WASHINGTON STATE DEPARTMENT OF ECOLOGY

Lower Duwamish Waterway

Source Control Action Plan for

Early Action Area 7

September 2007

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Lower Duwamish Waterway Source Control Action Plan for Early Action Area 7

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Executive Summary

The Lower Duwamish Waterway (LDW), located in Seattle, Washington, was added to the U.S. Environmental Protection Agency (EPA) National Priorities List (Superfund) on September 13, 2001. Ecology added the site to the Washington State Hazardous Sites List on February 26, 2002.

Contaminants of concern found in LDW sediments include polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), mercury and other metals, and phthalates. These contaminants of concern may pose threats to people, fish, and wildlife.

In December 2000, EPA and the Washington State Department of Ecology (Ecology) entered into an agreement with King County, the Port of Seattle, the city of Seattle, and The Boeing Company (Boeing), collectively referred to as the Lower Duwamish Waterway Group (LDWG) to conduct a Remedial Investigation (RI) and Feasibility Study (FS) of sediment contamination in the LDW to assess potential risks to human health and the environment and to evaluate cleanup alternatives. EPA is the lead agency for the RI/FS. Ecology is the lead agency for controlling ongoing sources of contamination 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, used existing data to provide an understanding of the nature and extent of chemical distributions in the LDW, provide a preliminary assessment of potential human health and ecological risks, identify information needs, and identify high priority areas for cleanup ("early action areas"). Seven candidate sites for early action were recommended, including Area 7, the Norfolk combined sewer overflow/storm drain (CSO/SD). Early Action Area 7 (EAA-7) is one of five early action areas that either had sponsors to begin investigations or were already under investigation by a member or group of members of the LDWG.

Section 1 of this Action Plan provides background information about the LDW site and EAA-7, including the source control strategy and participating agencies. Section 2 provides a description of the site and a discussion of the chemicals of concern for EAA-7 sediments, which consist primarily of PCBs, phthalates, PAHs, and hexachlorobenzene. It should be noted that although this Action Plan focuses on these chemicals of concern, other chemicals that could result in sediment recontamination will be addressed in the source control process as sources are identified. Section 3 provides an overview of potential sources of contaminants that may affect EAA-7 sediments, including piped outfalls, spills, properties adjacent to EAA-7, and upland properties. Section 3 also describes actions planned or currently underway to control potential sources of contaminants. Sections 4 and 5 describe monitoring and tracking/reporting activities, respectively.

Table ES-1 lists the source control actions that have been identified for EAA-7. This table includes a brief description of the potential contaminant sources (including the Norfolk CSO/SD, upland and adjacent properties, and spills and atmospheric deposition), source control action items, and parties involved in source control actions for each property or task.

Potential Sources	Action Items	Parties Involved
Norfolk Combined Sewer Overflow/Storm Drain (CSO/SD)		
Due to limitations of the available data, there is not a clear understanding of the configuration of portions of the Norfolk CSO/SD and the relationships between this system and private storm drain systems at the identified facilities of potential concern. In order to better evaluate the potential for surface or subsurface (soil or groundwater) contamination to migrate via the Norfolk CSO/SD to EAA-7, it is necessary to obtain a better understanding of the configurations, relationships, and interconnections of the various drainage systems. The in-line sediment sampling data identify contamination within the Norfolk CSO/SD, but it is of limited use in determining the contribution of contaminants in stormwater from some areas within the drainage basin.	Compile all available GIS location data in order to gain a better understanding of the configurations, relationships, and interconnections of the various stormwater systems. If such additional as-built information is not available, dye testing or other source tracing techniques should be employed to map out the system components.	Seattle Public Utilities, City of Tukwila, and King County
	Obtain drainage plans for private properties along East Marginal Way South to better delineate drainage basin boundaries in this area.	Seattle Public Utilities, City of Tukwila, and King County
	Conduct further source tracing and sampling within the Norfolk CSO/SD.	Seattle Public Utilities, City of Tukwila, and King County
Spills		
Spills of waste materials containing contaminants of concern may occur directly to the LDW or onto the ground within the drainage area that discharges into the LDW near EAA-7.	In the event of a spill, monitor the origin of the spill and any cleanup activities to identify any post-spill source control action that may be necessary.	Ecology and property owner
Boeing Developmental Center (BDC)		
In-line stormwater solid sampling (referred to as "effluent solid sampling in the referenced documents) from the south storm drain indicate the presence of PCBs residues. Storm drains at the property could be a source of PCBs to EAA-7 sediments. Spills at the BDC could enter the storm drain system and be discharged to EAA-7. However, activities that could potentially cause spills are controlled by the facility industrial stormwater permit and SWPPP. Parcel 0423049016, located at the southern portion of the BDC, may have been the location of a histrical barge operation. No sampling information exists for the property. It is not known if historic operations at the parcel have resulted in contamination that could result in contamination of EAA-7 sediments.	Continue sediment monitoring in the vicinity of the south storm drain sediment removal activities to evaluate the potential for sediment recontamination from existing sources at the BDC.	Boeing
	Determine the source of PCBs found in solids in the storm drains and conduct source control activities to remove the PCBs from the system.	Boeing
	Continue monitoring solids in the storm drains to assess the potential for sediment recontamination from any ongoing sources.	Boeing
	Determine cleanup of PCB-containing caulk and other building materials.	Ecology and Boeing
	Re-evaluate the existing SWPPP to determine whether process/operational changes have been made at the BDC, and make any necessary changes to address any new conditions that could be associated with ongoing sources.	Ecology and Boeing
	Re-evaluate the existing Industrial Stormwater General Permit to assure that the appropriate parameters are measured to assess ongoing sources.	Ecology and Boeing
	Determine whether groundwater and soil sampling are needed at parcel 0423049016 to assess possible historic contamination.	Ecology and Boeing
Military Flight Center (MFC)		
Areas at the MFC that were identified as containing PCBs. Materials that contain PCBs at a concentration greater than 50 mg/kg were removed during two sampling events in 2005 and 2006. A total of 25,550 linear feet of PCB joint material was removed. Additional material containaing PCBs still exist at the facility. Spills at the MFC may enter the storm drain system and be discharged to EAA-7. However, activities that could potentially cause spills are controlled by the facility industrial stormwater permit and SWPPP.	Provide reports of any further PCB caulk removal efforts and conduct testing to assess the effectiveness of the removal of PCB contaminated material to Ecology.	Boeing
	Re-evaluate the existing SWPPP and NPDES permit and make any necessary changes, including parameters to address potential ongoing sources.	Ecology and Boeing
	Inspect the MFC to ensure that pollutant prevention practices are adequate to control the ongoing discharge of pollutants from this site and that the MFC is in compliance with its Industrial Stormwater General Permit.	Ecology
	Monitor stormwater for PCBs at discharge points to assess potential ongoing sources.	Boeing
	Discuss cleanup options for removal of caulk containing PCBs at less than 50 mg/kg.	Ecology and Boeing
King County International Airport (KCIA)		
PCBs could be present in joint sealant material at the southern portion of KCIA that is located in the Norfolk CSO/SD drainage basin. Due to a lack of information about the locations of stormwater discharges from the southern portion of the KCIA into the LDW, it is not clear whether or not some stormwater discharges from the southern portion of KCIA into the EAA-7 area of interest. Spills at the southern end of the KCIA could enter the storm drain system and be discharged to the LDW. Available information does not indicate whether any of the discharges into the LDW are to the EAA-7 area. However, activities that could potentially cause spills are controlled by the facility Industrial Stormwater General Permit and SWPPP.	Determine where the KCIA storm drain system connects to the Norfolk CSO/SD.	KCIA
	Test, and as needed, remove any material (e.g., caulk containing PCBs) in the southern portion of KCIA that contains elevated levels of PCBs.	KCIA
	Re-evaluate the SWPPP and make any necessary changes to address ongoing sources.	Ecology and KCIA
Associated Grocers, Inc.		
According to the Ecology's online UST database, Associated Grocers, Inc. has two operational USTs. These 20,000 gallon tanks were installed in January 1979 and contain diesel fuel. Potential spills from these tanks could be a source of contamination to the Norfolk CSO/SD and EAA-7. Best management practices should be implemented in order to minimize potential spills. Three areas on the Associated Grocers, Inc. site have had known groundwater and/or soil contamination: the former truck shop; former USTs by the maintenance building; and the former Humble service station. The latest round of groundwater sampling at the former truck shop took place in June 2006. Benzene, TPH-diesel range, and TPH-gasoline range were detected at concentrations greater than the MTCA Method A groundwater cleanup levels. Free product consisting of a mixture of gasoline and diesel fuel also has been found several monitoring wells. All of these monitoring wells are located in the vicinity of the former pump island, which is east of the former truck shop facility. Contaminated groundwater from the former truck shop could potentially infiltrate into the storm drain system and eventually discharge into the LDW in the EAA-7.	Sample monitoring wells located by the former truck shop to evaluate current groundwater flow and extent of the contaminant plume. Evaluate monitoring well locations and depth intervals to determine if additional monitoring wells are needed to fully delineate the contaminant plume.	Current Property Owner
	Re-evaluate free product removal strategy in order to determine its source control effectiveness.	Current Property Owner
	Determine whether additional groundwater and soil assessment is needed for the maintenance building where USTs removal activities took place in 1995.	Ecology
	The new owners of the property may choose to redevelop the land. If any excavation is conducted as part of the redevelopment, contaminated soil and groundwater could be encountered. SPU will apprise the city of Seattle Department of Planning and Development of this to ensure that contractor addresses this in their construction dewatering plan.	SPU
	There are two operational USTs on the facility. Evaluate the spill prevention and cleanup plan to assure that potential for spills into the storm drain system are adequately addressed to control ongoing sources.	Ecology and Current Property Owner
	Continue to conduct business inspections at the Associated Grocers site to determine if the site is in compliance.	SPU
	Determine whether a SWPPP is required for Associated Grocers, Inc. to address potential ongoing sources.	Ecology

Northwest Auto Wrecking		
The Northwest Auto Wrecking site has confirmed soil and sediment contamination, and suspected groundwater, surface water, and air contamination. The confirmed and suspected contaminants are halogenated organic compounds, EPA priority pollutant metals, and cyanide, metals, PCBs, petroleum products, and non-halogenated solvents. The site is currently awaiting a Site Hazard Assessment by Ecology. No soil or groundwater sampling information for the site was found during the site file review. No information on stormwater drainage for the site was found during the site file review. Surface and subsurface contamination that may exist at the site could potentially enter into the on-site storm drain system and drain to the LDW. The likelihood of this is not presently possible to evaluate because of lack of information	Conduct soil, groundwater, surface water, and sediment sampling, as appropriate, to evaluate potential historic sources.	Northwest Auto Wrecking
	Review results of soil, groundwater, surface water, and sediment sampling to assess the potential historic impacts of soil and groundwater contamination to the Norfolk CSO/SD and EAA-7.	Ecology
	Conduct inspections of this facility to assess potential ongoing sources. SPU has recently entered into an MOA with The City of Tukwila to inspect 5 businesses in Tukwila that are located in the Norfolk drainage basin, including Northwest Auto Wrecking, as part of the LDW source control program.	SPU
	Determine whether a NPDES permit/SWPPP is required for the facility.	Ecology
	Obtain information pertaining to the storm drain system from Northwest Auto Wrecking to assess potential historic and ongoing sources.	Ecology
	Determine whether the storm drain system connects to the Norfolk CSO/SD to assess potential historic and ongoing sources.	Northwest Auto Wrecking
Affordable Auto Wrecking		
The Affordable Auto Wrecking site has suspected groundwater contamination and confirmed surface water and soil contamination. No soil or groundwater sampling information for the site was found during the site file review. The stormwater drainage configuration at the site is not known based on available data. Surface and subsurface contamination that may exist at this facility could potentially be a source of sediment recontamination of the LDW via the on-site storm drain system. The likelihood of such sediment contamination cannot be evaluated with available data.	Conduct surface water, soil, and groundwater sampling to assess the potential impacts of these media on the Norfolk CSO/SD and EAA-7.	Affordable Auto Wrecking
	Determine where the storm drain system connects to the Norfolk CSO/SD to assess potential historic and ongoing sources.	Affordable Auto Wrecking and SPU and/or city of Tukwila
	Conduct inspections of the facility to make sure that the recent changes made to the drainage system are currently functioning and that no contaminated runoff gets into the municipal storm drain system on MLK Way.	Ecology, SPU, and KCIW
	Determine cleanup options for the removal of historically contaminated media as appropriate.	Ecology and Affordable Auto Wrecking
	Re-evaluate the SWPPP and make any necessary changes to address potential ongoing sources.	Ecology and Affordable Auto Wrecking
	Continue to oversee and monitor discharges to the combined sewer system through the King County Industrial Waste Program to evaluate potential ongoing sources.	KCIW
Arco Gas Station		
The Arco Gas Station site has groundwater contamination below the cleanup level and soil contamination that has been remediated. The facility owner is pursuing a NFA determination by Ecology under the Voluntary Cleanup Program (Adams 2005). Available soil and groundwater information indicate that the groundwater on site is below the MTCA Method A cleanup levels. Soil boring samples are needed in the area adjacent to the tank farm to determine if soils are impacted and if those soils will need to be remediated in order to control this potential contaminant pathway. Additional information on the stormwater system is needed to assess this area as a potential source to EAA-7.	Under the Voluntary cleanup program, conduct soil sampling in the area adjacent to the former tank farm to determine if soils are impacted and if such historically impacted soils will need to be remediated in order to control this potential contaminant pathway.	Arco Gas Station
	Conduct additional groundwater monitoring.	Arco Gas Station
	After additional soil and groundwater sampling is complete, determine whether further actions are needed to address potential historic sources.	Ecology
	Determine if a SWPPP is required from Arco Gas Station to address potential ongoing sources.	Ecology
	Gain a better understanding of the storm drain system and possible historic or present connections to the Norfolk CSO/SD.	Ecology
Atmospheric Deposition		
Air pollution can enter the waterway directly or through stormwater, thus becoming a possible source of sediment contamination to EAA-7. Air pollution can be localized, such as paint overspray, sand-blasting, and fugitive dust and particulates from loading/unloading of raw materials such as sand, gravel, and concrete, or it can be widely dispersed from vehicle emissions, industrial smokestacks, and other sources.	Investigate atmospheric deposition to assess whether atmospheric deposition is a potential source of phthalates, particularly bis(2-ethylhexyl) phthalate, and other contaminants, in stormwater runoff.	Source Control Work Group

Key:

CSCSL: Confirmed and Suspected Contaminated Site List
CSO: Combined Sewer Overflow
EAA: Early Action Area
Ecology: Washington Department of Ecology
EPA: U.S. Environmental Protection Agency
LDW: Lower Duwamish Waterway
µg/kg: micrograms per kilogram
KCIA: King County International Airport
KCIW: King County Industrial Waste Program
µg/L: micrograms per liter
MTCA: Model Toxics Control Act
PCB: polychlorinated biphenyl
SWPPP: Stormwater Pollution Prevention Plan
TPH: total petroleum hydrocarbons
UST: underground storage tank

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Acronyms/Abbreviations

2LAET	Puget Sound Second Lowest Apparent Effects Threshold
AOC	Area of Concern
BDC	Boeing Developmental Center
BMPs	best management practices
Boeing	The Boeing Company
BNA	base neutral acid
cm	centimeters
CSCSL	Confirmed and Suspected Contaminated Site List
CSL	Cleanup Screening Level
CSO	Combined Sewer Overflow
dw	dry weight
E & E	Ecology and Environment, Inc.
EAA	Early Action Area
EAA-7	Early Action Area 7
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ESA	Environmental Site Assessment
FS	Feasibility Study
GIS	Geographic Information System
KCIA	King County International Airport
KCIW	King County Industrial Waste Program
LAET	Puget Sound Lowest Apparent Effects Threshold
LDW	Lower Duwamish Waterway
LDWG	Lower Duwamish Waterway Group
LUST	leaking underground storage tank
MFC	Military Flight Center
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
$\mu g/m^2/day$	micrograms per meter squared per day
MOF	Museum of Flight
MTCA	Model Toxics Control Act
NFA	No Further Action
NPDES	National Pollutant Discharge Elimination System
OC	organic carbon
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
ppb	parts per billion
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RM	river mile
ROD	Record of Decision

Acronyms/Abbreviations (Continued)

RWSP	Regional Wastewater Services Plan
SCWG	Source Control Work Group
SD	storm drain
SMS	Sediment Management Standards
SPU	Seattle Public Utilities
SQS	Sediment Quality Standards
SWMU	Stormwater Management Unit
SWPPP	Stormwater Pollution Prevention Plan
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TRI	Toxics Release Inventory
TSS	Total Suspended Solids
UST	underground storage tank
VCP	Voluntary Cleanup Program
WSDOT	Washington State Department of Transportation

1.0 Introduction

This Source Control Action Plan (Action Plan) describes potential sources of contamination that may affect sediments in and adjacent to Early Action Area 7 (EAA-7).[1] The purpose of this plan is to evaluate the significance of these sources and to determine if actions are needed to minimize the potential for recontamination of EAA-7 sediments. In addition, this Action Plan 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 a variety of sources, including the following documents:

- *Lower Duwamish Waterway, Early Action Area 7 Summary of Existing Information and Identification of Data Gaps Report*, Ecology and Environment (E & E), September 2007, located on Ecology's website: http://www.ecy.wa.gov/programs/tcp/sites/lower_duwamish/sites/early_action_area_7/EAA_7.html
- *Lower Duwamish Waterway Source Control Strategy*, Ecology, January 2004 also located on Ecology's website: http://www.ecy.wa.gov/programs/tcp/sites/lower_duwamish/source_control/sc.html
- Seattle Public Utilities (SPU) Business Inspections Forms, September 2002 through April 2003

1.1 Organization of Document

Section 1 of this Action Plan describes the LDW site, the strategy for source control, and the responsibilities of the public agencies involved in source control for the LDW. Section 2 provides background information on EAA-7, including a description of the chemicals of concern for EAA-7 sediments. Section 3 provides an overview of potential sources of contaminants that may affect EAA-7 sediments, including piped outfalls, spills, properties adjacent to EAA-7, and upland properties. Section 3 also describes actions planned or currently underway to control potential sources of contaminants. Sections 4 and 5 describe monitoring and tracking/reporting activities, respectively. Section 6 provides a list of references cited in this report.

[1] This Action Plan incorporates data published through April 27, 2007. Section 5 describes how newer data will be disseminated.

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 industry, the river is used for fishing, recreation, and wildlife habitat. Residential areas near the LDW 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 LDW 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 to 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 1950s. In 1988, the EPA investigated sediments in the LDW as part of the Elliott Bay Action Program. Problem chemicals identified by the EPA study included metals, PAHs, PCBs, phthalates, and other organic compounds. In 1999, EPA completed a study of approximately 6 miles of the LDW, from the southern tip of Harbor Island to just south of the turning basin near the Norfolk CSO/SD outfall (Weston 1999). This study confirmed the presence of PCBs, PAHs, phthalates, mercury, and other metals. These contaminants 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 Boeing, collectively known as the LDWG. Under the agreement, the LDWG is conducting an RI and FS of the LDW to assess potential 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 candidates 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, a FS will be completed 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 were recommended (Figure 1). The sites are:

- Area 1: Duwamish/Diagonal CSO/SD;
- Area 2: River mile (RM) 2.2, on the west side of the LDW, just south of the 1st Avenue South Bridge;
- Area 3: Slip 4 (RM 2.8);
- Area 4: South of Slip 4, on the east side of the LDW, just offshore of the Boeing Plant 2 and Jorgensen Forge properties (RM 2.9 to 3.7);
- Area 5: Terminal 117 and adjacent properties, located at approximately RM 3.6, on the west side of the LDW;
- Area 6: RM 3.8, on the east side of the LDW; and
- Area 7: Norfolk CSO/Storm Drain Area (RM 4.8 to 5.0), on the east side of the LDW.

Of the seven recommended Early Action Areas (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: Norfolk CSO/SD (the subject of this Action Plan); Slip 4; Terminal 117; Boeing Plant 2; and Duwamish/Diagonal. EPA is the lead for managing cleanup at Terminal 117 and Slip 4. The other two early action cleanup projects were begun before the current LDW RI/FS was initiated. Cleanup at Boeing Plant 2, under EPA Resource Conservation and Recovery Act (RCRA) management, is currently in the planning stage. The Duwamish/Diagonal cleanup, under King County management as part of the Elliott Bay-Duwamish Restoration Program, was partially completed in March 2004. 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 at:
http://yosemite.epa.gov/r10/cleanup.nsf/sites/lduwamish and
http://www.ecy.wa.gov/programs/tcp/sites/lower_duwamish/lower_duwamish_hp.html.

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 basic plan is to identify and manage sources of potential contamination and recontamination in coordination with sediment cleanups. The goal of the strategy is to minimize the potential for recontamination of sediments to levels exceeding the LDW sediment cleanup goals and the

Sediment Management Standards (SMS) (WAC 173-204). Existing administrative and legal authorities will be used to perform inspections and require necessary source control actions.

The strategy is being implemented through the development of a series of detailed, area-specific Action Plans that will be coordinated with sediment cleanups, beginning with the EAAs. Each Action Plan will document what is known about the area, the potential sources of recontamination, actions taken to address them, and how to determine when adequate source control is achieved for an area. Because the scope of source control for each site will vary, it will be necessary to adapt each plan to the specific situation at that site. 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 that must make necessary changes to control releases from their properties.

The source control strategy focuses on controlling contamination that affects LDW sediments. 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 Ecology's SMS (WAC 173-204). The first principle is to control sources early, starting with identifying all ongoing sources of contaminants to the site. EPA's Record of Decision (ROD) for the site will require that sources of sediment contamination to the entire site be evaluated, investigated, and controlled as necessary. Dividing source control work into specific Action Plans and prioritizing those plans to coordinate with sediment cleanups will address the guidance and regulations and will be consistent with the selected remedial actions in the EPA ROD.

Source control priorities are divided into four tiers. Tier One consists of source control actions associated with the EAAs identified to date. Tier Two 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 Three 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 Four consists of source control work identified by post-cleanup sediment monitoring (Ecology 2004). This document is a Tier One Source Control Action Plan for an early action sediment cleanup.

Further information about the Lower Duwamish Waterway Source Control Strategy can be found at: http://www.ecy.wa.gov/biblio/0409043.html and http://www.ecy.wa.gov/programs/tcp/sites/lower_duwamish/lower_duwamish_hp.html.

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, Port of Seattle, and EPA. Because the Port of Seattle has no jurisdiction over the area included in EAA-7, the Port is not directly involved in source control activities for EAA-7.

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 Action Plans, 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, city of Tukwila, and the Seattle/King County Department of Public Health. These agencies have been invited to participate as appropriate (Ecology 2004).

From 2003 through 2005, the King County Industrial Waste Program (KCIW) and SPU co-led the joint King County-Seattle program to inspect businesses in area that discharge to the LDW through either the city-owned storm drain system or the combined sanitary sewer/storm drain system, which includes the Norfolk CSO/SD. The goal of the joint inspection program was to combine resources in order to complete the business inspections before the start of sediment cleanup for the LDW Superfund Site (King County and Seattle Public Utilities 2005). Currently, King County and SPU are continuing with inspections on a separate basis under their respective regulatory authorities. King County inspects industrial dischargers to the sanitary sewer on an ongoing basis through its Industrial Waste Program. SPU is currently conducting the stormwater business inspections solely.

SPU has conducted two rounds of source control inspections at 40 businesses operating within the Norfolk SD drainage basin. The first round was conducted in 2001 and a second round was conducted in 2005-2006 as part of the LDW source control program. Corrective actions were required at 26 of the businesses. Types of problems or corrective actions identified during the 2005-2006 round are summarized below (Schmoyer 2007):

- Drainage facility needs to be cleaned/maintained (21 cases);
- Facility lacks proper spill prevention/cleanup plan/procedures (20 cases);
- Inadequate employee training on spill prevention/cleanup procedures (14 cases);
- Inadequate spill cleanup materials available on site (12 cases);
- Improper storage of hazardous products and waste materials (12 cases);
- Improper outdoor storage of non-hazardous materials/products (6 cases);
- Improper hazardous waste disposal (1 case); and
- Improper fueling operations (1 case).

SPU will continue to monitor business activities in the area through its citywide pollution prevention program. This program works with local businesses to ensure that they comply with the source control requirements of the city stormwater, grading, and drainage control code (SMC 22.800).

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2.0 Early Action Area 7

EAA-7 is located between 4.8 and 5.0 miles from the south end of Harbor Island on the east bank of the LDW. The location of EAA-7 is shown in Figure 1 (labeled 7. Norfolk CSO Area). This area is adjacent to the outfalls of the Norfolk CSO/SD and private storm drains at the Boeing Developmental Center (BDC). The locations of the Norfolk CSO/SD outfall and the private storm drain outfalls at BDC are shown in Figure 2.

The Norfolk CSO/SD system includes the municipal storm drain system for the 769 acre Norfolk SD and the King County combined sewer system for a 4,900 acre service area. The Norfolk SD drainage basin and county combined service areas are illustrated in Figure 3. The Norfolk CSO/SD system discharges stormwater and untreated sewage during periods of heavy rainfall when the sewer system is inundated with water. The 769 acre Norfolk SD basin includes mixed residential, commercial, and industrial property (King County 2007a).

The boundary for the EAA-7 sediments has not been officially determined by EPA; however, for the purposes of this document, EAA-7 includes the area where King County dredged contaminated sediments located near the Norfolk CSO/SD outfall in 1999 and the area where Boeing removed contaminated sediments near the Boeing south storm drain outfall in 2003. These sediment dredging actions are discussed further below. A photograph of the Norfolk CSO/SD outfall is presented in Figure 4. A photograph of the Norfolk CSO/SD and one of the Boeing-owned storm drain outfalls (labeled "Boeing South Storm Drain Outfall") is presented in Figure 5. The Boeing south storm drain outfall is also referred to as DC2, as shown in Figures 2 and 6.

For source control purposes, we are evaluating an area that includes the 1999 and 2003 dredge sites and that also encompasses the area adjacent to other storm drain outfalls near the dredge sites. These outfalls are included to assess their potential as sources of recontamination to the area. The areas of the 1999 and 2003 sediment dredging, the larger area of interest for LDW source control, and the additional storm drain outfalls considered in this Action Plan are illustrated in Figure 2. These other outfalls, as well as the Norfolk CSO/SD outfall and Boeing south storm drain outfall (DC2), are shown in Figures 2 and 6.

In 1999, King County dredged the area of the LDW near the Norfolk CSO/SD and backfilled the dredged area with clean sediment. Chemicals of concern at the site prior to cleanup activities included: mercury; 1,4-dichlorobenzene; bis(2-ethylhexyl)phthalate; and PCBs. Potential sources of contamination to EAA-7, and recontamination to the sediments capped in 1999, include stormwater discharges, CSO/SD discharges, residual sediment contamination, and contamination in banks adjacent to the waterway. Following the 1999 sediment cleanup, King County initiated a five-year sampling program to monitor the clean sediment backfill for potential recontamination by metals and organics contaminants. Potential sources of recontamination included the sediments between the northern extent of the dredging and the shoreline. Potential recontamination by PCBs was of particular concern. Due to concern about the possibility of recontamination of the sediment, Ecology's Toxics Cleanup Program conducted an assessment of PCB concentrations in the vicinity of the monitoring program locations in 2002. The results of the Ecology study were generally consistent with previous findings from the post-remedial monitoring conducted by King County, which were interpreted to indicate that the most likely source of PCB recontamination was erosion of PCB-contaminated sediments located inshore of the remediation site and adjacent to the Boeing south storm drain outfall (Ecology 2003). The King County and Ecology monitoring results are summarized in Section 2.2 below.

In order to address the issue of PCB sediment contamination, beginning in 2000, Boeing has conducted several phased investigations and removal actions at the south storm drain line and the LDW sediments near its outfall, including source control measures and a sediment removal action completed in 2003. These investigations and source control measures are discussed further in Section 3.4.1.3. During the 2003 cleanup of sediments near the Boeing south storm drain line, a vacuum truck equipped with hose extension and hand tool was used to remove approximately 60 cubic yards of contaminated sediment. The excavated area was backfilled with clean sand (Project Performance Corporation 2003). Boeing has conducted post-removal monitoring to evaluate the effectiveness of source-control measures in the south storm drain system. Although this monitoring has shown that PCBs are still present within an inaccessible portion of the south storm drain system, the 2005 report concluded, based in the sediment monitoring results, that the source control measures have significantly reduced PCB inputs to the LDW at the point of discharge (Calibre Systems 2005). However, samples of solids collected by Boeing at locations within the south storm drain system contained elevated levels of PCBs, indicating that elevated concentrations of PCBs remain in the system. Boeing indicated that it is planning to evaluate the feasibility and expected efficiency of additional source control measures for the south storm drain (Calibre System 2006).

2.1 Site Description

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

The LDW is a receiving water body for different types of industrial and municipal wastewater. There are currently no permitted industrial discharges of wastewater directly into the LDW. However, there are industrial and municipal stormwater discharges that currently enter the LDW. In addition, the CSO system, (including the Norfolk CSO/SD), which receives wastewater from a variety of industries, discharges into EAA-7 intermittently during periods of high rainfall (Windward 2003a).

Groundwater within the Duwamish Valley alluvium is typically encountered under unconfined conditions within approximately 10 feet (3 meters) of ground surface. Groundwater in this unconfined aquifer is found within fill and native alluvial deposits. The direction of groundwater flow in the unconfined aquifer is generally toward the LDW, although the direction may vary locally depending on the nature of subsurface material, and temporally based on proximity to the LDW and the influence of tidal action. Although high tides can cause temporary groundwater flow reversal, the net groundwater flow direction for the unconfined aquifer is believed to be toward the LDW. The area affected by tide-related flow direction reversals is generally within 300 to 500 feet (100 to 150 meters) of the LDW (Windward 2003a). A confined groundwater zone is present beneath the unconfined aquifer. Flow in this confined zone is to the north toward Elliott Bay. The bottom of the unconfined aquifer is located at the top of a layer of marine sediment at a depth of 45 to 50 feet (Cook 2001).

The Norfolk SD drainage basin includes several facilities of concern that could be sources of ongoing or future recontamination to EAA-7 sediments. These facilities are the BDC; the Boeing Military Flight Center (MFC); the southern portion of King County International Airport (KCIA); Associated Grocers, Inc; Affordable Auto Wrecking; Northwest Auto Wrecking; and the Arco Gas Station. The Norfolk SD drainage basin and locations of the identified facilities of concern are shown in Figure 7. Table 1 lists the identified facilities of concern.

Point discharges to the LDW within EAA-7 include the Norfolk CSO/SD and five private discharge points or outfalls owned by Boeing (BDC discharge points DC17, DC4, DC16, DC3, and DC2), illustrated in Figures 2 and 4. Figure 5 presents a photograph provided by Ecology that shows BDC discharge point DC2 in relation to the Norfolk SCO/SD outfall. According to the Stormwater Pollution Prevention Plan (SWPPP) for the BDC, a sixth private storm drain system owned by Boeing connects to the Norfolk CSO/SD at discharge point DC1, located a short distance upstream of the Norfolk CSO/SD's outfall into the LDW. Discussion of discharge point DC1 is included in the discussion of the Norfolk CSO/SD below. Known private and public drain lines and discharge points to the LDW are discussed in Section 3.1.

In addition to point discharges, erosion of bank soils could potentially contribute contamination of the LDW if the soils are contaminated. The BDC is the only facility of concern that is located along the bank of the LDW. No information during the file review indicated that bank soils at the BDC are a continued source of contamination.

Facilities of concern within EAA-7 are described in Section 3.

2.2 Chemicals of Concern in Sediments

Sediments within EAA-7 have been documented to be impacted at levels of concern by the several organic compounds based on results of sampling conducted between 1999 and 2005. The Washington State SMS (Chapter 173-204 WAC) establish Marine Sediment Quality Standards (SQS) and Sediment Impact Zone Maximum Level and Sediment Cleanup Screening Level (CSL)/Minimum Cleanup Level for some chemicals that may be found in sediments. The SQS identify chemical concentrations in surface sediments that have no adverse effects on biological resources and no significant health risk to humans. CSLs represent "minor adverse effects" levels used as an upper regulatory threshold for making decisions about source control and cleanup. For the purposes of this report, a chemical was identified as a chemical of potential concern for EAA-7 if the detected concentration in one or more EAA-7 sediment samples exceeded the SQS or CSL value. On this basis, the following chemicals were identified as chemicals of concern for EAA-7:

- Benzo(g,h,i)perylene

- Bis(2-ethylhexyl)phthalate
- Butyl benzyl phthalate
- Hexachlorobenzene
- PCBs

Additional chemicals were identified as chemicals of concern if the chemical was not detected in the EAA-7 sediment sample but the associated method detection limit exceeded the SQS or CSL value. The following are identified as chemicals of concern to EAA-7 on this basis:

- 2,4-dimethylphenol
- 2-methylnaphthalene
- Dibenzo(a,h)anthracene
- Dibenzofuran.
- Hexachlorobutadiene
- N-nitrosodiphenylamine

Under the SMS, the SQS and CSL values for some organic compounds are organic carbon (OC) normalized. As such, the detected concentrations (dry weight basis) for these compounds in sediment samples are normalized to the total organic carbon (TOC) concentration in the samples, as appropriate, to allow comparison with the SQS and CSL values. For those samples with TOC concentrations considered to be outside an acceptable range, the dry weight concentrations of the constituents were compared to the Puget Sound Lowest Apparent Effects Threshold (LAET) or Puget Sound Second Lowest Apparent Effects Threshold (2LAET) values.

Contaminant concentrations detected in storm drain sediment/solids samples presented in this document also were compared to SQS/CSL and/or LAET/2LAET values in order to provide a rough indication of contaminant levels in the storm drain sediments/solids. It should be emphasized that the SQS/CSL and LAET/2LAET values do not apply to storm drain sediments/solids. Any comparison of contaminant concentrations in storm drain sediment/solids samples to these sediment quality criteria is most likely conservative given that sediments/solids discharged from storm drains are highly dispersed upon being discharged into in the receiving environment.

A summary of sediment sampling conducted in EAA-7 between 1999 and 2005 is provided below. Those sediment sample results for which the detected concentration exceeded the SQS/CSL values, or for which the method detection limit was greater than the SQS/CSL values, are presented in Table 2. Sediment data are detailed in the *Summary of Existing Information and Identification of Data Gaps Report* (E & E 2007).

As stated above, in 1999, King County dredged LDW sediments in the area of the Norfolk CSO/SD outfall and backfilled the dredged area with clean sediment. Following the cleanup, King County initiated a five-year sampling program to monitor the clean sediment cap for potential recontamination by metals and organics contaminants. Monitoring results are presented in Sections 2.2.1 through 2.2.3. Results of the 2002 Ecology sediment sampling event near the Norfolk CSO/SD are summarized in Section 2.2.4. Results of Boeing's 2003 sediment cleanup near the south storm drain are presented in Section 2.2.5, and subsequent monitoring results for the south storm drain system are summarized in Sections 2.2.6 and 2.2.7. The south storm drain sediment cleanup and follow-up monitoring are also discussed in Section 3.4.1.3.

2.2.1 Norfolk CSO Sediment Remediation Project, Five-Year Monitoring Program, April 1999 Monitoring Report (King County Department of Natural Resources 1999)

For the first year of King County's five-year post-dredge monitoring program, four sediment samples from four locations (NFK501, NFK502, NFK503, and NFK504) were collected in 1999 to establish baseline data on the chemical characteristics of the sediment used as backfill material. The purpose of the five-year program was to monitor sediment placed as backfill material at the site for potential recontamination from CSO and other discharges. Samples were collected from the top 10 centimeters (cm) of sediment. The samples were analyzed for percent solids, TOC, 13 priority pollutant metals, base neutral acids (BNAs), and PCBs. Results are summarized below. The report noted that normalization to organic carbon can produce biased results when the organic carbon content of the sample is very low (e.g., near 0.1 or 0.2 %). TOC concentrations in samples collected from NFK501, NFK502, and NFK504 were all below 0.2%, and the TOC concentration in the sample collected from NFK503 was just above 0.3%. A number of chemicals in these samples exceeded the SQS or CSL, although they did not exceed the LAET or 2LAET on a dry weight basis. Results are summarized below:

- Percent solids ranged from 76.9 to 77.6%.
- TOC ranged from 1,210 to 3,180 milligrams per kilogram (mg/kg) dry weight (dw).
- No metals exceeded their SQS chemical criteria.
- 2,4-dimethylphenol was not detected in any of the samples above the method detection limit of 35 micrograms per kilogram (µg/kg) dw, which exceeded the SQS and CSL of 29 µg/kg dw for all four samples.
- For two samples, the method detection limits for 2-methylnaphthalene (46 mg/kg and 44 mg/kg OC) exceeded the SQS criteria of 38 mg/kg OC, although they were below the CSL of 64 mg/kg OC.
- Benzo(g,h,i)perylene was detected in two samples at concentrations of 62.6 and 56.0 mg/kg OC, which exceed the SQS of 31 mg/kg OC, but does not exceed the CSL of 78 mg/kg OC.
- Dibenzo(a,h)anthracene was not detected above the method detection limits (ranging from 18 to 46 mg/kg OC) in any of the samples. All of these method detection limits exceeded the SQS of 12 mg/kg OC, and two exceeded the CSL of 33 mg/kg OC.
- Hexachlorobenzene was detected in one sample at 0.80 mg/kg OC, which exceeds the SQS of 0.38 mg/kg OC, but not the CSL of 2.3 mg/kg OC. In two samples,

hexachlorobenzene was not detected above the method detection limits, but the method detection limits of 0.51 and 0.71 mg/kg OC exceeded the SQS.

- Butyl benzyl phthalate was not detected above the method detection limits, which ranged from 6.6 to 17 mg/kg OC, all of which exceeded the SQS of 4.9 mg/kg OC.
- Dibenzofuran was not detected above the method detection limits; in three samples the method detection limit (ranging from 20 to 29 mg/kg OC) exceeded the SQS of 15 mg/kg OC.
- Hexachlorobutadiene was not detected above the method detection limits, which ranged from 11 to 29 mg/kg OC, all of which exceeded the SQS of 3.9 mg/kg OC and the CSL of 6.2 mg/kg OC.
- N-nitrosodiphenylamine was not detected above the method detection limit, but the method detection limits for three samples (ranging from 20 to 29 mg/kg OC) exceeded the SQS and CSL of 11 mg/kg OC.
- Total PCBs were not detected above the method detection limits, but the method detection limits for three samples (ranging from 13 to 18 mg/kg OC) exceeded the SQS of 12 mg/kg OC.
- Bis(2-ethylhexyl)phthalate was not detected above the method detection limits, which ranged from 6.6 to 17 mg/kg OC, below the SQS (47 mg/kg OC) and CSL (78 mg/kg OC).
- None of the following analytes were detected above their respective method detection limits, all of which were below their SQS criteria: benzoic acid; benzyl alcohol; 2-methylphenol; 4-methylphenol; pentachlorophenol; and phenol.

2.2.2 Norfolk CSO Sediment Remediation Project, Five-year Monitoring Program, Annual Monitoring Report – Year Two, April 2001 (Mickelson 2001)

For year two of the King County post-dredging monitoring program, eight sediment samples from four locations (NFK501, NFK502, NFK503, and NFK504) were collected in 2001. Samples were collected from the top 2 cm and the top 10 cm of sediment. The sampling location for NFK503 was approximately 22 feet closer to the shore than for the 1999 sampling event. This location is near the edge of the clean sediment cap. The samples were analyzed for percent solids, TOC, 12 priority pollutant metals, BNAs, and PCBs:

- Percent solids ranged from 52.7 to 74.4%.
- TOC concentrations ranged from 2,770 to 15,600 mg/kg dw.
- Arsenic, cadmium, and silver were not detected above their respective detection limits, all of which were below the SQS (57, 5.1, and 410 mg/kg dw, respectively) and CSLs (93, 6.7, and 960 mg/kg dw, respectively). Concentrations of all the other metals were at levels reported to be typical of natural, area-wide concentrations.

- Benzoic acid was detected in all eight samples at concentrations ranging from 67.6 to 299 µg/kg dw. These concentrations are below the SQS and SCL criteria of 650 µg/kg dw. No other ionic organic chemicals were detected.
- Anthracene was detected at concentrations ranging from 0.98 to 1.4 mg/kg OC in four samples collected from 0 to 2 cm, below the SQS (220 mg/kg OC) and the CSL (1,200 mg/kg OC).
- Phenanthrene was detected in all but one sample from 0 to 10 cm, at concentrations ranging from 1.0 to 7.98 mg/kg, below the SQS criterion of 100 mg/kg OC and CSL criterion of 480 mg/kg OC.
- High-molecular weight PAHs were all below their SQS and CSL criteria.
- Chlorobenzenes were not detected above there respective method detection limits (ranging from 0.03 to 0.15 mg/kg OC) in any samples.
- Bis(2-ethylhexyl)phthalate was detected in all eight samples, ranging from 24.9 to 42.7 mg/kg OC, below the SQS criterion of 47 mg/kg OC and CSL criterion of 78 mg/kg OC.
- Butyl benzyl phthalate was detected in samples NFK501, NFK502, and NFK504 at concentrations ranging from 2.24 to 6.63 mg/kg OC. Concentrations in two samples (6.63 and 5.03 mg/kg OC) exceeded the SQS of 4.9 mg/kg OC.
- Dibenzofuran was not detected above the detection limits, which ranged from 1.7 to 6.8 mg/kg OC, below the SQS and CSL criteria of 15 and 58 mg/kg OC, respectively.
- Hexachlorobutadiene was not detected above the detection limits, which ranged from 0.091 to 0.36 mg/kg OC, below the SQS and CSL criteria of 3.9 and 6.2 mg/kg OC, respectively.
- N-nitrosodiphenylamine was not detected above the detection limits, which ranged from 2.4 to 9.7 mg/kg OC, below the SQS and CSL criteria of 11 mg/kg OC.
- PCBs (as total Aroclors) were detected in all eight samples, four of which (concentrations ranging from 18.6 to 677 mg/kg OC) exceeded the SQS (12 mg/kg OC) and CSL (65 mg/kg OC).

