
TERMINAL 115 ENVIRONMENTAL CONDITIONS REPORT



Property:

Port of Seattle Terminal 115
6000 to 6700 West Marginal Way Southwest
Seattle, Washington

Prepared for:

Port of Seattle
2711 Alaskan Way
Seattle, Washington



Date:

April 6, 2011



Prepared for:

Port of Seattle
2711 Alaskan Way
Seattle, Washington 98121

Terminal 115 Environmental Conditions Report

Port of Seattle Terminal 115
6000 to 6700 West Marginal Way Southwest
Seattle, Washington 98106

SoundEarth Project No.: 0675-002-01

Prepared by:

A handwritten signature in blue ink, appearing to read "Ryan M. Thompson".

Ryan M. Thompson
Project Scientist

A handwritten signature in blue ink, appearing to read "Chris Carter".

Chris Carter
Senior Scientist

Reviewed by:

A handwritten signature in blue ink, appearing to read "John Funderburk".

John Funderburk, MSPH
Principal

April 6, 2011



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EXECUTIVE SUMMARY

SoundEarth Strategies, Inc. was commissioned by the Port of Seattle to complete an Environmental Conditions Report of Terminal 115 listed as 6000 to 6700 West Marginal Way Southwest in Seattle, Washington. The primary objective of this Environmental Conditions Report is to perform an independent review and evaluation of current and historical spills and releases, land development activities, and operations on and immediately adjacent to Terminal 115 to identify, to the extent feasible, issues of environmental concern that may have included the use, manufacture, storage, and/or disposal of hazardous or toxic substances that could affect the environmental quality of soil, groundwater, surface water, or sediment at and adjoining Terminal 115. Additionally, the report evaluates the pathways that may allow for the migration of the identified potential and confirmed releases of hazardous or toxic substances to the Lower Duwamish Waterway.

Terminal 115 is located on the western shore of the Lower Duwamish Waterway between river mile 1.6 and river mile 2.1 and has an extensive history of industrial and commercial use that began in 1909. During the course of several investigations conducted along the Lower Duwamish Waterway, Terminal 115 was identified by the Washington State Department of Ecology as a site of potential interest for source control. Terminal 115 North, which is located within the Terminal 115 property boundaries, is currently managed under an Agreed Order between the Port of Seattle and the Washington State Department of Ecology.

Site operations have included dredging and filling, Boeing Plant 1 operations, retail gasoline service stations, vehicle maintenance and salvage, gravel and concrete/cement production, and tin reclamation. Terminal 115 is currently occupied by a number of seafood facilities, cargo storage and transfer operations, vehicle maintenance facilities, and a commercial fleet vehicle refueling station. Upgrades and improvements to infrastructure at Terminal 115 have occurred with each change of operation, and several subsurface investigations and sediment sampling events have been conducted at the property to evaluate the potential for environmental impacts as a result of past and current operations.

This report documents readily available information relevant to potential issues of environmental concern at Terminal 115. This information will be considered in the formulation and implementation of an effective, long-term source control strategy to control potential sources of contaminants to the Lower Duwamish Waterway associated with the Terminal 115 property. Not all of the potential issues of environmental concern translate to a direct or indirect contamination pathway for the waterway. In some cases, an evaluation of contamination pathways impacting the portions of the Lower Duwamish Waterway along Terminal 115 cannot be completed until data gaps associated with potential pathways resulting from current and former operations at Terminal 115 have been assessed and characterized. Source control action items may be identified by the Washington State Department of Ecology to address the data gaps associated with the potential pathways in order to assess the potential for sediment recontamination.

ACRONYMS AND ABBREVIATIONS

µg/L	micrograms per liter
1942 Boeing site plan	a drawing by Boeing titled “Boeing Aircraft Co. - Plant No. 1, Seattle, Wash.” and dated June 2, 1942
1952 Boeing site plan	a drawing by Boeing titled “Plant 1, General Layout Showing Air Distribution System” and dated December 10, 1952
1957 Boeing site plan	a drawing by Leo A. Daly & Associates titled “Sewer Layout: Sewer Facilities Plant I Modernization, Seattle, Washington, Boeing Airplane Company” and dated April 26, 1957
1963 Boeing site plan	a drawing by Boeing titled “Plot Plan: Former Plant I, Terminal 115” and dated 1963
AO	Agreed Order
AST	aboveground storage tank
Baist’s Atlases	Baist’s Real Estate Atlases
bgs	below ground surface
Boeing	The Boeing Company; formerly the Boeing Airplane Company
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CKD	cement kiln dust
cm	centimeter; centimeters
COC	chemical of concern
Columbia	Columbia Environmental Inc.
Crowley	Crowley Marine Services
CSL	Washington State Sediment Cleanup Screening Levels
CSO	combined sewer overflow
CUL	cleanup level
CVOC	chlorinated volatile organic compounds
cy	cubic yards



Data Gaps Report	Summary of Existing Information and Identification of Data Gaps Report
DMMP	Dredged Material Management Program
DRPH	diesel-range petroleum hydrocarbons
Ecology	Washington State Department of Ecology
ECR	Environmental Conditions Report
ENSR	ENSR Consulting and Engineering
EPA	U.S. Environmental Protection Agency
FS	feasibility study
ft/ft	feet per foot
GSM	GeoScience Management, Inc.
Glacier NW	Glacier Northwest, Inc.; formerly Lone Star Northwest, Inc.
GPMS	General Permit for Municipal Stormwater
GRPH	gasoline-range petroleum hydrocarbons
HLA	Harding Lawson Associates
HPAH	high molecular weight polycyclic aromatic hydrocarbon
Icicle	Icicle Seafoods, Inc.
IEC	Issue of Environmental Concern
ISWGP	Industrial Stormwater General Permit
Klinker	Klinker Sand & Gravel Company
Landau	Landau Associates, Inc.
LDW	Lower Duwamish Waterway
MCWPC	Mineralized Cell Wood Preserving Company
MG	million gallons
mg/kg	milligrams per kilogram



MRI	MRI Corporation
MSL	mean sea level
MTCA	Washington State Model Toxics Control Act
N/A	not applicable
Northland	Northland Services, Inc.
NPDES	National Pollutant Discharge Elimination System
ORPH	oil-range petroleum hydrocarbons
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCP	pentachlorophenol
PCS	petroleum-contaminated soil
Phoinix	Phoinix Corporation
POS	Port of Seattle
ppm	parts per million
Proler	Proler International
RCRA	Resource Conservation and Recovery Act
Reichhold	Reichhold, Inc.; formerly Reichhold Chemicals, Inc.
RI	remedial investigation
RM	river mile
ROW	right-of-way
Sanborn Map	Sanborn Fire Insurance Map
SCAP	Source Control Action Plans
Schnitzer	Schnitzer Steel Industries, Inc.
SD	storm drain



Seafreeze	Seafreeze Acquisition, LLC
sf	square feet
SHA	Site Hazard Assessment
Shaw	Shaw Environmental & Infrastructure, Inc.
SKCDPH	Seattle-King County Department of Public Health
SoundEarth	SoundEarth Strategies, Inc.
SPH	separate-phase hydrocarbons
SQS	Sediment Quality Standards
TCLP	Toxicity Characteristic Leaching Procedure
Terminal 115	Port of Seattle Terminal 115 property located at 6000 to 6700 West Marginal Way Southwest in Seattle, Washington
TFH	total fuel hydrocarbons
TPH	total petroleum hydrocarbons
TSCA	Toxic Substances Control Act
USACE	U.S. Army Corps of Engineers
UST	underground storage tank
VOC	volatile organic compounds

1.0 INTRODUCTION

SoundEarth Strategies, Inc. (SoundEarth) was commissioned by the Port of Seattle (POS) to complete an Environmental Conditions Report (ECR) of Terminal 115 listed as 6000 through 6700 West Marginal Way Southwest in Seattle, Washington (Terminal 115; Figure 1). The primary objective of this ECR is to perform an independent review and evaluation of current and historical spills and releases, land development activities, and operations on and around Terminal 115 to identify, to the extent feasible, Issues of Environmental Concern (IECs) that may have included the use, manufacture, storage, and/or disposal of hazardous or toxic substances that could affect the environmental quality of soil, groundwater, surface water, or sediment at and adjoining Terminal 115. Additionally, the ECR evaluates the pathways that may allow for the migration of the identified potential and confirmed releases of hazardous or toxic substances to the Lower Duwamish Waterway (LDW).

1.1 PURPOSE OF STUDY

Terminal 115 is located along the LDW, an approximately 5-mile stretch of the Duwamish River (river mile (RM) 0 to RM 4.9) that was added to the U.S. Environmental Protection Agency's (EPA's) Superfund list in 2001. In December 2000, the EPA and the Washington State Department of Ecology (Ecology) entered into an Agreed Order (AO) with King County, the POS, the City of Seattle, and The Boeing Company (Boeing). The purpose of the order is to perform a Remedial Investigation and Feasibility Study (RI/FS) of the waterway sediment contamination to assess potential risks to human health and the environment and evaluate cleanup alternatives. Ecology published the LDW Source Control Strategy in January 2004 to outline the major source control program elements for the LDW site (Ecology 2004). Preventing recontamination of sediments to levels that exceed the Washington State Sediment Management Standards (according to Chapter 173-204 of the Washington Administrative Code) and the LDW sediment cleanup goals is the primary focus of Ecology's source control strategy. The LDW source control program, under Ecology's lead, is designed to identify and manage sources of contamination to LDW sediments in coordination with sediment remediation activities. This program provides the framework for identifying source control issues and implementing effective remedial controls, potentially including various levels of source removal as remedial action. To support this program effort, Ecology is preparing a Summary of Existing Information and Identification of Data Gaps Report (Data Gaps Report) and Source Control Action Plans (SCAP) to establish current environmental conditions and evaluate historical and ongoing sources of contamination at identified sites along the LDW. Ecology will be producing an independent Lower Duwamish Waterway RM 1.6 to 2.1 West (Terminal 115) Data Gaps Report and SCAP, which includes Terminal 115 and all upland basin areas that may be impact contributors to the LDW.

Terminal 115 is located along the western shore of the LDW between RM 1.55 and RM 2.1, as shown on Figure 1, and has an extensive history of industrial and commercial use that began in 1909. During the course of several investigations along the LDW, Terminal 115 was identified by Ecology as a site of potential interest for source control. Terminal 115 North, which is located within the Terminal 115 property boundaries, is currently managed under an AO between the POS and Ecology. The Terminal 115 property is included in Ecology's Source Control Area RM 1.6 to RM 2.1 (Ecology 2008). Source control strategies specific to the Terminal 115 North site are being developed as part of an RI/FS currently in progress by the POS, under Ecology guidance.

This ECR is part of the comprehensive source control effort for Terminal 115 that the POS is using to establish the basis for developing, implementing, and managing future source control activities for Terminal 115. This document supports the Ecology-generated documents on the larger Source Control Area RM 1.6 to RM 2.1.

1.2 METHODOLOGY/SCOPE OF WORK

This ECR was conducted in accordance with *Scope of Work - RFQ 090053 TERMINAL 115 Baseline Environmental Conditions (and Data Gaps) Report, Port of Seattle Terminal 115*, prepared by SoundEarth and dated September 27, 2010.

The scope of work for this ECR included the following tasks:

- A review of various sources of historical information at **governmental agencies**, such as the Puget Sound Regional Archives, the King County Assessor's Office, the National Archives Seattle Regional Facility, the City of Seattle Department of Planning and Development, the City of Seattle Engineering Vault, the City of Seattle Municipal Photography Archives, and the Seattle Public Library.
- A review of various sources of historical information at **non-profit agencies**, such as the Seattle Museum of History and Industry, the Museum of Flight, and HistoryLink.org.
- A review of **historical documents**, such as Sanborn Fire Insurance Maps (Sanborn Maps), Kroll Maps, Baist's Real Estate Atlases (Baist's Atlases), reverse city directories published by Polk and Cole Co., aerial photographs dating from 1922, historical topographic maps, and historical newspaper articles published by *The Seattle Times* dating from 1921.
- A review of current **federal databases** including EPA Comprehensive Environmental Response, Compensation, and Liability Information System database; the EPA National Priority List; the EPA Resource Conservation and Recovery Act (RCRA) Notifiers; RCRA Corrective Action Report; Facility Index System; and the Emergency Response Notification System.
- A review of current **state databases** including the underground storage tank (UST), the leaking UST, and the confirmed and suspected contaminated sites databases.
- A **reconnaissance** of Terminal 115 and surrounding area to search for visual and/or olfactory evidence of contamination, such as stained soil, unusual odors, distressed vegetation, pipes, drums, oil sheens and/or discolored water, and improper manufacturing or waste disposal practices.
- A reconnaissance of Terminal 115 structures, facilities, equipment, utility services, and operations.
- The preparation of this report.

2.0 SITE DESCRIPTION

The following is a summary of the current configuration and historical land use at Terminal 115, including the location and legal description of the property, a discussion of property topography and shoreline characteristics, a discussion of property and regional geology and hydrogeology, and a

discussion of current property use including identification of current structures (both aboveground and subgrade) located at Terminal 115.

2.1 LOCATION AND LEGAL DESCRIPTION

Terminal 115 (which includes Terminal 115 North) is located in the northeast quadrant of Section 30, Township 24 North, Range 4 East in King County, Washington. The street address is 6000 through 6720 West Marginal Way Southwest and 150 through 206 Southwest Michigan Street in Seattle, Washington (Figure 1). Terminal 115 is bounded to the east by the LDW, to the west by West Marginal Way Southwest, and to the north by the Glacier NW property. Terminal 115 is bounded to the south by Southwest Michigan Street, although the office complex located at 200 Southwest Michigan Street (the former Foss Environmental site) is not included within the property boundaries. A vacant lot used for container storage located across Southwest Michigan Street and east of Second Avenue Southwest at 6000 West Marginal Way Southwest is included within the boundaries of Terminal 115.

Terminal 115 consists of two parcels (King County Parcel Nos. 536720-2503 and 536720-2505) covering a total of approximately 99.46 acres (0.155 square mile) of land, located approximately 2 miles south of downtown Seattle, Washington, as shown on Figure 2. Figure 3 depicts the stormwater and sewer infrastructure beneath Terminal 115.

The following is a legal description of Terminal 115.

King County Parcel No. 5367202503: MCLAUGHLINS WATER FRONT ADD PARCEL "F" SEATTLE LOT BOUNDARY ADJUSTMENT NO 2207807 REC NO 20030211900004 WCH IS POR OF JOSEPH R MCLAUGHLINS WATERFRONT ADDITION TO THE CITY OF SEATTLE PLAT IN NE 1/4 STR 30-24-04

King County Parcel No. 5367202505: MCLAUGHLINS WATER FRONT ADD PARCEL "A" SEATTLE LOT BOUNDARY ADJUSTMENT NO 2207807 REC NO 20030211900004 WCH IS POR OF JOSEPH R MCLAUGHLINS WATERFRONT ADDITION TO THE CITY OF SEATTLE PLAT IN NE 1/4 LESS POR CONV TO WASH STATE D.O.T. AS DESC IN Q.C.D. UNDER REC NO 20051129002556 (DESCRIBED AS 'TRACT 1' AND 'TRACT 2') AND LESS POR CONV TO CITY OF SEATTLE AS DESC IN Q.C.D. UNDER REC NO 20051129002557 AND LESS POR CONV TO CITY OF SEATTLE AS DESC IN Q.C.D. UNDER REC NOS 20051129002558 AND 20051129002559 LESS PORS CONV TO STATE OF WASHINGTON AS DESC IN Q.C.D. UNDER REC NO 20051129002573

2.2 TOPOGRAPHY AND SHORELINE CHARACTERISTICS

Terminal 115 has approximately 2,790 feet of shoreline bordering the west side of the LDW between RM 1.5 and RM 2.1. The shoreline includes approximately 1,260 linear feet of concrete and improved riprap bulkhead shoring and 1,510 linear feet of improved riprap, exposed soil, and vegetated slopes. The southern portions of the shoreline also include some dilapidated wood structures adjacent to the former Commercial Fence Corporation that were not investigated for purposes of this investigation because of safety and access limitations. Those portions of Terminal 115 located along the shoreline were constructed either from engineered fill material or former alluvial land that was excavated to create the LDW. The Terminal 115 shoreline is therefore considered an engineered artificial feature.

The Terminal 115 property is topographically flat, with most of the elevation changes occurring within 20 feet of the LDW and in areas abutting West Marginal Way Southwest (Figure 1). A large vegetated greenzone hillside is situated to the west of Terminal 115 with steep grades leading down (east) to the West Marginal Way Southwest right-of-way (ROW). The entirety of the site, not including shoreline areas abutting the LDW, is between 10 and 26 feet above mean sea level (MSL). Most of the terminal facilities reside at elevations of 18 to 25 feet above MSL, as shown on Figure 1. A small unfilled and

ungraded section of the southeastern corner of the Terminal 115 site that grades downward to the shoreline of the LSW is situated 10 to 20 feet above MSL. Terminal 115 North contains a terrace that was historically the location of settling basins for former detinning operations, which resulted in a small topographical feature ranging from 26 to 18 feet above MSL.

2.3 GEOLOGY AND HYDROGEOLOGY

The Terminal 115 landscape has an extensive history of erosion and deposition, from glaciofluvial sources to modern stream flow processes, culminating in extensive human modification by placement of fill in the historical Duwamish River channel (Troost and Booth 2008). The following sections provide a summary of the geomorphology and surficial geology, hydrology, and hydrogeology of Terminal 115.

2.3.1 Geology

During the Pleistocene Epoch, the Puget Lobe of the Cordilleran Ice Sheet advanced into the Seattle area. The glacial event, known as the Vashon Stade, resulted in the creation of the **Duwamish Trough** (Troost and Booth 2008). This significant erosional feature was formed by glacial ice scour from the advancing ice sheet and glaciofluvial processes during melting (Dragovich et al. 1994). The Duwamish Trough subsequently became the outlet for melt waters originating from the western Cascade Range and formed the Duwamish River (Troost and Booth 2008).

Historically, the area of Terminal 115 received alluvial and floodplain deposits of silt, clay, and sand, which are typical deposits from a large river system. The thickness and extent of the materials deposited on the area of Terminal 115 varied as the river meandered.

The majority of the filling activities occurred on the property in the 1950s through 1971. Beginning in November 1969 a program was instituted to reclaim and expand Terminal 115 through extensive filling, dredging, and excavation of the portion of the LDW and Turning Basin No. 1 flowing through the property and nearby river banks (Lane 1971, POS 1972a and 1972b). Figures 4B and 4C and the photographs in Appendix A illustrate progression of the reclamation process, filling the former Turning Basin No. 1 waterway and creating usable land for the expansion of Terminal 115. Based on comparisons between the current elevations of the Terminal 115 apron and the historical soundings of the LDW on the eastern portion of the property mapped in 1956, **this reclaimed area contains upwards of approximately 20 feet of fill above the pre-1969 riverbed.** Areas including and immediately adjacent to the former Foss Island (Figure 4B) consist of approximately 10 to 20 feet of fill above alluvium. The southern area of Terminal 115 generally has 10 feet or less of fill (Columbia 1997; GSM 1998). Terminal 115 North consists of approximately 0 to 25 feet of fill, with the fill-native interface increasing in depth from the west to east. According to Troost and Booth (2008), **fill used to reclaim the historical Duwamish River channel generally consisted of gravel, sand, silt, concrete, bricks, coal, wood, garbage, and other miscellaneous materials.** The operational fill history of Terminal 115 is discussed in Section 3.9.

A limited amount of site-specific soil boring data is available for Terminal 115. Soil boring logs from near-surface soil sampling and shallow groundwater monitoring well installations were reviewed to generally identify fill areas and thickness. The reviewed soil boring logs varied in the quality and clarity of lithologic descriptions. However, the following general observations could be gleaned from the available data and are referenced to areas on Terminal 115 (Figure 4):

- Former Boeing Plant 1: up to 10 feet of fill above alluvium (EMCON 1995).
- Schultz Distributing, Inc. (Cardlock Facility): fill to at least 15 feet (Columbia 1997).
- Buildings C1 and C2: fill to at least 15 feet (HLA 1990).
- Terminal 115 North: fill to at least 15 feet in the eastern area to approximately 1 to 5 feet in the western area (Landau 2009).

2.3.2 Hydrogeology

Terminal 115 is located on the west bank of the present day LDW (Figure 1). The Duwamish River was formed in the Pleistocene Epoch and is a meandering river with headwaters originating in the western Cascade Range (Troost and Booth 2008). According to Kroll Maps, Baist's Atlases, and Sanborn Maps, the Duwamish River was channelized in the early 1900s to provide a navigable waterway for commercial maritime traffic. Based on a review of U.S. Army Corps of Engineers (USACE) documents, historical photographs, Sanborn Maps, and Kroll Maps, the majority of the channelization took place between 1914 and the 1920s. Prior to channelization, the Duwamish River flowed in a series of meanders. As previously described, prior to commercial development of the Duwamish River, Turning Basin No. 1 (remnants of an oxbow meander) was located in the central portion of Terminal 115 (Figures 4B and 4C).

Significant data concerning shallow groundwater flow gradient(s) and direction(s) have not been collected for the eastern area of Terminal 115, specifically along the property's boundary with the LDW. Limited data have been collected in the area of Building W-2 in association with a leaking UST, which indicated groundwater flowed to the east (Environmental Science & Engineering, Inc. 1994). Because of this, complete data concerning the local groundwater flow direction and gradient, as well as surface water to groundwater interactions, are not available. However, limited groundwater data are available for other areas of Terminal 115. According to GeoScience Management, Inc. (GSM 1995a), in April 1995 groundwater levels measured in shallow monitoring wells near the southwestern corner of Terminal 115 (Figure 6B) indicated a southwesterly groundwater flow direction (away from the LDW) with a gradient of 0.03 feet per foot (ft/ft). These wells were located approximately 1,500 feet west of the Duwamish River (Figure 6). In 1995 groundwater levels measured in shallow monitoring wells near the southern boundary of Terminal 115 also indicated a southwesterly groundwater flow direction (EMCON 1995).

Numerous studies have been conducted on the hydrology of the Terminal 115 North and Reichhold, Inc. (Reichhold)/Glacier Northwest, Inc. (Glacier NW) sites (ERM 2009). In September 2003, Shaw Environmental & Infrastructure, Inc. (Shaw) measured groundwater levels in shallow monitoring wells on the Reichhold/Glacier NW property, located immediately north of Terminal 115 (Shaw 2003, 2008) and found that the water level data indicated a groundwater flow direction to the southeast at a gradient that ranged from 0.02 to 0.007 ft/ft. A groundwater depression was also noted in the southeast portion of the site (Shaw 2003, 2008). According to reports produced by the POS and Reichhold/Glacier NW, there also appears to be groundwater depression on the central portion of the Terminal 115 North site. Groundwater contours grade towards this point on both sites (Figure 6D).

In general, the flow direction(s) and gradient(s) of shallow groundwater across Terminal 115 are anticipated to be highly variable as a result of (1) the type(s) and extent(s) of fill material, (2)

areas of recharge and discharge to the shallow aquifer, and (3) the tidal fluctuations of the LDW. The limited site-specific water level data available for review support this supposition.

2.4 CURRENT PROPERTY USE

Terminal 115 is one of six principal marine cargo facilities and container cargo terminals located within industrial shoreline areas in south Elliott Bay. Terminal 115 includes approximately 99 acres of existing upland marine cargo marshalling area and cargo storage, warehouse, and processing facilities. The existing Terminal 115 upland area and dock structures have been in place since approximately 1970. During the past ten years to the present, principal uses and activities at Terminal 115 have included the following:

- Transshipment of bulk cargo using deep draft vessels.
- Barge cargo operations, including marshalling of cargo for truck, rail, and barge shipment.
- Seafood receiving, processing, and shipping.
- Petroleum storage and distribution.
- Repair and maintenance of cargo shipping containers.
- Cargo warehouse activities, including the storage of goods for trans-shipment.
- Industrial uses, including fabrication of rail sections for use in rail line construction, storage of construction crane equipment, and warehousing and storage of metal and wood construction materials.
- Vessel outfitting, maintenance, and repair.
- General warehouse uses.
- General lumber yard uses.
- Uses as a railroad spur.
- Transshipment and storage of auto vehicles.

The present configuration of Terminal 115 and a discussion of the current tenants are described below and presented on Figure 2. The measurements presented below are approximations that were made using scaled aerial photographs. The measurements are intended to present a general overview of the physical configuration of Terminal 115 and are not intended for planning and/or site assessment purposes.

2.4.1 Surface Structures and Improvements

Terminal 115 has undergone numerous upgrades and improvements throughout the POS's ownership history. Many of the recent improvements have been performed by the tenants to facilitate their operations. The current configuration of Terminal 115 is discussed below.

Entry and Egress. The Terminal 115 areas are served by frontage road and gate facilities located at the north and south margins of Terminal 115 (Figure 2). Northland Services, Inc. (Northland) operates a main entrance for container trucks and other incoming traffic on the southwest corner of the property adjacent to the Schultz Distributing Inc. refueling facility (Cardlock Facility), as well as a primary exit on the northwest corner of the property on the north side of

Terminal 115 North. Northland also operates a smaller gated maintenance and service entrance along West Marginal Way Southwest just south of Terminal 115 North. Northwest Container operates a single entrance and exit located along West Marginal Way on the north end of their leased area. The Seafreeze Acquisition, LLC (Seafreeze) and Icicle Seafoods, Inc. (Icicle) facilities are accessed by a gated entrance at the north end of Second Avenue Southwest. Figure 2 presents the tenant-occupied areas and primary entry and egress locations.

Buildings and Structures. There are 20 permanent structures on Terminal 115. In addition, there are several modular structures utilized for a variety of purposes located across the property.

Surface Conditions. Terminal 115 includes approximately 3,550,000 square feet of paved or concrete surface improvements (including approximately 520,000 square feet of building footprints), approximately 700,000 square feet of gravel/unpaved surface, and minor areas of vegetated surface.

South Berth Area. This area of Terminal 115 includes the two barge berths listed below:

- **Finger Pier berth (Berth 1).** Two creosote pile-supported finger piers (each approximately 70 feet long and 35 feet wide) provide cargo transfer to barges moored in this location.
- **Concrete pier and loading ramp berth (Berth 2).** The southeast corner of the existing concrete piling pier is used in combination with a floating steel transfer span (approximately 80 feet long and 20 feet wide). The transfer span is located parallel to the south edge of the concrete pier and connected to an upland hinge point independent of the concrete pier, which is used to transfer cargo to and from barges.

North Berth Area. The North Berth area (Berths 3 and 4) includes approximately 1,200 linear feet of deep draft vessel moorage at an existing concrete pile-supported pier, with approximately 2.3 acres of pier use area. The North Berth area is operated by Northland.

Other Docks. The area of Terminal 115 currently occupied by Seafreeze subtenant Icicle includes a creosote pile-supported pier used for unloading ships with supplies and live seafood. The southernmost area of Terminal 115 formerly occupied by Commercial Fence Corporation includes a creosote pile-supported pier and floating dock occasionally used for temporary boat moorage.

2.4.2 Subsurface Infrastructure

Five independent stormwater drainage basins convey drainage from the paved and graveled surfaces of the Terminal 115 facilities to eight outfalls that discharge to the LDW. Sewage, some stormwater, and process water are conveyed through multiple drain lines, manholes, and oil/water separators throughout the property to a King County Metro sanitary sewer main located beneath West Marginal Way Southwest. In 2005 and 2006, a resurfacing and stormwater project was conducted by Northland and the POS. Stormwater as-builts were provided to the POS. In August 2006, Phoinix Corporation (Phoinix) performed an inspection of Terminal 115 to locate and verify all drainage structures on the property, including structures related to the separate stormwater systems and the combined sewer system. Phoinix inspected Terminal 115 outfalls to verify their size and location in October 2006 and June 2007. The findings from the inspections performed on Terminal 115 are presented in Phoinix's Stormwater

Inspection Report dated December 5, 2006, and Outfall Verification Report dated September 18, 2007 (Phoinix 2006, 2007). Descriptions of the known and suspected subsurface drain infrastructure and outfalls are provided below, and significant features of the system are depicted on Figure 3.

Stormwater System

According to Phoinix's reports and a review of Seattle Public Utility records, the Terminal 115 stormwater system consists of approximately 366 structures, including 8 outfalls that discharge to the LDW and range in diameter from 12 to 48 inches. Based on POS, Metro King County, and City of Seattle data, POS outfalls 2128, 2127, and 2125 (Figure 3) are connected to City of Seattle storm drain features within the West Marginal Way Southwest ROW. The full extent of the upgradient storm drain infrastructure and contributing discharge sources to the outfalls located at Terminal 115 are discussed in the Ecology Lower Duwamish Waterway RM 1.6 to 2.1 West Data Gaps Report.

Sanitary Sewer System

Sewage is generated from several bathroom facilities on Terminal 115, and process water is generated at the following locations:

- Seafreeze and their subtenants' indoor and outdoor seafood processing areas.
- Northland's food storage container wash-out area.
- Northland's vehicle maintenance and wash facilities.
- Shultz Distributing's oil/water separator

Sewage and process water drain off the property through approximately 37 sewer structures within the Terminal 115 boundary to a 42-inch-diameter King County main line (the West Duwamish Interceptor) located beneath West Marginal Way Southwest. The main line routes wastewater to the West Point Treatment Plant located in Seattle, Washington, except when **overflow events** occur. Overflow events result in the discharge of combined sewer and storm drain (SD) effluents draining into the LDW from combined sewer overflow (CSO) lines which discharge into the LDW just south of Terminal 115 at the 36-inch-diameter West Michigan Regulator Station discharge pipeline (Discharge Serial Number 042), and on the northern property boundary at the Terminal 115 CSO/SD (Discharge Serial Number 038). The Terminal 115 CSO/SD is connected to the West Duwamish Interceptor through a 24-inch flap gate and discharges to a 48-inch-diameter storm drain on the Terminal 115 site.

2.4.3 Current Tenant Operations

A list of the current property tenants and subtenants, including a description of their operations, the location and approximate amount of space leased, origination of the lease, and stormwater permit information, is provided below. Tenant locations are presented on Figure 2, and stormwater features are presented on Figure 3.

The POS operates under a Phase I National Pollution Discharge Elimination System (NPDES) **General Permit for Municipal Stormwater (GPMS)**, which was issued by Ecology under the Federal Clean Water Act. Three tenants and subtenants on Terminal 115 are required to operate under **individual Industrial Stormwater General Permits (ISWGs)** in addition to the GPMS. The

POS requires Terminal 115 tenants to complete and maintain Stormwater Pollution Prevention Plans and implement measures to prevent and control the discharge of contaminated stormwater to surface water or groundwater within their operational footprint. Additionally, tenants and subtenants that operate under an ISWGP are also required to conduct quarterly stormwater sampling and submit discharge monitoring reports to Ecology. Current tenant operations are discussed in detail in Ecology's pending Terminal 115 Data Gaps Report.

Commercial Fence Corporation

Description of Operations: Construction contractor specializing in fences

Location: Terminal 115 North

Space Occupied: 28,152 square feet (sf) of land, and 8,374 sf of warehouse

Port Lease Dates: November 1, 2010 to October 31, 2013

Stormwater Permit: GPMS

Gene Summy Lumber Company

Description of Operations: Lumber yard

Location: Terminal 115 North

Space Occupied: 37,008 sf of land

Port Lease Dates: January 1, 2010 to December 31, 2014

Stormwater Permit: GPMS

Seafreeze Cold Storage

Description of Operations: Seafood processing and cold storage warehouse

Location: South end of Terminal 115

Space Occupied: 12.3 acres (817,429 sf of land and 17,254 sf of submerged land)

Lease Dates: November 1987 to November 21, 2027

Stormwater Permit: GPMS

Icicle Seafoods, Inc. (subtenant to Seafreeze)

Description of Operations: storage subtenant to Seafreeze, involved in seafood processing and cold storage

Location: Southeast corner of Terminal 115

Space Occupied: 5.8 acres

Port Lease Dates: Not applicable (N/A)

Stormwater Permit: ISWGP WAR010720 (formerly SO3010720A)

Shultz Distributing, Inc. (Cardlock Facility)

Description of Operations: Automated commercial vehicle fueling facility

Location: Southwest corner of Terminal 115

Space Occupied: 0.9 acre (40,894 sf of land and 1,560 sf building)

Lease Dates: August 10, 1994 to August 9, 2011

Stormwater Permit: GPMS

Subway Corporation (subtenant to Schultz Distributing)

Description of Operations: A fast food restaurant—a Subway sandwich shop franchise

Location: Southwest corner of Terminal 115

Space Occupied: 0.1 acre

Lease Dates: N/A

Stormwater Permit: N/A

Portside Coffee Company (subtenant to Schultz Distributing)

Description of Operations: A drive-through coffee stand

Location: Southwest corner of Terminal 115

Space Occupied: 0.1 acre

Lease Dates: N/A

Stormwater Permit: N/A

Sea-Pac Transport

Description of Operations: Cargo packaging and shipping

Location: West side of Terminal 115

Space Occupied: 1.26 acres (54,779 sf) land.

Lease Dates: January 1, 2011 to December 13, 2014

Stormwater Permit: GPMS (Formerly ISWGP SO3003983 with Certificate of No Exposure)

Northland Services, Inc.

Description of Operations: A marine shipping business that moves cargo to and from destinations in Alaska and Hawaii

Location: Central portion of Terminal 115

Space Occupied: 57.2 acres

Lease Dates: January 1, 2003 to present

Stormwater Permit: ISWGP WAR000471 (formerly SO3000471D)

Northwest Container Services, Inc. (subtenant to Northland Services, Inc.)

Description of Operations: Container and marine cargo handling

Location: West-central portion of Terminal 115

Space Occupied: 14.7 acres

Lease Dates: N/A

Stormwater Permit: ISWGP WAR003779 (formerly SO3003779C)

3.0 HISTORIC PROPERTY OWNERSHIP AND OPERATIONS

Prior to the 20th century, the Duwamish River valley was used for farming, pasture, logging, and subsistence gathering. After the channelization and dredging of the Duwamish River in the early 20th century, the areas surrounding the river were developed for large-scale industrial use. Seaports, factories, major utilities, and other heavy industrial uses were constructed along the Duwamish River and associated valley. Terminal 115 has been used extensively for commercial and industrial purposes from 1909 until the present. Based on the size and complexity of the site, not all property use and buildings historically present on Terminal 115 are explicitly identified below. Only those significant property uses that are considered Issues of Environmental Concern (IECs) are discussed in detail. An IEC is any current or historical property use that may have resulted in the release of hazardous or potentially hazardous substances to soil, air, groundwater, sediments, or surface water. An IEC is not necessarily considered or defined as potential source for recontamination of the adjacent waterway. The following is a discussion of relevant historical property uses that may be considered IECs, which are summarized in plan view on Figure 4; a timeline denoting significant changes in land use or IEC status is presented on Figure 7. Additional supporting information regarding each of the IECs is provided in Appendix B.

3.1 PRE-INDUSTRIAL HISTORY

The areas of the LDW were densely populated by the Duwamish Tribe, a Coast Salish people that inhabited many areas of King County and metropolitan Seattle prior to settlement in the 1850s by people of European descent. The Duwamish Tribe inhabited villages, practiced limited horticulture and land management, hunted game, and fished along the Duwamish River. Village sites located near the mouth of the Duwamish River and the current location of Terminal 107 (RM 0.5) indicate the former presence of Duwamish village sites consisting of midden piles and multiple longhouses that existed from the 6th century until the 19th century. No documented archeological sites have been recorded for the areas presently occupied by Terminal 115; however, the sources of the village site locations are reported from oral history (Washington State Department of Archeology and Historic Preservation 2010). No archeological evidence has been acquired for Terminal 115.

3.2 PRE-BOEING INDUSTRIAL DEVELOPMENT

As discussed earlier, the Duwamish River was channelized between 1914 and the early 1920s to provide a straight, engineered shipping lane for the industrial development of the Duwamish River Valley. The Terminal 115 property and east-adjointing waterway were channelized between 1915 and 1917. The channelization included the dredging of the bottom of the Duwamish River to an average depth of 20 to

30 feet, the excavating of land to the east and southeast of Terminal 115, and the filling of surrounding areas with dredged sediment (Figures 4B and 4C). Additional dredging operations on the Duwamish River to create desired channel depths continued into the 1920s. The previous oxbow meander of the Duwamish River that was located on Terminal 115 was altered to create Foss Island. In 1917, a rotating metal truss swing bridge, located at the now-vacated West Michigan Street, spanned the LDW (Figure 4).

In 1909, Edward Heath constructed a wood-framed, uninsulated, unheated, two-story boatyard building for the construction of wooden ships on the former Boeing Plant 1 site (Figures 4 and 4A). The boatyard building, referred to during the Boeing operations as building 1-05, now colloquially known as the Boeing Red Barn, was moved to its current location on East Marginal Way and is currently used by the Seattle Museum of Flight. The boatyard was originally built on 200 wooden pilings above the muddy banks of Turning Basin No. 1. Boats were assembled within the barn structure and launched from a quay (Spitzer 1999). Wood processing, treating, and assembly took place at the yard. In 1910, William Boeing Sr., later the founder of Boeing, bought the property and boat building facilities. The land purchased included Lots 7 through 11 of Block 33, McLaughlin's Addition, which is encompassed within the footprint of what would become Boeing Plant 1. The shipyard was utilized as a wooden boat building facility until Boeing occupied the premises in 1917, as discussed in Section 3.4.

3.3 SOUTHERN WATERFRONT BLOCKS—PETROLEUM SITES

The properties located on the southeastern portion of Terminal 115 included the McLaughlin's Waterfront Addition Blocks 18, 19, and 21. The facilities located on these blocks were occupied by private enterprises largely providing services to Boeing employees during the major production periods of Boeing Plant 1. Two historical service stations and a small building described in tax assessor records as a "refinery building" were located on Terminal 115, as shown on Figure 4.

According to archived tax records, a Standard Oil retail gasoline service station (IEC No. 1) was constructed at 171 Tronsen Place in 1923, although the service station was not visible in aerial photographs until 1929. Tronsen Place has been since vacated. The location of the historical service station is shown on Figure 4. Archived tax records indicate that the service station was equipped with three fuel dispensers. Although no additional information regarding the UST system was listed on the tax sheet, judging from the age of the service station and the type of dispensers installed at the facility (hand-operated, direct-feed dispensers), the USTs were likely located directly beneath the dispensers. An automotive repair and lubrication facility operated in conjunction with the retail gasoline service station. Tax records and aerial photographs indicated that the service station was demolished in 1965. According to aerial photographs taken between 1965 and 2008, the portion of the property that was formerly occupied by Standard Oil has remained undeveloped and is currently used as a parking lot and storage area.

Archived tax records indicate that a small building (IEC No. 2; Figure 4) was constructed on Terminal 115 in 1952 at 104 West Michigan Street. In archived tax documents the building is described as a "refinery building," although the type of refining operation was not identified in any of the records reviewed. The tax records suggest that the area was undeveloped by 1966. Aerial photographs from 1953 through 1964 indicate that a small shed structure and numerous automobiles were located on the property. Aerial photographs taken between 1965 and 2008 depict the property used as a parking lot and storage yard.

