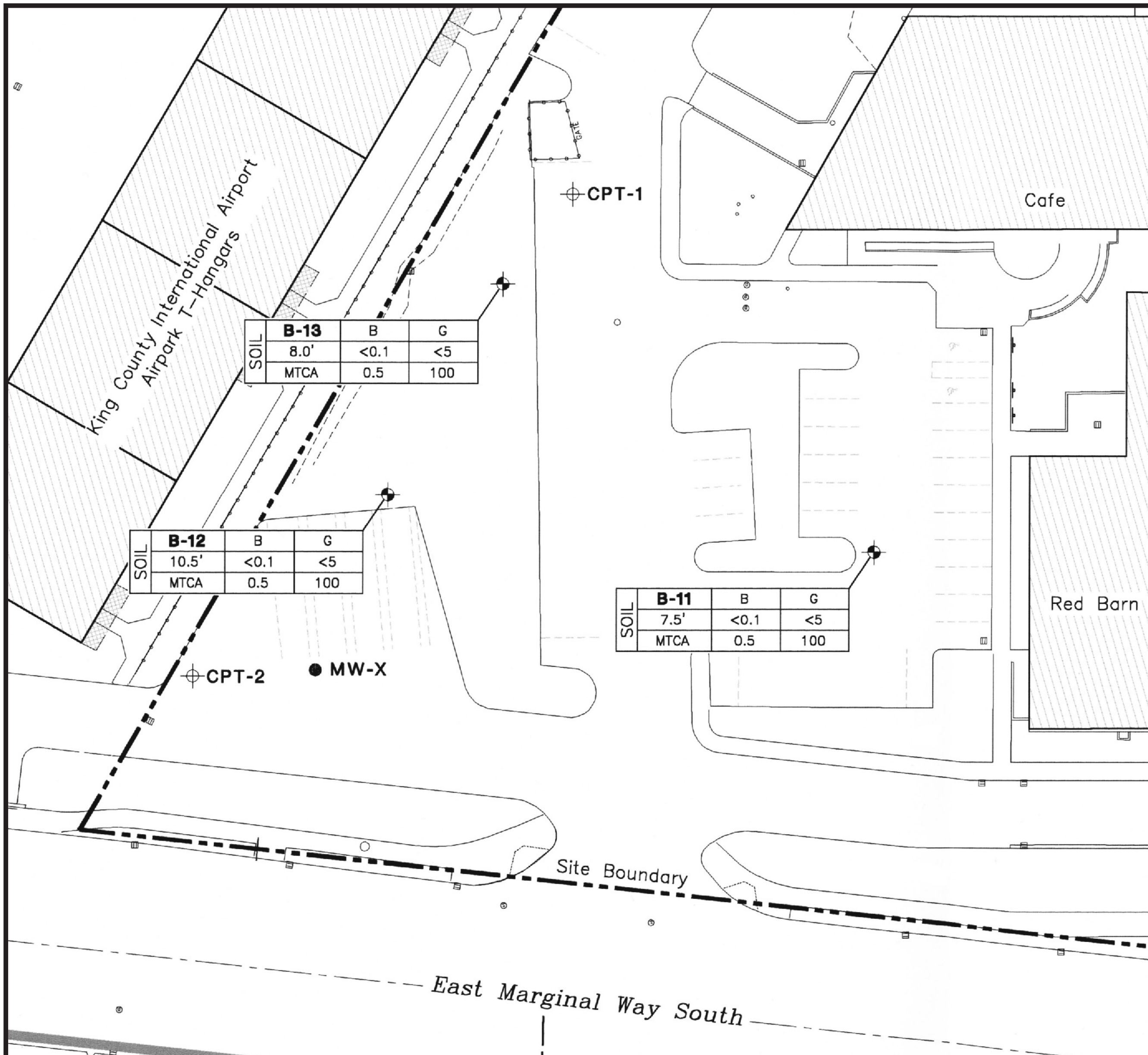
LOWER DUWAMISH WATERWAY
RM 3.9-4.3 EAST (SLIP 6)
Tukwila, Washington

Figure 22
MOF CHEMICAL ANALYTICAL DATA
SOUTH SOIL BORINGS

Source: Geo Engineers 2001.

Date:	Drawn by:	
7/17/08	AES	10:002330WD1402\fig 22



EXPLANATION:

B-11 — SOIL BORING INSTALLED BY GEOENGINEERS

CPT-1 — SOIL BORING INSTALLED BY SHANNON & WILSON

MW-X — MONITORING WELL INSTALLED BY SHANNON & WILSON

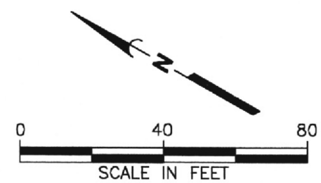
B — BENZENE– mg/kg (SOIL)

G — GASOLINE–RANGE HYDROCARBONS– mg/kg (SOIL)

MTCA — MODEL TOXICS CONTROL ACT METHOD A CLEANUP LEVELS

mg/kg — MILLIGRAMS PER KILOGRAM

CATCH BASIN



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.