Based on these data, Boeing and Ecology conducted additional site characterization in 2002, and Boeing implemented cleanup actions in the area near the south storm drain outfall in 2003.

2.2.3 Norfolk CSO Sediment Remediation Project, Five-year Monitoring Program, Annual Monitoring Report – Year Three, April 2002 (Mickelson 2002)

For year three of the King County post-dredging monitoring program, eight sediment samples from four locations (NFK501, NFK502, NFK503, and NFK504) were collected in 2002 from the Norfolk CSO/SD sediment remediation site. Samples were collected from the top 2 cm and the top 10 cm of sediment. The samples were analyzed for percent solids, TOC, 12 priority pollutant metals, BNAs, and PCBs.

- Percent solids ranged from 47.4% to 84.2%.
- TOC ranged from 980 to 26,200 mg/kg dw.
- Cadmium and silver were not detected in any samples. The detection limits were below their respective SQS values of 5.1 and 6.1 mg/kg dw. All other metal concentrations are at levels reported to be typical of natural area-wide concentrations and were below SQS chemical criteria.
- Benzoic acid was detected in seven of the samples at concentrations ranging from 84.3 to 210 µg/kg dw, below the SQS criterion (650 mg/kg dw).
- Anthracene and phenanthrene were detected in samples collected from both depth intervals. Anthracene concentrations ranged from 0.55 to 3.70 mg/kg OC, which is less than the SQS (220 mg/kg OC), and phenanthrene concentrations ranged from 3.76 to 7.96 mg/kg OC, below the SQS (100 mg/kg OC).
- Dibenzo(a,h)anthracene was detected in three of six samples, and the other eight high molecular weight PAH compounds were detected in all six samples collected from the two depth intervals. The concentrations did not exceed the SQS criteria.
- 1,4-dichlorobenzene was detected in all samples (ranging from 0.0452 to 1.6 mg/kg OC) below the SQS of 3.1 mg/kg OC.
- Benzyl butyl phthalate concentrations ranged from 2.23 to 3.75 mg/kg OC, below the SQS (4.9 mg/kg OC).
- Bis(2-ethylhexyl)phthalate was detected in samples at concentrations ranging from 40.6 to 63.3 mg/kg OC. One sample (63.3 mg/kg OC) exceeded the SQS (47 mg/kg OC).
- Di-n-butyl phthalate was detected in samples at concentrations ranging from 0.39 to 1.2 mg/kg OC, below the SQS (220 mg/kg OC).
- Dibenzofuran was not detected above the detection limits, which ranged from 1.2 to 18 mg/kg OC. The SQS and CSL criteria are 15 and 58 mg/kg OC, respectively.
- Hexachlorobutadiene was not detected above the detection limits, which ranged from 0.059 to 0.94 mg/kg OC, below the SQS and CSL criteria of 3.9 and 6.2 mg/kg OC, respectively.
- N-nitrosodiphenylamine was not detected above the detection limits, which ranged from 1.6 to 25 mg/kg OC. The SQS and CSL criteria are 11 mg/kg OC.
- PCBs (as total Aroclors) were detected in six samples with concentrations ranging from 3.61 to 30.4 mg/kg OC. The highest concentration (30.4 mg/kg OC) exceeded the SQS (12 mg/kg OC).

2.2.4 Norfolk Combined Sewer Overflow (Duwamish River) Sediment Cap Recontamination, Phase I Investigation (Ecology 2003)

In July 2002, Ecology collected twenty-two sediment samples from 21 sample stations from the inshore area between the Norfolk CSO/SD outfall and the Boeing south storm drain outfall. The primary objective of the study was to determine whether there may be PCB-contaminated sediment not removed during the 1999 cleanup that could potentially erode and be transported onto the clean backfill sediment cap. Samples were analyzed for TOC, percent solids, grain size, and PCBs as Aroclors. TOC ranged from 0.4 to 4.62%. Total PCB concentrations, based on detected Aroclors, ranged from 0.6 to 330 mg/kg OC. The total PCB concentrations in six of these samples (including a field duplicate) exceeded the SQS of 12 mg/kg OC, and of these, three exceeded the CSL of 65 mg/kg OC.

2.2.5 Cleanup Action Report, Sediment Removal near South Storm Drain Outfall (Project Performance Corporation on behalf of Boeing 2003)

Boeing completed a removal of approximately 60 cubic yards of PCB-contaminated sediments in the area ear the south storm drain outfall in 2003. As part of the removal action confirmatory sampling in the area of the south storm drain outfall, eighteen confirmation sediment samples (consisting of 12 initial confirmation samples and six secondary confirmation samples) were collected in October 2003 from the area where contaminated sediment removal activities took place. These samples were analyzed for PCBs as Aroclors and TOC. Results for TOC ranged from 0.18% to 2.20%. Total PCB concentrations ranged from non-detect to 2,190 mg/kg OC, and exceeded the SQS (12 mg/kg OC) in four samples, at concentrations ranging from 61 to 2,190 mg/kg OC. The report concluded that almost all sediment containing total PCBs above the SQS was removed, and that only a small area of sediment containing total PCBs above the CSL of 65 mg/kg OC was not removed.

2.2.6 2004 Annual Sampling Report, South Storm Drain System (Boeing Developmental Center) (Calibre Systems 2005)

In 2004, Boeing collected four sediment samples (S01, S02, S03, and a duplicate S06) from the LDW in the area near the south storm drain where contaminated sediment removal activities took place (Figure 8). The samples were analyzed for total PCBs and TOC. PCB concentrations ranged from non-detect to 27 µg/kg dw. TOC concentrations ranged from 0.128% to 0.242%. The results for all samples were below the SQS and LAET for PCBs.

In addition to the LDW sediment samples, on December 16, 2004 two solids samples were collected from the south storm drain. The samples were collected at manhole locations MH2 and MH3, which are located downstream and upstream of a combined sediment trap/oil-water separator, respectively (Figure 9). The samples were collected using 1-micron filter bags connected to steel frames that were bolted to the base and interior side walls of the storm drain so that stormwater would flow naturally through the filter bag. The accumulated solids were analyzed for PCBs, TOC, and percent solids. TOC results were 13.8% and 19.7%, respectively. Total PCB results were 7,100 µg/kg dw for the sample collected from MH 2 (downstream of the sediment trap/oil-water separator), and 20,000 µg/kg dw for the sample collected from MH3 (upstream) of the sediment trap/oil-water separator. Each of these PCB concentrations exceeded the LAET (130 µg/kg dw) and 2LAET 1,000 µg/kg dw) values.

2.2.7 2005 Annual Sampling Report, South Storm Drain System (Boeing Developmental Center) (Calibre Systems 2006)

Boeing collected four sediment samples (S1-05 and duplicate S4-05, S2-05, and S3-05) in the LDW from the area where contaminated sediment removal activities took place (Figure 10). The samples were analyzed for total PCBs and TOC. TOC concentrations ranged from 0.53% to 1.56%. PCB concentrations ranged from non-detect to 353 µg/kg dw (S1-05). The PCB result of the duplicate sample (S4-05) at this location was below the method detection limit. The difference between these results was attributed to sample heterogeneity. The organic carbon normalized concentration of S1-05 is 22.6 mg/kg OC. The PCB concentration in S1-05 exceeded the SQS (12 mg/kg OC) and LAET (130 µg/kg dw), but was below the CSL (65 mg/kg OC) and 2LAET (1,000 µg/kg dw). Total PCB results for S2-05, S3-05, and S4-05 were below the detection limits of 31 and 32 µg/kg dw, below the LAET value and corresponding to organic carbon-normalized values of 2.1 mg/kg OC and 5.8 mg/kg OC, below the SQS.

In addition to the LDW sediment samples, in November 2005 two solids samples were collected from the south storm drain at manhole locations MH2 and MH3, located downstream and upstream of a sediment trap/oil-water separator, respectively (Figure 8). The samples were collected using 10-micron filter bags connected to steel frames that were bolted to the base and interior side walls of the storm drain so that stormwater would flow naturally through the filter bag. The accumulated solids were analyzed for PCBs, TOC, and percent solids. TOC results ranged from 6.09% to 22.70%. Total PCB results ranged from 12,600 µg/kg dw (MH 2) to 61,500 µg/kg dw (MH3). In addition to samples collected from MH2 and MH3, two samples of accumulated solids were collected from the sediment trap/oil-water separator (ST0905-1 and ST0905-2). Total PCBs concentrations were 15,100 and 15,800 µg/kg dw. Concentrations of the storm drain solids and accumulated solids exceeded the LAET (130 µg/kg dw) and 2LAET (1,000 µg/kg dw).

3.0 Potential Sources of Sediment Recontamination

LDW sediments in EAA-7 have been impacted by chemical contaminants from various historical and potentially ongoing sources. Ecology identified several industrial facilities within the drainage basin that discharge to EAA-7 as facilities of concern. These facilities and other potential sources of contamination to EAA-7 sediments are illustrated in Figure7 and discussed below. To assess whether a facility could be a source of sediment recontamination, it is necessary to evaluate potential contaminant migration pathways that may exist between the potential sources and the LDW. Media relevant to source control that can potentially be impacted by human activities are water, soil, and air. Such contaminated media can impact sediments through several migration pathways, including direct discharges, stormwater discharges, CSOs, groundwater, bank erosion/leaching, atmospheric deposition, and spills. The potential contaminant migration pathways evaluated for EAA-7 are described below.

3.1 Piped Outfalls

Properties near the LDW in the vicinity of EAA-7 are served by a combination of storm drain, sanitary sewer, and combined sewer systems. Storm drains convey stormwater runoff collected from streets, parking lots, roof drains, and residential, commercial, and industrial properties to the LDW. There are both public and private storm drain systems within areas upland of EAA-7. Most of the waterfront properties along the LDW are served by privately owned systems that discharge directly to the LDW. The other upland areas are served by a combination of private and publicly owned systems.

Stormwater enters EAA-7 via storm drains and pipes, or directly from properties adjacent to the LDW. Stormwater runoff from urban areas can contain a wide variety of pollutants including bacteria, metals, oil, detergents, pesticides, and other chemicals that are washed off the land surface during rain events. These pollutants are transported in dissolved and particulate phases to the LDW by a combination of public and private storm drain systems. Storm drains can also convey materials from businesses with permitted discharges (i.e., National Pollutant Discharge Elimination System [NPDES] industrial stormwater permits), vehicle washing, runoff from landscaped areas, erosion of contaminated soil, groundwater infiltration, and materials illegally dumped into the system.

The sanitary sewer system collects municipal and industrial wastewater from throughout the LDW area and conveys it to King County's West Point wastewater treatment plant, where it is treated before being discharged to Puget Sound. The smaller trunk sewer lines, which collect wastewater from individual properties, are owned and operated by the individual municipalities (e.g., Cities of Seattle and Tukwila) and local sewer districts. The large interceptor system that collects wastewater from the trunk lines is owned and operated by King County.

Some areas adjacent to the LDW, including the area upland of EAA-7, are also served by combined sewer systems, which carry both stormwater and municipal/industrial wastewater in a single pipe. Combined sewer systems were generally constructed (typically before about 1970) because it was less expensive to install a single system rather than separate storm and sanitary systems. During large storm events, the volume of stormwater can sometimes exceed the capacity of the combined sewer system.

The collection system designed for the West Point treatment plant contains relief points, CSOs, to control the amount of combined sewage and stormwater that could enter the system, especially the Elliott Bay Interceptor. The CSOs prevent the combined system from backing up and creating flooding problems during large storm events. CSO events release a mixture of stormwater, municipally permitted industrial discharges, and untreated sewage directly into the waterway during heavy rainfall when the sewers have reached their capacity. CSO discharges can carry chemicals that impact sediments. The city of Seattle and King County are individual municipal NPDES permittees for CSOs. The city of Seattle owns about 100 CSOs and King County owns 38 CSO outfalls. Within the LDW site there are 9 CSOs that discharge in the LDW that are managed by King County. The King County CSO Control Program Review (April 2006) states that the King County Wastewater Treatment Division reviewed new and existing information, and completed studies to assess, both quantitatively and qualitatively, the health benefits to the public, environment, and endangered species, of bringing all CSOs under control. The assessment used information from studies describing existing environmental conditions and predicted conditions at the completion of the program. The assessment built on the findings of King County's 1998 Water Quality Assessment of the Duwamish River and Elliott Bay and the 1999 Sediment Management Plan - both done in support of the Regional Wastewater Services Plan (RWSP) - and on subsequent annual RWSP water quality reports. The RWSP calls for controlling the last of the CSOs in the LDW by the year 2030 (King County 2007c)

The Norfolk CSO/SD, discussed in further detail in Section 3.1.1, discharges to EAA-7. In addition, there are five private storm drains owned by Boeing that discharge to EAA-7. The outfalls of these private storm drain systems are referred to as discharge points DC17, DC 4, DC16, DC3, and DC2. These private storm drain systems are described in Section 3.1.2. Another storm drain system, operated by the Washington State Department of Transportation (WSDOT), discharges stormwater to the LDW approximately 1,400 feet upstream of EAA-7. This WSDOT storm drain system is discussed further in Section 3.1.3. Locations of the Norfolk CSO/SD, WSDOT I-5 storm drain, and Boeing storm drain outfalls are illustrated in Figure 2.

Other potential sources/pathways that may contribute pollution to these outfalls include:

- Chemicals carried by stormwater runoff (e.g., street dust, atmospheric deposition, automobile emissions, fertilizers, household pesticides, etc.)
- Industrial and municipal wastewater discharged through the Norfolk CSO/SD during CSO events
- Contaminated groundwater that may have infiltrated into the system through breaks in conveyance lines
- Materials improperly disposed of in the storm drain and/or combined/sanitary systems

National Pollution Discharge Elimination System Permits

In 2004 the city of Seattle conducted a comprehensive survey of outfall or outfall-like structures terminating in the LDW. The survey identified 211 active outfalls or structures, 4 channels/ditches, and 7 major seeps. Of these features, 61 are publicly-owned outfalls (Seattle, Tukwila, King County, Port of Seattle, WSDOT), 111 were identified as privately-owned outfalls, and 39 are of unknown ownership/origin. Discharges from many of these outfalls are permitted under NPDES. There are six types of NPDES permits covering the LDW, described below:

- The **Phase I Municipal Storm Water Permit** covers stormwater discharges from outfalls owned by the city of Seattle, the Port of Seattle, and King County. The 2006 revisions to the Phase I Municipal Stormwater Permit require monitoring for a greater number of analytes than do general permits. In addition, the municipal permit requires monitoring of the solids portion (e.g., sediments). Monitoring requirements are detailed in special conditions S8 in the Phase I permit. The permit was issued on 17 January 2007. The analyte list is tiered depending on how much sediment is collected. The storm water monitoring portion of the permit does not require monitoring on all outfalls. The monitoring is limited to only 3 basins or sub basins considered representative of residential, commercial, and industrial use. Any monitoring required under this permit is of limited value to the LDW source control effort. The Phase I permit is heavily dependent on best management practices (BMPs) of the permitee, such as street sweeping and catch basin cleaning. Another key component of the permit is the requirement placed on the permit holders to detect, remove, and prevent illicit connections and illicit discharges, including spills into the municipal separate storm drains (Special Condition 5.8.). This condition has resulted in the city, and County programs and ordinances governing storm water and surface water within their jurisdictions.
- The **Phase II Municipal Storm Water Permit** includes any city of Tukwila outfall. Part of the area that drains to EAA-7 is located within the city of Tukwila. Section S8 of the permit states:

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

- The **General Storm Water Permit for Industrial Activities** covers 112 industries within the natural drainage basin of the LDW. Within the area potentially affecting EAA-7, this permit covers the BDC, MFC, the southern portion of KCIA, Associated Grocers, Inc., Northwest Auto Wrecking, and Affordable Auto Wrecking. Coverage under the General Storm Water Permit for Industrial Activities requires monitoring of storm water discharges for copper, zinc, oils, and total suspended solids (TSS).

- The **General Sand and Gravel Permit** provides coverage for discharges of process water, stormwater, and mine dewatering water associated with sand and gravel operations, rock quarries and similar mining activities, including stockpiles of mined materials, concrete batch operations, and hot mix asphalt operations. There are five Sand and Gravel Permit holders along the LDW. The Sand and Gravel Permit generally requires monitoring for pH, turbidity, TSS, TDS, Temperature, Oils, and flow rate. There are no Sand and Gravel operations within the area that drains to EAA-7.
- The **General Boat Yard Permit** covers a commercial business engaged in the construction, repair, and maintenance of small vessels, 85% of which are 65 feet or less in length, or revenues from which constitute more than 85% of gross receipts. The permit generally requires monitoring for Copper, Oils, and TSS. These permits do not specifically require monitoring of the solids portion of storm water flow. There are two permitted boatyards in the LDW, neither of which is located within areas draining to EAA-7.
- An **Individual Permit** is written for a specific activity or facility to regulate discharges at a specific location. Individual permits may be written for industrial or municipal types of discharges at the discretion of the permitting agency, such as EPA or Ecology. There are no individual NDPES-permitted facilities discharging to the EAA-7, although there are four individual NPDES permits issued elsewhere within the Lower Duwamish Waterway (i.e., industrial permits to LaFarge Cement and Duwamish Shipyard and separate municipal permits to the city of Seattle and King County for respective CSO discharges). The Norfolk CSO/SD is the only CSO discharging to EAA-7.

3.1.1 Norfolk CSO/SD

The Norfolk CSO/SD system receives stormwater runoff from the 769-acre Norfolk SD drainage basin, and also serves as the CSO outfall for the 4,900-acre combined sewer service area (Figure 3). The following sections describe the storm drainage and combined sewer services areas that discharge to the Norfolk CSO/SD.

3.1.1.1 Stormwater Discharges

The 769-acre Norfolk SD drainage basin includes about 100 acres of the I-5 corridor. Land use in the basin is primarily industrial (32 percent) and right-of-way (32 percent) with smaller amounts of residential (16 percent and vacant land (17 percent) (Schmoyer 2007). The Norfolk SD drainage basin can be divided into 8 subbasins, described below:

- **WSDOT Interstate 5 (I-5) Subbasin.** The I-5 subbasin comprises the central portion of the Norfolk SD drainage basin, consisting of I-5 and the Military Road and Beacon Avenue subbasins. Runoff is conveyed in a series of pipes and ditches, and eventually discharges to the LDW in a 60-inch pipe. Low flows from the WSDOT I-5 system are routed to a stormwater treatment facility that discharges through a natural wetland system that drains to the Norfolk CSO/SD drainage system.

- **Military Road Subbasin.** The Military Road subbasin is located east of I-5 and west of Beacon Avenue South. Land use in this area is primarily residential. Runoff is transported by sheet flow along the streets and unpaved areas, eventually discharging to a ditch that runs along the east side of Military Road South and connects to the WSDOT I-5 drainage system.
- **Airport Way Subbasin.** The Airport Way subbasin runs along Airport Way South on the west side of I-5, collecting runoff from Airport Way South, the adjacent Burlington Northern-Santa Fe railroad track, and a small portion of the steep hillside east of I-5. Runoff from the southern half of the subbasin discharges to the LDW via the Norfolk CSO/SD. The northern half drains to the KCIA drainage system, which discharges to the LDW north of EAA-7.
- **Beacon Avenue Subbasin.** The Beacon Avenue subbasin is located between I-5 and Beacon Avenue South. This area consists predominantly of a steep forested hillside with some residential areas along the eastern border. Runoff is conveyed in a ditch that runs along the east side of I-5 and connects to the WSDOT I-5 system.
- **East Henderson Subbasin.** The East Henderson subbasin is a residential neighborhood located on top of a steep forested hillside located east of I-5 and north of South Norfolk Street. There is no formal drainage system in this area, although there is a combined sewer system with some inlets and catch basin serving the area. However, because of poorly graded streets and insufficient catch basins, most of the runoff from this subbasin sheetflows down the steep hillside on the south end of this basin and collects in a ditch/depression on the north side of South Norfolk Street.
- **Martin Luther King Junior Way Subbasin.** The Martin Luther King Junior Way subbasin is located on the eastern edge of the Norfolk SD drainage basin, draining the predominantly industrial area along Martin Luther King Junior Way South and steep, forested hillsides on both sides of the industrial area. Runoff is collected in a piped system that runs along Martin Luther King Junior Way South and then turns west through private property, discharging into a ditch that runs along the east side of I-5. This ditch crosses under I-5, discharging into the WSDOT stormwater treatment system at the head of the serpentine swale.
- **Ryan Way Subbasin.** The Ryan Way subbasin, which comprises residential and undeveloped forested areas within the city of Tukwila, is located at the southern end of the Norfolk SD drainage basin. There is an existing drainage system along Ryan Way that collects runoff from the road and some adjacent parcels, and then discharges into the ditch described above on east side of I-5.
- **Norfolk Street Subbasin.** The Norfolk Street subbasin comprises the lower portion of the Norfolk SD drainage basin, located on both the east and west sides of I-5. The portion on the east side drains to the ditch east of I-5. The portion on the west side includes the area between East Marginal Way South, Boeing Access Road, and Airport Way South, including the southern portion of KCIA. Runoff is collected in a series of informal culverts that drain to the LDW via the Norfolk CSO/SD outfall.

The Norfolk SD drainage basin contains several upland facilities of concern that could pose a threat of sediment recontamination in EAA-7. Information on the storm drain system at each upland facility of concern is provided in Section 3.4 and in the *Summary of Existing Information and Identification of Data Gaps Report* (E & E 2007).

The configuration of the city of Tukwila's storm drain system, based on a Geographic Information System (GIS) provided by city of Tukwila, is illustrated in Figures 11 through 14. King County combined sewer lines are also illustrated in these figures. The city of Tukwila storm drain system and the King County sewer lines appear to be at least partially interconnected along East Marginal Way South (Figure 13), which runs between the BDC, the eastern portion of the MFC, the western part of Associated Grocers, Inc., and Northwest Auto Wrecking. Many of the catch basins identified in the city of Tukwila's storm drain GIS are in the same approximate locations as those shown on the BDC storm drain system (Figures 6 and 14). This interconnection includes a part of piping and four catch basins, located in the southeastern portion of the BDC, that connects to the municipal storm drain system. A city of Tukwila storm drain catch basin located south of the Arco Gas Station that has been sampled by Seattle Public Utilities is shown in Figure 15.

Information regarding discharges to the Norfolk CSO/SD from the identified upland facilities of concern is summarized below. The BDC also has one discharge point (DC1) that discharges to the Norfolk CSO/SD line immediately upstream of its discharge to the LDW.

SPU is currently designing improvements to the stormwater drainage system in the Martin Luther King Jr. Way South subbasin to accommodate runoff from the newly constructed drainage system along Martin Luther King Jr. Way South (built by Sound Transit) and to fix a damaged section of the system. A 36-inch private storm drain located between Martin Luther King Jr. Way South and I-5 has collapsed in several places and has many breaks along its length. This storm drain line serves as a major trunk line in the Martin Luther King Jr. Way subbasin, conveying runoff from the road and properties east of Martin Luther King Jr. Way South to the ditch that runs along the east side of I-5. The ditch has also become plugged due to lack of maintenance, effectively blocking the downstream end of the 36-inch line. As a result, runoff from the Martin Luther King Jr. Way subbasin backs up, overflows into an adjacent sanitary sewer, and is routed north along Martin Luther King Jr. Way South to a city pump station. The pump station connects to the King County combined sewer system on South Norfolk Street. King County has notified the city of Seattle that stormwater discharges to the sanitary sewer system must be eliminated (Schmoyer 2007).

Construction of the proposed improvements to the municipal storm drain system is scheduled for 2008-2009. The proposed improvements consist of replacing the damaged section of the 36-inch line, restoring the hydraulic capacity of the existing ditch along the east side of I-5, and constructing a stormwater wet pond west of I-5 to treat runoff from this basin (Schmoyer 2007).

3.1.1.2 Combined Sewer Overflow Discharges

CSO events are combined discharges of stormwater, municipally permitted industrial discharges, and untreated sewage that are released directly into the waterway during heavy rainfall when the sewers have reached their capacity. CSO discharges can carry chemicals that impact sediments.

For the period from June 2000 through May 2005, two CSOs were discharged from the Norfolk CSO/SD. In the spring of 2005 the King County Wastewater Treatment Division completed the construction of the Henderson/Norfolk CSO Treatment Facility to reduce CSO discharges into Lake Washington and the LDW. The system consists of the inlet regulator; the 14-foot 8-inch inside diameter, 3,100-foot long 42nd Avenue Storage and Treatment Tunnel; the outlet regulator; several junction manholes, and auxiliary equipment. The system is located between South Henderson Street and South Norfolk Street just west of Martin Luther King Jr. Way. This facility provides storage and treatment of combined sewage and stormwater during peak storm events. The diversion of wastewater into the tunnel prevents a CSO discharge to surface waters during all but the most severe storms. CSOs that are discharged receive primary treatment by settling, screening, disinfection, and dechlorination. If the tunnel fills before the peak event is over, it will overflow the tunnel at the outlet regulator. The overflow is dechlorinated with sodium bisulfite, and passed through fine screens to remove floatable debris. Treated CSO discharges to the LDW through the treated CSO pipeline connect to the Norfolk CSO/SD (King County Department of Natural Resources 2006).

The Henderson/Norfolk CSO Control facility began operating in May 2005. During the annual reporting period of 2005-2006, the treatment tunnel did not need to operate, and there were no discharge events from any of the facilities controlled by this control facility. One-hundred percent of the volumes that previously discharged untreated at those CSOs was captured and received full secondary treatment and disinfection. The King County Wastewater Treatment Division concluded that, although it appears the project was successful, it will require a more normal rain pattern to fully assess effectiveness (King County Department of Natural Resources 2006).

3.1.1.3 Permitted Discharges

Within the Norfolk SD drainage basin, six industrial sites (BDC, MFC, KCIA, Associated Grocers, Inc., Northwest Auto Wrecking, and Affordable Auto Wrecking) that are identified facilities of concern are authorized to discharge stormwater to the LDW under the general NPDES permit for industrial stormwater (Industrial Stormwater General Permit). These permits are listed in Table 3 and are described briefly below.

In addition, individual Wastewater Discharge Authorizations are issued by King County for BDC and Affordable Auto Wrecking to discharge wastewater into the King County combined sewer system. The BDC has a Wastewater Discharge Authorization (No. 526-04) under the KCIW to discharge wastewater generated from the vactor decant station operations, composite parts wash stall operations, photo processing, water jet cutting operations, and groundwater remediation activities to the County combined sewer system. The maximum volume for this permit is 25,000 gallons per day, and 25,000 gallons per day allocated for groundwater remediation activities. Affordable Auto Wrecking has been issued a Minor Discharge Authorization No. 732-01 from the KCIW. This allows the site to discharge limited amounts of industrial wastewater into King County's sewer system in accordance with effluent imitations and other requirements and conditions listed in the document. According to the permit, discharge is to the south treatment plant for wastewater generated by contaminated stormwater with an oil/water separator as a pre-treatment process. The maximum volume allowed is 25,000 gallons per day.

3.1.1.4 In-Line Sediment Sampling

In an effort to help identify potential sources of Norfolk CSO/SD sediment recontamination, SPU collected samples of sediment deposited within the drainage system (i.e., at maintenance holes and from the WSDOT stormwater pond in the system). The eight sampling locations are shown in Figure 15. A summary of sampling dates and locations is provided in Table 4. Analytical results are provided in Appendix B and summarized below (Seattle Public Utilities 2005):

- **MH1.** Zinc concentrations in both samples from MH1 (1,150 mg/kg dw and 1,230 mg/kg dw) exceeded the SQS value (410 mg/kg dw) and the CSL value (960 mg/kg dw). Bis(2-ethylhexyl) phthalate concentrations in both samples (324 mg/kg OC and 343 mg/kg OC) exceeded the SQS value (47 mg/kg OC) and the CSL value (78 mg/kg OC). The samples contained total petroleum hydrocarbon (TPH) diesel at concentrations ranging from 2,300 mg/kg dw to 3,200 mg/kg dw and TPH-oil at concentrations ranging from 5,300 to 7,600 mg/kg.
- **MH3.** The sample collected in 2003 contained zinc (1,060 mg/kg dw) at a concentration greater than both the SQS value and the CSL value. The zinc concentration in the 2005 sample (847 mg/kg dw) exceeded only the SQS value. The 2003 and 2005 samples contained concentrations of bis(2-ethylhexyl) phthalate (309 mg/kg OC and 438 mg/kg OC, respectively), exceeding both the SQS and CSL values. TPH-diesel was detected in the 2003 sample at 2,200 mg/kg dw, and TPH-oil was detected at 5,000 mg/kg dw. TPH-diesel and TPH-oil concentrations were not available for the sample collected in 2005.
- **MH4.** Both the 2003 and 2005 samples contained zinc at concentrations (416 mg/kg dw and 415 mg/kg dw, respectively) that exceeded the SQS value. The 2003 sample contained TPH-oil at 2,900 mg/kg dw. TPH-diesel and TPH-oil concentrations were not available for the sample collected in 2005. The 2005 sample contained the following PAHs at concentrations exceeding the respective SQS values: benzo(a)pyrene (119 mg/kg OC) in exceedance of the SQS (99 mg/kg OC); benzo(g,h,i)perylene (32 mg/kg OC) in exceedance of the SQS value (31 mg/kg OC); chrysene (131 mg/kg OC) in exceedance of the SQS (110 mg/kg OC); fluoranthene (165 mg/kg OC) in excess of the SQS (160 mg/kg OC); and indeno(1,2,3-c,d)pyrene (36 mg/kg OC) in excedance of the SQS (34 mg/kg OC). Both samples contained concentrations of bis(2-ethylhexyl) phthalate (119 mg/kg OC and 444 mg/kg OC) in exceedance of the SQS value (47 mg/kg OC) and CSL value (78 mg/kg OC). The 2003 sample contained butylbenzylphthalate (6 mg/kg OC) in exceedance of the SQS value (5 mg/kg OC).
- **MH5-N2.** The sample contained TPH-oil at 3,600 mg/kg dw. The sample contained bis(2-ethylhexyl) phthalate (148 mg/kg OC) in exceedance of both the SQS value and the CSL value, and butylbenzylphthalate (41 mg/kg OC) in exceedance of the SQS value (4.9 mg/kg OC). The sample also contained n-nitrosodiphenylamine (20 mg/kg OC) in exceedance of both the SQS value (11 mg/kg OC) and CSL value (11 mg/kg OC).

- **MH5-N3.** The sample contained zinc at a concentration (9,980 mg/kg dw) significantly exceeding both the SQS and CSL values.
- **MH6.** The detected concentration of 627 mg/kg dw zinc was in exceedance of the SQS value.
- **MH7.** Neither sample contained concentrations of any contaminants in exceedance of SQS or CSL values.
- **Norfolk 20.** The detected zinc concentration (651 mg/kg dw) was in exceedance of the SQS value.
- **Norfolk 21.** No contaminants were detected at concentrations in exceedance of SQS or CSL values.

The in-line sediment sampling results characterize contaminant levels in the largest and most heavily industrialized part of the Norfolk SD drainage basin. In-line sampling data are not currently available for other portions of the Norfolk SD drainage basin.

3.1.1.5 Planned Source Control Actions

Information available for review pertaining to the location and configuration of the Norfolk CSO/SD and its components was limited to the following: GIS files obtained from the city of Tukwila showing locations pipes, ditches, and catch basin locations; GIS files from King County showing the locations of drain lines; and maps and drawings of individual facilities of concern (BDC, MFC, and Affordable Auto Wrecking) that illustrate the layout of on-site storm drainage systems. It should be noted that the city of Seattle has completed a study of the portion of the Norfolk CSO/SD drainage area that lies within the Seattle city limits; however, only limited information from this study was available for the preparation of this Action Plan. Due to limitations of the available data, there is an incomplete understanding of the configuration of portions of the Norfolk CSO/SD system and the relationships and interconnections of on-site storm drain systems at the identified facilities of concern (discussed below). In order to better evaluate the potential for surface or subsurface (soil or groundwater) contamination to migrate via the Norfolk CSO/SD to EAA-7, it is necessary to obtain a better understanding of the configurations, relationships, and interconnections of the various drainage systems.

The in-line sediment sampling data described in Section 3.1.1.4 identify accumulations of contaminated sediments within a significant portion of the Norfok CSO/SD. To date, in-line sediment sampling data for other portions of the Norfolk CSO/SD system are not available.

The following source control actions are planned:

- The city of Seattle (SPU), city of Tukwila, and King County will work together to compile all available data pertaining to stormwater and municipal sewer drainage systems in order to facilitate a better understanding of the configurations, relationships, and interconnections of the various systems. If such as-built information is not available, dye testing or other source tracing techniques will be employed to map out the system components.

- The city of Seattle (SPU), city of Tukwila, and King County will obtain drainage plans for private properties along East Marginal Way South to better delineate drainage basin boundaries in this area.
- The city of Seattle, city of Tukwila, and King County will conduct further source tracing and in-line sampling in the Norfolk CSO/SD drainage system.

3.1.2 Private Stormwater Discharges

Private stormwater discharges to the LDW within EAA-7 include five outfalls from BDC's storm drain system. The BDC covers a 174-acre area on the east bank of the LDW. Catch basins within the site collect stormwater and discharge it to the LDW at a total of 18 locations, five of which discharge directly to the LDW within EAA-7. These outfalls are: BDC discharge points DC17, DC4, DC16, DC3, and DC2 (Figures 2 and 6). A sixth private stormwater system owned by Boeing, discharge point DC1, connects to the Norfolk CSO/SD a short distance upstream of the Norfolk CSO/SD outfall into the LDW. Nine main lines have in-line oil/water separators installed in the system immediately prior to discharge. Smaller lines are not serviced with oil/water separators and discharge directly into the LDW because they drain areas of relatively low activity and small surface area (Boeing 2003a).

The six private storm drain systems with outfalls that discharge to the LDW within EAA-7 are illustrated in Figures 2 and 6 and described below:

- **Discharge Point DC17.** This outfall drains a small roof area of the southwest corner of the large 9-101 building, half the roof areas of each of the 9-140 and 9-130 buildings, and the parking and driving areas around portions of these buildings. Stormwater is collected into a drain system that discharges to the LDW. This is considered a small volume outfall (Boeing 2003a).
- **Discharge Point DC4.** This outfall drains the southwest corner of the roof of the small 9-140 building and the pavement and planted areas around this portion of the building. Stormwater is collected into a drain line which then discharges into the LDW. This is considered a very small volume outfall (Boeing 2003a).
- **Discharge Point DC16.** This outfall drains a small roof area of the southwest corner of the small 9-140 building and the pavement and planted areas around this part of the building. Stormwater is collected in one drain which then discharges into the LDW. This is considered a small volume outfall (Boeing 2003a).
- **Discharge Point DC3.** This outfall drains half of the roof of each of the small 9-140 and 9-130 buildings, the parking and driving areas around each of those buildings, and a small landscaped park-like area for employee use. Stormwater is collected into a drain line running through the area and discharges to the LDW. This is considered a small volume outfall (Boeing 2003a).
- **Discharge Point DC2.** This outfall drains half of the roof of the large 9-101 building, all of the small 9-110 building, and the parking and driving areas surrounding portions of those buildings. Stormwater is collected into a primary drain line which runs under part of the south end of the facility, discharging into the LDW. This is considered a large

volume outfall (Boeing 2003a). This storm drain is also referred to as the south storm drain.

- **Discharge Point DC1.** This outfall drains into the Municipal Storm Drain System, which then discharges into the LDW via the Norfolk CSO/SD outfall. The BDC outfall collects stormwater primarily from parking and drive areas and discharges to the county system via an oil/water separator (Boeing 2003a).

3.1.2.1 Investigation and Cleanup Activities

As discussed in Section 2.2, the south storm drain, the outfall of which is also referred to as BDC discharge point DC2, has been the subject of several investigations and cleanup actions addressing PCB contamination within the storm drain system and EAA-7 sediments in the vicinity of the outfall.

- Sampling to identify potential sources of PCBs in the south storm drain in 2000 and 2001 (Project Performance Corporation 2001).
- Pressure washing and removal of solids from portions of the south storm drain line in 2002 (Project Performance Corporation 2002).
- Installation of a combined sediment trap/oil-water separator in the south storm drain line in 2003 (completed by Landau Associates and summarized in Project Performance Corporation 2003).
- Completion of a sediment removal action in the area of the LDW located inshore of the 1999 King County sediment removal site and adjacent to the Boeing south storm drain outfall in 2003 (Project Performance Corporation 2003).
- Monitoring of LDW sediments and solids from the south storm drain system during 2004, 2005, and 2006.
- Annual maintenance and removal of accumulated solids from the sediment trap/oil-water separator in the south storm drain line

Additional details of the sampling and cleanup activities are provided in Section 3.4.1.3.

3.1.2.2 Planned Source Control Actions

Further investigation is required to determine whether on-site contamination or residual contamination within private storm drains may result in sediment recontamination within EAA-7. On-site contamination, characterization and cleanup within the south storm drain, and planned source control actions are discussed further in Section 3.4.

3.1.3 WSDOT Storm Drain

The 60-inch WSDOT storm drain discharges to the LDW approximately 1,400 feet upstream of the Norfolk CSO/SD outfall (Figures 2 and 3). This drain serves approximately 100 acres, including 1.5 miles of I-5, and other areas adjacent to I-5. The WSDOT system also accepts overflows from the MLK Way subbasin of the Norfolk SD drainage basin via an overflow structure located just south of the Associated Grocers property (Schmoyer 2007).

In 1999, WSDOT constructed a stormwater treatment system, consisting of a two-celled pond and a serpentine swale to treat runoff from the I-5 subbasin. The system is designed to treat runoff from the water quality design storm. Higher flows are routed around the treatment system to the WSDOT 60-inch storm drain. Flows up to and including the water quality design storm are routed through the treatment system and then in a culvert under the railroad right-of-way, where it ties into the Norfolk CSO/SD system. Runoff from the Martin Luther King Jr. Way subbasin enters the WSDOT system just below the pond and passes through the swale system

3.2 Spills

Spills of waste materials containing contaminants of concern may occur directly to the LDW or onto the ground within the drainage area that discharges into the LDW near EAA-7. Activities occurring directly adjacent to EAA-7 at this time may result in spills. Storm Water Pollution Prevention Plans outline areas of risk to storm water pollution for each facility of concern.

3.2.1 Planned Source Control Actions

The following source control actions are planned:

- In the event of a spill, Ecology and the property owner will monitor the origin of the spill and any cleanup activities to identify any post-spill source control action that may be necessary.

3.3 Properties Adjacent to EAA-7

The BDC is the only major facility located adjacent to EAA-7, although other entities own property adjacent to EAA-7, including Washington Department of Natural Resources and King County. Available information was reviewed to evaluate the potential for bank erosion or leaching of near-bank soils to recontaminate LDW sediments. Available information did not indicate the potential for sediment recontamination as a result of bank erosion or leaching of near bank soils.

3.4 Upland Properties

Upland sites may contribute contamination to EAA-7 through stormwater, illegal discharges, and spills that could enter into the piped drain systems that discharge to the LDW. In addition, contaminated groundwater from upland sites could discharge directly to the LDW or infiltrate into storm drains that discharge into the LDW. If chemicals of concern from an upland site reach the LDW, they could recontaminate the sediments. Ecology identified the following upland facilities of concern due to their potential to contaminate the sediments in EAA-7:

- BDC
- MFC

- KCIA
- Associated Grocers, Inc.
- Northwest Auto Wrecking
- Affordable Auto Wrecking
- Arco Gas Station.

The locations of these facilities are illustrated in Figures 11 through 14.

This section discusses current and historical land uses and summarizes environmental investigations and cleanups at the facilities listed above. Current land use information was obtained from existing reports and Ecology databases and was inferred from aerial photographs. The Ecology online databases were searched for information on current NDPES permit numbers, underground storage tanks (USTs), leaking underground storage tank (LUST) release incidents, hazardous waste facilities, and for inclusion of the property on the Washington Confirmed and Suspected Contaminated Sites List (CSCSL). Property ownership information was obtained from King County tax records and from existing reports. Table 1 summarizes property information, and Table 3 summarizes the regulatory database listings.

3.4.1 Boeing Developmental Center

3.4.1.1 Current Operations

The BDC is located at 9725 East Marginal Way South in Tukwila Washington. Boeing has operated on portions of this site continuously since 1956. The BDC facility layout is illustrated in Figure 16. The BDC is primarily an aircraft and aerospace research and development complex. Operations include manufacturing airplanes and missiles, which involves machining metal aircraft hardware, electroplating, chemical milling, conversion coating, painting, parts cleaning, and assembly (Bower 2002).

The BDC comprises about 174 acres. Fifty-four designated buildings are located on the site, including office buildings, the 9-101 high-rise manufacturing building, and buildings that house various aerospace manufacturing and support operations, which include manufacturing, fabrication, composite material assembly, painting, and other activities (Boeing 2001).

The land surrounding the facility is used primarily for industrial and commercial activities. It is located within a large, contiguous industrial area, which extends from Harbor Island to near the head of navigation of the LDW. To the east is the Boeing MFC, and further east is the southernmost portion of the KCIA. The LDW lies along the southern and the western portions of the property boundary. To the north, Slip No. 6 separates the BDC from the former Rhone Poulenc Company Chemical Manufacturing Facility (Bower 2002).

Information on parcels that comprise the BDC and the adjacent facilities was obtained from the King County tax assessor website (King County 2007b); this information is summarized in the *Summary of Existing Information and Identification of Data Gaps Report* (E & E 2007).