According to archived tax records, a Richfield-brand retail gasoline service station (IEC No. 3) was constructed at 120 West Michigan Street at an unlisted date. Aerial photographs taken between 1929 and 1936 indicate that the site was undeveloped. The archived tax records indicate that the site was remodeled in 1938; however, this appears to be the date the service station was constructed. Archived tax records indicate that the service station was equipped with three fuel-dispensing pump islands, a service and lubrication garage, and a retail office building. The fuel dispensers were connected to two 500-gallon USTs and one 1,000-gallon UST, and a hydraulic lift was located within a service garage. The current status of these USTs is unknown. The site is listed as a retail gasoline and service station in the 1938 Polk city directory, and aerial photographs between 1946 and 1964 show the service station building located on the site. Aerial orthographic photographs from 1965 through 2008 indicate that the area has remained undeveloped and is currently used as a parking lot and storage lot.

Multiple residences and small commercial facilities existed on the McLaughlin's Waterfront Addition that listed the heating source as "stove," although the later conversion of the heating sources to oil is possible. According to archived tax records, these residences and small businesses, including cafes and small retail stores, were constructed generally between 1920 and 1940, and they were demolished in 1963 and 1965.

3.4 BOEING PLANT 1 (1917–1970)

As mentioned in Section 3.2, the portion of Terminal 115 later known as Boeing Plant 1 (also known as the Oxbow Plant) originally was used for the manufacture of wooden boats (Spitzer 1999). The growing popularity of metal-hulled boats created a lull in sales for the shipyard, and the increase in demand for airplanes, specifically the seaplanes that Boeing was producing, created the incentive for William Boeing Sr. to move his airplane manufacturing company into the former shipyard in 1917. Because the first airplanes were constructed of wood and canvas, the former boat builder Edward Heath was hired, along with many other craftsmen, to construct seaplanes at the plant. According to photographs of the area and archived tax records, the plant expanded considerably in 1925, 1929, 1942, and 1955. The State of Washington Pollution Control Commission conducted a study in 1945 of sources of pollution on the Duwamish-Green River (Foster 1945). It stated in regards to Boeing Plant 1: "This plant has a highly-toxic, chromic acid waste which is discharged into the Turning Basin. This waste comes from two 2,200 gallon tanks which are dumped about every eight months. The daily loss of chromic acid through spillage and drippings amounts to 25 to 50 pounds. Acids are also used in the pickling room but the tanks are never dumped. A very small amount of cutting oil may also get into the river." The total duration of the cited dumping activities is unknown. The Boeing Plant 1 property and associated buildings were sold to the POS in 1970, and the structures located on the premises were demolished between 1970 and 1977. The majority of the Boeing Plant 1 structures were located on the current site of the Seafreeze building. These include buildings 1-02, 1-04, 1-12, 1-13, 1-21, 1-22, 1-25 through 27, 1-29, 1-30, 1-32, 1-35, 1-39, 1-43, 1-50, and the lift station.

The following subsections provide a more detailed review of the activities conducted during the operation of Boeing Plant 1. The composite layout of Boeing Plant 1 and associated operational areas are presented on Figure 4A.

3.4.1 World War I-Era Boeing Plant 1 (1917–1970)

Boeing Plant 1 began operations out of the former Heath Shipyard building (Building 1-05) in 1917, at which time the barn-like structure was outfitted with a second-story drafting and machining room for the manufacture of biplane seaplanes. The construction of components and the assembly of the planes occurred entirely within Building 1-05 until additional buildings were constructed in 1917 and 1918. Considerable expansion of the Boeing airplane factory commenced in 1917 and 1918 for the construction of warplanes used in World War I. According to archived tax assessor records and historical photographs, the assembly building (Building 1-03), plating and paint shop (Building 1-04), boiler house/test warehouse (Building 1-06), and dry kiln (Building 1-10) were constructed in 1917 and 1918. An assembly building, paint shop, storage facility, and crating shop were constructed within a single building in 1918 at Building 1-08. In addition, a small outlying dock was located to the northeast of Building 1-06 and an office was located to the south of Building 1-05. A transformer house (Building 1-07) was constructed as an addition to Building 1-06 in 1928.

According to a Boeing drawing titled “Boeing Aircraft Co. – Plant No. 1, Seattle, Wash.” dated June 2, 1942 (the 1942 Boeing site plan; Boeing 1942), and the 1950 Sanborn Map, Building 1-05 was used as a wood working and planning shop, as well as a storage facility. Building 1-23 appears to be attached to Building 1-05 and was used for paint storage. According to a Boeing drawing titled “Plant 1, General Layout Showing Air Distribution System” dated December 10, 1952 (the 1952 Boeing site plan; Boeing 1952), and a Leo A. Daly & Associates drawing titled “Sewer Layout: Sewer Facilities Plant I Modernization, Seattle, Washington, Boeing Airplane Company” dated April 26, 1957 (the 1957 Boeing site plan; Leo Daly 1957), Building 1-05 was utilized as a maintenance building. Building 1-05 was removed from the property in 1975.

Building 1-03 (IEC No. 4.01) was originally constructed to assemble large seaplanes. In the 1930s, the assembly building became obsolete as the size of the structure could not accommodate the size of modern all-metal aircraft. During the 1930s and 1940s, the building was used to assemble component parts that were later sent to Boeing Plant 2 and the Boeing Renton Factory for final assembly. According to Sanborn Maps and the 1942 Boeing site plan, an oil house was located 30 feet to the west of Building 1-03. Aerial photographs indicate that the assembly building was demolished by 1978.

Archived tax records and Boeing site plans indicate that Buildings 1-06 and 1-10 (IEC No. 4.02), the boiler house and dry kiln, respectively, were located on the waterfront of the World War I-era Boeing Plant 1. These buildings were involved in the drying and treating of wood and the production of heat for the plant. According to the 1942 Boeing site plan, a 4,200-gallon fuel oil UST (Tank No. 16; Figures 4A and 5) was located to the south of Building 1-06. Building 1-07 (IEC No. 4.03) housed a transformer and was built as an addition to the boiler house in 1928. Tax record photographs indicate that the transformer was rated for 26,000 volts. According to aerial photographs, these structures were removed from the site by 1978.

According to historical photographs, Building 1-08 (IEC No. 4.04) was constructed in approximately 1918. Building 1-08, referenced as the old assembly building, was originally used for assembly of parts before crating and delivery. The 1942 Boeing site plan and the 1950 Sanborn Map indicate the use of the building as a welding, paint spraying, crating, materials testing, shipping, and plaster shop. In the 1957 Sanborn Map, Building 1-08 was listed as housing the engineering drafting offices and was equipped with a tank of unknown contents

(Tank No. 15, Figures 4A and 5) located adjacent to the building to the east. The current status of Tank No. 15 is unknown. No other references to the tank were observed in the materials reviewed. The structure was demolished by 1974.

The paint spraying and plating shop (Building 1-04, IEC No. 4.05) was constructed in 1918. The building was located to the south of Building 1-03 and contained facilities for spraying paint and plating airplane parts. The 1942 Boeing site plan and the 1950 Sanborn Map indicate that the westernmost portion of the building was used primarily for paint spraying, and the remainder of the building was used for “anodic treatment,” which is synonymous with plating. This technique typically involves treating an aluminum alloy with acid or caustic liquid to improve adhesion of paint and resistance to corrosion. A section diagram included with the archived tax record included a reference to a “Tank - Personal” (Tank No. 14). This was interpreted to represent a storage tank associated with the historical use of the building. No other reference to the “personal” tank was observed in the available records. The current status of Tank No. 14 is unknown. The 1952 and 1957 Boeing site plans and a drawing by Boeing titled “Plot Plan: Former Plant I, Terminal 115” dated 1963 (the 1963 Boeing site plan; Boeing 1963) list Building 1-04 as utilized for finishing and inspection. According to aerial photographs, the building was demolished by 1974.

According to the 1942 Boeing site plan, a parts storage building (Building 1-12, IEC No. 4.06) was constructed at an unknown date south of Building 1-08. Historical photographs suggest that the building was constructed in 1918. Building 1-12, according to the 1957 Boeing site plan, was utilized as a maintenance welding facility. According to aerial photographs, the building was demolished in 1966.

According to aerial photographs taken in the years 1922, 1924, and 1936, several residences unassociated with the Boeing facilities were located on both the eastern and western banks of McAllister’s Slough. No building or tax records pertaining to these structures were observed in the available records. Aerial photographs indicate that the structures were removed by 1970 during the infilling of Terminal 115.

3.4.2 Machine Shop/Main Factory Facility—Building 1-02 (1925–1974)

Photographs taken in 1919 suggest that the area occupied by the Boeing Machine Shop (Building 1-02, IEC No. 4.07) was initially developed with a two-story office building. According to aerial photographs, by 1924 the area occupied by Building 1-02 was used as a storage and staging area for materials. According to archived King County tax records, Building 1-02 was constructed in 1925. A Sanborn Map published in 1929 and the 1942 Boeing site plan indicated that Building 1-02 contained brazing and welding facilities, a machine shop, a sheet metal shop, heat treating facilities, an assembly room for airplane components, and metal cutting, burning, and grinding shops. In addition, welding equipment, fuel, and sheet metal was stored in a structure to the west of the building. According to the 1942 Boeing site plan, a fuel dispenser and buried gasoline tank (Tank No. 8; Figures 4A and 5) (IEC No. 4.08) were located to the southwest of Building 1-02. The current status of Tank No. 8 is unknown. Several transformers were located in the vicinity of the building.

In 1951, engine testing facilities were constructed within the southwestern portion of Building 1-02. This area was equipped with 14 cells designed to test airplane engines. A concrete UST and three 5,000-gallon USTs (Tank Nos. 4 through 7; Figures 4A and 5) were installed to the south of

Building 1-02, and the tanks were connected to a system of pumps and fuel piping to connect with the experimental cells. No information regarding the current status of these USTs was available in the records reviewed.

According to the 1942, 1952, and 1957 Boeing site plans, a compressor house (Building 1-39, IEC No. 4.09) was constructed adjacent to the west of Building 1-02 by 1952, and aerial photographs indicate that the compressor house was demolished by 1978. The property is currently occupied by the 1978- and 1994-vintage Seafreeze buildings.

3.4.3 Eastern Test Facilities (1920s–1973)

According to archived tax records, a drop hammer shop and aluminum foundry (Building 1-29, IEC No. 4.10) was constructed to the east of Building 1-02 in 1936. The hammer shop was used to mold structural metal components with a large metal forging hammer. This structure was demolished by 1978 and was located within the footprint of the existing 1978-vintage Seafreeze building.

According to archived tax records, the static test building (Building 1-40, IEC No. 4.11) was constructed in 1942. Static testing refers to the process of strength and integrity testing of structural components of airplanes on the ground. The 1942 Boeing site plan describes buildings to the west of Building 1-40 as used for fuel testing. Photographs of Building 1-40 taken at an unknown date depict several large metal tanks (Tank Nos. 20 and 21; Figures 4A and 5) and storage drums located to the west of the building. According to the 1963 Boeing site plan, Building 1-40 was used as a foundry.

According to aerial photographs and Boeing site plans produced between 1942 and 1963, a brick incinerator operated on the eastern waterfront from at least 1938 until the demolition of Boeing Plant 1 in the 1970s (Building 1-42, IEC No. 4.12). No details regarding the specific materials incinerated at this facility were available.)

According to the 1942 Boeing site plan, three buildings located to the west of Building 1-40 were used for the storage of paint, rivets, and lubrication oil (IEC No. 4.13). A drum storage yard was also listed in the vicinity of the storage buildings. According to aerial photographs, the storage buildings were demolished and replaced by Building 1-41, the fuel-pump testing building, by 1946. According to a POS drawing titled “Longshoremen’s Restroom Sewer Plan” dated September 22, 1971 (POS 1971), two USTs (Tank Nos. 18 and 19; Figures 4A and 5), which were reportedly filled with sand and closed in place, were located to the southwest of the building. The contents of these tanks were not listed in any drawing or diagram. Building 1-41 was demolished by 1978.

According to aerial photographs, the engine testing facility (Building 1-34, IEC No. 4.14) was constructed by 1938. The 1942 Boeing site plan indicated that the engine test facility also included a fuel tank test shed located to the south of the building. According to the 1957 Boeing site plan, Building 1-34 was later converted into a structural test office. Aerial photographs indicated that Building 1-34 was demolished by 1973.

According to the 1942 Boeing site plan, Buildings 1-15, 1-16, and 1-17 were constructed in close proximity to each other, directly north of the drop hammer shop (Building 1-29). These buildings, according to the 1942 Boeing site plan and the 1950 Sanborn Map, were used for parts storage, heat treating, and wing testing. According to aerial photographs and archived tax records, Buildings 1-15, 1-16, and 1-17 were demolished in 1956. Archived tax records indicate

that a steam plant and a wastewater lift station were constructed in 1956 and 1957, respectively, in the former location of Buildings 1-15, 1-16, and 1-17. According to tax records and Boeing site plans, the steam plant (Building 1-30, IEC No. 4.15) was equipped with a 20,000-gallon diesel fuel UST (Tank No. 17; Figures 4A and 5) located adjacent to the northwest of the building. The steam plant operated until 1970 and was demolished by 1976. The 20,000-gallon UST was listed in POS drawings as decommissioned and filled in place in 1976. The lift station building (IEC No. 4.16) pumped waste water into a force main prior to discharging the water to outfalls. This structure was abandoned in 1976 and a new lift station that serviced Building 1-01 was installed off the property.

According to the 1952 Boeing site plan, a structure used for sandblasting (Building 1-44, IEC No. 4.17) was constructed on the northern portion of the Plant 1 site. According to aerial photographs and the 1957 and 1963 Boeing site plans, as well as archived tax records, sandblasting took place in this area until 1970. The structures in this area were demolished by 1973.

According to the 1952 Boeing site plan and aerial photographs taken between 1952 and 1970, an acid test building (Building 1-45, IEC No. 4.18) was located to the east of Building 1-40, directly abutting the LDW. The structure was demolished by 1978.

3.4.4 Western Test Facilities/Hazardous Materials Storage (1950s–1974)

According to archived King County tax records, five structures were constructed to the north of Boeing Plant 1 between 1955 and 1964. These structures include a 1955-vintage test revetment building (Building 1-50), a 1955-vintage fuel test laboratory (Building 1-21), a 1955-vintage fuel storage facility (Building 1-22), a 1959-vintage acid storage facility (Building 1-26), and a 1964-vintage flammable materials storage facility (Building 1-27). These facilities were located in close proximity to each other and are presented on Figure 4A.

The 1955-vintage revetment (Building 1-50, IEC No. 4.19) reportedly was used for test purposes. Boeing maintained similar test revetments at the Boeing airfield in the 1950s. Although revetments are often used for aircraft storage, aircraft were neither assembled nor stored at Terminal 115 after 1941. Similarly constructed test revetments utilized by Boeing were used for aircraft munitions testing and engine testing. The test revetment was demolished in 1966.

The 1955-vintage fuel test lab (Building 1-21, IEC No. 4.20) was located within a fenced compound and was constructed of plywood and contained five separated test rooms. The use of Building 1-21 as a fuel test facility is confirmed in the 1957 and 1963 Boeing site plans. According to a Boeing drawing titled “Underground Fuel Tank 3000 Gal Capacity—Move Gasoline Pump,” dated July 28, 1958 (Boeing 1958), a 3,000-gallon UST (Tank No. 13; Figures 4A and 5) containing gasoline was installed between the test lab and the fuel storage building (Building 1-22). A dispenser was installed near the tank. According to aerial photographs, Building 1-21 was demolished by 1973. The current status of Tank No. 13 is unknown.

The 1955-vintage fuel storage facility (Building 1-22, IEC No. 4.21) was located within a fenced compound. The structure was built of reinforced concrete. The site contained multiple unknown drums and a fuel dispenser in a 1960 tax assessment photograph. According to aerial photographs, Building 1-22 was demolished by 1973. The flammable liquids storage shed was built in 1964, and archived records indicate that USTs were located beneath the concrete slab

foundation. The structure appears to the north of Building 1-22 in the Boeing 1963 site plan. According to aerial photographs, Building 1-23 was demolished by 1973.

The 1959-vintage acid storage facility (**Building 1-26, IEC No. 4.22**) was located within a fenced compound and was constructed of concrete blocks. The approximately 15-foot by 100-foot structure contained waste acid and alkali materials produced by Boeing Plant 1 facilities. Waste was containerized in barrels and secured behind fences. According to aerial photographs, Building 1-26 was demolished by 1973.

In addition to the above structures, the 1963 Boeing site plan includes a reference to **Building 1-27 (IEC No. 4.23)**, listed as the **hazardous materials storage building**. Aerial photographs from 1961 through 1970 confirm the presence of Building 1-27. According to aerial photographs, Building 1-27 appears to have been demolished by 1973. No record of the contents of the structure or the presence of any storage tanks at this location was observed.

According to the 1942 Boeing Site Plan, the 1950 Sanborn Map, and the 1957 Boeing site plan, a paint storage building (**Building 1-23; IEC No. 4.24**) was located to the west of Building 1-05. The structure appears in aerial photographs taken between 1922 and 1957. The building appears to have been demolished by 1961.

3.4.5 Seafreeze Building (1978 to present)

The **Seafreeze building (IEC No. 5)** was constructed on the former site of Boeing Plant 1 in 1978. The two-story, concrete, tilt-up-framed, gas-heated structure is occupied by a bulk fish cold storage and processing facility. The facility includes three fish processing rooms and numerous cold storage rooms cooled predominately with an **ammonium system**. The processing rooms are equipped with numerous floor drains, which are connected to the King County Metro system. The cold storage rooms are used for the storage of fish products, ice cream, and other food items. The coolant system is located on the roof of the structure. No backup electricity generation is located at the facility. According to a 1980 Seafreeze blueprint (Seafreeze 1980), a 4,000-gallon diesel UST (**Tank No. 9**; Figure 5) was installed in the vicinity of the facility. The tank was located approximately 50 feet to the southwest of the electrical room at the southwest corner of the building. No evidence of any tanks was discovered during the site inspection, and site personnel were unaware of any USTs. A cold storage facility was constructed as an addition to the Seafreeze building in 1994.

3.5 SOUTHWEST TANK FARM AREAS

The boundaries defined as the southwest tank farm areas are presented on Figure 4, which include IEC Nos. 6, 7 and 8. This includes the current service station located at 6020 West Marginal Way Southwest, as well as areas south of the West Front Street ROW and north of the Seafreeze building.

According to archived tax records, a **retail gasoline service station** was constructed at 460 West Michigan Street in 1930 (**IEC No. 6**). The service station included two fuel dispensers and a service garage (grease shed) that was equipped with a hydraulic lift. No information regarding the tanks associated with this service station was available. However, judging from the age of installation of the system and the hand-pump dispensers installed at the service station, the storage system likely consisted of USTs installed directly beneath the dispensing pumps. Tax records indicate that in 1949 a new service garage was added adjoining the service station office, at which time the gasoline distributor operating at the service station was Texaco. Historical photographs indicate that the service station was

operated by SAV-MOR gasoline in 1956. According to tax records, the original grease shed and repair facility built in 1930 were utilized for **auto salvage** through at least 1967; the auto salvage yard was visible in the 1950 Sanborn Map. Kroll Maps indicate that an additional building existed to the east of the service station building. No tax records associated with this structure were identified. Reverse directories indicate that the retail gasoline service station was in operation until 1963. After this date, the building was converted to a tavern. Tax records and aerial photographs indicate that the building was demolished in 1970.

In addition, **an auto parts store, a tavern, and a single-family residence** existed from the 1930s to the 1970s along the central stretch of Southwest Michigan Street. These structures were not associated with Boeing or the above auto service and wrecking companies. Multiple residences, as evidenced by tax records and historical photographs, existed along the western side of McAllister's Slough and the areas surrounding the intersection of West Marginal Way Southwest and Southwest Front Street. Records and historical photographs indicate these residences were present from the 1920s through the late 1960s, when all structures in the vicinity were demolished.

Archived tax records indicate that an **aluminum smelter** was constructed in 1952 (**IEC No. 7**). The structure was equipped with an 9,500-gallon UST (**Tank No. 26**; Figures 4 and 5). According to historical photographs and reverse directories, the aluminum smelter was operated by Materials Reclamation and Maralco Aluminum from 1952 through 1985. In 1985, the building was occupied by a crane services company. A POS site plan titled "Marine Facilities, Terminal 115, Lafarge Temporary Storage Silo MUP: Vicinity Map," Port of Seattle No. 115-9001-C-1, undated (POS 1994), indicates that the building, designated as Building W-4, was utilized as an aluminum warehouse, with an attached maintenance building and office. In 1994, in preparation for the future installation of a retail gasoline station (the existing Cardlock Facility), geotechnical borings were advanced at the property. **Separate-phase hydrocarbons (SPH) as diesel-range petroleum hydrocarbons (DRPH) were observed in groundwater,** and soil contamination was confirmed (GSM 1995a). In 1995, the UST, which was reported to have a capacity of 9,500 gallons and was confirmed to be a buried tanker rail car that had been altered to serve as a heating oil tank, was removed. Contamination was discovered in soil and groundwater along the floor and sidewalls of the excavation, as well as surrounding the product piping. With the exception of soil underlying the building structural supports, soil was overexcavated and disposed of off the property. Contaminated soil that was left in place was to be removed with the installation of the Cardlock Facility (Columbia 1995). During construction work, a 600-gallon heating oil UST (**Tank No. 25**) was discovered at the property and was subsequently removed, and contaminated soil was over-excavated (GSM 1996). Property records indicate that the current **gasoline- and diesel-dispensing station** was installed in 1996 (**IEC No. 8**). Groundwater monitoring has been conducted at the site from 1995 until 2009, the results of which are discussed further in Section 5.1.2. The site is currently occupied by a **restaurant building, a drive-through coffee stand, and a commercial fleet refueling station** containing seven fuel-dispensing pump islands and three 10,000-gallon USTs (**Tank Nos. 22 through 24**; Figure 5).

3.6 KLINKER SAND & GRAVEL COMPANY/READY-MIX GRAYSTONE DIVISION (1922–1970)

According to aerial photographs taken in 1922, what appears to be a gravel mining and mixing plant was in operation along West Marginal Way Southwest near the west-central portion of Terminal 115 (Appendix A: Photo A-1). Archived tax records and a 1930 USACE investigation indicated that **Klinker Sand & Gravel Company** (Klinker) operated a sand and gravel mining and **cement mixing** operation in this area (**IEC No. 9**, Figure 4) (USACE 1930). The company was named "Klinker" in reference to the

owner of the company, Jesse Klinker. The USACE indicated in the investigation that water from the nearby slough was used as wash water for sluicing gravel and sand into a sorting box to be used as sanitary fill by the City of Seattle. The operation reportedly produced considerable amounts of fine silt that was discharged into Turning Basin No. 1 (Appendix A: A-1). The USACE did not find that the operation was a threat to the navigable channel. Archived tax records indicated that storage bunkers and a cement mixer were constructed at the facility between 1926 and 1928. Aerial photographs taken between 1946 and 1961 indicate that the areas surrounding the Klinker site became increasingly silted and the shoreline expanded progressively to the east over time (Appendix A: Photo A-2 through A-6), and considerable fill material was introduced to Turning Basin No. 1. According to maps and aerial photographs from 1956, the upland areas surrounding Klinker had expanded considerably since 1922. According to a 1960s Kroll Map and reverse directories, **Ready-Mix Concrete's Graystone Division** occupied the area formerly occupied by Klinker. Aerial photographs taken in 1961 showed extensive filling in the areas to the east of the former Klinker site, and a large sorting conveyor and barge loading dock had been constructed. Oblique photographs taken by the POS in the early 1960s show the whole of Foss Island connected to the mainland and being filled with a large quantity of **white-colored fill** material, which was being deposited into large dewatering lagoons constructed on the site (Appendix A: Photo A-6 and A-7). Multiple structures were constructed to accommodate the concrete loading facilities, and **large stockpiles of dry cement and concrete material** were maintained at the site. The cement loading, mixing, and dock facilities were removed by 1971 after the infilling of Turning Basin No. 1 (Appendix A: Photo A-8).

3.7 CENTRAL TERMINAL 115 FACILITIES (IEC 10, 12 AND 13)

Terminal 115 was initially the oxbow meander of the Duwamish River until 1914, when extensive channelization and dredging activities were completed to create the LDW. During the early periods of the management of the LDW, construction of improvements, landfilling, and waterway use was at times performed in an ad hoc and informal manner. For instance, the original 1909-vintage Heath Shipyard building was completed without USACE permission, and permission to operate the facility was sought retroactively by the proprietors. The management of the LDW and Turning Basin No. 1 primarily focused on maintaining navigable waterways through the elimination and prevention of infill of the shipping channel. Turning Basin No. 1 was used throughout its history as a log boom for the storage of timber and as a point where ships could turn around. **The northern areas of the turning basin were reportedly also used as a landfill for unwanted dredge material and cement kiln dust (CKD)** (POS 1987, Shannon & Wilson 1991). **Subsurface Investigations of soil conditions at Terminal 115 North are not indicative of CKD** (Landau 2009), therefore it is not fully understood which areas the reports are referring to. Areas of Terminal 115 bordering West Marginal Way Southwest were gradually filled by the sand and gravel mining and cement operations located on the hillside and central portions of Terminal 115. Silt was commonly sluiced directly into the turning basin from the Klinker operations (USACE 1930). Dredging ships would commonly remove river sediments and deposit the loads onto the northern and southern portions of Terminal 115. As the original upland areas were historically located only a few feet above sea level in the vicinity of former Boeing Plant 1 and Terminal 115 North, infilling was required to build any structures or roadways on the property. Dredging operations within the southern McLaughlin blocks were apparent in photographs taken in 1928, and a 1935 USACE dredge and fill blueprint indicated that the northern-adjointing areas of Terminal 115 also were filled with dredged materials collected from the waterway (USACE 1935). Aerial photographs from 1922 and 1929 indicate that filling of Terminal 115 North occurred prior to 1935. Further filling along the former McAllister's Slough was apparent through the 1930s and 1940s as the formerly inundated portions of Terminal 115 were raised to an elevation

suitable for building. In the 1940s, Turning Basin No. 1 east of West Marginal Way Southwest had been incrementally filled with material. In 1953, areas of Foss Island began to be filled with material from a loading site east of the gravel mining and cement operation and from dewatering lagoons used to build up usable land. By 1957, considerable new land had been developed along the mouth of the slough and on Foss Island itself. By 1961, a cement loading dock had been installed at the end of a large filled mass on the southern edge of Foss Island (Appendix A: Photo A-5). The loading area included a cement conveyor, stockpiling areas, multiple truck staging areas, several cranes, several office structures, and other equipment. Light-colored material had been pushed to the east of West Marginal Way Southwest across the entirety of the site, and Foss Island was at this point connected to the hillside. Areas to the east of Foss Island had at this point not been filled and remained as partially dredged waterway. Logs remained stored in booms along the eastern edge of Foss Island and the surrounding shoreline (Appendix A: Photo A-6).

According to reverse directories, a lumber products plant was located at 6336 West Marginal Way Southwest from 1940 until 1951. Aerial photographs indicate that in 1946 a number of small structures were located on the central portion of the property to the east of West Marginal Way Southwest, in the vicinity of a large number of floating log rafts in Turning Basin Number 1. The lumber plant was listed as vacant from 1955, and thereafter no listing was given for any addresses within the 6300 West Marginal Way Southwest block. Aerial photographs indicate that the former lumber plant structures were demolished between 1965 and 1970.

In 1969, work began on the large-scale filling of the footprint of Terminal 115. Initially, sediment unsuitable for use as underlying soil for the facility was removed. General Construction Co. and Morrison-Knudsen Co. initially removed unwanted sludge and debris that had accumulated on the banks of the LDW over the past 50 years. This involved removing 322,000 cubic yards (cy) of material by dredging and excavation in November 1969. In 1970, the area was filled with 740,000 cy of on-property material and 1.1 million cy of fill brought to the property. The material sourced from the property consisted of regrade and dredged material; the source of the off-property material is unknown. However, according to the POS (POS 1987) and aerial photographs taken during this time, the fill likely included CKD. The infilling process involved building a large dike from the Terminal 115 North property east and traversing south to Boeing Plant 1 (Appendix A: Photo A-7). The dike was then backfilled piecemeal with dewatering lagoons that were approximately 5 to 15 acres in area. The dewatering lagoons were filled with imported, reworked, and/or dredged material, and the water in the lagoons was pumped into the LDW. The site improvements were completed between 1971 and 1974. In addition, the POS purchased the former Boeing Plant 1 site from Boeing in 1970 and demolished multiple structures between 1970 and 1974.

A concrete and asphalt apron was constructed across the northern portions of Terminal 115 in 1971 and 1972 (Appendix A: Photo A-8). A concrete pier, 100 feet wide and 1,200 feet long, was installed along the northern portion of Terminal 115. Rail lines were constructed through the central portion of Terminal 115. According to a 1974 POS as-built drawing, eight buildings were completed on the newly constructed apron (POS 1974). The buildings present in 1975 were as follows:

- The Car Wash and Body Shop buildings (Building C-1 and C-2, IEC No. 10) were constructed in 1971. The one-story, steel-framed car wash building (Building C-1) was heated by electric baseboards. The building was equipped with subsurface troughs and reclaiming pits for the catchment of gray water before water was discharged to the sewer system. To the west of

- the building, a 2,000-gallon AST (Tank No. 27; Figure 5) and a 5,000-gallon kerosene-containing UST (Tank No. 28; Figure 5) were installed at the property in 1971 to fuel a heating device in the car wash and to collect kerosene from a separator system beneath the car wash, respectively. Kerosene was reportedly used as part of the washing process and was recollected. The USTs were removed in 1989. Building C-1, which is currently used as a repair shop and maintenance facility, is connected to on-site storm sewers that lead to the King County Metro sewer system. A 1,000-gallon aboveground storage tank (AST) containing diesel fuel (Tank No. 29; Figure 5) and a connected dispenser are currently located adjacent to the west of the building. The AST is concrete-lined, equipped with secondary containment, and used in refueling equipment by Northland.
- The body shop building (Building C-2) was constructed in 1971. The one-story, structural steel-framed building is located adjacent to the east of Building C-1. The building initially was constructed with a 10,000-gallon UST (Tank No. 30; Figure 5) and fuel-dispensing pump island. The UST and fuel dispenser were removed in 1989. Based on field observations by SoundEarth personnel, the building is currently used as a maintenance facility by Northland.
 - The Maintenance building (Building W-2, IEC No. 12) was constructed in 1972. The two-story, structural steel-framed building is currently used for the maintenance of Northland dock equipment. According to the 1975 as-built revisions to a container yard site plan (KPFF 1971a), a 6,000-gallon UST containing diesel (Tank No. 33; Figure 5) connected to a fuel dispenser was located approximately 100 feet to the northeast of Building W-2. The UST was removed in 1993, along with 220 tons of petroleum-contaminated soil (Environmental Science & Engineering, Inc. 1994). Tank No. 33 was replaced with a 6,000-gallon UST, which was installed in 1993 (Tank No. 34) and remains operational, in use by Northland Services. In addition, two ASTs exist in the vicinity of the UST. A 300-gallon, concrete AST containing gasoline and a 400-gallon metal-lined AST containing diesel are connected with fuel dispensers and are equipped with secondary containment (Tank Nos. 31 and 32; Figure 5).
 - The Terminal Office building (Building A-5, IEC No. 13) was constructed in 1971. The two-story, wood-framed structure is located to the west of the loading piers on the central portion of Terminal 115. According to 1975 drawings (POS 1975), Building A-5 was equipped with a fueling facility that was located approximately 40 feet to the west of the building. The fuel facility contained two fuel-dispensing pump islands, a 1,000-gallon gasoline UST, and a 2,000-gallon diesel fuel UST (Tank Nos. 36 and 37; Figure 5). According to UST closure documents, the USTs were removed in 1990. A 1,100-gallon UST was installed at the property in 1993 at the same location as the previously removed USTs (Tank No. 35). The fuel dispensers are not currently present, and the 1993-vintage UST has not been used since its installation.

Crowley Marine Services (Crowley), a lightering company and marine cargo handler which operates tugs and barges to facilitate marine shipping, leased 130,000 square feet of landlocked yard area and rail track at Terminal 115 from 1981 through 1991. Crowley used the land to load rail cars from trucks and trailers for transport to Alaska. It is not clear which area was being leased at this time. Crowley tug, barge, and vessel maintenance and repair operation occupied Terminal 115, as a subtenant of **Jones Stevedoring Company**, on an unknown area of the Terminal 115 property, from 2001 until 2004.

3.8 TERMINAL 115 NORTH

According to historical maps (POS 1970, 1994, and undated; ABA 1962) and aerial photographs, the west bank of the Duwamish River ran through the center of Terminal 115 North before the dredging operations of the LDW in the 1900s (Figures 4B and 4C). Aerial photographs taken in 1922 indicate that the areas to the north of the site were barely above sea level and appeared flooded. The Terminal 115 North site appears slightly higher than adjoining areas in 1922 aerial photographs. An **artificial berm** was constructed in an effort to prevent water flow beyond the banks; however, the land behind the berm was frequently inundated. An USACE drawing (USACE 1935) indicates that dredged material from the LDW was placed on portions of Terminal 115 North in 1935. However, judging from aerial photographs taken in 1922 and 1929, it appears the filling operation was restricted to the north-adjoining properties. Aerial photographs from 1922 depict Terminal 115 North at greater elevation than the north-adjoining land. Aerial photographs taken in 1936 and 1938 indicate that areas to the north of Terminal 115 North were no longer inundated by water and appeared to be level with the earthen berm observed in previous photographs.

Reverse directories and aerial photographs indicate that no improvements were located on Terminal 115 North until 1963, when a **detinning plant** was constructed (**IEC No. 14**; Figure 4). According to aerial photographs from 1965, a terraced plot of land was added to the eastern portion of this parcel to accommodate two evaporation/settling ponds installed as part of the tin reclamation operations. The shoreline was expanded between 1961 and 1965 to the current easternmost extent of Terminal 115 North to accommodate settling ponds created at the site. In 1970, the Duwamish River shoreline was extended eastward as part of the larger infilling operations at Terminal 115. No information regarding the source of the fill material brought to the site at this time was available.

The M&T detinning plant recycled metals by dissolving the waste metal in solution with **caustic lye** and separating it from solution via electrowinning. The plant was equipped with two 16-ton cranes, a plating room, a boiler room, and a detinning area where the caustic lye and metals materials were mixed in a chamber. The plant included three settling ponds intended to capture waste sludge for further extraction of metals. These **settling ponds were unlined** and included dikes to prevent loss of material. According to aerial photographs, and the 1998 Seattle-King County Department of Public Health Site Hazard Assessment (SHA), the evaporation/settling ponds were removed by 1972 (SKCDPH 1998). **Waste water** was released into the Duwamish River from a waste water system located at the facility. By 1991, the waste water was diverted to the King County Metro system (Advanced Environmental Technology 1991). The detinning plant ceased operations in 1998, and the western portion of the property is currently occupied by Commercial Fence Company, and a lumber yard.

3.9 FILL ACTIVITIES (IEC NO. 11)

The original topography of Terminal 115 and vicinity have been altered significantly during the industrial development of the area. Prior to the channelization of the Duwamish River, the area currently inhabited by Terminal 115 was the site of a river oxbow. The oxbow included a slough (McAllister Slough), which joined the Duwamish River in the vicinity of the present Cardlock Facility. Buildings constructed in the vicinity were built on wood pilings to raise the levels of the floors above the muddy floodplains that dominated the surface of lands surrounding the area. To allow for shipment of goods down the river, a channelization and dredging program of the LDW was initiated by the USACE. Starting in 1913, and continuing through the early 1920s, the Duwamish River was straightened, dredged, and channelized to the condition seen in aerial photographs in the 1920s through approximately 1970. The

areas directly surrounding and including the Terminal 115 property were channelized between the years 1915 and 1917. According to historical maps depicting the area before and after the dredging operations (USACE 1935), Foss Island was created out of riverbank material and likely dredge spoils. The LDW areas to the east of the former Boeing Plant 1 site were created from excavated river bank material. The main channel and portions of the river surrounding Foss Island were dredged to accommodate regular ship traffic. McAllister's Slough was not altered during this time frame. Historical photographs taken in 1928 show what appear to be dredge spoils deposited on the former Boeing Plant 1 site from a dredging boat extracting material from the LDW. According to USACE drawings from 1935, portions of Terminal 115 North and the north-adjointing property were filled using dredge spoils from the LDW channel. This material was also used as sanitary fill in areas south of Terminal 115 that would later be occupied by the First Avenue South Bridge.

Aerial photographs taken throughout the 1930s, 1940s, 1950s, and 1960s (Appendix A: Photo A-2 through A-6; Figures 4B and 4C) depict regular infilling activities along the western shores of the Duwamish Waterway Turning Basin No. 1. These activities appear to be associated with the Klinker operations located along West Marginal Way Southwest on the west-central portion of Terminal 115. According to archived tax records and an USACE investigation in 1930, the Klinker operations were involved with the production of sanitary fill for the City of Seattle and the mixing of cement products. According to City of Seattle photographs, McAllister Slough was filled in 1953 with unknown material. Based on review of the photographs, the material appears to consist of miscellaneous debris, including garbage. Aerial photographs from 1953 depict suspected land reclamation dewatering lagoons (dewatering lagoons) located on Foss Island (Appendix A: Photo A-4). Aerial photographs taken in 1956 depict the areas surrounding the Klinker site as extending to the east and connected to Foss Island. Aerial photographs from 1957 depict the entirety of Foss Island as filled with a layer of light-colored material. At that time, Foss Island was connected to the mainland and a berm of material was raised as a bank along the shore bordering the Duwamish River. Aerial photographs from 1961 depict two large dewatering lagoons on Foss Island, and the areas south of Foss Island, formerly occupied by Turning Basin No. 1, as infilled (Appendix A: Photo A-5). The filled land was occupied by a concrete terminal operated by Ready-Mix or Graystone Cement from the 1950s until 1970. The terminal included truck bays, a cement conveyor, several modular and permanent buildings, and a barge-loading pier. McAllister's Slough is depicted as nearly filled; however, a small stream still flowed into the LDW from this location. According to aerial photographs and archived tax records, the eastern portion of Terminal 115 North appears to have been filled sometime between 1963 and 1965 to the current eastern boundary of Terminal 115 North, and to slightly less than the current northern and southern boundaries of the Terminal 115 North property. The shoreline expansion was intended to create land for the construction of evaporation/settling ponds on the property. Aerial photographs taken in 1965 depict the entirety of the Foss Island area occupied by dewatering lagoons, with stockpiled soil in various areas of the cement terminal (Appendix A: Photo A-6). An oblique aerial photograph taken between 1965 and 1968 (Appendix A: Photo A-7) depict two large dewatering lagoons on the former site of Foss Island and an area south of Terminal 115 North. A large stockpile of light-colored fill material is located in the central portion of the Terminal 115 property between the two dewatering lagoons in the photograph. Aerial photographs taken in 1968 depict the Boeing Plant 1 site as surrounded by a raised fill causeway. The cement terminal is present and includes what appear to be large cement stockpiles and large stockpiled areas of light-colored material. The former dewatering lagoons at this point were filled in (Appendix A: Photo A-6 and Photo A-7).