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LOWER DUWAMISH WATERWAY
RM 3.9-4.3 EAST (SLIP 6)
Tukwila, Washington

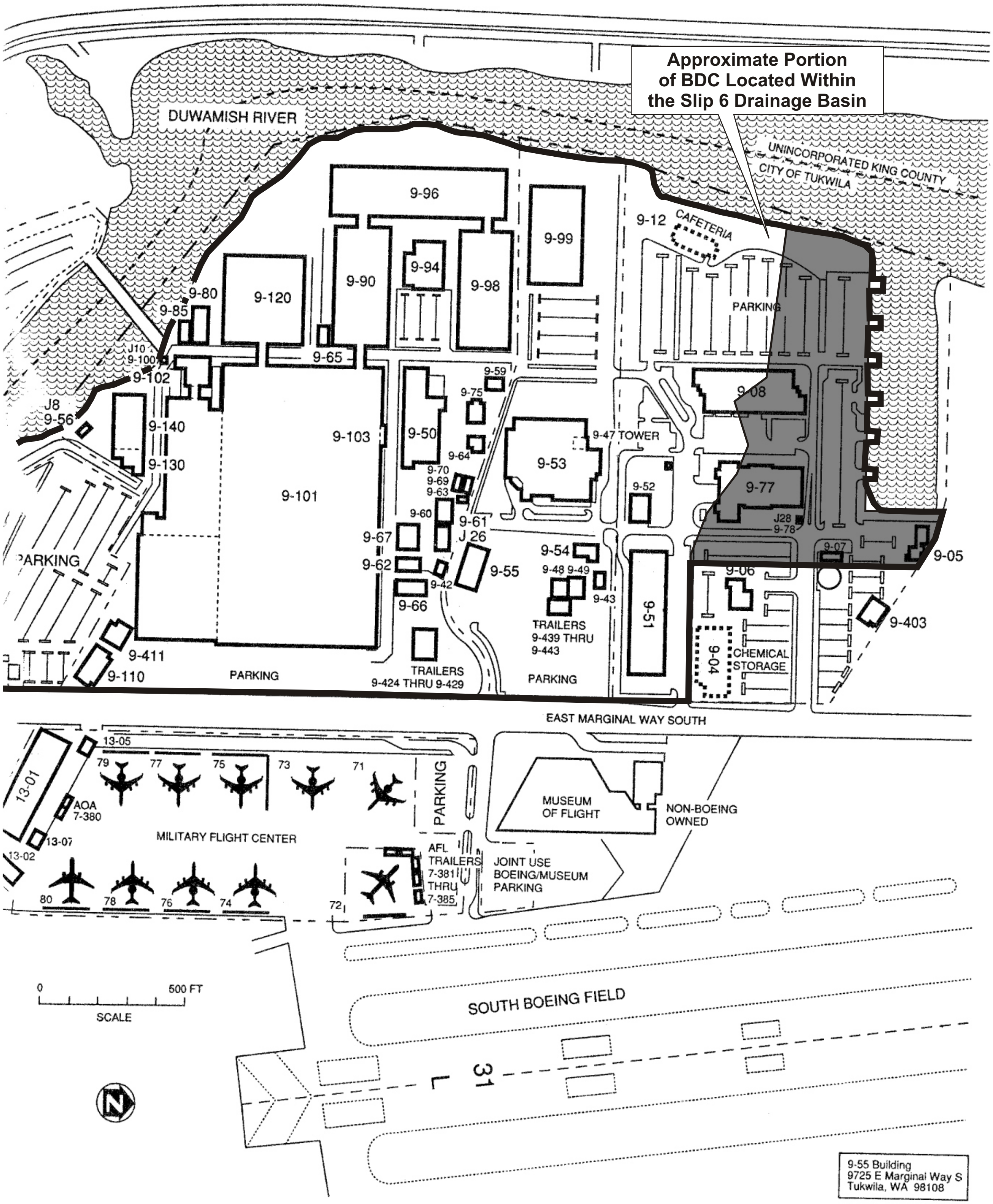
Figure 23
MOF CHEMICAL ANALYTICAL DATA
NORTH SOIL BORINGS

Source: Geo Engineers 2001.

Date: 7/17/08

Drawn by: AES

10:002330WD1402\fig 23



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LOWER DUWAMISH WATERWAY
RM 3.9-4.3 EAST (SLIP 6)
Tukwila, Washington

Figure 24
1991 BOEING DEVELOPMENTAL CENTER
FACILITY MAP

Base Map Reference: Boeing Defense & Space Group, July 1991	Date: 7-17-08	Drawn by: AES	10:002330WD1402\fig 24

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