The BDC has been issued an Industrial Stormwater General Permit No. SO3000146D by Ecology. The permit expires on September 20, 2007. Ecology plans to reissue Industrial Stormwater General Permits on August 20, 2007. Based on Ecology's online database, the parameters for this permit are for pH with a minimum of 6.5 and a maximum of 8.5 standard pH units. (Ecology 2007d)

The BDC is listed as a Hazardous Facility on Ecology's online Hazardous Site Facility Search database and has a RCRA ID No. WAD093639946 (Boeing A&M Developmental Center) (Ecology 2007e). According to the BDC SWPPP (Boeing 2001), solid and liquid hazardous wastes are accumulated at collection stations inside buildings where hazardous wastes are generated. These wastes are managed per the Hazardous Waste Management Plan, with liquid wastes held in areas with secondary containment. Most waste is generated in the 9-101 building. No documents indicated that Boeing is out of compliance.

The facility has been issued a Wastewater Discharge Authorization No. 526-04 from the KCIW to discharge wastewater generated from the vactor decant station operations, composite parts wash stall operations, photo processing, water jet cutting operations, and groundwater remediation activities. This authorization is effective November 17, 2005, through November 16, 2010.

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

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

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

3.4.1.2 Historic Use

Prior to 1918, the site was farmland until the U.S. Army Corps of Engineers channelized the Duwamish waterway. The earliest known commercial operations at the site began in 1927. Information on land use between 1927 and 1956 is not available. Boeing has operated on portions of this site continuously since 1956. Prior to 1980, the Military Airplane Company Division of Boeing operated this facility. The BDC began operations in October 1980. In

November 1987, the operation was transferred to the Boeing Advanced Systems Company Division. In 1990, as part of reorganization, Boeing separated the BDC from the MFC (Science Application International Corporation 1994).

Historic activities conducted by Boeing at the site include manufacturing of airplanes and missiles, which involves machining metal aircraft hardware, 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 (Johnstone1993).

Parcel 0423049016, located at the southern portion of the BDC, is leased by Boeing from East Marginal Associates. A 1984 WSDOT aerial photo obtained from Ecology appears to show a barge operation located on the parcel. This area has been used by Boeing since 1986 for employee parking, and is currently paved.

A detailed summary of historic use of all parcels is provided in the *Summary of Existing Information and Identification of Data Gaps Report* (E & E 2007)

3.4.1.3 Environmental Investigations and Cleanup Activities

The BDC is listed on several databases, including Ecology's online CSCSL database, Ecology's online Hazardous Waste Facility search database, and Ecology's online Industrial Stormwater General Permit databases. The BDC has had several environmental cleanup activities at the site, including RCRA corrective actions for groundwater and soil contamination, groundwater monitoring at the Museum of Flight (MOF) (Gate J-28), and soil remediation at the south storm drain (the outfall of which is also referred to as DC2).

The BDC is a RCRA-corrective action site with remedial activities conducted under the Ecology Voluntary Cleanup Program (VCP). Investigative activities have been conducted to determine if soil contamination and a historical gasoline leak have impacted groundwater (IT Corporation 2004).

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

In addition to these contaminants, chlorinated solvents, including tetrachloroethene, cis-1,2-dichloroethene, and vinyl chloride, were identified as contaminants of concern in groundwater as part of the EPA RCRA investigations and corrective actions (Jacob 2004). RCRA corrective actions are discussed further below.

The BDC (identified as the Developmental Center on Ecology's online UST database) is reported to have eleven USTs at the facility. Four of these USTs are listed as having been removed, one as closed in place, three as exempt, and three as operational and containing diesel fuel or unleaded gasoline. According to Ecology's online LUST database, the site (Facility Site

ID No. 2101) is listed as having soil and groundwater contamination. The database lists that the cleanup for both the soil and groundwater contamination has been started, at Building 9-52 (Ecology 2007b). The December 2003 SWPPP (Boeing 2003a) identifies the following five USTs located on site:

- DC16, a 1,000-gallon tank with diesel located south of building 9-101;
- DC18, a 550-gallon tank with diesel located north of building 9-52;
- DC19, a 1,100-gallon tank with unleaded gasoline located north of building 9-52;
- DC20, a 20,000-gallon tank with fuel oil located west of building 9-72; and
- DC21, a 20,000-gallon tank with fuel oil located west of building 9-72.

RCRA Corrective Actions

Under its RCRA corrective action authority, EPA conducted a RCRA Facility Assessment in 1994, and identified 157 Stormwater Management Units (SWMUs) and five Areas of Concern (AOCs) at the BDC. Subsequent investigation determined most of these do not pose a threat to human health or the environment. Following submittal of a Summary Report by Landau Associates (Landau 2002), Ecology determined the following areas required continued monitoring and evaluation: SWMU-17 and SWMU-20, and AOCs 01, 02, 03, 04, and 05. Two consecutive quarters of monitoring at AOC 01 through 04 showed contaminants of concern were not detected. (Jacob 2004).

RCRA corrective actions have been taken at AOC-5, SWMU-17, and SWMU-20. Each of these RCRA corrective action areas is located north of the area that drains into EAA-7. These RCRA corrective action areas are described in the EAA-7 *Summary of Existing Information and Identification of Data Gaps Report* (E & E 2007).

Other Investigations and Cleanup Activities

Remediation and investigation activities have taken place at two other sites of documented contamination at the BDC: the MOF property (Gate J-28) and the south storm drain. A summary of these activities is provided below.

Groundwater Monitoring at the Museum of Flight

Groundwater monitoring has been conducted at the MOF property, formally identified as Gate J-28, at the BDC. This portion of the site is not covered by the RCRA corrective actions. This property is no longer part of the BDC and is no longer owned by Boeing. In 2001, when this portion of the property was owned by Boeing, soil and groundwater samples were collected as part of a Phase II Environmental Site Assessment (ESA) completed before Boeing transferred the property to the MOF. Boeing investigated groundwater quality near the 9-04 building (Figure 17) (Bach 2003).

Groundwater in this area flows in a westerly direction. The groundwater in the area of the MOF likely discharges to the LDW north of the Norfolk CSO/SD outfall and EAA-7. According to

Boeing's drainage plans, stormwater at the 9-04 building does not drain to any of the six private outfalls that are of concern to EAA-7; stormwater in the 9-04 building appears to be discharged to the LDW via a private storm drain system that discharges to outfall DC9, located to the north of EAA-7 (Boeing 2003a). Additional information about groundwater monitoring at the MOF is summarized in the *Summary of Existing Information and Identification of Data Gaps Report* (E & E 2007).

PCB Sampling in South Storm Drain System

During 2001 samples of construction materials and accumulated solids were collected from and around the storm drain system in the vicinity of Building 9-101 at the BDC. The storm drain system in this area (also referred to as the south storm drain), south of the 9-101 Building, discharges to the LDW through outfall DC2, an outfall located approximately 120 feet downstream of the Norfolk CSO/SD outfall. The sampling was undertaken to determine if the storm drain system from this area contains PCBs at levels that could potentially impact the clean cap placed on the previously dredged area near the Norfolk CSO/SD outfall (Project Performance Corporation 2001).

Sampling was conducted over four phases. In Phase I, samples of accumulated solids were collected from selected locations within the storm drain system. In Phase II, samples of a variety of surface construction materials (primarily joint compounds used to seal adjoining concrete slabs) were collected. Phase III involved collecting samples of additional surface construction materials (primarily roofing materials) and samples of additional solids from locations within the storm drain system. In Phase IV, water samples were collected from the outfall at the point of discharge and samples of road paint were collected in the area of one catch basin. (Project Performance Corporation 2001)

For Phase I sampling, PCBs were detected in some solids samples from manholes and catch basins upstream from the outfall. The analytical results indicated samples from some locations contained high levels of PCBs, specifically Aroclor 1254. The initial laboratory results indicated that the concentration in the field duplicate differed from the regular sample by more than two orders of magnitude. Based on this large difference, the laboratory was directed to re-extract and re-analyze all of the samples in a subsequent split analysis of each sample. This second round of analyses showed a high degree of variability in concentrations between the original and split analysis (up to three orders of magnitude), which was attributed to a highly heterogeneous distribution of PCBs in the samples. Concentrations of Aroclor 1254 in manhole and catch basin samples ranged from 0.19 to 760 mg/kg dw for the initial analyses, and from 0.3 to 1,100 mg/kg dw in the split analysis. For example, sample CB-1 had an Aroclor 1254 concentration of 510 mg/kg dw for the initial analysis and 0.3 mg/kg dw for the split analysis. Sample CB-1-D, the duplicate of sample CB-1, had an Aroclor 1254 concentration of 0.64 mg/kg dw for the initial analysis and 0.3 mg/kg dw for the split analysis. Sample MH-3 had an Aroclor 1254 concentration of 0.19 mg/kg dw for the initial analysis and 1,100 mg/kg dw for the split analysis (Project Performance Corporation 2001). PCB concentrations in a number of these samples exceeded the LAET (130 µg/kg dw) and 2LAET 1,000 µg/kg dw) values.

For Phase II sampling, materials sampled included caulk, roofing materials, tar used as sealant, asphalt sealant at joint, and felt in sidewalk joint. Detected Aroclor 1254 concentrations ranged from 0.500 mg/kg dw (from older joint sealant caulking) to 2.1 mg/kg dw (from newer joint sealant caulking). Detection limits for non-detect results for Aroclor 1254 ranged from 0.980 mg/kg dw (felt material in joint) to 160 mg/kg dw (for newer joint sealant caulk).

Phase III sampling included additional sampling of roof materials, as well as soil accumulation on roofs and water from manholes (5 and 6) and organic sludge/solids from catch basins. The Phase III results indicated that some of the roofing materials contain Aroclor 1248 at concentrations ranging from 0.660 to 28 mg/kg dw. The water sample from manhole 6, located upstream of manhole 5 on the south end of 9-101 building, contained Aroclor 1248 at a concentration of 0.0042 milligrams per liter (mg/L). Organic sludge/solids samples from catch basins contained Aroclor 1254 at concentrations of 2.60 and 3.7 mg/kg dw, exceeding the LAET (130 µg/kg dw) and 2LAET 1,000 µg/kg dw) values for total PCBs. (Project Performance Corporation 2001)

The Phase IV outfall discharge sampling indicated that the two samples of stormwater discharged from the storm drain system did not contain PCBs at levels above the method detection limit of 1 µg/L. The report presents the results of an order of magnitude mass flux estimate based on the stormwater sample results. The calculated flux of PCBs in the stormwater (based on 10 gallons per minute flow and PCBs assumed at ½ the detection limit, 0.5 micrograms per liter [µg/L]) is less than 0.02 pounds/year (Project Performance Corporation 2001).

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. There were four sampling events during the project for the collection of aqueous and sediment/sludge samples. All aqueous samples and the first four sediment/sludge samples sent to the lab were extracted after the allowed holding period of seven days, and resulting concentrations of these samples were therefore qualified as estimated. Various Aroclors were detected above the detection limit in all 10 sediment/sludge samples (at total PCB concentrations ranging from 340 to 16,700 µg/kg dw) and in five of the 10 aqueous samples (ranging from 0.4 to 4.4 µg/L). The report noted that the water samples were collected after sampling solids/sludge samples from the separators and the water results are suspect due to the elevated turbidity resulting from the sludge sampling. (Boeing 2003c)

South Storm Drain Cleanout Work

In 2002, Boeing completed pressure cleaning of a segment of the south storm drain system located on the south side of the 9-101 Building in order to remove PCBs from the interior of the south storm drain line. High-levels of PCBs were found to be generally limited to the side-wall scum/organic material found on pipe interiors along the older storm drain line segment located downstream of manhole MH-6. Drain line solids were sampled; concentrations of Aroclor 1254 ranged from 0.22 to 32 mg/kg dw, all of which exceeded the LAET (130 µg/kg dw) value and some of which exceeded the 2LAET (1,000 µg/kg dw) value for total PCBs. The discharge water sampled at the outfall indicated nondetect levels of PCBs at detection limits of 1 µg/L. (Project Performance Corporation 2002).

Approximately 500 feet of 24-inch diameter concrete pipe was cleaned. Following completion of the cleanout work, a visual inspection using a video camera was completed in the 500 foot length of drain line that was cleaned. The video inspection indicated that the line cleaning was effective in removing the side-wall scum and solids adhered to the pipe side walls, and the concrete pipe appeared clean (Project Performance Corporation 2002).

Based on the video inspection, one segment of the south storm drain line still contained some solid material approximately 120 feet from the LDW. This segment, between manholes MH2 and MH3, was reported to have sand/gravel accumulation apparently several inches thick. Water was ponded on the upstream side of the section to a depth of approximately 6 inches. This sand/gravel accumulation appeared to cover somewhere between 25 to 50 feet in the line. Downstream of this accumulated solid material, there appeared to be an offset in the pipe connection. The accumulation was thought to be derived from the pipe anomaly in this area. It was concluded that the estimated offset of the pipe connection (approximately 4 to 6 inches) made slip-lining repair methods infeasible to implement, and excavation and repair of the section was expected to be the only feasible repair method. It was recommended by Boeing that when the pipe is excavated for repair that solids be removed from the storm drain (Project Performance Corporation 2002). Excavation and repair of the damaged storm drain was conducted in conjunction with the installation of a sediment trap/oil-water separator, discussed below (Bet 2007).

In 2003, Boeing installed a sediment trap/oil-water separator in the south storm drain upstream of manhole MH2 as a source control measure to help prevent stormwater solids from reaching the LDW by settling out the solids. Subsequent to installation of the sediment trap/oil-water separator, samples of stormwater solids have been collected from manholes located upstream and downstream of this unit as part of the annual monitoring for the south storm drain system (See Section 2.2). The sediment trap/oil-water separator unit is cleaned annually.

South Storm Drain Outfall Sediment Cleanup Activities

As discussed in Section 2.2, in September 2003, Project Performance Corporation, on behalf of Boeing, conducted sediment removal activities in the LDW immediately offshore of the south storm drain outfall. This work was conducted under Ecology's Voluntary Cleanup Program. A prior sediment removal action was completed in the adjacent areas in 1999 by King County. The 2003 removal was implemented to address nearshore sediments adjacent to the Boeing south storm drain outfall that were not addressed in the 1999 sediment removal and capping action conducted by King County near the Norfolk CSO/SD outfall (Project Performance Corporation 2003).

The south storm drain sediment removal area is located approximately 130 ft downstream of the Norfolk CSO/SD outfall. The area is illustrated in Figures 2, 8, and 18. The sediment was removed between the South 102nd Street Bridge (upstream) and the Boeing pedestrian bridge (downstream). The purpose of the removal was to protect the clean cap material installed during the Norfolk CSO/SD remediation project and to meet the SMS for PCBs in the removal area. The cleanup objective was to remove or cap all sediments containing PCBs above the CSL or 65 mg/kg OC (Project Performance Corporation 2003).

The 2003 removal activities involved excavation of about 60 cubic yards of sediments containing PCBs. Confirmation sampling indicated sediment located in a small area near the upper portion of the outfall drainage channel contained PCBs at concentrations above the CSL. Following the initial removal of sediment using a vacuum hose, the area was reworked twice using a pressure wash and vacuum recovery approach. Visual observations indicated this process was effective in removing sediment adhered to surfaces and trapped in cracks between rocks. A permeable carbon fabric layer was placed over the excavation surface and covered with clean sand fill. The purpose of the permeable carbon fabric beneath the fill was to limit potential upward migration of residual PCBs into the clean sand cap. The area underneath the engineered cap encompasses a small "hotspot" area where the highest total PCB concentrations have been consistently identified (e.g., sample CHBMS3; 2,190 mg/kg OC total PCBs). This area is limited to a small segment of the drainage channel located just below the south storm drain outfall (Project Performance Corporation 2003).

Post-removal monitoring is being conducted to evaluate the effectiveness of source control measures that have been implemented in the south storm drain system. Two years of post-cleanup sampling (2004 and 2005) has been completed, discussed below.

In the September 2004 sampling event, three sediment samples were collected from the sand cap (Figure 8). Each sample was collected at a depth of 0 to 2 inches. The only PCB detected was Aroclor 1248 at 27 µg/kg dw in sample S01. This was below the total PCB background concentration reported by King County for the last several years of sampling sediments in the general area. The 2004 monitoring report concluded that the results suggest that source control measures have met the objective of minimizing PCB inputs to the river at the point of discharge (Calibre Systems 2005). However, the results of solids sampling from the south storm drain indicate that a segment of the south storm drain system likely contain some PCB residues. Solids were collected at locations both downstream (MH2) and upstream (MH3) of the sediment trap/oil-water separator (Figure 9). The samples were collected using 1-micron filter bags connected to steel frames that were bolted to the base and interior side walls of the storm drain so that stormwater would flow through the filter bag. The solids accumulated in the filter were analyzed for PCBs, TOC, and percent solids. Total PCB results were 7,100 µg/kg dw for the sample collected from MH 2 (downstream of the sediment trap/oil-water separator), and 20,000 µg/kg dw for the sample collected from MH3 (upstream) of the sediment trap/oil-water separator. TOC results were 13.8% and 19.7%, respectively (Calibre Systems 2005). These TOC values are considered too high for organic carbon normalization of the PCB results. The PCB concentrations exceed the LAET (130 µg/kg dw) and 2LAET 1,000 µg/kg dw) values.

As part of the November 2005 monitoring event, Boeing collected four sediment samples (S1-05, S4-05, S2-05, and S3-05) from three locations within the area of the sand cap that was emplaced following the sediment removal work completed by Boeing in 2003 (Figure 10). Each sample was collected at a depth of 0 to 2 inches. The samples were analyzed for total PCBs and TOC. Two Aroclors (1254 and 1260) were detected in one sample with a total PCB concentration of 353 µg/kg dw. The PCB result of the duplicate sample of at this location was below the method detection limit. The difference between these results was attributed to heterogeneity in PCB concentrations. TOC concentrations ranged from 0.53% to 1.56%. Total PCB results for S2-05, S3-05, and S4-05 were below the detection limits of 31 and 32 µg/kg dw, corresponding to organic carbon-normalized values of 2.1 mg/kg OC and 5.8 mg/kg OC, below the SQS (12 mg/kg OC). The organic carbon-normalized total PCB result for sample S1-05 (22.6 mg/kg OC) was above the SQS (12 mg/kg OC) but below the CSL (65 mg/kg OC) for total PCBs.

In addition to the LDW sediment samples, in November 2005 four solids samples were collected from the south storm drain at manhole locations MH2 and MH3, located downsteam and upsteam of a sediment trap/oil-water separator, respectively (Figure 9). The samples were collected using 10-micron filter bags connected to steel frames that were bolted to the base and interior side walls of the storm drain so that stormwater would flow naturally through the filter bag. The samples of solids that accumulated in the filters were analyzed for PCBs, TOC, and percent solids. Total PCB results ranged from 12,600 µg/kg dw (MH2) to 61,500 µg/kg dw (MH3). In addition to samples collected from MH2 and MH3, two samples of accumulated solids were collected from the sediment trap/oil-water separator (ST0905-1 and ST0905-2). Total PCBs concentrations were 15,100 and 15,800 µg/kg dw. TOC results ranged from 6.09% to 22.70%. These PCB concentrations exceeded the LAET (130 µg/kg dw) and 2LAET 1,000 µg/kg dw) values for total PCBs.

The 2005 monitoring report concluded that 2005 sampling results indicate that source control measures have met the objective of minimizing PCB inputs to the LDW at the point of discharge (Calibre Systems 2006). However, the results of the solids sampling from the south storm drain for both the 2004 and 2005 sampling event indicate that PCBs remain in the south storm drain system. To address this, Boeing has implemented annual servicing and cleanout of accumulated solids from the solids trap/oil-water separator (Calibre Systems 2006). The source of the remaining PCBs in the system is suspected to be associated with a segment of storm drain line located beneath Building 9-101. Due to limited access under Building 9-101, only a portion of the storm drain system could be cleaned during the 2002 system cleanout activities (Calibre System 2006).

The data from the storm drain sampling indicate that further source control measures are needed to further reduce PCB inputs into the storm drain system. Based on the results of the solids sampling, Boeing indicated its intent to evaluate the feasibility and expected efficiency of additional source control measures for the south storm drain system. One option reportedly under consideration is additional cleaning of the storm drain segment located beneath Building 9-101. Further evaluation was to focus on re-routing roof drainage only, which represents the majority of flow into this segment of the storm drain system (Calibre System 2006).

3.4.1.4 Stormwater Drainage

Information regarding on-site stormwater drainage at the BDC, including investigation and cleanup of PCB contamination within the south storm drain system and of EAA-7 sediments at the south storm drain outfall, is summarized in Section 3.4.1.3.

Stormwater Pollution Prevention Plan

The 2003 revision of Boeing's SWPPP for the BDC (for Ecology Permit # S03-000146) includes a potential pollutant source inventory. The potential source inventory identifies activities or practices that may be a source of stormwater pollution and includes storage, waste handling, manufacturing, building processes, and transportation. The potential sources identified by Boeing for the BDC are listed below (Boeing 2003a):

- Roof contaminants are considered to be a minor stormwater risk at this site. Drums (drum contents are not identified in the SWPPP) are considered to be a risk to stormwater. Five USTs are listed in the SWPPP as being located at the BDC facility: DC16, a 1,000-gallon diesel tank located south of building 9-101; DC18, a 550-gallon diesel tank located north of building 9-52; DC19, a 1,100-gallon unleaded gasoline tank located north of building 9-52; DC20, a 20,000-gallon fuel oil tank located west of building 9-72; and DC21, a 20,000-gallon fuel oil tank located west of building 9-72.
- Portable tanks are considered to pose no risk to stormwater. One 180-gallon tank is used indoors at the 9-99 building for hydraulic testing.
- Oil and gas tanks are considered to be a moderate risk to stormwater. Fourteen diesel tanks are located at the site. Seven of these are located outdoors, and each one has secondary containment to hold at least the volume of the tank contents.
- Hazardous waste tanks and drums are considered to be a minor risk to stormwater. Most wastes are generated in the 9-101 building. There is one bulk hazardous waste storage tank on site, by the 9-51 building, which collects steam clean wastewater from the automotive maintenance shop.
- Tank and drum storage of hazardous materials are considered a minor risk to stormwater. Solid and liquid hazardous materials are centrally stored at the 9-52 and 9-60 Chemical Management Facilities at the BDC. The largest containers are 55-gallon drums.
- The storage of chemical materials and products are considered to be a minor stormwater risk. For the most part, chemicals are used inside of building 9-101 for aircraft part manufacturing and testing. The 9-52 and 9-60 chemical management facilities handle all central chemical storage.
- Fueling stations are considered a minor risk to stormwater. There is one fueling station near the fence north of the 9-52 building. The fueling station dispenses gasoline, diesel, and propane. This area is impervious and protected by a sump that drains to a nearby oil/water separator. The SWPPP does not specify where the oil/water separator discharges to.
- Material handling activities are considered to be a moderate risk to stormwater. The 9-52 and 9-60 buildings are where the majority of load/unloading activities take place. Most buildings have large roll-up doors that permit a great deal of loading and unloading to be done indoors.
- The handling of hazardous waste is considered to be a moderate risk to stormwater. Solid and hazardous wastes are accumulated in closed containers in indoor waste collection stations. A potential stormwater pollution risk at the site is located at the load area for the wastewater collection tank, BMA-30. This is located near the southwest corner of the 9-51 building. This tank is managed as if it was a hazardous waste tank. About six times a year, the tank is emptied and the waste is shipped off site.

- Transportation is considered to be a moderate risk to stormwater pollution. Materials to be stored indoors or outdoors may be transported on-site by flatbed trucks or other vehicles and unloaded or loaded either indoors or outdoors by forklift or by personnel. A significant amount of loading/unloading operations occurs primarily at four locations: the area north of the 9-101 building between the 9-50 and 9-67 buildings; the covered canopy area west of the 9-51 building; the 9-60 building; and the 9-52 building.
- Vehicle maintenance and cleaning activities are considered to be a minor risk to stormwater pollution. There is an automotive maintenance shop in the southwest corner of the 9-51 building. Parts may be steam cleaned here within containment. Infrequent vehicle repair and maintenance can occur outdoors when equipment fails. Vehicle washing is infrequent and there is no fleet washing of vehicles at this site. The floor of the wash stall is sloped to a containment sump from which the wastewater is pumped into tank BMA-030.
- Dust and particulate generation activities are considered to be a minor risk to stormwater pollution. There are no specific outdoor operations that generate dust or particulate. Dust collectors, servicing various shops, are located outside the buildings throughout the plant. A wet dust collector, located on the north side of the 9-101 building, supports the Tool Grind shop.
- Non-stormwater discharges are considered to be a minor risk to stormwater pollution. These discharges include, on occasion: dewatering for construction projects; infrequent flushing of municipal water from fire sprinkler systems; discharges of groundwater or stormwater that accumulates in utility vaults; and discharges of condensate from air handling units to the storm drainage system.
- A decant station near the 9-60 building is considered to be a minor risk to stormwater pollution. The decant station is used for street sweeping run-off and effluent from annual cleaning of catch basins. The area by this building drains to the LDW at discharge point (DC9), which is north of the six private Boeing outfalls and thus outside of EAA-7.

3.4.1.5 Potential for Future Releases

Annual sediment sampling in the LDW at the south storm drain outfall (also referred to as DC2) at the BDC started in September 2004 following 2003 sediment removal activities. Two of the three annual sampling events required by Ecology have been completed. LDW sediment sampling results presented in the 2004 and 2005 monitoring reports (Calibre Systems 2005 and 2006) show that PCB inputs to the LDW have been significantly reduced. In-line storm drain solids sampling results show that source control measures to date have significantly reduced PCB impacts to EAA-7; however, the data also show that the south storm drain system still contains PCBs. Based on the solids sampling results, Boeing indicated that it is planning to evaluate the feasibility and expected efficiency of additional source control measures for the south storm drain system. One option reportedly being considered is additional cleaning of the storm drain segment located beneath Building 9-101. Further evaluation is to focus on re-routing roof drainage only, which represents the majority of flow into this segment of the storm drain system. (Calibre Systems 2006)

Results of the 2006 sampling event and subsequent monitoring events are expected to provide additional information on whether the objective of minimizing PCB input to the LDW at the south storm drain is being met.

Boeing has completed extensive materials testing for PCBs in the area of the south storm drain system. Information on materials testing for other portions of the BDC is not currently available to assess potential sources of sediment recontamination.

Parcel 0423049016, located at the southern portion of the BDC, is leased by Boeing from East Marginal Associates. A 1984 WSDOT aerial photo obtained from Ecology appears to show a barge operation located on the parcel. This area has been used by Boeing since 1986 for employee parking, and is currently paved. No sampling information exists for the property. It is not known if historic operations at the parcel have resulted in contamination that could result in contamination of EAA-7 sediments.

Spills at the BDC could enter the storm drain system and be discharged to EAA-7. However, Boeing has developed a SWPPP to minimize the potential for spills to impact the drainage system.

3.4.1.6 Planned Source Control Actions

The following source control actions are planned. Table ES-1 presents a summary of source control actions planned for the BDC.

- Boeing will complete the required sediment monitoring in the LDW in the area of the south storm drain sediment removal to evaluate potential sediment recontamination from existing sources at the BDC.
- Boeing will continue monitoring solids within the storm drain system to assess the potential for sediment recontamination from any potential ongoing sources.
- Boeing will continue regular maintenance and cleanout of the south storm drain sediment trap/oil water separator.
- Information on materials testing for some portions of the BDC is not currently available to assess potential sources of sediment recontamination. Boeing will prepare and implement a phased investigation plan to test materials for these portions of the BDC. Ecology and Boeing will determine whether clean up PCB-containing caulk or other building materials that may be identified is required, and Boeing will clean up any such materials as required.
- Boeing will continue to evaluate the feasibility and expected efficiency of additional source control measures for the south storm drain system, including additional cleaning of the storm drain segment located beneath Building 9-101 and evaluation of re-routing roof drainage.
- Ecology and Boeing will re-evaluate the existing SWPPP to determine whether process/operational changes have been made at the BDC, and make any necessary changes to address any new conditions.

- Ecology and Boeing will re-evaluate the existing Industrial Stormwater General Permit to assure that the appropriate parameters are measured.
- Ecology and Boeing will determine whether groundwater and soil sampling are needed at parcel 0423049016 to assess possible historic contamination.

3.4.2 Boeing Military Flight Center

3.4.2.1 Current Operations

The Boeing MFC is located at 10002 East Marginal Way South, Seattle, Washington. It is situated approximately 1200 feet northeast of LDW's eastern bank. The MFC location is illustrated in Figures 11 and 13. The site consists of 24.6 acres of land owned by Boeing. Major facilities at the site support the flight line and consist of aircraft storage, preparation for flight, general servicing, and maintenance and repair. Processes conducted at the MFC include: coating, conversion coating, cold solvent cleaning, machining, sealing, bonding, adhesion, facilities/stores/automotive/equipment maintenance/airplane washing, laboratory operation, photographic/graphic processing, and airplane hydraulic/fuel testing (Johnstone 1993).

According its 2003 SWPPP, five buildings are located on the site and occupy 1.69 acres. Two buildings are general office areas; one is a maintenance/servicing shed, and two are guard buildings. There are several small portable maintenance sheds located on site. The military flight line occupies 17.05 acres, parking areas occupy 5.04 acres, and the remaining area is occupied by buildings and surrounding surfaces. This entire site is covered by impervious surfaces (Boeing 2003b).

According to the King County online tax assessor website, the property is located on tax parcel 0003400021, which is 24.17 acres and is owned by Boeing.

An access road on the southern edge of the flight line separates the flight line from the buildings occupying the southern end of the property. There is an impervious surface of the runway to the west of the property and a grassy boundary to the south.

The MFC has an Industrial Stormwater General Permit No. SO3000150D, which expires on September 20, 2007. Based on Ecology's online database, the parameters for this permit are for pH, with a minimum of 6.5 and a maximum of 8.5 standard pH units (Ecology 2007d). Ecology plans to reissue Industrial Stormwater General Permits on August 20, 2007. These reissued permits would be effective on September 20, 2007, and would expire on September 20, 2012 (Ecology 2007d). According to Ecology's online NPDES and State Waste Discharge Permit database, this site does not have an Individual Wastewater Discharge permit (Ecology 2007c).

This site was issued a Wastewater Discharge Authorization No. 363-02 from the KCIW to discharge wastewater generated by airplane washing operations to the county combined sewer system. Wastewater is pretreated in a gravity separator. The permit allows a maximum discharge of 25,000 gallons per day and is effective April 18, 2002, through April 18, 2007 (King County 2002).

The MFC is listed on Ecology's online Hazardous Site Facility Search and has a RCRA ID No. WAD988475943, which has been inactive since December 31, 1996 (Ecology 2007e).

EPA's online TRI database (EPA 2007) was searched for the MFC. Release Reports, Waste Transfer Reports, and Waste Quantity Reports were also searched. The MFC is not listed in any of the three reports.

3.4.2.2 Historic Use

Little historic use information was found for the MFC, and no purchase information was available on the King County online tax assessor website. In 1990, as part of a reorganization, Boeing separated the BDC from the MFC.

3.4.2.3 Environmental Investigations and Cleanup Activities

The MFC is not listed as a Confirmed and Suspected Contaminated Site on Ecology's CSCSL database (Ecology 2007a). The site is not listed in Ecology's online LUST or UST databases (Ecology 2007b).

PCB Remediation

In July 2005 the EPA approved remediation plans from Boeing to conduct sampling and removal of PCB contamination and PCB bulk product waste caulk at the MFC (Downey 2005). In March, April, and July of 2005, an investigation was conducted to characterize the material filling concrete expansion joints at the MFC. During the investigation, joint materials with similar characteristics (e.g. color, sheen, texture, etc.) were grouped and identified as one type of material and given an alphabetical designation from Q to Y. A total of nine different material types were identified. Samples from the nine materials were collected and tested for the presence of PCBs. The results indicated that five of the nine types of material contained PCBs at concentrations ranging from 3.9 to 99,000 mg/kg dw. Type U material had PCB concentrations less than 10 mg/kg dw. Results for at least one sample of each of the other four types of material (identified as types Q, R, S, and V) indicated a total PCB concentration greater than 50 mg/kg dw. Joint material that contained total PCB concentrations above 50 mg/kg dw was removed. A total of 14,300 linear feet of types Q, R, S, and V material were removed from stalls 76, 77, and 80 from May through July of 2005 (Boeing 2006).

Additional removal activities were conducted from May through September of 2006. A total of 11,250 linear ft of PCB-containing joint material was removed during the 2006 activities. A total of 25,550 linear ft of PCB-containing joint material has been removed from the MFC (Landau 2007).

During these removal activities, control measures were implemented to capture wastewater, slurry, and debris. Control measures included the use of air-powered drum vacuums to vacuum the wastewater and slurry during cutting and pressure washing. At each catch basin located within 25 ft of removal activities, covers were placed over the catch basin and inflatable plugs, if needed, were placed in the discharge and inflow pipes to minimize contaminated water from entering the storm drain system during the joint removal activities. Following removal of the joint material within an area, a pressure washer was used to clean the concrete surface in the work area and remove any accumulated debris from the joint prior to refilling the joint. Immediately following removal of all joint material within an area, the joints were filled by Boeing Maintenance (Boeing 2006).

The 2007 Removal Report states that all planned primary and residual concrete expansion joint material containing PCB concentrations greater than 50 mg/kg dw at the MFC has been completed. Some Type Q, R, S, and V, primary and residual joint material containing PCBs at concentrations greater than 50 mg/kg dw may be present in concrete expansion joints beneath the buildings or structures (Landau 2007).

Stormwater Pollution Prevention Plan

According to the SWPPP, the site is essentially completely impervious. A grassy boundary to the south of the MFC is not impervious. Stormwater from the entire site is collected by a conventional storm drain system with catch basins and associated piping. Two oil/water separators are located within the system. All collected stormwater is discharged to the LDW through the Norfolk CSO/SD (Boeing 2003b).

The 2003 revision of Boeing's SWPPP for the MFC (for WDOE Permit No. S03-000150) includes a potential pollutant source inventory (Boeing 2003b). The inventory identifies activities or practices that may be sources of stormwater pollution and includes storage, waste handling, manufacturing, building processes, and transportation. The potential sources identified by Boeing for the MFC are listed below:

- Roof contaminants are considered a minor stormwater risk at the site.
- Solid waste management practices are considered moderate stormwater risks at this site. Ten outside dumpsters are used for non-hazardous waste.
- Material and equipment storage at this site is considered a moderate stormwater pollution risk. Some large equipment and aircraft maintenance equipment can be found at 13-01 Building's loading dock and to the west of the building.
- Surplus storage is considered a minor stormwater risk. Metal equipment and tub skids are stored in a yard area at the southeast side of the site. The metal containers and the residue they may contain could potentially impact stormwater through rainwater collecting in them and leaching out metals as well as debris they may contain.
- Tanks and drums may pose a threat to stormwater. Chemicals for use in industrial processes and hazardous waste and materials can be stored in drums or tanks.
- Portable tanks are considered a significant stormwater pollution risk. Aircraft are fueled on the flightline from tanker trucks, and portable diesel tanks are used to fuel support equipment.
- Oil and gas tanks are considered a minor stormwater pollution risk. A 200-gallon aboveground storage tank containing diesel fuel is located southeast of the 13-03 building, within a fenced area. This double-walled tank supports an emergency generator.

- Hazardous waste tanks and drums are considered a moderate stormwater pollution risk. Seven waste collection stations are used for accumulated solid and liquid hazardous wastes. There is secondary containment at these stations to prevent a spill or release of waste.
- Hazardous material tanks and drums are considered a moderate stormwater pollution risk. There are no permanent stationary hazardous material tanks at the site. Solid and liquid hazardous materials are centrally stored at the 9-52 and 9-60 Chemical Management Facilities at the BDC. The largest containers are 55-gallon drums. Raw materials and chemicals used on the flightline and in the various shops are stored inside of the 13-01 building. Typically, these chemicals are stored in covered areas that have secondary containment.
- Chemical materials and products are considered a moderate stormwater pollution risk. Material storage is on the BDC at buildings 9-52 and 9-60. Some small hazardous material storage cabinets are in sheds located on the flightline. Hazardous materials typically stored here are solvents, hydraulic oils, paints, lubricants, aerosols, and adhesives, with an average container size of less than 1 quart.
- Fueling stations are considered a moderate risk to stormwater pollution. There are no permanent fueling stations on the site. Aircraft are fueled by tanker or by portable fueling carts.
- Material handling activities are considered a moderate stormwater pollution risk. The highest potential for chemical spills during material handling are at the flight line maintenance sheds where the majority of chemicals are handled.
- Hazardous waste handling is considered a moderate risk to stormwater pollution. A significant amount of outdoor waste loading occurs at a flightline at Stall 75, where a waste collection station is located.
- Transportation is considered a moderate stormwater pollution risk.
- Vehicle maintenance and cleaning are considered minor stormwater pollution risks.
- Dust and particulate generators are considered minor risks to stormwater pollution.
- Several non-stormwater discharges and pollutants are considered minor stormwater pollution risks. These non-stormwater discharges may include the following: dewatering for construction projects (typically, KCIW is contacted to obtain authorization to discharge the dewatered groundwater to the sanitary sewer system); flushing of municipal water from fire sprinkler systems; groundwater or stormwater that accumulates in utility vaults; and discharges of condensate that may accumulate in air handling units, ventilation equipment, humidifiers, hot water heaters, and other equipment.
- Outdoor industrial activities are considered a moderate risk to stormwater pollution. These activities include an aircraft wash area at Stall 75, which has containment curbing to control outflow of rinse water and discharges to the sanitary sewer in accordance with King County discharge authorizations.

The site files contain no other information regarding current or historic monitoring or remediation. No information regarding facility inspections is available.

3.4.2.4 Stormwater Drainage

The MFC covers a 24.6-acre area, east of the BDC. Runoff from the site is collected and routed to the municipal storm drain system on East Marginal Way South, which discharges to the LDW via the Norfolk CSO/SD outfall. The stormwater drainage system at the MFC is illustrated in Figure 19.

The flight line was constructed so a high point exists mid-line, trending roughly north-south and splitting the flight line into two separate drainage areas with surface water moving either east or west from mid-line. A series of catch basins run along the western edge of the flight line and connect to the municipal storm drain system in East Marginal Way South via a 15-inch, 18-inch, and a 24-inch line. These catch basins collect runoff from the MOF parking lot located just north of the MFC. Runoff then passes through an oil/water separator before entering an 84-inch line that also collects the combined sewer overflow originating from a pump station at the southeast corner of the property. Runoff from the eastern side of the flight line drains generally to the east. The northeast section drains into grassy areas adjacent to the KCIA. The southeast section drains into an asphalt-lined ditch east of the blast fence. The ditch is served by an oil/water separator and eventually drains into a 42-inch line running east along the northern edge of the site to the 84-inch municipal line described above (Boeing 2003b).

Three of the five storm drains are serviced by the two oil/water separators; these storm drains drain the three northernmost drainage areas of the MFC (Areas 1, 2, and 4 in Figure 19). These areas include the MOF parking and roadway areas, several parked museum-displayed planes, all flight line stalls, the 13-03 office building (with some small hazardous material/waste storage areas in the building), storage sheds, trailers, equipment storage areas, four hazardous waste storage buildings, six hazardous material storage buildings, six covered dumpsters, portable fuel spill vacuum equipment, and a liquid nitrogen tank. The two southernmost drainage areas of the site (Areas 5 and 3 in Figure 19) discharge to the municipal storm drain system on East Marginal Way South (which discharges to the LDW via the Norfolk CSO/SD outfall) without passing through an oil/water separator. These drainage areas contain a transportation access corridor to the flight lines to the north, the 13-01 office building, the 13-02 maintenance building, storage sheds, trailers, equipment storage areas, hazardous material and waste storage areas in the buildings, two hazardous material storage buildings, two covered dumpsters, and two liquid nitrogen tanks (Boeing 2003b).

3.4.2.5 Potential for Future Releases

The MFC storm drain system does not pass through areas of known or suspected soil or groundwater contamination. Based on available information, infiltration of subsurface contamination into the storm drain system has not been identified as a likely source of sediment contamination in EAA-7.

Some primary and residual joint caulk material with total PCB concentrations greater than 50 mg/kg dw are likely present in concrete expansion joints beneath buildings or structures that were not accessible during the PCB caulk removal activities. This material is a potential source of PCB contamination to EAA-7 sediments. Boeing indicated that it will document and report to EPA any future sampling or removal work associated with concrete expansion joint material containing PCBs at concentrations greater than 50 mg/kg dw (Landau 2007).

No monitoring information for PCBs that may exist in stormwater that discharges from the MFC is available. Such monitoring data would be useful to evaluate whether PCBs may be discharging to EAA-7.

Spills at the MFC could potentially enter the storm drain system and be discharged to EAA-7. MFC maintains a SWPPP to minimize the potential for spills to enter the LDW via the onsite storm drain system.

3.4.2.6 Planned Source Control Actions

The following source control actions are planned:

- Boeing will provide reports to Ecology of any further PCB caulk removal efforts and conduct testing to assess the effectiveness of the removal of PCB contaminated material.
- Ecology and Boeing will re-evaluate the existing SWPPP and make any necessary changes.
- Ecology and Boeing will re-evaluate the existing NPDES permit for monitoring parameters.
- Ecology will inspect the MFC to ensure that pollutant prevention practices are adequate to control the discharge of pollutants from this site and that the MFC is in compliance with its Industrial Stormwater General Permit.
- Ecology and Boeing will discuss cleanup options for removal of caulk containing PCBs at concentrations less than 50 mg/kg dw.
- Boeing will monitor stormwater for PCBs at discharge points.

3.4.3 King County International Airport

3.4.3.1 Current Operations

KCIA, also known as Boeing Field, is located at 7277 Perimeter Road South, Seattle, Washington. This facility is also listed as located at 6518 Ellis Ave, Seattle, Washington, on Ecology's online UST database. Only the southern portion of the site is located in the Norfolk SD drainage basin, as illustrated in Figure 7. This portion of the airport consists of the southern end of the runway, known as 13R-31L, and the surrounding landscaped areas.

KCIA is a general aviation airport owned and operated by King County as a public utility. The site covers about 615 acres, 435 of which are impervious surface covered by buildings and paved areas. The remaining 180 acres consist of grass and landscape area (Cargill et al. 2006).