According to a 1971 article in *The Seattle Times* (Lane 1971), construction of the current Terminal 115 configuration began in November of 1969, at which time 322,000 cy of unusable bank material were excavated from the site. Dredging of the site was completed, and the site was filled with 722,000 cy of dredge spoils and 1.1 million cy of off-site fill material. The filling process is detailed in aerial photographs taken around 1970, as shown in Appendix A, Photo A-7. Aerial photographs taken in 1968 and in early 1970 depict what appears to be a retaining dike built across the current shoreline of the site, with dewatering lagoons built behind the retaining dike (Appendix A: Photo A-7). The 1971 article in *The Seattle Times* reported that the dewatering lagoons were installed to prevent siltation of the LDW during infilling activities; to shore the lagoons and dike, 11,495 linear feet of creosoted logs were installed at the site. According to 1970 as-built diagrams produced for the POS, silt was allowed to settle within the dewatering lagoons prior to the water being pumped and discharged into the LDW. Aerial photographs taken in late 1970 show Terminal 115 with its present land area (Appendix A: Photo A-8 through A-10). As a result of the filling activities, the entirety of Turning Basin No. 1 was filled and Glacier Bay to the north was created. Current Terminal 115 improvements, including the apron, docks, and a number of buildings were constructed throughout 1971 and 1972.

CKD is suspected to have been used as fill material at Terminal 115. No evidence exists that CKD was used as fill material on Terminal 115 North. In two reports, CKD is listed as material used as fill on Terminal 115 and vicinity. In a report produced for the City of Seattle (Shannon & Wilson 1991), CKD was mentioned as a fill material deposited in the northern areas of the former Turning Basin No. 1. According to the POS (POS 1987), CKD is listed as fill material imported to the site in 1963 to backfill dewatering lagoons. In addition, cement storage, transport, mixing, truck washing, and the storage of cement slurry occurred on the north-adjointing property.

4.0 OFF-PROPERTY OPERATIONAL HISTORY

The properties adjoining Terminal 115 have been used extensively for industrial and commercial purposes since the early 1900s. While not necessarily associated with Terminal 115 operations, the potential exists for contaminated soil and/or groundwater at off-property facilities to impact Terminal 115 and subsequently the LDW via the stormwater, erosion/leaching, and/or groundwater pathways. The IECs discussed below are presented in plan view on Figure 4.

4.1 SOUTH-ADJOINING PROPERTIES

Prior to industrial development of Terminal 115, the areas to the south of Terminal 115 were used for pastureland and agricultural uses. In 1916, the Michigan Street Bridge was constructed to the south of and on Terminal 115. The areas to the south of Terminal 115 included the Boeing administration building (Building 1-01), several single-family residences, an auto parts store, and a shingle mill. These structures were demolished by 1955 in preparation for the construction of the First Avenue Bridge. In 1956, the First Avenue Bridge was completed, and the Michigan Street Bridge was destroyed. The approaches and transportation infrastructure associated with State Route 99 and the First Avenue Bridge have existed to the south of the Terminal 115 property since that time. The areas to the south of Terminal 115, with the exception of the Boeing Building 1-01, have remained unimproved since 1956.

4.1.1 Boeing Building 1-01

In 1929, Boeing constructed their two-story administrative office building (IEC No. 15.01), which was heated by an oil-burning furnace. King County tax records indicate that the ground floor of

Building 1-01 was utilized as a **metallurgical laboratory** by Boeing in 1966. Boeing sold the property to the POS in 1970. The property was bought by Foss Redevelopment in 1998 and used as an office and emergency cleanup response center until 2002. The property is currently used as an office building.

According to a POS demolition plan produced in 1991 (Wood/Harbinger 1991), a 4,000-gallon heating oil tank (**Tank No. 1**; Figure 5) was located to the north of Building 1-01 and removed in 1991. In addition, a 3,000-gallon bunker fuel UST and a 1,000-gallon diesel UST (**Tank Nos. 2 and 3**; Figure 5) were discovered on the southwestern portion of the property in 1998. These tanks were removed, along with areas of petroleum-contaminated soil (PCS), in 1998 and 2002 (Urban Redevelopment, LLC 2002).

4.1.2 Duwamish Shingle

Tax records indicate that in 1926 a small **shingle factory** and residence were constructed at 449 West Michigan Street. The mill was located directly across West Michigan Street from the former SAV-MOR service station located at 460 West Michigan Street. The shingle mill appears in photographs in the tax records as a small hut with an attached burner, and the residence is shown with a **small AST** attached to the building. Reverse city directories indicate that the shingle mill was listed on the property from 1930 until 1940. The site was later filled and leveled before it was incorporated into the ROW for the intersection of Highland Park Way Southwest and West Marginal Way Southwest.

4.2 WEST-ADJOINING PROPERTIES

Prior to the industrial development of the LDW, several single-family residences existed to the west of the Terminal 115 North area. These wood-framed, one- and two-story, stove-heated single-family residences were built between 1890 and 1916. These residences were removed in the 1980s and 1990s. Sand and gravel mining facilities operated in the hillsides overlooking West Marginal Way Southwest from at least the 1920s until an unknown date. Several vacated public ROWs have also been located on the hillside.

4.2.1 Klinker Sand & Gravel Company/Al Bolser Tire Store (**IEC No. 9 and 15.02**)

According to aerial photographs taken in 1922 and 1924, sand and gravel mining has occurred on the central portions of the west-adjointing property in conjunction with the Klinker operations discussed in Section 3.6. A review of aerial photographs, reverse directories, and archived tax records indicates that a **sand and gravel mining and/or cement mixing** facility operated at 6515 West Marginal Way Southwest from 1926 until 1960. In the 1960s, the Graystone Company, later purchased and operated by Ready-Mix, Inc., established cement mixing and transport operations on the former Klinker site. In 1986, Al Bolser Tire Stores (IEC No. 15.02) was constructed on the property. The two-story, masonry-framed tire retail and service station was used as a retail floor and a service station for tire and auto repair. According to UST decommissioning records, a **gasoline-containing UST** and dispenser were located on the property. In 2006, the 5,000-gallon UST was reported removed (Fillco 2006). The building is currently occupied by an equipment rental facility.

4.2.2 Aluminum and Bronze Fabrication (**IEC No. 15.03**)

According to archived tax records and aerial photographs, the property located at 6301 West Marginal Way Southwest was initially developed with a single-family residence in the 1910s. The

wood-framed, one-story residence was heated by a stove. It was demolished in 1964 and replaced by the currently existing 1964-vintage, **aluminum and bronze smelting** facility (IEC No. 15.03). The smelting facility was originally heated by an **oil-burning furnace**. The smelter is a single-story, concrete-framed structure, which is located across West Marginal Way Southwest.

4.3 EAST-ADJOINING PROPERTIES

Prior to the dredging and channelization of the Duwamish River, the McLaughlin’s Addition plat, located on the southern portions of Terminal 115, included areas now submerged beneath the LDW. According to 1910 tax rolls, a small structure of unknown use occupied this area before its apparent demolition by 1916. The uses of the areas of the former Foss Island were excavated as part of the channelization process for the LDW. Land use prior to 1916 was likely agricultural or pastureland. The areas proximal to the east of Terminal 115 have been a part of the LDW since 1916 (Figure 4C).

4.4 NORTH-ADJOINING PROPERTIES

A single parcel is situated directly-adjointing Terminal 115 to the north of Terminal 115 North (Figure 4). This site is currently used as a cement distribution terminal. Environmental investigations and remediation activities are ongoing as part of an AO between Ecology and the current and previous owners of the property, including Reichhold and Glacier NW.

4.4.1 Reichhold, Inc. (IEC No. 15.04)

The north-adjointing Reichhold/Glacier NW property was historically comprised of three tax parcels, which according to archived tax records and Kroll Maps of Seattle were named Tax Lots 29, 30, and 65. Tax Lot 65, a small parcel adjoining West Marginal Way, was improved by 1938 with a small wooden structure and listed in the 1940 Polk phone directory as occupied by a **tool manufacturer**. Tax Lot 65 was deeded to the Carlisle **Lumber Company** in 1941, which deeded the property to the U.S. Government in 1943. According to aerial photographs, archived tax records, and Polk phone directories from 1937 and 1938, the north-adjointing Reichhold/Glacier NW property was initially developed as a **wood-preserving plant**, which occupied Tax Lot 30. Tax Lot 29 was vacant at this time. Tax Lots 29 and 30 were owned by King County from 1927 to April 1943, when they were deeded to the Carlisle Lumber Company, who deeded both properties to the U.S. government in July 1943. Polk phone directories list the property as occupied by the Mineralized Cell Wood Preserving Company (MCWPC) in 1937 and 1938, at address 5942 West Marginal Way Southwest. The 5942 West Marginal Way Southwest site was listed as vacant in the 1939 Polk reverse phone directory. The tax record for Tax Lot 30 includes a photograph taken in September 20, 1937, of the MCWPC plant. Depicted in the photograph and described in the tax card is a wood-framed 16’x26’ shed, inside of which appears to be numerous bags of unspecified products. Adjoining the shed is a small structure with a canopy and smokestack. A wooden A-frame is depicted in the photograph with a single line or hose running from what appears to be a suspended tank or barrel. The tank or barrel appears to be hoisted in the A-frame to approximately 30 feet above the ground. To the west of the shed, upended wooden barrels are observed lying on the exposed surface. In the background of the photograph are numerous logs connected with what appears to be gaskets and hoses, with all the hoses running behind the shed. Runners appear below the logs perpendicular to the length of the logs. The photograph appears to be facing southeast, based on knowledge of the regional geography. The tax card indicates that the shed was constructed in 1927 and was demolished in 1943. The 1937 aerial photograph of Tax Lot 30 depicts two small structures in the central

portion of Tax Lot 30. Observed to the south of the two buildings are two parallel light-colored lines running east-west, and a line of darker lines, interpreted to be the logs depicted in the 1937 tax record photograph of Tax Lot 30, running north-south. In 1935, the MCWPC was granted a patent for a method of preserving wood. The technical details of the patent include the following:

- A solution of **arsenic, copper, and zinc**, as well as trace iron sulfate was to be mixed at elevated temperature (60 degrees Celsius) for use as a wood preserving product.
- Gaskets were to be attached to the ends of newly-felled trees and rubber hoses attached to the gaskets. The wood-treatment solution was to be introduced to the logs under pressure over the course of 96 or more hours.
- The maximum pressure for introduction of the solution into the logs was to not necessitate more than 10 pounds per square inch. The normal operating conditions were stated to be between 5 to 7 pounds per square inch.
- The injected treatment solution was introduced in the end connected to the gasket, and the solution was allowed to exit the treated log on the opposite end.

The MCWPC patent includes diagrams of gaskets and a solution delivery system to be attached to treated logs nearly identical to those observed in the 1937 tax record photograph of the MCWPC plant. A newspaper article from 1937 on the Portland MCWPC plant (Barber 1937) includes a photograph of a plant operation nearly identical to that depicted in the 1937 tax record photograph of the MCWPC plant.

According to environmental reports, tax archive records, and aerial photographs of the area, the north-adjointing Reichhold/Glacier NW property was developed as a lumber yard, which included the **production of charcoal** from 1941 until 1943. In 1943, the lumber yard/charcoal production facility was converted for use as a factory for wartime production of charcoal filters, specifically a **copper-impregnated charcoal product** named whetlerite, for use in U.S. Army gas masks. The Crown-Zellerbach Corporation operated the facility from 1943 until 1945. The charcoal was produced at the site in blast furnaces and impregnated with copper to produce the filter cartridges. The facility produced 2.6 million pounds of whetlerite material during its operation from 1943 until 1944 (USACE 1994). According to the *Sources of Pollution in the Duwamish-Green River Drainage Area* study (Foster 1945), the gas mask production process included a copper ammoniate solution wash tank of approximately 750 gallons. The contents of the wash tank were reportedly dumped into the LDW monthly. The Pollution Commission at this time recommended the contents of the wash tank be dumped onto Tax Lot 30 instead, due to concerns over water fouling of the LDW. Tax Lot 30 was reported at this time to be a dump site for discarded charcoal and sawdust.

The charcoal filter factory was leased to Reichhold in 1946 for use as a pilot-scale factory of **plywood resins and wood-treating agents**. The factory was involved in the production and use of **formaldehyde, hydrochloric acid, sodium hydroxide, epoxies, phenols, urea, formic acid, polychlorinated phenolic compounds**, and other chemicals (RETEC 1996, Perkins Coie 2008, Shaw 2008). The facility was in operation from 1947 until 1960 and was equipped with thirteen 25,000-gallon chemical ASTs comprising a storage tank farm. In addition, a railway spur that was used to store chemical tank cars was located near the tank farm. According to aerial

photographs and archived tax records, the Reichhold plant was located on the central portion of the north-adjointing property. Multiple instances of spills in connection to the chemical production activities at the site were recorded during Reichhold’s use of the property. In 1948, drums of ammonia and 8,000 gallons of formalin were reported spilled into the LDW. In 1953, 500 pounds of glue product entered the LDW, and 8,000 gallons of formalin was allowed to enter the LDW through a waste ditch. Phenol, formaldehyde, urea, blood, and resins were reported present in on-site sumps at this time (Perkins Coie 2008). The State of Washington Pollution Control Commission 1955 study *An Investigation of Pollution in the Green-Duwamish River* (SWPCC 1955) indicated that “highly toxic conditions [existed] in the vicinities of the outfall sewers” of the Reichhold plant which “coincided with accidental slug discharges within the industry.” Phenol concentrations of LDW water in the vicinity of the outfall were reported to be in excess of 18,000 parts per million (ppm), with a pH of 3.8 at this time (Perkins Coie 2008). Environmental reports (SWPCC 1955, Shaw 2008) indicate that a wastewater impoundment containing hydrochloric acid waste liquids was located on the central portion of the north-adjointing property, approximately 200 feet from the nearest property boundary, and that a pilot-scale pentachlorophenol (PCP) production facility was located on the central portion of the factory grounds. According to aerial photographs and previous reports (Shaw 2003, ERM 2009), waste ditches were located on the central portions of the north-adjointing property and near the southern boundary of the property. After 1958, Reichhold maintained only limited operations at the factory as a laboratory. Reichhold’s lease expired in 1961. The factory facilities were demolished between 1964 and 1969.

4.4.2 Glacier NW (IEC No. 15.05)

The POS owned the north-adjointing property from 1964 until 1969. The POS leased the property and granted development rights to Kaiser Gypsum for the construction of buildings associated with cement and concrete production and shipping. A cement distribution terminal was built on the north-adjointing property in 1967. In 1969, the property was sold by the POS to Kaiser Gypsum. In 1987, Kaiser Gypsum sold the property to Lone Star Northwest, Inc., which through business acquisition was renamed Glacier NW. Cement silos, loading bays, processing equipment, and washing racks were installed on the property. The current dock located at the property was installed in 1980. The embayment created by the Terminal 115 apron and the former LDW shoreline located to the north of Terminal 115 has been recently dredged. The property is currently used as a cement distribution terminal. Areas directly north of the property are utilized as a parking lot for cement trucks. A large dock for cement loading is located to the northeast of the Terminal 115 piers.

5.0 ENVIRONMENTAL INVESTIGATION SUMMARIES

Since 1990, several source evaluation investigations have been conducted in five separate areas located on or adjoining Terminal 115, as shown on Figure 6. The investigations on Terminal 115 were primarily conducted in response to petroleum releases from former USTs located on southern portions of Terminal 115, and several investigations were conducted on Terminal 115 North to evaluate the environmental quality of soil and groundwater as a result of the former operations of M & T Chemical and MRI Corporation (MRI), as well as to evaluate catch basin solids, the presence of fill at the property, and any former operations at the property. In addition, sediment quality was evaluated within Berth 1,

located on the eastern portion of Terminal 115. These investigations have included sampling and analyses of soil, groundwater, stormwater outfalls and catch basins, and near-shore sediments.

The following sections provide an overview of previous sampling events completed at Terminal 115 and adjacent properties. Copies of selected portions of the investigation reports are included in Appendix C.

5.1 ON-PROPERTY INVESTIGATIONS

The following sections summarize previous subsurface investigations conducted on Terminal 115.

5.1.1 Seafreeze/Boeing USTs (IEC No. 5)

In 1994, EMCON conducted an environmental assessment following the removal of three abandoned 6,000-gallon USTs (Tank Nos. 10 through 12; Figure 5) encountered during construction activities near the southwest corner of the existing Seafreeze facility (Figures 6 and 6A; EMCON 1995). According to EMCON's report, seven soil samples collected at 4 and 8 feet below ground surface (bgs) from the excavation sidewalls contained concentrations of gasoline-range petroleum hydrocarbons (GRPH), DRPH, oil-range petroleum hydrocarbons (ORPH), and/or total xylenes that exceeded the current (2001) Washington State Model Toxics Control Act (MTCA) Method A cleanup levels (CULs) for soil. The sidewall samples were not analyzed for volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), RCRA 8 metals, or polychlorinated biphenyls (PCBs), and no floor samples were collected due to the presence of groundwater at the bottom of the excavation. According to the report, approximately 80 cy of soil were removed from the excavation area, but excavation activities were limited due to the proximity of construction activities.

A composite sample of sludge was collected from within the three USTs and analyzed for GRPH; DRPH; ORPH; benzene, toluene, ethylbenzene, and total xylenes (BTEX); VOCs; semivolatiles organic compounds; RCRA 8 metals; and PCBs. The sludge sample contained concentrations of GRPH, DRPH, ORPH, naphthalene, ethylbenzene, and total xylenes that exceeded their respective 2001 MTCA Method A CULs for soil. Composite soil samples collected from the soil stockpiles generated during the removal of the USTs also contained concentrations of GRPH that exceeded the 2001 MTCA Method A CUL. SPH was observed floating on the groundwater within the UST excavation area at 9 feet bgs. Groundwater and SPH were removed from the excavation with a vacuum truck. Groundwater samples were not submitted for laboratory analysis during this investigation.

Additional subsurface investigations were performed at the site from 1994 until 1997. During the course of these investigations, four permanent monitoring wells were installed at the site, to the south, east, west, and within the 1994 UST excavation limits, as well as seven hand-augured temporary wells (EMCON 1995). Groundwater was identified in the course of these investigations to flow to the south. Groundwater samples were collected from the wells from 1994 until 1997. The samples collected from the monitoring wells contained concentrations of lead above the MTCA Method A CUL. In addition, groundwater samples collected from monitoring wells MW08 and MW09 contained concentrations of DRPH above the MTCA Method A CUL. Groundwater samples collected in 1994 from MW08 contained concentrations of vinyl chloride above the MTCA Method A CUL, and MW08 has not been tested for chlorinated volatile organic compounds (CVOCs) since that date. Groundwater samples collected from MW09 contained concentrations of benzene above the current MTCA Method A CUL from 1994 until

1997. No subsurface investigation or groundwater monitoring has been completed at the site since 1997.

5.1.2 Southwest Tank Yard/Cardlock Facility (IEC No. 8)

In July 1995, GeoScience Management, Inc. (GSM) conducted a subsurface investigation and identified the approximate location of an abandoned UST. Historical drawings indicated the presence of an 9,500-gallon heating oil UST (Tank No. 26; Figure 5) used for storing fuel oil to the east of the existing Cardlock Facility on Terminal 115 (Figures 6 and 6B; GSM 1995a). The UST was determined to be a buried tank rail car, with rudimentary fuel delivery systems. The investigation was prompted by the discovery of 2 feet of SPH floating on groundwater in monitoring well MW12. Monitoring well MW12 was installed by AGRA Earth and Environmental Technologies, Inc. on Terminal 115 in 1994 as part of a geotechnical evaluation prior to constructing the Cardlock Facility. The depth to groundwater in MW12 at the time of the initial investigation was approximately 8 feet bgs. At the time of the initial investigation, the current diesel-dispensing Cardlock Facility was not present at Terminal 115.

According to the GSM report, 12 hand-auger borings (HB-1 through HB-12) and seven hollow-stem auger borings (SB-3 and MW-13 through MW-18) were advanced to depths between 3.5 and 14 feet bgs to assess the extent of petroleum contamination in soil and groundwater at the Cardlock Facility site. According to the report, two of four soil samples analyzed contained concentrations of DRPH exceeding the 2001 MTCA Method A CUL for soil. In addition, groundwater samples collected from monitoring wells MW-14 through MW-17 contained concentrations of DRPH that exceeded the 2001 MTCA Method A CUL for groundwater. Groundwater samples were not collected from monitoring wells MW-12 and MW-18 due to the presence of SPH. The depth to groundwater in wells MW-13 through MW-18 ranged from approximately 4 to 8 feet bgs.

In June 1995, GSM conducted recovery of SPH from monitoring wells MW-12 and MW-18. A skimmer originally installed in well MW-12 was moved to MW-18 due to decreased thickness of SPH in MW-12. A total of approximately 7.3 gallons of SPH was removed from monitoring wells MW-12 and MW-18, and monitoring well MW-12 was subsequently abandoned in July 1995 due to “concerns regarding well construction” (GSM 1995b).

In August 1995, GSM collected groundwater samples from monitoring wells MW-13 through MW-17 (GSM 1995a). According to the groundwater monitoring report, the samples contained concentrations of DRPH ranging from 460 micrograms per liter (µg/L) in MW-16 to 180,000 µg/L in MW-14. Samples were not collected from monitoring wells MW-12 or MW-18 due to the presence of SPH (Figure 6B).

In September 1995, the above-mentioned abandoned UST was removed from the Cardlock Facility by Lee Morse General Contractor and the site assessment was conducted by Columbia Environmental Inc. (Columbia 1995). According to the Columbia report, the UST had a capacity of approximately 9,500 gallons and was corroded and generally in poor condition. The report noted that the product lines from the UST were running to the north in the area of previously confirmed petroleum-impacted soil and groundwater. The report concluded that, although only one soil sample collected during the investigation contained a concentration of DRPH exceeding the 2001 MTCA Method A CUL (soil sample S11, collected from the west sidewall at a depth of 9

feet bgs), “significant additional remediation” in the vicinity of the UST excavation may be warranted.

In March 1996, Columbia conducted a subsurface investigation to assess soil conditions prior to and during the construction of the existing Cardlock Facility (Figure 6 and 6B; Columbia 1996a). According to the report, soil samples collected at 4 to 7 feet bgs from three hand-auger borings (HA-1 through HA-3) did not contain concentrations of DRPH, GRPH, or BTEX that exceeded the laboratory reporting limits.

Columbia conducted an additional site assessment in September 1996 (Columbia 1996b). Soil samples were collected prior to the construction of the existing Cardlock Facility from the proposed locations of the new USTs (Tank Nos. 22 through 24), dispenser, catch basin, and oil/water separator. None of the soil samples contained concentrations of DRPH, GRPH, or BTEX in excess of their respective MTCA Method A CULs.

In September 1996, Lee Morse Construction, Inc. removed an abandoned 600-gallon UST (Tank No. 25; Figure 5) used for heating oil storage from the northeast corner of the proposed Cardlock Facility (Figure 6B). GSM conducted the site assessment during the UST removal (GSM 1996). According to the report, the UST was in poor condition with numerous holes observed on the ends and bottom of the tank. Soil samples were analyzed for DRPH and ORPH. Only one soil sample collected from the west excavation sidewall contained a concentration of DRPH that exceeded the 2001 MTCA Method A CUL. According to the report, approximately 25 cy of PCS was stockpiled and the excavation area was backfilled with clean imported fill. Groundwater was not encountered during excavation activities.

In January 1997, Columbia conducted a subsurface investigation to assess the soil and groundwater conditions prior to starting the operation of the Cardlock Facility (Columbia 1997). Four soil borings, completed as monitoring wells MW-19 through MW-22, were advanced to a maximum depth of 17 feet bgs. Soil samples were analyzed for DRPH and ORPH. A discrete soil sample collected from MW-21 at 6 feet bgs contained a concentration of DRPH that exceeded the MTCA Method A CUL. Composite soil samples collected from MW-19, MW-20, and MW-22 contained concentrations of DRPH that were below the MTCA Method A CUL.

Groundwater samples were analyzed for DRPH, ORPH, GRPH, and BTEX, none of which were detected in groundwater collected from wells MW-20 or MW-22. The concentration of DRPH detected in the groundwater sample collected from MW-21 was 908 µg/L, which exceeded the MTCA Method A CUL. Groundwater in monitoring well MW-19 was not sampled.

In April 1997, GSM conducted a groundwater sampling event at the site. Monitoring wells MW13 through MW22 were sampled during this event. The report indicated that concentrations of DRPH ranged from 308 µg/L (MW-17) to 1030 µg/L (MW-15) and monitoring wells MW-14 and MW-18 were not sampled due to the presence of SPH (GSM 1997).

In April 1998, GSM installed one groundwater monitoring well (MW-23) to evaluate soil and groundwater quality immediately downgradient of the former 9,500-gallon UST (Tank No. 26; Figure 5). GSM installed five extraction wells (RW-1 through RW-5) to the east of the Cardlock Facility and surrounding MW-18 in an effort to define the extent of SPH in groundwater. All six wells were advanced to a depth of 14 feet bgs. GSM conducted high-vacuum pilot testing and completed hydrogen peroxide treatments for groundwater. The report concluded that “high-vacuum extraction is not an appropriate remedial technology for the removal of free product

from the site,” and that “hydrogen peroxide treatments did not have any significant effects in reducing dissolved hydrocarbon concentrations” in groundwater (GSM 1998).

Groundwater monitoring reports from 1995 until 2009, as well as POS groundwater monitoring data tables dated 2001 to 2008, indicated that measurable SPH was present in monitoring wells MW 14, MW-18, and MW-19 and extraction wells RW-1 through RW-5.

5.1.3 The Car Wash and Body Shop Buildings (Buildings C-1 and C-2, IEC No. 10)

In 1990, Harding Lawson Associates (HLA 1990) conducted a subsurface investigation at the existing Building C-1 following the removal of a 5,000-gallon UST (known as Tank 115E) (Tank No. 28, Figure 5) from the northeast portion of the building (Figure 6C) in 1989. The UST was used for the storage of kerosene. During the UST removal by Meridian Excavating, a 3-foot-thick concrete pad and PCS were observed within the excavation area. Meridian collected two soil samples from outside the margins of the concrete pad at 13 feet bgs; the samples were analyzed for total fuel hydrocarbons (TFH) by modified EPA Method 8015 and total petroleum hydrocarbons (TPH) by EPA Method 418.1. The TFH analysis characterized the petroleum as number 1 diesel fuel (equivalent to kerosene). According to the HLA report, a 2,000-gallon AST used for kerosene storage (Tank No. 27; Figure 5) and a kerosene/water separator were located adjacent to the south and west, respectively, of the former UST.

HLA’s subsurface investigation included the advancement of eight soil borings, four of which were completed as groundwater monitoring wells MW-115-1 through MW-115-4, to a maximum depth of 22.5 feet bgs. Groundwater was observed between 10 and 13 feet bgs. All of the soil and groundwater samples that were submitted to the laboratory were analyzed for TFH, and selected soil samples were analyzed for TPH. TFH was not detected in any of the groundwater samples. According to HLA’s report, 3 of 11 soil samples contained concentrations of TFH that exceeded Ecology’s “soil guidance cleanup level.” Two samples were subsequently analyzed for TPH; the highest concentration was 31,360 mg/kg TPH in boring B-115-7 at a depth of 13 feet. What appeared to be SPH was observed in soil samples collected from B-115-6 and B-115-7 at depths at and above the water table. The locations of these borings is shown on Figure 6C. HLA concluded that the approximate area of PCS was 50 by 30 feet and to a depth of approximately 13 feet bgs. No additional subsurface investigation reports were available for this area.

The body shop building was originally constructed to refuel and service imported cars at Terminal 115 and was equipped with a 10,000-gallon gasoline UST and dispensing equipment (Tank No. 30). The UST was operational from 1971 until 1978 and the UST system was removed in 1989 by Meridian Excavation & Wrecking and Northwest EnviroService (POS 1989c). A UST site assessment was completed at the time of excavation and no contamination was reportedly encountered. The UST was decommissioned prior to excavation, and 740 gallons of gasoline were removed from the UST. No evidence of corrosion was observed on the UST, and no staining was evident on any areas of the excavation. Five confirmation samples were collected from the excavation. None of the soil samples contained detectable concentrations of petroleum hydrocarbons, with the exception of the north sidewall sample, which contained a concentration of total petroleum hydrocarbons of 28 mg/kg. No further remedial activities were considered necessary at the site.

5.1.4 Maintenance Shop UST (Building W-2, IEC 12)

In 1993, a 6,000-gallon diesel-containing UST (Tank No. 33) was removed from the vicinity of the Maintenance Building (Building W-2). During the course of the UST removal, PCS was discovered within the excavation. Soil was overexcavated until the concentration of DRPH in soils collected from the excavation sidewalls and floor was below the MTCA Method A CUL. Approximately 220 tons of soil were removed from the site and disposed of in an approved receiving facility. Groundwater was infiltrating the excavation and was pumped and disposed of. Groundwater discovered in the excavation contained concentrations of DRPH at 8 mg/kg, which is above the MTCA Method A CUL. In 1994, three groundwater monitoring wells were installed in the vicinity of Tank No. 33. The borings were completed to a depth of 25 to 27 feet bgs as monitoring wells. Monitoring wells MW05 and MW06 were installed in the vicinity of the UST, and MW07 was installed approximately 50 feet to the east of the UST. No detectable concentration of DRPH above laboratory reporting limits was detected in any soil sample. The concentration of ORPH in soil was in excess of the 2001 MTCA Method A CUL for MW06 at 5 feet bgs and was not detected above laboratory detection limits for MW05 and MW07 at depths of 5 and 10 feet bgs, respectively. The concentrations of ORPH and DRPH in groundwater were below the MTCA Method A CULs in all three monitoring wells. Detectable concentrations of DRPH were found in all of the wells. A concentration of ORPH was detected in MW05.



No sampling events have been conducted in the vicinity of the Maintenance Building or Tank No. 33 since 1994.

5.1.5 Terminal 115 North (IEC No. 14)

In 1987, Ecology conducted a Toxic Substances Control Act (TSCA) inspection of MRI, a tin reclamation and recycling facility located on Terminal 115 North (Ecology 1987). The Ecology inspector noted the presence of 13 bulk ASTs, 5 of which were double-walled (Tank No. 40; Figure 5) on concrete pads located on the north side of the facility, as shown on Figure 6D. The ASTs were used for the storage of sulfuric acid, sodium hydroxide, and spent electrowinning solution. According to the inspector's report, surface water from the tank farm drained to a stormwater drain that flowed into the LDW. Spills within the plant were reportedly collected in a sump and recycled back into the production process (EPA 1988). Spills in the vicinity of the storage tanks were reportedly collected in a series of sumps and trenches and pumped to a pretreatment area prior to discharge to the sanitary sewer. The inspector stated that MRI was in violation of state water quality control regulations because the facility did not have an adequate secondary containment for the tank farm in the event of a large spill event and subsequent surface water runoff.

A 1997 Site Hazard Assessment (SHA) conducted by Seattle-King County Department of Public Health (SKCDPH 1998) stated that the tin reclamation and recycling facility had operated under the names M & T Chemical, MRI (affiliated with American Can), Proler International (Proler), and Proler Recycling, and was, at the time of the SHA, owned by Schnitzer Steel Industries, Inc. (Schnitzer). According to the SHA, the facility conducted detinning activities from 1963 to 1997. SKCDPH collected three soil samples near the railroad spur area of the site and analyzed them for RCRA 8 metals, tin, and zinc. One of the three samples contained a concentration of 470 mg/kg for lead, which exceeded the MTCA Method A CUL for lead in soil.

In 1999, Schnitzer sent a letter to the POS (Schnitzer 1999b) referencing subsurface investigations conducted by Proler in 1991, as well as a UST removal and site assessment overseen by ENSR Consulting and Engineering (ENSR). The letter stated that in 1991 Proler had analyzed a **composite soil sample** for zinc, lead, chromium, cadmium, and tin at the site. The sample was composited from 15 sampling locations across the site, each of which was collected at a depth of 2 feet bgs. According to the letter, the composite soil sample did not contain concentrations of metals above the MTCA Method C CULs for industrial sites. Proler also collected 36 samples of the **black mud generated by the detinning process**, composited the samples into 6 samples, and analyzed them for RCRA metals in accordance with the Toxicity Characteristic Leaching Procedure (TCLP), as well as tin and zinc. The letter indicated that none of the samples contained concentrations of metals that were “above levels that would classify the black mud as dangerous waste in the State of Washington.” Proler also conducted another subsurface investigation in 1997, which included collecting two samples of the black mud that were analyzed for TCLP metals, evaluating static acute fish toxicity test to evaluate the black mud, and collecting one surface water sample that had been in contact with the black mud (Schnitzer 1999a, 1999b). The letter indicated that all fish survived the 96-hour test, and based on these results, the black mud would not be designated as a dangerous waste under the State of Washington dangerous waste regulations. The surface water sample was below MTCA Method C Groundwater and Surface Water CULs for aluminum, cadmium, lead, tin, and zinc.



The Schnitzer letter also referenced two tanks formerly located at the site: a 250-gallon AST used for storing diesel fuel (**Tank No. 39**) and a 1,100-gallon UST used for storing heating oil (**Tank No. 38**; Figure 5). The tanks were removed by 1992, and a “**moderate fuel odor**” was reported by ENSR. A subsurface investigation in the former UST area was conducted by ENSR in 1993 (Schnitzer 1999b). The investigation included four soil borings; the samples were collected at 5 and 8 feet bgs. Only one sample reportedly contained a detectable concentration of heating oil at 66 mg/kg, which was below the MTCA Method A CUL.

In 2009, Landau Associates, Inc. (Landau 2009) completed an Environmental Investigation Report for the POS Terminal 115 North. The purpose of the investigation was to evaluate potential contaminant source areas at the site and to evaluate migratory pathways from these potential source areas to the LDW. Landau concluded in the report that potential migratory pathways from the site to Glacier Bay (located to the north of the site and within the LDW) include groundwater and the existing storm drain system. Soil was not considered a potential pathway; however, leaching of contaminants from soil to groundwater was noted as an indirect pathway for contaminants to enter Glacier Bay.

Landau advanced **11 borings** (boring DP-1 and monitoring wells MW-1 through MW-10) at the site (Figure 6D) and concluded in their report that **metals, PAHs, acetone, and lube oil-range** petroleum hydrocarbons were present at levels that exceed MTCA Method A, B, and/or C screening levels in soil, groundwater, and/or storm drain solids throughout the site. However, arsenic was the only contaminant found in groundwater samples collected from monitoring wells MW-9 and MW-27 (a previously installed well) located immediately adjacent to Glacier Bay.

Further work to characterize the nature and extent of the releases at Terminal 115 North and the adjacent property to the north is ongoing under an Ecology directed AO.

5.1.6 Terminal 115 Berth 1 Sediment Sampling

Chemicals of concern (COCs) identified in the sediment within the LDW include, but are not limited to, PCBs, PAHs, metals, dioxins, and phthalates.

In 2009, Anchor QEA, LLC collected a series of sediment grab samples (T115-SS01 through T115-SS05) in the vicinity of Berth 1 prior to conducting maintenance dredging activities (Figure 6E). The results of samples collected during the event were compared to the Sediment Quality Standards (SQS) and the Dredge Material Management Program sediment standards (DMMP); only one analyte exceeded the criteria (butylbenzyl phthalate, which was detected in a sediment sample [T115-SS05; Anchor 2009a] collected at a depth of 0 to 10 centimeters [cm]).

Upon completion of the construction and dredging activities that followed the 2009 sediment sampling event, Science and Engineering for the Environment LLC (Science and Engineering) conducted a post-dredge subsurface characterization event in 2010.. Sediment samples were collected from stations SC01 through SC04 at depths ranging from 0 to 4 feet. Data were compared to Dredged Material Management Program (DMMP) screening levels. The following analytes exceeded the DMMP screening levels:

- Butylbenzyl phthalate (SC02 from 1 to 2 feet, SC03 [SC032] from 0 to 1 foot)
- Flouranthene (SC01 from 3 to 4 feet)
- Pyrene (SC01 from 3 to 4 feet, SC03 [SC032] from 1 to 2 feet)
- Benzo(a)anthracene (SC03 [SC032] from 1 to 2 feet)
- Chrysene (SC03 [SC032] from 1 to 2 feet)
- Total high molecular weight polycyclic aromatic hydrocarbons (HPAHs) (SC01 from 2 to 4 feet, SC02 from 3 to 4 feet, and SC03 [SC032] from 1 to 2 feet)
- Total PCBs (SC01 and SC02 from 0 to 4 feet, SC03 [SC032] from 0 to 3 feet, and SC04 [SC043] from 0 to 1 foot)
- Total dioxins Toxicity Equivalency Quotient (SC01 from 1 to 4 feet, SC02 and SC03 [SC032] from 0 to 4 feet)

In an effort to mitigate exposure to the contaminants identified in the post-dredge sediment, a sand cap was placed over the exposed material. Sand within the first 0 to 10 cm of the cap was analyzed for the COCs identified above, and none of the samples contained concentrations of COCs in excess of the screening levels. The results of both phases of the characterization are discussed in detail within Science and Engineering's post-Dredge Subsurface Sediment Characterization and Sand Cover Monitoring Report, dated June 25, 2010. A 3-year sand cap monitoring program has been established to evaluate the ongoing effectiveness of the cap in providing a barrier to the contaminated sediment below.

Ecology's pending Lower Duwamish Waterway [RM 1.6 to 2.1 West Data Gaps Report](#) will include consolidated sediment data, including Berth 1 data, compared to the Sediment Quality Standards (SQS) and the Washington State Sediment Cleanup Screening Level (CSL) per Washington Administrative Code 173-204-320.

5.2 OFF-PROPERTY INVESTIGATIONS

The following sections summarize previous off-property subsurface investigations conducted in the vicinity of Terminal 115.

5.2.1 First Avenue Bridge Landfill

A large-scale investigation of the vicinity of the First Avenue Bridge was completed in 1994 in association with the redesign of public streets south of Terminal 115 (Dames & Moore 1994). Soil borings were advanced on Terminal 115, as well as on the south-adjointing properties and within tidal flats along the LDW, and a monitoring well was installed in the vicinity of the Seafreeze loading dock (MW-19). No petroleum hydrocarbons or solvents were encountered at concentrations above their respective detection limits in groundwater samples collected and analyzed from MW-19. A groundwater sample collected from MW-19 contained a concentration of 13 µg/L total lead, which exceeded the MTCA Method A CUL; however, concurrent analyses for dissolved lead did not reveal concentrations above the reporting limit. Concentrations of cadmium, arsenic, mercury, and chromium in the groundwater sample collected from MW-19 were below applicable MTCA Method A CULs and/or laboratory reporting limits.

Sediment samples were collected southwest of Terminal 115 near the First Avenue Bridge as part of the study. With the exception of mercury, the samples collected near the southern Terminal 115 property boundary were found to contain concentrations of metals, TPH, and VOCs below applicable MTCA Method A soil CULs. Mercury was detected at a concentration of 5.2 mg/kg in a tidal flat sample collected at 5 feet bgs. This concentration is, however, within the range of background mercury concentrations commonly found in the LDW, which are cited as ranging from 0.012 to 28.8 mg/kg. VOCs and TPH were detected in soil and groundwater samples collected from areas to the south of the First Avenue Bridge and on the eastern banks of the LDW. These localized areas of contamination were reported to be hydrologically crossgradient, involved soil impacts only, or were limited in nature.

5.2.2 Boeing Building 1-01 (IEC No. 15.01)

Boeing Building 1-01 was constructed in 1929 and was used as an administrative building, a metallurgical laboratory, and later by Foss Environmental as an office and spill response center. A tank removal form and letter indicates that in 1991, a 4,000-gallon diesel UST (Tank No. 1; Figure 5) was removed from the property (POS 1991). The location of the tank was not provided on the removal form. O’Sullivan Construction completed the tank removal and collected soil stockpile samples. No contamination was reportedly discovered during the investigation. No other information regarding the tank was reported.