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, and military and other aircraft. The airport also is home to the Boeing 737 aircraft flight-test program along with other Boeing operations (KCIA 2007).

According to the King County tax assessor website, the portion of the KCIA located within the Norfolk SD drainage basin is part of parcel 2824049007, the listed address of which is 6505 Perimeter Road South (King County 2007b). This parcel consists of 564.77 acres and 101 buildings that have various uses, including office buildings, storage hangars, industrial light manufacturing, material storage sheds and warehouses, and service repair garages (King County 2007b). Available aerial photos and site layout maps indicate no buildings are located on the parcel. East of this portion of the parcel (no listed address, parcel 0323049035) is a 7.75-acre vacant railroad operating property. The Boeing MFC site is located to the west, and the Associated Grocers, Inc., facility is located to the south (King County 2007b).

KCIA does not have an Industrial Stormwater General Permit for the portion of the facility located within the Norfolk SD drainage basin.

According to Ecology's online NPDES and State Waste Discharge Permit database, the portion of KCIA that is located in the Norfolk SD drainage basin does not have an Individual Wastewater Discharge permit (Ecology 2007c).

3.4.3.2 Historic Use

Airport construction began in 1928. The airport served as the community's aviation center until the U.S. Army took it over on December 6, 1941, for strategic and production reasons. The airport remained under military jurisdiction through the end of World War II. In the late 1940s, the airport reopened for passenger and other commercial traffic. After Sea-Tac International Airport opened in 1947, KCIA usage evolved to general aviation, serving industrial, business, and recreational purposes (Cargill et al. 2006).

3.4.3.3 Environmental Investigations and Cleanup Activities

According to Ecology's online UST database, the KCIA does not have any USTs within the portion of the facility that is located within the Norfolk SD drainage basin (Ecology 2007b). According to Ecology's online LUST database, no groundwater or soil contamination from leaking USTs are identified within the portion of the KCIA that is located within the Norfolk SD drainage basin (Ecology 2007b).

No facilities located in the southern portion of the KCIA within the area that drains to the EAA-7 area of the LDW are listed on Ecology's online CSCSL database (Ecology 2007a).

No cleanups on the portion of the KCIA facility that is located within the Norfolk SD drainage basin are documented.

The site files contain no mention of facility inspections by King County and/or SPU. There are also no current or historic monitoring or remediation activities mentioned in the site files conducted in the portion of the KCIA property located within the Norfolk SD drainage basin.

3.4.3.4 Stormwater Drainage

There are approximately 15 miles of storm drain pipe within in the entire KCIA storm drain system. Stormwater drainage at KCIA is illustrated in Figure 20. Based on available information, it is unclear whether any of the collected stormwater discharges to EAA-7. Stormwater from some KCIA properties along East Marginal Way South drains into a combination of Boeing and city of Tukwila storm drainage systems (KCIA 2006). Part of the southern portion of the KCIA facility drains to "Discharge # 3" (Figure 20). The remainder of the southern portion of KCIA drains to "Discharge # 4." It is not apparent from the available KCIA SWPPP (KCIA 2006) or CAD files (KCIA 2007) where "Discharge # 3" or "Discharge # 4" drain into the LDW; however, it is unlikely that "Discharge # 4" drains into EAA-7. According to SPU, most of the KCIA drains to Slip 4, the former Slip 5, and Slip 6, all of which are located downstream of EAA-7 (Schmoyer 2007). According to SPU, this KCIA storm drain crosses the Boeing Thompson property and discharges to the LDW at the former Slip 5 (Schmoyer 2007).

Based on available information, the KCIA storm drain system does not pass through areas of known or suspected subsurface soil or groundwater contamination. However, contaminants that may be present on the surface could potentially migrate to the LDW via the stormwater system. For example, joint caulk that could contain PCBs may be present at the southern end of the KCIA. In the North Boeing Field area, located north of EAA-7, Boeing has been removing concrete joint caulk that contains PCBs at concentrations up to 79,000 mg/kg dw from the facility (Cargill et al. 2006). Approximately 80,000 lineal feet of joint caulk has been removed. An additional 1,400 lineal feet of caulk was scheduled for removal in 2006, most of which is located between stalls C-3 and C-4.

3.4.3.5 Potential for Future Releases

The southern portion of this facility is located within the Norfolk SD drainage basin. There are no buildings, USTs, or known areas of groundwater or subsurface soil contamination identified on this portion of the KCIA. PCBs could be present in joint sealant material at the southern portion of KCIA that is located in the Norfolk SD drainage basin. Due to a lack of information about the locations of stormwater discharges from the southern portion of the KCIA into the LDW, it is not clear whether or not some stormwater discharges from the southern portion of KCIA into EAA-7.

Spills at the southern end of the KCIA could enter the storm drain system and be discharged to the LDW. Available information does not indicate whether any of the discharges into the LDW are to EAA-7. Activities that could potentially cause spills are controlled by the facility Industrial Stormwater General Permit. KCIA maintains a SWPPP to minimize the potential for spills to enter the LDW via the onsite storm drain system.

3.4.3.6 Planned Source Control Actions

The following source control actions are planned:

- KCIA will identify possible connections of the KCIA storm drain system to the Norfolk CSO/SD.
- KCIA will test, and as needed, remove any material (e.g., caulk containing PCBs) in the southern portion of KCIA that contains elevated levels of PCBs.
- Ecology and KCIA will re-evaluate the SWPPP and make any necessary changes.

3.4.4 Associated Grocers, Inc.

3.4.4.1 Current Operations

Associated Grocers, Inc., is located at 3301 South Norfolk Street, Seattle, Washington. The facility is situated in the southeast quadrant of the intersection of East Marginal Way, South Norfolk Street, and north of South Boeing road, as illustrated in Figure 21**.** The LDW is located approximately 1,000 feet west of the facility.

Associated Grocers, Inc., is a wholesaler providing food, general merchandise, and retail services to stores throughout Washington, Alaska, Oregon, Hawaii, Guam, and the Pacific Rim. Founded in 1934, Associated Grocers, Inc., has grown to over 320 customer locations. According to the Associated Grocers, Inc., website (Associated Grocers, Inc. 2007), activities at the site include the procurement and distribution of a variety of perishable and nonperishable commodities, including: grocery, meat, produce, deli, natural, specialty, ethnic, service deli, service bakery, general merchandise, and health and beauty care products.

The Associated Grocers, Inc. facility lies on 25 King County parcels owned by Sea-Tuk Warehouse LLC. Associated Grocers, Inc. has reportedly been sold recently; however, information regarding the sale is not yet available on the King County tax assessor website. (King County 2007b)

On the Ecology online Industrial Stormwater General Permit database, this site is listed as having Permit SO3002040D. Based on Ecology's online database (Ecology 2007d) parameters for this permit are for pH with a maximum of 8.5 and a minimum of 6.5 standard pH units. The permit expires on September 20, 2007. Ecology plans to reissue Industrial Stormwater General Permits on August 20, 2007. These reissued permits would be effective on September 20, 2007, and would expire on September 20, 2012 (Ecology 2007d).

This site is listed on Ecology's online Hazardous Site Facility Search and has RCRA ID No. WAD007942535 (Ecology 2007e).

No Wastewater Discharge Permits were discovered on searching the KCIW files (KCIW 2006).

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

3.4.4.2 Historic Use

The available site files contained no information on historic use at this site.

3.4.4.3 Environmental Investigations and Cleanup Activities

According to the Ecology's online UST database, Associated Grocers, Inc., has two operational USTs. These 20,000 gallon tanks were installed in January 1979 and contain diesel fuel. The database also shows 12 tanks have been removed from the site and one tank was closed in place (Ecology 2007b).

According to Ecology's online LUST database, the site initiated soil and groundwater cleanup activities in February1997. These activities have not been not completed (Ecology 2007b).

According to Ecology's online CSCSL database, the site (Facility Site ID No. 73338176) has suspected and confirmed soil and groundwater contamination. These include halogenated organic compounds, petroleum products, and non-halogenated solvents. A site discovery report was completed in July 2001, an initial investigation was completed in November 2001, and an Early Notice Letter was sent by December 2001. Ecology's status on this site is awaiting assessment (Ecology 2007a).

Three areas on the Associated Grocers, Inc., site have known groundwater and/or soil contamination: the former truck shop; former USTs by the maintenance building; and the former Humble service station. The following summarizes the activities at each of these areas.

Former Truck Shop

Ongoing groundwater monitoring has been performed at the former truck shop since at least June 2002. This shop consists of a building currently used for dry storage. The location and layout of the area of the former truck shop are illustrated in Figure 22. There are currently no USTs at the truck shop site, and no truck repairs are presently conducted in the building. The former truck shop consists of a 9,000-sq. ft. building, a pump island canopy, and the surrounding driveway and parking areas (Lie 2006). According to notes from an October 2005 inspection at the facility, the former truck shop is contracted out to Penske (Tuomisto 2005a).

The latest round of groundwater sampling took place in June 2006. The following compounds were detected at concentrations greater than the MTCA Method A groundwater cleanup levels. Benzene was detected in MW-6 at 7.0 µg/L. TPH in the diesel range was detected in MW-8, MW-205, and MW-206 at 920 mg/L, 6,400 mg/L, and 2,000 mg/L, respectively. TPH in the gasoline range was detected in MW-8 and MW-205 at 1,300 mg/L and 970 mg/L, respectively.

Free product consisting of a mixture of gasoline and diesel fuel has been found in MW-1, MW-2, MW-3, and MW-201. All of these monitoring wells are located in the vicinity of the former pump island, which is east of the former truck shop facility. MW-2 has not contained significant free product since 2004. The amount of free product from the other three wells has varied widely. Manual bailing of free product is conducted on a semi-weekly basis. Recovery of approximately 50 liters of free phase product has been recorded to date; recovery of product is not currently being measured (Lie 2006).

Sampling by Terra Associates in June of 2006 indicates that the plume of groundwater contamination is not migrating off site, however not all monitoring wells were sampled. Terra Associates also concluded the area producing free product has not expanded, and there has been no increase in the amount of free product (Lie 2006).

Former USTs near the Maintenance Building

In April 1995, two USTs (450-gallon and a 300-gallon) were removed from the southern end of the maintenance shop. The locations of these USTs are illustrated in Figure 23. It is suspected that the maintenance shop was formerly a dry cleaning facility and the USTs were abandoned cleaning solvent tanks. Upon removal of the tanks, no odors or visibly contaminated soils were noted. Four soil borings were advanced in the area of the former USTs following their removal (Figure 23). Soil samples from the borings were analyzed for volatile organics. The highest concentrations of volatile organic compounds were detected in a soil sample from Boring 3 at 10 feet: 54 parts per billion (ppb) ethylbenzene; 130 ppb m,p-xylene; 1,000 ppb n-prophlbenzene; 410 ppb 1,3,5-trimethylbenzene; 25 ppb butylbenzene; 1,600 ppb 1,2,4-trimethylbenzene; 230 ppb s-butylbenzene; and 91 ppb 1,2-dichlorobenzenne (Fladseth 1996). The ethylbenzene and xylene concentrations are below MTCA Method A soil cleanup levels for unrestricted land use. There is no information in the site files regarding groundwater sampling.

Former Humble Service Station

In 1991, a site remediation was conducted by Terra Associates, Inc., at the former gasoline service station (Former Humble Oil Service Station), illustrated in Figure 24. This facility was first developed in 1965 and consisted of two pump islands, three underground storage tanks for gasoline storage for retail, and one heating oil tank for on-site use. There was also a repair garage, a drum storage area, and a catch basin with an oil/water separator in the repair area of the building. This catch basin appears to have drained toward a dry well northeast of the structure (Lie 1991).

Terra Associates, Inc. determined, after the removal of the pump island and underground storage tanks, that soils at the dry well required remediation. It appeared waste oils had been disposed of in this sump. All the soils exceeding Ecology's recommended maximum contaminant levels, comprising 500 cubic yards, were removed from the site and disposed of at landfills. In addition, 11,000 gallons of water with elevated levels of hydrocarbons were pumped and removed from the site for treatment. Groundwater samples were taken after soil removal activities were complete. Two groundwater samples contained contaminants above detection limits. The March 21, 1991, sample from monitoring well B-7A contained 22 ppb benzene, exceeding the MTCA Method A groundwater cleanup level (5 µg/L). The December 13, 1990, sample from sample point RS-1 contained 13 ppb benzene, 17 ppb ethylbenzene, 6 ppb m,p-xylene, and 9 ppb o-xylene. (Lie 1991)

Terra Associates, Inc. recommended groundwater monitoring be performed and stated that additional groundwater remediation may be required. Groundwater samples and water level measurements were taken at the six on-site monitoring wells in 1990 an 1991. Groundwater appeared to flow towards the northwest. Terra Associates, Inc. stated the site may be affected by tides and that water levels will fluctuate somewhat through the year due to variations in rainfall (Lie 1991).

In 1992, a sample from monitoring well B-7 contained a benzene concentration of 3 ppb, down from 13 ppb seven months before.

Ongoing groundwater monitoring continued until 1993. A No Further Action (NFA) determination was requested in 1998 (Lie 1998). Ecology issued a NFA through the VCP program December 29, 1998 (Ecology 2007f).

Business Inspections

The area of the former truck shop facility, grocery warehouse, and maintenance shop on the Associated Grocers, Inc., property was inspected as part of the LDW source control program on October 25, 2005. During the inspection, it was noted that no pretreatment was provided for industrial wastes discharged to the sewer. The seven or eight catch basins on site are not equipped with outlet traps and are cleaned quarterly. There was no evidence of contaminants in the catch basins at the time of the inspection, and there were no signs of leaks from vehicles stored on site (Tuomisto 2005b).

In the area containing the two operational diesel USTs, the fueling area was not covered and the fuel pad did not have a separate drainage system. There were also two gasoline aboveground storage tanks on this part of the facility. There were catch basins in the vicinity of the fueling locations, along with required non-water absorbent materials. A storm drain cover and plug kit were not present. It was noted that storage areas were paved and there was no oil staining or visible sheen observed (Tuomisto 2005a).

The following corrective actions were specified:

- Complete a spill prevention and cleanup plan and post the plan at appropriate locations at the facility.
- Obtain a drain cover for the spill kit located at the fueling pad and on the mobile fueling truck. The drain cover should be the first thing pulled out of the kits and used during a spill.
- Clearly mark the spill kits.
- Install outlet traps in all of the catch basins.
- Cover the scrap metal dumpster to keep stormwater from collecting at the bottom of the dumpster and leaching metal into the storm drains.

A follow-up inspection of the facility by SPU completed on December 16, 2005, determined the site was in compliance with the city of Seattle Stormwater, Grading, and Drainage Code (SMC 22.800) (Tuomisto 2005c).

The portion of the site known as the former truck shop, which is currently contracted to Penske, was inspected by SPU on October 25, 2005. The results of the inspection indicated the site was in compliance with the city of Seattle Stormwater, Grading, and Drainage Code (SMC 22.800).

3.4.4.4 Stormwater Drainage

The surface drainage flow direction, drainage sub-area boundaries, and storm drainage system configuration of Associated Grocers, Inc. are illustrated in Figure 25. Runoff from the southern portion of the property discharges into the 60-inch WDOT storm drain and runoff from the northern portion of the property discharges into the Norfolk CSO/SD.

Associated Grocers' storm drain system appears to run through areas of known groundwater and/or soil contamination, and therefore is a possible source of sediment recontamination to EAA-7. There are three areas within the Associated Grocers, Inc., facility with known groundwater and/or soil contamination: the former truck shop; former USTs by the maintenance building; and the former Humble service station.

Groundwater contamination has been identified at the former truck shop (Figures 21 and 22). USTs were removed from the southern end of the maintenance shop. These areas are drained by drainage sub-area C of Associated Grocers' storm drainage system (Figure 25). Groundwater and soil contamination has been identified at the former Humble service station, located in drainage sub-areas A and B of Associated Grocers' storm drainage system (Figure 25). Drainage sub-areas A, B, and C drain into the Norfolk CSO/SD system.

3.4.4.5 Potential for Future Release

According to the Ecology's online UST database, Associated Grocers, Inc. has two operational USTs. These 20,000 gallon tanks were installed in January 1979 and contain diesel fuel. Potential spills from these tanks could be a source of contamination to the Norfolk CSO/SD and EAA-7. Best management practices should be implemented in order to minimize potential spills.

Three areas on the Associated Grocers, Inc. site have had known groundwater and/or soil contamination: the former truck shop; former USTs by the maintenance building; and the former Humble service station. Ecology issued an NFA for the Humble service station through the VCP program on December 29, 1998.

The latest round of groundwater sampling at the former truck shop took place in June 2006. The following compounds were detected at concentrations greater than the MTCA Method A groundwater cleanup levels. Benzene was detected in MW-6 at 7.0 µg/L. TPH-diesel range was detected in MW-8, MW-205, and MW-206 at 920 mg/L, 6,400 mg/L, and 2,000 mg/L, respectively. TPH-gasoline range was detected in MW-8 and MW-205 at 1,300 mg/L and 970 mg/L, respectively. Free product consisting of a mixture of gasoline and diesel fuel has been found in MW-1, MW-2, MW-3, and MW-201. All of these monitoring wells are located in the vicinity of the former pump island, which is east of the former truck shop facility. Contaminated groundwater from the former truck shop could potentially infiltrate into the storm drain system and eventually discharge into the LDW in EAA-7.

3.4.4.6 Planned Source Control Actions

The following source control actions are planned:

- The owners of the Associated Grocers, Inc. property will sample monitoring wells located by the former truck shop to evaluate current groundwater flow and extent of the contaminant plume. Monitoring well locations and depth intervals will be evaluated to determine if additional monitoring wells are needed to fully delineate the contaminant plume.
- The owners of the Associated Grocers, Inc. property will re-evaluate the free product removal strategy to determine its source control effectiveness.
- Ecology will determine whether additional groundwater and soil assessment is needed for the maintenance building where USTs removal activities took place in 1995.
- If additional soil and groundwater monitoring results indicate that subsurface contamination could potentially enter the storm drain system and migrate to EAA7, source control measures will be implemented as appropriate.
- The new owners of the property may choose to redevelop the land. If any excavation is conducted as part of the redevelopment, contaminated soil and groundwater could be encountered. Ecology or SPU will apprise the city of Seattle Department of Planning and Development of this to ensure that contractor addresses this in their construction dewatering plan.
- There are two operational USTs on the facility. Ecology and Associated Grocers, Inc., will evaluate the spill prevention and cleanup plan to assure that potential for spills into the storm drain system are adequately addressed.
- SPU will continue to conduct business inspections at the Associated Grocers site to determine if the site is in compliance.
- Ecology will determine whether a SWPPP is required for Associated Grocers, Inc.

3.4.5 Northwest Auto Wrecking

3.4.5.1 Current Operations

Northwest Auto Wrecking is located at 10230 East Marginal Way South, Tukwila, Washington. The location and layout of the facility are illustrated in Figure 26. The auto wrecking facility is located on tax parcels 0423049102 and 0323049062, and is owned by Northwest Auto Wrecking Company (King County 2007b). Parcel 0423049102 is 1.84 acres in size and contains four structures: a 1,500-sq. ft. service repair garage built in 1962; a 1,800-sq. ft. retail store built in 1958; a 1,560-sq. ft. material storage shed built in 1922; and a 2,064-sq. ft. material storage shed built in 1922. Parcel 0323049062 is 3.51 acres in size and zoned for commercial use.

On the Ecology online Industrial Stormwater General Permit database, this facility is listed as having Permit SO000961D. Based on Ecology's online database (Ecology 2007d) the parameters for this permit are for pH with a maximum of 8.5 and a minimum of 6.5 standard pH units. The permit expires on September 20, 2007. Ecology plans to reissue Industrial Stormwater General Permits on August 20, 2007. These reissued permits would be effective on September 20, 2007, and would expire on September 20, 2012 (Ecology 2007d).

According to Ecology's online NPDES and State Waste Discharge Permit database, this facility does not have a NPDES permit (Ecology 2007c).

This site was not listed as a Hazardous Waste Facility on Ecology's online Hazardous Waste Facility Search database (Ecology 2007e).

3.4.5.2 Historic Use

Review of available information did not identify prior uses or ownership of the property.

3.4.5.3 Environmental Investigations and Cleanup Activities

Northwest Auto Wrecking is not listed on Ecology's online UST or LUST database (Ecology 2007b).

According to Ecology's CSCSL online database, the facility (Facility Site ID No. 2287) has confirmed soil and sediment contamination, and suspected groundwater, surface water, and air contamination. The confirmed and suspected contaminants are halogenated organic compounds, EPA priority pollutant metals, and cyanide, metals, PCBs, petroleum products, and non-halogenated solvents. According to the database, a Site Discovery/Report was received and determined completed on October 31, 1990. The current status is awaiting Site Hazard Assessment (Ecology 2007a).

In 1993, meetings were held between Jerry Haapla of Northwest Auto Wrecking, Inc., and Ecology to discuss cleanup options for high levels of lead contamination located on the property (Chaitin 1993).

In 1997, a letter to Dan Marsh of Marsh Industrial Research from David Hohmann of Ecology's Hazardous Waste and Toxics Reduction program stated some soils failing the TCLP test for lead leachability may be awaiting final cleanup on the site. Marsh Industrial Research performed bench testing and proposed stabilizing the remaining soils by adding Portland cement so metals are fixed and stabilized. Ecology responded that for this process to be done, it must be performed at the site where waste is generated and conducted to prevent a release of waste and waste constituents. Ecology also stipulated the resulting concrete could not be buried in the ground unless a solid waste disposal permit was acquired, and that a Waste Analysis Plan would need to be developed and approved by Ecology (Hohmann 1997).

No information was located regarding subsequent cleanup plans or actions for this site after 1997, nor was information regarding analytical data or information regarding the suspected groundwater, surface water, or air contamination.

3.4.5.4 Stormwater Drainage

Northwest Auto Wrecking is located west of Associated Grocers, Inc., and east of the LDW. No information regarding Northwest Auto Wrecking's drainage system, including a SWPPP, was available for review. Subsurface contamination that may exist at this facility could potentially be a source of sediment recontamination of the LDW via the on-site storm drain system. However, there is insufficient information to determine if Northwest Auto Wrecking's storm drain system passes through areas of subsurface soil or groundwater contamination, or whether contaminants at the surface could enter into the storm drain system.

3.4.5.5 Potential for Future Release

According to Ecology's CSCSL online database, the facility (Facility Site ID No. 2287) has confirmed soil and sediment contamination, and suspected groundwater, surface water, and air contamination. The confirmed and suspected contaminants are halogenated organic compounds, EPA priority pollutant metals, and cyanide, metals, PCBs, petroleum products, and non-halogenated solvents. According to the database, a Site Discovery/Report was received and determined completed on October 31, 1990. The site is currently awaiting a Site Hazard Assessment (Ecology 2007a). No soil or groundwater sampling information for the site was found during the site file review.

No information on stormwater drainage for the site was found during the site file review.

Surface and subsurface contamination that may exist at the site could potentially enter into the on-site storm drain system and drain to the LDW. The likelihood of this is not presently possible to evaluate because of lack of information

3.4.5.6 Planned Source Control Actions

The following source control actions are planned:

- Northwest Auto Wrecking will conduct soil, groundwater, surface water, and sediment sampling, as appropriate.
- Results of soil, groundwater, surface water, and sediment sampling will be reviewed by Ecology to assess the potential impacts of soil and groundwater contamination to the Norfolk CSO/SD and EAA-7.
- SPU has recently entered into an MOA with the city of Tukwila to inspect 5 businesses in Tukwila that are located in the Norfolk SD drainage basin, including Northwest Auto Wrecking, as part of the LDW source control program. SPU will conduct inspections of this facility.
- Ecology will determine whether a NPDES permit/SWPPP is required for the facility.
- Ecology will obtain information pertaining to the storm drain system from Northwest Auto Wrecking.
- Northwest Auto Wrecking will determine whether the storm drain system connects to the Norfolk CSO/SD.

3.4.6 Affordable Auto Wrecking

3.4.6.1 Current Operations

Affordable Auto Wrecking is located at 9802 Martin Luther King Jr. Way South, Seattle, Washington. The area of Affordable Auto Wrecking is illustrated in Figure 27. This facility salvages and sells miscellaneous vehicle parts, then crushes and sells the remaining vehicle components in bulk to local metal salvage businesses. Cars are processed at the southern end of the property, where the car crusher is located. At the southern end of the facility, fluids are removed from incoming automobiles. Some of these automobiles are later crushed. Cars not crushed at this time are moved to the northern end of the property, where they are used for parts salvage.

According to King County tax assessor records, the facility is located on tax parcel number 0323049092 (King County 2007b). Ecology analyzed aerial images of the Affordable Auto Wrecking facility in 2004 and determined the facility spans a total of three parcels. The two additional parcels are numbers 0323049091 and 0323049107 (Wood 2004). The area of these parcels is illustrated in Figure 28.

According to Ecology's online Industrial Stormwater General Permit database, Affordable Auto Wrecking is listed as having Permit SO000843D. Based on Ecology's online database, the parameters for this permit are for pH with a maximum of 8.5 and a minimum of 6.5 standard pH units. Ecology plans to reissue Industrial Stormwater General Permits on August 20, 2007. These reissued permits would be effective on September 20, 2007, and would expire on September 20, 2012. (Ecology 2007d)

This facility has been issued a Minor Discharge Authorization No. 732-01 (EPA ID No. 2-473944-236520) from the King County Wastewater Treatment Division to discharge limited amounts of industrial wastewater into King County's sewer system in accordance with effluent imitations and other requirements and conditions listed in the document. According to the permit, discharge is to the south treatment plant for wastewater generated by contaminated stormwater with an oil/water separator as a pre-treatment process. The maximum volume allowed is 25,000 gallons per day. The permit is effective April 1, 2003, through April 1, 2008.

This facility is not listed on Ecology's online NPDES and Waste Discharge Permit Database (Ecology 2007c) or on Ecology's Hazardous Waste Facility Search Database (Ecology 2007e).

3.4.6.2 Historic Use

Review of available information did not identify prior uses or ownership of the property.

3.4.6.3 Environmental Investigations and Cleanup Activities

On Ecology's online CSCSL database, Affordable Auto Wrecking (Facility Site ID No. 7163112) is listed as having suspected groundwater contamination and confirmed surface water and soil contamination. The contaminants are listed as EPA priority pollutants metals and cyanide, petroleum products, non-halogenated solvents, and PAHs. In July 2006, the site was added to the Hazardous Sites List with a rank of 5 (This ranking is based on a scale of 1 to 5. On this scale, "1" represents the highest relative risk, and "5" represents the lowest relative risk. This ranking is designed to estimate the potential threat to human health and/or the environment, relative to all other sites in Washington State). The site is awaiting remedial action (Ecology 2007e).

The facility is not listed on Ecology's online LUST database (Ecology 2007b). There are no USTs listed for this facility on Ecology's online UST database (Ecology 2007b).

Ecology Hazardous Waste and Toxics Reduction Program

In May 2000, this facility was inspected by Ecology's Hazardous Waste and Toxics Reduction Program. Work was done at the facility by Hazardous Waste and Toxics Reduction and Seattle Public Utilities (Surface Water). On June 16, 2000, a Notice of Correction was issued to the site to outline steps needed to bring the site into compliance (Ecology 2000). A follow-up inspection was completed on November 21, 2000, at which time no hazardous waste violations were noted (Zimmermann 2000).

This facility was inspected by Ecology's Hazardous Waste and Toxics Reduction Program on August 3, 2004. Agencies involved in this inspection were: Ecology Hazardous Waste and Toxics Reduction, Ecology Water Quality, Washington State Patrol, Seattle Police Department, Fire Marshal's Office, Seattle Public Utilities, and KCIW. The agencies' main issue of concern was whether the management of waste gasoline and the general environmental management practices at the site could be improved by better "housekeeping practice" (Zimmermann 2004a).

During the August 3, 2004 site visit the integrity of the concrete covering could not be assessed because many areas of concrete were covered by a thick layer of dirt and debris. Deep grooves cut into the concrete slab were noted in several areas. The inspection concentrated on the southern end of the property where fluids were removed from incoming automobiles and some of the automobiles were crushed. It was observed that lead-acid batteries were sometimes stored in a manner that could allow the acid to drain to the ground. This same situation was observed during a May 2000 inspection. Waste antifreeze was also found to be improperly managed and stored. It was not determined if waste gasoline was being properly managed. It also was not determined if wastewater separated from gasoline drained from the automobile fuel tanks was being properly managed and disposed of (Zimmermann 2004a).

Business Inspections

SPU inspected Affordable Auto Wrecking on the following dates: October 30, 2001; December 4, 2002; December 20, 2002; March 5, 2003; August 3, 2004; November 10, 2004; December 15, 2004; and December 29, 2004; October 26, 2005; and January 27, 2006.

The following actions were identified during inspections conducted prior to October 2005 (Bassett 2005):

- Removing a by-pass line to route runoff through an oil/water separator before discharge to the sanitary sewer.

- Implementing BMPs to minimize the amount of contaminants discharged to the sanitary sewer: keeping lids on drums, buckets, and drip pans with petroleum products or other hazardous liquids so stormwater would not accumulate and overflow the containers.
- Implementing appropriate spill control procedures to ensure that leaks and spills are immediately and effectively cleaned up, to collect and properly dispose of spilled material and cleanup materials, and to install and maintain an oil/water separator at the north side of the yard.

In a follow-up inspection conducted on October 26, 2005, the following two corrective actions were identified:

- Provide spill containment and clean-up materials for the crushing area at the south end of the property. These were to be clearly marked and easily accessible.
- Educate employees at the site about the spill plan and spill containment and clean-up materials.

Both these items were completed by the facility, and during the re-inspection on January 27, 2006, it was determined the facility did not have any environmental compliance problems.

King County Industrial Waste Program

On January 28, 2005, the KCIW requested that Affordable Auto Wrecking clean the oil/water separator that discharges to the sanitary sewer system. The follow-up inspection on May 18, 2005, found the oil/water separator (pretreatment system) had not been cleaned. A Notice of Violation letter was sent on May 27, 2005, for failure to clean the pretreatment system. A 14-day report was received on June 16, 2005, that stated the costs for cleaning were prohibitive. At the time, temporary steps were taken to remove some of the solids from the sump pump intake and to place the sump pump above the level of contaminated dirt. Samples collected on February 2, 2006, indicated the discharge was back in compliance with discharge standards. KCIW stated the contaminated solids accumulated in the separator must be removed and disposed of in accordance with environmental regulations (Haberman 2006).

3.4.6.4 Stormwater Drainage

Affordable Auto Wrecking has recently diverted all contaminated stormwater runoff to the sanitary sewer, which suggests that Affordable Auto Wrecking may not discharge to EAA-7 via the Norfolk CSO/SD except during CSO events. A current and accurate description of Affordable Auto Wrecking's storm drain system is necessary to further evaluate potential impacts to EAA-7.

3.4.6.5 Potential for Future Release

The facility is listed on Ecology's CSCSL database as having suspected groundwater contamination and confirmed surface water and soil contamination. No soil or groundwater sampling information for the site was found during the site file review. The stormwater drainage configuration at the site is not known based on available data.

Surface and subsurface contamination that may exist at this facility could potentially be a source of sediment recontamination of the LDW via the on-site storm drain system. The likelihood of such sediment contamination cannot be evaluated with available data.

3.4.6.6 Planned Source Control Actions

The following source control actions are planned:

- Ecology, SPU, and KCIW will conduct inspections of the facility to confirm that the recent changes made to the drainage system are currently functioning and that no contaminated runoff enters the municipal storm drain system on Martin Luther King Jr. Way South.
- Affordable Auto Wrecking and SPU and/or city of Tukwila will determine where the on-site storm drain system connects to the Norfolk CSO/SD system.
- Ecology and Affordable Auto Wrecking will re-evaluate the SWPPP in light of the recent changes to the stormwater drainage system that reroute stormwater drainage to the sanitary sewer system.
- Affordable Auto Wrecking will conduct surface water, soil, and groundwater sampling to assess the potential impacts contamination of these media on the Norfolk CSO/SD and EAA-7, as necessary.
- Ecology and Affordable Auto Wrecking will determine cleanup options for the removal of contaminated media as appropriate.
- The KCIW will continue to oversee and monitor discharges to the combined sewer system.

3.4.7 Arco Gas Station

3.4.7.1 Current Operations

An Arco Gas Station facility was formerly located on King County tax parcel 0323049008, which is identified on the King County tax assessor online parcel database as having an address of 9834 Martin Luther King Junior Way South, Seattle, Washington (King County 2007b). The reported address of the former Arco Gas Station facility on Ecology's UST and LUST databases is 9830 Martin Luther King Way South, Seattle, Washington (Ecology 2007b). In various Ecology documents, the Arco Gas Station is reported to have a street address of 9840 Martin Luther King Junior Way South, Seattle, Washington. The area of the site is illustrated in Figure 29. Parcel 0323049008 is a 2.95-acre property zoned for commercial use and owned by John Eastey.

According to Ecology's online NPDES and State Waste Discharge Permit database, this facility does not have a NPDES permit (Ecology 2007c). The facility does not have an Industrial Stormwater General Permit (Ecology 2007d) and is not listed on Ecology's online Hazardous Waste Facility Search Database (Ecology 2007e).

3.4.7.2 Historic Use

Review of available information did not identify prior uses or ownership of the property.

3.4.7.3 Environmental Investigations and Cleanup Activities

The facility is listed on Ecology's online CSCSL database as a contaminated site (Facility Site ID 29429665), with groundwater contamination determined to be below the cleanup level and soil contamination that has been remediated (Ecology 2007a). The facility owner is pursuing a NFA determination by Ecology under the Voluntary Cleanup Program (Adams 2005).

According to Ecology's online UST and LUST databases, 26 USTs have been removed from the facility, and the site is awaiting soil cleanup. There are no USTs remaining on site (Ecology 2007b).

The 26 former USTs reported to have existed at the site included: sixteen 10,000-gallon unleaded gas USTs; five 20,000-gallon diesel USTs; one 20,000-gallon unleaded gas UST; two 8,500-gallon unleaded gas USTs; and two 7,500-gallon unleaded gas USTs (Peterson 2005). The general locations of these former USTs are shown in Figure 29.

The USTs were removed in 1991 and 1992, and a verbal notice of release was provided to Ecology in 1994 (Adams 2005). No soil sampling data associated with the tank removal have been submitted to Ecology, and Ecology is not aware of any other soil characterization data for the site. The nature and extent of soil contamination reported in 1994 by the site owners are unknown to Ecology (Adams 2005). Ecology did not receive an Underground Storage Tank Removal Report or Site Assessment Report for the tank closures. Bison Environmental, the firm that reportedly completed the UST closure site assessment, is no longer in business. Ecology identified a number of concerns to be addressed before issuing a NFA determination. First, if the site is to proceed with containment of the unknown contamination as the selected cleanup action, an alternative point of compliance for compounds in soil associated with petroleum fuel tank farms would need to be established. Second, to demonstrate groundwater flowing through the site is uncontaminated based on the three on-site monitoring wells, a conditional point of compliance would need to be established for groundwater. Third, institutional controls, likely including a restrictive covenant, would need to be established to assure integrity of the contaminated system (Adams 2005).

Three monitoring wells are located on site. No well completion information is available for these wells. HWA GeoSciences, Inc. conducted a groundwater sampling event on December 14, 2004. The samples were analyzed for: gasoline range TPH, benzene, etheylbenzene, toluene, xylene, TPH- diesel range, and TPH-lube oil range. The samples from MW-1, MW-2, and MW-3 contained <50 μg/L gasoline, <1 μg/L Benzene, <1 μg/L ethylbenzene, <1 μg/L toluene, <3 μg/L xylene, <130 μg/L diesel, and <250 μg/L lube oil. Results for all samples were reported below the MTCA Method A cleanup levels (Peterson 2005).

In December 2005, HWA GeoSciences, Inc. installed two temporary hand-driven piezometers to further characterize groundwater flow at the site. Groundwater levels were measured at the two piezometers and three monitoring wells on December 8, 2005; January 5, 2006; and February 1, 2006. The apparent groundwater gradient was reported to be to the south and west.

A third piezometer was installed in May 2006 at the request of Ecology, and another set of groundwater measurements were taken on May 11, 2006. Groundwater in the area of the former USTs was reported to flow to the south and southwest. HWA GeoSciences, Inc. asserted that the three monitoring wells were located downgradient of the former USTs, making them favorably positioned to monitor groundwater quality. In 2006, HWA GeoSciences, Inc. recommended continued groundwater sampling from the three wells to evaluate groundwater compliance (Sugar 2006). No documents available for review indicate that further groundwater sampling has been conducted.

In September 2006, Ecology agreed with the conclusions of HWA GeoSciences, Inc. (Sugar 2006) that the three monitoring wells were favorably positioned to monitor groundwater quality relative to the former UST locations. Ecology recommended that Geoprobe borings be conducted within the edges of the tank nest excavations to evaluate both internal backfill and exterior native soils (Adams 2006). No documents available for review indicate that further soil boring installation has been conducted.

As part of the LDW source control program, SPU collected in-line sediment samples from eight locations in the Norfolk CSO/SD system in 2003-2005, as discussed in Section 3.1.1.4. Some of the sample locations, including MH4 and MH5, are located downgradient of the Arco Gas Station. Samples from these locations contained elevated concentrations of TPH-oil range.

3.4.7.4 Stormwater Drainage

Arco Gas Station is located just southeast of Affordable Auto Wrecking. No information regarding Arco Gas Station's storm drain system, including a SWPPP, was available for review. Thus, it is not possible to definitively determine how the storm drain system serving the Arco Gas Station facility could facilitate the migration of contaminants to the LDW in EAA-7 via the stormwater pathway.

There are no documented areas of groundwater contamination at the site; however, follow-up sampling specified by Ecology in the area of the former USTs has apparently not been completed, and thus there remains uncertainty about the presence of subsurface contamination through which an on-site storm drain system could potentially pass.

Limited information provided by SPU indicates that diesel contamination has been investigated within Arco Gas Station's storm drainage system, and a wash pad has been found at the Coluccio yard that was incorrectly plumbed to the storm drain system. The facility owner was directed to replumb to the sanitary sewer in 2005 (Schmoyer 2007).

3.4.7.5 Potential for Future Release

The facility is listed on Ecology's online CSCSL database as a contaminated site (Facility Site ID 29429665), with groundwater contamination determined to be below the cleanup level and soil contamination that has been remediated (Ecology 2007a). The facility owner is pursuing a NFA determination by Ecology under the Voluntary Cleanup Program (Adams 2005).

Available soil and groundwater information indicate that the groundwater on site is below the MTCA Method A cleanup levels. Soil boring samples are needed in the area adjacent to the tank farm to determine if soils are impacted and if those soils will need to be remediated in order to control this potential contaminant pathway.

Additional information on the stormwater system is needed to assess this area as a potential source to EAA-7.

3.4.7.6 Planned Source Control Actions

The following source control actions are planned:

- Arco Gas Station, under the Voluntary cleanup program, will conduct soil sampling in the area adjacent to the former tank farm to determine if soils are impacted and if those soils will need to be remediated in order to control this potential contaminant pathway.
- Additional groundwater monitoring will be conducted as appropriate.
- After additional soil and groundwater sampling is complete, Ecology will determine whether further actions are needed.
- Ecology will determine if a SWPPP is required from Arco Gas Station.
- Ecology will gain a better understanding of the storm drain system and possible historic or present connections to the Norfolk CSO/SD.

3.5 Atmospheric Deposition

Air pollution can enter the LDW directly or through stormwater, thus becoming a possible source of sediment contamination to EAA-7. Air pollution can be localized, such as paint overspray, sand-blasting, and fugitive dust and particulates from loading/unloading of raw materials such as sand, gravel, and concrete, or it can be widely dispersed from vehicle emissions, industrial smokestacks, and other sources.

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

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

Available information (e.g. EPA TRI database) does not indicate that any of the identified facilities of concern are sources of the chemicals of concern in EAA-7 sediments.

3.5.1 Planned Source Control Actions

Atmospheric deposition should be further evaluated to assess whether it is a potential source of phthalates (particularly bis(2-ethylhexyl) phthalate) and other contaminants (such as PCBs) in stormwater runoff. However, at this time, there are no available resources to address this issue. The SCWG will conduct any future atmospheric deposition work to assess potential sources of phthalates and other potential contaminants, and will consider the findings and recommendations of the Phthalate Work Group.

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4.0 Monitoring

Monitoring efforts by Seattle Public Utilities, the city of Tukwila, Boeing, and King County will continue to assist in identifying and tracing ongoing sources of the chemicals of concern present in the LDW sediments. This information is being used to focus source control efforts on specific problem areas within Norfolk SD drainage basin and to track the progress of the source control program. The following types of sampling will continue to be implemented:

- Additional source tracing within the drainage basin to identify potential ongoing discharges to the LDW (e.g., in-line sediment grabs and traps, and onsite/right-of-way catch basin sampling).
- Soil and groundwater sampling 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 contaminants of concern. In-water sediment 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 on the action items for each Action Plan annually, and will periodically update the plans with technical memoranda.

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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. In turn, all source control activities will be documented by the appropriate agency performing the source control work. The agencies will provide reports to Ecology, who will provide LDW-wide and basin-specific reports.

The management of information and data is divided into two levels. The first level is documentation and tracking, where information is organized so that Ecology can track and manage source control activities at a given source or within a given basin. The second level is reporting to EPA. Please refer to the Lower Duwamish Source Control Strategy for further details (Ecology 2004).

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Appendix A Toxics Release Inventory, Quantities of Releases Summarized by Report Type

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Table A-1: Summary of TRI Release Reports for Boeing Developmental Center

Facility/Chemicals	Date	Fugitive Air	Stack Air	Total Air Emissions	Total On-site disposal or other releases	Total Off-Site Disposal-Landfill/Surface Impoundments	Off-Site Disposal-Other Off-site Management	Total Off-site disposal or other releases	Total On- and Off-site disposal or other releases
BDC: 1,1,1-Trichloroethane	1994	18,000	250	18,250	18,250	0	0	0	18,250
BDC: 1,1,1-Trichloroethane	1993	18,000	0	18,000	18,000	0	0	0	18,000
BDC: 1,1,1-Trichloroethane	1992	27,000	0	27,000	27,000	0	0	0	27,000
BDC: 1,1,1-Trichloroethane	1991	27,000	0	27,000	27,000	0	0	0	27,000
BDC: 1,1,1-Trichloroethane	1990	28,432	3,268	31,700	31,700	0	750	750	32,450
BDC: Freon 113	1990	77,328	0	77,328	77,328	0	250	250	77,578
BDC: Methyl Ethyl Ketone	1990	3,660	7,503	11,163	11,163	0	6,588	6,588	17,751
BDC: Toluene	1990	1,639	6,284	7,923	7,923	250	4,781	5,031	12,954
BDC: 1,1,1-Trichloroethane	1989	27,000	3,000	30,000	30,000	0	1,000	1,000	31,000
BDC: Acetone	1989	1,400	7,000	8,400	8,400	250	3,600	3,850	12,250
BDC: Freon 113	1989	94,000	0	94,000	94,000	0	250	250	94,250
BDC: Methyl Ethyl Ketone	1989	3,100	6,500	9,600	9,600	0	5,700	5,700	15,300
BDC: Toluene	1989	1,800	6,600	8,400	8,400	250	5,100	5,350	13,750
BDC: 1,1,1-Trichloroethane	1988	35,000	3,800	38,800	38,800	0	0	0	38,800
BDC: Acetone	1988	16,000	750	16,750	16,750	0	0	0	16,750
BDC: Freon 113	1988	85,000	0	85,000	85,000	0	0	0	85,000
BDC: Methyl Ethyl Ketone	1988	28,000	750	28,750	28,750	0	0	0	28,750
BDC: Toluene	1988	6,200	6,200	12,400	12,400	0	0	0	12,400

All measurements are in pounds

Key:

Fugitive Air: Fugitive Air emissions are all releases to air that are not released through a confined air stream. Fugitive emissions include equipment leaks, evaporative losses from surface impoundments and spills, and releases from building ventilation systems. Data from Section 5.1 on the TRI Form R.
Stack Air: Stack or point source air emissions occur through confined air streams suck as stack, vents, ducts, or pipes. Data from Section 5.2 on the TRI Form R.
Total Air Emissions: includes both fugitive air emissions and point source air emissions. Data from Section 5.1 plus Section 5.2 o the TRI Form R.
Total On-site disposal or other releases: include emissions to the air, discharges to bodies of water, disposal at the facility to land, and disposal in underground injection wells. Disposal or other releases are reported to TRI by media type. On-site disposal or other releases are reported in Section 5 of the TRI Form R.
Total Off-Site Disposal-Landfill/Surface Impoundments: Transferred to landfills and disposal surface impoundments. Data from Section 6.2, Code M72, on the TRI Form R.

Off-Site Disposal-Other Off-Site Management: Chemicals in waste sent to sites where the waste is managed by techniques not specifically listed in Section 6.2. Data from Section 6.2, Code M90, on the TRI Form R.

Total Off-site disposal or other releases: a discharge of a toxic chemical to the environment that occurs as a result of a facility's transferring a waste containing a TRI chemical off-site disposal or other release, as reported in Section 6 of the TRI Form R.

Total On- and Off-Site Disposal and other releases: the sum of total on-site disposal or other release and total off-site disposal or other releases as reported in Section 5 and 6 on the TRI Form R.

Table A-2: Summary of TRI Waste Transfer Reports for Boeing Developmental Center

Facility/Chemical	date	Transfers to Recycling	Transferred to Energy Recovery	Transfers to treatment	Transfers to POTWs Non Metals	Transfers Off-Site for Disposal or Other Releases	Total Transfers Off-site for Further Waste Management
BDC: 1,1,1-Trichloroethane	1994	250	0	505	0	0	755
BDC: 1,1,1-Trichloroethane	1993	250	0	1,505	0	0	1,755
BDC: 1,1,1-Trichloroethane	1992	250	750	250	0	0	1,250
BDC: 1,1,1-Trichloroethane	1991	250	.	750	0	0	1,000
BDC: 1,1,1-Trichloroethane	1990	0	0	0	15	750	755
BDC: Freon 113	1990	0	0	0	0	250	250
BDC: Methyl Ethyl Ketone	1990	.	.	750	5	6,588	7,343
BDC: Toluene	1990	.	.	250	5	5,031	5,286
BDC: 1,1,1-Trichloroethane	1989	0	0	0	0	1,000	1,000
BDC: Acetone	1989	.	.	250	250	3,850	4,350
BDC: Freon 113	1989	0	0	0	0	250	250
BDC: Methyl Ethyl Ketone	1989	0	0	250	0	5,700	5,950
BDC: Toluene	1989	.	.	250	0	5,350	5,600
BDC: 1,1,1-Trichloroethane	1988	0	0	330	1	0	331
BDC: Acetone	1988	0	0	1,650	20	0	1,670
BDC: Freon 113	1988	0	0	1,200	0	0	1,200
BDC: Methyl Ethyl Ketone	1988	0	0	3,350	4	0	3,354
BDC: Toluene	1988	0	0	4,050	4	0	4,054

All measurements are in pounds

Key

Transfers to Recycling: the total among of toxic chemical in the waste stream transferred from the facility to an off-site location during the calendar year (January 1 - December 31) for recycling to manage the toxic chemical. This refers to the ultimate disposition of the toxic chemical, not the intermediate activities used for the waste stream. Data from Section 6.2, Codes M20, M24, M26, M28, M93, on the TRI Form R.

Transferred to Energy Recovery: the total amount of the toxic chemical in the waste stream transferred from the facility to an off-site location during the calendar year for energy recovery to manage the toxic chemical. Data from Section 6.2, Codes M56 and M92, on the TRI Form R.

Transfers to treatment: the total amount of toxic chemical in the waste stream transferred from the facility to an off-site location during the calendar year for treatment to manage the toxic chemical. Data from Section 6.2, Codes M40, M50, M54, M61, M69, and M95 on the TRI Form R.

Transfers to POWs Non Metals: the total amount of the toxic chemical in the waste stream transferred from the facility to all POTWs during the calendar year. Data from Section 6.1 on the TRI Form R.

Transfers Off-Site for Disposal or Other Releases: sum of transfers to underground injection, RCRA Subtitle C landfills, other landfills, storage, solidification/stabilization of metals and metal category compounds, RCRA Subtitle C surface impoundments, other surface impoundments, land treatment, other land disposal, other off-site waste management, waste broker for disposal, and unknown.

Total Transfers Off-Site of Further Waste Management: the sum of transfers to recycling, transfers to energy recovery, transfers to treatment, transfers to POTWs and other off-site transfers, including transfers to disposal or other releases.
POTW = Publicly Owned Treatment works
"." means the facility left that particular cell blank in its Form R submission (a zero in a cell demotes either that the facility reported "0" or "NA" in its Form R submission

Table A-3: Summary of TRI Waste Quantity Reports for Boeing Developmental Center

Facility/Chemical	date	Recycled On-site	Recycled Off-site	Energy Recovery On-site	Energy-Recovery Off-site	Treated On-site	Treated Off-site	Total Quantity Disposed or Otherwise Released On- and Off-site	Total Production-related Waste Managed	Non-production related Waste Managed
BDC: 1,1,1-Trichloroethane	1994	0	20	0	0	0	100	18,000	18,120	0
BDC: 1,1,1-Trichloroethane	1993	0	220	0	0	0	950	18,000	19,170	0
BDC: 1,1,1-Trichloroethane	1992	0	60	0	860	0	320	27,000	28,240	0
BDC: 1,1,1-Trichloroethane	1991	1	210	0	0	0	870	27,000	28,080	0

All measurements are in pounds

Key

Recycled On-site: the amount of the toxic chemical recycled on-site during the calendar year for which the report was submitted. Data from Section 8.4 from the TRI Form R.

Recycled Off-site: the total amount of the toxic chemical sent off-site for recycling during the calendar year for which the report was submitted. Section 8.5 on the TRI Form R.

Energy Recovery On-site: the total amount of the toxic chemical in waste burned for energy recovery on-site during the calendar year for which the report was submitted. Data from Section 8.2 on the TRI Form R.

Energy Recovery Off-site: the total amount of the toxic chemical in waste sent off-site to be burned for energy recovery during the calendar year for which the report was submitted. Data from Section 8.3 on the TRI Form R.

Treated On-site: the total amount of the toxic chemical treated on-site during the calendar year for which the report was submitted. Data from Section 8.6 on the TRI Form R.

Treated Off-site: the total amount of the toxic chemical sent for treatment off-site during the calendar year for which the report was submitted. Data from Section 9.7 on the TRI Form R.

Total Quantity Disposed or otherwise released On- and Off-site: the total amount of the toxic chemical disposed of or release due to production related events by the facility to all environmental media both on and off site during the calendar year for which the report was submitted. Data from Section 8.1 on the TRI Form R.

Total Production-related Waste Managed: the sum of recycled on-site, recycled off-site, energy recovery on-site, energy recovery off-site, treated on-site, treated off-site, and quantities disposed of or otherwise released on- and off-site. Data from Sections 8.1 through 8.7 on the TRI Form R.

Non-production related Waste Managed: the total amount of the toxic chemical released directly to the environment or sent off-site for recycling, energy recovery, treatment, or disposal during the reporting year due to remedial actions, catastrophic events, such as earthquakes or floods, and one-time events not associated with normal or routine production processes. Data from Section 8.8 on the TRI Form R.

Appendix B In-Line Sediment Sampling Analytical Results

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Appendix B
In-line Sediment Sampling Results (Dry Weight)
Early Action Area 7

Basin			Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk
Sample ID	**SQS**	**CSL**	**MH1[e]**	**MH1-D**	**MH3[e]**	**MH3[e]**	**MH4[e]**	**MH4[e]**	**MH5-N2**	**MH5-N3**	**MH6**	**MH7[e]**	**MH7[e]**	**Norfolk20**	**Norfolk21**
Date			10/01/03	10/01/03	10/01/03	03/16/05	10/01/03	03/16/05	10/01/03	10/01/03	10/01/03	10/02/03	03/16/05	09/30/04	09/30/04
TOC (%)			7.4	7	8.1	6.4	4.7	4.96	4.6	NA	7.7	2.2	1.21	5.34	1.65
Metals (mg/kg DW)															
Arsenic	57	93	**20**	**20**	**10**	**10**	8 U	8 U	**8**	**120**	**11**	20 U	6 U	**10**	7
Copper	390	390	**147**	**181**	**153**	**131**	**55.7**	**74.8**	**73**	**3,960**	**118**	**51.1**	**24.6**	**149**	**39.9**
Lead	450	530	**217**	**261**	**183**	**226**	**79**	**82**	**66**	**700**	**198**	**51**	**16**	**245**	**38**
Mercury	0.41	0.59	**0.4**	**0.2**	**0.2**	**0.2**	**0.09**	**0.11**	0.06 U	0.04 U	**0.33**	0.05 U	0.05 U	**0.18**	0.06 U
Zinc	410	960	**1,150**	**1,230**	**1,060**	**847**	**416**	**415**	**357**	**9,980**	**627**	**127**	**90**	**651**	**108**
Total petroleum hydrocarbons (mg/kg DW)															
TPH-diesel	2,000[a]		**2,300**	**3,200**	**2,200**	NA	**1,400**	NA	**1,800**	NA	**650**	**88**	NA	**140**	**43**
TPH-oil	2,000[a]		**5,300**	**7,600**	**5,000**	NA	**2,900**	NA	**3,600**	NA	**1,700**	**300**	NA	**580**	**200**
LPAH (ug/kg DW)															
Acenaphthene			930 U	600 U	480 U	640 U	120 U	**490**	170 U	NA	NA	**70**	120 U	98	20 U
Acenaphthylene			930 U	600 U	480 U	640 U	120 U	300 U	170 U	NA	NA	38 U	120 U	98 U	20 U
Anthracene			930 U	600 U	480 U	640 U	120 U	**1,900**	170 U	NA	NA	**330**	120 U	98	20 U
Fluorene			930 U	600 U	480 U	**830**	**200**	**670** U	170 U	NA	NA	**95**	120 U	98 U	20 U
Naphthalene			930 U	600 U	480 U	640 U	120 U	300 U	**190**	NA	NA	38 U	120 U	98 U	20 U
Phenanthrene			930 U	**610**	**1,800**	**2,700**	**1,600**	**4,000**	**490**	NA	NA	**930**	**130**	**190**	20 U
HPAH (ug/kg DW)															
Benzo(a)anthracene			930 U	**1,000** M	**1,400**	640 U	**1,000**	**1,000**	380 M	NA	NA	**250**	120 U	**200**	20 U
Benzo(a)pyrene			**1,000**	**910**	**960**	**2,400**	**1,200**	**5,900**	**240**	NA	NA	**410**	120 U	**300**	20 U
Benzo(b)fluoranthene			**930**	**920**	**1,100**	**1,100**	**1,100**	**2,800**	**260**	NA	NA	**260**	120 U	**400**	20 U
Benzo(g,h,i)perylene			**1,000**	**910**	**1,200**	**1,100**	**910**	**1,600**	**250**	NA	NA	**130**	120 U	**410**	20 U
Benzo(k)fluoranthene			**930**	**920**	**1,100**	**1,500**	**1,100**	**2,900**	**260**	NA	NA	**260**	120 U	**300**	20 U
Chrysene			930 U	**1,000** M	**1,700**	**2,700**	**1,100**	**6,500**	380 M	NA	NA	**810**	**120**	**340**	20 U
Dibenzo(a,h)anthracene			930 U	600 U	480 U	640 U	**230**	**490**	170 U	NA	NA	76 Y	120 U	98	20 U
Fluoranthene			**1,800**	**1,600**	**2,800**	**3,300**	**2,600**	**8,200**	**790**	NA	NA	**1,100**	**230**	**450**	20 U
Indeno(1,2,3-c,d)pyrene			930 U	**690**	**1,000**	**860**	**970**	**1,800**	**200**	NA	NA	**170**	120 U	**320**	20 U
Pyrene			**2,200**	**1,900**	**2,900**	**3,000**	**1,700**	**6,600**	**820**	NA	NA	**1,100**	**200**	**320**	20 U
Phthalates (ug/kg DW)															
Bis(2-ethylhexyl)phthalate			**24,000**	**24,000**	**25,000**	**28,000**	**5,600**	**22,000**	**6,800**	NA	NA	**670**	**400**	**620**	**63**
Butylbenzylphthalate			930 U	750 M	990 M	640 U	**300**	300 U	**1,900**	NA	NA	**61**	120 U	**120** U	20 U
Diethylphthalate			930 U	600 U	480 U	640 U	120 U	300 U	170 U	NA	NA	38 U	120 U	98 U	20 U
Dimethylphthalate			930 U	600 U	480 U	640 U	120 U	300 U	170 U	NA	NA	38 U	120 U	98 U	20 U
Di-n-butylphthalate			930 U	600 U	480 U	640 U	120 U	300 U	**320**	NA	NA	38 U	120 U	98	20 U
Di-n-octyl phthalate			2,300 M	2,300 M	2,500 M	**2,200**	**570** M	**1,400**	**1,100**	NA	NA	**91** M	120 U	98 U	20 U
PCBs (ug/kg DW)															
Aroclor 1016			20 U	20 U	20 U	73 U	19 U	20 U	20 U	NA	NA	19 U	19 U	20 U	20 U
Aroclor 1242			20 U	20 U	20 U	73 U	19 U	20 U	20 U	NA	NA	19 U	19 U	20 U	20 U
Aroclor 1248			59 Y	32 Y	100 Y	73 U	19 U	20 U	20 U	NA	NA	19 U	19 U	20 U	20 U
Aroclor 1254			**33**	**42**	**36**	**110**	**21** J	**25**	**22** J	NA	NA	**14** J	19 U	**67**	20 U
Aroclor 1260			**46**	**61**	**46**	200 Y	**22**	50 Y	**21** J	NA	NA	**11** J	19 U	**41**	20 U
Aroclor 1221			39 U	40 U	39 U	73 U	38 U	20 U	39 U	NA	NA	38 U	19 U	20 U	20 U
Aroclor 1232			20 U	20 U	20 U	73 U	19 U	20 U	20 U	NA	NA	19 U	19 U	20 U	20 U
Total			**79**	**103**	**82**	**110**	**43** J	**25**	**43** J	NA	NA	**25** J	19 U	**108**	20 U
Other organic compounds (ug/kg DW)															
1,2,4-Trichlorobenzene			930 U	600 U	480 U	640 U	120 U	300 U	170 U	NA	NA	38 U	120 U	98 U	20 U
1,2-Dichlorobenzene			930 U	600 U	480 U	640 U	120 U	300 U	170 U	NA	NA	38 U	120 U	98 U	20 U
1,3-Dichlorobenzene			930 U	600 U	480 U	640 U	120 U	300 U	170 U	NA	NA	38 U	120 U	98 U	20 U
1,4-Dichlorobenzene			930 U	600 U	480 U	640 U	120 U	300 U	170 U	NA	NA	38 U	120 U	98 U	20 U
2,2'-Oxybis(1-chloropropane)			930 U	600 U	480 U	640 U	120 U	300 U	170 U	NA	NA	38 U	120 U	98 U	20 U
2,4,5-Trichlorophenol			4,600 U	3,000 U	2,400 U	3,200 U	580 U	1,500 U	870 U	NA	NA	190 U	580 U	490 U	99 U

Appendix B
In-line Sediment Sampling Results (Dry Weight)
Early Action Area 7

Basin			Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk
Sample ID	SQS	CSL	MH1[e]	MH1-D	MH3[e]	MH3[e]	MH4[e]	MH4[e]	MH5-N2	MH5-N3	MH6	MH7[e]	MH7[e]	Norfolk20	Norfolk21
Date			10/01/03	10/01/03	10/01/03	03/16/05	10/01/03	03/16/05	10/01/03	10/01/03	10/01/03	10/02/03	03/16/05	09/30/04	09/30/04
2,4,6-Trichlorophenol			4,600 U	3,000 U	2,400 U	3,200 U	580 U	1,500 U	870 U	NA	NA	190 U	580 U	490 U	99 U
2,4-Dichlorophenol			2,800 U	1,800 U	**1,400**	3,200 U	350 U	1,500 U	520 U	NA	NA	110 U	580 U	490 U	99 U
2,4-Dimethylphenol[a]	29	29	930 U	600 U	480 U	640 U	120 U	300 U	170 U	NA	NA	38 U	120 U	98 U	20 U
2,4-Dinitrophenol			9,300 U	6,000 U	4,800 U	6,400 U	1,200 U	3,000 U	1,700 U	NA	NA	380 U	1,200 U	980 U	200 U
2,4-Dinitrotoluene			4,600 U	3,000 U	2,400 U	3,200 U	580 U	1,500 U	**2,100**	NA	NA	190 U	580 U	490 U	99 U
2,6-Dinitrotoluene			4,600 U	3,000 U	2,400 U	3,200 U	580 U	1,500 U	870 U	NA	NA	190 U	580 U	490 U	99 U
2-Chloronaphthalene			930 U	600 U	480 U	640 U	120 U	300 U	170 U	NA	NA	38 U	120 U	98 U	20 U
2-Chlorophenol			930 U	600 U	480 U	640 U	120 U	300 U	170 U	NA	NA	38 U	120 U	98 U	20 U
2-Methylnaphthalene			930 U	600 U	1,400 U	**2,300**	**1,200**	**1,100**	**690**	NA	NA	38 U	120 U	**98**	20 U
2-Methylphenol[a]			930 U	600 U	480 U	640 U	120 U	300 U	170 U	NA	NA	38 U	120 U	98 U	20 U
2-Nitroaniline			4,600 U	3,000 U	2,400 U	3,200 U	580 U	1,500 U	870 U	NA	NA	190 U	580 U	490 U	99 U
2-Nitrophenol			4,600 U	3,000 U	2,400 U	3,200 U	580 U	1,500 U	870 U	NA	NA	190 U	580 U	490 U	99 U
3,3'-Dichlorobenzidine			4,600 U	3,000 U	2,400 U	3,200 U	580 U	1,500 U	870 U	NA	NA	190 U	580 U	490 U	99 U
3-Nitroaniline			5,600 U	3,600 U	2,900 U	3,200 U	700 U	1,500 U	1,000 U	NA	NA	230 U	580 U	490 U	99 U
4,6-Dinitro-2-methylphenol			9,300 U	6,000 U	4,800 U	6,400 U	1,200 U	3,000 U	1,700 U	NA	NA	380 U	1,200 U	980 U	200 U
4-Bromophenyl-phenylether			930 U	600 U	480 U	640 U	120 U	300 U	170 U	NA	NA	38 U	120 U	98 U	20 U
4-Chloro-3-methylphenol			1,900 U	1,200 U	960 U	3,200 U	230 U	1,500 U	350 U	NA	NA	76 U	580 U	490 U	99 U
4-Chloroaniline			2,800 U	1,800 U	1,400 U	3,200 U	350 U	1,500 U	520 U	NA	NA	110 U	580 U	490 U	99 U
4-Chlorophenyl-phenylether			930 U	600 U	480 U	640 U	120 U	300 U	170 U	NA	NA	38 U	120 U	98 U	20 U
4-Methylphenol[a]	670	670	930 U	600 U	480 U	640 U	120 U	300 U	170 U	NA	NA	38 U	120 U	98 U	20 U
4-Nitroaniline			4,600 U	3,000 U	2,400 U	3,200 U	580 U	1,500 U	870 U	NA	NA	190 U	580 U	490 U	99 U
4-Nitrophenol			4,600 U	3,000 U	2,400 U	3,200 U	580 U	1,500 U	870 U	NA	NA	190 U	580 U	490 U	99 U
Benzoic acid[a]	650	650	9,300 U	6,000 U	4,800 U	6,400 U	1,200 U	3,000 U	1,700 U	NA	NA	380 U	1,200 U	980 U	200 U
Benzyl alcohol[a]			930 U	600 U	480 U	**3,900**	120 U	**380**	170 U	NA	NA	38 U	120 U	98 U	20 U
bis(2-Chloroethoxy) methane			930 U	600 U	480 U	640 U	120 U	300 U	170 U	NA	NA	38 U	120 U	98 U	20 U
Bis-(2-chloroethyl) ether			1,900 U	1,200 U	960 U	640 U	230 U	300 U	350 U	NA	NA	76 U	120 U	98 U	20 U
Carbazole			930 U	600 U	480 U	640 U	**160**	**350**	170 U	NA	NA	**110**	120 U	98	20 U
Dibenzofuran			930 U	600 U	480 U	640 U	120 U	300 U	170 U	NA	NA	38 U	120 U	98 U	20 U
Hexachlorobenzene			930 U	600 U	480 U	640 U	120 U	300 U	170 U	NA	NA	38 U	120 U	98 U	20 U
Hexachlorobutadiene			930 U	600 U	480 U	640 U	120 U	300 U	170 U	NA	NA	38 U	120 U	98 U	20 U
Hexachlorocyclopentadiene			4,600 U	3,000 U	2,400 U	3,200 U	580 U	1,500 U	870 U	NA	NA	190 U	580 U	490 U	99 U
Hexachloroethane			930 U	600 U	480 U	640 U	120 U	300 U	170 U	NA	NA	38 U	120 U	98 U	20 U
Isophorone			930 U	600 U	480 U	640 U	120 U	300 U	170 U	NA	NA	38 U	120 U	98 U	20 U
Nitrobenzene			930 U	600 U	480 U	640 U	120 U	300 U	170 U	NA	NA	38 U	120 U	98 U	20 U
N-Nitroso-di-n-propylamine			1,900 U	1,200 U	960 U	3,200 U	230 U	1,500 U	350 U	NA	NA	76 U	580 U	490 U	99 U
N-Nitrosodiphenylamine			930 U	600 U	480 U	640 U	120 U	300 U	**910**	NA	NA	38 U	120 U	98 U	20 U
Pentachlorophenol[a]	360	690	4,600 U	3,000 U	2,400 U	3,200 U	580 U	1,500 U	870 U	NA	NA	190 U	580 U	490 U	99 U
Phenol[a]	420	1,200	930 U	600 U	480 U	**660** B	120 U	300 U	170 U	NA	NA	38 U	120 U	98 U	20 U

a. SMS based on dry weight concentration.
b. MTCA Method A soil cleanup level for unrestricted use.
J = Concentration is less than the reporting limit.
M = Estimated value due to low spectral match parameters.
Chemical is detected and confirmed by analyst.
P = High RPD on dual column analysis without obvious interference.
U = Chemical not detected at concentration shown
Y = Chemical not detected at concentration shown. Reporting limit raised due to background interference.

Appendix B
In-line Sediment Sampling Results (Organic Carbon Normalized)
Early Action Area 7

Basin			Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk
Sample ID	SQS	CSL	MH1[e]	MH1-D	MH3[e]	MH3[e]	MH4[e]	MH4[e]	MH5-N2	MH5-N3	MH6	MH7[e]	MH7[e]	Norfolk20	Norfolk21
Date			10/01/03	10/01/03	10/01/03	03/16/05	10/01/03	03/16/05	10/01/03	10/01/03	10/01/03	10/02/03	03/16/05	09/30/04	09/30/04
TOC (%)			7.4	7	8.1	6.4	4.7	4.96	4.6	NA	7.7	2.2	1.21	5.34	1.65
LPAH (ug/kg DW)															
Acenaphthene	16	57	13 U	9 U	6 U	10 U	3 U	**10**	4 U	NA	NA	**3**	10 U	**2**	1 U
Acenaphthylene	66	66	13 U	9 U	6 U	10 U	3 U	6 U	4 U	NA	NA	2 U	10 U	2 U	1 U
Anthracene	220	1,200	13 U	9 U	6 U	10 U	3 U	**38**	4 U	NA	NA	**15**	10 U	**2**	1 U
Fluorene	23	79	13 U	9 U	6 U	**13**	**4**	14 U	4 U	NA	NA	**4**	10 U	2 U	1 U
Naphthalene	370	780	13 U	9 U	6 U	10 U	3 U	6 U	**4**	NA	NA	2 U	10 U	2 U	1 U
Phenanthrene	100	480	13 U	**9**	**22**	**42**	**34**	**81**	**11**	NA	NA	**42**	**11**	**4**	1 U
HPAH (ug/kg DW)															
Benzo(a)anthracene	110	270	13 U	14 M	**17**	10 U	**21**	**20**	8 M	NA	NA	**11**	10 U	**4**	1.2 U
Benzo(a)pyrene	99	210	14	**13**	**12**	**38**	**26**	**119**	**5**	NA	NA	**19**	10 U	**6**	1.2 U
Benzo(b)fluoranthene			**13**	**13**	**14**	**17**	**23**	**56**	**6**	NA	NA	**12**	10 U	**7**	1.2 U
Benzo(g,h,i)perylene	31	78	**14**	**13**	**15**	**17**	**19**	**32**	**5**	NA	NA	**6**	10 U	**8**	1.2 U
Benzo(k)fluoranthene			**13**	**13**	**14**	**23**	**23**	**58**	**6**	NA	NA	**12**	10 U	**6**	1.2 U
Chrysene	110	460	13 U	14 M	**21**	**42**	**23**	**131**	8 M	NA	NA	**37**	**10**	**6**	1.2 U
Dibenzo(a,h)anthracene	12	33	13 U	9 U	6 U	10 U	**5**	**10**	4 U	NA	NA	3 Y	10 U	**2**	1.2 U
Fluoranthene	160	1,200	**24**	**23**	**35**	**52**	**55**	**165**	**17**	NA	NA	**50**	19	**8**	1.2 U
Indeno(1,2,3-c,d)pyrene	34	88	13 U	**10**	**12**	**13**	**21**	**36**	**4**	NA	NA	**8**	10 U	**6**	1.2 U
Pyrene	1,000	1,400	**30**	**27**	**36**	**47**	**36**	**133**	**18**	NA	NA	**50**	**17**	**6**	1.2 U
Phthalates (ug/kg DW)															
Bis(2-ethylhexyl)phthalate	47	78	**324**	**343**	**309**	**438**	**119**	**444**	**148**	NA	NA	**30**	**33**	**12**	**4**
Butylbenzylphthalate	5	64	13 U	11 M	12 M	10 U	**6**	6 U	**41**	NA	NA	**3**	10 U	2 U	1 U
Diethylphthalate	61	110	13 U	9 U	6 U	10 U	3 U	6 U	4 U	NA	NA	2 U	10 U	2 U	1 U
Dimethylphthalate	53	53	13 U	9 U	6 U	10 U	3 U	6 U	4 U	NA	NA	2 U	10 U	2 U	1 U
Di-n-butylphthalate	220	1,700	13 U	9 U	6 U	10 U	3 U	6 U	**7**	NA	NA	2 U	10 U	**2**	1 U
Di-n-octyl phthalate	58	4,500	31 M	33 M	31 M	**34**	12 M	**28**	**24**	NA	NA	4 M	10 U	2 U	1 U
PCBs (ug/kg DW)															
Aroclor 1016			0.3 U	0.3 U	0.2 U	1.1 U	0.4 U	0.4 U	0.4 U	NA	NA	0.9 U	1.6 U	0.4 U	1.2 U
Aroclor 1242			0.3 U	0.3 U	0.2 U	1.1 U	0.4 U	0.4 U	0.4 U	NA	NA	0.9 U	1.6 U	0.4 U	1.2 U
Aroclor 1248			0.8 Y	0.5 Y	1.2 Y	1.1 U	0.4 U	0.4 U	0.4 U	NA	NA	0.9 U	1.6 U	0.4 U	1.2 U
Aroclor 1254			**0.4**	**0.6**	**0.4**	**1.7**	**0.4** J	**0.5**	**0.5** J	NA	NA	**0.6** J	1.6 U	**1.3**	1.2 U
Aroclor 1260			**0.6**	**0.9**	**0.6**	3.1 Y	**0.5**	1.0 Y	**0.5** J	NA	NA	**0.5** J	1.6 U	**0.8**	1.2 U
Aroclor 1221			0.5 U	0.6 U	0.5 U	1.1 U	0.8 U	0.4 U	0.8 U	NA	NA	1.7 U	1.6 U	0.4 U	1.2 U
Aroclor 1232			0.3 U	0.3 U	0.2 U	1.1 U	0.4 U	0.4 U	0.4 U	NA	NA	0.9 U	1.6 U	0.4 U	1.2 U
Total	12	65	**1.1**	**1.5**	**1.0**	**1.7**	**0.9** J	**0.5**	**0.9** J	NA	NA	**1.1** J	1.6 U	**2.0**	1.2 U
Other organic compounds (ug/kg DW)															
1,2,4-Trichlorobenzene	0.8	1.8	13 U	9 U	6 U	10 U	3 U	6 U	4 U	NA	NA	2 U	10 U	2 U	1 U
1,2-Dichlorobenzene	2.3	2.3	13 U	9 U	6 U	10 U	3 U	6 U	4 U	NA	NA	2 U	10 U	2 U	1 U
1,3-Dichlorobenzene			13 U	9 U	6 U	10 U	3 U	6 U	4 U	NA	NA	2 U	10 U	2 U	1 U
1,4-Dichlorobenzene	3.1	9.0	13 U	9 U	6 U	10 U	3 U	6 U	4 U	NA	NA	2 U	10 U	2 U	1 U
2,2'-Oxybis(1-chloropropane)			13 U	9 U	6 U	10 U	3 U	6 U	4 U	NA	NA	2 U	10 U	2 U	1 U
2,4,5-Trichlorophenol			62 U	43 U	30 U	50 U	12 U	30 U	19 U	NA	NA	9 U	48 U	9 U	6 U
2,4,6-Trichlorophenol			62 U	43 U	30 U	50 U	12 U	30 U	19 U	NA	NA	9 U	48 U	9 U	6 U
2,4-Dichlorophenol			38 U	26 U	**17**	50 U	7 U	30 U	11 U	NA	NA	5 U	48 U	9 U	6 U
2,4-Dinitrophenol			126 U	86 U	59 U	100 U	26 U	60 U	37 U	NA	NA	17 U	99 U	18 U	12 U
2,4-Dinitrotoluene			62 U	43 U	30 U	50 U	12 U	30 U	**46**	NA	NA	9 U	48 U	9 U	6 U
2,6-Dinitrotoluene			62 U	43 U	30 U	50 U	12 U	30 U	19 U	NA	NA	9 U	48 U	9 U	6 U
2-Chloronaphthalene			13 U	9 U	6 U	10 U	3 U	6 U	4 U	NA	NA	2 U	10 U	2 U	1 U
2-Chlorophenol			13 U	9 U	6 U	10 U	3 U	6 U	4 U	NA	NA	2 U	10 U	2 U	1 U
2-Methylnaphthalene	38	64	13 U	9 U	17 U	**36**	**26**	**22**	**15**	NA	NA	2 U	10 U	**2**	1 U
2-Nitroaniline			62 U	43 U	30 U	50 U	12 U	30 U	19 U	NA	NA	9 U	48 U	9 U	6 U
2-Nitrophenol			62 U	43 U	30 U	50 U	12 U	30 U	19 U	NA	NA	9 U	48 U	9 U	6 U

Appendix B
In-line Sediment Sampling Results (Organic Carbon Normalized)
Early Action Area 7

Basin			Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk	Norfolk
Sample ID	**SQS**	**CSL**	**MH1[e]**	**MH1-D**	**MH3[e]**	**MH3[e]**	**MH4[e]**	**MH4[e]**	**MH5-N2**	**MH5-N3**	**MH6**	**MH7[e]**	**MH7[e]**	**Norfolk20**	**Norfolk21**
Date			10/01/03	10/01/03	10/01/03	03/16/05	10/01/03	03/16/05	10/01/03	10/01/03	10/01/03	10/02/03	03/16/05	09/30/04	09/30/04
3,3'-Dichlorobenzidine			62 U	43 U	30 U	50 U	12 U	30 U	19 U	NA	NA	9 U	48 U	9 U	6 U
3-Nitroaniline			76 U	51 U	36 U	50 U	15 U	30 U	22 U	NA	NA	10 U	48 U	9 U	6 U
4,6-Dinitro-2-methylphenol			126 U	86 U	59 U	100 U	26 U	60 U	37 U	NA	NA	17 U	99 U	18 U	12 U
4-Bromophenyl-phenylether			13 U	9 U	6 U	10 U	3 U	6 U	4 U	NA	NA	2 U	10 U	2 U	1 U
4-Chloro-3-methylphenol			26 U	17 U	12 U	50 U	5 U	30 U	8 U	NA	NA	3 U	48 U	9 U	6 U
4-Chloroaniline			38 U	26 U	17 U	50 U	7 U	30 U	11 U	NA	NA	5 U	48 U	9 U	6 U
4-Chlorophenyl-phenylether			13 U	9 U	6 U	10 U	3 U	6 U	4 U	NA	NA	2 U	10 U	2 U	1 U
4-Nitroaniline			62 U	43 U	30 U	50 U	12 U	30 U	19 U	NA	NA	9 U	48 U	9 U	6 U
4-Nitrophenol			62 U	43 U	30 U	50 U	12 U	30 U	19 U	NA	NA	9 U	48 U	9 U	6 U
bis(2-Chloroethoxy) methane			13 U	9 U	6 U	10 U	3 U	6 U	4 U	NA	NA	2 U	10 U	2 U	1 U
Bis-(2-chloroethyl) ether			26 U	17 U	12 U	10 U	5 U	6 U	8 U	NA	NA	3 U	10 U	2 U	1 U
Carbazole			13 U	9 U	6 U	10 U	**3**	**7**	4 U	NA	NA	**5**	10 U	**2**	1 U
Dibenzofuran	15	58	13 U	9 U	6 U	10 U	3 U	6 U	4 U	NA	NA	2 U	10 U	2 U	1 U
Hexachlorobenzene	0.4	2.3	13 U	9 U	6 U	10 U	3 U	6 U	4 U	NA	NA	2 U	10 U	2 U	1 U
Hexachlorobutadiene	3.9	6.2	13 U	9 U	6 U	10 U	3 U	6 U	4 U	NA	NA	2 U	10 U	2 U	1 U
Hexachlorocyclopentadiene			62 U	43 U	30 U	50 U	12 U	30 U	19 U	NA	NA	9 U	48 U	9 U	6 U
Hexachloroethane			13 U	9 U	6 U	10 U	3 U	6 U	4 U	NA	NA	2 U	10 U	2 U	1 U
Isophorone			13 U	9 U	6 U	10 U	3 U	6 U	4 U	NA	NA	2 U	10 U	2 U	1 U
Nitrobenzene			13 U	9 U	6 U	10 U	3 U	6 U	4 U	NA	NA	2 U	10 U	2 U	1 U
N-Nitroso-di-n-propylamine			26 U	17 U	12 U	50 U	5 U	30 U	8 U	NA	NA	3 U	48 U	9 U	6 U
N-Nitrosodiphenylamine	11	11	13 U	9 U	6 U	10 U	3 U	6 U	**20**	NA	NA	2 U	10 U	2 U	1 U

a. SMS based on dry weight concentration.
b. MTCA Method A soil cleanup level for unrestricted use.
J = Concentration is less than the reporting limit.
M = Estimated value due to low spectral match parameters. Chemical is detected and confirmed by analyst.
P = High RPD on dual column analysis without obvious interference.
U = Chemical not detected at concentration shown
Y = Chemical not detected at concentration shown. Reporting limit raised due to background interference.

Figures

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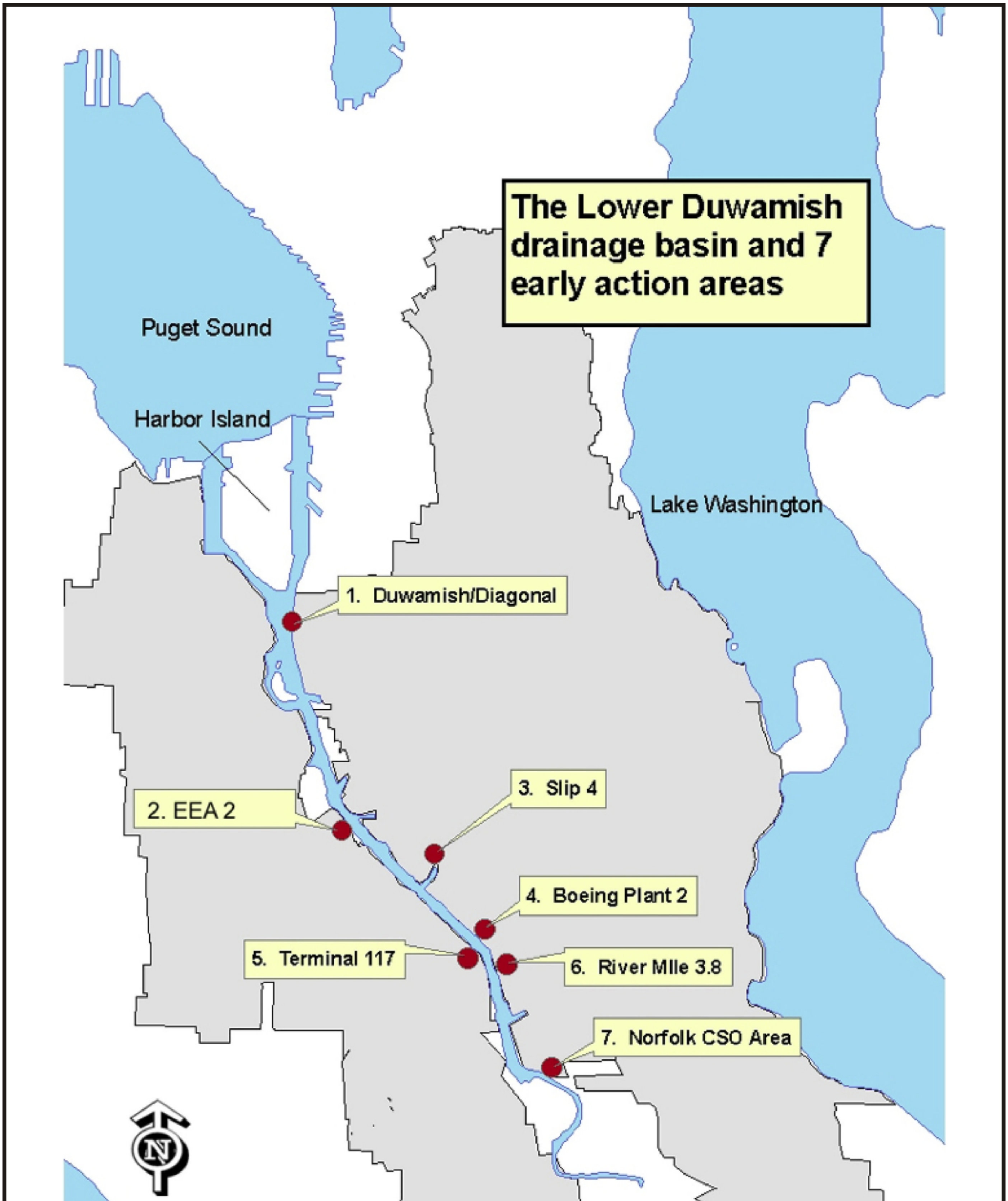
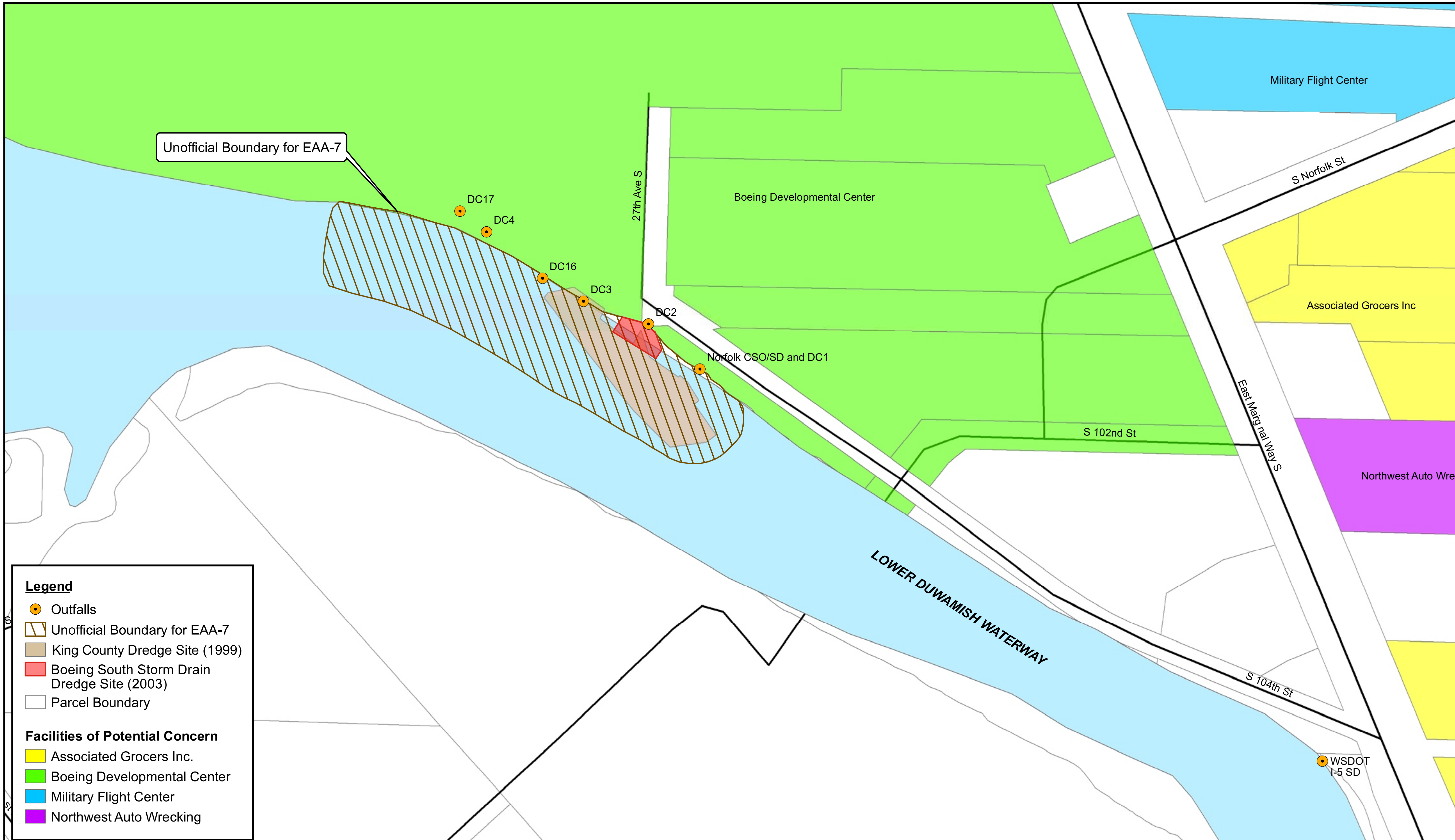


ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY EARLY ACTION AREA 7 Seattle, Washington	Figure 1 LOWER DUWAMISH WATERWAY EARLY ACTION AREAS
	Base Map Reference: Ecology 2006.	Date: 4-4-07 | Drawn by: AES | 10:002330WD0402\fig 1



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

Map Source Information: King County GIS Data, June 2003. City of Tukwila Storm Drain Data.