In 1998, two additional USTs were removed from the southwestern portion of the property (SD&C 1998). The tanks included a 3,000-gallon Bunker C UST and a 1,000-gallon diesel UST (Tank Nos. 2 and 3; Figure 5). The 1,000-gallon UST was associated with a limited subsurface release of diesel fuel. Remedial activities included the removal of PCS and 110 gallons of petroleum-impacted groundwater from the excavations. Overexcavation of PCS could not be completed due to the proximity of the Southwest Michigan Avenue underground utilities. PCS was left in place until 2002, when Urban Redevelopment and Foss Redevelopment oversaw the subsequent removal of 45 tons of PCS from the former excavation areas. Compliance monitoring was completed in 2003, and confirmation soil and groundwater samples collected from the site

indicated that concentrations of DRPH were at or below the MTCA Method A CUL (Urban Redevelopment 2003).

5.2.3 Al Bolser Tire Store (IEC No. 15.02)

A tire repair facility, which included a sales office, repair garage, and fuel-dispensing pump islands, operated on a west-adjointing property across West Marginal Way Southwest at 6515 West Marginal Way Southwest. A gasoline UST with a capacity of 5,264 gallons was removed from the site in 2006 (Filco 2006). A stockpile sample contained detectable concentrations of GRPH, ethylbenzene, and total xylenes below applicable MTCA Method A CULs. No other stockpile or excavation samples contained detectable concentrations of petroleum hydrocarbons, and the excavation was backfilled with the stockpiled soil.

5.2.4 Reichhold/Glacier NW Agreed Order Site (IEC Nos. 15.04 and 15.05)

Subsurface investigations of environmental quality on the north-adjointing property have been conducted since 1985. A detailed discussion of the investigations is provided in the 2008 *Remedial Activities Summary Report* (Shaw 2008) and the 2009 draft *Summary of Existing Information and Data Gaps Report* (ERM 2009). The site is managed under an AO between Ecology, Reichhold, and Glacier NW. Confirmed and suspected sources of contamination at the property include the historical operation of an arsenic-based wood-preservation plant, a charcoal and gas mask production plant, a chemical factory, and a cement storage and distribution facility. Sediment characterization studies have been conducted in the vicinity of the Reichhold/Glacier NW site since 1998.

5.2.4.1 Subsurface Investigations at Reichhold/Glacier NW

As a result of historical use of the property, several COCs and areas of contamination were identified. The locations of a former PCP production facility, tank farm, wastewater impoundment, water treatment tank, PCP pilot production areas, a septic tank, and wastewater drainage ditches were identified as areas containing highly elevated soil and groundwater concentrations of chlorinated phenols, including PCP (RETEC 1996, SAIC 2007, Shaw 2008, ERM 2009).

These historical release areas were primarily located on the central and northern portions of the property. Arsenic was detected in soil and groundwater in an undefined area located on the central portion of the property, extending south to the property boundary adjoining Terminal 115 (ERM 2009, Landau 2009). The area of arsenic contamination, although of unknown source in previous investigations, appears to coincide with the areas of operation of the Mineralized Cell Wood Preserving Company's operations in 1937 and 1938, according the 1937 aerial photographs, Kroll Maps, and historical phone directories. Furthermore, the Mineralized Cell Wood Preserving Company is an identified potential source of arsenic contamination in the Boeing Isaacson site's AO (Ecology 2010b). PCP was detected in soil and groundwater above the MTCA Method C CULs in soil and groundwater near the former pilot-scale production areas of the property and the former wastewater impoundment. Concentrations of PCP in soil reached 1,000 mg/kg in soil boring GP-16, approximately 100 feet north of Terminal 115 (Shaw 2008, ERM 2009). A soil sample collected from boring GP-15, which was advanced between soil boring GP-16 and the northern Terminal 115 property boundary, exhibited PCP concentrations below laboratory reporting limits. Groundwater concentrations of PCP and related phenolic compounds did not exceed detection limits of 1 µg/L and 5 µg/L, respectively, in monitoring

wells located along the northern Terminal 115 property boundary (MW3S, MW3D, MW18, MW20, and MW24 through MW26) (ERM 2009).

Trace pesticides and phthalates were confirmed in soil beneath the property, and elevated concentrations of DRPH and GRPH were identified in soil in localized areas across the property. Silver and arsenic were confirmed to be above MTCA Method A, B, and/or C CULs in both soil and groundwater (Shaw 2008, ERM 2009).

Approximately 3 to 5 feet of fill material consisting of silt, sand, and “concrete debris” comprise the shallow subsurface; no mention of CKD was made in any reports or boring logs prepared for the property. A perched groundwater zone was observed at depths of 4 to 13 feet bgs. Lower hydrologic units below the perched zones were confined to clay/silt layers defined as aquitards. The general flow of the perched layer was reported to be toward the southeast, defining Terminal 115 as downgradient of the Reichhold/Glacier NW site. Deeper groundwater within the lower lithologic layers was found to flow in a northeasterly direction (RETEC 1996, Shaw 2008, ERM 2009).

5.2.4.2 Remedial Activities at Reichhold/Glacier NW

Pilot-scale testing of treatment methods to address COCs on the Reichhold/Glacier NW site began in 1997. An ozone sparging system was installed to remediate the PCP plume in groundwater, and a hydrogen peroxide injection and groundwater removal system was evaluated for the treatment of arsenic contamination in groundwater. The systems operated from 2000 until 2006. The treatment processes were highly successful in the remediation of groundwater concentrations of PCP and arsenic in groundwater. Monitoring well MW-13, for example, experienced a drop in PCP concentrations from a pretreatment high of 8,040 µg/L to a post-treatment concentration in 2007 of 569 µg/L. In the impoundment area, a PCP peak of 63.2 µg/L in pretreatment wells decreased to 2 µg/L after treatment in four of five groundwater samples collected at the site.

5.2.5 Glacier Bay Sediment Sampling

Significant sediment impacts have been reported by Ecology in Glacier Bay, located north of Terminal 115 and east of the Reichhold/Glacier NW site. According to the 2007 Ecology Glacier Bay Data Gaps Report, dioxin and furan concentrations confirmed in the offshore sediments of Glacier Bay are higher than at any other area in the LDW (SAIC 2007). The following are COCs associated with sediments that have exceeded the applicable SQS in Glacier Bay: arsenic, mercury, zinc, copper, lead, antimony, tributyltin, dioxins/furans, PCBs, phthalates, PAHs, 1,2-dichlorobenzene, PCP, benzyl alcohol, and organo-tin products.

The portion of the LDW located along the Reichhold/Glacier NW site has been identified as a source control area by Ecology, and continued sediment sampling is planned to assess source control options and the full extent of sediment impacts at the site.

Ecology’s pending Lower Duwamish Waterway RM 1.6 to 2.1 West Data Gaps Report, and Ecology’s Glacier Bay Source Control Area Summary of Existing Data and Identification of Data Gaps Report (SAIC 2007) includes consolidated sediment data, including Glacier Bay data, compared to the Sediment Quality Standards (SQS), as defined in WAC 173-204-320, and the Washington State Sediment Cleanup Screening Level (CSL), as defined in WAC 173-204-520.

5.2.6 Duwamish Waterway Sediment Sampling

Evaluations of sediment quality within the LDW have been conducted since the 1970s. A detailed discussion of the investigation activities conducted prior to 2003 is provided in the Windward Phase 1 Remedial Investigation (RI) (Windward 2003). These and subsequent sampling events conducted in the vicinity of Terminal 115 are discussed below.

Approximately 30 sediment samples were collected along the shoreline of Terminal 115 during the RI and previous sampling events (Figure 6, Windward 2010). The following analytes exceeded the SQS in sediment samples collected along the shoreline of Terminal 115 (Figures 6 and 6E):

- HPAHs
- Metals, including arsenic, copper, mercury, and zinc
- PCBs
- Dioxins
- Phthalates, including dimethyl phthalate, butylbenzyl phthalate, bis(2-ethylhexyl)phthalate, and di-n-octyl phthalate

Ecology's pending Lower Duwamish Waterway RM 1.6 to 2.1 West Data Gaps Report will include consolidated sediment data compared to the Washington State Sediment Cleanup Screening Levels (CSL), as defined in WAC 173-204-520, and the Sediment Quality Standards (SQS), as defined in WAC 173-204-320

6.0 ISSUES OF ENVIRONMENTAL CONCERN

The following section provides a synopsis of each of the IECs identified in preceding sections (Table 1, Figure 4). Current tenant operations and a further discussion of source control strategies are discussed in detail in Ecology's pending Terminal 115 Data Gaps Report. The potential of the IECs to impact the LDW and require source control actions is discussed in Section 7.0 below.

6.1 SOUTHERN WATERFRONT BLOCKS PETROLEUM SITES

The following IECs, which are located on the southeast corner of Terminal 115, are summarized below and discussed in greater detail in Section 3.3. No environmental investigations have taken place in the vicinity of the historical automotive service stations that formerly existed on the southern portions of Terminal 115.

- **Standard Oil Station (IEC No. 1).** The retail gasoline service station, which operated at the southeast portion of Terminal 115 between 1923 and 1965, was equipped with a UST system and an automotive repair and lubrication facility.
- **Refinery Building (IEC No. 2)** Although the exact nature of the facility is unknown, the use and storage of petroleum products is possible.
- **Richfield Service Station Site (IEC No. 3).** The retail gasoline service station and repair facility were equipped with two 500-gallon USTs, a 1,000-gallon UST, and a hydraulic lift. It operated on the southeast portion of Terminal 115 between 1938 and 1964.

6.2 BOEING PLANT 1

The IECs listed below include those identified in association with the former Boeing Plant 1 operations.

6.2.1 World War I-Era Boeing Plant 1 Site

As discussed in Section 3.4.1, numerous IECs have been identified in association with the historical uses of the World War I-era Boeing Plant 1 site. No subsurface investigations have been completed in the vicinity of the facilities, which include the following:

- **Assembly Building (Building 1-03, IEC No. 4.01).** Building 1-03 was originally constructed to assemble large seaplanes. During the 1930s and 1940s, the assembly building was used to assemble component parts that were later sent to Boeing Plant 2 and Boeing Plant 3 for final assembly. According to Sanborn Maps and the 1942 Boeing site plan, an oil house was located 30 feet to the west of Building 1-03.
- **Boiler House and Dry Kiln (Buildings 1-06 and 1-10, IEC No. 4.02).** The dry kiln and boiler house were located on the waterfront of the World War I-era Boeing Plant 1. These buildings were involved in the drying and treating of wood and the production of heat for the Boeing plant.
- **Transformer House (Building 1-07, IEC No. 4.03).** The transformer house was built as an addition to the boiler house in 1928. Tax record photographs indicate that the transformer was rated for 26,000 volts.
- **Old Assembly Building (Building 1-08, IEC No. 4.04).** The old assembly building was constructed in 1918 and was originally used for the assembly of parts before crating and delivery. The 1942 Boeing site plan and the 1950 Sanborn Map indicate the use of the building as welding, paint spraying, crating, materials testing, shipping, and a plaster shop.
- **Paint Spraying Shop (Building 1-04, IEC No. 4.05).** The paint spraying and plating shop was constructed in 1918 and contained facilities for spraying paint and plating airplane parts. The 1942 Boeing site plan and the 1950 Sanborn Map indicate that the westernmost portion of the building was used primarily for paint spraying and the remainder of the building was used for “anodic treatment.” Paint spraying and anodic treatment of airplane parts involve the use and likely discharge of hexavalent chromium, cyanide, paint products, cutting oil, and various other metals and chemicals.
- **Maintenance Welding Building (Building 1-12, IEC No. 4.06).** Welding and unspecified storage of equipment have been documented to have occurred at this site.

6.2.2 Machine Shop (Building 1-02)

The following are IECs associated with Building 1-02 as discussed in Section 3.4.2 and discussed below.

- **Main Factory Building (Building 1-02, IEC No. 4.07).** The main building contained brazing and welding facilities, a machine shop, a sheet metal shop, heat treating

facilities, an assembly room for airplane components, and metal cutting, burning, and grinding shops. In addition, welding equipment fuel was stored in a structure to the west of the building.

- **Former Engine Testing Facility (Building 1-02, IEC No. 4.07).** The facility was equipped with three 5,000-gallon USTs that were removed in 1994 (Tanks Nos. 5-7). GRPH contamination was discovered in stockpiled soil removed from the UST excavation, and SPH was observed on groundwater. No further subsurface investigations have taken place at the site. Apparent monitoring well monuments were observed in the area of the former USTs during the site reconnaissance; however, the current status of the wells was not evaluated.
- **Buried fuel dispenser and gasoline tank (Tank No. 8, IEC No. 4.08).** According to the 1942 Boeing site plan, the UST system was located to the southwest of Building 1-02. Several transformers also were located in the vicinity of Building 1-02.
- **Compressor House (Building 1-39, IEC No. 4.09).** The compressor house was constructed adjacent to the west of Building 1-02 by 1952, and according to aerial photographs, it was demolished by 1978. The area of the former compressor house has not been investigated, and the widespread use of chlorinated solvents and lubrication oil is suspected.

6.2.3 Eastern Test Facilities

The following are IECs identified previously in Section 3.3.3. No subsurface investigations have been conducted to evaluate the environmental quality of soil and groundwater in the vicinity of these IECs, which include the following:

- **Hammer Shop (Building 1-29, IEC No. 4.10).** The hammer shop and foundry building was constructed to the east of Building 1-02 in 1936 and was involved in the forming of structural metal components for airplane components. Metal tailings and waste materials would have resulted from the production of metal components.
- **Static Test Building (Building 1-40, IEC No. 4.11).** The static test building area was an area documented to contain several ASTs. As the areas surrounding Building 1-40 are reportedly associated with testing engines, fuel pumps, and structural components, the likelihood of the use and storage of fuel in these areas is high. In addition, Building 1-40 also was utilized as a foundry.
- **Brick Incinerator (Building 1-42, IEC No. 4.12).** According to aerial photographs and Boeing site plans produced between 1942 and 1963, a brick incinerator operated on the eastern waterfront from at least 1938 until the demolition of Boeing Plant 1.
- **Storage Buildings (IEC No. 4.13).** The buildings located to the west of Building 1-40 were used for the storage of paint, rivets, and lubrication oil. A drum storage yard was also listed in the vicinity of the storage buildings. According to aerial photographs, the storage buildings were demolished and replaced by 1946 with

Building 1-41, the fuel-pump testing building; two USTs, which were reportedly filled with sand and closed in place, were located to the west of the building.

- **Engine Testing Facility (Building 1-34, IEC No. 4.14).** According to the 1942 Boeing site plan, the engine test facility also included a fuel tank test shed located to the south of the building.
- **Steam Plant (Building 1-30, IEC No. 4.15).** According to tax records and Boeing site plans, the steam plant was equipped with a 20,000-gallon diesel fuel UST located adjacent to the northwest of the building. The steam plant operated until 1970 and was demolished by 1976, at which time the UST was also closed in place.
- **Lift Station (IEC No. 4.16).** The lift station building pumped waste water into a force main prior to discharging the water to sewer outfalls. Wastewater generated at the site during the operation of the lift station included chromates and cyanide, and many other COCs are suspected to have entered the waste stream.
- **Sandblasting Area (Building 1-44, IEC No. 4.17).** According to aerial photographs and the 1957 and 1963 Boeing site plans, as well as archived tax records, sandblasting took place in this area until 1970. Sandblasting is associated with elevated concentrations of arsenic, cadmium, and other heavy metals.
- **Acid Test Building (Building 1-45, IEC No. 4.18).** The acid test building was located to the east of Building 1-40, directly abutting the LDW. The structure was demolished by 1978.

6.2.4 Western Test Facilities/Hazardous Materials Storage Area

The following include the IECs identified in Section 3.4.4 and 3.4.5:

- **Test Revetment (Building 1-50, IEC No. 4.19).** Revetments are often used for aircraft storage; however, aircraft were neither assembled nor stored at Terminal 115 after 1941. Similarly constructed test revetments utilized by Boeing were used for aircraft munitions testing and engine testing. The test revetment was demolished in 1966.
- **Fuel Test Lab (Building 1-21, IEC No. 4.20).** The 1955-vintage fuel test lab contained five separated test rooms. According to a Boeing drawing (Boeing 1958), a 3,000-gallon UST containing gasoline was installed between the test lab and the fuel storage building (Building 1-22) and a dispenser was installed near the tank. No decommissioning records were observed for the 1958-vintage UST and dispensing systems.
- **Fuel Storage Facility (Building 1-22, IEC No. 4.21).** The fuel storage building was used for the storage of flammable materials, and a 1960 photograph of the building indicated the presence of multiple unknown barrels and a fuel dispenser. In addition, a flammable materials storage shed was constructed in 1964, and archived records indicate that USTs were located beneath the concrete slab foundation. The structure appears to the north of Building 1-22 in the Boeing 1963 site plan. According to aerial photographs, Building 1-22 was demolished by 1973.

- **Acid Storage (Building 1-26, IEC No. 4.22).** The acid storage building contained waste acid and alkali materials that were stored in drums.
- **Hazardous Materials Storage (Building 1-27, IEC No. 4.23).** No data were available regarding the type or quantity of the materials stored within Building 1-27 or of the containers that were used to store the materials. However, various potentially hazardous chemicals have been listed in previous sections and were possibly stored in this building.
- **Paint Storage (Building 1-23, IEC No. 4.24).** A paint storage building (Building 1-23) was located to the west of Building 1-05. In the 1961 aerial photograph, Building 1-23 appears to have been demolished.
- **Seafreeze Tanks (Tank No. 9, IEC No. 5).** The Seafreeze building was constructed on the former site of Boeing Plant 1 in 1978. According to a 1980 Seafreeze blueprint, a 4,000-gallon diesel UST was installed at the southwest corner of the building. In 1994, EMCON conducted an environmental assessment following the removal of three abandoned 6,000-gallon USTs encountered during construction activities near the southwest corner of the Seafreeze facility. These three USTs are unrelated to the UST identified in the 1980 blueprint. Soil samples collected during the excavation activities contained concentrations of GRPH, DRPH, ORPH, and total xylenes that exceeded their respective 2001 MTCA Method A CULs. SPH was observed floating on the groundwater within the UST excavation.

6.3 SOUTHWEST TANK FARM AREAS AND FORMER KLINKER GRAVEL

The following IECs, which are located on the southwestern portion of Terminal 115, are summarized below and discussed in greater detail in Sections 3.5 and 3.6:

- **Former SAV-MOR Gas and Auto Salvage (IEC No. 6).** The historical repair facility, retail gasoline station, and auto salvage yard operated on the southwest portion of Terminal 115 between 1930 and 1967. The service station included two fuel dispensers and a service garage (grease shed) installed with a hydraulic lift. No subsurface investigations have been conducted in the vicinity of the site.
- **Material Reclamation Smelter (IEC No. 7).** Archived tax records indicate that an aluminum smelter equipped with an 8,000-gallon UST was constructed in 1952 at 6730 West Marginal Way. According to historical photographs and reverse directories, the site was occupied by Materials Reclamation and Maralco Aluminum as an aluminum smelter from 1952 through 1985. In 1994, in preparation for the installation of a fuel dispensing station, geotechnical borings were advanced at the property. SPH was observed in groundwater, and extensive soil contamination was confirmed. In 1995, the UST, which was reported to have a capacity of 9,500 gallons, was removed. Additionally, the tank was confirmed to be a buried tanker rail car that had been modified to serve as an underground heating oil tank. Soil and groundwater contamination was discovered in the floor and sidewalls of the excavation, as well as surrounding the product piping. Soil was overexcavated and disposed of off the property, with the exception of soil underlying the building structural supports. Contaminated soil that was left in place was to be removed with the installation of the fuel

dispensing facility; however, no subsequent evaluation of soil and groundwater quality as a result of the smelter operations has reportedly been conducted.

- **Cardlock Facility (IEC No. 8).** Property records indicate that the current gasoline- and diesel-dispensing station was installed in 1996. Groundwater monitoring has been conducted at the property since 1995, the results of which are discussed further in Section 5.1.2. The site is currently occupied by a restaurant building and a commercial fleet refueling station containing seven fuel-dispensing pump islands and three 10,000-gallon USTs. No information regarding surface water, soil, or groundwater impacts associated with the current use and storage of gasoline and diesel in association with the existing commercial fleet vehicle refueling station were observed. However, the risk for a release to the subsurface exists.
- **Klinker/Ready-Mix Graystone Division (IEC No. 9).** According to aerial photographs taken in 1922, what appears to be a sand and gravel mining and mixing plant was in operation along West Marginal Way Southwest near the west-central portion of Terminal 115. Water from the nearby slough was used as wash water for sluicing gravel and sand into a sorting box to be used as sanitary fill by the City of Seattle. The operation reportedly produced considerable amounts of fine silt that was discharged into Turning Basin No. 1. Aerial photographs taken between 1946 and 1965 indicate that the areas surrounding the Klinker site became increasingly silted and the shoreline expanded progressively to the east over time. The cement loading, mixing, and dock facilities were removed by 1971 after the infilling of Turning Basin No. 1.

6.4 CENTRALTERMINAL 115 FACILITIES

The following IECs are associated with current and former operations across Terminal 115. They are summarized below and discussed in greater detail in Section 3.7.

- **Car Wash Building (Building C-1, IEC No. 10).** This structure is currently present on Terminal 115 and is used as a repair and maintenance shop. The building was equipped with subsurface troughs and reclaiming pits for the catchment of gray water before the water was discharged to the sewer system. To the west of the building, a 2,000-gallon UST and a 5,000-gallon UST, both of which were used for the storage of kerosene, were installed at the property in 1971 to fuel a heating device in the car wash and to collect kerosene from a separator system. The 5,000-gallon UST (Tank No. 28) was removed in 1989. Soil samples collected during excavation activities contained concentrations of TPH that exceeded the MTCA Method A CULs. No investigations of the active AST (Tank No. 29) located at the facility have been conducted.
- **Body Shop Building (Building C-2, IEC No. 10).** The building initially was constructed with a 10,000-gallon UST (Tank No. 30) and fuel-dispensing pump island. The UST and fuel dispenser were removed in 1989. No evidence of petroleum contamination was discovered in the course of UST removal activities.
- **Maintenance Building (Building W-2, IEC No. 12).** The 1972-vintage structure was utilized for repair services and was equipped with a 6,000-gallon UST (Tank No. 33) that originally contained diesel. The UST was connected to a fuel dispenser located approximately 100 feet to the northeast of Building W-2. The UST contained diesel fuel in 1993 and was replaced in

1994 by a 6,000-gallon diesel UST (Tank No. 34). In addition, a 400-gallon, concrete AST containing gasoline and a 300-gallon metal lined AST containing diesel (Tank Nos. 32 and 31, respectively) are currently located near the building and are connected with fuel dispensers.

- **Terminal Office Building (Building A-5, IEC No. 13).** The office building was constructed in 1971. According to 1975 drawings, the building was equipped with a fueling facility that was located approximately 40 feet to the west of the building. The fuel facility was equipped with two fuel-dispensing pump islands, a 1,000-gallon gasoline UST, and a 2,000-gallon diesel fuel UST (Tank Nos. 36 and 35, respectively). According to UST closure documents, both USTs were removed in 1990. A 1,100-gallon diesel UST (Tank No. 38) was installed in 1993 in the place of the former USTs. Fuel dispensers are not currently present, and the UST has not been used since its installation.

6.5 FILL MATERIAL (IEC NO.11)

As discussed in Section 3.9, much of Terminal 115 has been altered with the addition of fill. Fill material was introduced to the site from a variety of sources, such as dredge spoils from the LDW and other unknown off-property sources.

The periods of fill activities at the property include the following:

- In 1916 and 1917, the portion of the Duwamish River located in the vicinity of Terminal 115 was channelized. Foss Island was created from a combination of dredge spoils and natural banks during this time.
- In 1928, dredge ships deposited spoils onto the southern portions of Terminal 115.
- In 1935, dredge spoils from the LDW were deposited on Terminal 115 North and the north-adjointing property.
- In the early 1950s, Klinker expanded the shoreline in the vicinity of its operations on West Marginal Way Southwest and McAllister's Slough was partially filled by the City of Seattle and property owners. In addition, in 1953, a large dewatering lagoon was constructed on Foss Island.
- In the late 1950s, light-colored fill material was deposited on Terminal 115. The filling activities connected Foss Island to the land directly east of West Marginal Way Southwest. Fill material was deposited across all of Foss Island, as well as areas to the north and west of Turning Basin No. 1. Reclaimed land was occupied by a concrete barge loading facility.
- In 1963, the shoreline was expanded in the vicinity of Terminal 115 North, which brought the shoreline to the eastern extent of the Terminal 115 North property boundary. The land reclaimed was utilized as settling ponds for a detinning plant that operated on the property.
- Between 1965 and 1969, two large dewatering lagoons were constructed using light-colored fill material. These dewatering lagoons were located on and to the west of the former Foss Island. A large stockpile of light-colored material was observed in the center of Foss Island between the dewatering lagoons.
- Between 1969 and 1971, the remainder of Terminal 115 was infilled and graded.

- Between 1973 and 1976, the Boeing Plant 1 facilities were demolished, fill material was added to the former building sites, and the area was graded.

6.6 TERMINAL 115 NORTH (IEC NO. 14)

Terminal 115 North, located on the northern portion of Terminal 115 has one IEC associated with the former operations of M&T Chemical and MRI, as summarized below and discussed in greater detail in Section 3.8.

Reverse directories and aerial photographs indicate that the first developed use of Terminal 115 North was in 1963, when a detinning plant was constructed. The plant recycled metals by dissolving the waste metal in solution with caustic lye and separating it from solution via electrowinning. The plant was equipped with two 16-ton cranes, a plating room, a boiler room, 13 ASTs, a 250-gallon AST used for storing diesel fuel, a 1,100-gallon UST used for storing heating oil, and a detinning area where the caustic lye and metals materials were mixed in a chamber. The UST was removed in 1992. The plant also included two evaporation/settling ponds intended to capture waste sludge for further extraction of metals. These evaporation/settling ponds were unlined and included dikes to prevent loss of material. Waste water was pumped into the sanitary sewer located near the facility (Ecology 1998). The stormwater on the site appears to have been discharged into the Duwamish River until 1991, when stormwater was diverted to the King County Metro system (Metro 1991). Due to the failure of the site to meet wastewater discharge limits in 1996, all process wastewater and stormwater was reused on site (Ecology 1998).

Further subsurface investigation work is proposed for the site, and a full characterization of the site is ongoing under an Ecology-supervised AO.

6.7 OFF-PROPERTY ISSUES OF ENVIRONMENTAL CONCERN

Several industrial uses on adjoining properties have been identified as IECs, which are summarized below and discussed in greater detail in Section 4.0:

- Administrative Building (Building 1-01, IEC No. 15.01).** Boeing Building 1-01 was constructed in 1929 and used as an administrative building, a metallurgical laboratory, and an office and spill response center. A tank removal form and letter indicate that in 1991 a 4,000-gallon diesel UST was removed from the property and no contamination was discovered during the investigation. No other information regarding the tank was reported. In 1998, two additional USTs were removed from the southwestern portion of the property. The tanks included a 1,000-gallon diesel UST and a 3,000-gallon Bunker C UST. The 1,000-gallon UST was associated with a limited subsurface release of diesel fuel. PCS was left in place until 2002, when it was overexcavated. Compliance monitoring was completed in 2003, and confirmation soil and groundwater samples collected from the site indicated that concentrations of DRPH were at or below MTCA Method A CULs.
- Klinker/Al Bolser Tire Store (IEC No. 15.02).** A sand and gravel mining and cement mixing operation existed on the west-adjoining property from the 1920s through the 1950s. The presence of CKD on the site has been documented in previous reports and historical maps and aerial photographs. In addition, a tire repair facility, which included a sales office, repair garage, and fuel-dispensing pump islands, operated on a west-adjoining property across

West Marginal Way Southwest at 6515 West Marginal Way Southwest. A gasoline UST with a capacity of 5,264 gallons was removed from the site in 2006. A stockpile sample contained detectable concentrations of GRPH, ethylbenzene, and total xylenes below applicable MTCA Method A CULs. No other stockpile or excavation samples contained detectable concentrations of petroleum hydrocarbons, and the excavation was backfilled with the stockpiled soil.

- **Aluminum and Bronze Fabrication (IEC No. 15.03).** According to archived tax records and aerial photographs, the property located at 6301 West Marginal Way Southwest was initially developed with a single-family residence in the 1910s. The wood-framed, one-story residence was heated by a stove. It was demolished in 1964 and replaced by the currently existing 1964-vintage, aluminum and bronze smelting facility. The smelting facility was originally heated by an oil-burning furnace. No investigations have been conducted to evaluate soil and groundwater quality in the vicinity of the operational smelter.
- **Reichhold (IEC No. 15.04).** According to environmental reports, tax archive records, and aerial photographs of the area, the north-adjointing Reichhold/Glacier NW property was initially developed as an arsenic-based wood-preservation plant in 1937. In 1943, a factory that produced copper-impregnated charcoal filters for use in U.S. Army gas masks was located on the site. The charcoal filter factory was leased to Reichhold in 1947 for use as a pilot-scale factory of plywood resins and wood-treating agents. The factory was involved in the production and use of formaldehyde, epoxies, phenols, polychlorinated phenolic compounds, and other chemicals until 1960. The factory was equipped with thirteen 25,000-gallon, chemical ASTs. In addition, a railway spur that was used to store chemical storage train cars was located near the tank farm. A pilot-scale PCP production facility was located on the northern portion of the factory grounds. The former locations of the PCP production facility, tank farm, wastewater impoundment, water treatment tank, PCP pilot production areas, a septic tank, and wastewater drainage ditches were identified as areas containing highly elevated soil and groundwater concentrations of chlorinated phenols, including PCP. Arsenic was identified in soil and groundwater beneath the central portion of the property, extending south to the property boundary adjoining Terminal 115, and beyond. Trace pesticides and phthalates were confirmed in soil beneath the property, and elevated concentrations of DRPH and GRPH were identified in soil in localized areas across the property. Silver and arsenic were confirmed to be above MTCA Method A, B and/or C CULs in both soil and groundwater.
- **Glacier NW (IEC No. 15.05).** A cement storage, shipping, and processing facility was built on the Glacier NW property in 1967. Cement silos, loading bays, processing equipment, and washing racks were installed on the property. The current dock located at the property was installed in 1980. The embayment created by the Terminal 115 apron and the former LDW shoreline located to the north of Terminal 115 is regularly dredged by Glacier NW, the current owner of the property. The property is currently used as a cement shipping site equipped with storage, loading, and processing facilities. Investigation of confirmed subsurface contamination at the site is ongoing under an Ecology-supervised AO.

7.0 POTENTIAL PATHWAYS OF CONTAMINATION

The pathways described in Ecology's Source Control Strategy, the applicability of each pathway to Terminal 115, and an evaluation of the pathways as they relate to the IECs are discussed below. Current tenant operations and evaluation of the stormwater pathway as it pertains to the current tenant operations are discussed in detail in Ecology's pending Terminal 115 Data Gaps Report.

7.1 SOURCE CONTROL STRATEGY PATHWAYS

Prior to developing source control management strategies, a preliminary evaluation of the applicability of each pathway identified in the Lower Duwamish Waterway Source Control Strategy (<http://www.ecy.wa.gov/pubs/0409043.pdf>) and their relevance to Terminal 115 was conducted, as summarized below. The pathways considered to be of concern for potential impacts to LDW sediments are presented conceptually on Figure 8.

7.1.1 Direct Discharges

The direct discharge of pollutants to the waterway from commercial, industrial, private, and municipal outfalls may impact sediment quality, depending on the origin and character of the effluent. Many of these discharges are permitted under the NPDES. Permitted discharges, regardless of whether they exceed applicable permit levels, may result in sediment contamination. Permitted industries include sand and gravel facilities, boatyards, shipyards, and other facilities.

Terminal 115 Applicability:

- Three tenants on Terminal 115 currently operate and discharge stormwater under an ISWGP; the remaining areas of Terminal 115 operate and discharge stormwater under a GPMS. Stormwater outfalls and other subsurface infrastructure are discussed in Section 2.4.2 above, and stormwater discharge and management is discussed above in Section 2.4.3.
- Because Terminal 115 discharges stormwater to private and municipal outfalls, this potential pathway to the LDW sediments is considered complete.

7.1.2 Stormwater Pathway

Stormwater enters the waterway directly from properties adjacent to the waterway and via storm drains and pipes, ditches, and creeks. Stormwater pollution is generated when rain contacts pollutants that have accumulated in or on exposed soil and other surfaces, or comes from illegal discharges or illicit connections to storm sewers. Contaminated solids that collect in storm drains/pipes, ditches, or creeks may be carried to the waterway by stormwater. In the LDW area, 80 industrial sites are authorized to discharge under the general NPDES permit for industrial stormwater. In addition, three individual NPDES permits are active for given industrial operations in the area. The City of Seattle and King County are municipal NPDES permittees for stormwater.

Terminal 115 Applicability:

- Same as Direct Discharge above.

- This potential pathway to the LDW sediments is considered **complete.**

7.1.3 Combined Sewer Overflows

Combined Sewer Overflow (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. The City of Seattle and King County are municipal NPDES permittees for CSOs.

Terminal 115 Applicability:

- Terminal 115 tenants **Shultz Distributing, Inc. and Seafreeze** discharge to the King County sanitary sewer, which is connected to two CSOs located on and in the vicinity of Terminal 115.
- The Terminal 115 CSO/SD is located in the vicinity of the northern property boundary, on Terminal 115 North, and is an uncontrolled 48-inch-diameter Metro King County overflow outfall. The discharge is delivered to the LDW. Since 2006, the CSO has average **2.5 overflow events per year, averaging 3.52 million gallons (MG) per year** between 2003 and 2007. Control measures including a 0.5 MG storage tank are expected to be completed by 2027 (King County 2009).
- The West Michigan Regulator/CSO is located in the vicinity of the First Avenue South Bridge, located approximately 100 feet south of Terminal 115. The CSO is a 36-inch-diameter, deep water, uncontrolled Metro King County overflow outfall which discharges into the LDW. The overflow average since 1991 is **4.8 events per year**. The average overflow volume between 2001 and 2007 was **1.23 MG per year**. No specific control measures for this CSO are planned at this time; however, control is currently expected to be completed by 2027 (King County 2008).
- This potential pathway to LDW sediments is considered **complete.**

7.1.4 Groundwater

Contaminated groundwater may enter directly into the LDW via seeps or it may infiltrate into storm drains/pipes, ditches, or creeks that discharge to the waterway.

Terminal 115 Applicability:

- The presence of shallow groundwater has been confirmed at Terminal 115 (Section 2.3.2).
- Active and abandoned subsurface storm drains/pipes are situated in confirmed and potentially contaminated areas of Terminal 115, as described in Section 2.4.2 above.
- This potential pathway to LDW sediments is considered **complete.**

7.1.5 Erosion/Leaching

Waterway bank soil, contaminated fill, waste piles, landfills, and surface impoundments may release contaminants directly to the LDW through erosion, via soil erosion to stormwater, or by leaching to groundwater.

Terminal 115 Applicability:

- Terminal 115 has some limited exposed waterway bank soil and unpaved surfaces that may be susceptible to erosion (Figure 3).
- Terminal 115 has confirmed shallow groundwater and subsurface storm drain systems, as described above.
- Approximately two-thirds of Terminal 115 is comprised of fill, the majority of which has unknown origin.
- This potential pathway to LDW sediments is considered **complete.**

7.1.6 Spills, Dumping, Leaks, and Inappropriate Housekeeping/Management Practices

Spills, dumping, and leaks within the Terminal 115 property may result in contaminant releases to soil, groundwater, and/or stormwater that may impact sediments. Dumping material such as wood waste or debris directly into the waterway may also impact sediments. Inappropriate management practices either within the storm drain or CSO basins tributary or directly adjacent to the LDW increase the risk of sediment contamination.

Terminal 115 Applicability:

- Terminal 115 operations currently include some limited handling of potential contaminants, such as oils and grease, cleaners, and hazardous material cargo, that have the potential to spill, be dumped, leak, or be handled inappropriately.
- Acknowledging the close proximity of Terminal 115 to the LDW and the confirmed presence of groundwater and subsurface drainage features, this potential pathway to LDW sediments is considered **complete.**

7.1.7 Waterway Operations and Traffic

Contaminants from riverside docks, wharves, and piers, discharges from vessels (gray, bilge, ballast or other waters), fuel releases, and other spills may impact sediments. Inappropriate general housekeeping and management practices for waterside construction, vessel fueling, hull maintenance, wastes and other materials at marinas and small boatyards may also impact sediment quality.

Terminal 115 Applicability:

- Terminal 115 waterway operations primarily involve the loading and unloading of cargo to/from non-powered barges. There are no marine vessel maintenance or fueling operations at the property. There is potential for spills to occur from the barges, cargo, or loading vehicles.
- Terminal 115 does have some wood piers that may contain **creosote.** A majority of the pier columns at Terminal 115 have been upgraded to steel.

- This potential pathway to LDW sediments is considered **complete.**

7.1.8 Atmospheric Deposition

Air pollution can enter the waterway directly or through stormwater, and become a potential source of sediment contamination. Air pollution can be localized, such as paint over-spray, sandblasting, 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 and industrial smokestacks.

Terminal 115 Applicability:

- Terminal 115 operations that may result in localized air pollution (e.g., sandblasting and painting) are very limited and performed within containments.
- Cargo loaded and unloaded at the facility is primarily containerized, and no known raw materials handling is performed as part of the current tenant operations.
- Terminal 115 does not have any industrial smokestacks, and vehicle emissions from vehicles operating at the property are not considered significant.
- Potential contaminants associated with exposed (non-paved) surfaces at Terminal 115 and surrounding properties can become airborne. Airborne particulates can migrate to the LDW via wind dispersion.
- Off-site-generated airborne contaminants collected on the paved surfaces at Terminal 115 can collect and migrate to the LDW via the stormwater system.
- This potential pathway to LDW sediments is considered **complete.**

7.2 PATHWAYS EVALUATION

The following section provides a preliminary evaluation of the potential for contaminants to migrate to the LDW via the applicable pathways as a result of conditions at the IECs discussed in Section 6.0. A summary of the IECs and the applicable pathways is presented in Table 1.

7.2.1 Southern Waterfront Blocks Petroleum Sites (IEC Nos. 1, 2, 3)

The IECs identified in association with the former Southern Waterfront Blocks Petroleum sites include the use, storage, and/or distribution of petroleum hydrocarbons. To date, no subsurface investigations have been conducted on this area of Terminal 115 to assess whether a release of petroleum hydrocarbons to the subsurface has occurred. If a release of petroleum hydrocarbons to soil and/or groundwater has occurred in this area, there is potential for contaminants to migrate to the LDW via the groundwater pathway.