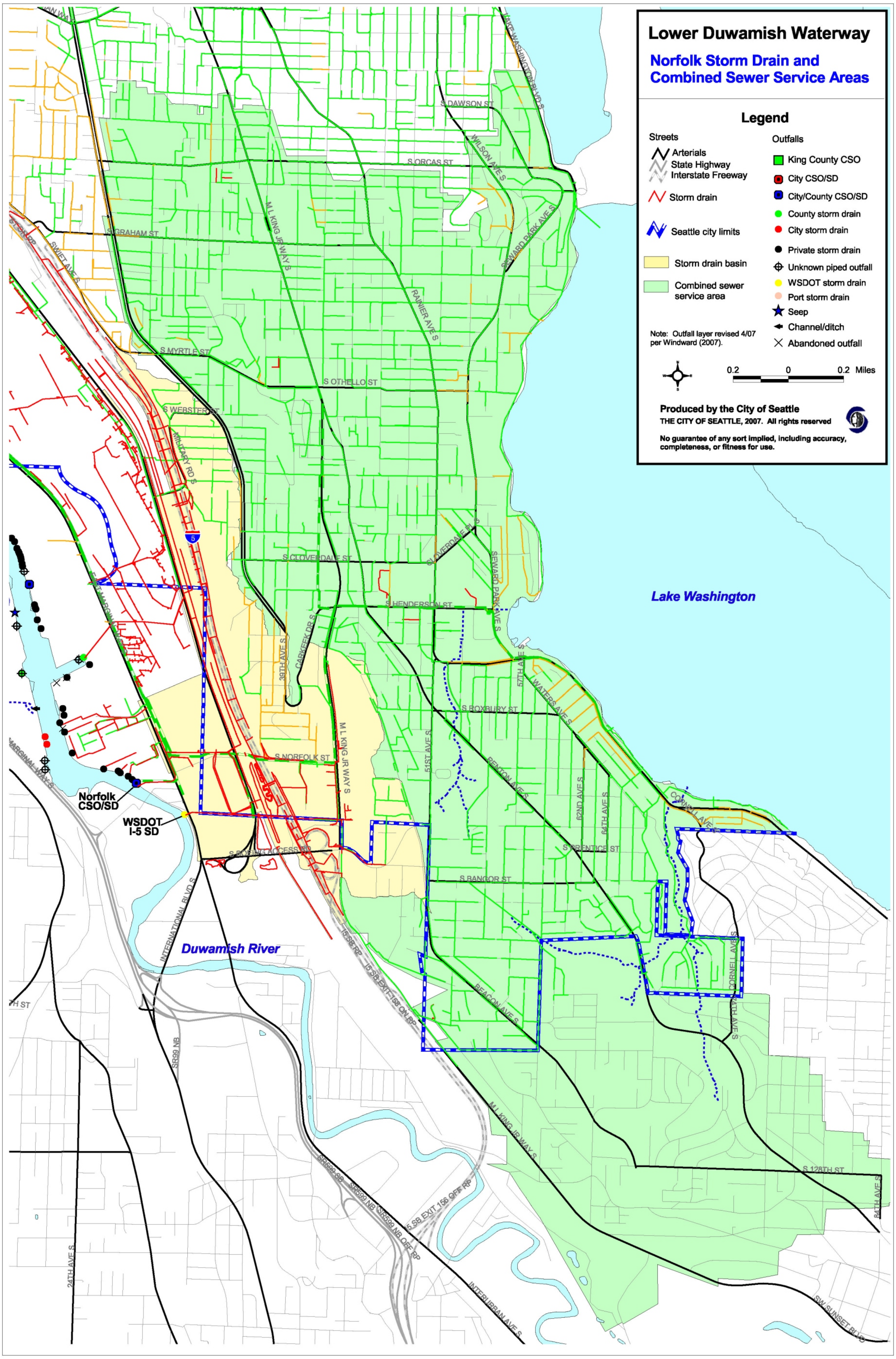
LOWER DUWAMISH WATERWAY
EARLY ACTION AREA 7

Seattle/Tukwila, WA

Figure 2
EARLY ACTION AREA 7
APPROXIMATE SOURCE CONTROL BOUNDARY

Date:	GIS:	Job Number:
6/28/2007	avh	002330.WD04.02

GIS figure converted to CorelDraw



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Seattle, Washington

LOWER DUWAMISH WATERWAY
EARLY ACTION AREA 7
Seattle, Washington

Figure 3
NORFOLK COMBINED SEWER OVERFLOW/ STORM DRAIN AREA

Base Map Reference: SPU 2007.

Date:	Drawn by:	
6/28/07	AES	10:002330WD0402\fig 3

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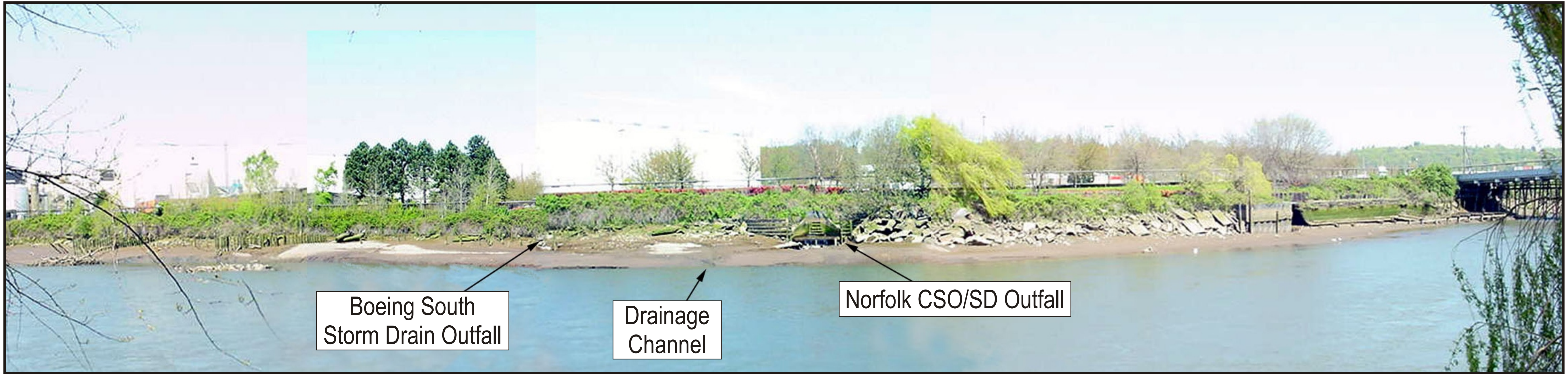
LOWER DUWAMISH WATERWAY
EARLY ACTION AREA 7
Seattle, Washington

Figure 4
NORFOLK CSO/SD OUTFALL

Base Map Reference: Ecology 2007.

Date:	Drawn by:	
6/28/07	AES	10:002330WD0402\fig 4



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International Specialists in the Environment
Seattle, Washington

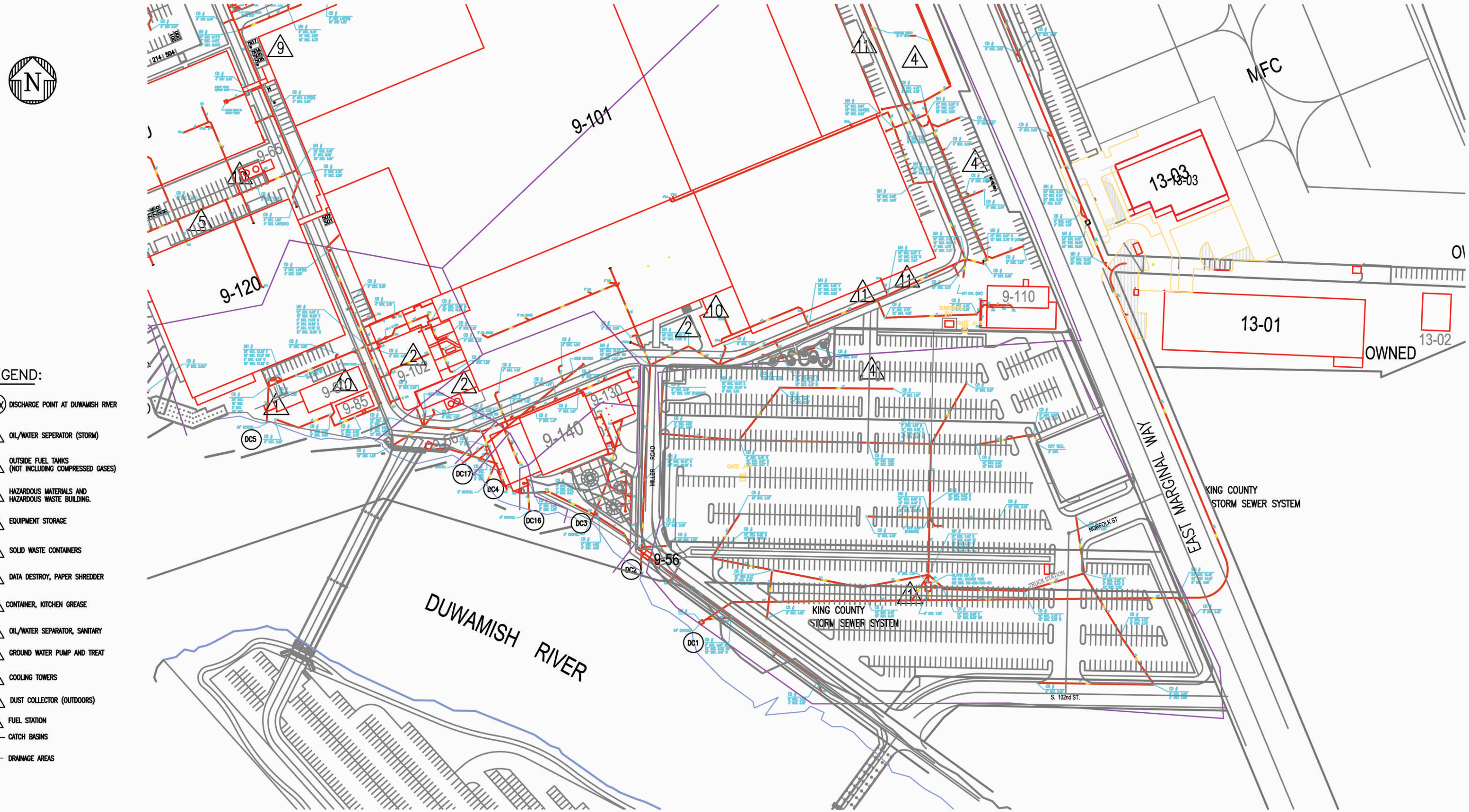
Base Map Reference: Ecology 2007.

LOWER DUWAMISH WATERWAY
EARLY ACTION AREA 7
Seattle, Washington

Figure 5

NORFOLK CSO/SD OUTFALL AND BOEING SOUTH STORM DRAIN OUTFALL

Date:	Drawn by:	
6/28/07	AES	10:002330WD0402\fig 5



LEGEND:

- DCX — DISCHARGE POINT AT DUWAMISH RIVER
- 1 — OIL/WATER SEPERATOR (STORM)
- 2 — OUTSIDE FUEL TANKS (NOT INCLUDING COMPRESSED GASES)
- 3 — HAZARDOUS MATERIALS AND HAZARDOUS WASTE BUILDING.
- 4 — EQUIPMENT STORAGE
- 5 — SOLID WASTE CONTAINERS
- 6 — DATA DESTROY, PAPER SHREDDER
- 7 — CONTAINER, KITCHEN GREASE
- 8 — OIL/WATER SEPARATOR, SANITARY
- 9 — GROUND WATER PUMP AND TREAT
- 10 — COOLING TOWERS
- 11 — DUST COLLECTOR (OUTDOORS)
- 12 — FUEL STATION
- CATCH BASINS
- DRAINAGE AREAS

SCALE IN FEET: 1"= 1000'

0 1000 2000 3000

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Seattle, Washington

DESIGNED BY:

CHECKED BY:

DRAWN BY: V. RAYNER

BASE MAP REFERENCE: THE BOEING COMPANY 2003

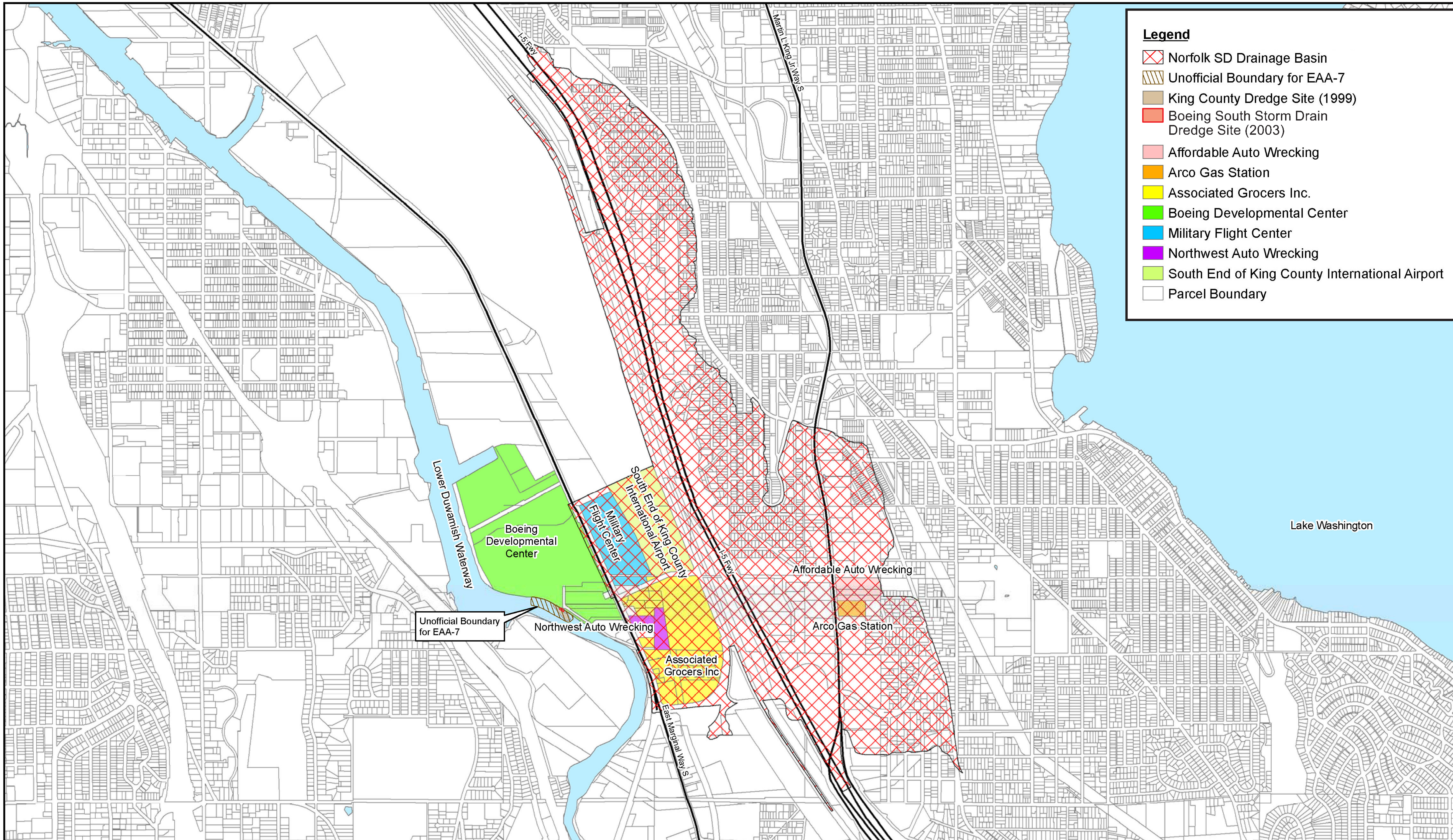
SCALE: NOTED

DATE ISSUED: 05-29-07

CAD FILE NO.: EAA-7_Norfolk CSO\SCAP Report\CAD\DC_052907.dwg

Figure 6
BOEING DEVELOPMENTAL CENTER STORMWATER DRAINAGE SYSTEM

LOWER DUWAMISH WATERWAY
EARLY ACTION AREA 7
Tukwila, Washington



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N S E W

0 495 990 1,980 2,970 3,960 4,950
Feet
Scale = 1:20,000

Map Source Information: King County GIS Data, June 2003.
City of Tukwila Storm Drain Data.

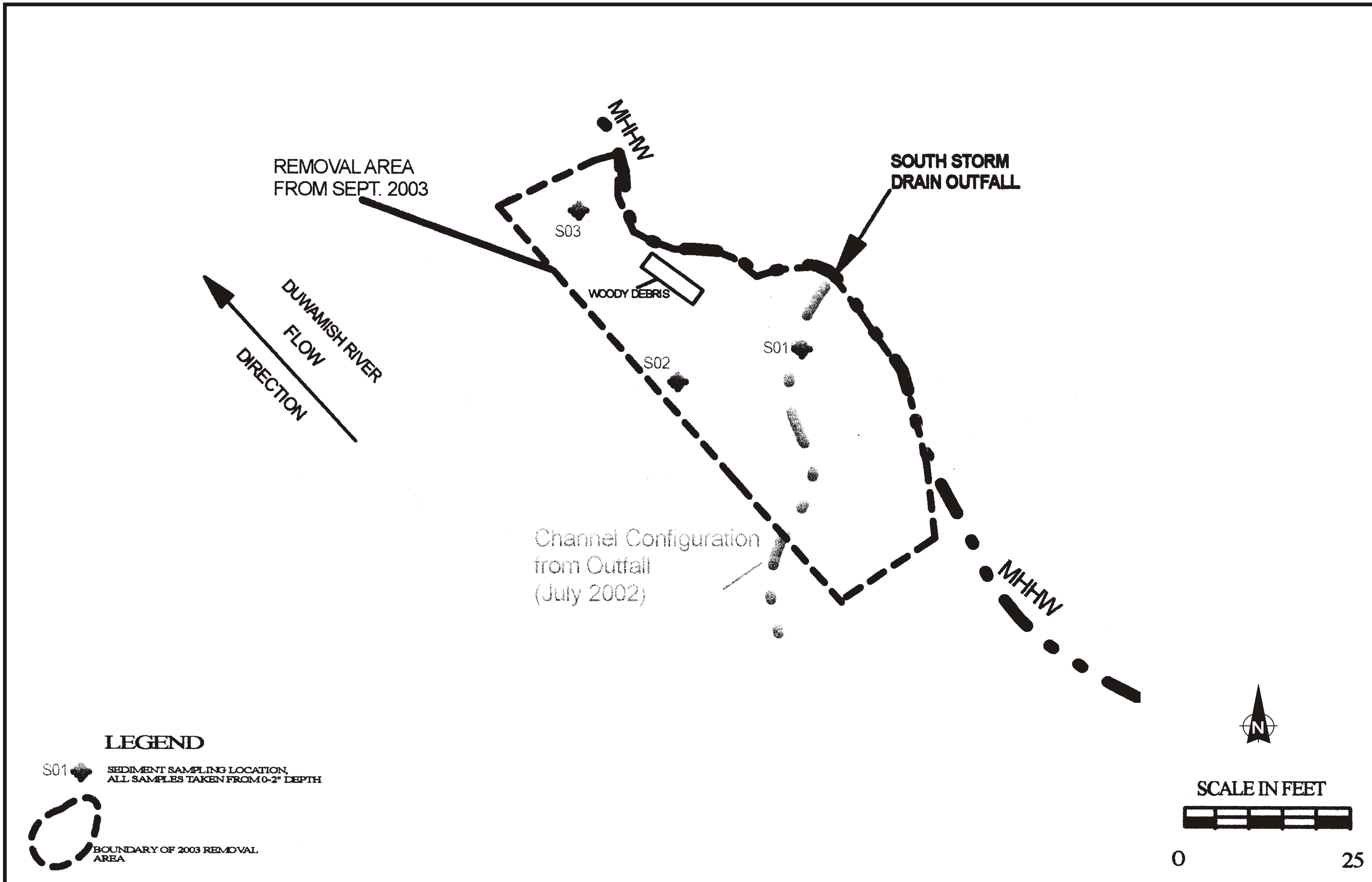
LOWER DUWAMISH WATERWAY
EARLY ACTION AREA 7

Seattle/Tukwila, WA

Figure 7
NORFOLK DRAINAGE BASIN and POTENTIAL SOURCES of SEDIMENT RECONTAMINATION

Date:	GIS:	Job Number:
6/25/2007	avh	002330.WD04.03

\edms-projects\norfolk\scap report\figure 5.mxd



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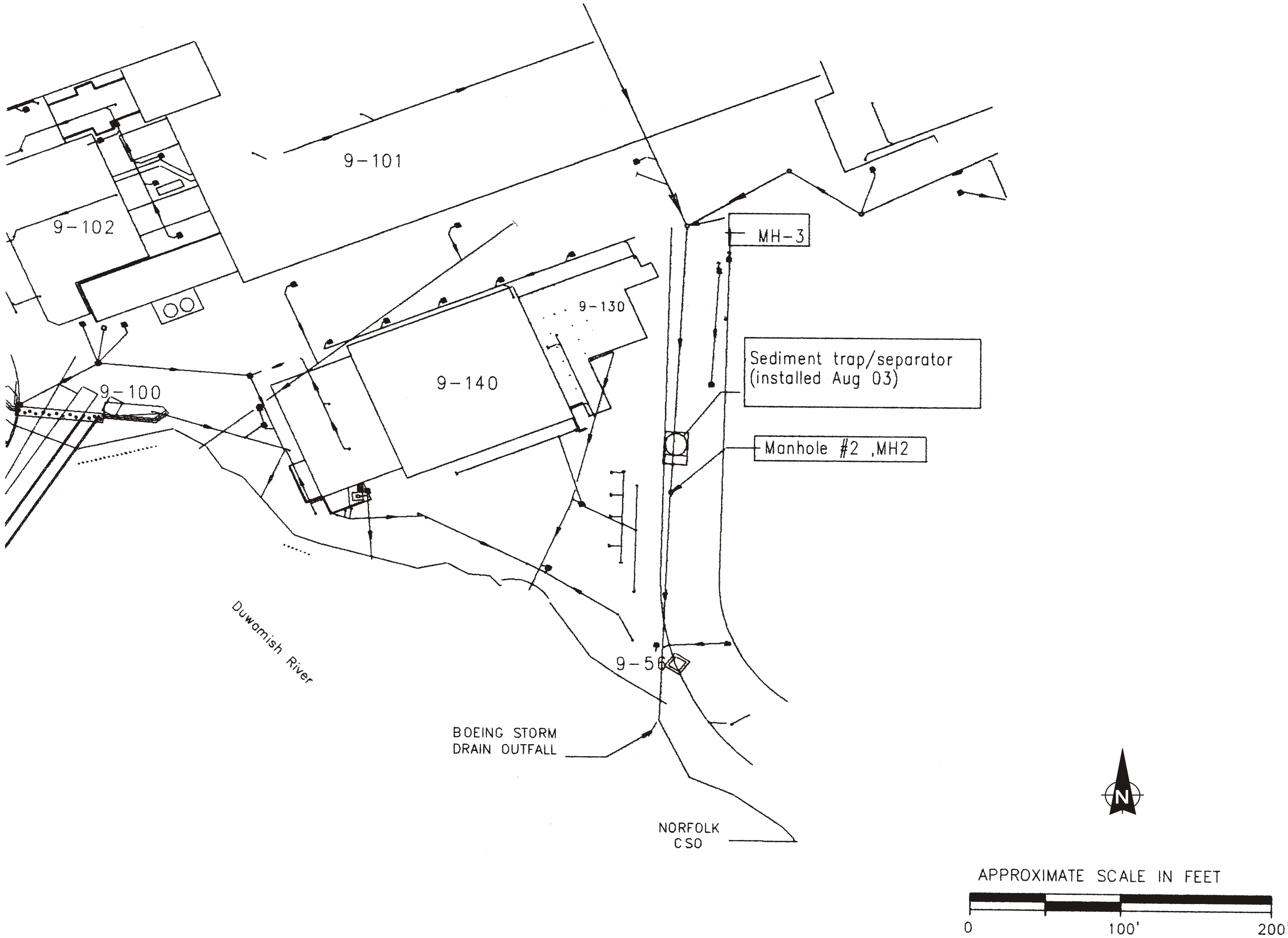
LOWER DUWAMISH WATERWAY
EARLY ACTION AREA 7
Seattle, Washington

Base Map Reference: Boeing 2004.

Figure 8
2004 SEDIMENT SAMPLING LOCATIONS
BOEING SOUTH STORM DRAIN OUTFALL

Date:	Drawn by:	
6/28/07	AES	10:002330WD0402\fig 8



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LOWER DUWAMISH WATERWAY
EARLY ACTION AREA 7
Seattle, Washington

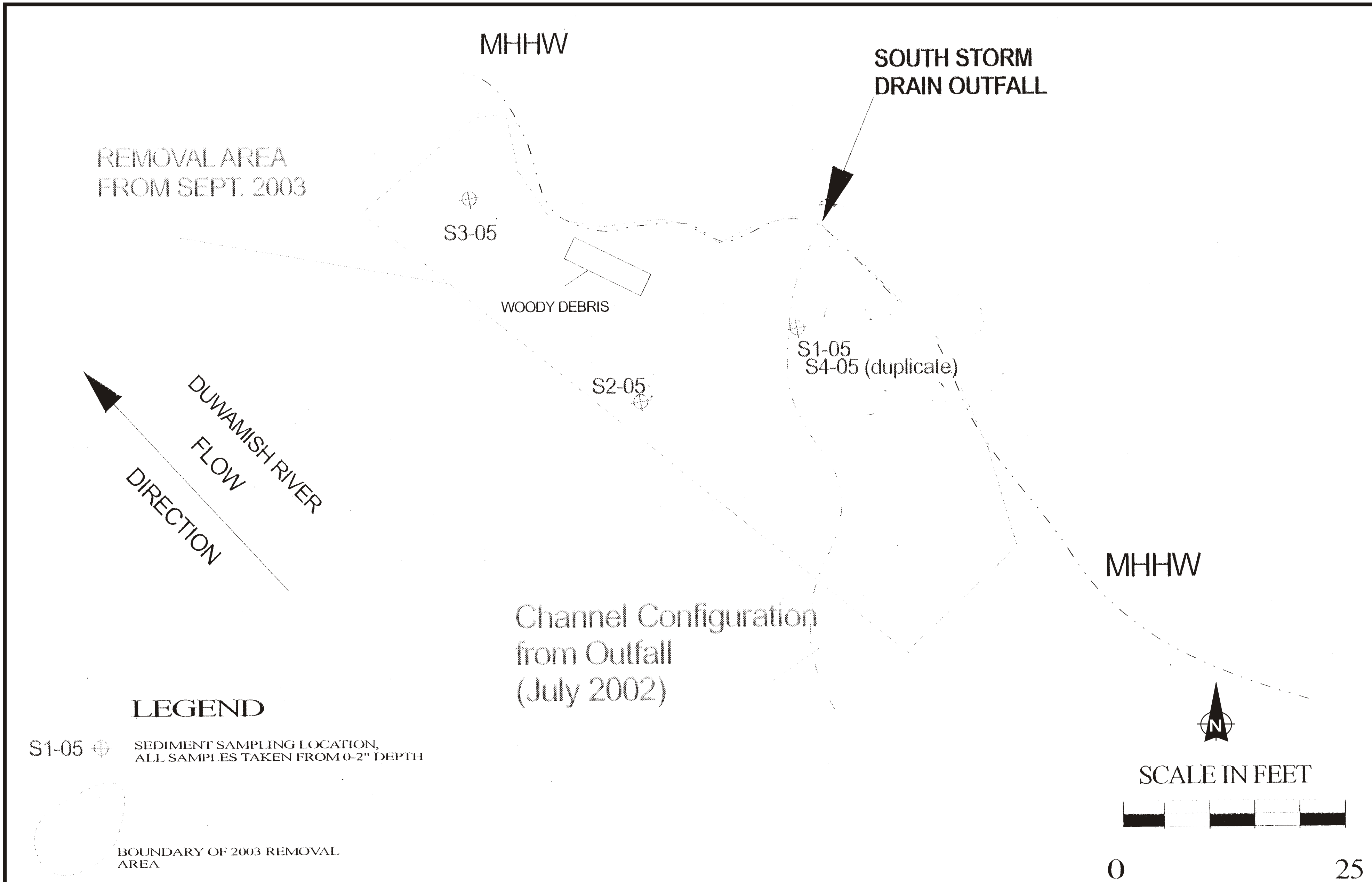
Figure 9
STORMWATER SOLIDS
SAMPLING LOCATIONS, BDC

Base Map Reference: Boeing 2004.

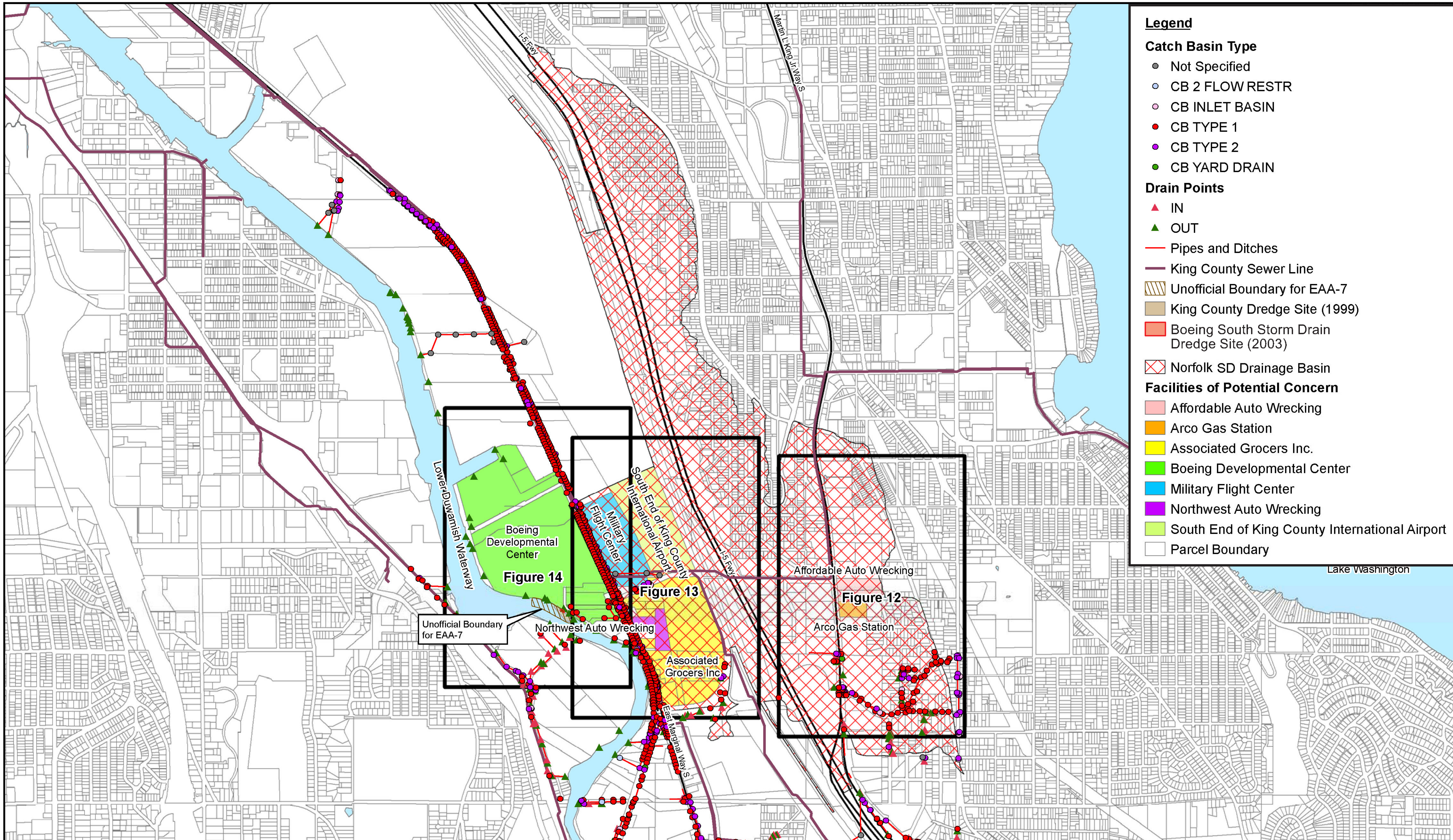
Date: 6/28/07

Drawn by: AES

10:002330WD0402\fig 9



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY EARLY ACTION AREA 7 Seattle, Washington	Figure 10 2005 SEDIMENT SAMPLING LOCATIONS BOEING SOUTH STORM DRAIN OUTFALL
	Base Map Reference: Boeing 2005.	Date: 6/28/07 · Drawn by: AES · 10:002330WD0402\fig 10



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Seattle, Washington

Map Source Information: King County GIS Data, June 2003.
City of Tukwila Storm Drain Data.

LOWER DUWAMISH WATERWAY
EARLY ACTION AREA 7

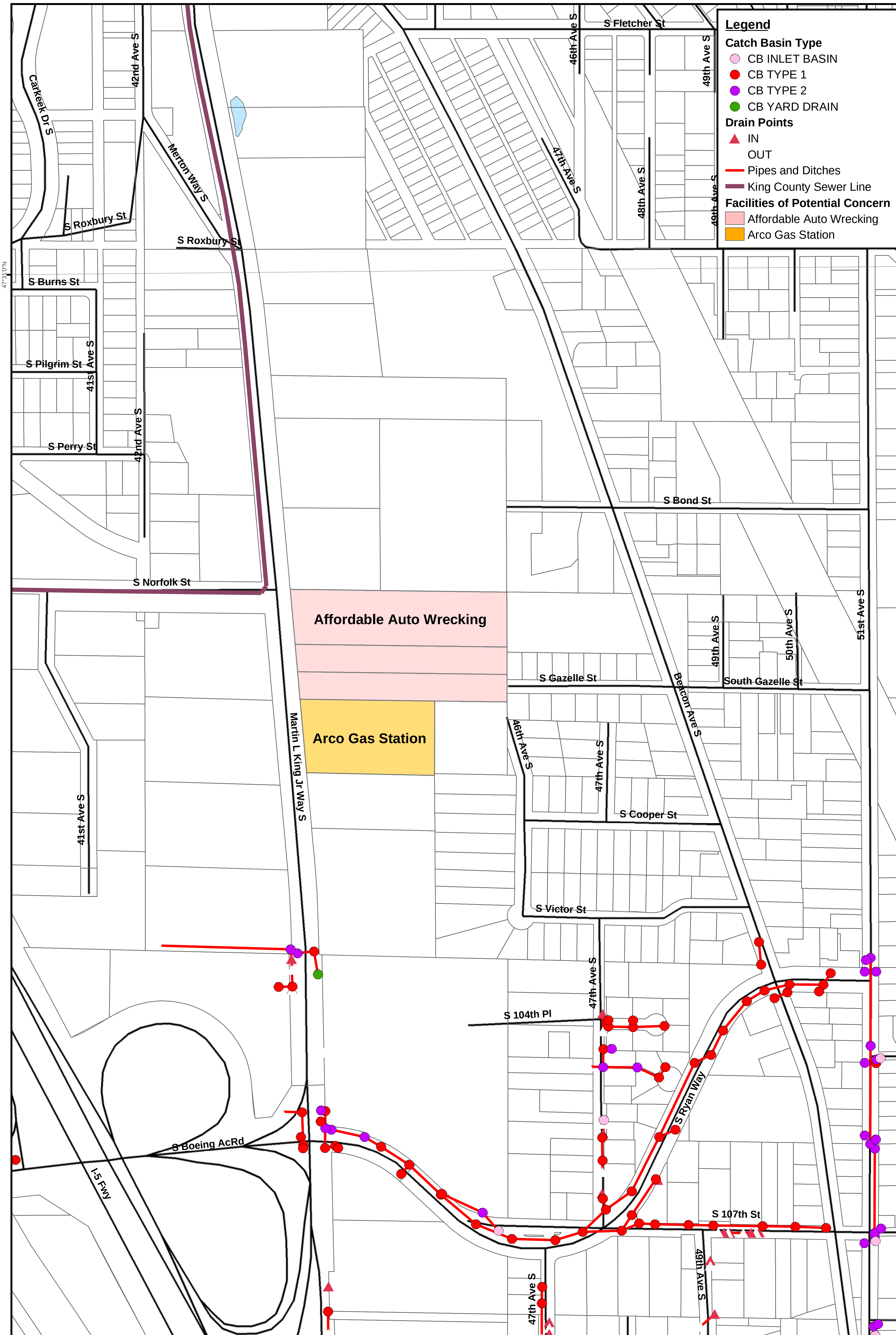
Seattle/Tukwila, WA

Figure 11

NORFOLK SD DRAINAGE BASIN and STORM DRAIN and SEWER SYSTEMS

Date:	GIS:	Job Number:
6/25/2007	avh	002330.WD04.03

\edms-projects\norfolk\scap report\figure 11.mxd



N
W E
S

0 125 250 500 750

Feet

Scale 1:4,000

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Seattle, Washington

LOWER DUWAMISH WATERWAY
EARLY ACTION AREA 7

Seattle/Tukwila, Washington

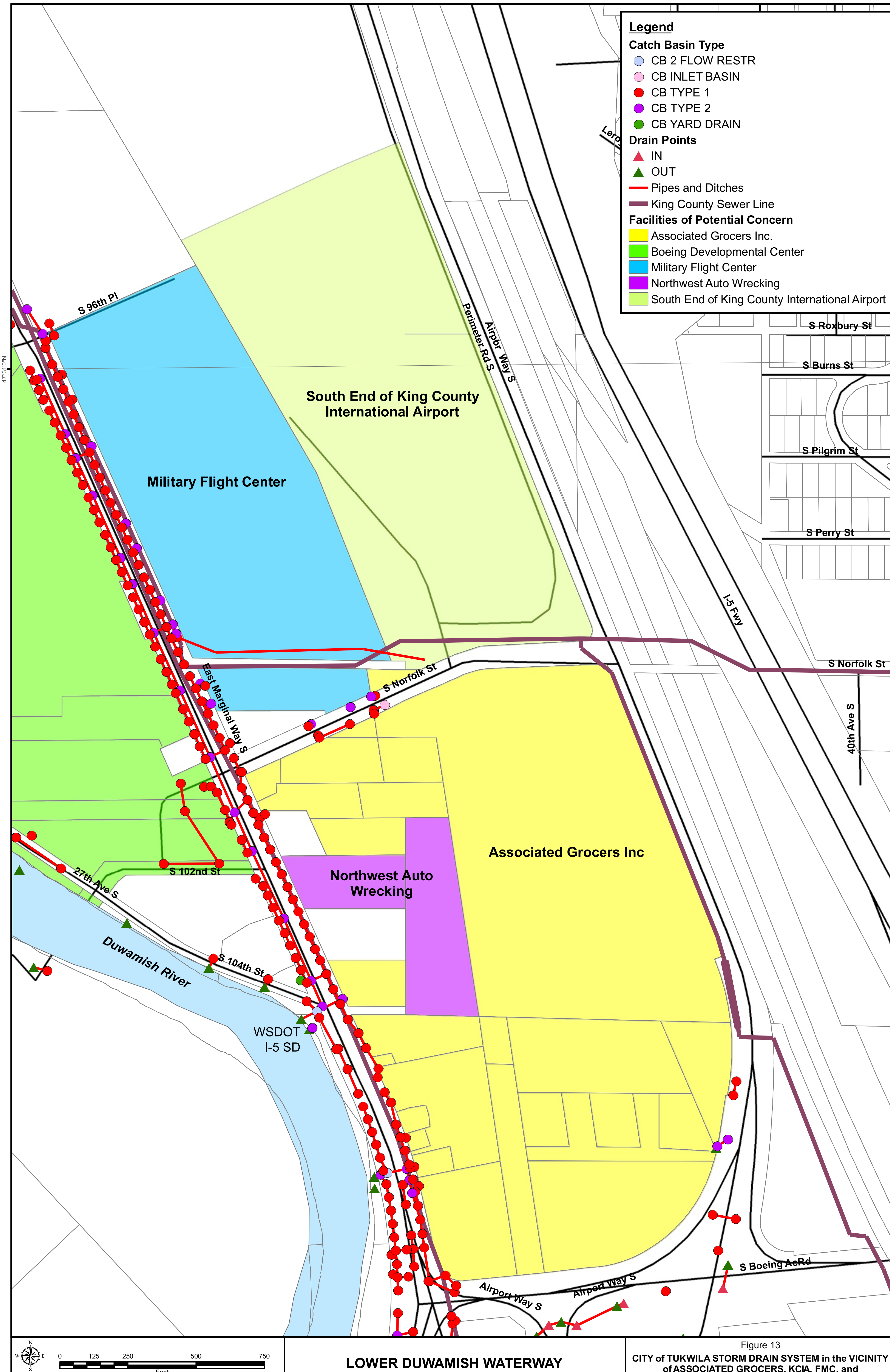
Figure 12

CITY of TUKWILA STORM DRAIN SYSTEM in the VICINITY of the AFFORDABLE AUTO WRECKING and ARCO GAS STATION

Map Source Information: King County GIS Data, June 2003.
City of Tukwila Storm Drain Data.

Date:	GIS Analyst:
4/3/2007	avh

\edms-projects\norfolk\scap report\figure 12.mxd



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Seattle, Washington

LOWER DUWAMISH WATERWAY
EARLY ACTION AREA 7

Seattle/Tukwila, Washington

Figure 13
CITY of TUKWILA STORM DRAIN SYSTEM in the VICINITY of ASSOCIATED GROCERS, KCIA, FMC, and NW AUTO WRECKING

Map Source Information: King County GIS Data, June 2003.
City of Tukwila Storm Drain Data.

Date:	GIS Analyst:
6/28/2007	avh

GIS figure converted to CorelDraw

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LOWER DUWAMISH WATERWAY EARLY ACTION AREA 7

Seattle/Tukwila, Washington

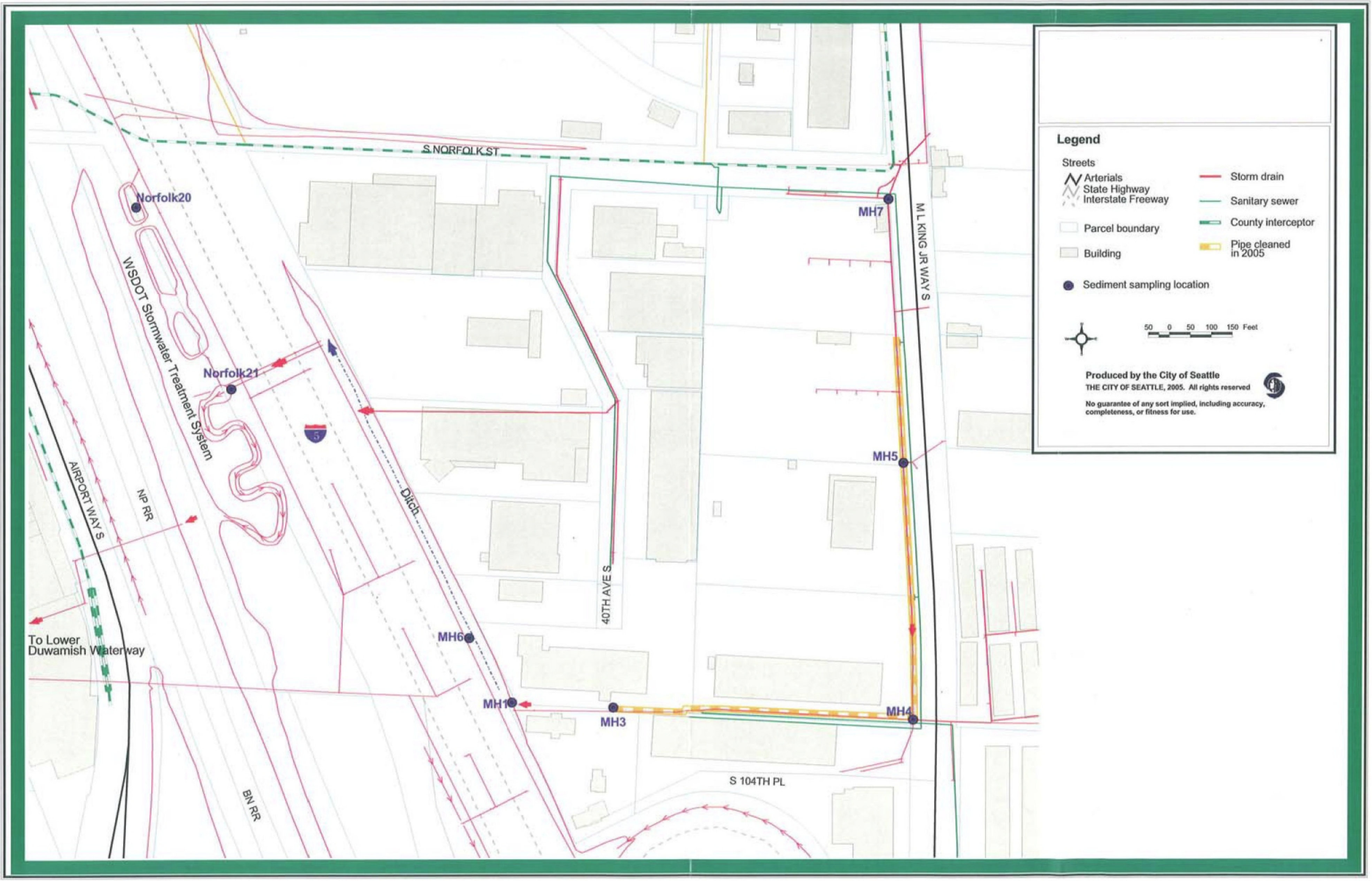
Figure 14

CITY of TUKWILA STORM DRAIN SYSTEM in the VICINITY of the BOEING DEVELOPMENTAL CENTER

Map Source Information: King County GIS Data, June 2003.
City of Tukwila Storm Drain Data.

Date:	GIS Analyst:
6/25/2007	avh

\edms-projects\norfolk\scap report\figure 14.mxd



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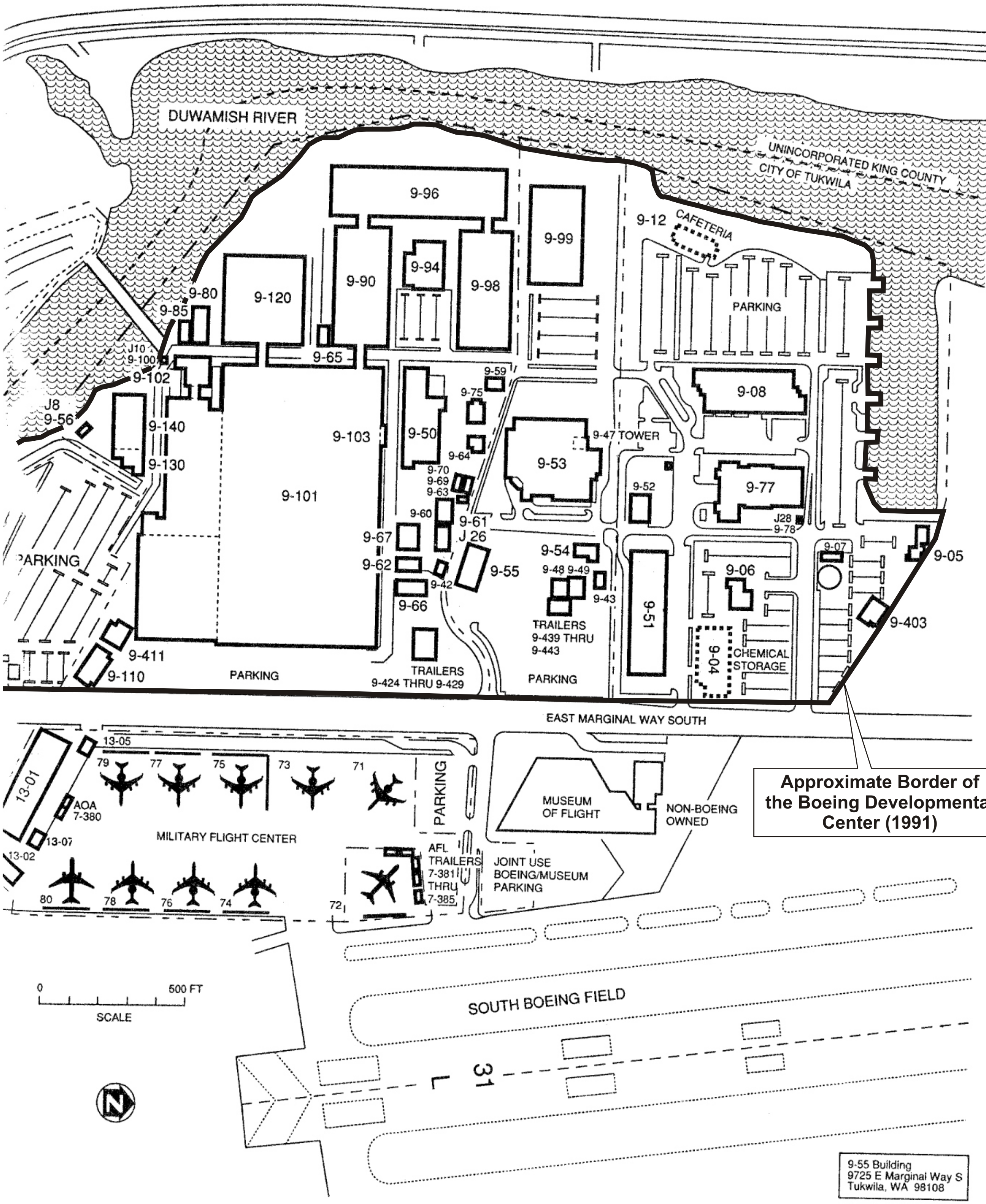
Seattle, Washington

LOWER DUWAMISH WATERWAY
EARLY ACTION AREA 7
Seattle, Washington

Figure 15
IN-LINE STORM DRAIN SEDIMENT SAMPLING LOCATIONS IN NORFOLK CSO/SD SYSTEM

Base Map Reference: The City of Seattle 2005.

Date:	Drawn by:	
6/28/07	AES	10:002330WD0402\fig 15



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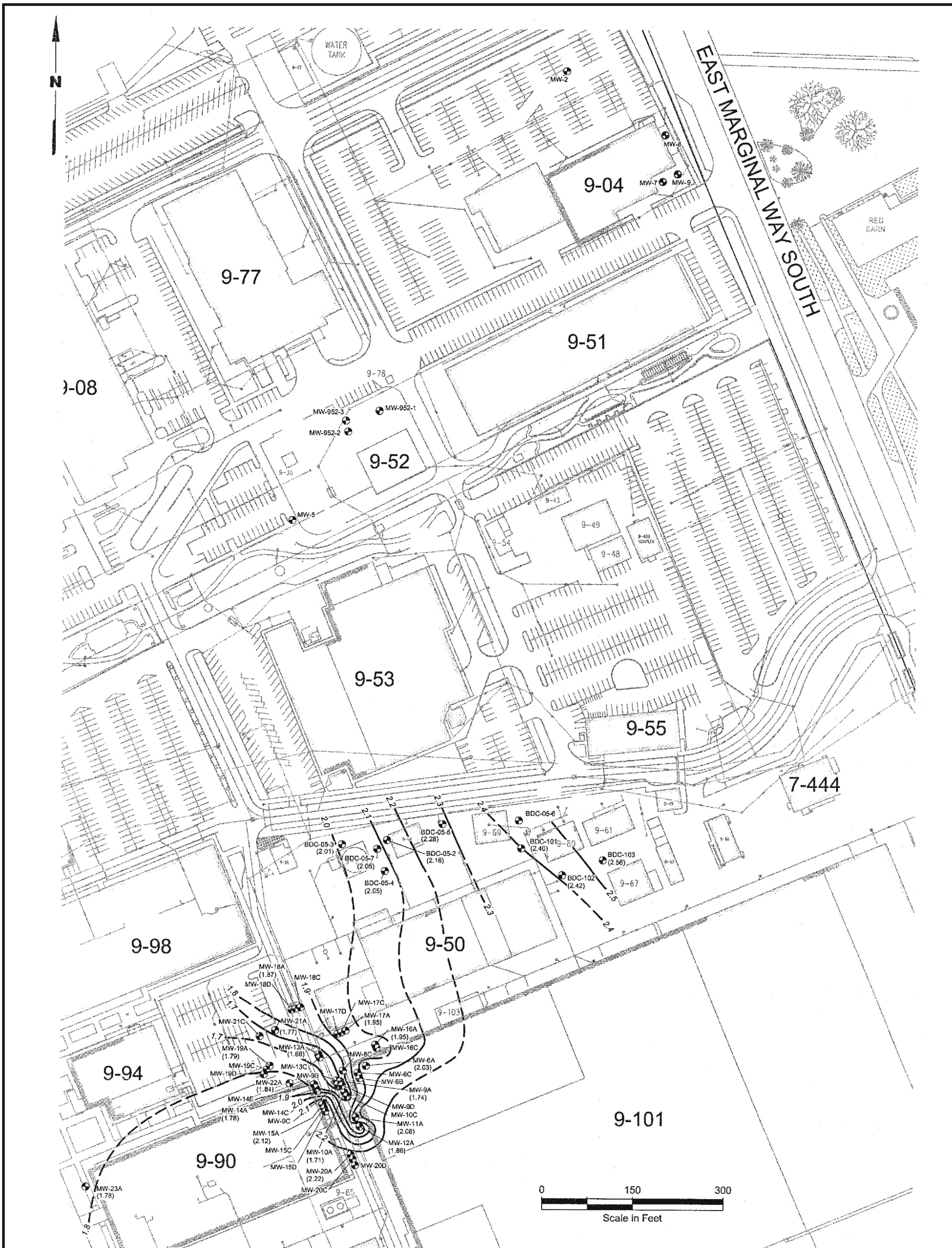
Seattle, Washington

LOWER DUWAMISH WATERWAY
EARLY ACTION AREA 7
Seattle, Washington

Figure 16
1991 BOEING DEVELOPMENTAL CENTER
FACILITY MAP

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

Date:	Drawn by:	
6-28-07	AES	10:002330WD0402\fig 16



Notes:

1. Water level measurements were made during May 2006.
2. Groundwater elevation contours are for shallow (A-Horizon) monitoring wells.

Legend

(1.97) Measured Groundwater Elevation, Ft. - Relative to NGVD 29

2.1 Estimated Groundwater Elevation Contour, Ft. - Relative to NGVD 29

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Seattle, Washington

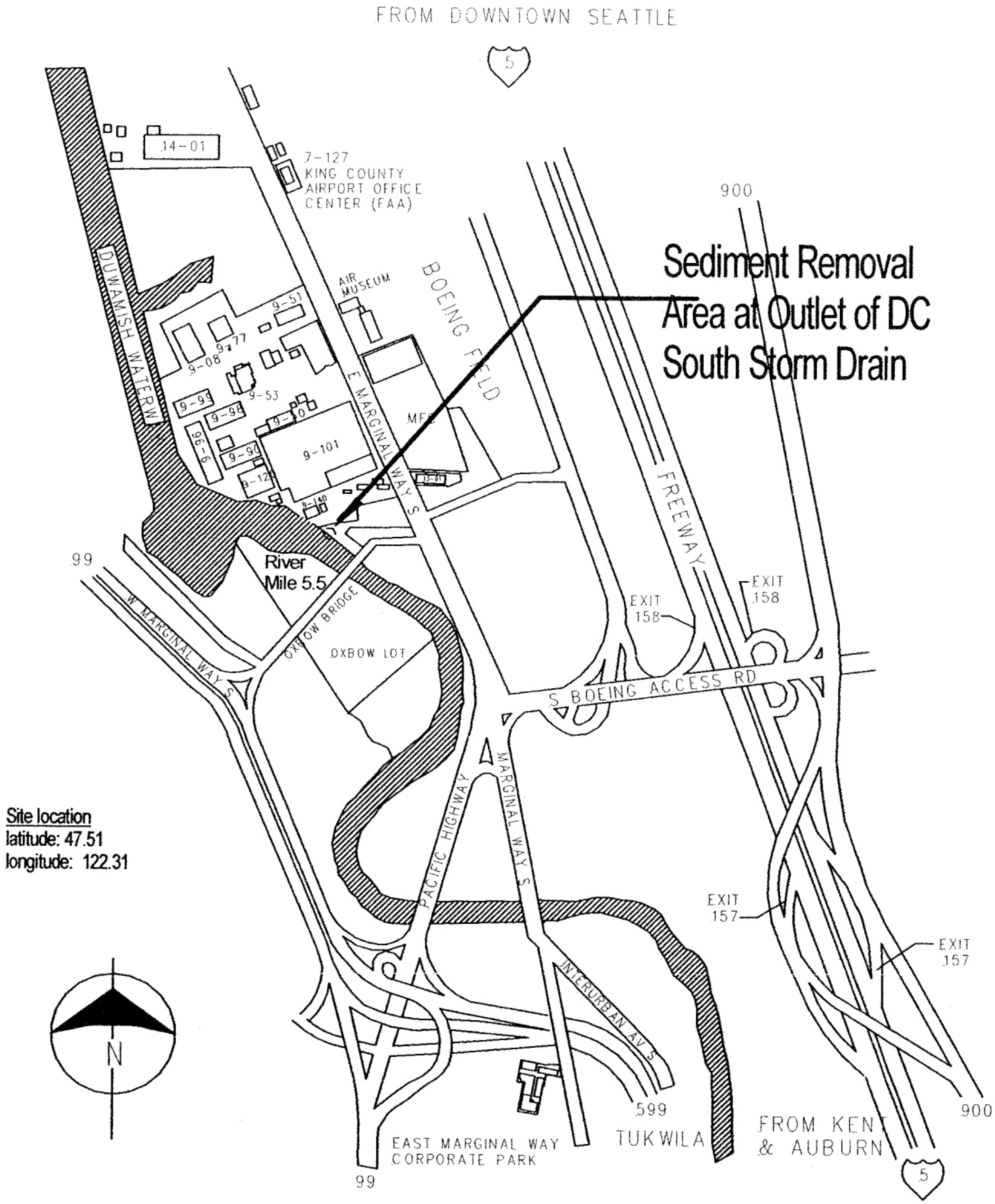
LOWER DUWAMISH WATERWAY
EARLY ACTION AREA 7
Seattle, Washington

Figure 17

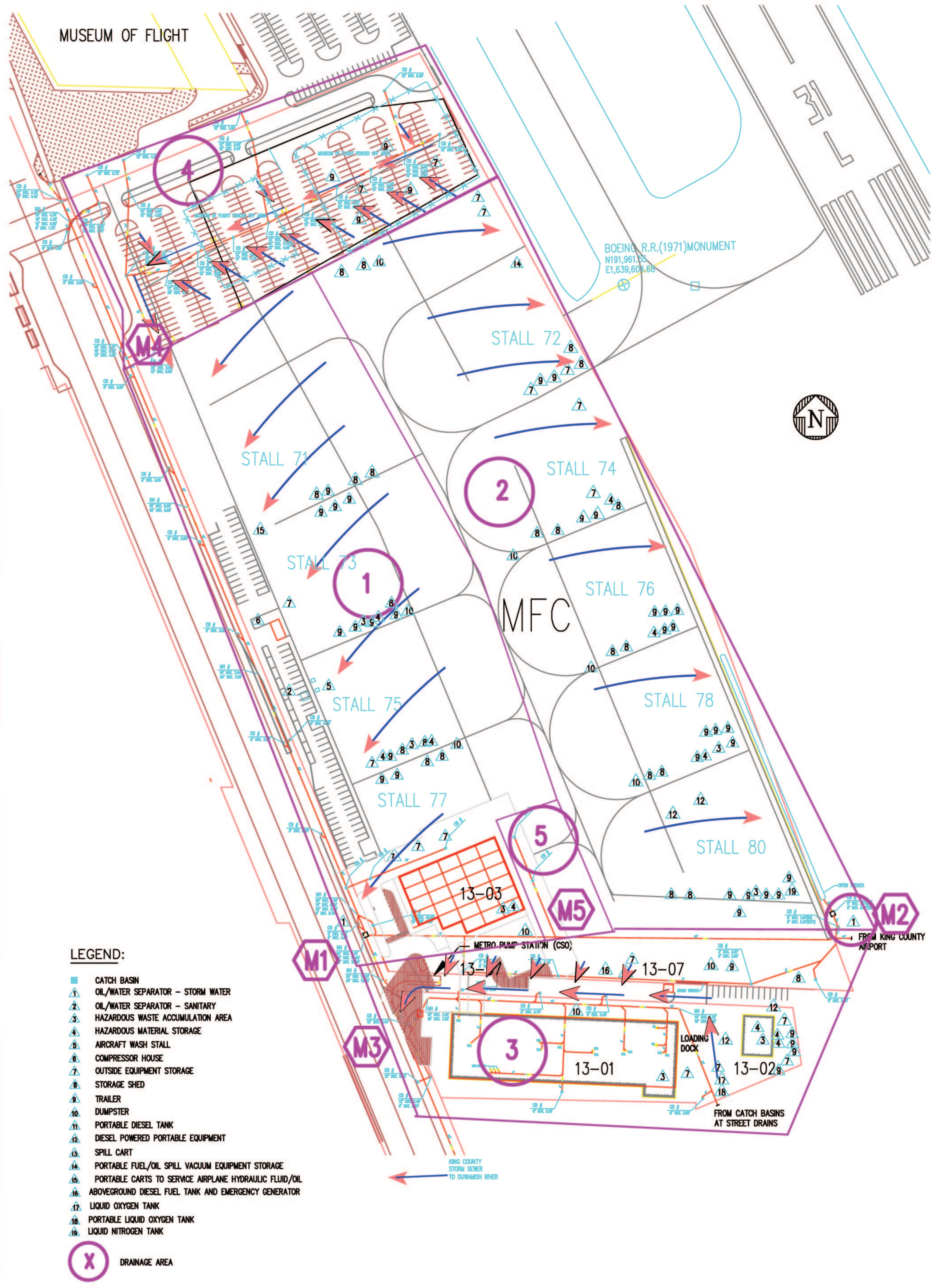
BOEING DEVELOPMENTAL CENTER
GROUNDWATER ELEVATION CONTOUR MAP

Base Map Reference: Landau Associates, July 2006

Date:	Drawn by:	
6/28/07	AES	10:002330WD0402\fig 17



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY EARLY ACTION AREA 7 Seattle, Washington	Figure 18 BOEING DEVELOPMENTAL CENTER SOUTH STORM DRAIN SEDIMENT REMOVAL AREA		
	Base Map Reference: The Boeing Company, 2003	Date: 6-28-07	Drawn by: AES	10:002330WD0402\fig 18



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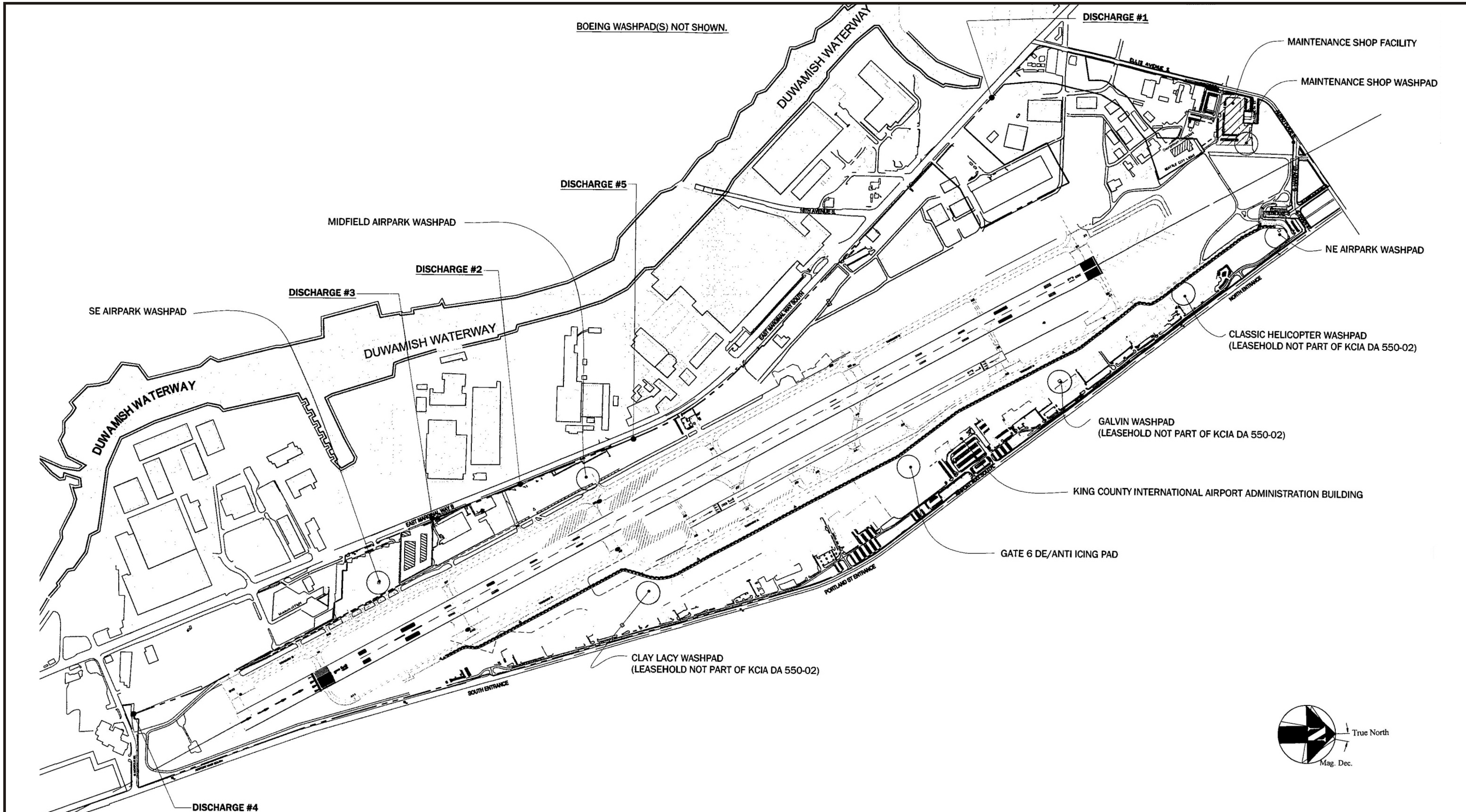
International Specialists in the Environment
Seattle, Washington

DESIGNED BY:
CHECKED BY:
DRAWN BY: V. RAYNER

BASE MAP REFERENCE: THE BOEING COMPANY 2003

Figure 19
MILITARY FLIGHT CENTER STORMWATER DRAINAGE SYSTEM
LOWER DUWAMISH WATERWAY
EARLY ACTION AREA 7
Tukwila, Washington

SCALE	DATE ISSUED	CAD FILE NO.
NOTED	05-29-07	EEA-7_Norfolk CSO\SCAP Report\CAD\MFC_052907.dwg



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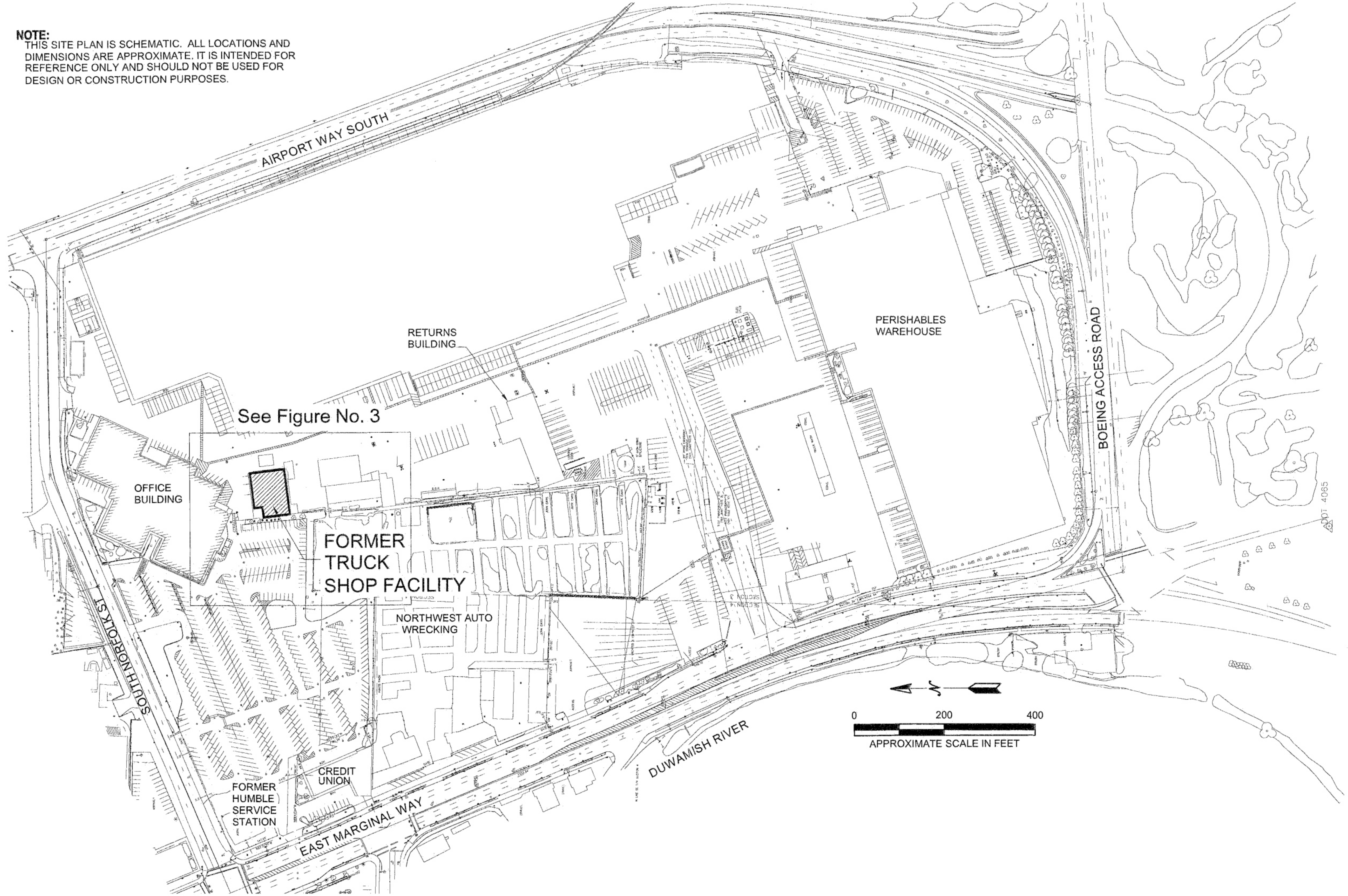
Seattle, Washington

Base Map Reference: King County International Airport, 2006.

LOWER DUWAMISH WATERWAY
EARLY ACTION AREA 7
Seattle, Washington

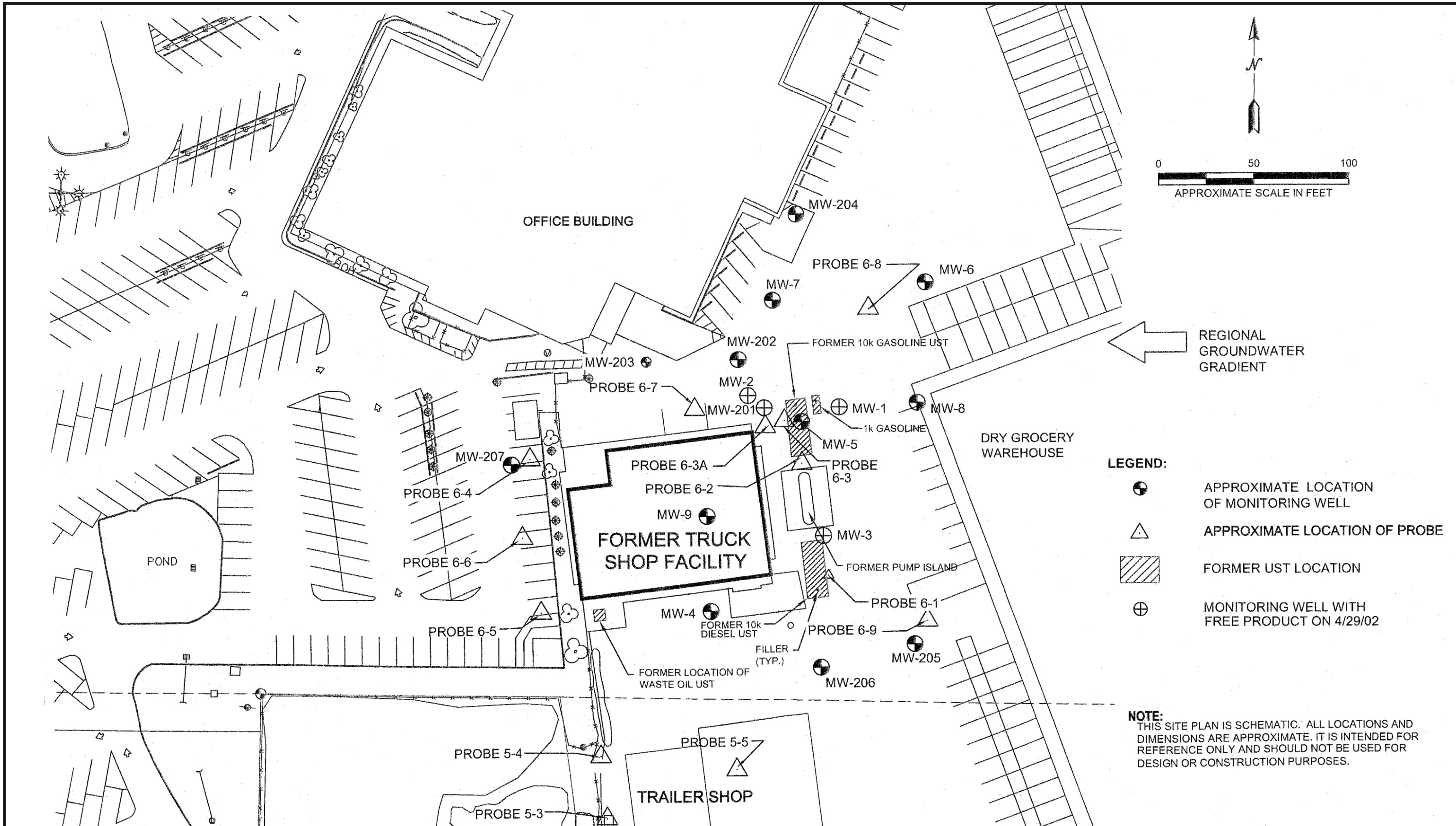
Figure 20
KING COUNTY INTERNATIONAL AIRPORT
STORMWATER OUTFALL MAP

Date:	Drawn by:	
6/28/07	AES	10:002330WD0702\fig 20



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	**Base Map Reference:** Terra Associates, Inc., September 2006	LOWER DUWAMISH WATERWAY EARLY ACTION AREA 7 Seattle, Washington	Figure 21 ASSOCIATED GROCERS, INC. FACILITY MAP

Date:	Drawn by:	
6/28/07	AES	10:002330WD0402\fig 21



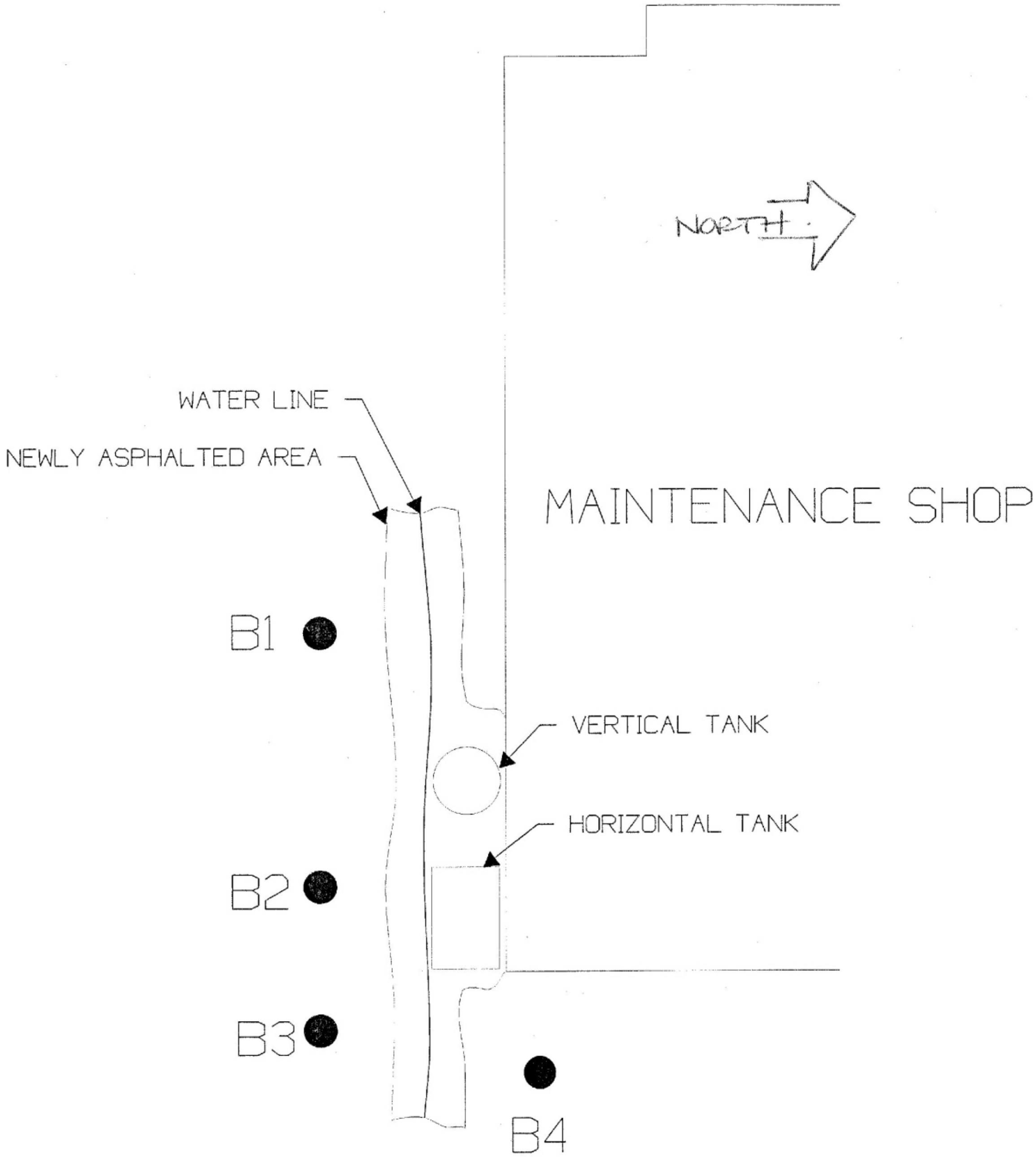
ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

Base Map Reference: Terra Associates, Inc., September 2006

LOWER DUWAMISH WATERWAY
EARLY ACTION AREA 7
Seattle, Washington

Figure 22
ASSOCIATED GROCERS, INC.
FORMER TRUCK SHOP FACILITY

Date:	Drawn by:	
6/28/07	AES	10:002330WD0402\fig 22



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International Specialists in the Environment
Seattle, Washington

LOWER DUWAMISH WATERWAY
EARLY ACTION AREA 7
Seattle, Washington

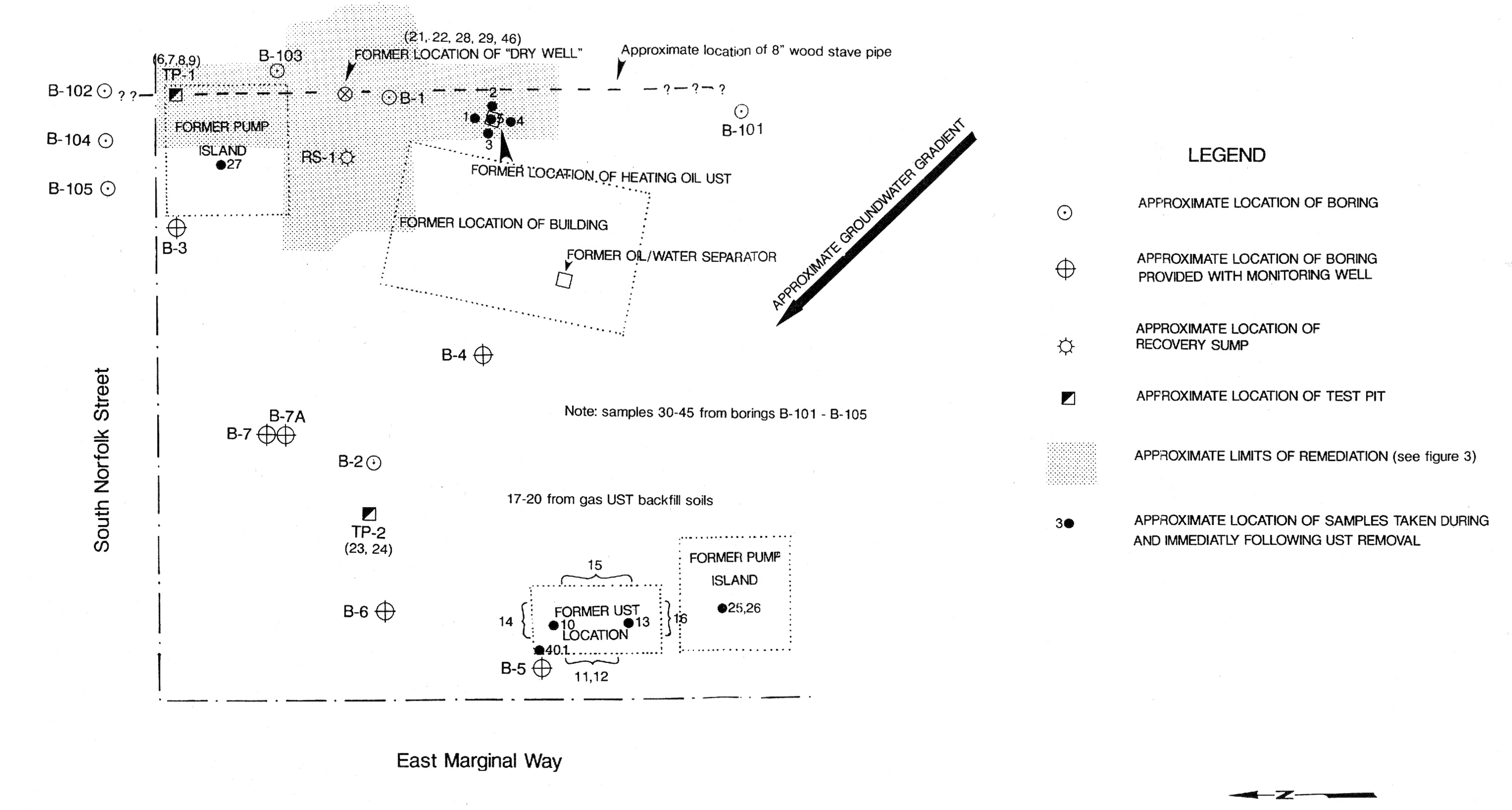
Figure 23
ASSOCIATED GROCERS INC. MAINTENANCE SHOP AND UST REMOVAL AREA

Base Map Reference:
Global Environmental 1996.