7.2.2 Boeing Plant 1 (IEC No. 4)

The IECs identified in association with the former Boeing Plant 1 operations may have included the use and/or storage of materials including cyanide, chromates, industrial bases and acids, solvents, petroleum hydrocarbons (including jet fuel, avgas, gasoline, cutting oil, lubrication oil, diesel fuel, bunker fuel, and other distillates), PCBs, petroleum-based paints, and metals. To date, **no subsurface investigations have been conducted on the former Boeing Plant 1 area** of Terminal 115 to assess whether a release of hazardous materials to the subsurface has occurred,

with the exception of the former Boeing/Seafreeze UST removal and associated investigations, A release of petroleum hydrocarbons to subsurface soil and groundwater has been confirmed in the vicinity of the former Boeing/Seafreeze USTs, as well as a release of CVOCs and metals from an unknown source confirmed in groundwater samples collected from nearby monitoring wells (EMCON 1995). Contaminated soil and groundwater have the potential to migrate to the LDW via the groundwater and stormwater pathways. However, considering the distance of the Boeing/Seafreeze UST release from the **LDW (1,068 feet)** a release to the waterway via the groundwater pathway is considered unlikely. The extent of the Seafreeze UST release, or any other Boeing-related releases, has not been fully characterized and the potential risk of migration to the LDW has not been assessed.

7.2.3 Southwest Tank Farm Areas and Former Klinker Gravel (IEC Nos. 8 and 9)

The former SAV-MOR retail gasoline station and auto salvage may have included the use, storage, and/or distribution of petroleum hydrocarbons and/or metals. To date, no subsurface investigations have been conducted on this area of Terminal 115 to evaluate whether a release of contaminants to the subsurface has occurred. If a release of contaminants to soil and/or groundwater has occurred in this area, there is potential for contaminants to migrate to the LDW via the groundwater and stormwater pathways. However, considering the distance of the SAV-MOR site from the **LDW (1,406 feet)** a release to the waterway via the groundwater pathway is considered unlikely.

The former material reclamation smelter may have used and/or stored metals and petroleum hydrocarbons. To date, no subsurface investigations have been conducted to evaluate the environmental quality of soil and groundwater as a result of the former smelter operations. However, investigations documenting the removal and closure of the former buried rail car and 600-gallon heating oil UST confirmed a release of petroleum hydrocarbons to subsurface soil and groundwater. Contaminants have the potential to migrate to the LDW via the groundwater pathway. Considering the distance of the release from the **LDW (1,378 feet west), a majority of the site is capped by asphalt, and that stormwater infrastructure is unconnected with the contaminated zone,** a release to the waterway via the groundwater, erosion/leaching, stormwater, and air pollution pathways is considered unlikely. However, additional site characterization and a formal evaluation of the potential risk of migration to the LDW is warranted, given the confirmed impacts associated with the site.

The operational Cardlock Facility uses, stores, and distributes petroleum hydrocarbons. While several investigations have confirmed a release of petroleum hydrocarbons to the subsurface in the vicinity of the facility as a result of former operations, no evaluation of the existing UST system has been conducted. Contaminated soil and groundwater have the potential to migrate to the LDW via the groundwater and stormwater pathways. Considering the distance of the release from the **LDW (1,265 feet west)** and the **licensed UST facility is regularly tested for tightness,** a release to the waterway via the groundwater pathway is considered unlikely.

The former Klinker/Ready-Mix Graystone Division site may have used and stored petroleum hydrocarbons and/or concrete products containing metals. To date, no subsurface investigations have been conducted on the former concrete mixing and storage yard, former barge loading terminal, or fill operations in this area of Terminal 115 to confirm or dismiss a release of hazardous materials to the exposed surface or subsurface. If present, contaminated soil and

groundwater have the potential to migrate to the LDW via the groundwater, stormwater, erosion/leaching, and air pollution pathways.

7.2.4 Car Wash and Body Shop Buildings (Buildings C-1 & C-2, IEC No. 10)

The Car Wash Building (Building C-1) included the use and storage of petroleum hydrocarbons. A localized release of petroleum hydrocarbons to soil and groundwater has been confirmed in the vicinity of the former USTs. Contamination has the potential to migrate to the LDW via the groundwater pathway. However, considering the distance of the release from the LDW (890 feet) a release to the waterway is considered unlikely.

The Body Shop Building (Building C-2) included the use and storage of gasoline for the refueling of vehicles imported to the facility. Petroleum-contaminated soil and groundwater was not discovered during the removal of a 10,000-gallon UST or the associated dispensing equipment. If a release of contaminants to soil and/or groundwater is discovered in this area, there would be potential for contaminants to migrate to the LDW via the groundwater pathway. As the decommissioning of the UST and dispensing equipment at Building C-2 was free of contamination during removal, no other sources of contamination are known to exist at Building C-2, and considering the distance of any potential release from the LDW (800 feet west), a release to the waterway via the groundwater pathway is considered unlikely.

7.2.5 Terminal Office Building (Building A-5, IEC No. 13)

The Terminal Office Building (Building A-5) formerly used, stored, and/or distributed petroleum hydrocarbons. To date, no subsurface investigations have been conducted on this area of Terminal 115 to evaluate whether a release of contaminants to the subsurface has occurred. If a release of contaminants to soil and/or groundwater has occurred in this area, there would exist a potential for contaminants to migrate to the LDW via the groundwater pathway. As no contamination was discovered during the decommissioning of two USTs in 1990 and the current UST at the site has been inactive since its installation, a release to the waterway via the groundwater pathway is considered unlikely.

7.2.6 Maintenance Building (Building W-2, IEC No. 12)

The Terminal Maintenance Building (Building W-2) currently uses, distributes, and stores petroleum hydrocarbons. The ASTs located at this site include secondary containment. During UST decommissioning in 1993, soil and groundwater contamination was discovered. The subsequent subsurface investigation confirmed the presence of diesel- and oil-range petroleum contamination of soil and groundwater in the vicinity of the removed UST. Concentrations of DRPH or ORPH in soil and groundwater samples taken from 50 feet downgradient from the former UST were below MTCA Method A CULs. The UST removed in 1993 was replaced by a diesel-containing UST. Considering the site is asphalt-paved, contamination resulting from the former UST has not been discovered beyond the vicinity of the UST, the active AST systems are properly maintained and contained, and the stormwater system located at the site includes oil-water separators, a release to the waterway via the groundwater and stormwater pathways is unlikely. However, additional site characterization and a formal evaluation of the potential risk of migration to the LDW is warranted, given the confirmed impacts and active fuel storage and dispensing system located at the site.

7.2.7 Fill Activities (IEC No. 11)

Fill material was deposited across Terminal 115 between 1915 and 1971. Fill material has included dredge spoils, excavated earth, sanitary landfill, concrete and cement products, and other material of unknown origin. The filling operations primarily occurred between the 1950s and 1970s. Several areas of historical filling activity remain unpaved, such as in the western portion of the loading terminal. Acknowledging the various sources of fill listed previously in this report, metals, petroleum hydrocarbons, creosote, and solvents are contaminants that are potentially associated with fill material. No investigations have been conducted to assess impacts associated with the fill material used at Terminal 115. If a release of contaminants to soil and/or groundwater has occurred on filled areas of Terminal 115, there is potential for contaminants to migrate to the LDW via the groundwater, erosion/leaching, stormwater, and air pollution pathways, due to leaching of contaminants to the groundwater from the fill, the release of contaminants from fill to surface water in unpaved areas, the erosion of fill materials from the banks of T115, and the conveyance of fill via wind in unpaved areas of T115. The potential for a release has not been fully characterized, and migration to the LDW has not been confirmed or dismissed.

7.2.8 Terminal 115 North (IEC No. 14)

Terminal 115 North was historically the site of a metals recycling facility from the 1960s until the 1990s. In 2010, the POS signed an AO with Ecology to perform RI/FS activities. The work associated with the AO is expected to perform any required cleanup actions and subsequent source controls. Pending any change in the AO, the Terminal 115 North site's source control strategies are to be managed by the AO participants. Preliminary analysis of the source control strategies, current environmental conditions, and data gaps have been produced for the POS in the 2009 Landau *Environmental Investigation Report* (Landau 2009) and the 2010 GeoEngineers Data Gaps Memorandum (GeoEngineers 2010). The POS is completing a characterization of available source control strategies under the AO rubric.

7.2.9 Boeing Administration Building (Building 1-01, IEC No. 15.01)

The Boeing Administration Building (Building 1-01) is located to the south of the Terminal 115 property, and historically used and stored heating oil. A release of petroleum hydrocarbons to subsurface soil and groundwater has been confirmed in the vicinity of the former heating oil USTs near the building. During subsequent subsurface investigations and remedial activities, soil and groundwater concentrations were below applicable MTCA Method A CULs. Furthermore, groundwater flows south, away from the nearest property boundary with Terminal 115. Contamination may have the potential to migrate to the LDW via the groundwater pathway, but not by means of conveyance through the Terminal 115 site. The extent of the release has not been fully characterized; however, the potential for migration to Terminal 115 has been dismissed, and the site does not represent a source control issue for Terminal 115.

7.2.10 Klinker /AI Bolser Tire Store (IEC No. 15.02)

The former Klinker/AI Bolser Tire Store included the use and storage of petroleum hydrocarbons and cement products. To date, no known subsurface investigations have been conducted on the Klinker site to evaluate whether a release of hazardous materials to the subsurface has occurred, with the exception of a UST site assessment performed during the removal of a 5,500-gallon UST and associated dispensing equipment formerly located at the AI Bolser Tire Store. No

contamination was discovered as a result of this investigation. The contamination of soil or groundwater at the site as a result of the operation of a repair garage or a gravel and cement production and loading facility remains unassessed. If a release of contaminants to the soil and/or groundwater has occurred at the site, the potential for these contaminants to migrate to the Terminal 115 property, and subsequently to the LDW, via the groundwater, erosion/leaching, stormwater, and air pollution pathways exists.

7.2.11 Aluminum and Bronze Fabrication (IEC No. 15.03)

The aluminum and bronze fabrication smelter that has existed to the west of Terminal 115 since 1967 included the use and storage of metal products, and it is suspected to have included the use and storage of solvents and petroleum hydrocarbons. No known subsurface investigations have been conducted at the site to evaluate whether a release of petroleum hydrocarbons, solvents, or metals to the subsurface has occurred. If a release of petroleum hydrocarbons to soil and/or groundwater has occurred at this site, there is potential for contaminants to migrate to Terminal 115 via the groundwater, erosion/leaching, stormwater, and air pollution pathways. The site has not been fully characterized, and migration to Terminal 115, and subsequently to the LDW, has not been confirmed or dismissed.

7.2.12 Reichhold/Glacier NW. (IEC Nos. 15.04 and 15.05)

The Reichhold/Glacier NW site was occupied by a chemical production plant and cement terminal that was involved in the use, storage, and production of chlorinated phenolic compounds, as well as the storage and distribution of cement products. In addition, fill material has been historically deposited on the site, the majority of which is unpaved. Numerous subsurface investigations have confirmed the presence of soil, sediment, and groundwater impacts of PAHs, dioxins, polychlorinated phenols, phenols, formaldehyde, metals, phthalates, furans, petroleum hydrocarbons, chlorinated solvents, and pesticides. Contaminated soil and groundwater have the potential to migrate to the Terminal 115 property via the groundwater, stormwater, erosion/leaching, and air pollution pathways. Considering the proximity of the site to Glacier Bay and Terminal 115 (adjoining), continued releases of contaminants to the LDW and Terminal 115 North are considered likely.

8.0 CONCLUSIONS AND RECOMMENDATIONS

Terminal 115 has a long history of industrial use, which began in approximately 1909. Operations have included dredging and filling, numerous Boeing Plant 1 operations, retail gasoline stations, vehicle maintenance and salvage, gravel and concrete/cement production, and tin reclamation. Terminal 115 is currently occupied by a number of seafood facilities, cargo storage and transfer operations, vehicle and container maintenance facilities, rail fabrication, warehouses, construction storage, and a retail gasoline station. Upgrades and improvements to infrastructure at Terminal 115 have occurred with each change of tenant operations. As a result, a majority of the terminal is either paved with asphalt or capped with a building slab or a roof cover. Furthermore, several subsurface investigations and sediment sampling events have been conducted at the property to evaluate the potential for environmental impacts as a result of past and current operations.

This diverse current and operational history of the site has resulted in a number of issues of environmental concern that will be considered in the formulation and implementation of an effective, long-term source control strategy. However, the potential risk of a release from many of the IECs

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identified for Terminal 115 has not been evaluated, and several confirmed releases at Terminal 115 have not been fully characterized. A comprehensive evaluation of contamination pathways impacting the portions of the LDW along Terminal 115 cannot be completed until the potential environmental impacts associated with current and former operations at Terminal 115 have been assessed and characterized. In addition, source control strategies are being developed at the Terminal 115 North site as part of an AO between the POS and Ecology. Source control action items may be identified by Ecology to address the data gaps associated with the potential pathways in order to assess the potential for sediment recontamination.

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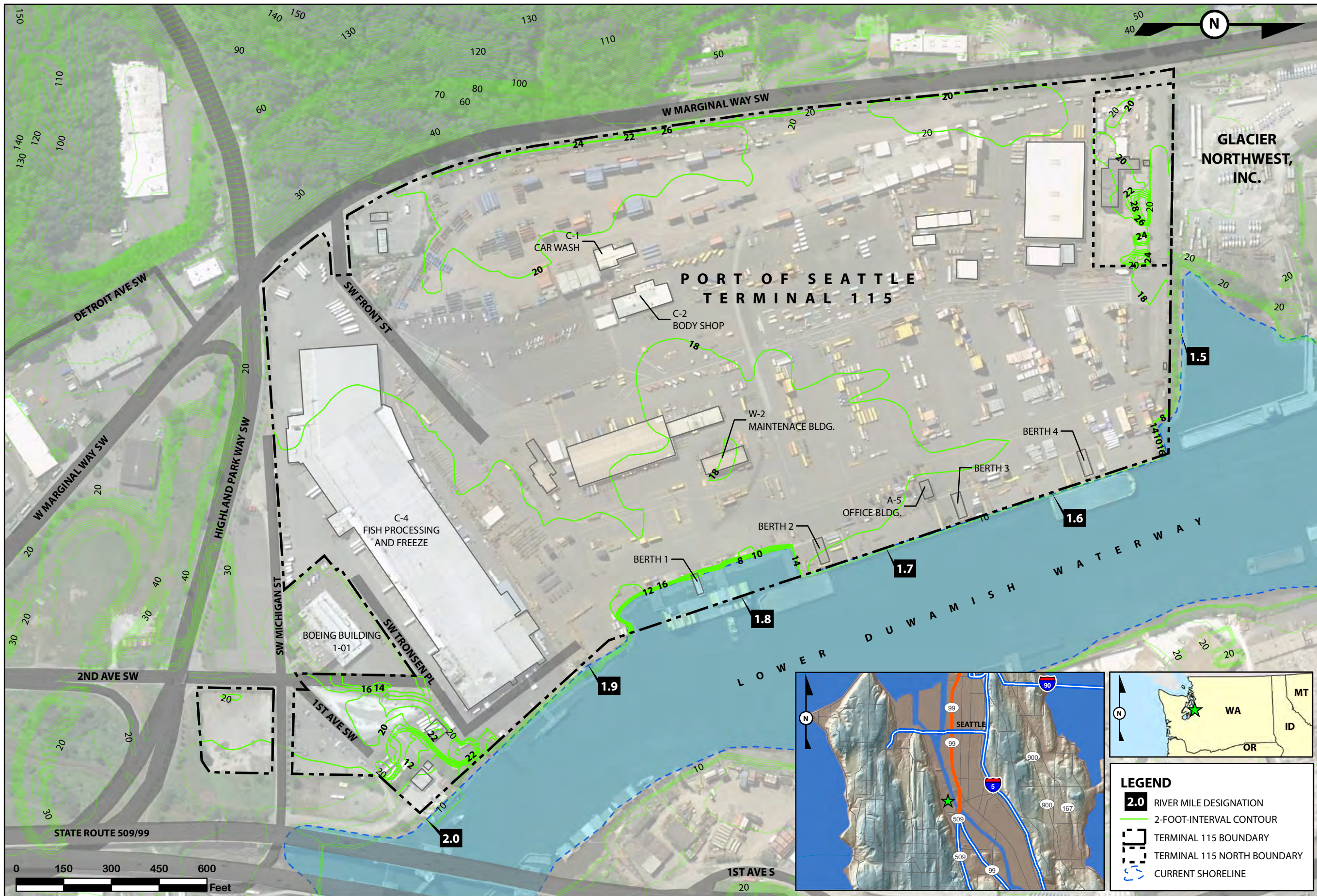
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10.0 LIMITATIONS

The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, expressed or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others or the use of segregated portions of this report.

FIGURES



LEGEND

- 2.0** RIVER MILE DESIGNATION
- 2-FOOT-INTERVAL CONTOUR
- TERMINAL 115 BOUNDARY
- TERMINAL 115 NORTH BOUNDARY
- CURRENT SHORELINE

FIGURE 1
SITE VICINITY MAP

PROJECT NUMBER: 0675-001-01
 ADDRESS: WEST MARGINAL WAY SW
 CITY, STATE: SEATTLE, WASHINGTON

DATE: 11/1/10
 DRAWN BY: NAC
 CHECKED BY: CMC



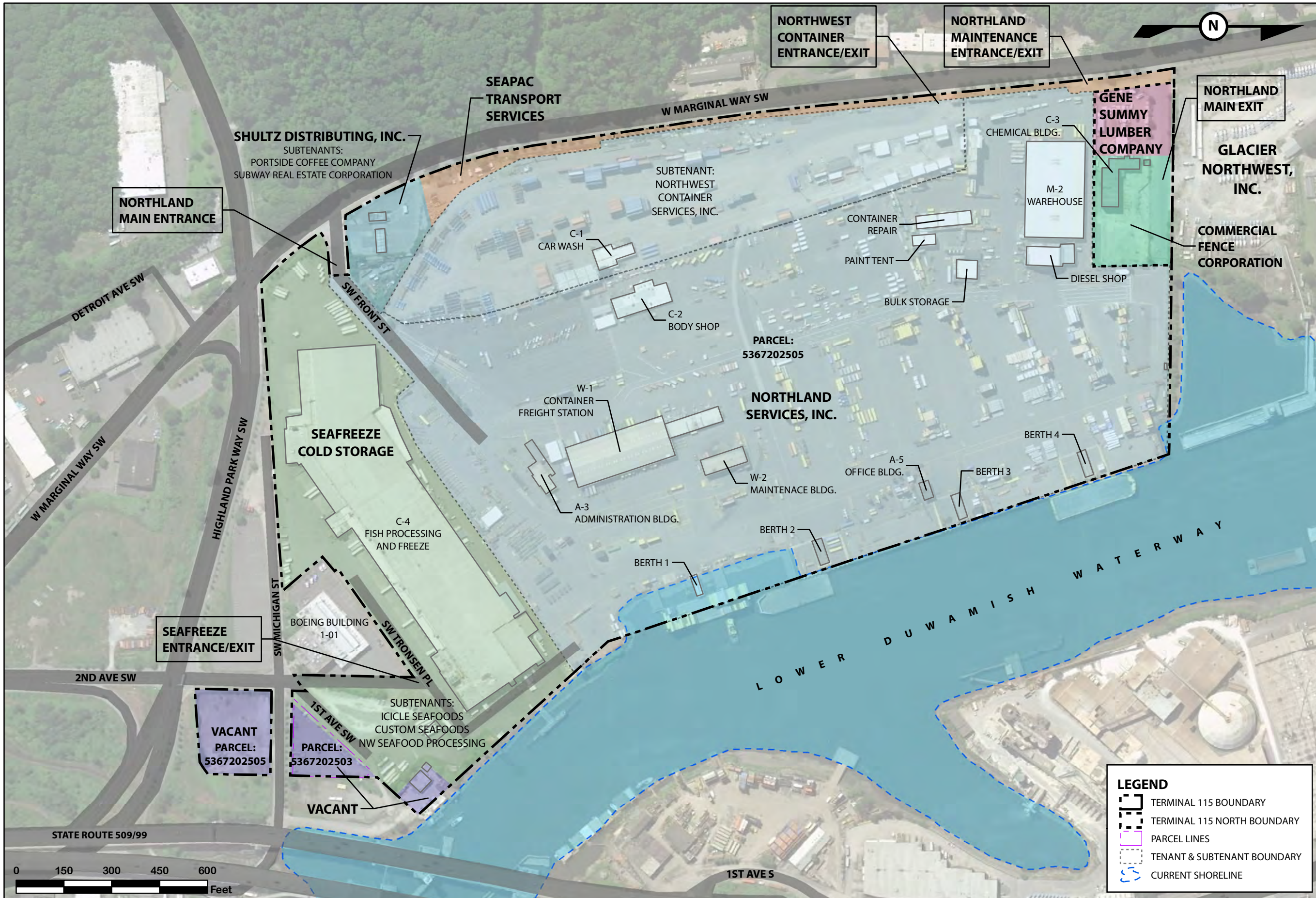


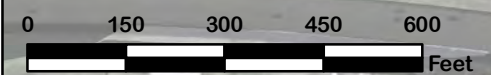
FIGURE 2
CURRENT SITE CONFIGURATION MAP

PROJECT NUMBER: 0675-001-01
ADDRESS: WEST MARGINAL WAY SW
CITY, STATE: SEATTLE, WASHINGTON

DATE: 11/1/10
DRAWN BY: NAC
CHECKED BY: CMC

LEGEND

	TERMINAL 115 BOUNDARY
	TERMINAL 115 NORTH BOUNDARY
	PARCEL LINES
	TENANT & SUBTENANT BOUNDARY
	CURRENT SHORELINE



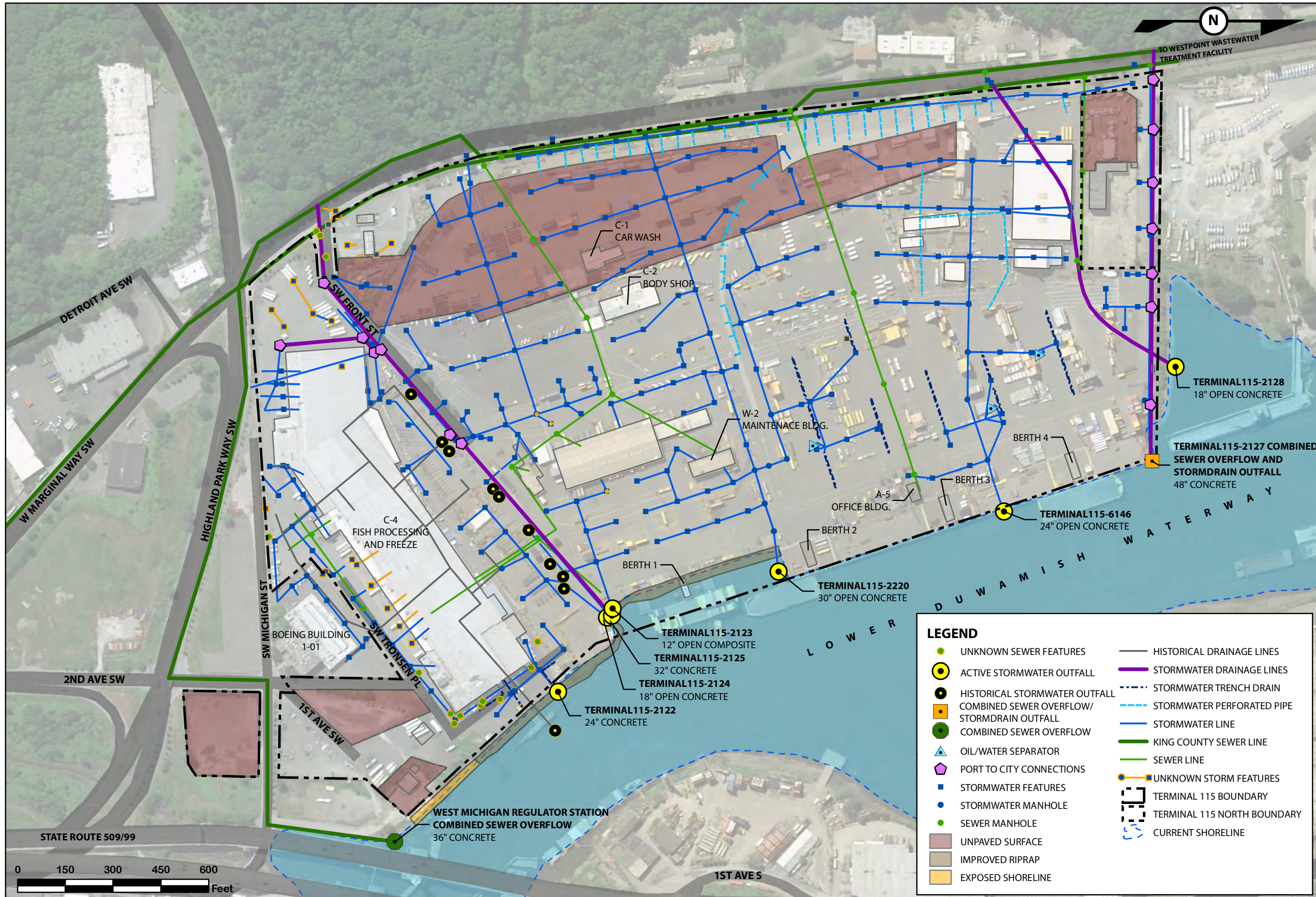
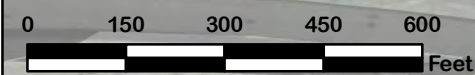


FIGURE 3
 STORMWATER AND SEWER
 INFRASTRUCTURE MAP

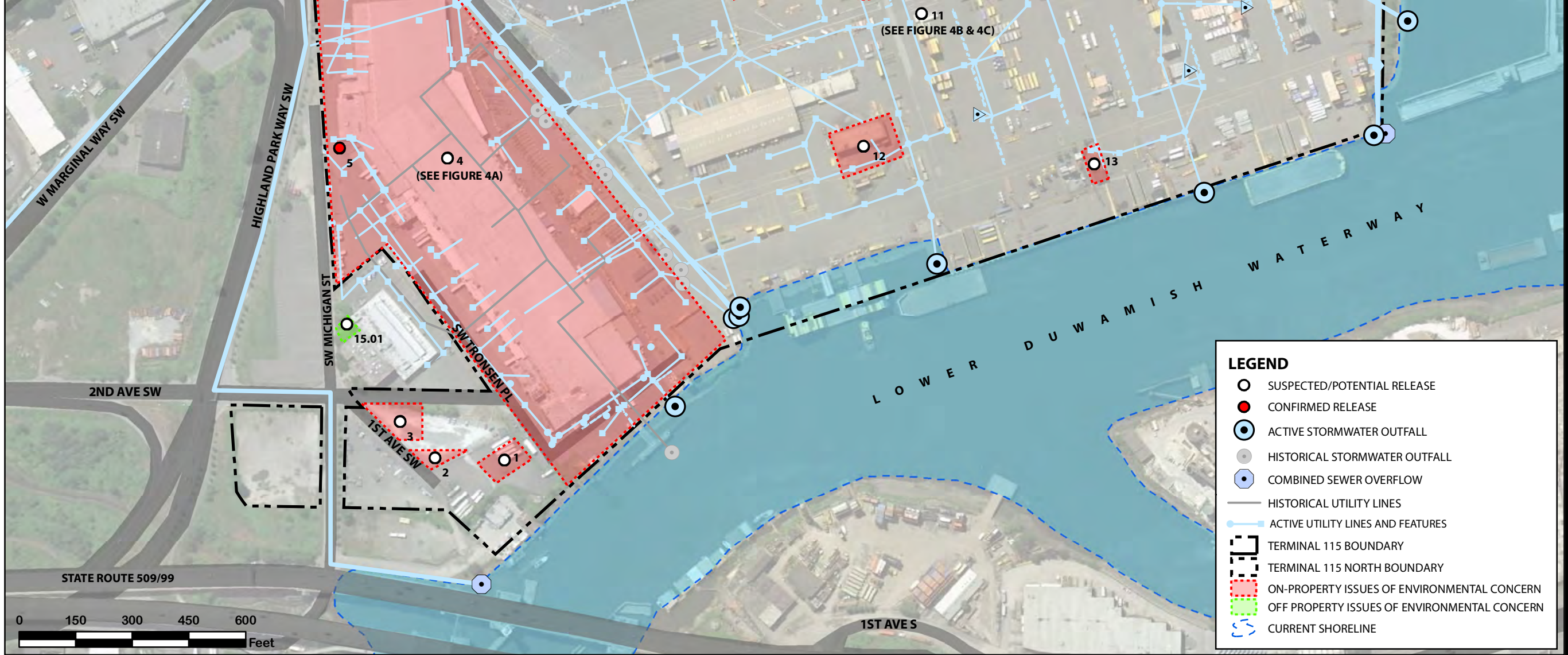
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 ADDRESS: WEST MARGINAL WAY SW
 CITY, STATE: SEATTLE, WASHINGTON

DATE: 11/1/10
 DRAWN BY: NAC
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LEGEND			
	UNKNOWN SEWER FEATURES		HISTORICAL DRAINAGE LINES
	ACTIVE STORMWATER OUTFALL		STORMWATER DRAINAGE LINES
	HISTORICAL STORMWATER OUTFALL		STORMWATER TRENCH DRAIN
	COMBINED SEWER OVERFLOW/ STORMDRAIN OUTFALL		STORMWATER PERFORATED PIPE
	COMBINED SEWER OVERFLOW		STORMWATER LINE
	OIL/WATER SEPARATOR		KING COUNTY SEWER LINE
	PORT TO CITY CONNECTIONS		SEWER LINE
	STORMWATER FEATURES		UNKNOWN STORM FEATURES
	STORMWATER MANHOLE		TERMINAL 115 BOUNDARY
	SEWER MANHOLE		TERMINAL 115 NORTH BOUNDARY
	UNPAVED SURFACE		CURRENT SHORELINE
	IMPROVED RIPRAP		
	EXPOSED SHORELINE		



IEC Identification	
IEC #	Name
1	Standard Oil
2	"Refinery Building"
3	Richfield Oil Gas Station
4	Boeing Plant #1
5	Seafreeze/Boeing USTs
6	Auto Salvage Yard/Sav-Mor Service Station
7	Materials Reclamation Smelter
8	Southwest Tank Yard/Cardlock Facility
9	Klinker Gravel/Ready Mix
10	Buildings C1 & C2/Carwash
11	Landfill Activities
12	Building M2/Maintenance Building
13	Building A5/Marine Office Building
14	Tin Reclamation - T115N
15	Off-Property IECs
15.01	Boeing Building 1-01 USTs
15.02	Tire Shop
15.03	Foundry
15.04	Reichhold Chemical
15.05	Glacier NW/Kaiser



LEGEND

- SUSPECTED/POTENTIAL RELEASE
- CONFIRMED RELEASE
- ⊙ ACTIVE STORMWATER OUTFALL
- ⊙ HISTORICAL STORMWATER OUTFALL
- ⊙ COMBINED SEWER OVERFLOW
- HISTORICAL UTILITY LINES
- ACTIVE UTILITY LINES AND FEATURES
- TERMINAL 115 BOUNDARY
- TERMINAL 115 NORTH BOUNDARY
- ON-PROPERTY ISSUES OF ENVIRONMENTAL CONCERN
- OFF PROPERTY ISSUES OF ENVIRONMENTAL CONCERN
- CURRENT SHORELINE

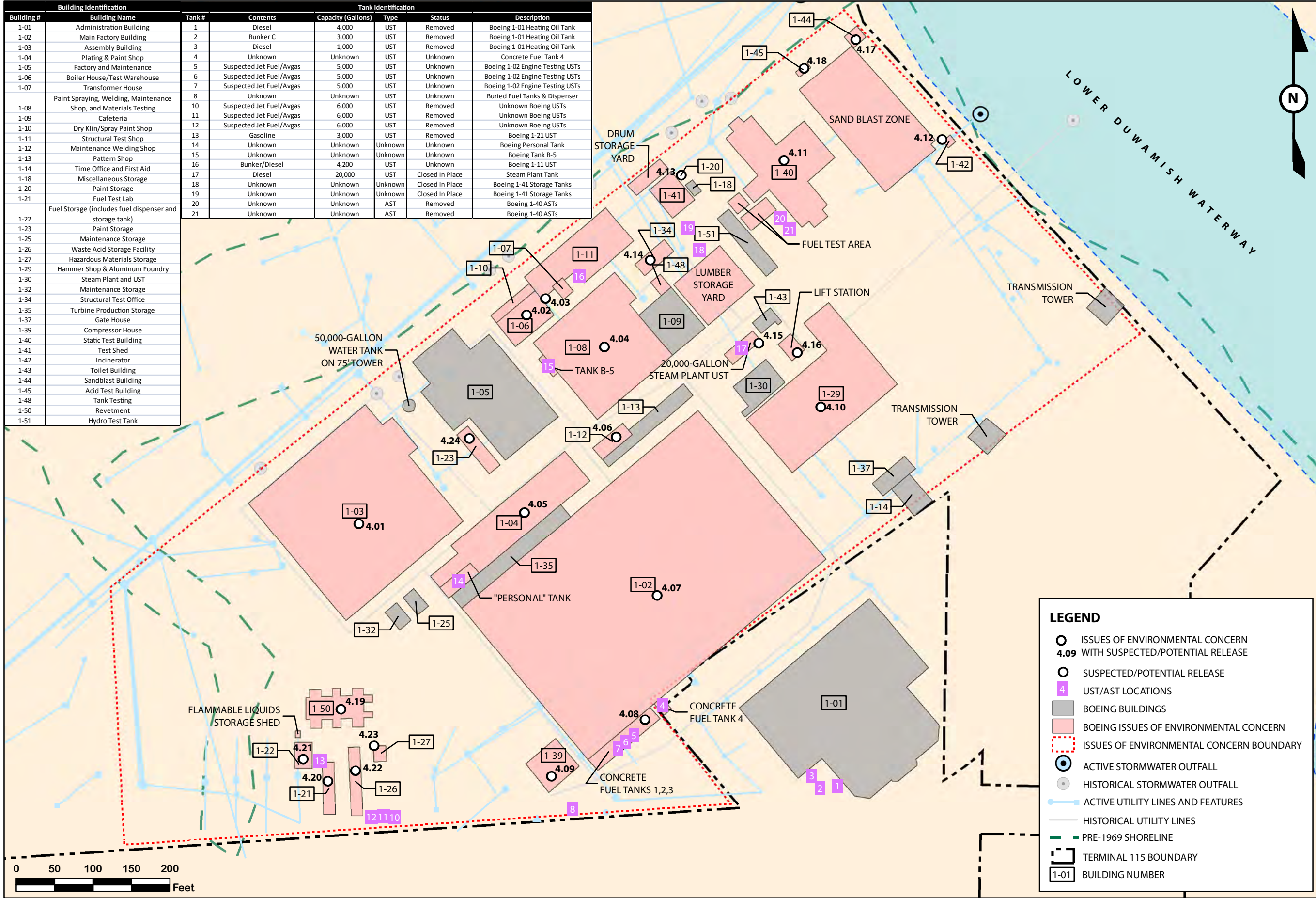
FIGURE 4
ISSUES OF ENVIRONMENTAL CONCERN
MASTER FIGURE

PROJECT NUMBER: 0675-001-01
ADDRESS: WEST MARGINAL WAY SW
CITY, STATE: SEATTLE, WASHINGTON

DATE: 11/1/10
DRAWN BY: NAC
CHECKED BY: CMC



Building Identification		Tank Identification					
Building #	Building Name	Tank #	Contents	Capacity (Gallons)	Type	Status	Description
1-01	Administration Building	1	Diesel	4,000	UST	Removed	Boeing 1-01 Heating Oil Tank
1-02	Main Factory Building	2	Bunker C	3,000	UST	Removed	Boeing 1-01 Heating Oil Tank
1-03	Assembly Building	3	Diesel	1,000	UST	Removed	Boeing 1-01 Heating Oil Tank
1-04	Plating & Paint Shop	4	Unknown	Unknown	UST	Unknown	Concrete Fuel Tank 4
1-05	Factory and Maintenance	5	Suspected Jet Fuel/Avgas	5,000	UST	Unknown	Boeing 1-02 Engine Testing USTs
1-06	Boiler House/Test Warehouse	6	Suspected Jet Fuel/Avgas	5,000	UST	Unknown	Boeing 1-02 Engine Testing USTs
1-07	Transformer House	7	Suspected Jet Fuel/Avgas	5,000	UST	Unknown	Boeing 1-02 Engine Testing USTs
	Paint Spraying, Welding, Maintenance Shop, and Materials Testing	8	Unknown	Unknown	UST	Unknown	Buried Fuel Tanks & Dispenser
1-08	Cafeteria	10	Suspected Jet Fuel/Avgas	6,000	UST	Removed	Unknown Boeing USTs
1-09	Dry Klin/Spray Paint Shop	11	Suspected Jet Fuel/Avgas	6,000	UST	Removed	Unknown Boeing USTs
1-10	Maintenance Welding Shop	12	Suspected Jet Fuel/Avgas	6,000	UST	Removed	Unknown Boeing USTs
1-11	Pattern Shop	13	Gasoline	3,000	UST	Removed	Boeing 1-21 UST
1-12	Time Office and First Aid	14	Unknown	Unknown	Unknown	Unknown	Boeing Personal Tank
1-18	Miscellaneous Storage	15	Unknown	Unknown	Unknown	Unknown	Boeing Tank B-5
1-20	Fuel Test Lab	16	Bunker/Diesel	4,200	UST	Unknown	Boeing 1-11 UST
1-21	Fuel Storage (includes fuel dispenser and storage tank)	17	Diesel	20,000	UST	Closed In Place	Steam Plant Tank
1-22	Paint Storage	18	Unknown	Unknown	Unknown	Closed In Place	Boeing 1-41 Storage Tanks
1-23	Maintenance Storage	19	Unknown	Unknown	Unknown	Closed In Place	Boeing 1-41 Storage Tanks
1-25	Waste Acid Storage Facility	20	Unknown	Unknown	AST	Removed	Boeing 1-40 ASTs
1-26	Hazardous Materials Storage	21	Unknown	Unknown	AST	Removed	Boeing 1-40 ASTs
1-27	Hammer Shop & Aluminum Foundry						
1-29	Steam Plant and UST						
1-30	Maintenance Storage						
1-32	Structural Test Office						
1-34	Turbine Production Storage						
1-35	Gate House						
1-37	Compressor House						
1-39	Static Test Building						
1-40	Test Shed						
1-41	Incinerator						
1-42	Toilet Building						
1-43	Sandblast Building						
1-44	Acid Test Building						
1-45	Tank Testing						
1-48	Revetment						
1-50	Hydro Test Tank						
1-51							



LEGEND

- ISSUES OF ENVIRONMENTAL CONCERN
4.09 WITH SUSPECTED/POTENTIAL RELEASE
- SUSPECTED/POTENTIAL RELEASE
- UST/AST LOCATIONS
- BOEING BUILDINGS
- BOEING ISSUES OF ENVIRONMENTAL CONCERN
- ⋯ ISSUES OF ENVIRONMENTAL CONCERN BOUNDARY
- ⊙ ACTIVE STORMWATER OUTFALL
- ⊙ HISTORICAL STORMWATER OUTFALL
- ACTIVE UTILITY LINES AND FEATURES
- HISTORICAL UTILITY LINES
- PRE-1969 SHORELINE
- ⬜ TERMINAL 115 BOUNDARY
- 1-01 BUILDING NUMBER

FIGURE 4A
FORMER BOEING PLANT COMPOSITE

PROJECT NUMBER: 0675-001-01
ADDRESS: WEST MARGINAL WAY SW
CITY, STATE: SEATTLE, WASHINGTON

DATE: 11/1/10
DRAWN BY: NAC
CHECKED BY: CMC



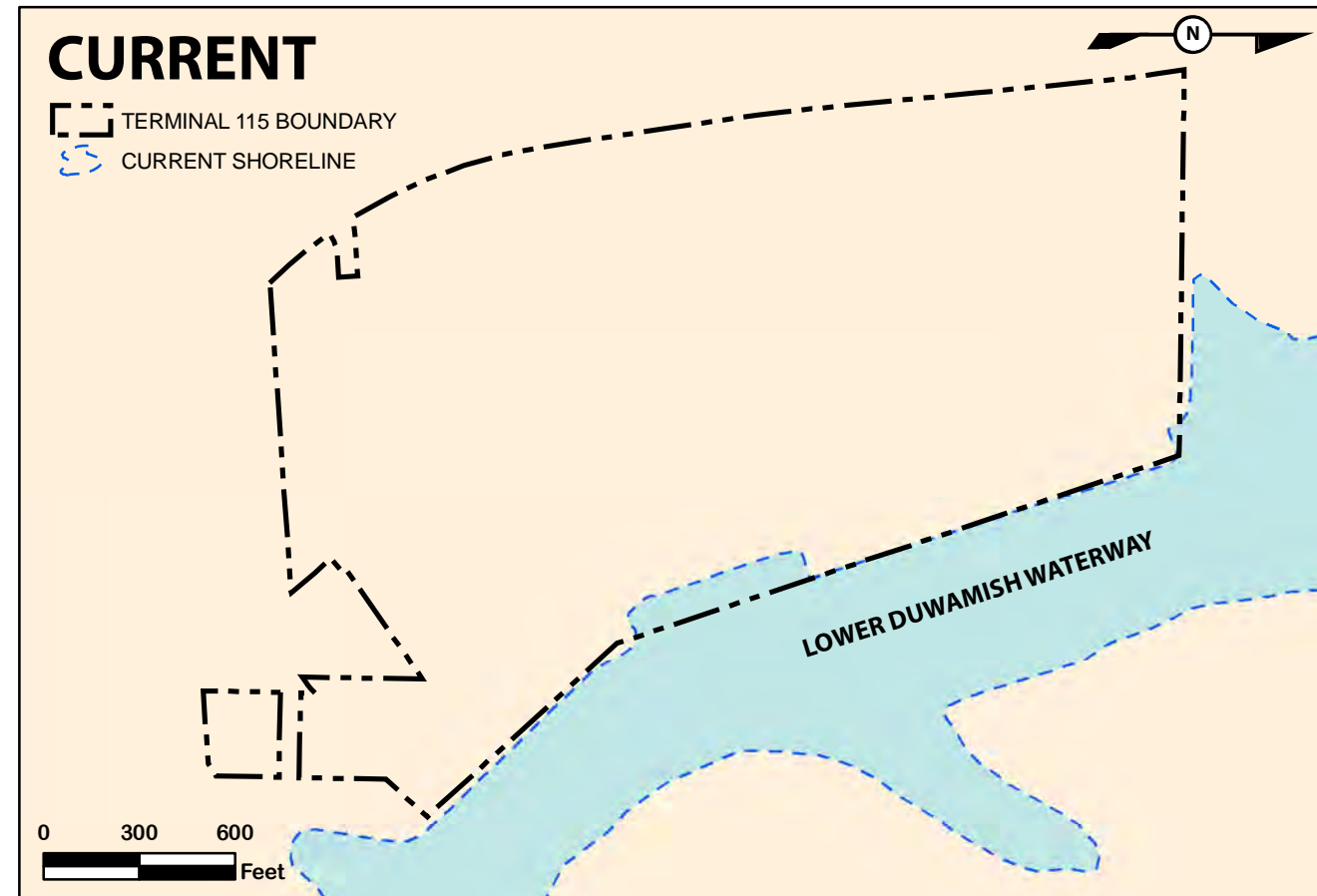
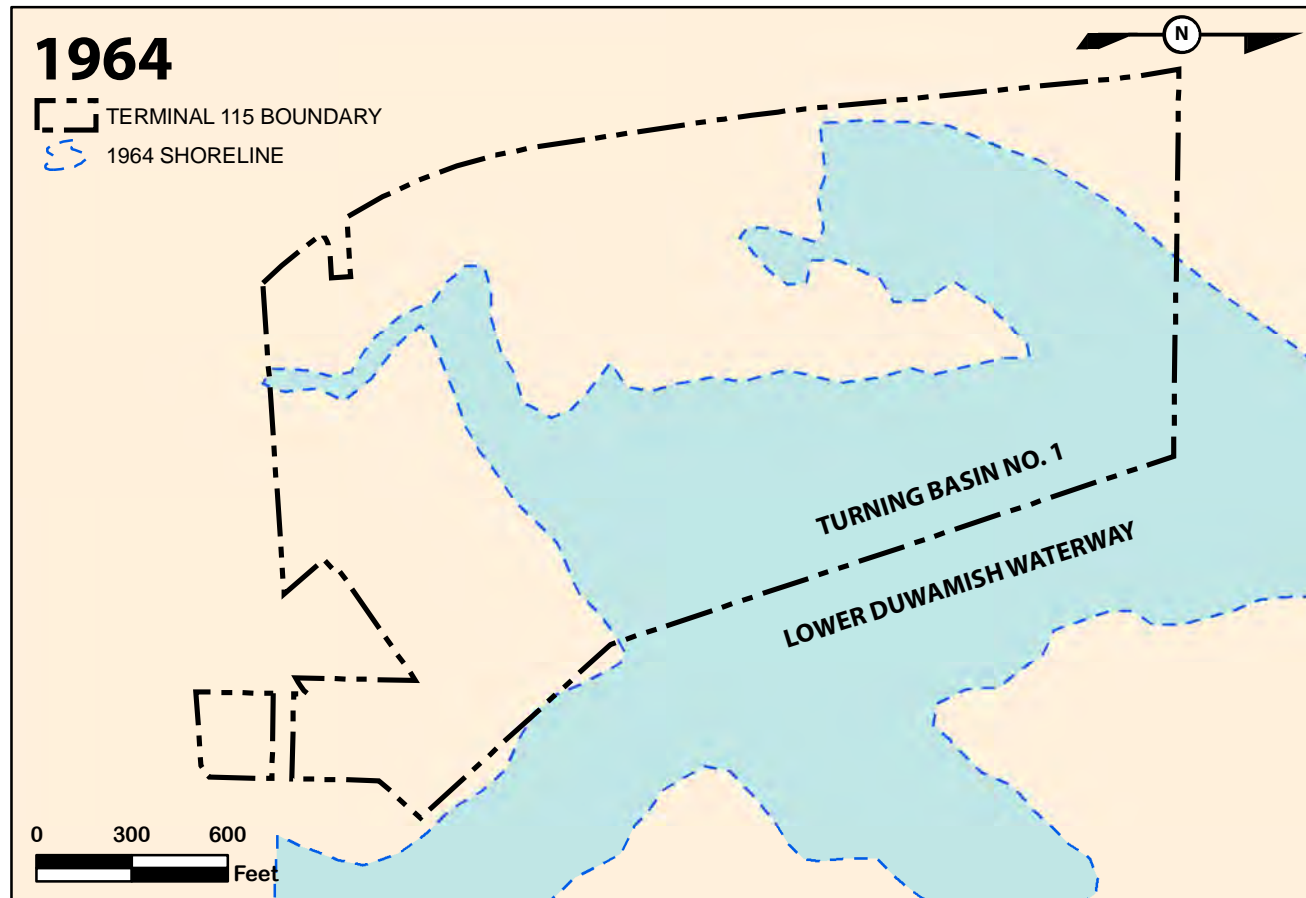
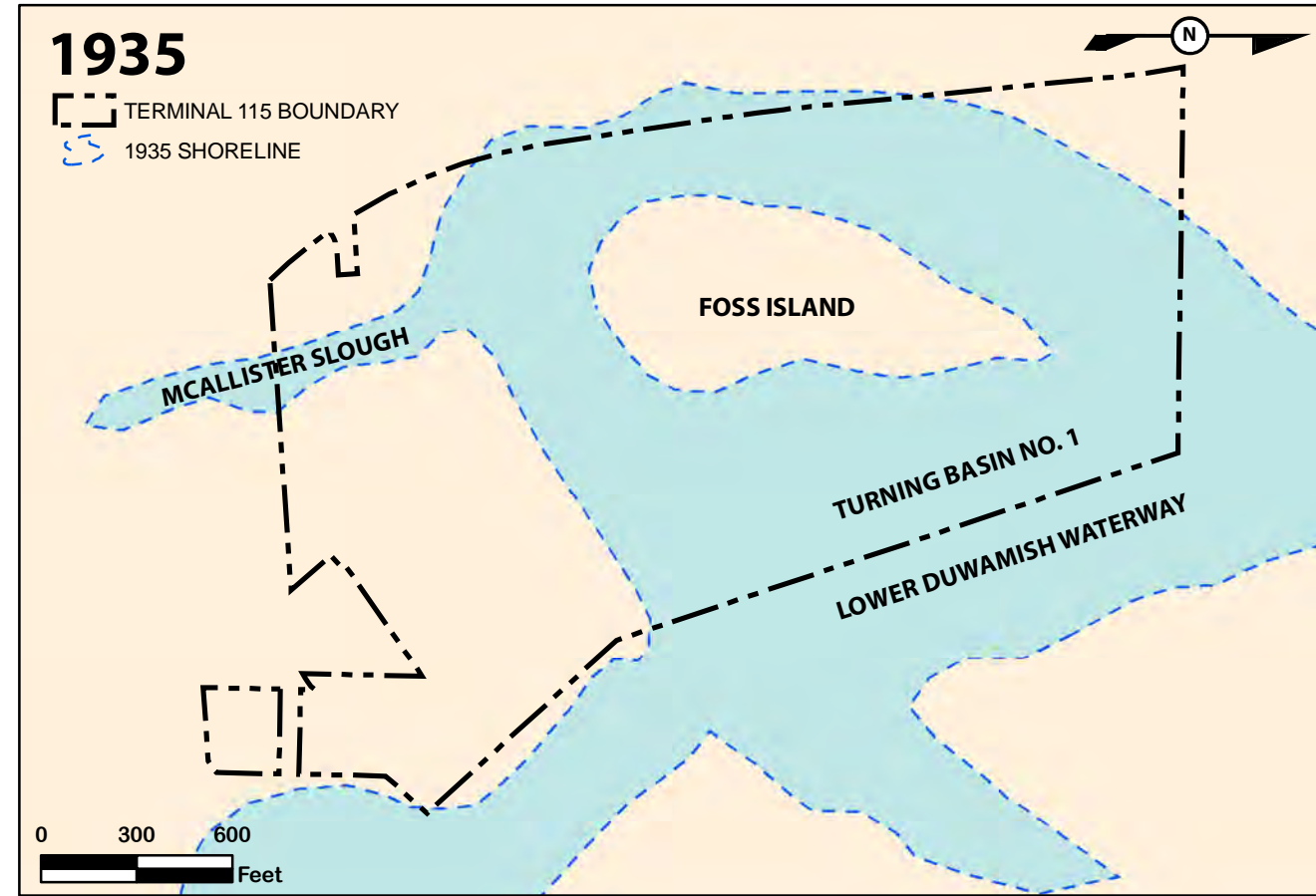
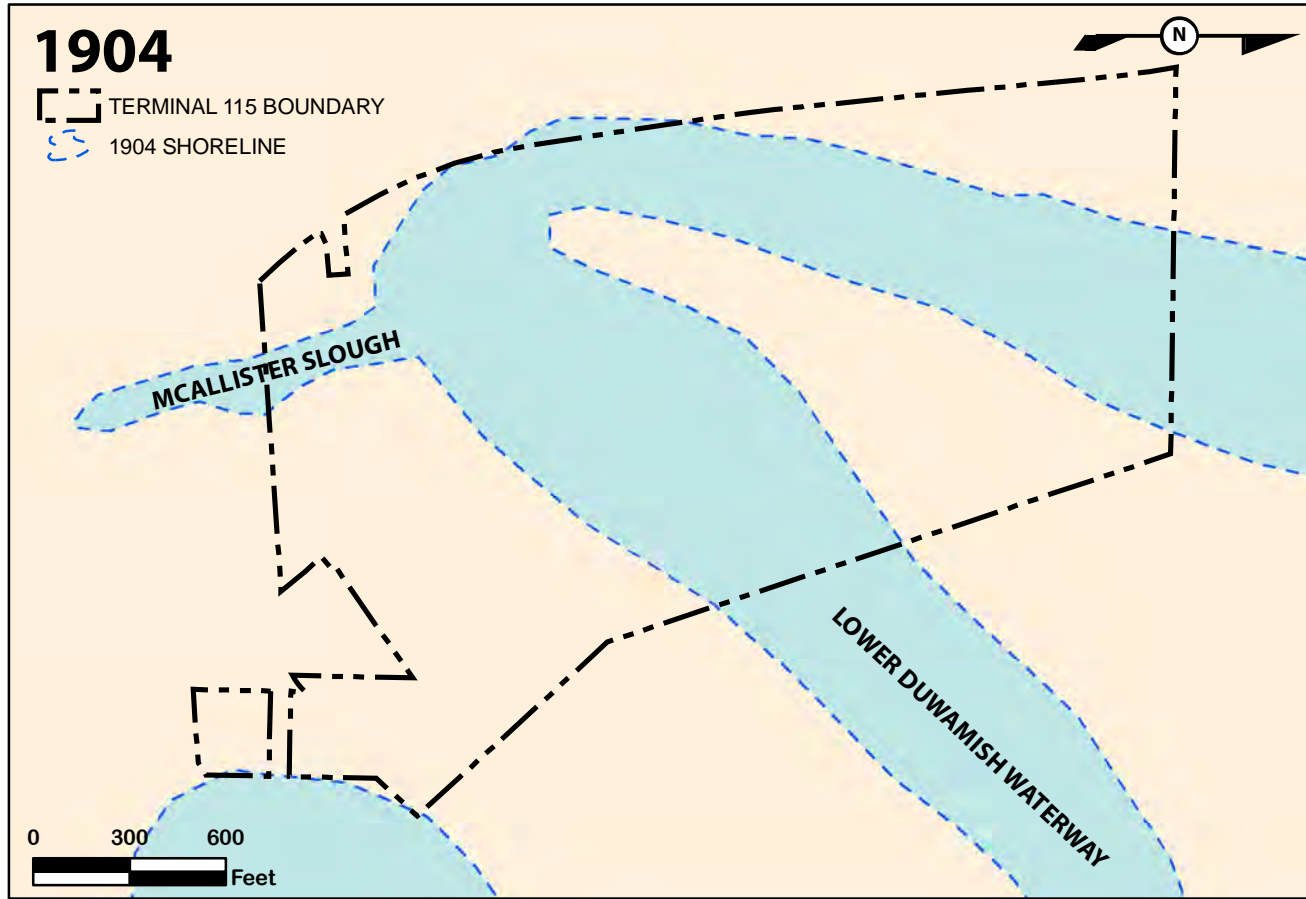
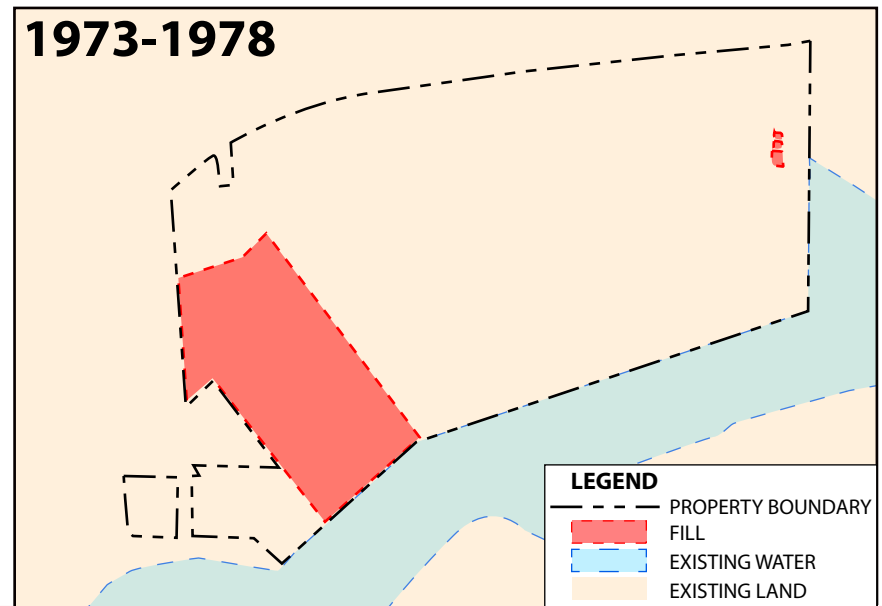
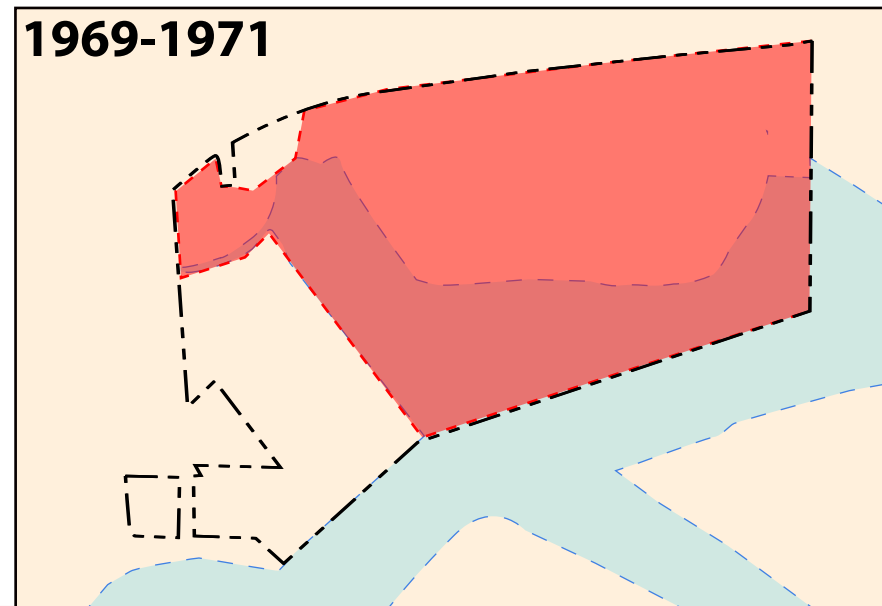
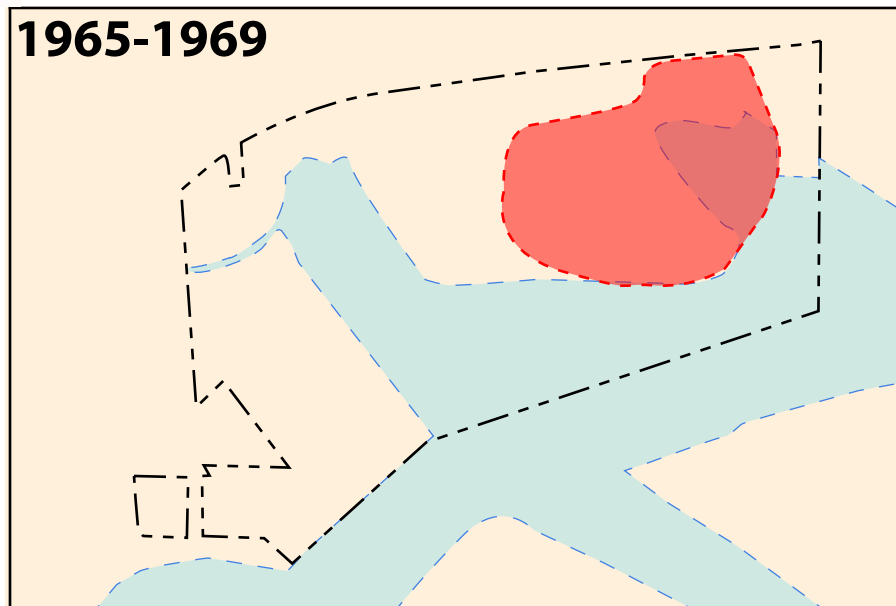
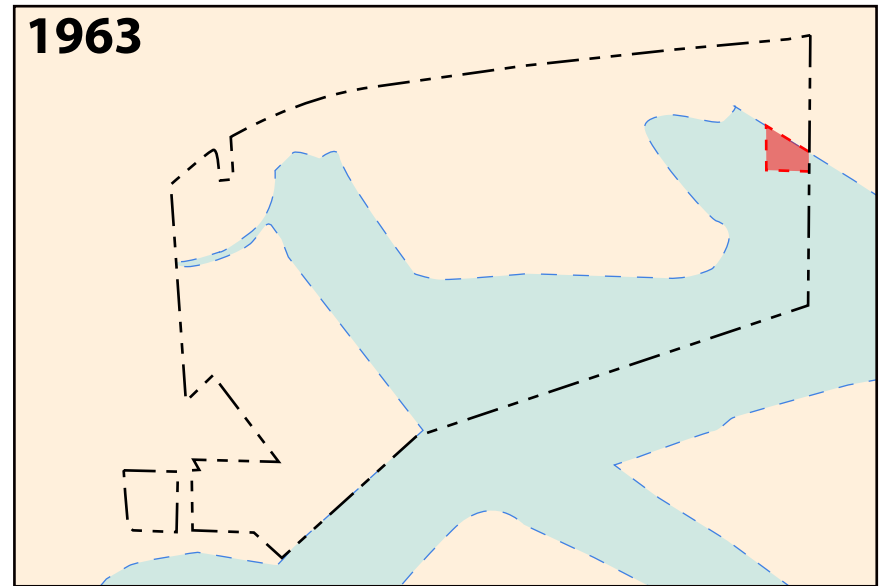
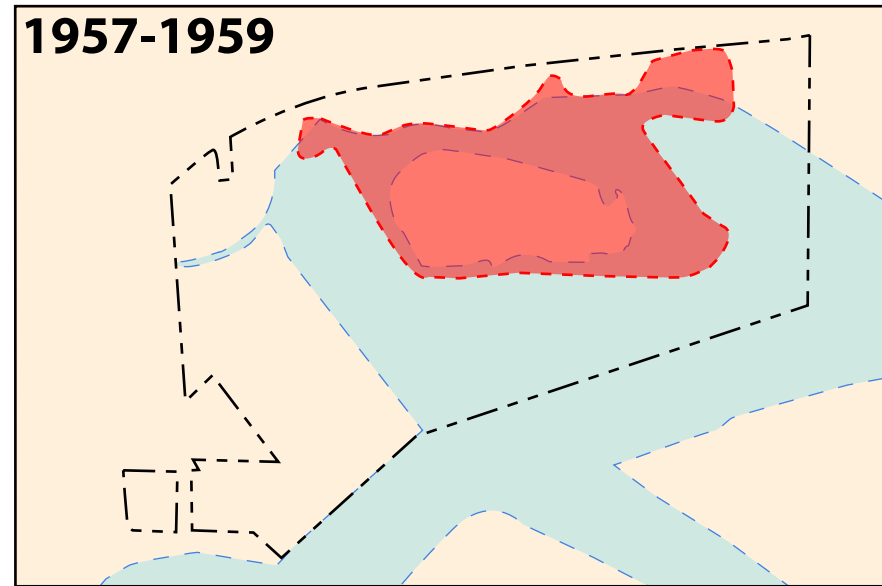
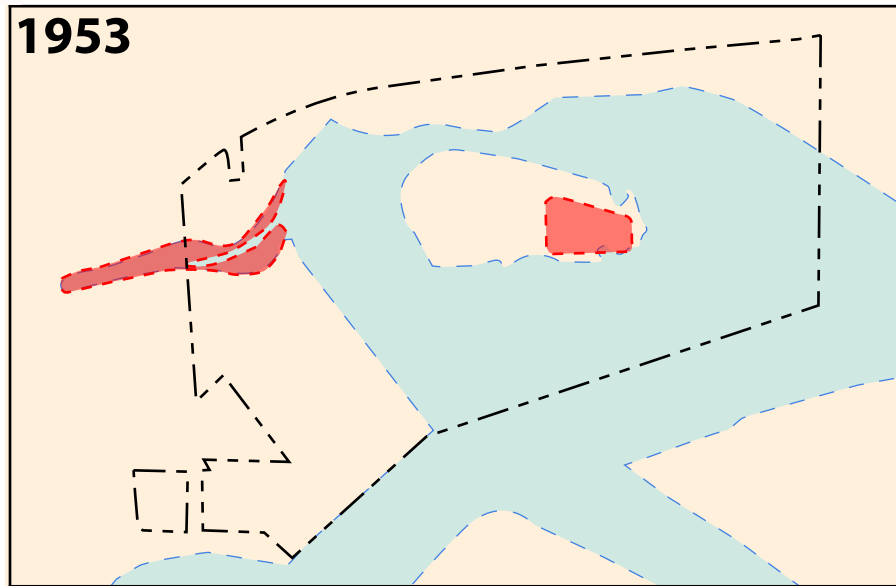
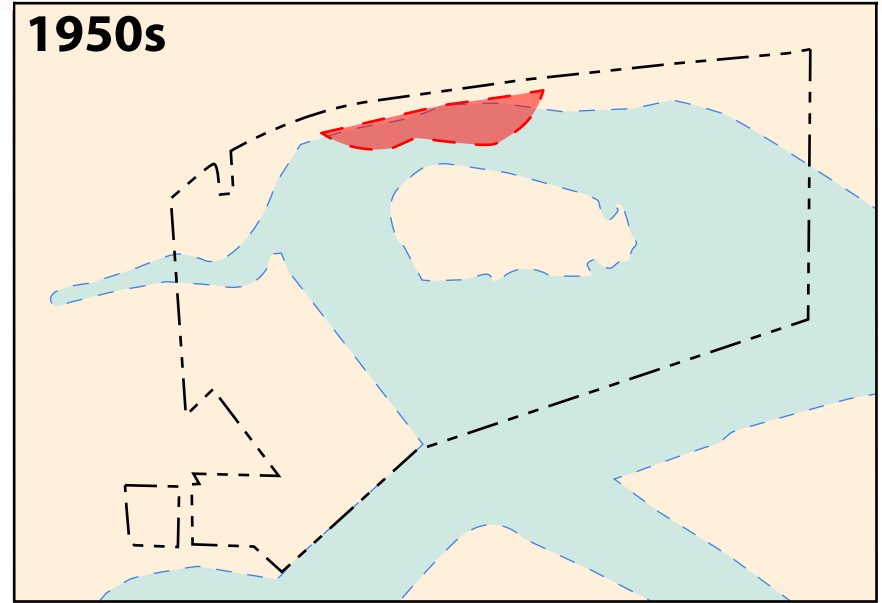
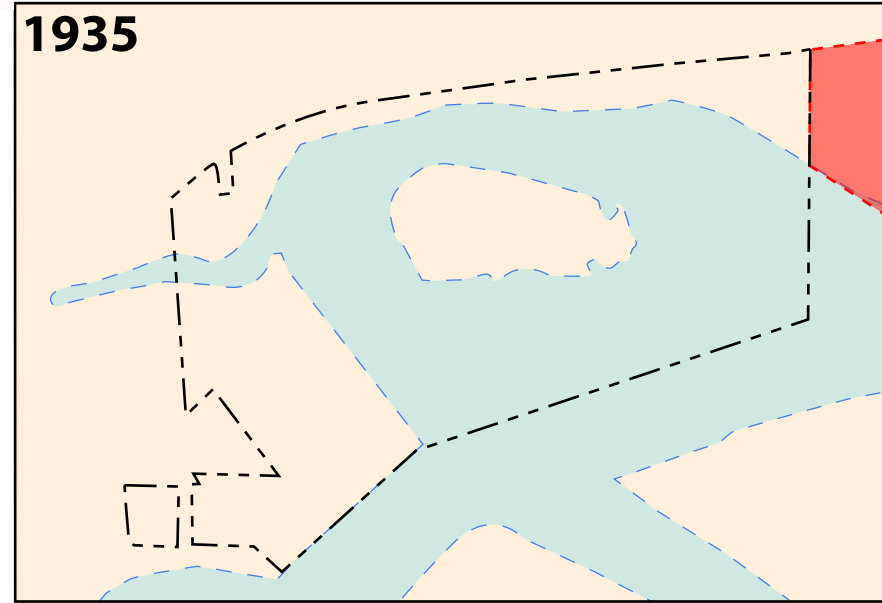
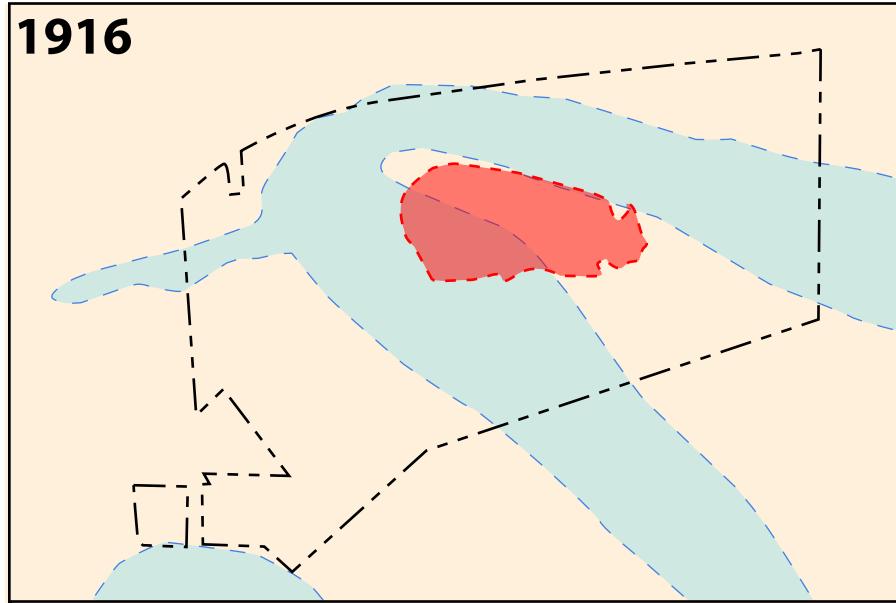


FIGURE 4B
HISTORICAL SHORELINE DIAGRAM

PROJECT NUMBER: 0675-001-01
 ADDRESS: WEST MARGINAL WAY SW
 CITY, STATE: SEATTLE, WASHINGTON

DATE: 11/1/10
 DRAWN BY: NAC
 CHECKED BY: CMC





LEGEND
 - - - - - PROPERTY BOUNDARY
 ■ FILL
 ■ EXISTING WATER
 ■ EXISTING LAND

FIGURE 4C
 HISTORICAL FILL AREAS

PROJECT NUMBER: 0675-001-01
 ADDRESS: WEST MARGINAL WAY SW
 CITY, STATE: SEATTLE, WASHINGTON

DATE: 11/1/10
 DRAWN BY: NAC
 CHECKED BY: CMC



Tank Identification						
Tank #	Contents	Capacity (Gallons)	Type	Status	Description	Port Designation
1	Diesel	4,000	UST	Removed	Boeing 1-01 Heating Oil Tank	T-115L
2	Bunker C	3,000	UST	Removed	Boeing 1-01 Heating Oil Tank	--
3	Diesel	1,000	UST	Removed	Boeing 1-01 Heating Oil Tank	--
4	Unknown	Unknown	UST	Unknown	Concrete Fuel Tank 4	--
5	Suspected Jet Fuel/Avgas	5,000	UST	Unknown	Boeing 1-02 Engine Testing USTs	--
6	Suspected Jet Fuel/Avgas	5,000	UST	Unknown	Boeing 1-02 Engine Testing USTs	--
7	Suspected Jet Fuel/Avgas	5,000	UST	Unknown	Boeing 1-02 Engine Testing USTs	--
8	Unknown	Unknown	UST	Unknown	Buried Fuel Tanks & Dispenser	--
9	Diesel	4,000	UST	Unknown	Unknown Seafreeze UST	--
10	Suspected Jet Fuel/Avgas	6,000	UST	Removed	Unknown Boeing USTs	T-115Q
11	Suspected Jet Fuel/Avgas	6,000	UST	Removed	Unknown Boeing USTs	T-115R
12	Suspected Jet Fuel/Avgas	6,000	UST	Removed	Unknown Boeing USTs	T-115O
13	Gasoline	3,000	UST	Removed	Boeing 1-21 UST	T-115I
14	Unknown	Unknown	Unknown	Unknown	Boeing Personal Tank	--
15	Unknown	Unknown	Unknown	Unknown	Boeing Tank B-5	--
16	Bunker/Diesel	4,200	UST	Unknown	Boeing 1-11 UST	--
17	Diesel	20,000	UST	Closed In Place	Steam Plant Tank	T-115H
18	Unknown	Unknown	Unknown	Closed In Place	Boeing 1-41 Storage Tanks	T-115F
19	Unknown	Unknown	Unknown	Closed In Place	Boeing 1-41 Storage Tanks	T-115G
20	Unknown	Unknown	AST	Removed	Boeing 1-40 ASTs	--
21	Unknown	Unknown	AST	Removed	Boeing 1-40 ASTs	--
22	Diesel	10,000	UST	Active	Cardlock UST	--
23	Diesel	10,000	UST	Active	Cardlock UST	--
24	Diesel	10,000	UST	Active	Cardlock UST	--
25	Diesel	600	UST	Removed	Smelter Heating Oil UST	T-115S
26	Diesel	9,500	UST	Removed	Smelter Tanker Truck UST	T-115P
27	Kerosene	2,000	AST	Removed	Car Wash Kerosene Tanks	--
28	Kerosene	5,000	UST	Removed	Car Wash Kerosene Tanks	T-115E
29	Diesel	1,000	AST	Active	Building C-1 Diesel Dispenser	--
30	Gasoline	10,000	UST	Removed	Building C-2 refueling tank	T-115D
31	Diesel	1,000	AST	Active	T115 Building M-2 Tanks	--
32	Gasoline	1,000	AST	Active	T115 Building M-2 Tanks	--
33	Diesel	6,000	UST	Removed	T115 Building M-2 Tanks	T-115C
34	Diesel	6,000	UST	Active	T115 Building M-2 Tanks	T-115N
35	Diesel	1,100	UST	Not in Service	T115 Building A-5 Tanks	T-115M
36	Diesel	2,000	UST	Removed	T115 Building A-5 Tanks	T-115A
37	Gasoline	1,000	UST	Removed	T115 Building A-5 Tanks	T-115B
38	Diesel/Bunker Fuel	1,100	UST	Removed	T115-North Heating Oil Tank	--
39	Diesel	250	AST	Removed	T115-North Diesel Tank	--
40	H2SO4, NaOH, chemical wastes	13 Bulk ASTs	AST	Removed	T115-North Chemical Storage	--

-- = no applicable Port designation is known
 closed in place = tank decommissioned in place before 1980
 Not in Service = Tank is not decommissioned, however does not store fuel products
 Suspected Jet Fuel/Avgas = Analytical results and/or historical data suggests that the tanks stored an aviation fuel



FIGURE 5
 STORAGE TANK LOCATIONS MAP

PROJECT NUMBER: 0675-001-01
 ADDRESS: WEST MARGINAL WAY SW
 CITY, STATE: SEATTLE, WASHINGTON

DATE: 11/1/10
 DRAWN BY: NAC
 CHECKED BY: CMC



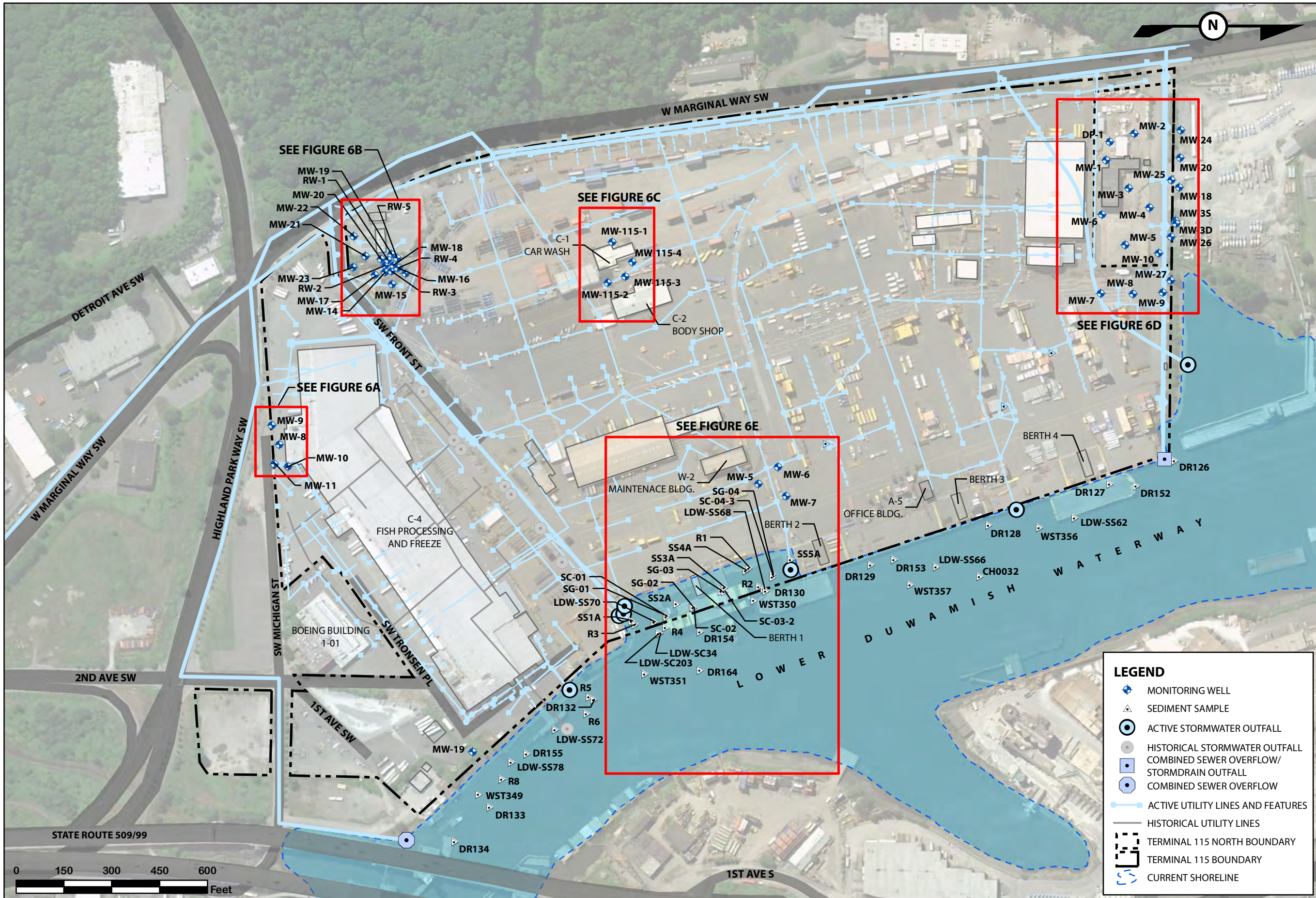


FIGURE 6
 INVESTIGATION AREAS MAP
 MASTER FIGURE

PROJECT NUMBER: 0675-001-01
 ADDRESS: WEST MARGINAL WAY SW
 CITY, STATE: SEATTLE, WASHINGTON

DATE: 11/1/10
 DRAWN BY: NAC
 CHECKED BY: CMC

LEGEND

- ◆ MONITORING WELL
- ▲ SEDIMENT SAMPLE
- ACTIVE STORMWATER OUTFALL
- HISTORICAL STORMWATER OUTFALL
- COMBINED SEWER OVERFLOW/
STORMDRAIN OUTFALL
- ⊕ COMBINED SEWER OVERFLOW
- ACTIVE UTILITY LINES AND FEATURES
- - - HISTORICAL UTILITY LINES
- - - TERMINAL 115 NORTH BOUNDARY
- - - TERMINAL 115 BOUNDARY
- ~ CURRENT SHORELINE