Date: 6-28-07

Drawn by: AES

10:002330WD0402\fig 23



NOTE: THIS DRAWING IS BASED ON FIELD MEASUREMENTS REFERENCED TO THE FORMER BUILDING.
PROPERTY LINE LOCATIONS ARE AS SUCH ASSUMED AND ARE SCHEMATIC IN NATURE.

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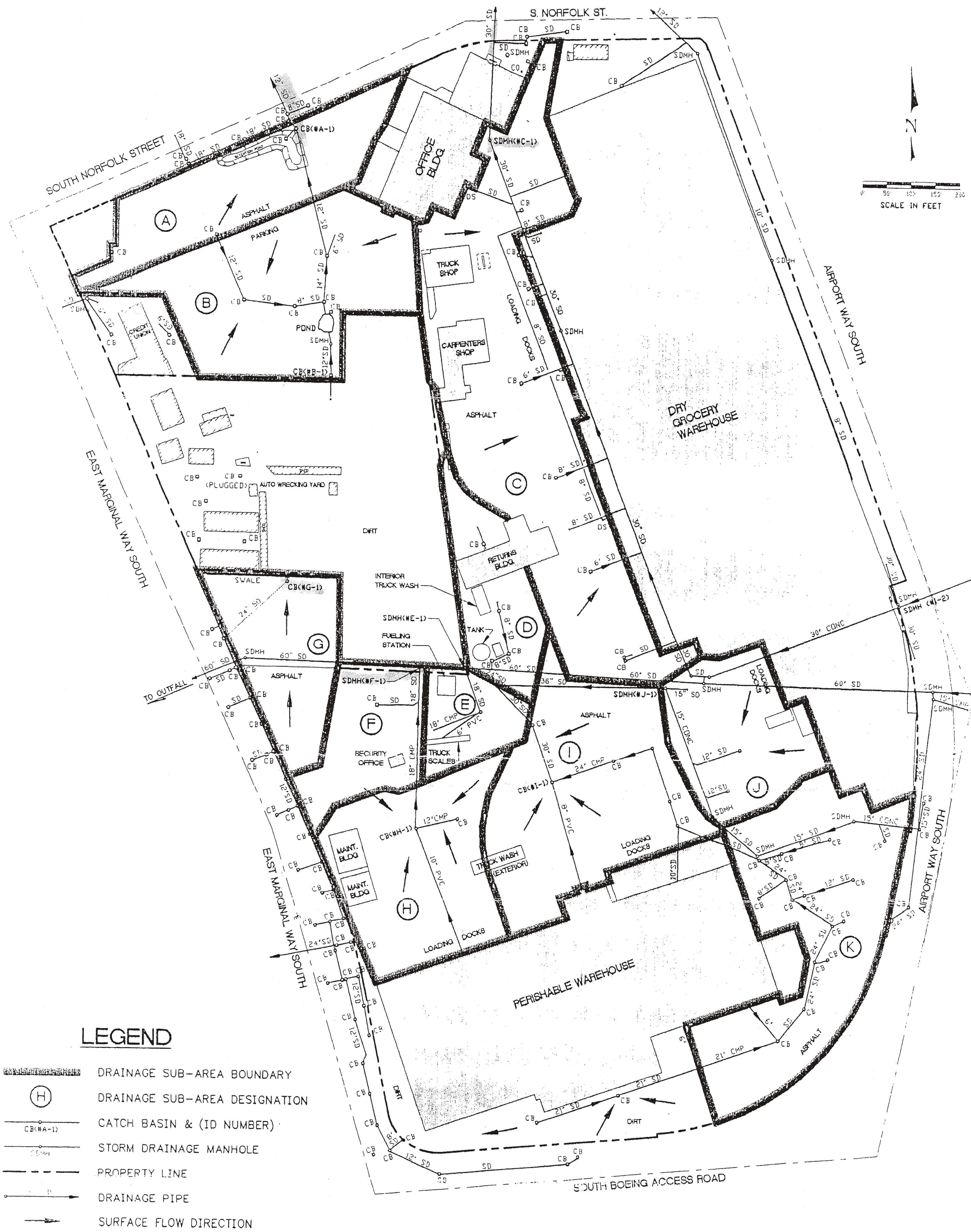
Base Map Reference: Terra Associates, Inc., February 1991

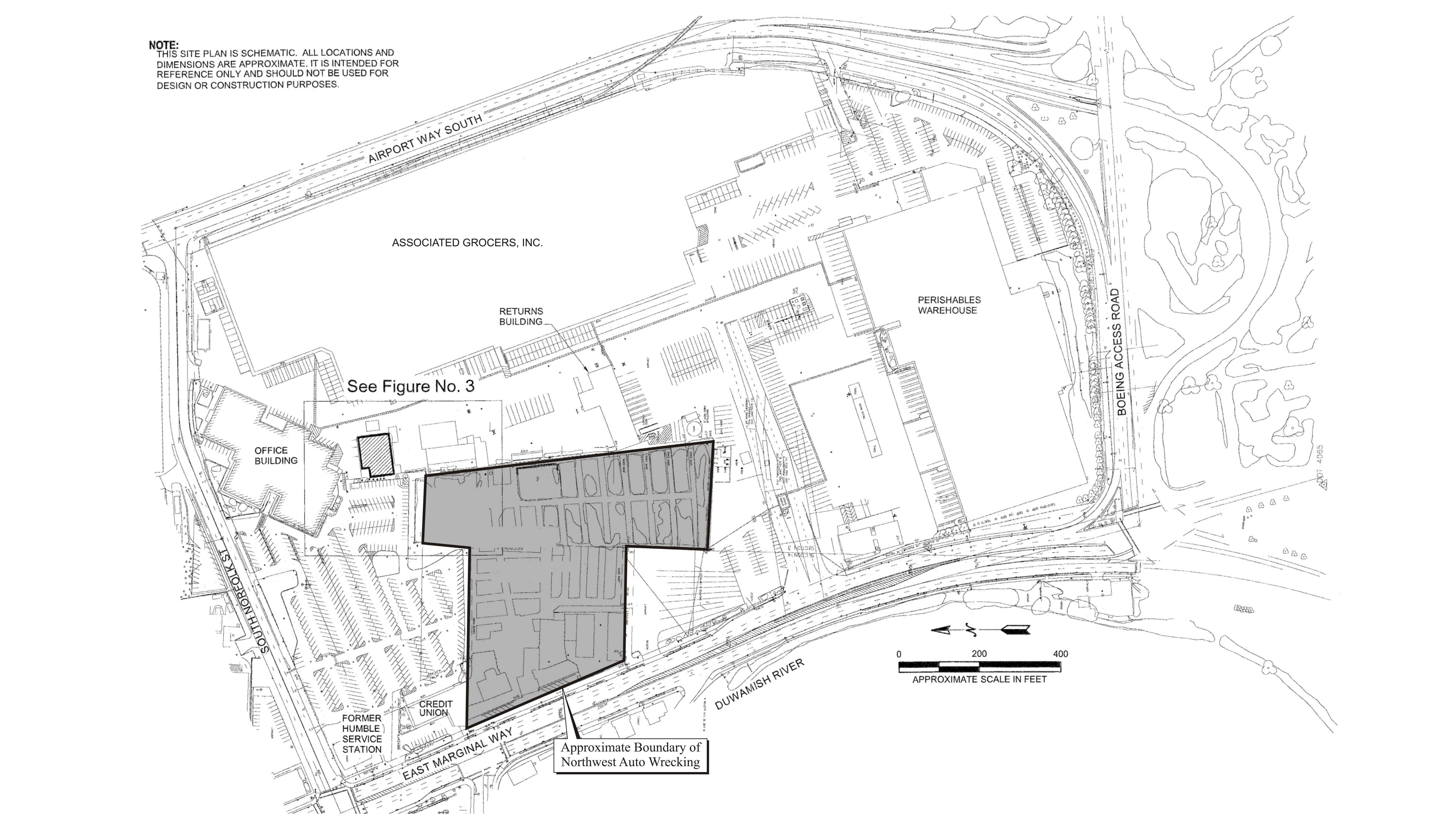
LOWER DUWAMISH WATERWAY
EARLY ACTION AREA 7
Seattle, Washington

Figure 24
ASSOCIATED GROCERS, INC.
FORMER HUMBLE SERVICE STATION AREA

Date:	Drawn by:	
6/28/07	AES	10:002330WD0402\fig 24



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY EARLY ACTION AREA 7 Seattle, Washington	Figure 25 ASSOCIATED GROCERS INC., STORMWATER DRAINAGE SYSTEM
	Base Map Reference: Barrett Consulting Group	Date: 6/28/07 · Drawn by: AES · 10:002330WD0402\fig 25



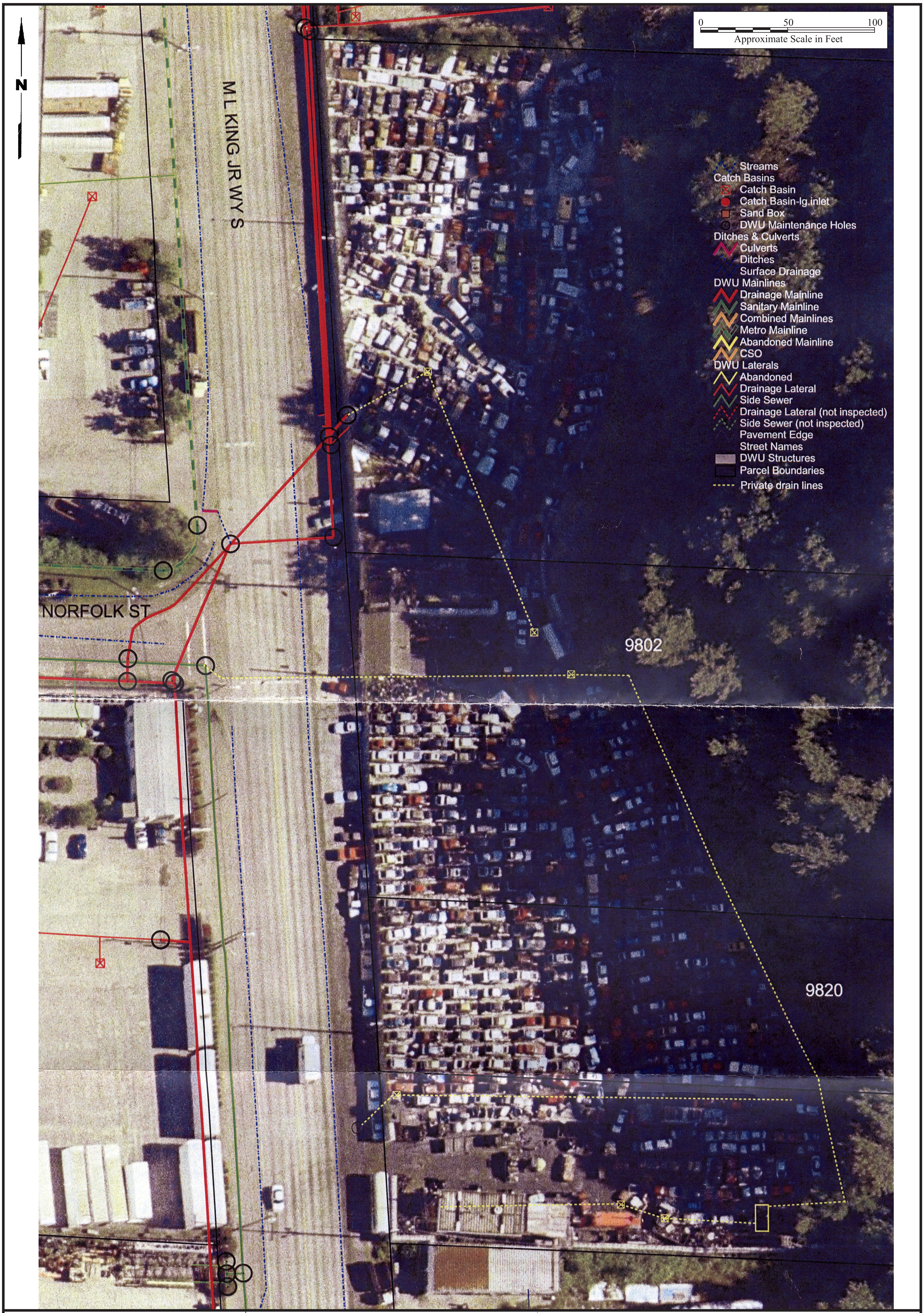
ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

Base Map Reference: Terra Associates, Inc., September 2006

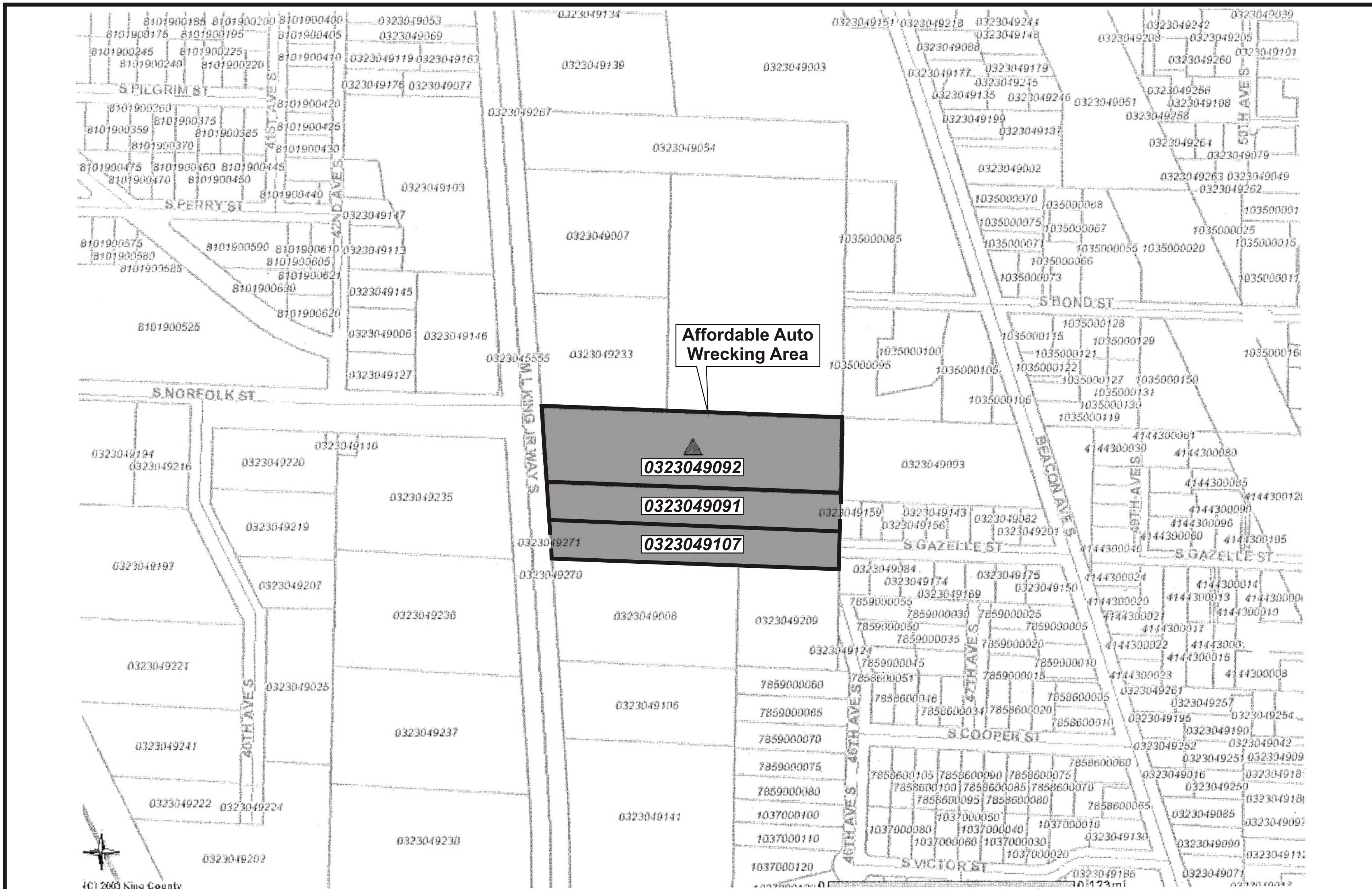
LOWER DUWAMISH WATERWAY
EARLY ACTION AREA 7
Seattle, Washington

Figure 26
NORTHWEST AUTO WRECKING FACILITY MAP

Date: 6/28/07
Drawn by: AES
10:002330WD0402\fig 26



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY EARLY ACTION AREA 7 Seattle, Washington	Figure 27 AERIAL PHOTOGRAPH OF AFFORDABLE AUTO WRECKING AREA		
	Base Map Reference: City of Seattle, 2006.	Date: 6/28/07	Drawn by: AES	10:002330WD0402\fig 27



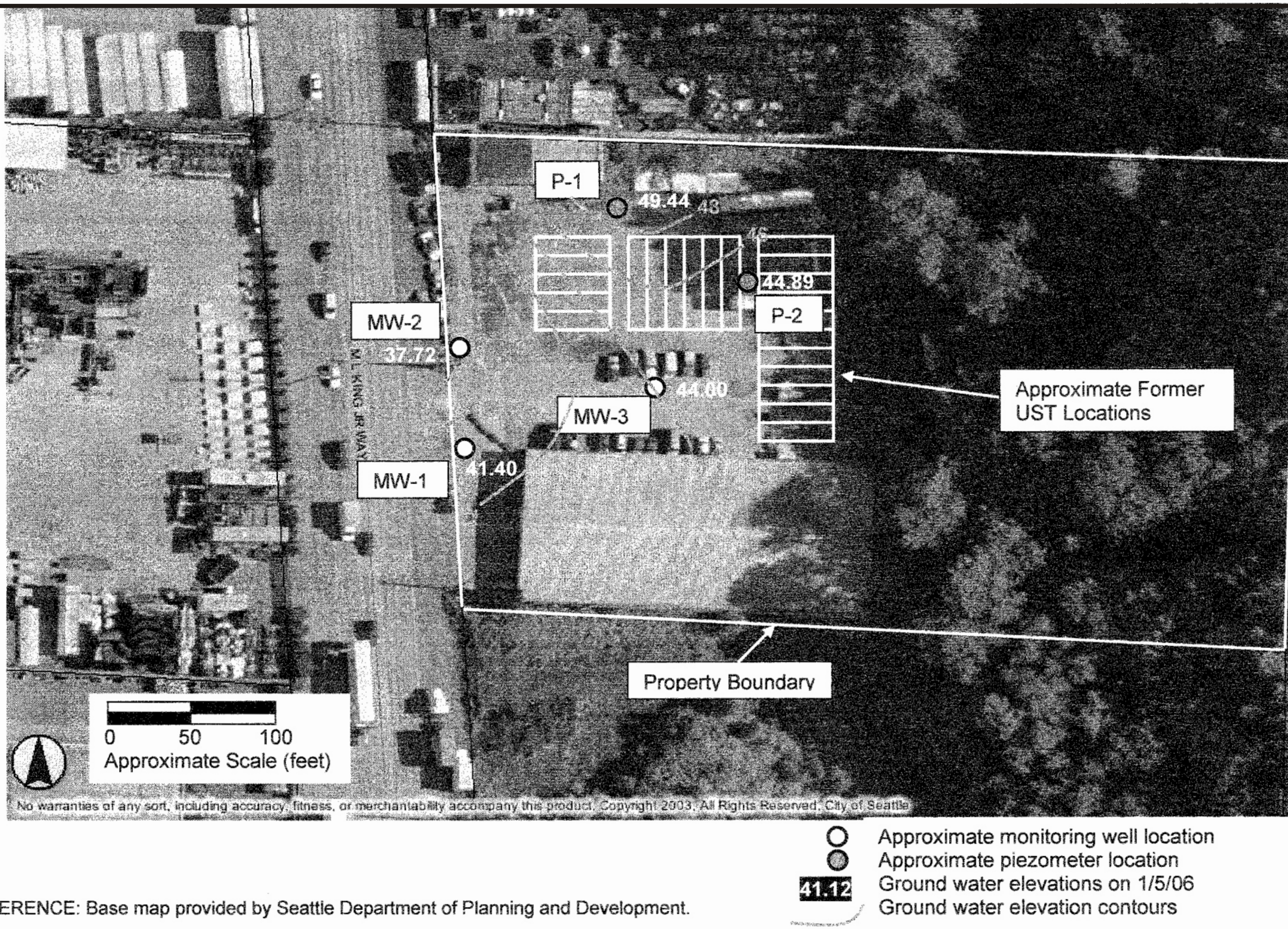
ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

LOWER DUWAMISH WATERWAY
EARLY ACTION AREA 7
Seattle, Washington

Figure 28
AFFORDABLE AUTO WRECKING AREA
AND TAX PARCELS

Base Map Reference: King County 2003.

Date:	Drawn by:	
6/28/07	AES	10:002330WD0402\fig 28



REFERENCE: Base map provided by Seattle Department of Planning and Development.

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER DUWAMISH WATERWAY EARLY ACTION AREA 7 Seattle, Washington	Figure 29 ARCO GAS STATION MAP		
	Base Map Reference: HWA GeoSciences Inc., February 2006	Date: 6/28/07	Drawn by: AES	10:002330WD0402\fig 29

Tables

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Table 1: Identified Facilities of Concern

Facility Name	Facility Physical Address	Facility Mailing Address	Facility Phone Number	Facility Owner Name, Title, and Contact Information	Facility Operator Name, Title, and Contact Information	Property Owner (if different from Facility Owner/Operator) Name, Address, and Phone Number (King County tax assessor)	Regulatory Contact
Affordable Auto Wrecking	9802 Martin Luther King Jr Way South, Seattle, WA 98118	9802 Martin Luther King Jr Way South, Seattle, WA 98118	206-723-9820	Ronald Settergren	Ronald Settergren, Cognizant Official 206-723-9820	Corky Morris LLC and Ronald and Carol Settegren	
Arco Gas Station	9840 Martin Luther King Jr. Way South, Seattle, WA 98118. Note: Also shown as 9830 Martin Luther King Jr. Way South, Seattle, WA 98118 in Ecology online databases	9840 Martin Luther King Jr. Way South, Seattle, WA 98118. Note: Also shown as 9830 Martin Luther King Jr. Way South, Seattle, WA 98118 in Ecology online databases	206-722-4188	Peter Eastey, Jack's Auto Parts Inc. 9423 Martin Luther King Jr. Way South, Seattle WA 98118	Peter Eastey, Jack's Auto Parts Inc. 9423 Martin Luther King Jr. Way South, Seattle WA 98118	Estate of John Kline Eastey	
Associated Grocers Inc Seattle	3301 South Norfolk Street, Seattle, WA 98168	3301 South Norfolk Street, Seattle, WA 98168	206-762-2100	Associated Grocers Inc . President and Chief Executive Officer, John Runyan	David McDonald, Cognizant Official 206-764-7627	Sea-Tuk Warehouse LLC	Richard W Newton II P.O. Box 3763 3301 South Norfolk Street 206-647-7802
Boeing Developmental Center	9725 East Marginal Way South, Tukwila, WA 98108	The Boeing Company, P.O. Box 3707,MS 4H-26, Seattle, WA 98124	206-679-0433	Boeing Commercial Airplane Group P.O. Box 9707 MS 5R-14, Seattle, WA 98124 and The Boeing Company Office of the General Council 100 N Riverside Chicago, Il 60606	Integrated Defense and Space Division (IDS) of the Boeing Space Company P.O. Box 3707 M/C 80-RX	The Boeing Comany P.O. Box 3707, Seattle, WA 98124	Enviromental contact, James Bet (206) 679-0433 Cindy Naucler, General Contact 206-773-8571
Boeing Military Flight Center	10002 East Marginal Way South, Seattle, WA	P.O. Box 3707 MC 46-23, Seattle, WA 98124	206-679-0433	Boeing Commercial Airplane Group P.O. Box 9707 MS 5R-14, Seattle, WA 98124	Integrated Defense and Space Division (IDS) of the Boeing Space Company	The Boeing Company P.O. Box 3707, Seattle, WA 98124	Enviromental contact, James Bet (206) 679-0433Thomas D. Gallacher, regulatory contact and cognizant official P.O. Box 3707 MC 46-23 Seattle, WA 98124 206-544-1230
King Co. International Airport (Boeing Field)	7277 Perimeter Rd South, Seattle, WA 98108. Note, also listed as 6505 Perimeter Road South, Seattle	P.O. Box 80245, 7277 Perimeter Rd South, Seattle, WA 98108	206-296-7380	Department of Construction and Facilities Management P.O. Box 80245 Seattle, WA 98108	Operations and Compliance, 206-296-7334 7299 Perimeter Rd S	King County	Rick Renaud (206) 296-7427
Northwest Auto Wrecking	10230 East Marginal Way South, Tukwila, WA 98188	10230 East Marginal Way South, Tukwila, WA 98188	206-762-0220	Northwest Auto Wrecking Company , Jerry Haapla	Herb Pierce, Cognizant Official 425-201-6848		

Lower Duwamish Waterway
Early Action Area 7
Table 2: Chemicals of Concern in EAA-7 Sediment

Source	Sample Location	Chemical	Concentration	TOC mg/kg DW	SQS	CSL	LAET	2LAET	Units
KC DNR, 1999	NFK501	2,4-Dimethylphenol	<MDL (35)	1,760	29	29			µg/kg DW
	NFK502	2,4-Dimethylphenol	<MDL (35)	1,210	29	29			µg/kg DW
	NFK503	2,4-Dimethylphenol	<MDL (35)	3,180	29	29			µg/kg DW
	NFK504	2,4-Dimethylphenol	<MDL (35)	1,260	29	29			µg/kg DW
	NFK502	2-Methylnaphthalene	<MDL (46)	1,210	38	64			mg/kg OC
	NFK502	2-Methylnaphthalene	<MDL (56)	1,210			670	1,400	µg/kg DW
	NFK504	2-Methylnaphthalene	<MDL (44)	1,260	38	64			mg/kg OC
	NFK504	2-Methylnaphthalene	<MDL (55)	1,260			670	1,400	µg/kg DW
	NFK502	Benzo(g,h,i)perylene	62.6	1,210	31	78			mg/kg OC
	NFK502	Benzo(g,h,i)perylene	75.7	1,210			670	720	µg/kg DW
	NFK504	Benzo(g,h,i)perylene	56	1,260	31	78			mg/kg OC
	NFK504	Benzo(g,h,i)perylene	70.5	1,260			670	720	µg/kg DW
	NFK501	Dibenzo(a,h)anthracene	<MDL (32)	1,760	12	33			mg/kg OC
	NFK501	Dibenzo(a,h)anthracene	<MDL (56)	1,760			230	540	µg/kg DW
	NFK502	Dibenzo(a,h)anthracene	<MDL (46)	1,210	12	33			mg/kg OC
	NFK502	Dibenzo(a,h)anthracene	<MDL (56)	1,210			230	540	µg/kg DW
	NFK503	Dibenzo(a,h)anthracene	<MDL (18)	3,180	12	33			mg/kg OC
	NFK503	Dibenzo(a,h)anthracene	<MDL (56)	3,180			230	540	µg/kg DW
	NFK504	Dibenzo(a,h)anthracene	<MDL (44)	1,260	12	33			mg/kg OC
	NFK504	Dibenzo(a,h)anthracene	<MDL (55)	1,260			230	540	µg/kg DW
	NFK501	Hexachlorobenzene	<MDL (0.51)	1,760	0.38	2.3			mg/kg OC
	NFK501	Hexachlorobenzene	<MDL (0.90)	1,760			31	70	µg/kg DW
	NFK502	Hexachlorobenzene	0.80	1,210	0.38	2.3			mg/kg OC
	NFK502	Hexachlorobenzene	<MDL (0.89)	1,210			31	70	µg/kg DW
	NFK504	Hexachlorobenzene	<MDL (0.71)	1,260	0.38	2.3			mg/kg OC
	NFK504	Hexachlorobenzene	<MDL (0.89)	1,260			31	70	µg/kg DW
	NFK501	Butyl Benzyl Phthalate	<MDL (12)	1,760	4.9	64			mg/kg OC
	NFK501	Butyl Benzyl Phthalate	<MDL (21)	1,760			63	900	µg/kg DW
	NFK502	Butyl Benzyl Phthalate	<MDL (17)	1,210	4.9	64			mg/kg OC
	NFK502	Butyl Benzyl Phthalate	<MDL (21)	1,210			63	900	µg/kg DW
	NFK503	Butyl Benzyl Phthalate	<MDL (6.6)	3,180	4.9	64			mg/kg OC
	NFK503	Butyl Benzyl Phthalate	<MDL (21)	3,180			63	900	µg/kg DW
	NFK504	Butyl Benzyl Phthalate	<MDL (17)	1,260	4.9	64			mg/kg OC
	NFK504	Butyl Benzyl Phthalate	<MDL (21)	1,260			63	900	µg/kg DW
	NFK501	Dibenzofuran	<MDL (20)	1,760	15	58			mg/kg OC
	NFK501	Dibenzofuran	<MDL (35)	1,760			540	700	µg/kg DW
	NFK502	Dibenzofuran	<MDL (29)	1,210	15	58			mg/kg OC
	NFK502	Dibenzofuran	<MDL (35)	1,210			540	700	µg/kg DW
	NFK504	Dibenzofuran	<MDL (28)	1,260	15	58			mg/kg OC
	NFK504	Dibenzofuran	<MDL (35)	1,260			540	700	µg/kg DW
	NFK501	Hexachlorobutadiene	<MDL (20)	1,760	3.9	6.2			mg/kg OC
	NFK501	Hexachlorobutadiene	<MDL (35)	1,760			11	120	µg/kg DW
	NFK502	Hexachlorobutadiene	<MDL (29)	1,210	3.9	6.2			mg/kg OC
	NFK502	Hexachlorobutadiene	<MDL (35)	1,210			11	120	µg/kg DW
	NFK503	Hexachlorobutadiene	<MDL (11)	3,180	3.9	6.2			mg/kg OC
	NFK503	Hexachlorobutadiene	<MDL (35)	3,180			11	120	µg/kg DW
	NFK504	Hexachlorobutadiene	<MDL (28)	1,260	3.9	6.2			mg/kg OC
	NFK504	Hexachlorobutadiene	<MDL (35)	1,260			11	120	µg/kg DW
	NFK501	N-Nitrosodiphenylamine	<MDL (20)	1,760	11	11			mg/kg OC
	NFK501	N-Nitrosodiphenylamine	<MDL (35)	1,760			28	40	µg/kg DW
	NFK502	N-Nitrosodiphenylamine	<MDL (29)	1,210	11	11			mg/kg OC
	NFK502	N-Nitrosodiphenylamine	<MDL (35)	1,210			28	40	µg/kg DW
	NFK504	N-Nitrosodiphenylamine	<MDL (28)	1,260	11	11			mg/kg OC
	NFK504	N-Nitrosodiphenylamine	<MDL (35)	1,260			28	40	µg/kg DW
	NFK501	Total PCBs	<MDL (13)	1,760	12	65			mg/kg OC
	NFK501	Total PCBs	<MDL (22)	1,760			130	1,000	µg/kg DW
	NFK502	Total PCBs	<MDL (18)	1,210	12	65			mg/kg OC
	NFK502	Total PCBs	<MDL (22)	1,210			130	1,000	µg/kg DW
	NFK504	Total PCBs	<MDL (17)	1,260	12	65			mg/kg OC
	NFK504	Total PCBs	<MDL (22)	1,260			130	1,000	µg/kg DW
Mickelson, S., 2001	NFK501 (0-10 cm)	Butyl Benzyl Phthalate	6.63	8,670	4.9	64			mg/kg OC
	NFK501 (0-10 cm)	Butyl Benzyl Phthalate	246	8,670			1,300	1,900	µg/kg DW
	NFK502 (0-10 cm)	Butyl Benzyl Phthalate	5.03	4,990	4.9	64			mg/kg OC
	NFK502 (0-10 cm)	Butyl Benzyl Phthalate	192	4,990			1,300	1,900	µg/kg DW
	NFK502 (0-2 cm)	Total PCBs	24.8	6,510	12	65			mg/kg OC
	NFK502 (0-2 cm)	Total PCBs	161	6,510			130	1,000	µg/kg DW
	NFK 502 (0-10 cm)	Total PCBs	18.9	4,990	12	65			mg/kg OC
	NFK 502 (0-10 cm)	Total PCBs	94.1	4,990			130	1,000	µg/kg DW
	NFK503 (0-2 cm)	Total PCBs	677	2,770	12	65			mg/kg OC
	NFK503 (0-2 cm)	Total PCBs	1,880	2,770			130	1,000	µg/kg DW
	NFK503 (0-10 cm)	Total PCBs	369	3,600	12	65			mg/kg OC
	NFK503 (0-10 cm)	Total PCBs	1,330	3,600			130	1,000	µg/kg DW
Mickelson, S., 2002	NFK504 (0-2 cm)	Bis (2-ethylhexyl) Phthalate	63.3	10,800	47	78			mg/kg OC
	NFK504 (0-2 cm)	Bis (2-ethylhexyl) Phthalate	682	10,800			1,300	1,900	µg/kg DW

	NFK503 (0-10 cm)	Total PCBs	30.4	25,500	12	65			mg/kg OC
	NFK503 (0-10 cm)	Total PCBs	777	25,500			130	1,000	µg/kg DW
	NFK503 (0-2 cm)	Total PCBs	260	26,200			130	1,000	µg/kg DW
	NFK501 (0-2 cm)	Total PCBs	168	23,000			130	1,000	µg/kg DW
	NFK501 (0-10 cm)	Total PCBs	174	21,300			130	1,000	µg/kg DW
Ecology, 2003	Station 4	Total PCBs	330	23,200	12	65			mg/kg OC
	Station 5	Total PCBs	22	12,100	12	65			mg/kg OC
	Station 6	Total PCBs	16	9,200	12	65			mg/kg OC
	Station 7	Total PCBs	160	29,200	12	65			mg/kg OC
	Station 7 - duplicate	Total PCBs	230	26,100	12	65			mg/kg OC
	Station 11	Total PCBs	18	8,000	12	65			mg/kg OC
Project Performance Corporation, 2003	DNC2S3	Total PCBs	61	6,200	12	65			mg/kg OC
	CHSSS2	Total PCBs	110	22,000	12	65			mg/kg OC
	CHBMS3	Total PCBs	2,190	21,000	12	65			mg/kg OC
	CHBSS1	Total PCBs	90	22,000	12	65			mg/kg OC
Calibre Systems, 2006	SI-05	Total PCBs	22.6	15,600	12	65			mg/kg OC
	SI-05	Total PCBs	353	15,600			130	1,000	µg/kg DW

2LAET = Puget Sound second lowest apparent effects threshold
CSL = Washington State Sediment Management Standard, Sediment Impact Zone Maximum Level and Sediment Cleanup Screening Level
DW = Dry Weight Normalized
LAET = Puget Sound lowest apparent effects threshold
OC = Organic Carbon Normalized
SQS = Washington State Sediment Management Standards, Marine Sediment Quality Standard

Lower Duwamish Waterway
Early Action Area 7
Table 3: Regulatory Database Listings for Identified Facilities of Concern

Facility	Address	Industrial Stormwater General Permit	UST list (#UST/Status)	LUST list (#Reported Release/Status)	Hazardous Waste Facility (RCRA SITE ID)	King County Industrial Waste Discharge Authorizations	CSCSL	NPDES and State Waste Discharge
Boeing Developmental Center	9725 East Marginal Way South, Tukwila	SO3000343D	Not Listed	Not Listed	WAD093639946	Discharge Authorization #526-04	Site ID 4581384	Not Listed
Boeing Military Flight Center	10002 East Marginal Way South, Tukwila	SO3000150D	Not Listed	Not Listed	WAD988475943 (Inactive as of 12/31/1996)	Discharge Authorization #363-02	Not Listed	Not Listed
King County International Airport	7277 Perimeter Road South, Seattle	SO3000343D	5 closed	2 Reported Cleaned Up	WAD980986848 (For Airport Maintenance: 6518 Ellis Ave South)	Discharge Authorization #4109-01	Not Listed	Not Listed
Associated Grocers, Inc.	3301 South Norfolk Street, Seattle	SO3002040D	2 operational	2 Cleanup Started	WAD007942535	Not Listed	Site ID 73338176	Not Listed
Northwest Auto Wrecking	10230 East Marginal Way South, Tukwila	SO000961D	Not Listed	Not Listed	Not Listed	Not Listed	Site ID 2287	Not Listed
Affordable Auto Wrecking	9802 Martin Luther King Jr. Way South, Seattle	SO000843D	Not Listed	Not Listed	Not Listed	Discharge Authorization #732-01	Site ID 7163112	Not Listed
Arco Gas Station	9840 Martin Luther King Jr. Way South, Seattle	Not Listed	26 removed	1 Cleanup Started	Not Listed	Not Listed	Site ID 29429665	Not Listed

Key:
NPDES: National Pollutant Discharge Elimination System
UST List: Ecology Underground Storage Tank List
LUST list: Ecology Leaking Underground Storage Tank List
CSCSL: Ecology Suspected and Confirmed Contaminated Sites List
RCRA: Resource Conservation and Recovery Act

Lower Duwamish Waterway
Early Action Area 7
Table 4: In-line Storm Drain Sediment Sampling Locations, Norfolk CSO/SD

Basin	Sample Location ID	Date	Location	Description	Sample ID
Norfolk	MH1[e]	10/01/03	Norfolk-MLK Way SD 36" outfall to ditch	Sediment from hole at buried outfall	MH1-100103-N
Norfolk	MH2[e]	10/01/03	Norfolk-MLK Way SD 36" outfall to ditch	Duplicate of MH1	MH2-100103-N
Norfolk	MH3[e]	10/01/03	MH adjacent to wash pad at 9892 40th Ave S (36")	Hyster	MH3-100103-N2
Norfolk	MH3[e]	03/16/05	MH adjacent to wash pad at 9892 40th Ave S (36")	Hyster	MH3-031605
Norfolk	MH4[e]	10/01/03	MH ML King Jr Wy S and driveway, NW corner		MH4-100103-N2
Norfolk	MH4[e]	03/16/05	MH ML King Jr Wy S and driveway, NW corner		MH4-031605
Norfolk	MH5-N2[e]	10/01/03	MH SE corner 9901 MLK Jr Way S		MH5-100103-N2
Norfolk	MH5-N3	10/01/03	Black sand/grit stored at 9901 MLK Jr Way S	Coluccio yard	MH5-100103-N3
Norfolk	MH6	10/01/03	Norfolk ditch opp. fueling pad at 9892 40th Ave S		MH6-100103-N1
Norfolk	MH7[e]	10/02/03	MH ML King Jr Wy S and S Norfolk St, NE corner		MH7-100203-N1
Norfolk	MH7[e]	03/16/05	MH ML King Jr Wy S and S Norfolk St, NE corner		MH7-031605
Norfolk	Norfolk20	09/30/04	WSDOT pond: first cell		Norfolk20-093004
Norfolk	Norfolk21	09/30/04	WSDOT pond: head of swale (at outlet SPU drain)		Norfolk21-093004

Source: SPU 2005