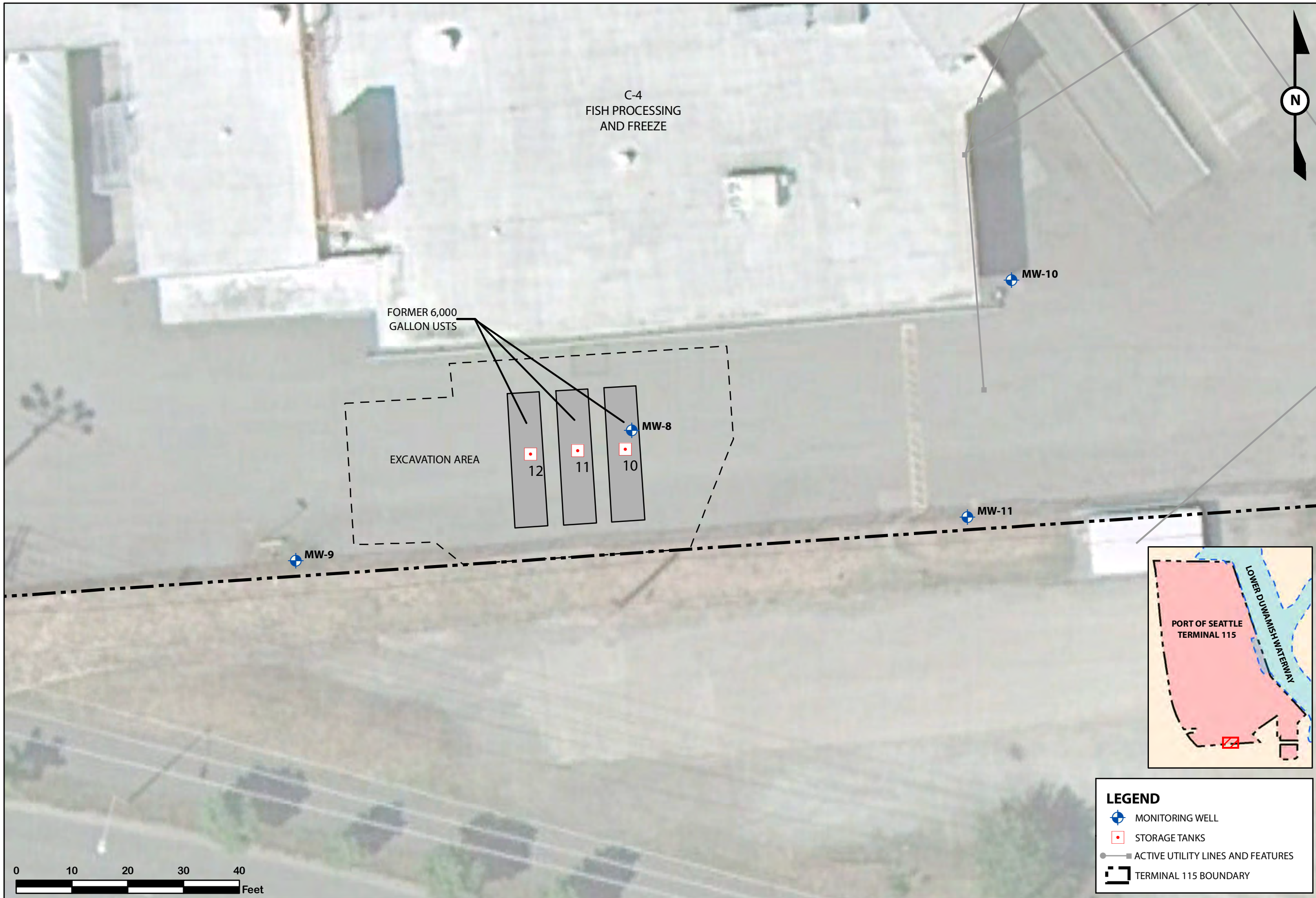


FIGURE 6A
 INVESTIGATION AREAS MAP
 SEAFREEZE/BOEING USTS

PROJECT NUMBER: 0675-001-01
 ADDRESS: WEST MARGINAL WAY SW
 CITY, STATE: SEATTLE, WASHINGTON

DATE: 11/1/10
 DRAWN BY: NAC
 CHECKED BY: CMC

LEGEND

- MONITORING WELL
- STORAGE TANKS
- ACTIVE UTILITY LINES AND FEATURES
- TERMINAL 115 BOUNDARY



FIGURE 6B
 INVESTIGATION AREAS MAP
 CARDLOCK FACILITY
 SHULTZ DISTRIBUTING

PROJECT NUMBER: 0675-001-01
 ADDRESS: WEST MARGINAL WAY SW
 CITY, STATE: SEATTLE, WASHINGTON

DATE: 11/1/10
 DRAWN BY: NAC
 CHECKED BY: CMC

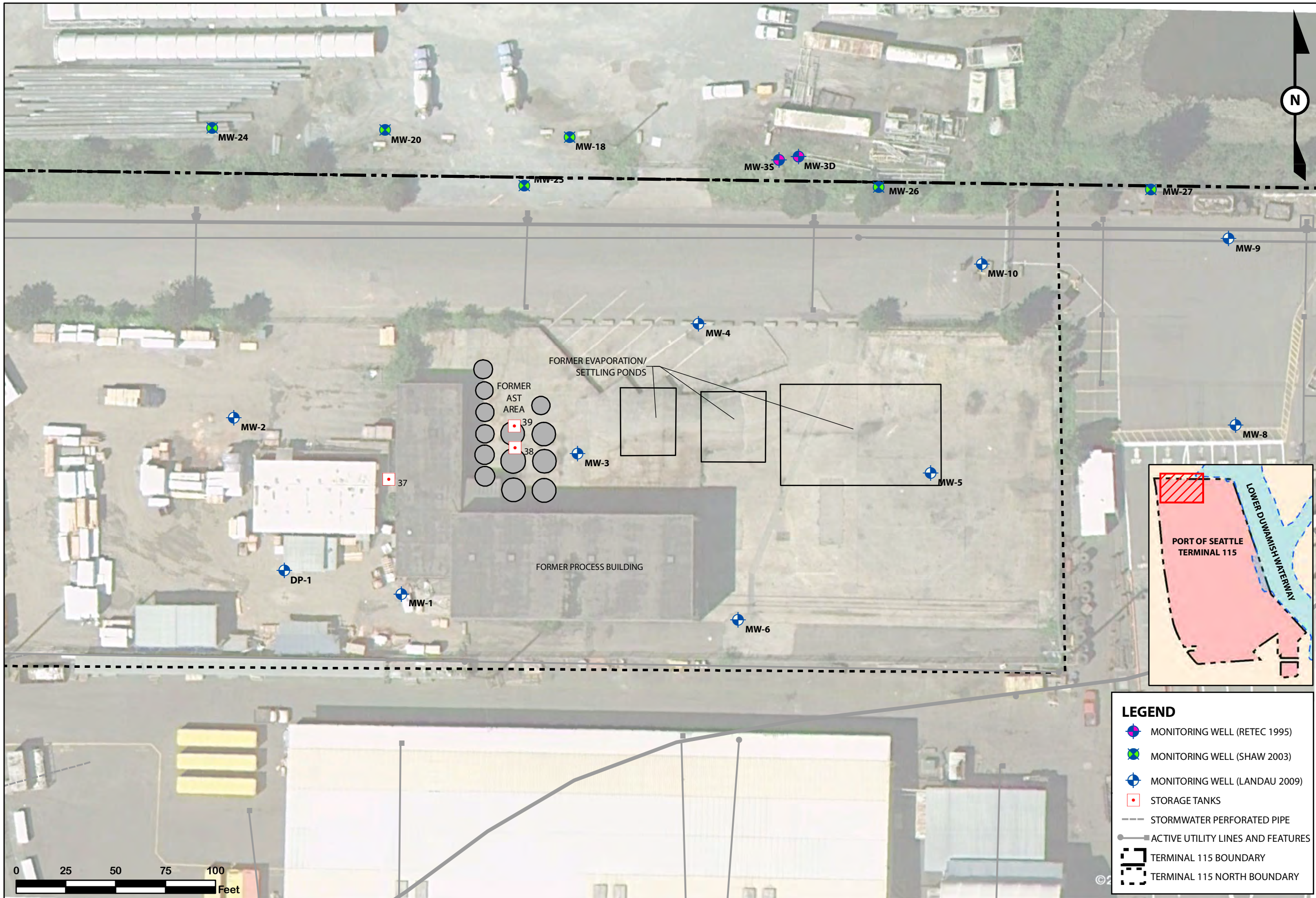




FIGURE 6C
INVESTIGATION AREAS MAP
BUILDING C-1 CARWASH FACILITY

PROJECT NUMBER: 0675-001-01
ADDRESS: WEST MARGINAL WAY SW
CITY, STATE: SEATTLE, WASHINGTON

DATE: 11/1/10
DRAWN BY: NAC
CHECKED BY: CMC



LEGEND

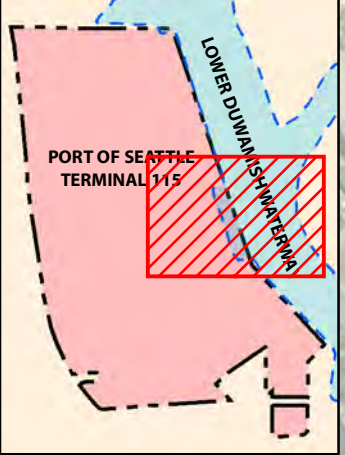
- MONITORING WELL (RETEC 1995)
- MONITORING WELL (SHAW 2003)
- MONITORING WELL (LANDAU 2009)
- STORAGE TANKS
- STORMWATER PERFORATED PIPE
- ACTIVE UTILITY LINES AND FEATURES
- TERMINAL 115 BOUNDARY
- TERMINAL 115 NORTH BOUNDARY

FIGURE 6D
 INVESTIGATION AREAS MAP
 TERMINAL 115 NORTH

PROJECT NUMBER: 0675-001-01
 ADDRESS: WEST MARGINAL WAY SW
 CITY, STATE: SEATTLE, WASHINGTON

DATE: 11/1/10
 DRAWN BY: NAC
 CHECKED BY: CMC





LEGEND

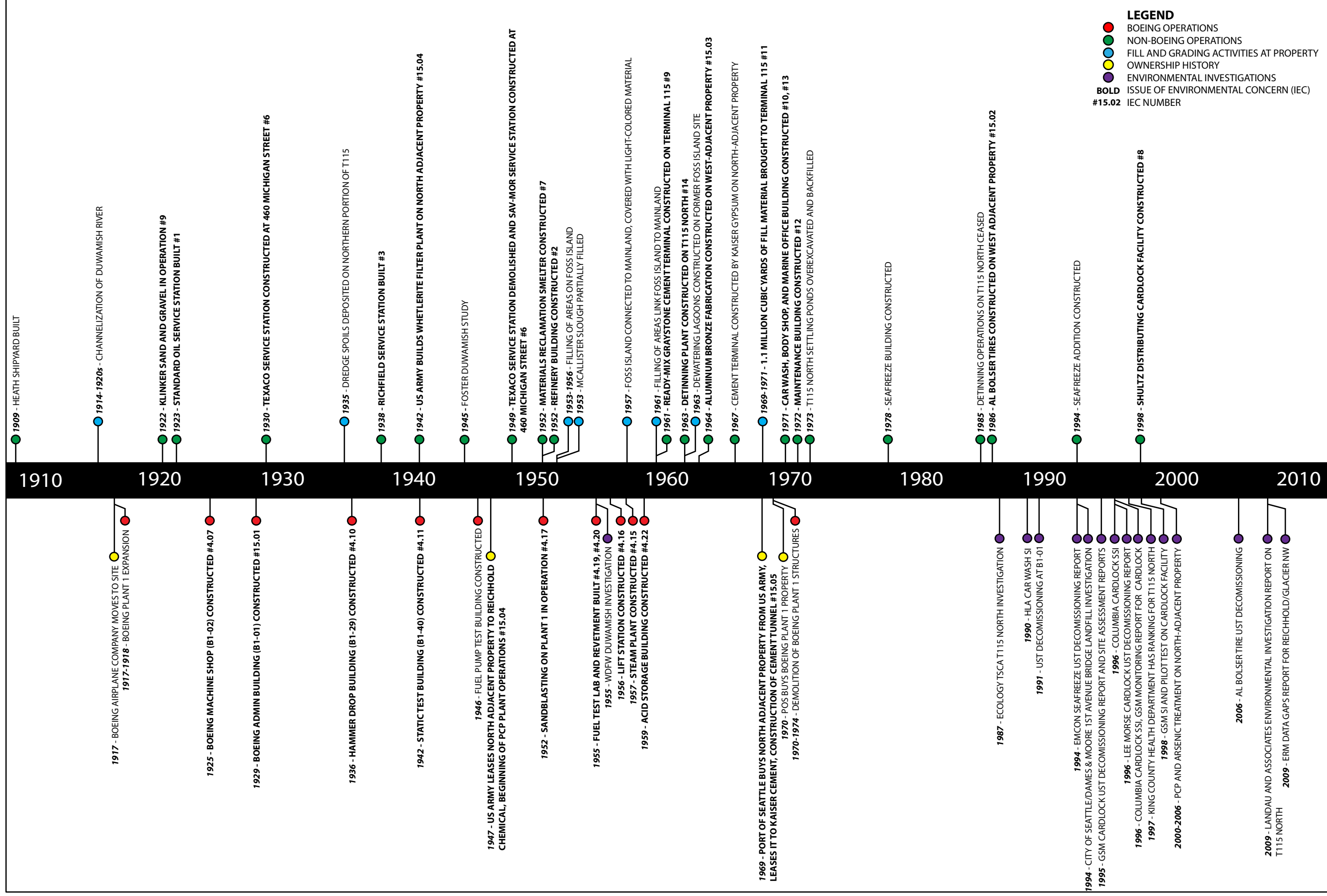
- SEDIMENT SAMPLE
- MONITORING WELL
- TERMINAL 115 BOUNDARY

FIGURE 6E
INVESTIGATION AREAS MAP
BERTH 1

PROJECT NUMBER: 0675-001-01
ADDRESS: WEST MARGINAL WAY SW
CITY, STATE: SEATTLE, WASHINGTON

DATE: 11/1/10
DRAWN BY: NAC
CHECKED BY: CMC

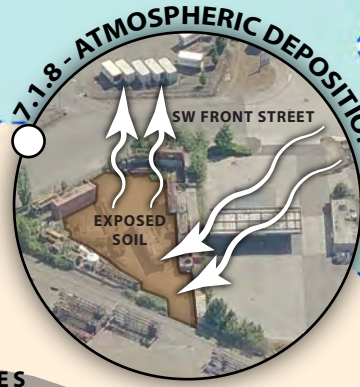
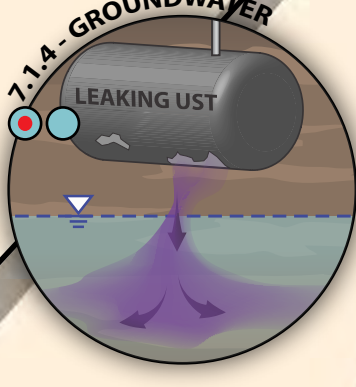
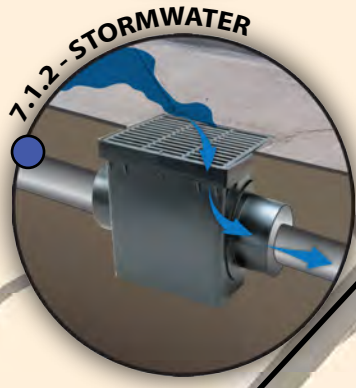
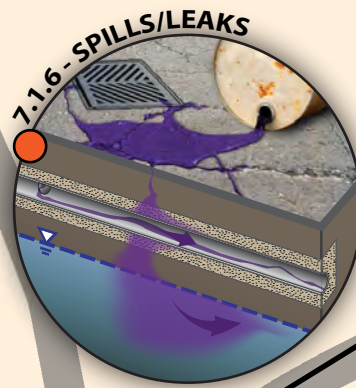
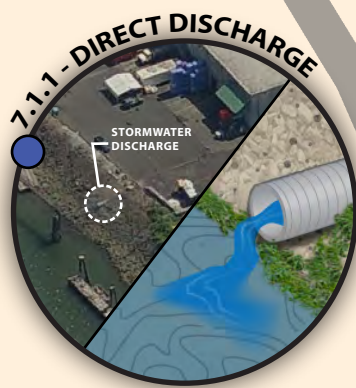
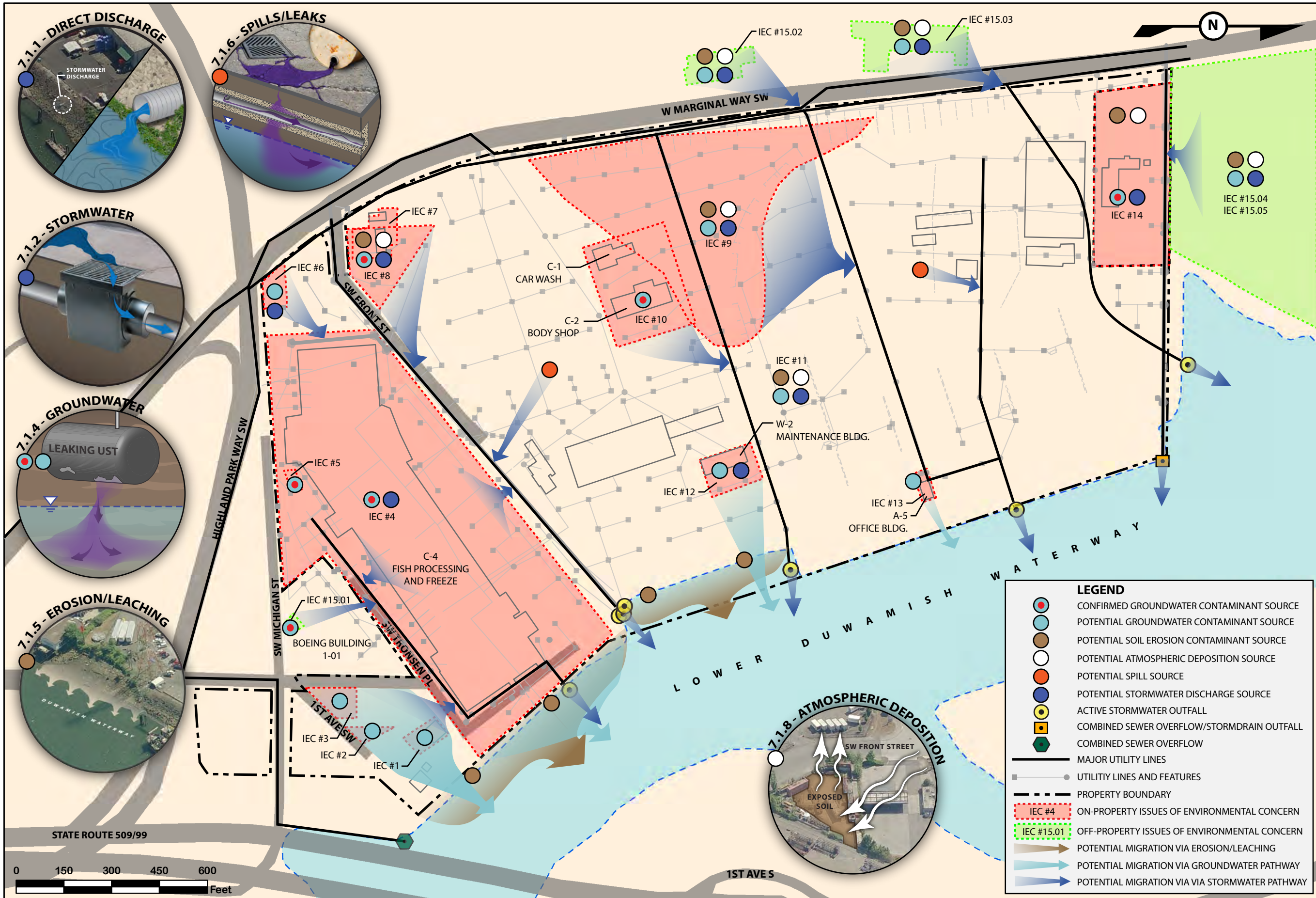




DATE: 11/1/10
 DRAWN BY: NAC
 CHECKED BY: CMC

PROJECT NUMBER:..... 0675-001-01
 ADDRESS:..... WEST MARGINAL WAY SW
 CITY, STATE:..... SEATTLE, WASHINGTON

FIGURE 7
 HISTORICAL TIMELINE MAP



LEGEND

- CONFIRMED GROUNDWATER CONTAMINANT SOURCE
- POTENTIAL GROUNDWATER CONTAMINANT SOURCE
- POTENTIAL SOIL EROSION CONTAMINANT SOURCE
- POTENTIAL ATMOSPHERIC DEPOSITION SOURCE
- POTENTIAL SPILL SOURCE
- POTENTIAL STORMWATER DISCHARGE SOURCE
- ACTIVE STORMWATER OUTFALL
- COMBINED SEWER OVERFLOW/STORMDRAIN OUTFALL
- COMBINED SEWER OVERFLOW
- MAJOR UTILITY LINES
- UTILITY LINES AND FEATURES
- - - PROPERTY BOUNDARY
- IEC #4 ON-PROPERTY ISSUES OF ENVIRONMENTAL CONCERN
- IEC #15.01 OFF-PROPERTY ISSUES OF ENVIRONMENTAL CONCERN
- POTENTIAL MIGRATION VIA EROSION/LEACHING
- POTENTIAL MIGRATION VIA GROUNDWATER PATHWAY
- POTENTIAL MIGRATION VIA VIA STORMWATER PATHWAY

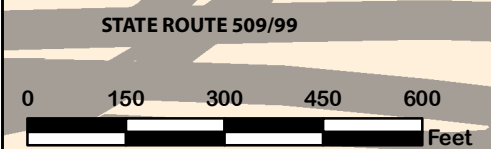


FIGURE 8
CONCEPTUAL SITE MODEL

PROJECT NUMBER: 0675-001-01
ADDRESS: WEST MARGINAL WAY SW
CITY, STATE: SEATTLE, WASHINGTON

DATE: 11/1/10
DRAWN BY: NAC
CHECKED BY: CMC



TABLE

Table 1
IEC Information and Potential Migration Pathways
Port of Seattle Terminal 115
6700 West Marginal Way Southwest
Seattle, Washington

IEC Number	Name	Location and Distance to LDW	Operations and Dates	Environmental Investigations	Confirmed COCs	Potential COCs	Source Control Media Affected		Potential Pathways			Comments/Data Needs
							Surface Water	GW	Soil	Sediments	Direct Discharge/Stormwater	
1	Standard Oil	<ul style="list-style-type: none"> Formerly in the southeast corner of Terminal 115 Approximate distance to LDW = 187 feet River Mile 1.9 	Former Petroleum Sales 1920s-1960s	None	None	Petroleum Hydrocarbons, PAHs	Confirmed: None	None	Groundwater	Soil	<ul style="list-style-type: none"> Groundwater 	Subsurface Investigation may be warranted.
2	104 W Michigan Building (Refinery Building)	<ul style="list-style-type: none"> Formerly in the southeast corner of Terminal 115 Approximate distance to LDW = 309 feet River Mile 1.9 	Former Refining of Unknown Product 1952-1964	None	None	Petroleum Hydrocarbons, PAHs	Confirmed: None	None	Groundwater	Soil	<ul style="list-style-type: none"> Groundwater 	Subsurface Investigation may be warranted.
3	Richfield Oil	<ul style="list-style-type: none"> Formerly in the southeast corner of Terminal 115 Approximate distance to LDW = 384 feet River Mile 1.9 	Former Petroleum Sales 1938-1964	None	None	Petroleum Hydrocarbons, PAHs	Confirmed: None	None	Groundwater	Soil	<ul style="list-style-type: none"> Groundwater 	Subsurface Investigation may be warranted.
4	Boeing Plant #1	<ul style="list-style-type: none"> Formerly occupied the south end of Terminal 115 Approximate distance to LDW = 45 feet River Mile 1.85-1.95 	Former Airplane Manufacturing 1917-1970	None	None	Petroleum Hydrocarbons, Metals, Solvents, acids/caustics (pH)	Confirmed: None	None	Groundwater	Soil	<ul style="list-style-type: none"> Groundwater Direct Discharge/Stormwater 	Subsurface Investigation may be warranted.
5	Seafreeze/Boeing USTs	<ul style="list-style-type: none"> Formerly located on the south-central portion of Terminal 115 Approximate distance to LDW = 1,068 feet River Mile 1.9 	Three 6,000 gallon Jet Fuel USTs decommissioned by removal in 1995. Operation dates unknown	EMCON, 1995	Petroleum Hydrocarbons, VOCs, metals	None suspected in association with former operation	Confirmed: Groundwater	Soil	None	None	<ul style="list-style-type: none"> Groundwater 	Full extent of release has not been characterized. Active and abandoned stormwater features and utility lines exist in the vicinity of the release.
6	Auto Salvage Yard/Sav-Mor Service Station	<ul style="list-style-type: none"> Formerly located in the southwest corner of Terminal 115 Approximate distance to LDW = 1,406 feet River Mile 1.95 	Former Auto Wrecking, Auto Service, and Petroleum Sales 1930-1963	None	None	Petroleum Hydrocarbons, Metals, Solvents, PAHs	Confirmed: None	None	Groundwater	Soil	<ul style="list-style-type: none"> Direct Discharge/Stormwater Groundwater 	Subsurface Investigation may be warranted.
7	Materials Reclamation Smelter	<ul style="list-style-type: none"> Formerly located in the southwest corner of Terminal 115 Approximate distance to LDW = 1,378 feet River Mile 1.9 	Former Aluminum Smelter 1952-1985	GSM 1995-1998 Columbia 1995-1997	Petroleum Hydrocarbons	Potential: Metals	Confirmed: Groundwater	Soil	Surface Water	None	<ul style="list-style-type: none"> Groundwater Erosion/Leaching Atmospheric Deposition Direct Discharge/Stormwater 	Release is not fully characterized. Active stormwater features and utility lines exist in the vicinity of the release.
8	Southwest Tank Yard/Cardlock Facility	<ul style="list-style-type: none"> Formerly located in the southwest corner of Terminal 115 Approximate distance to LDW = 1,265 feet River Mile 1.9 	Current Petroleum Sales 1998-present	Same as above	Petroleum Hydrocarbons	None suspected in association with current operation	Confirmed: Groundwater	Soil	None	None	<ul style="list-style-type: none"> Groundwater Direct Discharge/Stormwater 	A potential release associated with the current Cardlock Facility operations has not been assessed.
9	Klinker/Ready Mix	<ul style="list-style-type: none"> Formerly located in the west central area of Terminal 115 Approximate distance to LDW = 1,078 feet River Mile 1.7-1.95 	Former Gravel Loading and Marine Transport/Concrete Manufacturing 1922 (est) - 1969	None	None	Metals, pH	Confirmed: None	None	Groundwater	Soil	<ul style="list-style-type: none"> Groundwater Erosion/Leaching Atmospheric Deposition Direct Discharge/Stormwater 	Subsurface investigation of suspected COCs may be warranted concurrent with other investigations.
10	Buildings C-1/Car Wash & C-2/Body Shop	<ul style="list-style-type: none"> Formerly located in the central area of Terminal 115 Approximate distance to LDW = 890 feet River Mile 1.7 	Former Car Wash and Body Shop 1971-1990	HLA 1990 POS 1989	Kerosene (diesel)	Lube-oil, gasoline, metals, solvents	Confirmed: Groundwater	Soil	None	None	<ul style="list-style-type: none"> Groundwater 	The Building C-1 release is localized and does not appear to be in direct contact with any utilities that may provide a migration pathway. No impacts associated with Building C-2 were discovered during UST decommissioning.
11	Fill Activities	<ul style="list-style-type: none"> Nearly the entire site, excluding some southern portions of the property Approximate distance to LDW = 0 feet River Mile 1.55 	Historical filling to expand functional land space 1916-1971	None	None	Metals, petroleum hydrocarbons, polycyclic aromatic hydrocarbons, pH	Confirmed: None	None	Groundwater	Soil	<ul style="list-style-type: none"> Groundwater Erosion/Leaching Atmospheric Deposition Direct Discharge/Stormwater 	Subsurface investigation of suspected COCs may be warranted concurrent with other investigations.
12	Building M-2/Maintenance Building	<ul style="list-style-type: none"> Currently located in the central area of Terminal 115 Approximate distance to LDW = 281 feet River Mile 1.7 	Current Vehicle Maintenance 1972-Present	Environmental Science and Engineering, 1994	None	Petroleum Hydrocarbons, Solvents, metals	Confirmed: Groundwater	Soil	Surface Water	None	<ul style="list-style-type: none"> Groundwater Direct Discharge/Stormwater 	Further subsurface investigation or groundwater assessment may be warranted.

Table 1
IEC Information and Potential Migration Pathways
Port of Seattle Terminal 115
6700 West Marginal Way Southwest
Seattle, Washington

IEC Number	Name	Location and Distance to LDW	Operations and Dates	Environmental Investigations	Confirmed COCs	Potential COCs	Source Control Media Affected		Potential Pathways			Comments/Data Needs
							Surface Water	GW	Soil	Sediments	Direct Discharge/Stormwater	
13	Building A-5/Marine Office Building	<ul style="list-style-type: none"> Currently located in the east central area of Terminal 115 Approximate distance to LDW = 141 feet River Mile 1.6 	Current Administrative and Former Fueling area 1971-Present	None	None	Petroleum Hydrocarbons	Confirmed: None	Groundwater	Soil	Sediment	<ul style="list-style-type: none"> Groundwater Direct Discharge/Stormwater 	UST decommissioning may be warranted.
14	Tin Reclamation - T115N	<ul style="list-style-type: none"> Formerly located in the northwest corner of Terminal 115 Approximate distance to LDW = 56 feet River Mile 1.55-1.6 	Former Tin Reclamation Facility 1963-1985	Ecology 1987 SKCDPH 1998 Schnitzer 1999 Landau 2009	Total and Dissolved Metals	Other metals, TBT, PAHs, solvents, petroleum hydrocarbons	Confirmed: Groundwater	Soil	Surface Water	<ul style="list-style-type: none"> Groundwater Erosion/Leaching Atmospheric Deposition Direct Discharge/Stormwater 	Metals, PCP, and other COCs are likely migrating onto the property via the groundwater pathway.	
15	Off-Property IECs											
• 15.01	Boeing Building 1-01 USTs	<ul style="list-style-type: none"> Former Boeing administrative building adjacent to the south property boundary of Terminal 115 (Figure 5) Approximate distance to LDW = 628 feet Approximate distance to Terminal 115 = 94 feet River Mile 1.9 	Former Boeing Administrative Building 1929-1990	POS 1991 SD&C 1998 Urban Redevelopment 2002-2003	Heating Oil (diesel)	None currently known	Confirmed: Groundwater	Soil	<ul style="list-style-type: none"> Groundwater 	<ul style="list-style-type: none"> Groundwater 	Petroleum hydrocarbons may be migrating onto Terminal 115 via the groundwater and/or stormwater pathways. Stormwater drain lines in the vicinity of the former USTs connect to the Terminal 115 stormwater system, which drain to the LDW.	
• 15.02	Al Bolser Tire Stores	<ul style="list-style-type: none"> Formerly located on the west side of West Marginal Way Southwest Approximate distance to LDW = 1,500 feet Approximate distance to Terminal 115 = 66 feet River Mile 1.6 	Former Tire Reseller, Installation, and Maintenance 1986-2006	Filco 2006	None	Petroleum Hydrocarbons, metals	Confirmed: None	Groundwater	Soil	Surface Water	<ul style="list-style-type: none"> Groundwater Erosion/Leaching Atmospheric Deposition Direct Discharge/Stormwater 	None
• 15.03	Foundry	<ul style="list-style-type: none"> Formerly located on the west side of West Marginal Way Approximate distance to LDW = 1,453 feet Approximate distance to Terminal 115 = 66 feet River Mile 1.55 	Current Metals Foundry 1964-Present	None	None	Metals	Confirmed: None	Groundwater	Soil	Surface Water	<ul style="list-style-type: none"> Groundwater Erosion/Leaching Atmospheric Deposition Direct Discharge/Stormwater 	None
• 15.04	Reichhold	<ul style="list-style-type: none"> Formerly located north adjacent to Terminal 115N Approximate distance to LDW = 0 feet Approximate distance to Terminal 115 = 0 feet River Mile 1.4 to 1.55 	Former Resin and Chemical Manufacturing 1944-1961	Parametrix 1985, 1990 ACOE 1994 RETEC 1996 Shaw 2008 ERM 2009	Phthalates, PAHs, pesticides, polychlorinated phenolic compounds, phenol, formaldehyde, metals, petroleum hydrocarbons, solvents	Dioxins, herbicides	Confirmed: Soil	Sediment	Surface Water	<ul style="list-style-type: none"> Groundwater Direct Discharge/Stormwater Erosion/Leaching Atmospheric Deposition 	Metals, PCP, and other COCs are likely migrating onto Terminal 115 and to the LDW via the groundwater pathway.	
• 15.05	Glacier NW/Kaiser	<ul style="list-style-type: none"> Currently located north adjacent to Terminal 115N Approximate distance to LDW = 0 feet Approximate distance to Terminal 115 = 0 feet River Mile 1.4 to 1.55 	Current Concrete Manufacturing 1969-present	Same as above	Metals	None currently known	Confirmed: Groundwater	Soil	Sediment	Surface Water	<ul style="list-style-type: none"> Groundwater Direct Discharge/Stormwater Erosion/Leaching Atmospheric Deposition 	Metals, PCP, and other COCs are likely migrating onto Terminal 115 and to the LDW via the groundwater pathway.

NOTES:

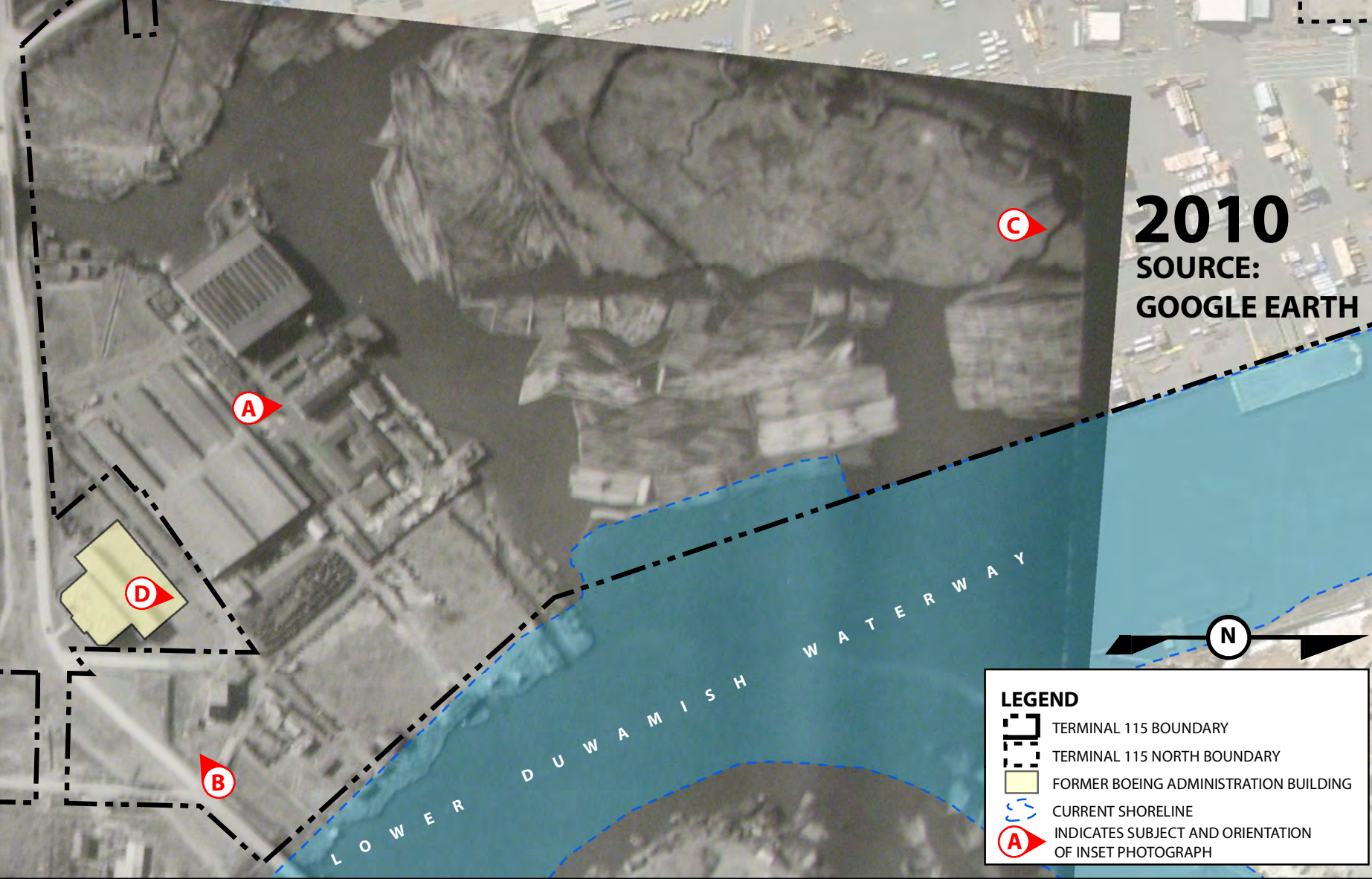
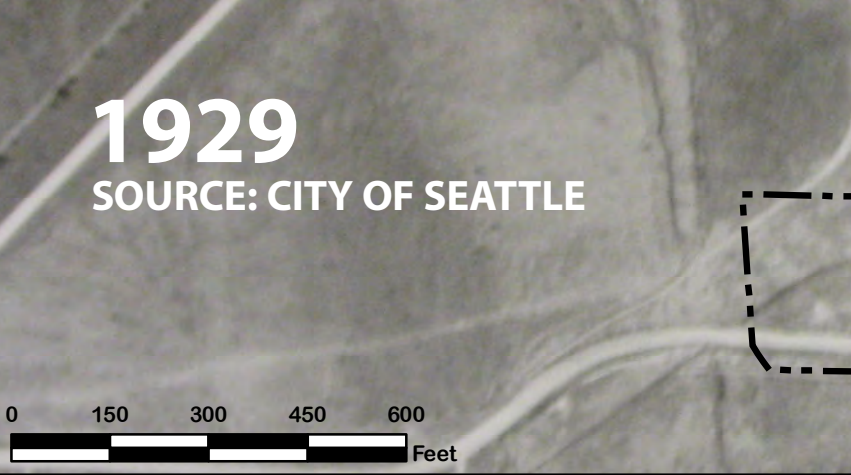
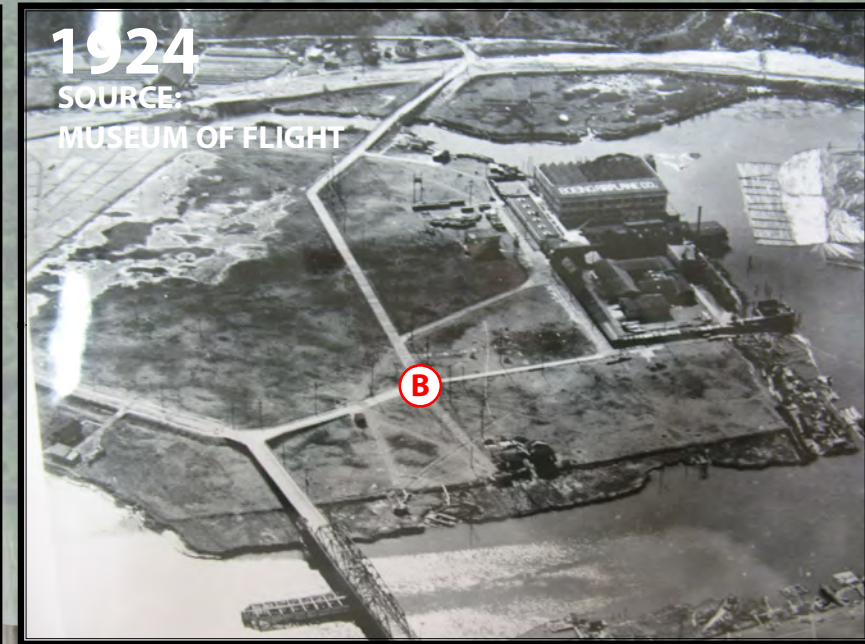
ACOE = U.S. Army Corps of Engineers
 COC = chemical of concern
 Columbia = Columbia Environmental Inc.
 Ecology = Washington State Department of Ecology
 ERM = Environmental Resources Management
 est = estimated
 Filco = Filco Company Inc.
 Glacier NW = Glacier Northwest, Inc.
 GSM = GeoScience Management, Inc.
 GW = Groundwater
 HLA = Harding Lawson Associates
 Klinker = Klinker Sand & Gravel Company
 Landau = Landau Associates
 LDW = Lower Duwamish Waterway

PAH = polycyclic aromatic hydrocarbon
 Parametrix = Parametrix, Inc.
 PCP = Pentachlorophenol
 POS = Port of Seattle
 Reichhold = Reichhold, Inc.
 RETEC = Remediation Technologies, Inc.
 SC = source control
 Schnitzer = Schnitzer Steel industries, Inc.
 SD&C = Slotta Design and Construction
 Shaw = Shaw Environmental & Infrastructure, Inc.
 SKCDPH = Seattle-King County Department of Public Health
 SPH = separate-phase hydrocarbon
 TBT = tributyltin
 UST = underground storage tank



APPENDIX A

Historical Photographs

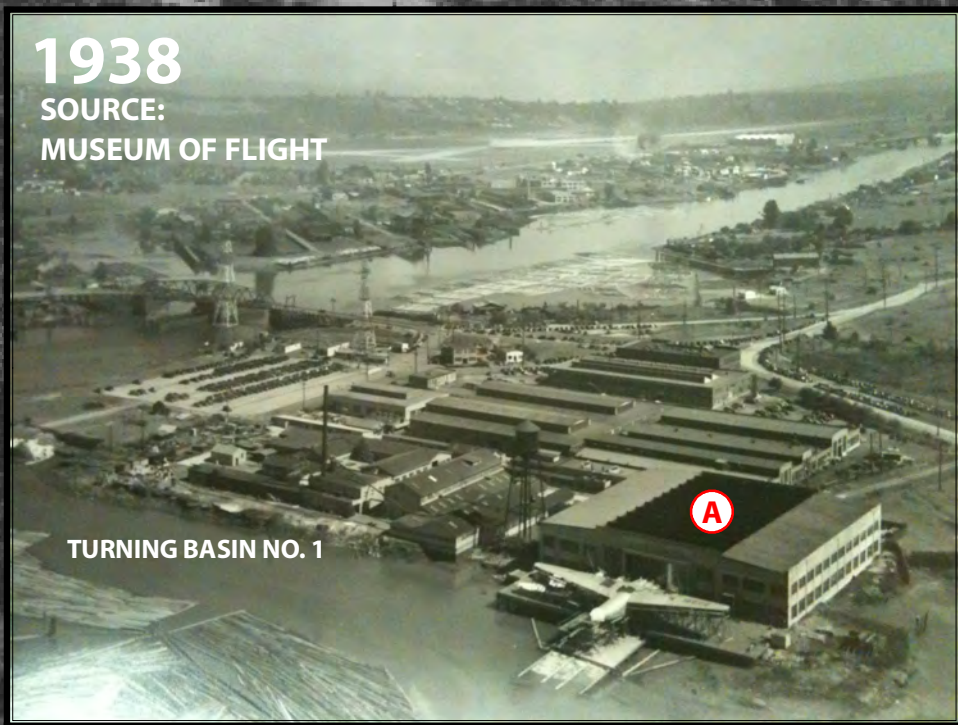


APPENDIX A: PHOTO A-1
1922-1929

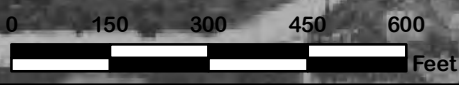
PROJECT NUMBER: 0675-001-01
ADDRESS: WEST MARGINAL WAY SW
CITY, STATE: SEATTLE, WASHINGTON

DATE: 11/1/10
DRAWN BY: NAC
CHECKED BY: CMC





1936
SOURCE: KING COUNTY IMAP



LEGEND

- TERMINAL 115 BOUNDARY
- TERMINAL 115 NORTH BOUNDARY
- FORMER BOEING ADMINISTRATION BUILDING
- CURRENT SHORELINE
- INDICATES SUBJECT AND ORIENTATION OF INSET PHOTOGRAPH

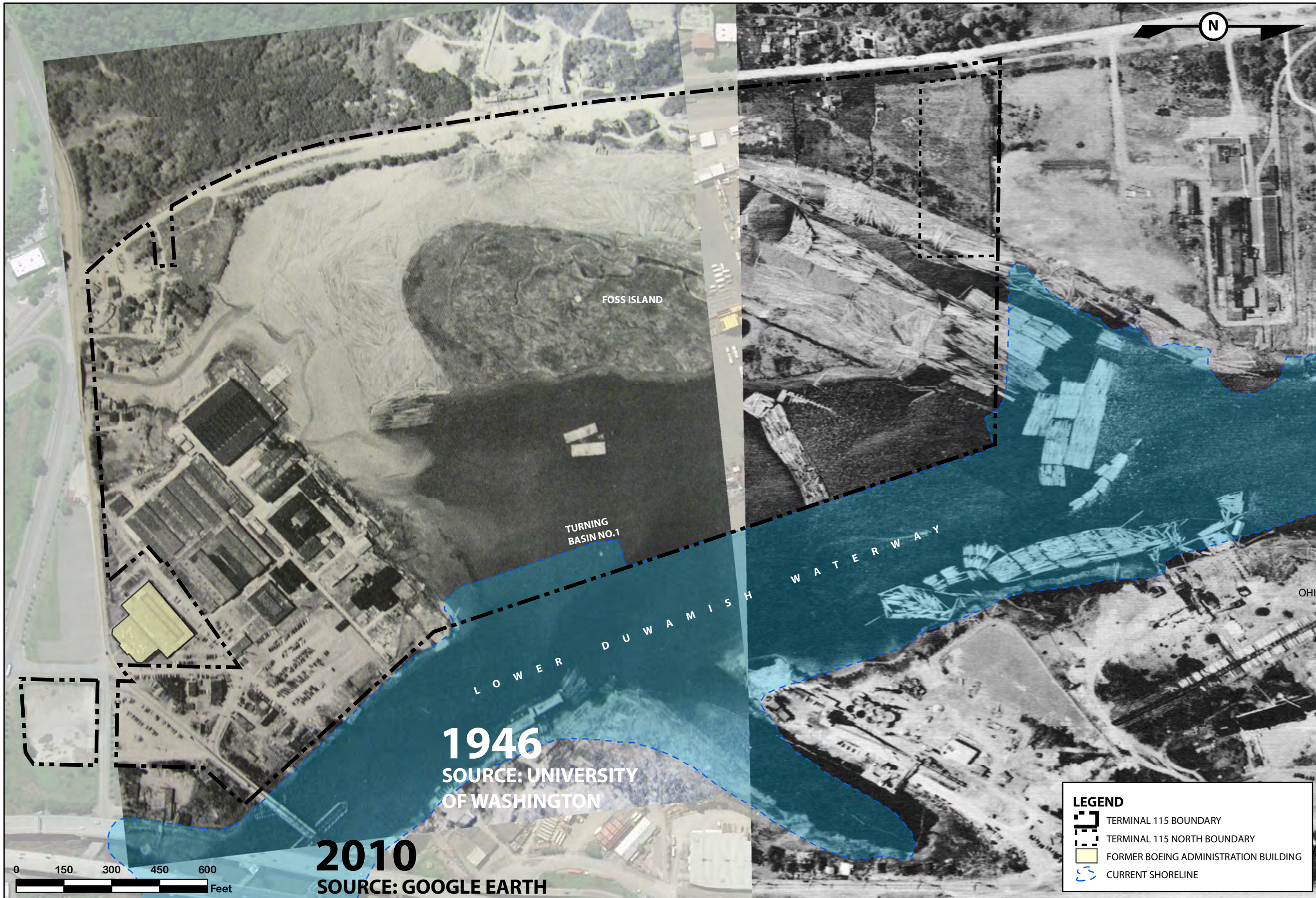


APPENDIX A: PHOTO A-2
1936-1938

PROJECT NUMBER: 0675-001-01
ADDRESS: WEST MARGINAL WAY SW
CITY, STATE: SEATTLE, WASHINGTON





DATE: 11/1/10
DRAWN BY: NAC
CHECKED BY: CMC





1946
SOURCE: UNIVERSITY OF WASHINGTON

2010
SOURCE: GOOGLE EARTH

- LEGEND**
-  TERMINAL 115 BOUNDARY
 -  TERMINAL 115 NORTH BOUNDARY
 -  FORMER BOEING ADMINISTRATION BUILDING
 -  CURRENT SHORELINE

APPENDIX A: PHOTO A-3
1946

PROJECT NUMBER: 0675-001-01
ADDRESS: WEST MARGINAL WAY SW
CITY, STATE: SEATTLE, WASHINGTON

DATE: 11/1/10
DRAWN BY: NAC
CHECKED BY: CMC



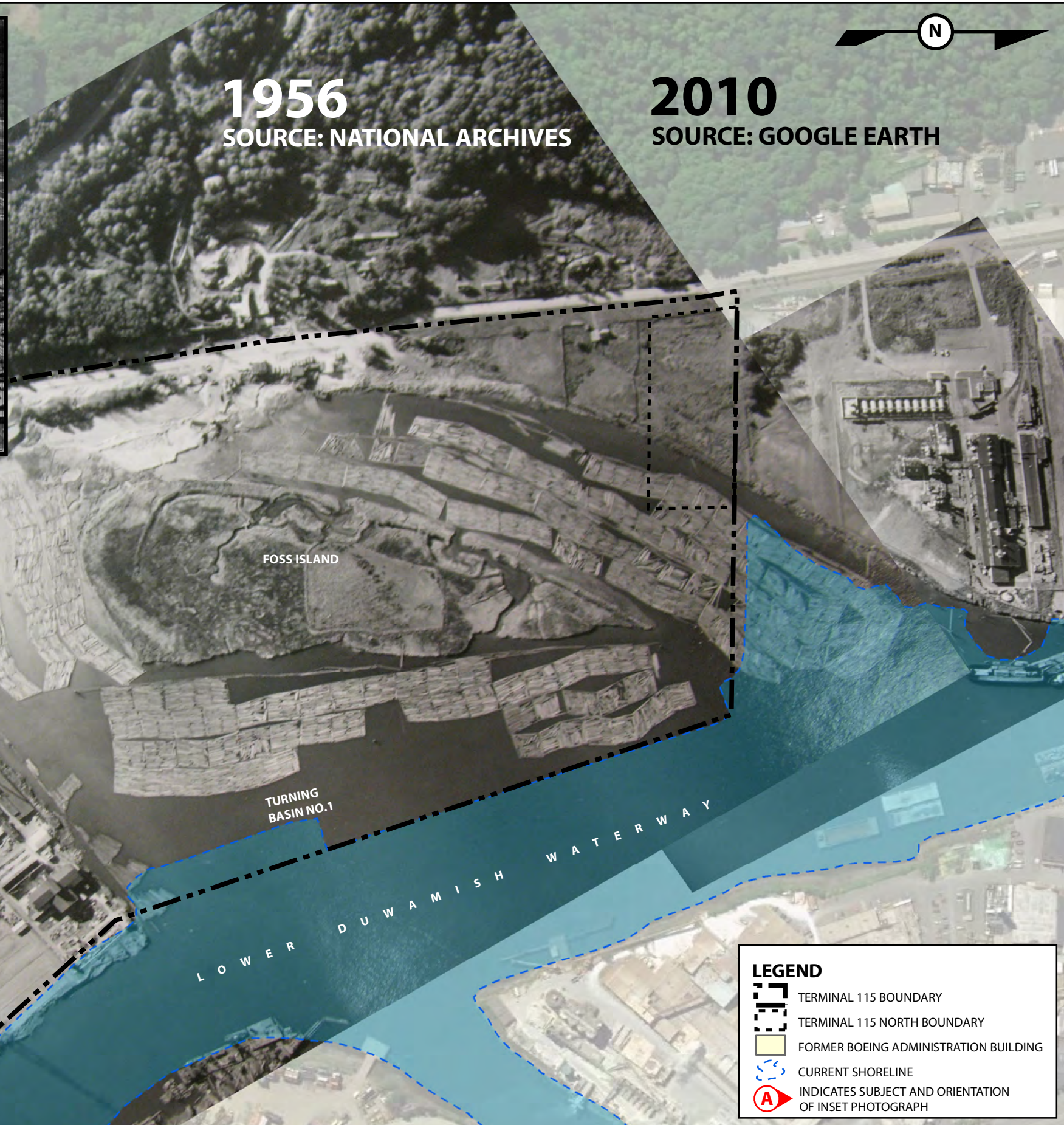
1954

SOURCE: CITY OF SEATTLE
MUNICIPAL ARCHIVES



1956

SOURCE: NATIONAL ARCHIVES

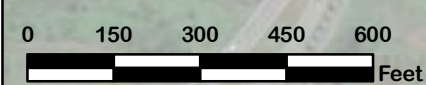


2010

SOURCE: GOOGLE EARTH

LEGEND

- TERMINAL 115 BOUNDARY
- TERMINAL 115 NORTH BOUNDARY
- FORMER BOEING ADMINISTRATION BUILDING
- CURRENT SHORELINE
- INDICATES SUBJECT AND ORIENTATION OF INSET PHOTOGRAPH



APPENDIX A: PHOTO A-4
1954-1956

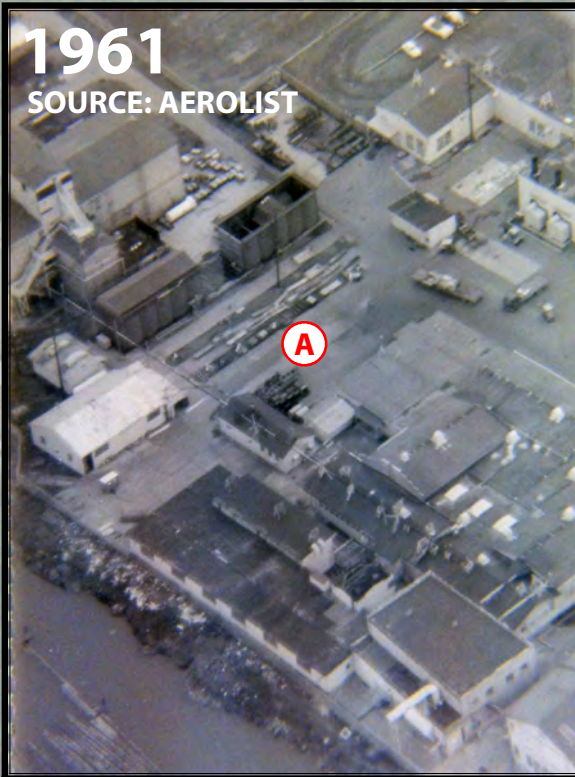
PROJECT NUMBER: 0675-001-01
ADDRESS: WEST MARGINAL WAY SW
CITY, STATE: SEATTLE, WASHINGTON

DATE: 11/1/10
DRAWN BY: NAC
CHECKED BY: CMC



1961

SOURCE: AEROLIST



1961

SOURCE: AEROLIST

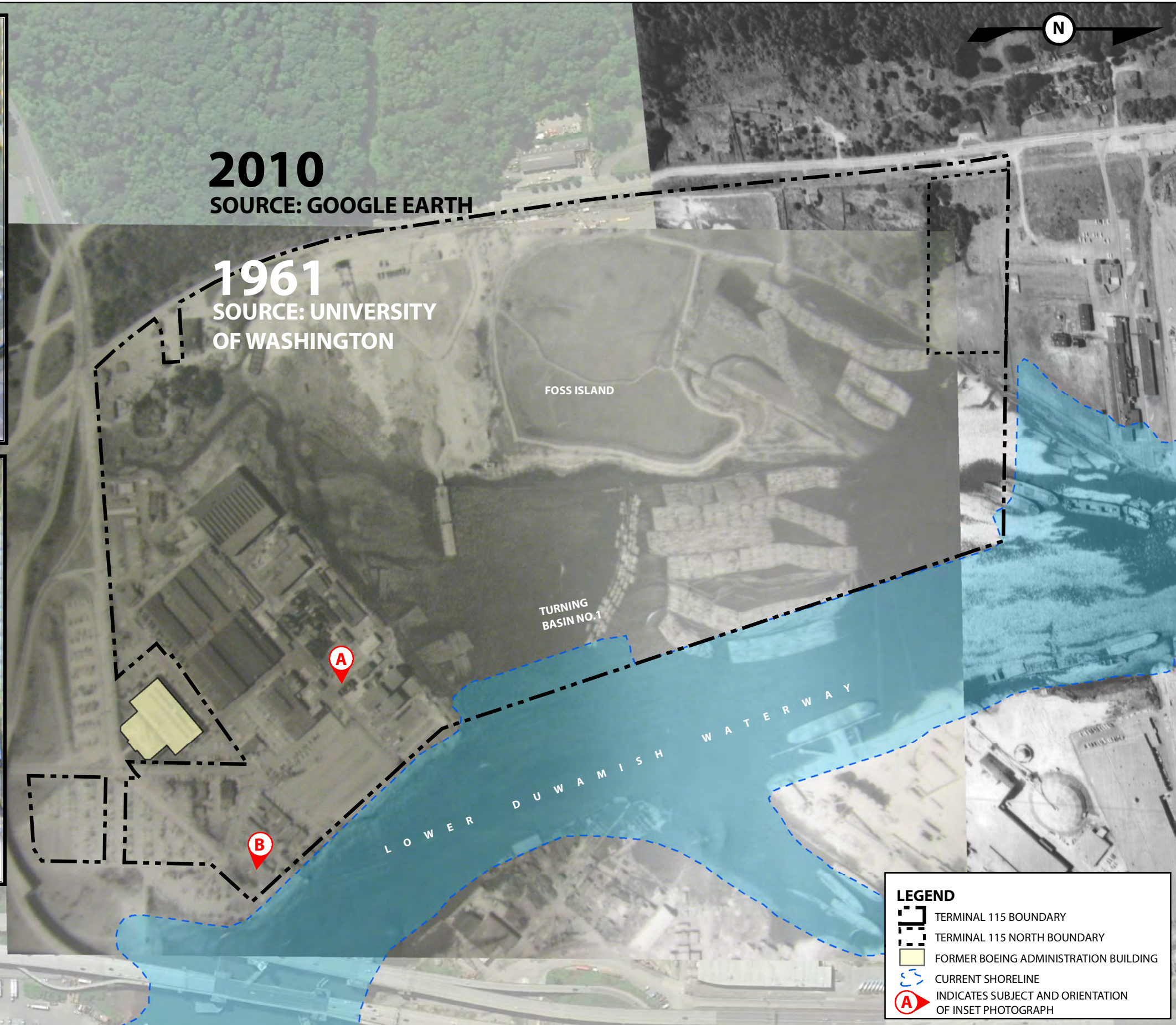


2010

SOURCE: GOOGLE EARTH

1961

SOURCE: UNIVERSITY OF WASHINGTON



0 150 300 450 600 Feet

LEGEND

- TERMINAL 115 BOUNDARY
- TERMINAL 115 NORTH BOUNDARY
- FORMER BOEING ADMINISTRATION BUILDING
- CURRENT SHORELINE
- INDICATES SUBJECT AND ORIENTATION OF INSET PHOTOGRAPH

APPENDIX A: PHOTO A-5
1961

PROJECT NUMBER: 0675-001-01
ADDRESS: WEST MARGINAL WAY SW
CITY, STATE: SEATTLE, WASHINGTON

DATE: 11/1/10
DRAWN BY: NAC
CHECKED BY: CMC



1968

SOURCE: AEROLIST



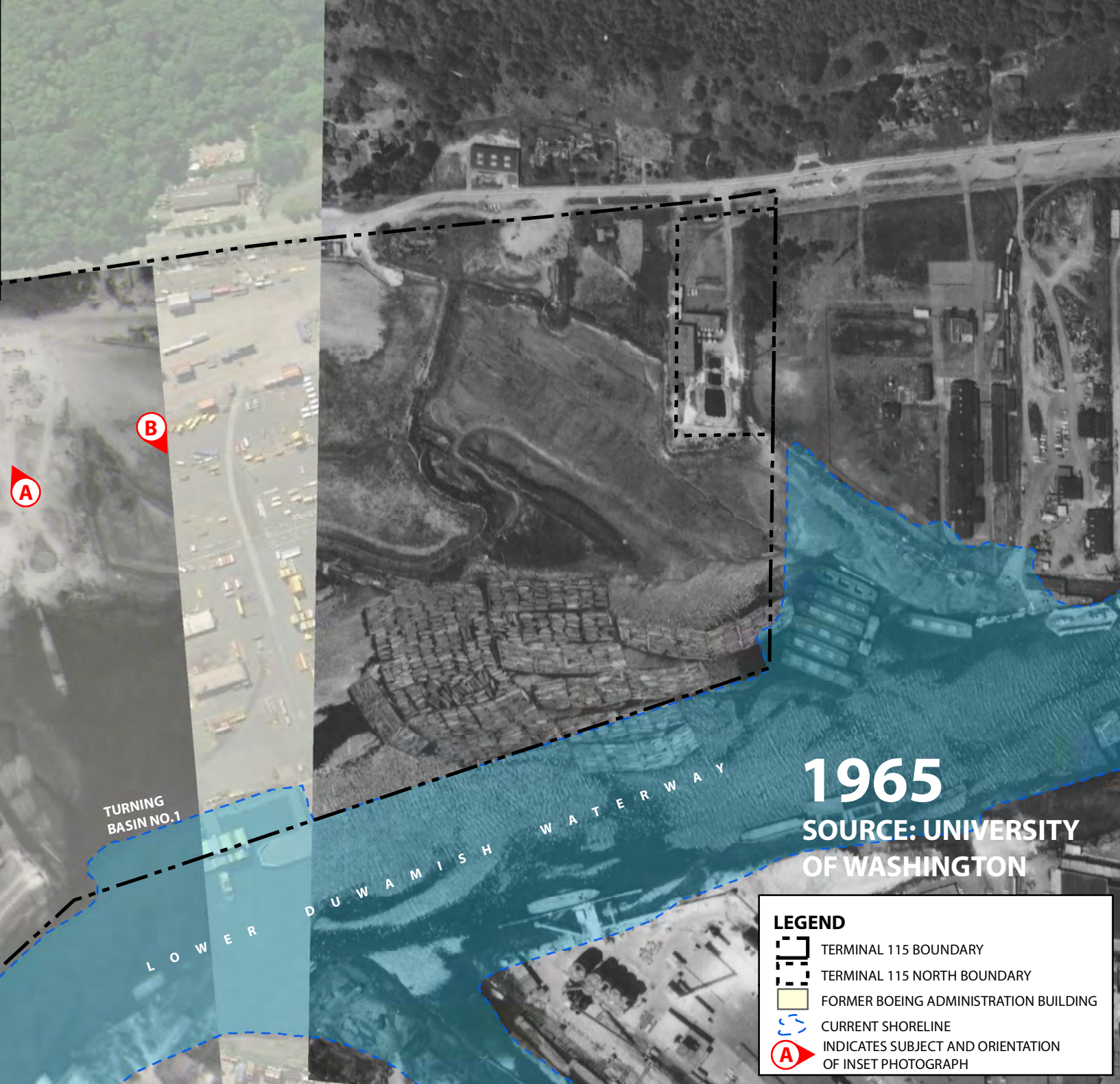
1963

SOURCE: AEROLIST



2010

SOURCE: GOOGLE EARTH



1963

SOURCE: AEROLIST

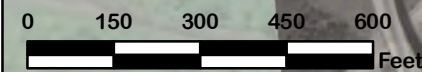


1965

SOURCE: UNIVERSITY OF WASHINGTON

LEGEND

- TERMINAL 115 BOUNDARY
- TERMINAL 115 NORTH BOUNDARY
- FORMER BOEING ADMINISTRATION BUILDING
- CURRENT SHORELINE
- INDICATES SUBJECT AND ORIENTATION OF INSET PHOTOGRAPH

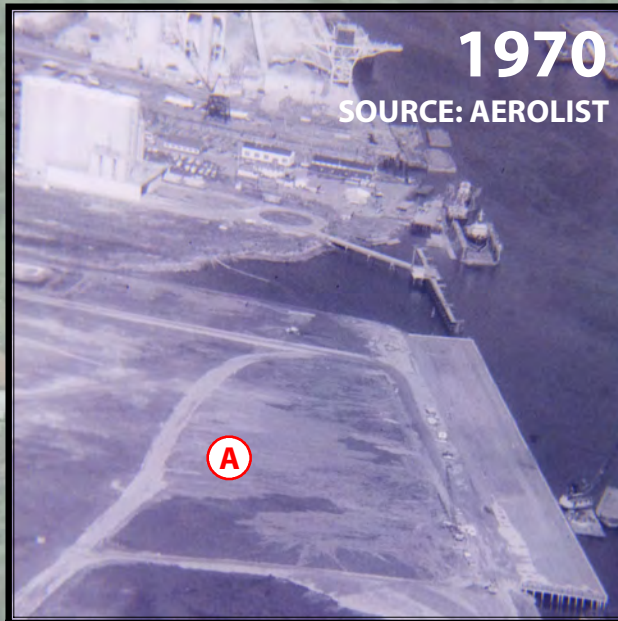


APPENDIX A: PHOTO A-6
1963-1968

PROJECT NUMBER: 0675-001-01
ADDRESS: WEST MARGINAL WAY SW
CITY, STATE: SEATTLE, WASHINGTON

DATE: 11/1/10
DRAWN BY: NAC
CHECKED BY: CMC





1970
SOURCE: AEROLIST



1969
SOURCE:
PORT OF SEATTLE








1970
SOURCE:
UNIVERSITY OF
WASHINGTON



0 150 300 450 600
Feet

1970
SOURCE: UNIVERSITY
OF WASHINGTON

LEGEND

-  TERMINAL 115 BOUNDARY
-  TERMINAL 115 NORTH BOUNDARY
-  FORMER BOEING ADMINISTRATION BUILDING
-  CURRENT SHORELINE
-  INDICATES SUBJECT AND ORIENTATION OF INSET PHOTOGRAPH

APPENDIX A: PHOTO A-7
1969-1970

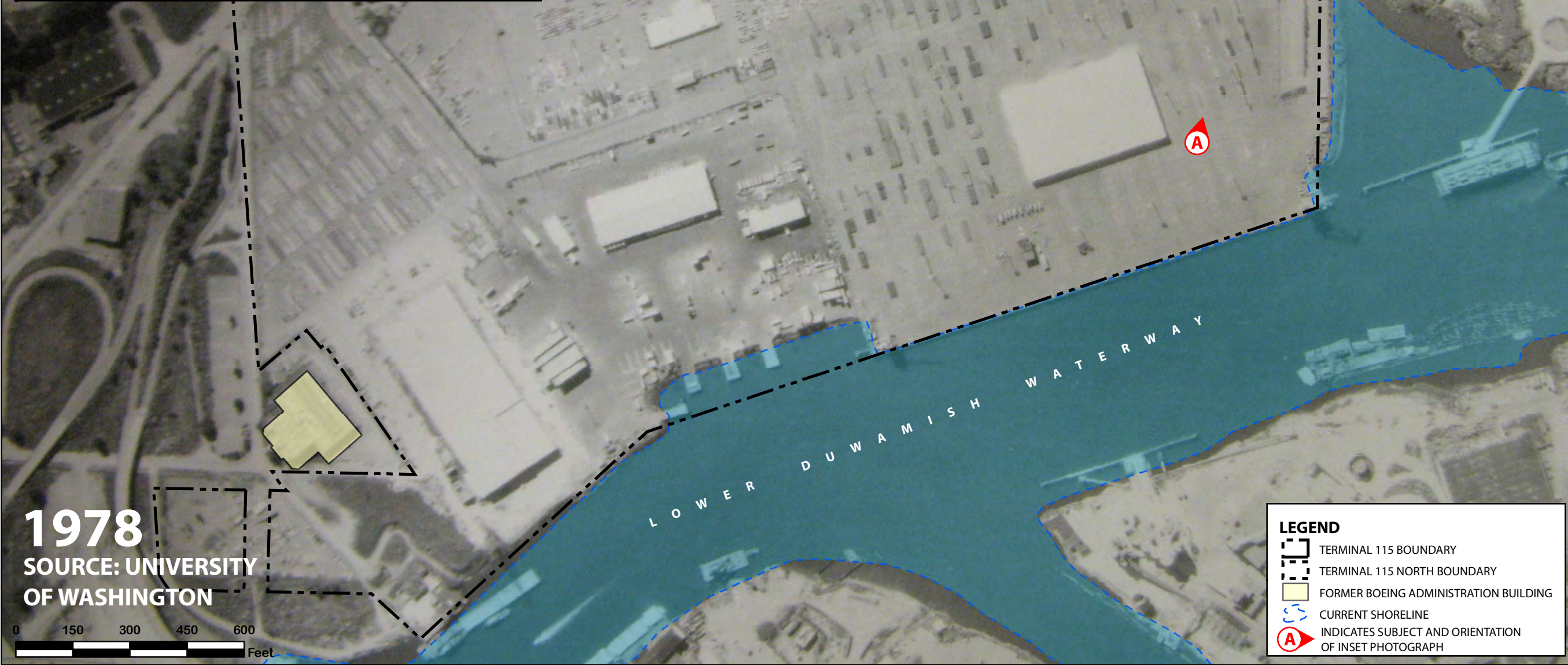
PROJECT NUMBER: 0675-001-01
ADDRESS: WEST MARGINAL WAY SW
CITY, STATE: SEATTLE, WASHINGTON

DATE: 11/1/10
DRAWN BY: NAC
CHECKED BY: CMC



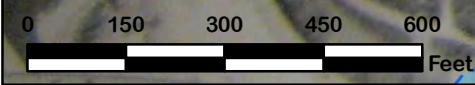
1970

SOURCE: AEROLIST








1978

SOURCE: UNIVERSITY OF WASHINGTON



LEGEND

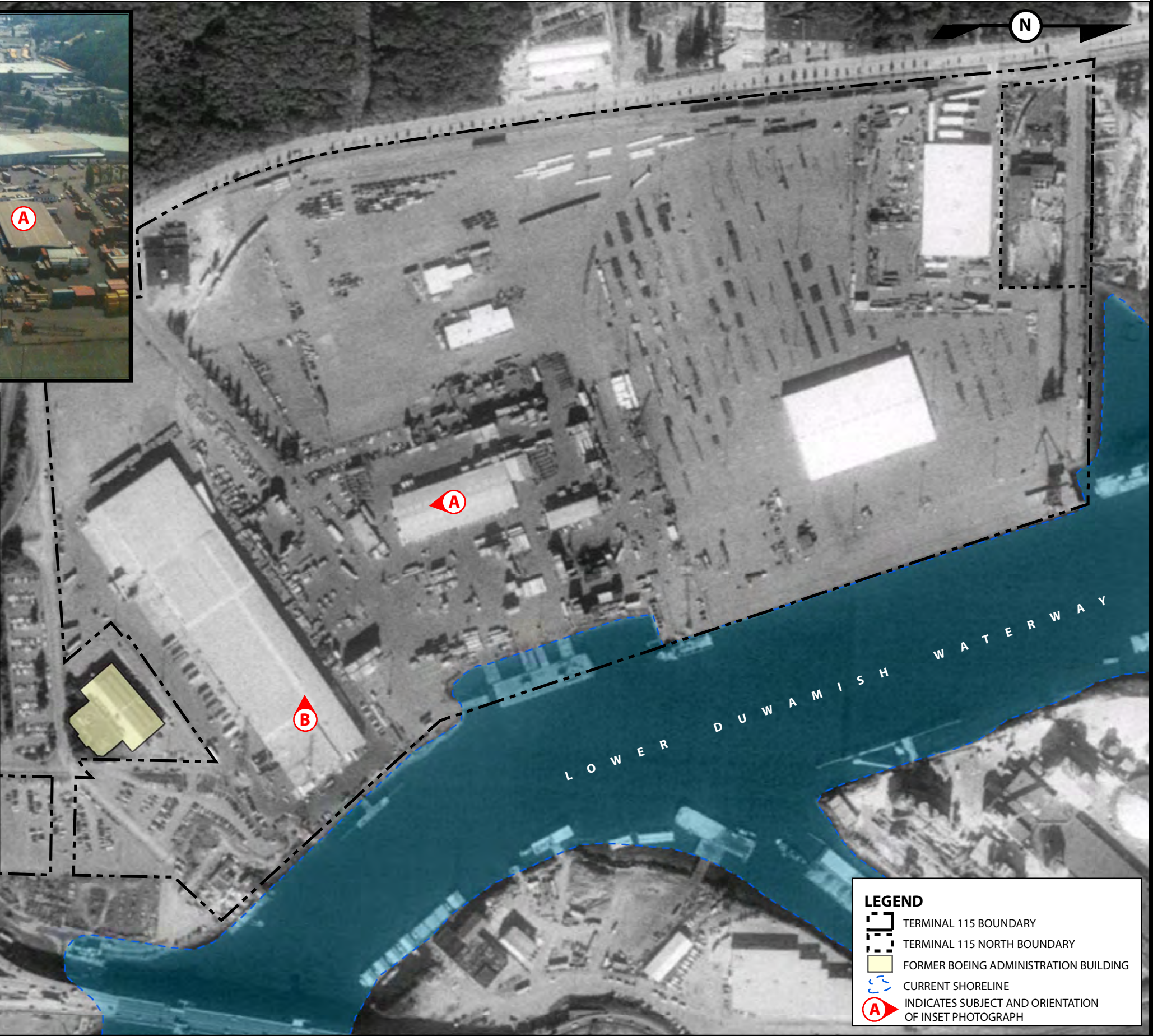
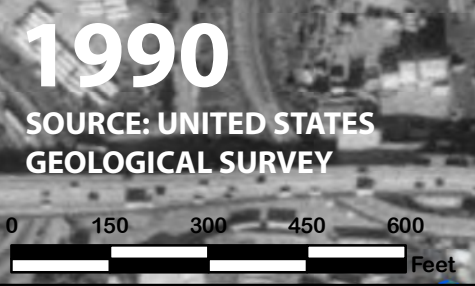
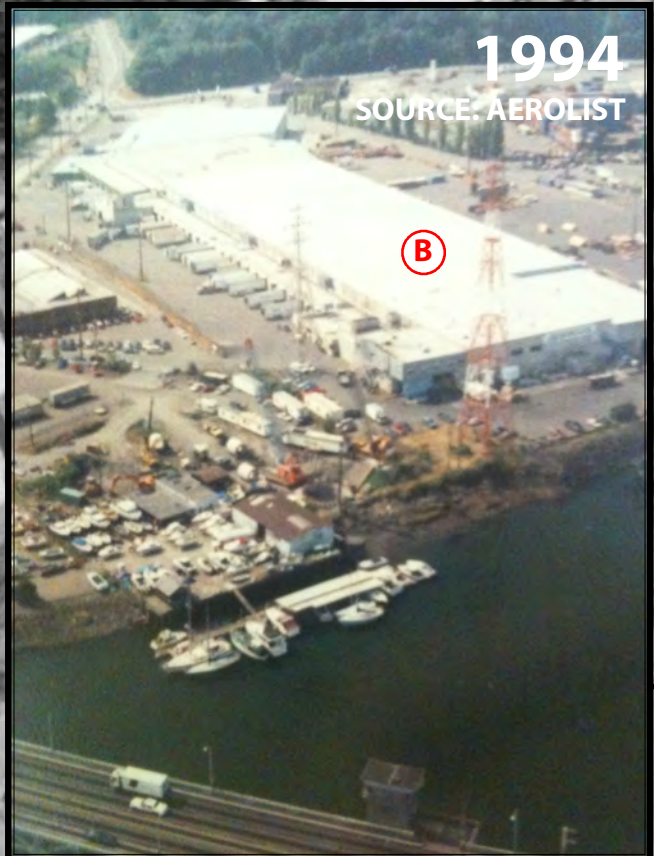
-  TERMINAL 115 BOUNDARY
-  TERMINAL 115 NORTH BOUNDARY
-  FORMER BOEING ADMINISTRATION BUILDING
-  CURRENT SHORELINE
-  INDICATES SUBJECT AND ORIENTATION OF INSET PHOTOGRAPH

APPENDIX A: PHOTO A-8
1970-1978

PROJECT NUMBER: 0675-001-01
ADDRESS: WEST MARGINAL WAY SW
CITY, STATE: SEATTLE, WASHINGTON

DATE: 11/1/10
DRAWN BY: NAC
CHECKED BY: CMC





- LEGEND**
- TERMINAL 115 BOUNDARY
 - TERMINAL 115 NORTH BOUNDARY
 - FORMER BOEING ADMINISTRATION BUILDING
 - CURRENT SHORELINE
 - INDICATES SUBJECT AND ORIENTATION OF INSET PHOTOGRAPH

APPENDIX A: PHOTO A-9
1990-1994

PROJECT NUMBER: 0675-001-01
ADDRESS: WEST MARGINAL WAY SW
CITY, STATE: SEATTLE, WASHINGTON

DATE: 11/1/10
DRAWN BY: NAC
CHECKED BY: CMC





2002
SOURCE: GOOGLE EARTH

LEGEND	
	TERMINAL 115 BOUNDARY
	TERMINAL 115 NORTH BOUNDARY
	FORMER BOEING ADMINISTRATION BUILDING
	CURRENT SHORELINE

APPENDIX A: PHOTO A-10
2002

PROJECT NUMBER: 0675-001-01
ADDRESS: WEST MARGINAL WAY SW
CITY, STATE: SEATTLE, WASHINGTON

DATE: 11/1/10
DRAWN BY: NAC
CHECKED BY: CMC





Appendix B

IEC Reference Materials



APPENDIX B IS INCLUDED IN THE ATTACHED CD



Appendix C Reports by Others



APPENDIX C IS INCLUDED IN THE ATTACHED CD